



**METROPOLITAN COAL CONSTRUCTION MANAGEMENT PLAN**

**SURFACE WORKS ASSESSMENT FORM**

**EXPLORATION BOREHOLES AND SUBSIDENCE MONITORING SURVEY  
LINE EXTENSION**

**JANUARY 2020**

# Metropolitan Coal

## Proposed Installation of Exploration Boreholes and Subsidence Monitoring Survey Line Extension

### Background

The subject Surface Works Assessment Form (SWAF) is submitted to Department of Planning, Industry & Environment (DPIE) and WaterNSW for the proposed vegetation clearance of an extension to a survey line to measure subsidence and installation of exploration boreholes.

Creating a defined path will allow surveyors to walk the same route rather than varied routes each time, in order to lessen the potential impacts to vegetation. The surveys will be used for a number of monitoring operations in accordance with the Metropolitan Coal Project Approval and associated Environmental Management Plans and Monitoring Programs.

The boreholes will be drilled using a truck mounted rig and track mounted rod handler. The boreholes will be drilled to various diameters (as summarised in Table 1) and depths of 600m. Vibrating wire piezometers (VWP) will be installed at various depths to measure groundwater behaviour.

A summary of the boreholes and survey line extension proposed in this SWAF is provided in Table 1.

**Table 1**

Site	Easting	Northing	Vegetation Clearing	Borehole Instrumentation	Borehole diameter
2020EX01	310411	6215826	30m x 30m (900m <sup>2</sup> )	VWP	122 mm
2020EX02	312268	6217920	15m x 60m (900m <sup>2</sup> )	VWP	122 mm
300XL (East End)	311763	6216698	3m wide clearing	N/A	N/A
300XL (West End)	311125	6216917	3m wide clearing	N/A	N/A

This SWAF provides details of construction and environmental management measures for the proposed works as outlined in the Metropolitan Coal Construction Management Plan (ConMP), approved by DP&E on 25 August 2015.

### Site Location

The site is within the Woronora Special Area in the local government area (LGA) of Wollongong City Council. The Woronora Special Area covers a region of approximately 75 square kilometres (km<sup>2</sup>) and includes the catchment of Woronora Dam. WaterNSW manages the Woronora Special Area and public access is restricted.

The proposed activities are situated within the Metropolitan Coal mining lease (Consolidated Coal Lease (CCL) 703). The township of Helensburgh is located approximately 5 km to the east.

### **Water Management and Cuttings Containment**

Each borehole will require approximately 40,000 litres of water to lubricate the drill bit and flush the well of cuttings which will then be deposited into a closed reticulated system (i.e. the above ground containerised drill water sumps).

Delivery of drilling water to the borehole site will involve deployment of water tanks to the drill site, to act as a large volume reservoir for supply water.

Drill cuttings and fines will be captured in the containerised drill water settling tanks. Solids from these tanks will be pumped out by enclosed vacuum truck as required and disposed of at a registered landfill site or utilised back at the mine site.

### **Installation and Operation of Equipment**

The exploration boreholes and 2020EX01 and 2020EX02 will be grouted following the completion of relevant test work and installation of VWP's.

### **Site Rehabilitation**

Construction sites will be rehabilitated in accordance with Metropolitan Coal's Rehabilitation Management Plan.

The area disturbed by the footprint of the drill rig, rod carriers, settling tanks and access tracks will be remediated.

### **Fuel Management**

Large quantities of fuel will not be stored on site with fuel brought to site for refuelling only if and when required. Care will be taken not to spill fuel. Oil/fuel absorbent materials or other containment materials will be made available at the site to prevent contact with the surrounding environment.

Equipment (e.g. drill rigs, pumps) will be regularly inspected for leaks of oil/fuel/coolant. Impervious bunding will be provided with greater than 110% of the capacity of the item being banded. Spill containment/treatment resources (i.e. spill kits) will be provided. The spill kits will include: absorbent material 40 L bag of Organic Oil/Fuel absorbent; absorbent pads: 20 of 480 X 430 mm pads; garbage bags; shovel; and a bag of rags.

Any spill that occurs will be immediately cleaned up and reported to:

- the site supervisor;
- the Metropolitan Coal Environment & Community Superintendent (Stephen Love 0417 584 121); and
- WaterNSW (via the incident Management Number 1800 061 069).

The site supervisor and the Metropolitan Coal Environment & Community Superintendent will investigate any spills.

### **Human Waste Water**

A portable toilet will be located on a proximal access road near the construction sites. The toilet will be serviced fortnightly.

## Construction Management Plan Surface Works Assessment Form

**Note, this form must be completed in full  
prior to the commencement of surface disturbance works**

**Date:** January 2020

**Name and position:** Stephen Love (Environment and Community Superintendent)

**Register number (i.e. Number 1, 2, etc.):**

**RMP register number:** 14

**Site name:**

- 2020EX01 Exploration Borehole
- 2020EX02 Exploration Borehole
- 300XL Survey Line

**Site type:**

Exploration Boreholes (2020EX01 and 2020EX02) and Subsidence Monitoring Survey Line Extension (300XL).

**Site co-ordinates (easting/northing):**

Site	Easting	Northing
2020EX01	310411	6215826
2020EX02	312268	6217920
300XL	311763 to 311125	6216698 to 6216917

**Expected duration of works:** 12 weeks (weather permitting)

**Works schedule:**

- Describe the activities (including timing) to be conducted during construction works.

- *Establishment and implementation of pre-construction management measures (e.g. erosion and sediment controls, vegetation clearance)*

Exploration Boreholes (2020EX01 and 2020EX02)

*Borehole site development occurs in two (2) stages: site preparation and drilling*

*Site preparation will involve:*

- *Use of existing tracks and fire trails, negating the need to prepare a new access track*
- *Use of trittering attachment to mulch vegetation in-situ*
- *Excavator to prepare each borehole site (including a level drill pad and border set down and work area)*
- *Erosion and sediment controls*

Drilling of boreholes will involve:

- Delivery of tray and track mounted drill rigs to site (including ancillary equipment)
- Water delivery (each borehole will use approximately 40,000 litres of water to lubricate and flush cuttings which will be deposited into a closed reticulated system i.e. an above-ground containerised drill water sump). Containerised drill water and cuttings will be removed from site.
- Use of rotary or hammer drilling to target depth using appropriate drilling techniques to prevent well head pressure loss and aquifer contamination
- Recovering core material from drill column, cataloguing and removing from site
- Sealing of the Borehole(s) to the surface with a cement/bentonite mix as per the standard requirements of Division of Resources and Geoscience (DRG)
- Revegetation (Brush Matting, planting and/or direct seeding)
- Site clean-up (e.g. removal of equipment, materials and waste)
- Monitoring during and following completion of construction

#### 300XL Subsidence Monitoring Survey Line Extension

After completion of Flora, Fauna and Archaeological Assessments identify the straightest possible line of sight extension of 300XL Subsidence Monitoring Survey Line and mark with tape.

Cut a 3m wide trail by trittering the vegetation above ground level and leaving the lower stems and roots in-situ to maximise the potential for natural regrowth; Vegetation cuttings will be placed in a random pattern to Brush Matt areas of disturbance. Vegetation disturbance will be minimised to the smallest footprint required.

#### **Review of baseline information - site features (refer Section 5 of the ConMP)**

**Are any of the following features located within the proposed disturbance area or immediate surrounds?**

Are there occurrences of the Southern Sydney Sheltered Forest on transitional Sandstone Soils EEC in the general area? **No**

Are there occurrences of the O'Hares Creek Shale Forest EEC in the general area? **No**

Are upland swamps located in the general area? **Yes**

Are there records of known threatened flora species in the general area? **Yes**

*The proposal aims to avoid threatened flora.*

Are there records of known threatened fauna species in the general area? **Yes**

*The proposal aims to avoid threatened fauna.*

Are existing (or proposed) monitoring sites located nearby? **No**

What vegetation type is present?

*Sandstone gully apple-peppermint forest, Exposed sandstone scribbly gum woodland, Silvertop ash ironstone woodland, and Sandstone heath-woodland, Rock plate heath-mallee. Neither the proposed Boreholes or extension of the Subsidence Monitoring Survey Line will significantly impact any Threatened Ecological Communities (TEC).*

Are known Aboriginal heritage sites present? **Yes**

Is this an area in which disturbance is to be avoided and/or limited? (refer Sections 6.1.1 and 6.1.2 of the ConMP) **No**

**If the proposed disturbance area is located in an area to be avoided or limited, relocate site where appropriate in accordance with the requirements of the ConMP**

Date of survey for threatened flora.

*24<sup>th</sup> and 27<sup>th</sup> of September 2019*

Name of suitable qualified ecologist conducting survey

*Sarah Webb (Senior Environmental Approvals Consultant), Renee Regal (Senior Heritage Team Leader) and Simon Tweed (Senior Ecology Team Leader) of Niche Environment and Heritage, Layne Holloway (Heritage Consultant) and Sarah Hart (Ecologist).*

Have any threatened flora been identified within the proposed disturbance area or immediate surrounds. **Yes**

Scientific names of threatened flora species recorded.

*Pultenaea aristata.*

Will works be relocated to avoid or minimise impacts on the threatened flora species? **Yes**

*The Exploration Borehole construction sites and Subsidence Monitoring Survey Line Extension have been located to avoid the known records of Pultenaea aristata. Individuals will be demarcated and their location made known to project personnel so they can be avoided and protected during works. With the mitigation measures in place, minimal impact to Pultenaea aristata is expected as a result of the proposed works.*

If it is not feasible to relocate the works, have the impacts of the proposed works on the population of the threatened flora species been assessed by a suitably qualified and experienced ecologist? **N/A**

**If No, do not proceed**

Has the assessment concluded that the proposed surface activities are likely to have a significant impact on a population of the threatened flora species? **No**

**If Yes, the proposed works are to be modified to avoid such an outcome**

[Attach any relevant ecological reports to this assessment form]

*Flora, Fauna and Archaeological Assessment – Metropolitan Coal Exploration Borehole Sites and Subsidence Monitoring Survey Line (Attachment 1)*

**Vegetation clearance and site access (refer Section 6.1.6 of ConMP)**

Is vegetation clearing required for the construction works? If yes, describe extent (e.g. m<sup>2</sup>) and method of clearing (e.g. slashing/lopping branches/removal)? **Yes**

*The proposed borehole sites and subsidence monitoring survey line will result in up to approximately 0.41 hectares of primary clearing, additionally proposed works will occur in 0.21 ha of previously cleared areas along existing tracks Fire Trail 9I and an unnamed track from 9E. With the proposed mitigation measures in place, the proposal is unlikely to result in any significant impact on any TEC, or threatened species listed.*

Describe the access requirements for the construction site (e.g. vehicle/pedestrian/helicopter) and where the access will be from (e.g. which fire road).

*Existing Fire Trail 9I and 9E (including an unnamed track from 9E) will be used for siting/delivery of equipment and for access to sites.*

Is vegetation clearing required for site access? If yes, describe the extent and method of clearing? **No**

### **Vegetation management measures to be implemented (refer Section 6.1.4 of the ConMP)**

*Disturbance would be appropriately limited by the following mitigation measures:*

- *Care will be taken to minimise disturbance to vegetation.*
- *Pultenea aristata individuals demarcated with tape and their location made known to project personnel so they can be avoided and protected during works.*
- *Existing fire trails, tracks and exposed bedrock will be used for access and placement of equipment.*
- *Erosion and sediment controls to be implemented as appropriate on downslope sides of the site as per Metropolitan Coal Construction Management Plan to ensure that no sediment from drilling or other earth works enters adjacent table drains.*
- *Cleared vegetation will be placed within the footprint of clearing and not on adjacent vegetation.*

### **Site Layout Plan (refer Section 6.1.5 of ConMP)**

Has a Site Layout Plan been prepared and attached to the Works Assessment Form? **Yes**

*Refer to Figures in Attachment 1*

Have the following been indicated on the Site Layout Plan? **Yes**

- Site location
- Works design
- Management measures (e.g. erosion and sediment controls, spill kits)
- Access track/s (indicate type of access, e.g. pedestrian/vehicle. Also indicate location of nearest fire trail where access will be from)
- Areas of vegetation clearance
- Location of equipment (e.g. pump, generator, fuel storage, portable toilets)
- Equipment storage areas
- Safety equipment (e.g. fire extinguisher and first aid kit)

**Attach photographs, where appropriate**



*Photo showing unnamed access track from Fire Trail 9E and Exploration Borehole site 2020EX02 overview.*



*Photo showing Exploration Borehole site 2020EX01 overview*

**Aboriginal heritage pre-clearance survey (refer Section 6.2 of the ConMP)**

Date of pre-clearance survey for Aboriginal heritage sites.

*A visual inspection was conducted on the 24<sup>th</sup> and 27<sup>th</sup> September 2019 with an extensive search of the Aboriginal Heritage Information Management System (AIMS) on the 18<sup>th</sup> October 2019.*

Name of suitably qualified archaeologist conducting survey

*Renee Regal (Senior Heritage Consultant and Team Leader Aboriginal Heritage) and Layne Holloway (Heritage Consultant).*

Are any Aboriginal heritage sites identified within the proposed disturbance area or immediate surrounds?

**No**



Description of recorded Aboriginal heritage sites. **N/A**

Will works be relocated to avoid impacts on the Aboriginal heritage site? **N/A**

If it is not feasible to relocate the works to avoid impacts to the Aboriginal heritage site, management and/or mitigation measures to be implemented in accordance with the Metropolitan Mine Heritage Management Plan. Describe measures below. **N/A**

Where avoidance is not practicable, has a comprehensive baseline record been obtained and salvage considered in consultation with Aboriginal stakeholders prior to disturbance. **N/A**

*Niche Environment and Heritage's "Metropolitan Colliery Surface Works Assessment – Aboriginal Objects Due Diligence Assessment – Stage 1 Exploration Sites 2020EX01, 2020EX02 and Subsidence Monitoring Line 300XL" is attached as Attachment 2.*

### **Known Aboriginal heritage sites located close to surface disturbance works**

Details of demarcation (e.g. fencing, sign-posting or temporary flagging) implemented to avoid accidental damage to known Aboriginal heritage sites located close to surface disturbance works.

*An Aboriginal Objects Due Diligence Assessment has concluded there will be negligible risk of harm to Aboriginal objects.*

### **Erosion or sediment control measures required?**

- Is any erosion or sediment control required? **Yes**
- If yes, has an Erosion and Sediment Control Plan been prepared and attached to the Surface Works Assessment Form? **Yes**

### **Fuel and spill management measures required?**

- Are compressors and pumps bunded and with sufficient capacity? **Yes**
- Where fuels are used, are spill kits available at the construction site? **Yes**
- Have personnel been trained in spill clean-up procedures? **Yes**

### **List Hazardous Materials and Storage Requirements**

- What hazardous materials are required to be used and how will they be stored on site?

*If fuel (diesel or petrol) is required at the sites it will be stored on-site during construction works in bunded containers.*

- Are Materials Safety Data Sheets (MSDS) for hazardous materials located at the construction site? **Yes**

### **Bushfire Preparedness and Management**

- Have MCPL staff and contractors been provided with fire awareness and fire safety training? **Yes**
- Has a Hot Work Permit been obtained from the Water NSW if required? **N/A**

## **Erosion and Sediment Control Plan**

Correct location, design of the work site and work practices will minimise the risk of erosion and sedimentation at each of the sites. Effectively managing this issue will be achieved by carrying out the following:

- Minimise the disturbance area of the access trails and work site, this will accordingly reduce the likelihood and severity of erosion needing to be controlled
- Slashing or vegetation disturbance will be conducted following the strategies listed in the vegetation management section above;
- Correct aspect and site location. The sites have been selected in appropriate areas that will minimise the risk of erosion (i.e. flat sites, not on hard rock);
- Sediment control will be managed in accordance with the Blue Book (Volume 1 and Volume 2E), including the installation of sediment fences as per the standard drawing 6-8 of the Blue Book Volume 1;
- Whilst drilling is being conducted, the collar of the drill hole will have a section installed to allow sediment to be deposited directly into a baffled tank for collection. Cuttings will be removed at the half way point of each drilling program and then again upon completion of the bore;
- All workers will be trained in the appropriate work practices and the drilling operation will be constantly manned whilst in operation.

## **Attachment 1**

*“Flora, Fauna and Archaeological Assessment – Metropolitan Coal Exploration Borehole Sites and Subsidence Monitoring Survey Line” dated 9<sup>th</sup> January 2020 (Project No: 5365).*

**Flora, Fauna and Archaeological Assessment  
Metropolitan Coal Exploration Borehole Sites and Subsidence Monitoring  
Survey Line**

Helensburgh, NSW

Prepared for Metropolitan Coal Pty Ltd

Prepared by Niche Environment and Heritage | 22 January 2020



## Document control

Project number	Client	Project director	Project manager	LGA
5365	Metropolitan Coal	Chris McEvoy	Sarah Webb	Wollongong City Council

Version	Author	Review	Status	Date
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D2	Sarah Hart	Sarah Webb	Draft	25 October 2019
R0	Sarah Hart	Metropolitan Coal	Draft	05 November 2019
R1	Sarah Hart	-	Final	06 November 2019
R2	Sarah Hart	Metropolitan Coal	Final	12 December 2019
R3	Richard Sheehan	Richard Sheehan	Final	08 January 2020
R4	Richard Sheehan	Richard Sheehan	Final	21 January 2020

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## Executive summary

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Niche Environment and Heritage (Niche) has undertaken an assessment of the ecological and archaeological constraints and potential impacts associated with the development of two proposed exploration borehole sites and the extension of the subsidence monitoring survey line by Metropolitan Coal.

The two proposed borehole sites, 2020EX01 and 2020EX02, are required for exploration. The extension of a subsidence monitoring survey line (300XL) by approximately 670m is required for the regular survey which monitors potential subsidence.

The proposal seeks to minimise disturbance by using previously developed tracks where possible. It would result in approximately 0.4 hectare of primary clearing, additionally 0.11 ha is in previously cleared areas along existing tracks Fire Trail 9I and an unnamed track from 9E.

Provided the mitigation measures are implemented, the proposal will not cause any significant impact to any Threatened Ecological Communities (TEC) or threatened biodiversity listed on the NSW *Biodiversity Conservation Act 2016* (BC Act) and Commonwealth *Environment Protection Biodiversity Conservation Act 1999* (EPBC Act).

The proposed sites have been inspected by an archaeologist. An Aboriginal Objects Due Diligence Assessment has concluded there will be no adverse effects to Aboriginal cultural heritage sites as a result of the proposed borehole sites and access tracks (refer Annex 3).

The relevant management measures as outlined in the Metropolitan Coal Construction Management Plan shall be implemented in order to minimise impacts to the environment.

This report supports the Surface Works Assessment Form required to be completed for the proposed activities under the Metropolitan Coal Construction Management Plan. Metropolitan Coal will provide the details of the proposed surface construction works (in the form of a completed Surface Works Assessment Form to the DPIE and WaterNSW for comment).

## Table of Contents

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<b>Executive summary</b> .....	<b>i</b>
<b>Table of Contents</b> .....	<b>ii</b>
<b>1. Introduction</b> .....	<b>1</b>
1.1 Context .....	1
1.2 Proposed works .....	1
1.2.1 Borehole sites .....	1
1.2.2 Subsidence monitoring line .....	3
<b>2. Proposed borehole site locations</b> .....	<b>5</b>
<b>3. Environmental assessment</b> .....	<b>7</b>
3.1 Site assessment .....	7
3.2 Impact assessment .....	7
3.3 Recommendations and control measures.....	12
<b>4. Conclusion</b> .....	<b>16</b>
<b>References</b> .....	<b>17</b>
<b>Annex 1 Figures</b> .....	<b>18</b>
<b>Annex 2 Plates</b> .....	<b>28</b>
<b>Annex 3 Aboriginal Objects Due Diligence Assessment</b> .....	<b>30</b>
<b>Annex 4 Threatened flora and fauna likelihood of occurrence</b> .....	<b>31</b>
<b>Annex 5 Assessment of Significance BC Act</b> .....	<b>47</b>
<b>Annex 6 Assessment of Significance EPBC Act</b> .....	<b>51</b>
<b>List of Figures (Annex 1)</b>	
Figure 1: Location of study area .....	19
Figure 2: Site Plan .....	20
Figure 3: Site Plan with vegetation mapping.....	21
Figure 4: AHIMS maps .....	22
Figure 5: Threatened Flora within 10 km .....	23
Figure 6: Threatened Fauna within 10 km.....	24
Figure 7: 2020EX01 Borehole Site Plan .....	25
Figure 8: 2020EX02 Borehole Site Plan .....	26

Figure 9: Subsidence monitoring survey line Site Plan..... 27

**List of Tables**

Table 1: Location of proposed boreholes..... 5

Table 2: Proposed vegetation clearing ..... 8

Table 3: Affected threatened fauna (NSW and Commonwealth) ..... 10

Table 4: Proposed works and mitigation measures ..... 14

**List of Plates**

Plate 1: Site 2020EX01 overview ..... 28

Plate 2: Site 202EX02 overview ..... 28

Plate 3: Site 2020EX01 hollow bearing tree with small hollow ..... 28

Plate 4P: Site 2020EX02 small table drain ..... 28

Plate 5: Site 300XL start of track ..... 29

Plate 6: *Pultenea aristata* individual ..... 29



## 1. Introduction

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### 1.1 Context

Niche Environment and Heritage (Niche) has undertaken an assessment of the ecological constraints and potential impacts associated with the development of two proposed exploration borehole sites (2020EX01 and 2020EX02) and an extension to an existing subsidence survey monitoring line (300XL) by Metropolitan Coal (Refer Figure 1 to Figure 9).

The proposed borehole sites are required for exploration monitoring investigations, the survey line is required for monitoring of subsidence.

### 1.2 Proposed works

#### 1.2.1 Borehole sites

Location details, including site specific environmental constraints, safeguards, and access considerations are outlined below in Table 1. Site plans are provided in Annex 1 (Figure 7 and Figure 8) and site photos are provided in Annex 2.

##### 1.2.1.1 Borehole sites development

Borehole site development occurs in two main stages: site preparation and drilling including supply of water.

#### Site preparation will involve:

- Access via existing fire trails and access tracks wherever possible, negating the need to prepare a new access track.
- Use of a large tractor with a “trittering” attachment to prepare the borehole site (where required). The “trittering” attachment effectively mulches the vegetation in situ, which leaves root balls intact under the ground surface. In areas where machinery access is difficult or is constrained by steep or rugged terrain hand clearing techniques would likely be employed. These techniques both result in much faster vegetative regeneration than standard land clearing techniques, and the mulch left on the surface provides excellent protection against erosion. Most of the proposed sites are on cleared Fire Trail verges and will not require additional clearing (refer Table 1).
- Use of an excavator to prepare each borehole site. Each site includes a level drill pad, and a broader set down and work area (approximately 30 m x 30 m or nominally 900m<sup>2</sup>). Where practicable, in order to reduce vegetation clearing requirements and maximise the use of linear clearing along previous fire trails in particular for sites located adjacent to these fire trails, borehole sites will be set up in a rectangular shape (e.g. 15 m x 60 m) or similar to achieve the required 900m<sup>2</sup>. Proposed site geometry is provided for each site in Annex 1.
- Installation of two above ground containerised drill water sumps (nominally 4m x 2m x 1.5m). The use of containerised drill water sumps is consistent with WaterNSW recommended practice rather than in ground sumps which require excavation and therefore surface disturbance. The use of containerised sumps also allows for the opportunity to reuse water onsite.

- Installation of erosion and sediment controls (surface flows diversion bunding, silt fencing and or silt sausages, filter cloth) around the site to divert offsite flows around the site, direct site runoff to controls to capture and or remove suspended solids.
- Installation of appropriate ground covering material in areas of high activity to reduce soil disturbance at the drill site. Such material may include rubber lattice or a temporary layer of sandstone aggregate on top of geofabric to facilitate local drainage of the surface area.
- The use of large metal plates (3m x 6m x 0.25m) may be used from time to time on access tracks and borehole sites to minimise soil disturbance and provide access to heavy vehicles like water trucks.

**Drilling of boreholes will involve:**

- Delivery and deployment of tray and track mounted drill rigs to site. Delivery vehicles may include custom designed tilt tray trucks or skid steer units.
- Delivery and deployment of ancillary equipment including rod truck/stand, pumps, consumables, core boxes and testing equipment.
- Water delivery to site (see below).
- Use of rotary or hammer drilling to target drilling depth. Drill diameter is typically 96mm or 122mm.
- Use of appropriate drilling techniques to prevent well head pressure loss and aquifer contamination.
- Recovering any core samples from the drill column, cataloguing them and removing them from site.

Each borehole will use approximately 40,000 litres of water to lubricate the drill bit and flush the well of cuttings which will then be deposited into a closed reticulated system that is the above-ground containerised drill water sumps. Delivery of drilling water to the borehole site by water tanker may also be supplemented by deployment of water tanks to the drill site, to act as a large volume reservoir for supply water.

**1.2.1.2 Borehole site closure and rehabilitation, revegetation.**

Borehole site closure and rehabilitation occurs in two main stages: site closure and rehabilitation, and site revegetation.

**Site closure and rehabilitation will involve the following:**

- Sealing the borehole to the surface with a cement/bentonite mix as per the standard requirements of Division of Resources and Geoscience (DRG).
- Capping and reporting the sealed borehole to the standards required by the DRG.
- Tanker access to the drill sites will be required upon completion of drilling operations to empty the above ground containerised drill water sumps of wastewater and drill cuttings. These materials are transported off-site to an approved disposal site.
- Use of an excavator or similar, to scarify compacted soils to enhance the bed for seed and new vegetative growth, if required.

- Use of an excavator or similar, to place larger items (notably rocks and logs) back over the site in order to arrest water flow over the disturbed ground and provide a structure for emergent seedlings and other regenerating plants to shelter as required.

**Revegetation, if required, may involve the following in isolation or combination:**

- **Brush Matting:** using handheld vegetation cutting equipment to source seed bearing branches from shrubs adjacent to the disturbance footprint and placing those limbs on the disturbed area. Brush matting introduces both locally sourced seed and a physical structure for seedling establishment to a disturbed site.
- **Direct Seeding:** direct seeding may be used to deliver larger quantities of seed to a disturbed site. Direct seeding may use locally sourced or ‘provenance’ seed, or commercially available, sterile cover grass mixes.  
It is noted that the use of cover grass seed is not typically the preferred seed type used in catchment lands as it has potential to increase the presence of weed species in the area, hence cover grass seed will only be used if requested by WaterNSW and under strict management of the site operations team.
- **Planting:** Planting of locally sourced or ‘provenance’ tubestock is typically undertaken to introduce more mature plants to a disturbed site to assist faster regeneration. Planting may be used on very large disturbance footprints to supplement brush matting and or direct seeding.

Given the nature of the disturbance footprint (typically narrow linear disturbance adjacent to Fire Trails) and the existence of high quality native vegetation adjacent to each borehole site, only brush matting, in association with the replacement of larger items (logs and rocks) where required, is proposed.

A typical site layout is shown in Diagram 1.

**1.2.2 Subsidence monitoring line**

Location details, including site specific environmental constraints, safeguards, and access considerations are outlined in Table 1.

Identified safeguards are included in Table 4.

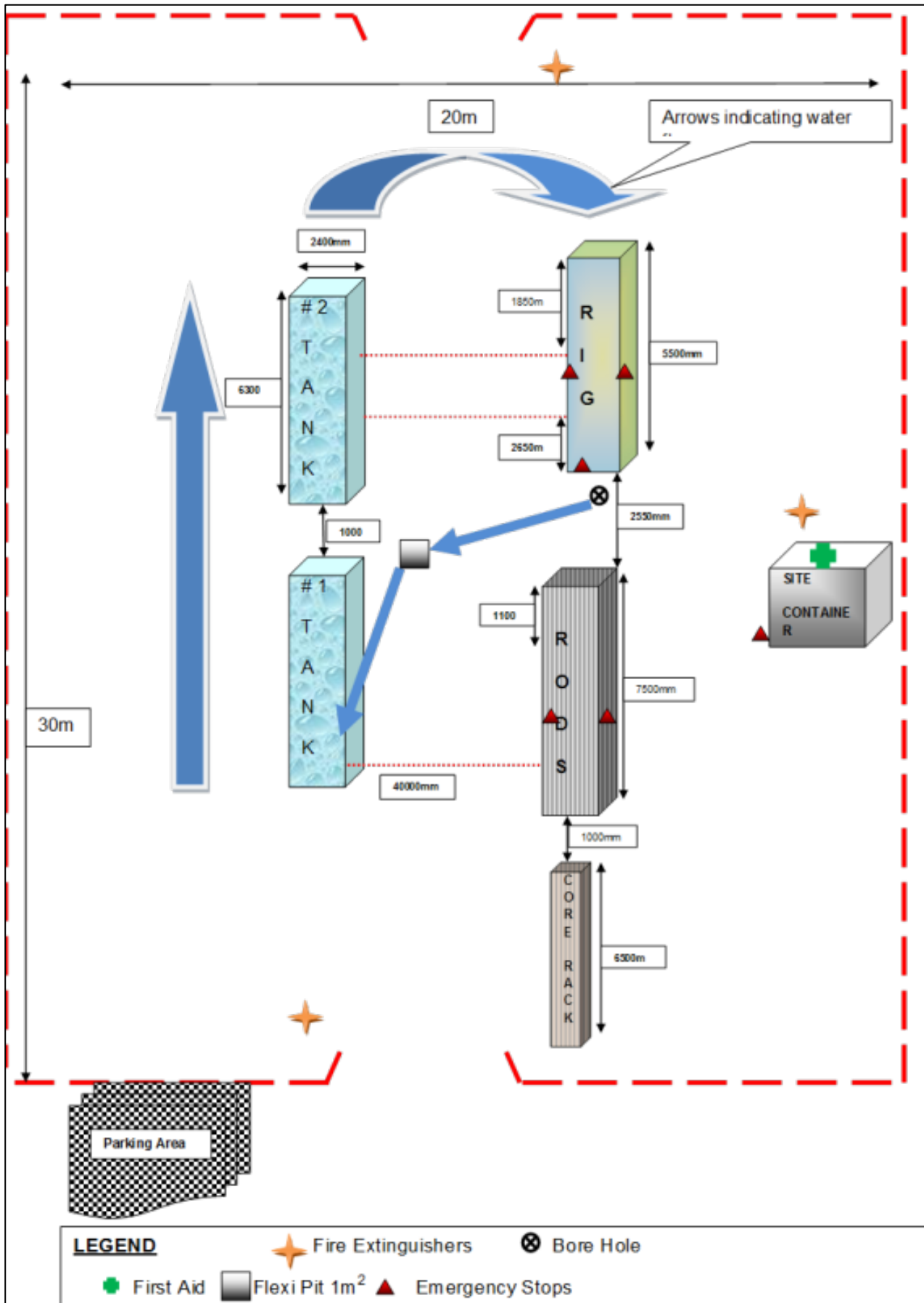
Site plans are provided in Annex 1 (Figure 9) and site photos are provided in Annex 2.

**Site preparation will involve:**

Due to the steep rugged terrain typical vegetation clearing techniques using trittrering are not able to be implemented, and handheld clearing techniques will be utilised. The use of hand clearing also allows for root balls and ground level vegetation to be left intact.

This has the benefit of much faster vegetative regeneration than standard land clearing techniques, with the mulch left on the surface providing excellent protection against erosion. Most of the proposed Subsidence monitoring survey line is within primary vegetation and will require additional clearing (refer Table 1).

Diagram 1 Typical site layout



## 2. Proposed borehole site locations

Details of the proposed borehole site locations, access, site specific constraints are detailed in Table 1. Refer to attached Figures and Borehole Site Plans in Annex 1 and Plates in Annex 2.

**Table 1: Location of proposed boreholes**

Site	MGA56 E	MGA56 N	Purpose	Hole Furniture	Hole diameter	Description of proposed works and site constraints
2020EX01	310411	6215826	600mm deep exploration borehole site to replace S288 from 1960's	10 Vibrating Wire Piezometer (vwp)'s at various depths for pressure monitoring	PQ - 122mm	<ul style="list-style-type: none"> <li>The site is located at the end of an unnamed track to the east of Fire Trail 9E and centred on a turn-around area (approximately 10 m wide) which has been cleared (Plate 1). Access to the site would be via the existing unnamed track and no additional clearing is required.</li> <li>The borehole site would utilise 0.02 ha associated with the previously cleared track and turnaround area.</li> <li>However additional clearing around the edges is required to provide the 30m x 30m borehole site. This will require some additional clearing (up to 0.07 ha) of MU34 Sandstone heath-woodland.</li> <li>Some branch trimming of mature trees (Eucalyptus species) is likely to be required along the access track at two locations (one tree at each location: -34.18076,150.93987; --34.18078, 150.94037). Branches did not contain hollows at one location, whereas a branch at the second location had very small hollows (&lt; 1cm) which would not be used by any threatened or vertebrate fauna.</li> </ul>
2020EX02	321168	6217920	600mm exploration borehole site – characterise FN004	10 Vibrating Wire Piezometer (vwp)'s at various depths for pressure monitoring	PQ - 122mm	<ul style="list-style-type: none"> <li>Access to the borehole site is directly on Fire Trail 9I which is a wide track requiring no further clearing.</li> <li>The site occurs within mapped Coastal Upland Swamps (TEC) and therefore all construction works will be limited to the existing clearing along the Fire Trail 9I.</li> <li>The borehole site is mapped within the Woronora swamps, although the site is directly along the road 10 x 60m (0.06 ha) which has severely modified any swamp habitat. The borehole site will utilise the track and will not require any additional clearing.</li> <li>Adjacent table drains present as likely habitat for the Red-crowned Toadlet.</li> </ul>

Site	MGA56 E	MGA56 N	Purpose	Hole Furniture	Hole diameter	Description of proposed works and site constraints
300XL	311125	6216917	Subsidence monitoring survey line	N/A	N/A	<ul style="list-style-type: none"> <li>• Creation of a survey line for the purposes of subsidence monitoring 675m long and up to 5m wide clearing of vegetation.</li> <li>• Access to the subsidence monitoring line (300XL) is on Fire Trail 9E.</li> <li>• Small areas along the survey line are quite steep and constrained by rocky outcrops</li> <li>• The monitoring line runs east towards the Waratah Rivulet from Fire Trail 9E.</li> <li>• The clearing requires a maximum width of 5m to ensure line of sight to survey markers. Hence primary clearing of; <ul style="list-style-type: none"> <li>○ 0.02ha of MU 25 Sandstone gully apple-peppermint forest,</li> <li>○ 0.06ha of MU29 Exposed sandstone scribbly gum woodland, 0.06ha of MU33 Silvertop ash ironstone woodland,</li> <li>○ 0.11ha of MU34 Sandstone heath-woodland and</li> <li>○ 0.09ha of MU39 Rock plate heath-mallee.</li> </ul> </li> </ul> <p>The primary vegetation clearing is 0.34 ha in total.</p>

### 3. Environmental assessment

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#### 3.1 Site assessment

Site assessments were conducted on 24 September 2019 by Sarah Webb (Senior Environmental Approvals Consultant), Renée Regal (Senior Heritage Team Leader) and Simon Tweed (Senior Ecology Team Leader) of Niche. An additional site assessment was conducted on 27 September 2019 by Layne Holloway (Heritage Consultant) and Sarah Hart (Ecologist).

The site assessment involved traversing the proposed areas of disturbance for each of the two borehole sites (2020EX01 and 2020EX02), associated access tracks and the length of the proposed subsidence monitoring survey line (300XL). The field survey included assessing environmental constraints, marking any constraints to be avoided in pink flagging tape and recording on GPS.

#### 3.2 Impact assessment

##### **Vegetation disturbance**

The study area has been mapped by NSW National Parks and Wildlife Service (NPWS) (*The native vegetation of the Woronora, O'Hares and Metropolitan Catchments*, 2003). The vegetation mapping is provided in site specific plans on Figure 3, Figure 7 - Figure 9. Specifically, the swamp (Figure 8) has been mapped as a result of the Longwalls 301-303 Upland Swamp Vegetation Mapping and Proposed Monitoring Program (Eco Logical 2016).

The site assessment observations confirmed that distribution and composition of the vegetation within the study area was broadly in conformity with that mapped by NPWS.

The proposed works for the installation of the two boreholes and survey line would require approximately 0.41ha of primary clearing of vegetation. It is noted that this total incorporates efforts to minimise disturbance by using previously developed tracks and or cleared areas wherever possible works, which have resulted in a clearing reduction of 0.11 ha. This has been achieved by utilising previously cleared areas along existing tracks Fire Trail 9I and an unnamed track from 9E. See (Table 2).

The vegetation disturbance associated with the proposed borehole sites and proposed subsidence monitoring survey line is provided in Table 2, photos of each borehole site and start of the survey line are provided in Annex 2 of this report.

Native vegetation communities that will be impacted by the proposal include: Sandstone gully apple-peppermint forest, Exposed sandstone scribbly gum woodland, Silvertop ash ironstone woodland, Sandstone heath-woodland, Rock plate heath-mallee and borehole site 2020EX02 is in the vicinity of Upland swamps: sedgeland-heath complex. None of the proposed borehole sites or the subsidence monitoring survey line will significantly impact any Threatened Ecological Communities (TECs) (Annex 5 & 6). Upland swamps will be avoided by keeping disturbance on the existing access tracks and mitigation measures adhered to by Metropolitan Coal Construction Management Plan (Peabody Energy 2015).

After decommissioning, the sites will be rehabilitated, monitored, and actions taken as required to ensure no active erosion is occurring.

**Table 2: Proposed vegetation clearing**

Vegetation communities	2020EX01	2020EX02*	Survey line 300XL (ha)	Total impacts
MU 25 Sandstone gully apple-peppermint forest	-	-	0.02	0.02
MU29 Exposed sandstone scribbly gum woodland	-	-	0.06	0.06
MU33 Silvertop ash ironstone woodland	-	-	0.06	0.06
MU34 Sandstone heath-woodland	0.07	-	0.11	0.18
MU39 Rock plate heath-mallee	-	-	0.09	0.09
<b>Total impact</b>	<b>0.07</b>	<b>0.00</b>	<b>0.34</b>	<b>0.41</b>
<b>Utilisation of existing cleared areas</b>	0.02	0.09	n/a	0.11
<b>Number of <i>Pultenaea aristata</i></b>	9	-	-	0**

All units are in hectares

\*Borehole site 2020EX02 is regionally mapped within Woronora swamps (Eco Logical 2016).

\*\*No individuals are expected to be impacted with the implementation of described mitigation measures.

### **Threatened ecological communities**

A list of threatened ecological communities (TECs) occurring or potentially occurring within the locality was determined from database searches (the NSW Bionet Database Search tool and EPBC Act Protected Matters Search Tool).

Based on the database searches, one TEC exists near the study area; Coastal Upland Swamp (MU44). Coastal Upland Swamp is listed as endangered on both the BC and EPBC Acts.

The results of the field survey found that the swamp vegetation occurs within the vicinity of the disturbed area. An assessment of significance was completed for indirect impacts to the TEC and determined that the proposed installation of site 2020EX02 would be unlikely to significantly impact Coastal Upland Swamp, as the site is positioned on an existing Fire Trail (91) and Metropolitan Coal will adhere to the mitigation measures outlined in *Section 6.3 Erosion and sediment management* in the Construction Management Plan (Peabody Energy 2015).

### **Threatened flora**

A total of 26 threatened flora, as listed on the BC and/or EPBC Acts, were considered in this assessment (Annex 4). These records were derived from the Atlas of NSW Wildlife (OEH 2019a) and the Commonwealth EPBC Act Protected Matters Search tool (DPIE 2019).

13 threatened flora were considered to have a High or Moderate likelihood of occurrence in the study area: *Acacia baueri* subsp. *baueri*, *A. bynoeana*, *Astrotricha crassifolia*, *Callistemon linearifolius*, *Callitris endlicheri*, *Cryptostylis hunteriana*, *Epacris purpurascens* var. *purpurascens*, *Eucalyptus camfieldii*, *Genoplesium baueri*, *Leucopogon exolasius*, *Melaleuca deanei*, *Persoonia hirsuta* and *Pultenaea aristata*.

Nine *Pultenaea aristata* individuals were recorded during the survey of the proposed subsidence monitoring survey line (300XL). A number of individuals were noted as occurring around the access track to



2020EX01 Borehole Site these individuals are located adjacent to and to the north of the track and there is unlikely to be any impact associated with the use of this existing access track. Whilst individuals were recorded within MU33 (Waypoints 1 and 2) and MU29 (Waypoints 3-9) vegetation communities (refer Borehole Site Plans in Annex 1, Figure 9) no individuals were recorded in the two proposed borehole sites. See Table 2.

All *Pultenaea aristata* have been marked with pink flagging tape. *Pultenaea aristata* individuals will be demarcated and their location made known to project personnel so they can be avoided and protected during works along the subsidence survey monitoring line (300XL). With the mitigation measures in place, minimal impact to *Pultenaea aristata* is expected as a result of the proposed works.

Most of the other candidate threatened species are relatively conspicuous and were not detected during the current survey or previous surveys in the study area. Surveys were conducted just inside the flowering period of *Cryptostylis hunteriana* (November to February) and outside survey period for *Genoplesium baueri* (February and March), however with only two previous records within a 10 km radius of the study area and associate orchids not recorded, they are considered unlikely to be present in the study area.

The proposed borehole site locations and access tracks are therefore unlikely to impact any threatened flora species. No further assessment of threatened flora species is required.

### **Fauna**

The vegetation communities provide a wide range of food and shelter for vertebrate fauna. Trees from the family Myrtaceae (mostly *Eucalyptus* spp.) generally dominate the upper canopy in these areas and supply direct (foliage, nectar, exudates) and indirect food (arthropods) for a range of vertebrates, particularly birds and arboreal mammals.

Tree hollows (formed in stags and mature trees) provide nesting and roosting habitat for hollow-dwelling fauna and are important habitat components of native forests. No tree hollows will be removed by the proposal.

### **Threatened fauna**

A probable Red-crowned Toadlet was heard calling within the study area during the current survey at site 2020EX02, there are known populations within the surrounding areas (OEH 2019a &b).

A total of 71 threatened fauna have previously been recorded (OEH 2019a) or are predicted to have habitat (EPBC Act) within 10 km of the study area (Annex 4). The analysis (Annex 4) resulted in 24 threatened fauna being rated as having a moderate or high likelihood within the study area (Table 3).

Developments can impact upon fauna in several ways. The significance of an impact would be greatest if any of the following situations occur:

- Death or injury of individuals.
- Loss or disturbance of limiting foraging resources.
- Loss or disturbance of limiting breeding resources.

Limiting resources are those that are of importance for the survival of a species.

All these species (Table 3) may have potential foraging or move-through habitat within the study area, however important features such as hollow bearing trees, stags, termite mounds, dense shrubs and mature

trees have been avoided. Bushland immediately adjacent to the study area is extensive and provides a variety of important habitat features. The current proposal will not remove any hollow bearing trees, stags or mature trees and occurs primarily on pre-existing tracks.

Given the above factors, it is unlikely that the proposal will result in significant loss of habitat or direct impact to any threatened fauna species.

An assessment of significance (5-part test) has been completed for the Red-crowned Toadlet (Annex 5 Assessment of Significance BC Act due to a potential observation during the field survey. Provided mitigation measures are implemented impacts for this species should be minor.

**Table 3: Affected threatened fauna (NSW and Commonwealth)**

Species	BC Act	EPBC Act	Likelihood of Occurrence	Potential to be affected by the proposal
Red-crowned Toadlet <i>Pseudophryne australis</i>	V	-	Moderate	Potential habitat nearby <b>2020EX01</b> for a variety of uses in small ephemeral drainages of the study area. Low impacts are likely to be negligible, due to the mitigation measures around drainage lines. (See Annex 5 for Assessment of significance)
Barking Owl <i>Ninox connivens</i>	V	-	Moderate	None; no limiting foraging or breeding habitat within the study area. Hollow bearing trees will be avoided and thus impacts are likely to be negligible.
Dusky Woodswallow <i>Artamus cyanopterus cyanopterus</i>	V	-	Moderate	None; no limiting foraging or breeding habitat within the study area. Impacts are likely to be negligible.
Eastern Bristlebird <i>Dasyornis brachypterus</i>	E	E	Moderate	None; no limiting foraging or breeding habitat within the study area. Impacts are likely to be negligible.
Gang-gang Cockatoo <i>Callocephalon fimbriatum</i>	V	-	High	None; no limiting foraging or breeding habitat within the study area. Hollow bearing trees will be avoided and thus impacts are likely to be negligible.
Glossy Black-Cockatoo <i>Calyptorhynchus lathami</i>	V	-	Moderate	None; no limiting foraging or breeding habitat within the study area. Hollow bearing trees will be avoided and thus impacts are likely to be negligible.
Little Eagle <i>Hieraetus morphnoides</i>	V	-	Moderate	None; no limiting foraging or breeding habitat within the study area. Impacts are likely to be negligible.
Powerful Owl <i>Ninox strenua</i>	V	-	High	None; no limiting foraging or breeding habitat within the study area. Hollow bearing trees will be avoided and thus impacts are likely to be negligible.
Sooty Owl <i>Tyto tenebricosa</i>	V	-	Moderate	None; no limiting foraging or breeding habitat within the study area. Hollow bearing trees will be avoided and thus impacts are likely to be negligible.
Swift Parrot <i>Lathamus discolor</i>	E	E	Moderate	None; no limiting foraging or breeding habitat within the study area. Impacts are likely to be negligible.
Varied Sittella <i>Daphoenositta chrysoptera</i>	V	-	Moderate	None; no limiting foraging or breeding habitat within the study area. Impacts are likely to be negligible.

Species	BC Act	EPBC Act	Likelihood of Occurrence	Potential to be affected by the proposal
Eastern Bentwing-bat <i>Miniopterus schreibersii oceanensis</i>	V	-	High	None; no limiting foraging or breeding habitat within the study area. Sparse occurrence if present. Important habitat features would not be affected. Impacts are likely to be negligible.
Eastern False Pipistrelle <i>Falsistrellus tasmaniensis</i>	V	-	Moderate	None; no limiting foraging or breeding habitat within the study area. Sparse occurrence if present. Important habitat features would not be affected. Impacts are likely to be negligible.
Eastern Freetail-bat <i>Mormopterus norfolkensis</i>	V	-	Moderate	None; no limiting foraging or breeding habitat within the study area. Sparse occurrence if present. Important habitat features would not be affected. Impacts are likely to be negligible.
Eastern Pygmy-possum <i>Cercartetus nanus</i>	V	-	Moderate	None; no limiting foraging or breeding habitat within the study area. Sparse occurrence if present. Important habitat features would not be affected. Impacts are likely to be negligible.
Grey-headed Flying-fox <i>Pteropus poliocephalus</i>	V	V	Moderate	None; no limiting foraging or breeding habitat within the study area. Sparse occurrence if present. Important habitat features would not be affected. Impacts are likely to be negligible.
Koala <i>Phascolarctos cinereus</i>	V	V	Known	None; no limiting foraging or breeding habitat within the study area. Sparse occurrence if present. Important habitat features would not be affected. Impacts are likely to be negligible.
Large-eared Pied Bat <i>Chalinolobus dwyeri</i>	V	V	Moderate	None; no limiting foraging or breeding habitat within the study area. Sparse occurrence if present. Important habitat features would not be affected. Impacts are likely to be negligible.
Little Bentwing-bat <i>Miniopterus australis</i>	V	-	Moderate	None; no limiting foraging or breeding habitat within the study area. Sparse occurrence if present. Important habitat features would not be affected. Impacts are likely to be negligible.
New Holland Mouse <i>Pseudomys novaehollandiae</i>	-	V	Moderate	None; no limiting foraging or breeding habitat within the study area. Sparse occurrence if present. Important habitat features would not be affected. Impacts are likely to be negligible.
Spotted-tailed Quoll <i>Dasyurus maculatus maculatus</i>	V	E	Moderate	None; no limiting foraging or breeding habitat within the study area. Important habitat features would not be affected. Impacts are likely to be negligible.
Squirrel Glider <i>Petaurus norfolcensis</i>	V	-	Moderate	None; no limiting foraging or breeding habitat within the study area. Sparse occurrence if present. Important habitat features would not be affected. Impacts are likely to be negligible.
Broad-headed Snake <i>Hoplocephalus bungaroides</i>	E	V	High	Small areas of marginal preferred habitat (exposed sandstone with exfoliations) are located along 300XL, however any possible breeding habitat (exfoliating rock plates) will be avoided. Impacts are likely to be negligible given the low likelihood of breeding/sheltering sites and avoidance measures.

Species	BC Act	EPBC Act	Likelihood of Occurrence	Potential to be affected by the proposal
Rosenberg's Goanna <i>Varanus rosenbergi</i>	V	-	High	None; no limiting foraging or breeding habitat within the study area. Termite mounds will not be impacted. Impacts are likely to be negligible.

### 3.3 Recommendations and control measures

The proposal aims to avoid disturbance to the following:

- Threatened flora and fauna
- Hollow bearing trees, limbs and stags
- Termite mounds
- Bush-rock.
- Rock outcrops
- Large hollow logs

The following mitigation measures will be implemented to minimise direct and indirect impacts from the proposal:

- Specifically, the number of individual *P. aristata* requiring clearing would be reduced by;
  - The marking of all observed individuals within the proposed development area during the field survey with pink flagging tape
  - The implementation of measures to demarcate and protect *P.aristata* individuals at all sites prior to the clearing works commencing
  - Incorporation of information on the location of the *P.aristata* individuals and the identification measures at all sites into the works prestart activities to ensure information is made known to project personnel to assist in ensuring individuals can wherever possible avoided during works.
  - A review by an ecologist of the proposed tracks and sites, including the known and potential threatened *P.aristata* records, to ensure that the measures to demarcate and flag any individuals remain accurate and intact.

Within dense areas of *P.aristata* the vegetation clearing will be reduced by;

- Carrying out required clearing by hand-held devices to assist in ensuring the proposed works avoid any individuals of *P.aristata*.
- Noting that the proposed access tracks are already narrowed so that only that clearing that is required is carried out, wherever possible individuals of *P.aristata* would be avoided via implementation of a route through the vegetation that requires the least clearing of *P.aristata*.
- General mitigation measures are noted to include
  - Erosion and sediment controls to be implemented as appropriate on downslope sides of the site as per Section 6.3 of the Metropolitan Coal Construction Management Plan (Peabody Energy 2015).
  - In addition to any generic measures outlined within the Management Plan, measures will be taken to ensure that no sediment from drilling or other earthworks associated with borehole site 2020EX02 enters adjacent table drains.

Given the careful design of the proposed works, mitigation measures proposed in the Metropolitan Coal Construction Management Plan and the high level of experience and commitment to best practice site

works and rehabilitation, the proposed exploration program is considered unlikely to have a significant impact on threatened biodiversity.

**Table 4: Proposed works and mitigation measures**

Details of the proposed borehole site locations, access, site specific constraints and safeguards are detailed in Table 1 with an impact assessment in the following sections. Refer to attached Figures and Borehole Site Plans in Annex 1 and Plates in Annex 2.

Site	Purpose	Hole Furniture	Hole diameter	Description of proposed works and site constraints	Site-specific Environmental Safeguards
2020EX01	600mm deep exploration borehole site to replace S288 from 1960's	10 Vibrating Wire Piezometer (vwp)'s at various depths for pressure monitoring	PQ - 122mm	<ul style="list-style-type: none"> <li>The site is located at the end of an unnamed track to the east of Fire Trail 9E and centred on a turn-around area (approximately 10 m wide) which has been cleared (Plate 1). Access to the site would be via the existing unnamed track and no additional clearing is required.</li> <li>The borehole site would utilise 0.02 ha associated with the previously cleared track and turnaround area.</li> <li>However additional clearing around the edges is required to provide the 30m x 30m borehole site. This will require some additional clearing (up to 0.07 ha) of MU34 Sandstone heath-woodland.</li> <li>Some branch trimming of mature trees (Eucalyptus species) is likely to be required along the access track at two locations (one tree at each location: -34.18076,150.93987; --34.18078, 150.94037) See <b>Figure 7</b>. Branches did not contain hollows at one location, whereas a branch at the second location had very small hollows (&lt; 1cm) which would not be used by any threatened or vertebrate fauna.</li> <li>There are individuals of the threatened species <i>P.aristata</i> which are located adjacent to the existing access track. As the proposed works do not involve any additional clearing of the track impact is unlikely.</li> </ul>	<ul style="list-style-type: none"> <li>Vegetation disturbance will be minimised to the smallest footprint required.</li> <li>Avoid hollow bearing tree (HBT) that occurs within the site boundary, and fenced off.</li> <li>Diversion of upstream water around the site</li> <li>Sediment controls to be implemented as appropriate on downslope sides of the site.</li> <li>No additional clearing of vegetation along the access trail</li> </ul>
2020EX02	600mm exploration borehole site – characterise FN004	10 Vibrating Wire Piezometer (vwp)'s at various depths for pressure monitoring	PQ - 122mm	<ul style="list-style-type: none"> <li>Access to the borehole site is directly on Fire Trail 9I which is a wide track requiring no further clearing.</li> <li>The site occurs within mapped Coastal Upland Swamps (TEC) and therefore all construction works will be limited to the existing clearing along the Fire Trail 9I.</li> <li>The borehole site is mapped within the Woronora swamps, although the site is directly along the road 10 x 60m (0.06 ha) which has severely modified any swamp habitat. The borehole site will utilise the track and will not require any additional clearing.</li> <li>Adjacent table drains present as likely habitat for the Red-crowned Toadlet.</li> </ul>	<ul style="list-style-type: none"> <li>Vegetation disturbance will be minimised to the smallest footprint required</li> <li>Sediment controls to be implemented as appropriate on downslope sides of the site.</li> <li>Careful management of sediment or any material or fluid loss will occur to prevent any sedimentation of adjacent table drains which are likely habitat for the Red-crowned Toadlet.</li> </ul>

Site	Purpose	Dimensions of the line	Hole diameter	Description of proposed works and site constraints	Site-specific Environmental Safeguards
300XL	Subsidence monitoring survey line	675m long and up to 5m wide.	N/A	<ul style="list-style-type: none"> <li>• Access to the subsidence monitoring line (300XL) is on Fire Trail 9E.</li> <li>• Small areas along the survey line are quite steep and constrained by rocky outcrops</li> <li>• The monitoring line runs east towards the Waratah Rivulet from Fire Trail 9E.</li> <li>• The clearing requires a maximum width of 5m to ensure line of sight to survey markers. Hence primary clearing of;               <ul style="list-style-type: none"> <li>○ 0.02ha of MU 25 Sandstone gully apple-peppermint forest,</li> <li>○ 0.06ha of MU29 Exposed sandstone scribbly gum woodland,</li> <li>○ 0.06ha of MU33 Silvertop ash ironstone woodland,</li> <li>○ 0.11ha of MU34 Sandstone heath-woodland and</li> <li>○ 0.09ha of MU39 Rock plate heath-mallee.</li> </ul> </li> <li>• The primary vegetation clearing is 0.34 ha in total.</li> </ul>	<ul style="list-style-type: none"> <li>• Creation of a survey line for the purposes of subsidence monitoring 675m long and up to 5m wide clearing of vegetation.</li> <li>• Vegetation disturbance will be minimised to the smallest footprint required.</li> <li>• Use of hand clearing techniques to assist in reducing impact to threatened species</li> <li>• <i>Pultenaea aristata</i> on the monitoring line (See Borehole Site Plans: Figure 9) will be identified, prior to demarcation.</li> <li>• Project personnel to be notified of the location. These plants will be avoided and protected.</li> </ul>

## 4. Conclusion

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The proposed borehole sites and subsidence monitoring survey line will result in up to 0.4 hectare of primary clearing, additionally proposed works will occur in 0.11 ha of previously cleared areas along existing tracks Fire Trail 9I and an unnamed track from 9E

With the proposed mitigation measures in place, the proposal is unlikely to result in a significant impact on any TEC, or threatened species including *P.aristata* listed under the BC Act and/or EPBC Act.

The proposed sites have been inspected by an archaeologist. An Aboriginal Objects Due Diligence Assessment has concluded there will be no adverse effects to Aboriginal cultural heritage sites as a result of the proposed borehole sites and subsidence monitoring survey line (refer Annex 3).

The relevant management measures as outlined in this report and the Metropolitan Coal Construction Management Plan shall be implemented in order to minimise impacts to the environment.

This report supports the Surface Works Assessment Form required to be completed for the proposed activities under the Metropolitan Coal Construction Management Plan. Metropolitan Coal will provide the details of the proposed surface construction works (in the form of a completed Surface Works Assessment Form to the DP&E and Water NSW for comment).



## References

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DPIE (2019) *SPRAT Database and Protected Matters Search Tool* (accessed October 2019), <http://www.environment.gov.au/>, Commonwealth Department of Sustainability, Environment, Water, Population and Communities. Provides access to threatened species profiles, recovery plans and final determinations by the Commonwealth Scientific Committee.

Eco Logical Australia (2016) Longwalls 301-303 Upland Swamp Vegetation Mapping and Proposed Monitoring Program. Report prepared for Metropolitan Coal. August 2016.

OEH (2019a) *Atlas of NSW Wildlife* (accessed October 2019), NSW Office of Environment and Heritage (OEH), Goulburn St, Sydney.

OEH (2019b) *OEH Threatened Species Profiles Database*, accessed October 2019. Also provides access to threatened species Final Determinations by the NSW Scientific Committee.

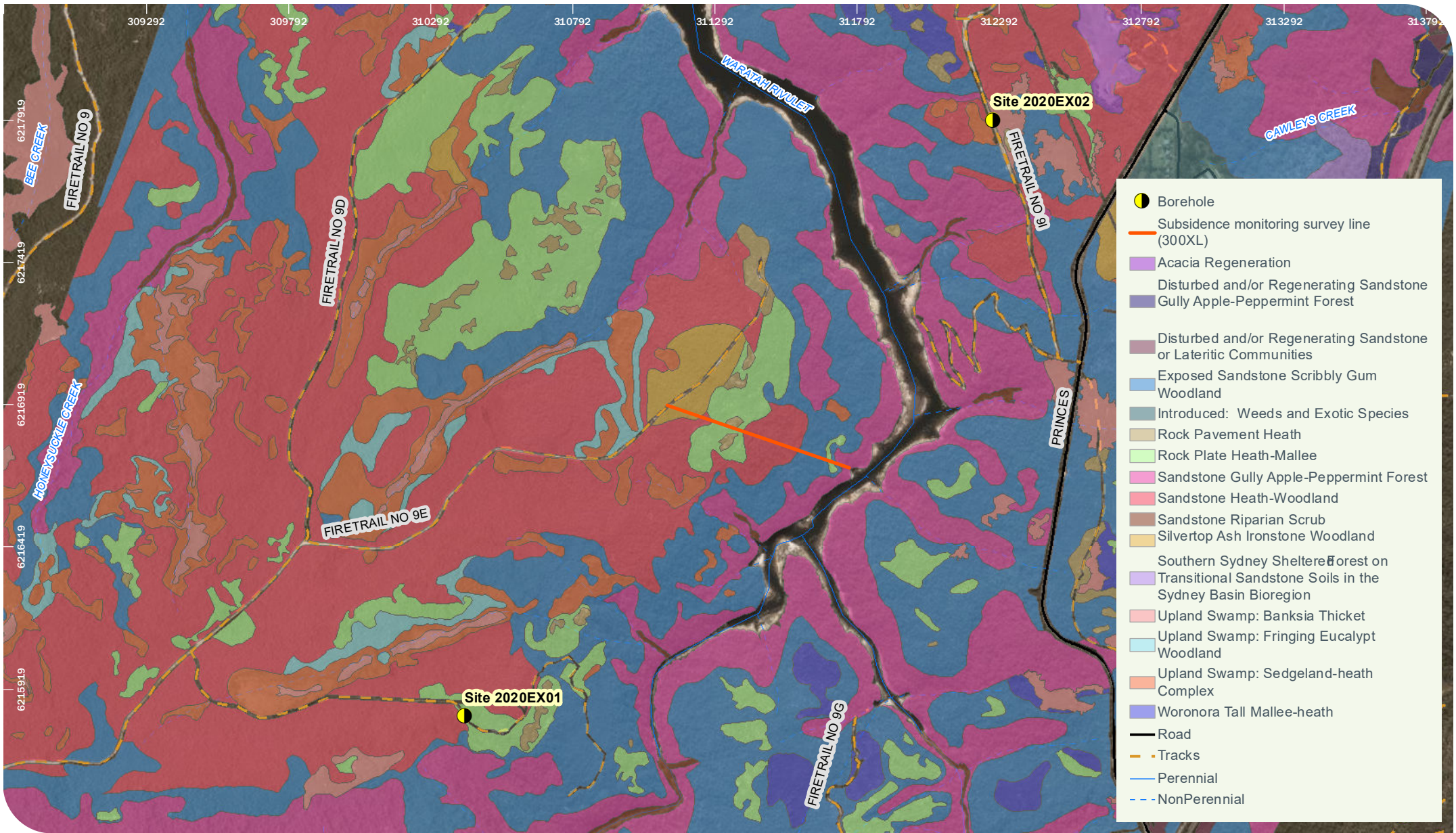
Peabody Energy (2015). Metropolitan Coal Construction Management Plan. Revision ConMP-R01-D. August 2015.

# Annex 1 Figures

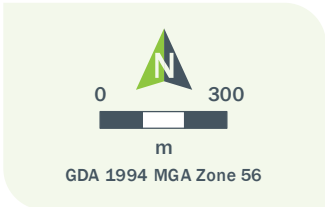
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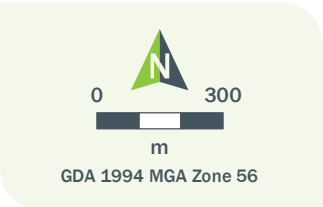
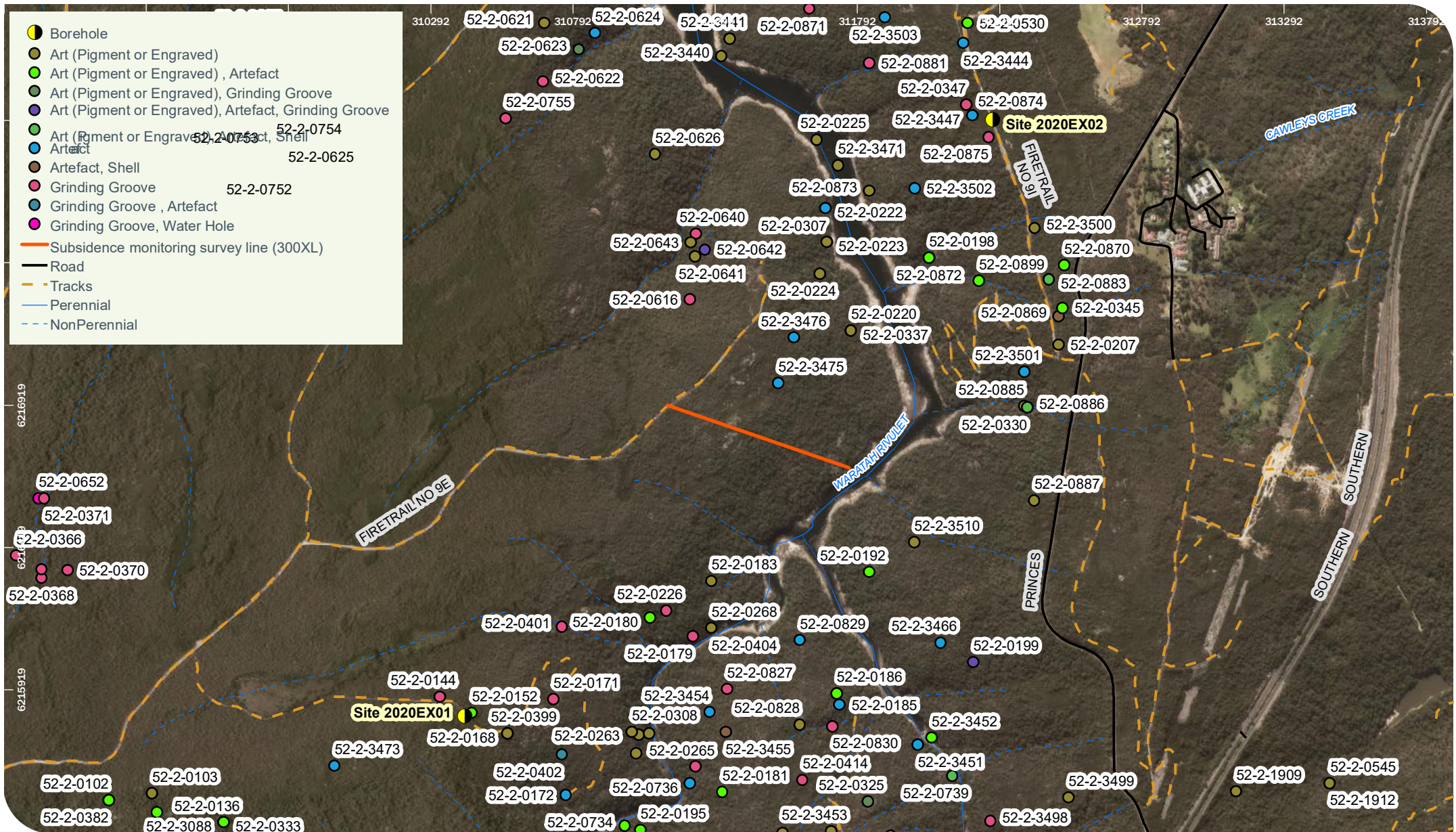
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Niche PM: Sarah Webb  
 Niche Proj. #: 5365  
 Client: Peabody Energy – Metropolitan Coal

Site Plan with vegetation mapping  
 Metropolitan Colliery Surface Works

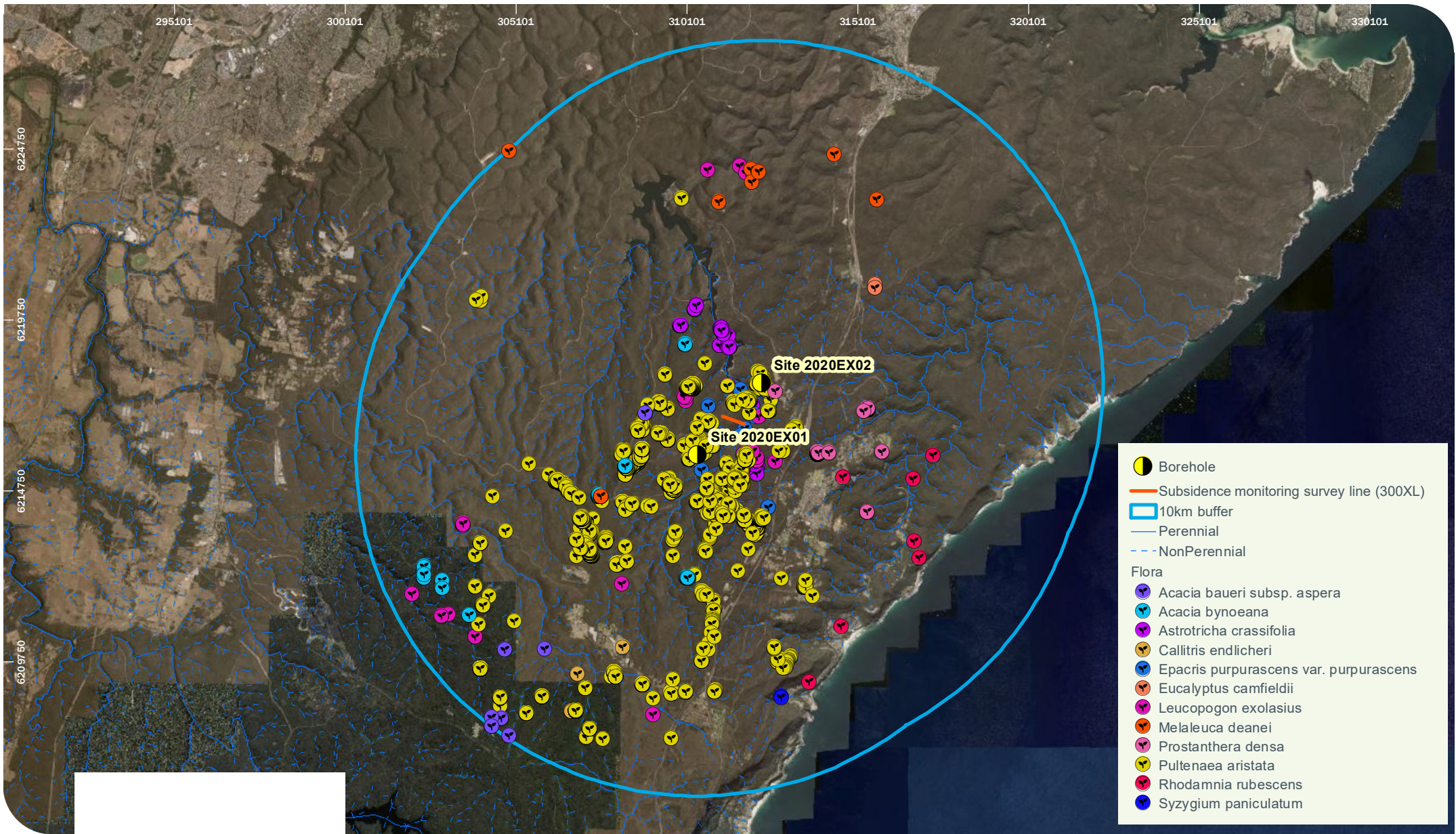
Figure 3



Niche PM: Sarah Webb  
 Niche Proj. #: 5365  
 Client: Peabody Energy – Metropolitan Coal

**Site Plan with AHIMS**  
 Metropolitan Colliery Surface Works

**Figure 4**



- Borehole
  - Subsidence monitoring survey line (300XL)
  - 10km buffer
  - Perennial
  - NonPerennial
- Flora
- Acacia baueri* subsp. *aspera*
  - Acacia bynoeana*
  - Astrotricha crassifolia*
  - Callitris endlicheri*
  - Epacris purpurascens* var. *purpurascens*
  - Eucalyptus camfieldii*
  - Leucopogon exolasius*
  - Melaleuca deanei*
  - Prostanthera densa*
  - Pultanea aristata*
  - Rhodamnia rubescens*
  - Syzygium paniculatum*

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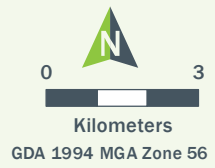
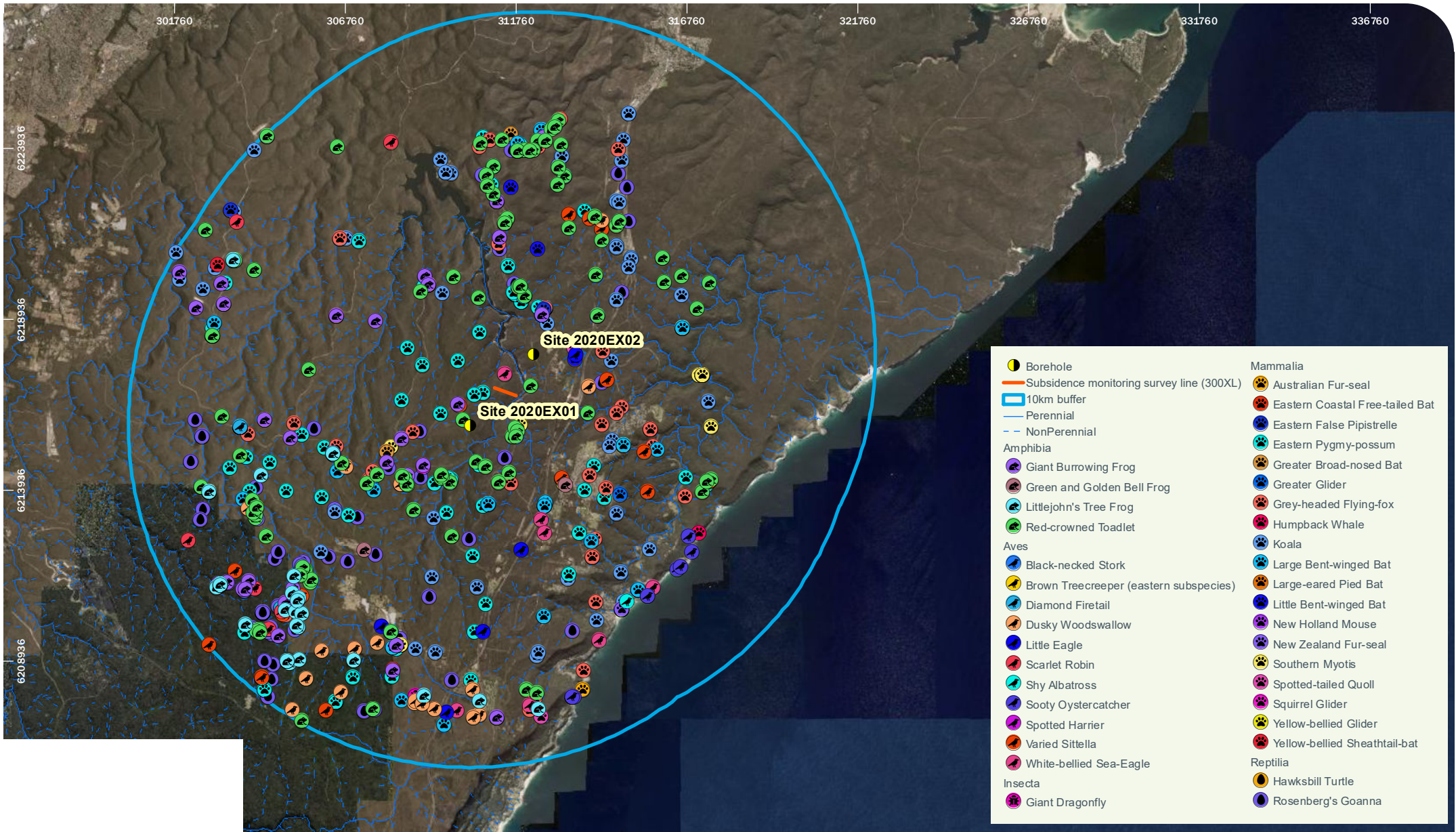
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Niche PM: Sarah Webb  
Niche Proj. #: 5365  
Client: Peabody Energy – Metropolitan Coal

**Threatened Flora within 10 km  
Metropolitan Colliery Surface Works**

**Figure 5**

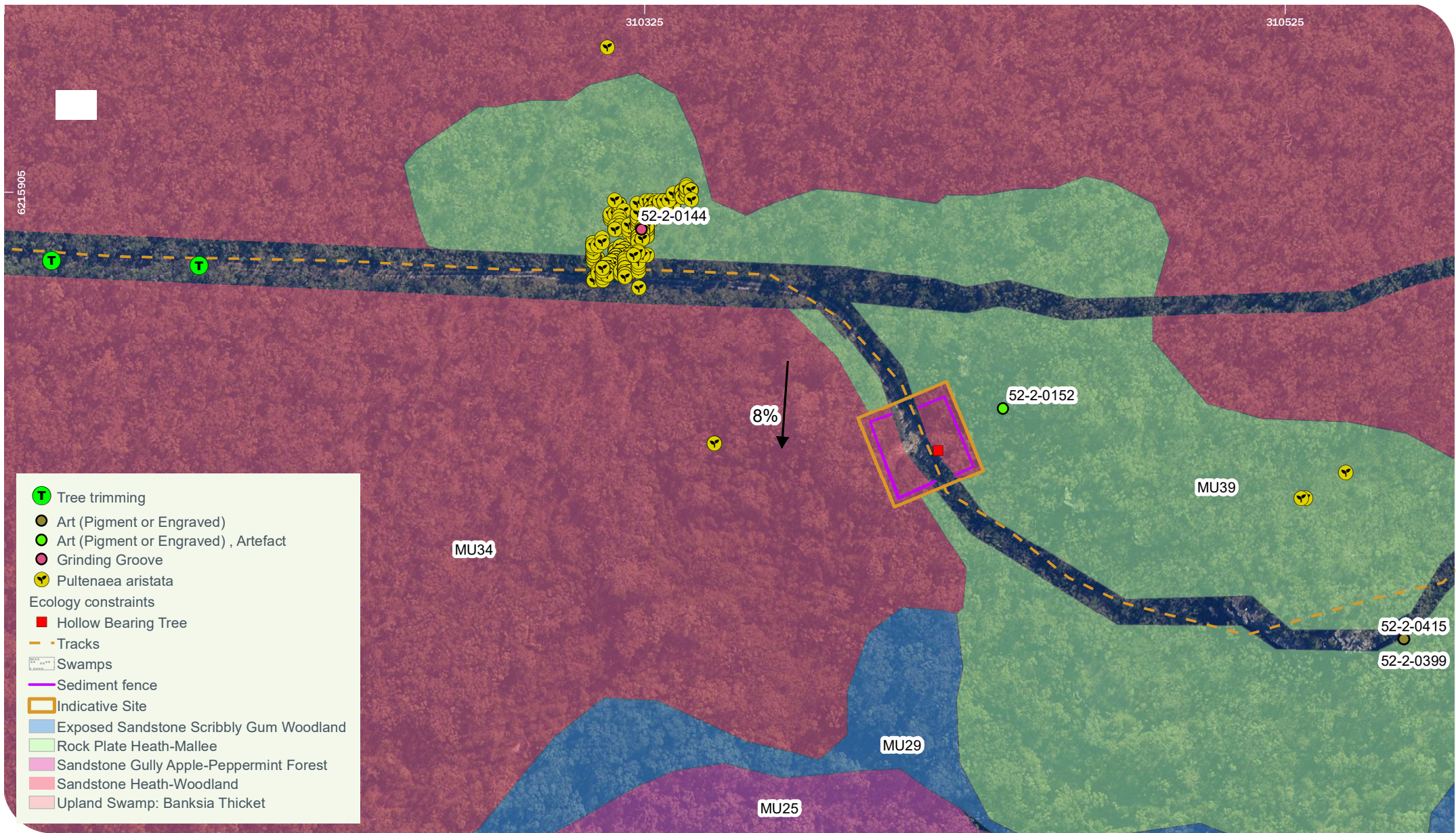
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Niche Proj. #: 5365  
Client: Peabody Energy – Metropolitan Coal

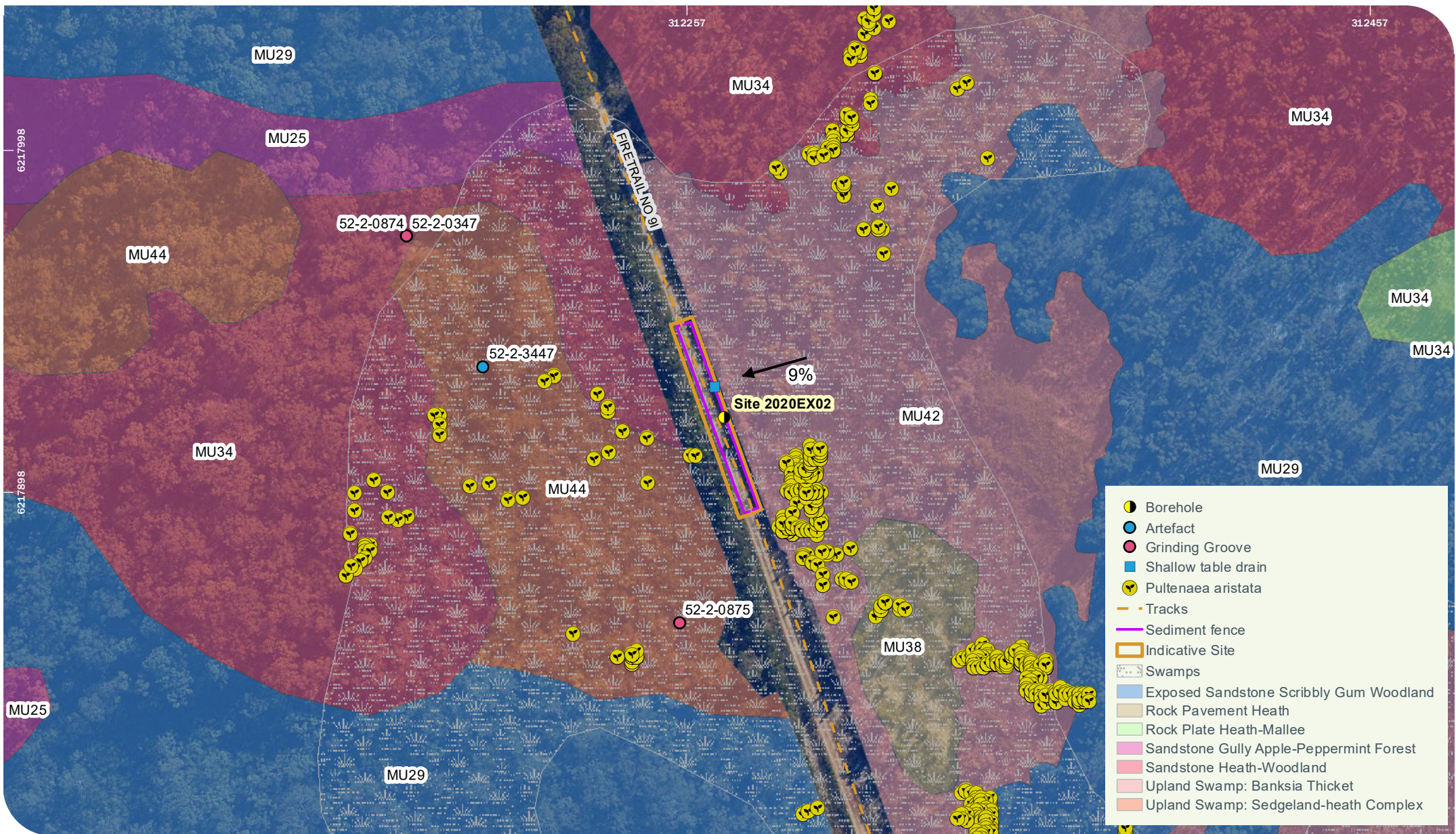
**Threatened Fauna within 10 km  
Metropolitan Colliery Surface Works**

**Figure 6**

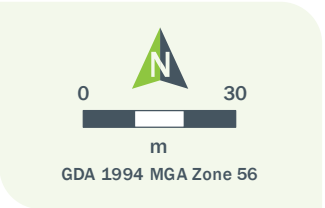


- T Tree trimming
- Art (Pigment or Engraved)
- Art (Pigment or Engraved) , Artefact
- Grinding Groove
- ♻️ Pultenaea aristata
- Ecology constraints
- Hollow Bearing Tree
- - - Tracks
- ▨ Swamps
- Sediment fence
- ▭ Indicative Site
- ▨ Exposed Sandstone Scribbly Gum Woodland
- ▨ Rock Plate Heath-Mallee
- ▨ Sandstone Gully Apple-Peppermint Forest
- ▨ Sandstone Heath-Woodland
- ▨ Upland Swamp: Banksia Thicket





- Borehole
- Artefact
- Grinding Groove
- Shallow table drain
- Pultenaea aristata*
- Tracks
- Sediment fence
- Indicative Site
- Swamps
- Exposed Sandstone Scribbly Gum Woodland
- Rock Pavement Heath
- Rock Plate Heath-Mallee
- Sandstone Gully Apple-Peppermint Forest
- Sandstone Heath-Woodland
- Upland Swamp: Banksia Thicket
- Upland Swamp: Sedgeland-heath Complex



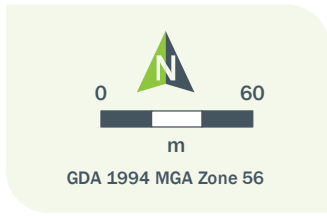
Niche PM: Sarah Webb  
 Niche Proj. #: 5365  
 Client: Peabody Energy – Metropolitan Coal

**2020EX02 Borehole Site Plan**  
 Metropolitan Colliery Surface Works

**Figure 8**



	Pultenaea aristata		Swamps		Exposed Sandstone Scribbly Gum Woodland		Sandstone Heath-Woodland
	Artefact		Contours (2m)		Rock Pavement Heath		Silvertop Ash Ironstone Woodland
	Subsidence monitoring survey line (300XL)		Perennial		Rock Plate Heath-Mallee		Upland Swamp: Fringing Eucalypt Woodland
	Clearing area 5 m buffer		NonPerennial		Sandstone Gully Apple-Peppermint Forest		Upland Swamp: Sedgeland-heath Complex
	Tracks						



Niche PM: Sarah Webb  
 Niche Proj. #: 5365  
 Client: Peabody Energy – Metropolitan Coal

**Subsidence monitoring survey line (300XL) Site Plan**  
 Metropolitan Colliery Surface Works

**Figure 9**

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## Annex 2 Plates



**Plate 1: Site 2020EX01 overview**



**Plate 2: Site 2020EX02 overview**



**Plate 3: Site 2020EX01 hollow bearing tree with small hollow**



**Plate 4P: Site 2020EX02 small table drain**



Plate 5: Site 300XL start of track



Plate 6: *Pultenea aristata* individual

## Annex 3 Aboriginal Objects Due Diligence Assessment

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5 November 2019

Mr Kane Organ  
 Environment and Community Coordinator  
 Peabody Energy- Metropolitan Coal  
 Parkes Street  
 Helensburgh NSW 2508

Via Email: [KOrgan@peabodyenergy.com](mailto:KOrgan@peabodyenergy.com)

Dear Mr Organ,

**Re: Metropolitan Colliery Surface Works Assessment - Aboriginal Objects Due Diligence Assessment - Stage 1 Exploration Sites 2020EX01, 2020EX02 and Subsidence Monitoring line 300XL (Niche ref: #5365)**

Niche Environment and Heritage (Niche) was commissioned by Peabody Energy Metropolitan Colliery (Peabody Energy) to conduct an Aboriginal Objects Due Diligence Assessment for the proposed investigations at the two proposed groundwater monitoring borehole sites (2020EX01 and 2020EX02) and one subsidence monitoring line (300XL). The proposed Subject Areas are located of the Princes Highway Helensburgh NSW, within the Peabody Energy Metropolitan Colliery Mine lease area (Figures 1 -3). The following assessment has been prepared to satisfy the NSW Minerals Council (2010) *NSW Minerals Industry Due Diligence Code of Practice for the Protection of Aboriginal Objects*, referred to as ‘The Code.’

**Step 1. Are there any relevant confirmed site records or other associated landscape feature information on AHIMS?**

Yes.

An extensive search of the Aboriginal Heritage Information Management System (AHIMS) was conducted on 18 October 2019 (AHIMS ID’s 457450, 457452, 457455, 457457, 457460 and 457464). There are six previously recorded Aboriginal archaeological site within a 200m proximity to the proposed Subject Areas of boreholes 2020EX01 and 2020EX02. There are no sites within proximity to 300XL subsidence monitoring line. Aboriginal cultural heritage site information is outlined in Table 1.

**Table 1: AHIMS sites within 200 m proximity of work zones**

AHIMS ID	Near Subject Areas	Site Name	Site type
52-2-0144	2020EX01	Flat Rock Creek 193	Axe Grinding Groove
52-2-0399 duplicate of 52-2-0415	2020EX01	Flat Rock Creek 62	Shelter with Art
52-2-0415 duplicate of 52-2-0399	2020EX01	Flat Rock Creek 62	Shelter with Art
52-2-0874 duplicate of 52-2-0347	2020EX02	Flat Rock Creek 95	Axe Grinding Groove
52-2-0347 duplicate of 52-2-0874	2020EX02	Flat Rock Creek 95	Axe Grinding Groove
52-2-3447	2020EX02	Flat Rock Creek 316	Artefact

Flat Rock Creek 193 (AHIMS ID# 52-2-0144) is an axe grinding groove site located on a clear sandstone outcrop 10 m from north site of unnamed Firetrail, 1.1 km east of Firetail 9E. One worn axe grinding groove was located measuring 28 x 4 x 0.5 cm. It is not anticipated that the proposed works associated with 2020EX01 will harm this Aboriginal cultural heritage site.

Flat Rock Creek 62 (AHIMS ID# 52-2-0399 duplicate of AHIMS ID#52-2-0415) is a shelter with art. The art comprises of 10 charcoal and 1 red ochre motifs, 5 stone artefacts and 9 axe grinding grooves. The shelter is located under a cliff line on the north side of unnamed fire trail, 1.4 km east of firetail 9E facing south, overlooking Waratah Rivulet. This site recording has been duplicated in the AHIMS database and appears as two separate site coordinates in Figure 3 of the Flora, Fauna and Archaeological Assessment. Based on landscape information gathered from the site inspection, the correct location of the site is represent by AHIMS ID# 52-2-0399 which is located approximately 120 m from the proposed Subject Area of 2020EX01, therefore, the data point representing AHIMS ID# 52-2-0415 is not valid. It is not anticipated that the proposed works associated with 2020EX01 will harm this Aboriginal cultural heritage site.

Flat Rock Creek 95 (AHIMS ID# 52-2-0874 duplicate of AHIMS ID#52-2-0347) is an axe grinding groove site on western edge of a large flat sandstone outcrop pan located 80 m west of Firetrail 9I and 300m south of the 9S and 9T intersection. Five axe grinding grooves are present measuring on average 30 x 4.5 x 0.5 cm. The two duplicated AHIMS site recordings representing Flat Rock Creek 95 (AHIMS ID# 52-2-0347 and AHIMS ID#52-2-0874) locates the site 20 m north west of borehole site 2020EX02, however the inspection confirmed that Flat Rock Creek 95 (AHIMS ID# 52-2-0347 and 52-2-0874) is located 150 m to the north west of borehole site 2020EX02. It is not anticipated that the proposed works associated with 2020EX02 will harm this Aboriginal cultural heritage site.

Flat Rock Creek 316 (AHIMS ID# 52-2-3447) is an artefact scatter site located under a cliff line located on the fringe of a swamp located 250 m of southern arm of Firetrail 9T. This artefact site is located, on the opposing site of the road of borehole site 2020EX02, approximately 20 m south of Subject Area of 2020EX02. It is not anticipated that the proposed works associated with 2020EX02 will harm this Aboriginal cultural heritage site.

**Step 2. Is the activity defined as a ‘low impact activity’, as defined by the NPW Regulation?**

No.

The activity is not low impact as defined under Clause 80B (1)-(3) of the Code.

**Step 3. Are there landscape features that are likely to indicate the presence of Aboriginal objects?**

Yes.

The proposed investigation sites are located within the WaterNSW drinking water catchment area. A number of previous Aboriginal Cultural Heritage Assessments have been carried out within proximity to the Subject Area.

These studies suggest that the majority of the Aboriginal site types within the WaterNSW drinking water catchment areas are sandstone shelters containing art, artefacts and/ or potential archaeological deposit or sandstone rock platforms containing axe grinding grooves.

During the site assessment, no further Aboriginal cultural heritage sites were identified within the Subject Area.

**Step 4: Does a desktop assessment and visual inspection confirm that there are Aboriginal objects or that they are likely?**

A visual inspection was conducted by Renée Regal (Senior Heritage Consultant and Team Leader Aboriginal Heritage) on the 24<sup>th</sup> September 2019 and Layne Holloway (Heritage Consultant) on the 27 September 2019.

No new Aboriginal objects were found during the survey. The desktop assessment and visual inspection has confirmed that there are no known Aboriginal objects or sites within the Subject Areas of borehole sites 2020EX01 and 2020EX02 and subsidence monitoring line 300XL. This field survey, previous partial surveys of the WaterNSW Catchment Area, and surveys of the surrounding areas have found little evidence of past Aboriginal land use within the area of the proposed boreholes.

**Step 5: Can the activity be relocated away from the known/ Likely area for Aboriginal Objects?**

Not applicable. The results of this assessment indicate there is a negligible risk of harm to Aboriginal objects, meaning harm is avoided, so there is no compelling reason to avoid the activity.

**Step 6. Further investigations and impact assessment**

No Aboriginal objects were discovered during the site inspection survey. The desktop assessment and site inspection undertaken in accordance with *the Code* and consideration of previous Aboriginal cultural heritage assessments indicates that no Aboriginal objects are located within immediate proximity to the proposed Subject Areas. Therefore, no further investigations or impact assessment is necessary.

The following recommendations are made:

- Standard work procedures for protection and reporting of Aboriginal objects of Metropolitan Colliery and sites be implemented;
- Project personnel to be made aware of the archaeological sites near 2020EX01 and 2020EX02 to avoid any disturbance outside the borehole sites;
- Should Aboriginal objects or sites be identified during any works, works should cease in the vicinity of the find and a qualified archaeologist should be consulted on appropriate management actions.

In conclusion there are no constraints relating to Aboriginal cultural heritage for the proposed investigation works, and the works may proceed with caution.

Please do not hesitate to contact me if you would like to discuss this assessment further.

Yours sincerely,



Layne Holloway

Heritage Consultant

Niche Environment and Heritage



## Annex 4 Threatened flora and fauna likelihood of occurrence

Scientific Name	Common Name	BC Act	FM Act	EPBC Act	Habitat	Likelihood of Occurrence	Potential for impact
<b>Amphibians</b>							
<i>Heleioporus australiacus</i>	Giant Burrowing Frog	V	-	V	The Giant Burrowing Frog has been recorded breeding in a range of water bodies associated with more sandy environments of the coast and adjacent ranges from the Sydney Basin south the eastern Victoria. It breeds in hanging swamps, perennial non-flooding creeks and occasionally permanent pools, but permanent water must be present to allow its large tadpoles time to reach metamorphosis.	Moderate	Low – no suitable habitat within proposed work areas
<i>Litoria aurea</i>	Green and Golden Bell Frog	E	-	V	Inhabits a very wide range of water bodies including marshes, dams and streams, particularly those containing emergent vegetation such as bullrushes or spikerushes. It also inhabits numerous types of man-made water bodies including quarries and sand extraction sites. Optimum habitat includes water-bodies that are un-shaded, free of predatory fish such as Plague Minnow, have a grassy area nearby and diurnal sheltering sites available.	Low	Low
<i>Litoria littlejohni</i>	Littlejohn's Tree Frog	V	-	V	Occurs in wet and dry sclerophyll forests and heathland associated with sandstone outcrops between 280 and 1000 m on the eastern slopes of the Great Dividing Range from the Central Coast down into Victoria. Individuals have been collected from a wide range of water bodies that includes semi-permanent dams, permanent ponds, temporary pools and permanent streams, with calling occurring from fringing vegetation or on the banks. Individuals have been observed sheltering under rocks on high exposed ridges during summer and within deep leaf litter adjacent to the breeding site. Calling occurs in all months of the year, often in association with heavy rains. The tadpoles are distinctive, being large and very dark in colouration.	Low	Low
<i>Litoria raniformis</i>	Southern Bell Frog	E	-	V	A highly adaptable and wide-ranging large frog found in a very wide range of habitats to the west of the Great Dividing Range in SW NSW. This includes permanent and ephemeral black box-lignum-nitre goosefoot swamps, lignum-typha swamps and river red gum swamps or billabongs along floodplains and river valleys as well as irrigated rice crops and farm dams in agricultural environments. they prefer areas with emergent aquatic vegetation that they can use for shelter	Low	Low

Scientific Name	Common Name	BC Act	FM Act	EPBC Act	Habitat	Likelihood of Occurrence	Potential for impact
					and for basking sites. Individuals can be found sheltering and overwintering under debris or in vegetation immediately adjacent to the breeding sites.		
<i>Mixophyes balbus</i>	Stuttering Frog	E	-	V	Associated with streams in dry sclerophyll and wet sclerophyll forests and rainforests of more upland areas of the Great Dividing Range of NSW and down into Victoria. Breeding occurs along forest streams with permanent water where eggs are deposited within nests excavated in riffle zones by the females and the tadpoles swim free into the stream when large enough to do so. Outside of breeding, individuals range widely across the forest floor and can be found hundreds of metres from water	Low	Low
<i>Pseudophryne australis</i>	Red-crowned Toadlet	V	-	-	Occurs on wetter ridge tops and upper slopes of sandstone formations on which the predominant vegetation is dry open forests and heaths. This species typically breeds within small ephemeral creeks that feed into larger semi-perennial streams. After rain these creeks are characterised by a series of shallow pools lined by dense grasses, ferns and low shrubs and usually contain leaf litter for shelter. Eggs are terrestrial and laid under litter, vegetation or rocks where the tadpoles inside will reach a relatively late stage of development before waiting for flooding waters before hatching will occur.	High	Low – mitigation measures of nearby proposed works
<b>Birds</b>							
<i>Anthochaera phrygia</i>	Regent Honeyeater	CE	-	E,M	The Regent Honeyeater mainly inhabits temperate woodlands and open forests of the inland slopes of south-east Australia. Birds are also found in drier coastal woodlands and forests in some years. The distribution of the species has contracted dramatically in the last 30 years to between north-eastern Victoria and south-eastern Queensland. There are only three known key breeding regions remaining: north-east Victoria (Chiltern-Albury), and in NSW at Capertee Valley and the Bundarra-Barraba region. In NSW the distribution is very patchy and mainly confined to the two main breeding areas and surrounding fragmented woodlands. In some years flocks converge on flowering coastal woodlands and forests.	Low	Low
<i>Artamus cyanopterus cyanopterus</i>	Dusky Woodswallow	V	-	-	Dusky woodswallows are widespread in eastern, southern and south western Australia. The species occurs throughout most of New South Wales, but is sparsely scattered in, or largely absent from, much of the upper western region.	Moderate	Low – no limiting habitat

Scientific Name	Common Name	BC Act	FM Act	EPBC Act	Habitat	Likelihood of Occurrence	Potential for impact
					Most breeding activity occurs on the western slopes of the Great Dividing Range. Primarily inhabit dry, open eucalypt forests and woodlands, including mallee associations, with an open or sparse understorey of eucalypt saplings, acacias and other shrubs, and ground-cover of grasses or sedges and fallen woody debris.		being modified or removed
<i>Botaurus poiciloptilus</i>	Australasian Bittern	E	-	E	The Australasian Bitterns is widespread but uncommon over south-eastern Australia. In NSW they may be found over most of the state except for the far north-west. Favours permanent freshwater wetlands with tall, dense vegetation, particularly bullrushes and spikerushes.	Low	Low
<i>Calidris canutus</i>	Red Knot	-	-	E, M	The Red Knot is a non-breeding migratory visitor from Arctic regions of Siberia. In NSW it is recorded in small numbers replenishing fat stores along some of the major river estuaries and sheltered embayments of the coastline, in particular the Hunter River estuary, after which the birds proceed to Victoria by October.	Low	Low
<i>Calidris ferruginea</i>	Curlew Sandpiper	E	-	-	The Curlew Sandpiper is distributed around most of the coastline of Australia. It occurs along the entire coast of NSW, particularly in the Hunter Estuary, and sometimes in freshwater wetlands in the Murray-Darling Basin. It generally occupies littoral and estuarine habitats, and in New South Wales is mainly found in intertidal mudflats of sheltered coasts. It also occurs in non-tidal swamps, lakes and lagoons on the coast and sometimes the inland	Low	Low
<i>Collocephalon fimbriatum</i>	Gang-gang Cockatoo	V	-	-	In summer, occupies tall montane forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. Also occur in subalpine snow gum woodland and occasionally in temperate or regenerating forest. In winter, occurs at lower altitudes in drier, more open eucalypt forests and woodlands, particularly in box-ironbark assemblages, or in dry forest in coastal areas. It requires tree hollows in which to breed.	High	Low – no limiting habitat being modified or removed
<i>Calyptorhynchus lathami</i>	Glossy Black-Cockatoo	V	-	-	Inhabits forest with low nutrients, characteristically with key Allocasuarina spp. Tends to prefer drier forest types with a middle stratum of Allocasuarina below Eucalyptus or Angophora. Often confined to remnant patches in hills and gullies. Breed in hollows stumps or limbs, either living or dead. Endangered population in the Riverina.	Moderate	Low – no limiting habitat being modified or removed

Scientific Name	Common Name	BC Act	FM Act	EPBC Act	Habitat	Likelihood of Occurrence	Potential for impact
<i>Circus assimilis</i>	Spotted Harrier	V	-	-	The Spotted Harrier occurs throughout the Australian mainland, except in densely forested or wooded habitats of the coast, escarpment and ranges, and rarely in Tasmania. Individuals disperse widely in NSW and comprise a single population. Occurs in grassy open woodland including acacia and mallee remnants, inland riparian woodland, grassland and shrub steppe. It is found most commonly in native grassland, but also occurs in agricultural land, foraging over open habitats including edges of inland wetlands.	Low	Low
<i>Climacteris picumnus victoriae</i>	Brown Treecreeper (eastern subspecies)	V	-	-	Found in eucalypt woodlands (including box-gum woodland) and dry open forest of the inland slopes and plains inland of the Great Dividing Range; mainly inhabits woodlands dominated by stringybarks or other rough-barked eucalypts, usually with an open grassy understorey, sometimes with one or more shrub species; also found in mallee and river red gum forest bordering wetlands with an open understorey of acacias, saltbush, lignum, cumbungi and grasses; usually not found in woodlands with a dense shrub layer; fallen timber is an important habitat component for foraging; also recorded, though less commonly, in similar woodland habitats on the coastal ranges and plains.	Low	Low
<i>Daphoenositta chrysoptera</i>	Varied Sittella	V	-	-	Inhabits wide variety of dry eucalypt forests and woodlands, usually with either shrubby under storey or grassy ground cover or both, in all climatic zones of Australia. Usually in areas with rough-barked trees, such as stringybarks or ironbarks, but also in paperbarks or mature Eucalypts with hollows.	Moderate	Low – no limiting habitat being modified or removed
<i>Dasyornis brachypterus</i>	Eastern Bristlebird	E	-	E	Found in coastal woodlands, dense scrub and heathlands, particularly where it borders taller woodlands.	Moderate	Low – no limiting habitat being modified or removed
<i>Ephippiorhynchus asiaticus</i>	Black-necked Stork	E	-	-	Mainly found on shallow, permanent, freshwater terrestrial wetlands, and surrounding marginal vegetation, including swamps, floodplains, watercourses and billabongs, freshwater meadows, wet heathland, farm dams and shallow floodwaters, as well as extending into adjacent grasslands, paddocks and open savannah woodlands. They also forage within or around estuaries and along intertidal shorelines, such as saltmarshes, mudflats and sandflats, and mangrove vegetation.	Low	Low

Scientific Name	Common Name	BC Act	FM Act	EPBC Act	Habitat	Likelihood of Occurrence	Potential for impact
<i>Haematopus fuliginosus</i>	Sooty Oystercatcher	V	-	-	In NSW the Sooty Oystercatcher occupies rocky headlands, reefs and offshore islands along the entire coast, apparently as a single continuous population.	Low	Low
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle	-	-	M	Inhabits coastal and near coastal areas, building large stick nests, and feeding mostly on marine and estuarine fish and aquatic fauna.	Low	Low
<i>Hieraaetus morphnoides</i>	Little Eagle	V	-	-	Most abundant in lightly timbered areas with open areas nearby. Often recorded foraging in grasslands, crops, treeless dune fields, and recently logged areas. May nest in farmland, woodland and forest in tall trees.	Moderate	Low – no limiting habitat being modified or removed
<i>Hirundapus caudacutus</i>	White-throated Needletail	-	-	M	An aerial species found in feeding concentrations over cities, hilltops and timbered ranges.	Low	Low
<i>Lathamus discolor</i>	Swift Parrot	E	-	E	The Swift Parrot occurs in woodlands and forests of NSW from May to August, where it feeds on eucalypt nectar, pollen and associated insects. The Swift Parrot is dependent on flowering resources across a wide range of habitats in its wintering grounds in NSW. This species is migratory, breeding in Tasmania and also nomadic, moving about in response to changing food availability.	Moderate	Low – no limiting habitat being modified or removed
<i>Lophoictinia isura</i>	Square-tailed Kite	V	-	-	Typically inhabits coastal forested and wooded lands of tropical and temperate Australia. In NSW it is often associated with ridge and gully forests dominated by <i>Eucalyptus longifolia</i> , <i>Corymbia maculata</i> , <i>E. elata</i> or <i>E. smithii</i> . Individuals appear to occupy large hunting ranges of more than 100km <sup>2</sup> . They require large living trees for breeding, particularly near water with surrounding woodland -forest close by for foraging habitat. Nest sites are generally located along or near watercourses, in a tree fork or on large horizontal limbs.	Low	Low
<i>Neophema pulchella</i>	Turquoise Parrot	V	-	-	The Turquoise Parrot's range extends from southern Queensland through to northern Victoria, from the coastal plains to the western slopes of the Great Dividing Range. Lives on the edges of eucalypt woodland adjoining clearings, timbered ridges and creeks in farmland. Nests in tree hollows, logs or posts, from August to December. It lays four or five white, rounded eggs on a nest of decayed wood dust.	Low	Low

Scientific Name	Common Name	BC Act	FM Act	EPBC Act	Habitat	Likelihood of Occurrence	Potential for impact
<i>Ninox connivens</i>	Barking Owl	V	-	-	Generally found in open forests, woodlands, swamp woodlands and dense scrub. Can also be found in the foothills and timber along watercourses in otherwise open country.	Moderate	Low – no limiting habitat being modified or removed
<i>Ninox strenua</i>	Powerful Owl	V	-	-	Occupies wet and dry eucalypt forests and rainforests. Can occupy both un-logged and lightly logged forests as well as undisturbed forests where it usually roosts on the limbs of dense trees in gully areas. It is most commonly recorded within red turpentine in tall open forests and black she-oak within open forests. Large mature trees with hollows at least 0.5 m deep are required for nesting. Tree hollows are particularly important for the Powerful Owl because a large proportion of the diet is made up of hollow-dependent arboreal marsupials. Nest trees for this species are usually emergent with a diameter at breast height of at least 100 cm.	Moderate	Low – no limiting habitat being modified or removed
<i>Numenius madagascariensis</i>	Eastern Curlew	-	-	M	A primarily coastal distribution. Found in all states, particularly the north, east, and south-east regions including Tasmania. Rarely recorded inland. Mainly forages on soft sheltered intertidal sand flats or mudflats, open and without vegetation or cover. Breeds in the northern hemisphere.	Low	Low
<i>Petroica boodang</i>	Scarlet Robin	V	-	-	The Scarlet Robin is found from SE Queensland to SE South Australia and also in Tasmania and SW Western Australia. In NSW, it occurs from the coast to the inland slopes. The Scarlet Robin lives in dry eucalypt forests and woodlands. The understorey is usually open and grassy with few scattered shrubs.	Low	Low
<i>Pezoporus wallicus wallicus</i>	Eastern Ground Parrot	V	-	-	Large populations occur on the NSW South Coast, particularly Barren Grounds NR, Budderoo NP, the Jervis Bay area and Nadgee NR. Small numbers are recorded at Morton and Ben Boyd NP and other areas on the South Coast. The Ground Parrot occurs in high rainfall coastal and near coastal low heathlands and sedgeland, generally below one metre in height and very dense (up to 90% projected foliage cover). These habitats provide a high abundance and diversity of food, adequate cover and suitable roosting and nesting opportunities for the Ground Parrot, which spends most of its time on or near the ground.	Low	Low
<i>Rostratula australis</i>	Painted Snipe	E	-	E, M	In NSW, this species has been recorded at the Paroo wetlands, Lake Cowell, Macquarie Marshes and Hexham Swamp. Most common in the Murray-Darling	Low	Low

Scientific Name	Common Name	BC Act	FM Act	EPBC Act	Habitat	Likelihood of Occurrence	Potential for impact
					Basin. Prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber. Nests on the ground amongst tall vegetation, such as grasses, tussocks or reeds.		
<i>Stagonopleura guttata</i>	Diamond Firetail	V	-	-	Feeds exclusively on the ground, on ripe and partly-ripe grass and herb seeds and green leaves, and on insects (especially in the breeding season). Found in grassy eucalypt woodlands, including box-gum woodlands and snow gum woodlands. Also occurs in open forest, mallee, natural temperate grassland, and in secondary grassland derived from other communities.	Low	Low
<i>Sternula nereis nereis</i>	Fairy Tern	-	-	V	Distribution includes the southern half of NSW coast. Fairy Terns utilise a variety of habitats including offshore, islands in estuaries or lakes, wetlands, beaches and spits.	Low	Low
<i>Thalassarche cauta</i>	Black-browed Albatross	V	-	-	The Black-browed Albatross has a circumpolar range over the southern oceans, and are seen off the southern Australian coast mainly during winter. Inhabits antarctic, subantarctic, subtropical marine and coastal waters over upwellings and boundaries of currents.	Low	Low
<i>Thalassarche cauta (sensu stricto)</i>	Shy Albatross		-	V, M, MA	Marine species occurring in subantarctic and subtropical waters. Birds have been noted in shelf-waters around breeding islands and over adjacent rises. Nests on rocky islands.	Low	Low
<i>Thalassarche cauta eremita</i>	Chatham Albatross		-	E, M, MA	Marine species that occurs in subantarctic and subtropical waters reaching the tropics. It appears to be largely pelagic and has been noted in shelf-waters around breeding islands, over continental shelves during the non-breeding season, and occurs inshore and offshore. It usually nests on rocky ledges and steep slopes.	Low	Low
<i>Thalassarche cauta steadi</i>	White-capped Albatross		-	V, M, MA	Common off the coast of south-east Australia throughout the year. It has been observed that juveniles are rare in New Zealand waters, being more common off south-east Australia and South Africa. Breeding colonies occur on islands south of New Zealand.	Low	Low
<i>Tyto novaehollandiae</i>	Masked Owl	V	-	-	Inhabits a diverse range of wooded habitat that provide tall or dense mature trees with hollows suitable for nesting and roosting. Mostly recorded in open forest and woodlands adjacent to cleared lands. Nest in hollows, in trunks and in near	Low	Low

Scientific Name	Common Name	BC Act	FM Act	EPBC Act	Habitat	Likelihood of Occurrence	Potential for impact
					vertical spouts or large trees, usually living but sometimes dead. Nest hollows are usually located within dense forests or woodlands. Masked owls prey upon hollow-dependent arboreal marsupials, but terrestrial mammals make up the largest proportion of the diet.		
<i>Tyto tenebricosa</i>	Sooty Owl	V	-	-	Often found in tall old-growth forests, including temperate and subtropical rainforests. In NSW mostly found on escarpments with a mean altitude less than 500 metres. Nests and roosts in hollows of tall emergent trees, mainly eucalypts often located in gullies. Nests have been located in trees 125 to 161 centimetres in diameter.	Moderate	Low – no limiting habitat being modified or removed
<b>Invertebrates</b>							
<i>Petalura gigantea</i>	Giant Dragonfly	E	-	-	The Giant Dragonfly is found along the east coast of NSW from the Victorian border to northern NSW. It is not found west of the Great Dividing Range. There are known occurrences in the Blue Mountains and Southern Highlands, in the Clarence River catchment, and on a few coastal swamps from north of Coffs Harbour to Nadgee in the south. Live in permanent swamps and bogs with some free water and open vegetation. Adults emerge from late October and are short-lived, surviving for one summer after emergence.	Low	Low
<b>Reptiles</b>							
<i>Eretmochelys imbricata</i>	Hawkesbill Turtle		-	V, M, MA	Pelagic and coastal species that may occupy coastal waters including estuaries but more common in warmer tropical waters of Queensland.	None	Low
<i>Hoplocephalus bungaroides</i>	Broad-headed Snake	E	-	V	Occurs almost exclusively in association with communities occurring on Triassic sandstone within the Sydney Basin. Typically found among exposed sandstone outcrops with vegetation types ranging from woodland to heath. Within these habitats they spend most of the year sheltering in and under rock crevices and exfoliating rock. However, some individuals will migrate to tree hollows to find shelter during hotter parts of summer.	Moderate	Low – no limiting habitat being modified or removed
<i>Varanus rosenbergi</i>	Rosenberg's Goanna	V	-	-	This species is a Hawkesbury-Narrabeen sandstone outcrop specialist. Occurs in coastal heaths, humid woodlands and both wet and dry sclerophyll forests.	High	Low – no limiting habitat being modified or removed



Scientific Name	Common Name	BC Act	FM Act	EPBC Act	Habitat	Likelihood of Occurrence	Potential for impact
<b>Mammals</b>							
<i>Cercartetus nanus</i>	Eastern Pygmy-possum	V	-	-	Inhabits rainforest through to sclerophyll forest and tree heath. Banksias and myrtaceous shrubs and trees are a favoured food source. Will often nest in tree hollows, but can also construct its own nest. Because of its small size it is able to utilise a range of hollow sizes including very small hollows. Individuals will use a number of different hollows and an individual has been recorded using up to 9 nest sites within a 0.5ha area over a 5 month period.	Moderate	Low – no limiting habitat being modified or removed
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	V	-	V	Located in a variety of drier habitats, including the dry sclerophyll forests and woodlands to the east and west of the Great Dividing Range. Can also be found on the edges of rainforests and in wet sclerophyll forests. This species roosts in caves and mines in groups of between 3 and 37 individuals.	Moderate	Low – no limiting habitat being modified or removed
<i>Dasyurus maculatus maculatus</i>	Spotted-tailed Quoll	V	-	E	Spotted-tailed Quoll are found on the east coast of NSW, Tasmania, eastern Victoria and north-eastern Queensland. Only in Tasmania is it still considered common. Recorded across a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline.	Moderate	Low – no limiting habitat being modified or removed
<i>Falsistrellus tasmaniensis</i>	Eastern False Pipistrelle	V	-	-	Inhabit sclerophyll forests, preferring wet habitats where trees are more than 20 m high. Two observations have been made of roosts in stem holes of living eucalypts. There is debate about whether or not this species moves to lower altitudes during winter, or whether they remain sedentary but enter torpor. This species also appears to be highly mobile and records showing movements of up to 12 km between roosting and foraging sites.	Moderate	Low – no limiting habitat being modified or removed
<i>Isoodon obesulus obesulus</i>	Southern Brown Bandicoot (eastern)	E	-	-	Prefers sandy soils with scrubby vegetation and-or areas with low ground cover that are burn from time to time. A mosaic of post fire vegetation is important for this species.	Low	Low
<i>Miniopterus australis</i>	Little Bentwing-bat	V	-	-	Coastal north-eastern NSW and eastern Queensland. Little Bent-wing Bat is an insectivorous bat that roost in caves, in old mines, in tunnels, under bridges, or in similar structures. They breed in large aggregations in a small number of known caves and may travel 100s km from feeding home ranges to breeding sites. Little	Moderate	Low – no limiting habitat being modified or removed

Scientific Name	Common Name	BC Act	FM Act	EPBC Act	Habitat	Likelihood of Occurrence	Potential for impact
					Bent-wing Bat has a preference for moist eucalypt forest, rainforest or dense coastal banksia scrub where it forages below the canopy for insects.		
<i>Myotis macropus</i>	Southern Myotis	V	-	-	The Large-footed Myotis is found in the coastal band from the north-west of Australia, across the top-end and south to western Victoria. Generally roost in groups of 10 - 15 close to water in caves, mine shafts, hollow-bearing trees, storm water channels, buildings, under bridges and in dense foliage.	Low	Low
<i>Petauroides volans</i>	Greater Glider	-	-	V	The Greater Glider occurs in eucalypt forests and woodlands. The Greater Glider occurs in eucalypt forests and woodlands. The species nests in hollows and are typically found in older forests. Generally, the home range for the greater glider is between 0.7-3 hectares and tends to have a population density of 0.01-5 individuals per hectare. The home ranges of females can overlap with males and females however for the males the home ranges never overlap.	Low	Low
<i>Petaurus australis</i>	Yellow-bellied Glider	V	-	-	Occur in tall mature eucalypt forest generally in areas with high rainfall and nutrient rich soils. forest type preferences vary with latitude and elevation; mixed coastal forests to dry escarpment forests in the north; moist coastal gullies and creek flats to tall montane forests in the south. Found along the eastern coast to the western slopes of the Great Dividing Range, from southern Queensland to Victoria.	Low	Low
<i>Petaurus norfolcensis</i>	Squirrel Glider	V	-	-	Generally occurs in dry sclerophyll forests and woodlands but is absent from dense coastal ranges in the southern part of its range. Requires abundant hollow bearing trees and a mix of eucalypts, banksias and acacias. There is only limited information available on den tree use by Squirrel gliders, but it has been observed using both living and dead trees as well as hollow stumps. Within a suitable vegetation community at least one species should flower heavily in winter and one species of eucalypt should be smooth barked. Endangered population in the Wagga Wagga LGA.	Moderate	Low – no limiting habitat being modified or removed
<i>Petrogale penicillata</i>	Brush-tailed Rock-wallaby	E	-	V	Found in rocky areas in a wide variety of habitats including rainforest gullies, wet and dry sclerophyll forest, open woodland and rocky outcrops in semi-arid country. Commonly sites have a northerly aspect with numerous ledges, caves and crevices.	Low	Low

Scientific Name	Common Name	BC Act	FM Act	EPBC Act	Habitat	Likelihood of Occurrence	Potential for impact
<i>Phascolarctos cinereus</i>	Koala	V	-	V	Inhabits eucalypt forests and woodlands. The suitability of these forests for habitation depends on the size and species of trees present, soil nutrients, climate and rainfall.	Moderate	Low – no limiting habitat being modified or removed
<i>Pseudomys novaehollandiae</i>	New Holland Mouse	-	-	V	The New Holland Mouse currently has a disjunct, fragmented distribution across Tasmania, Victoria, New South Wales and Queensland. Across the species' range the New Holland Mouse is known to inhabit open heathlands, open woodlands with a heathland understorey, and vegetated sand dunes.	Low	Low
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	V	-	V	This species is a canopy-feeding frugivore and nectarivore of rainforests, open forests, woodlands, melaleuca swamps and banksia woodlands. Bats commute daily to foraging areas, usually within 15 km of the day roost although some individuals may travel up to 70 km.	Moderate	Low – no limiting habitat being modified or removed
<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail-bat	V	-	-	Roosts singly or in groups of up to six, in tree hollows and buildings; in treeless areas they are known to utilise mammal burrows. When foraging for insects, flies high and fast over the forest canopy, but lower in more open country. Forages in most habitats across its very wide range, with and without trees; appears to defend an aerial territory.	Low	Low
<i>Scoteanax rueppellii</i>	Greater Broad-nosed Bat	V	-	-	Prefer moist gullies in mature coastal forests and rainforests, between the Great Dividing Range and the coast. They are only found at low altitudes below 500 m. In dense environments they utilise natural and human-made opening in the forest for flight paths. Creeks and small rivers are favoured foraging habitat. This species roosts in hollow tree trunks and branches.	Low	Low
<b>Marine Mammals</b>							
<i>Arctocephalus forsteri</i>	New Zealand Fur-seal	V	-	-	Prefers rocky parts of islands with jumbled terrain and boulders.	None	None
<i>Megaptera novaeangliae</i>	Humpback Whale		-	V, M, W	Migrates between Antarctica and the GBR between March and November. Widely distributed in coastal waters and may enter deep embayment's at times.	None	None
<b>Fish</b>							

Scientific Name	Common Name	BC Act	FM Act	EPBC Act	Habitat	Likelihood of Occurrence	Potential for impact
<i>Macquaria australasica</i>	Macquarie Perch	-	E	E	Recent research indicates that there may be at least two distinct forms of Macquarie Perch, one from the western rivers (Murray-Darling Basin form) and one from the eastern rivers (the Shoalhaven and Hawkesbury-Nepean systems) (the coastal form). The species has also been stocked or translocated into a number of reservoirs including Talbingo, Cataract and Khancoban reservoirs and translocated into streams including the Mongarlowe River. Macquarie Perch are found in both river and lake habitats; especially the upper reaches of rivers and their tributaries	Low	Low
<b>Plants</b>							
<i>Acacia baueri subsp. aspera</i>	<i>Acacia baueri subsp. aspera</i>	V	-	-	Occurs in low, damp heathlands, often on exposed rocky outcrops over a wide range of climatic and topographical conditions. Appears to prefer open conditions; rarely observed where there is any shrub or tree canopy development; and many of the observations of this species have been made following fire, suggesting the species prefers early successional habitats. Restricted to the Sydney region, occurring on the Kings Tableland in the central Blue Mountains and with sporadic occurrences on the Woronora Plateau in the Royal National Park, Mt. Keira district and at Wedderburn. May also occur on the escarpment-Woronora Plateau in the Flat Rock Junction and Stanwell Tops area of the Illawarra.	Moderate	Low – no limiting habitat being modified or removed
<i>Acacia bynoeana</i>	Bynoe's Wattle	E	-	V	Grows mainly in heath and dry sclerophyll forest in sandy soils. Mainly south of Dora Creek-Morriset area to Berrima and the Illawarra region, west to the Blue Mountains, also recorded from near Kurri Kurri in the Hunter Valley and from Morton National Park.	Moderate	Low – no limiting habitat being modified or removed
<i>Allocasuarina glareicola</i>		E	-	E	Primarily restricted to the Richmond (NW Cumberland Plain) district, but with an outlier population found at Voyager Point, Liverpool. Grows in Castlereagh woodland on lateritic soil. Found in open woodland with <i>Eucalyptus parramattensis</i> , <i>Eucalyptus fibrosa</i> , <i>Angophora bakeri</i> , <i>Eucalyptus sclerophylla</i> and <i>Melaleuca decora</i> . Common associated understorey species include <i>Melaleuca nodosa</i> , <i>Hakea dactyloides</i> , <i>Hakea sericea</i> , <i>Dillwynia tenuifolia</i> , <i>Micromyrtus minutiflora</i> , <i>Acacia elongata</i> , <i>Acacia brownei</i> , <i>Themeda australis</i> and <i>Xanthorrhoea minor</i> .	Low	Low

Scientific Name	Common Name	BC Act	FM Act	EPBC Act	Habitat	Likelihood of Occurrence	Potential for impact
<i>Astrotricha crassifolia</i>		V	-	V	Occurs near Patonga (Gosford LGA), and in Royal NP and on the Woronora Plateau (Sutherland and Campbelltown LGAs). There is also a record from near Glen Davis (Lithgow LGA). Also in Victoria. Occurs in dry sclerophyll woodland on sandstone.	Moderate	Low – no limiting habitat being modified or removed
<i>Caladenia tessellata</i>	Thick-lip Spider Orchid	E	-	V	The Tessellated Spider Orchid is found in grassy sclerophyll woodland on clay loam or sandy soils, though the population near Braidwood is in low woodland with stony soil. Known from the Sydney area (old records), Wyong, Ulladulla and Braidwood in NSW. Populations in Kiama and Queanbeyan are presumed extinct.	Low	Low
<i>Callistemon linearifolius</i>		V	-	-	Recorded from the Georges River to Hawkesbury River in the Sydney area, and north to the Nelson Bay area of NSW. Recorded in 2000 at Coalcliff in the northern Illawarra. For the Sydney area, recent records are limited to the Hornsby Plateau area near the Hawkesbury River. Grows in dry sclerophyll forest on the coast and adjacent ranges.	Moderate	Low – no limiting habitat being modified or removed
<i>Callitris endlicheri</i>	Black Cypress Pine, Woronora Plateau population	EP	-	-	This population represents the coastal limit of the species' range and is disjunct from other known populations of the species. The Woronora Plateau population is restricted to a single outcrop of sandstone about two hectares in area. The soils at this site are skeletal sandy loams and the heathlands on sandstone outcrops in the area are restricted and highly distinctive.	Low	Low
<i>Cryptostylis hunteriana</i>	Leafless Tongue-orchid	V	-	V	Does not appear to have well defined habitat preferences and is known from a range of communities, including swamp-heath and woodland. The larger populations typically occur in woodland dominated by Scribbly Gum ( <i>Eucalyptus sclerophylla</i> ), Silvertop Ash ( <i>E. sieberi</i> ), Red Bloodwood ( <i>Corymbia gummifera</i> ) and Black Sheoak ( <i>Allocasuarina littoralis</i> ); appears to prefer open areas in the understorey of this community and is often found in association with the Large Tongue Orchid ( <i>C. subulata</i> ) and the Tartan Tongue Orchid ( <i>C. erecta</i> ).	Moderate	Low – no limiting habitat being modified or removed
<i>Cynanchum elegans</i>	White-flowered Wax Plant	E	-	E	Recorded from rainforest gullies scrub and scree slopes from the Gloucester district to the Wollongong area and inland to Mt Dangar.	Low	Low

Scientific Name	Common Name	BC Act	FM Act	EPBC Act	Habitat	Likelihood of Occurrence	Potential for impact
<i>Epacris purpurascens</i> var. <i>purpurascens</i>		V	-	-	Recorded from Gosford in the north, to Narrabeen in the east, Silverdale in the west and Avon Dam vicinity in the south. Found in a range of habitat types, most of which have a strong shale soil influence.	Moderate	Low – no limiting habitat being modified or removed
<i>Eucalyptus camfieldii</i>	Heart-leaved Stringybark	V	-	V	Restricted distribution in a narrow band with the most northerly records in the Raymond Terrace Area south to Waterfall. Localised and scattered distribution includes sites at Norah Head (Tuggerah Lakes), Peats Ridge, Mt Colah, Elvina Bay Trail (West Head), Terrey Hills, Killara, North Head, Menai, Wattamolla and a few other sites in Royal National Park. Poor coastal country in shallow sandy soils overlying Hawkesbury sandstone. Coastal heath mostly on exposed sandy ridges. Occurs mostly in small scattered stands near the boundary of tall coastal heaths and low open woodland of the slightly more fertile inland areas.	Moderate	Low – no limiting habitat being modified or removed
<i>Genoplesium baueri</i>	Bauer's Midge Orchid	E	-	E	Grows in dry sclerophyll forest and moss gardens over sandstone. Flowers February to March. Has been recorded between Ulladulla and Port Stephens. Currently the species is known from just over 200 plants across 13 sites. The species has been recorded in Berowra Valley Regional Park, Royal National Park and Lane Cove National Park and may also occur in the Woronora, O'Hares, Metropolitan and Warragamba Catchments.	Moderate	Low – no limiting habitat being modified or removed
<i>Haloragis exalata</i> subsp. <i>exalata</i>	Square Raspwort	V	-	V	Occurs in 4 widely scattered localities in eastern NSW. It is disjunctly distributed in the Central Coast, South Coast and North-western Slopes botanical subdivisions of NSW. The species appears to require protected and shaded damp situations in riparian habitats.	Low	Low
<i>Leucopogon exolasius</i>	Woronora Beard-heath	V	-	V	Grows in woodland on sandstone. Restricted to the Woronora and Grose Rivers and Stokes Creek, Royal National Park.	Moderate	Low – no limiting habitat being modified or removed
<i>Melaleuca deanei</i>	Deane's Paperbark	V	-	V	Grows in wet heath on sandstone in coastal districts from Berowra to Nowra.	Moderate	Low – no limiting habitat being modified or removed

Scientific Name	Common Name	BC Act	FM Act	EPBC Act	Habitat	Likelihood of Occurrence	Potential for impact
<i>Persoonia hirsuta</i>	Hairy Geebung	E	-	E	Distributed from Singleton in the north, along the east coast to Bargo in the south and the Blue Mountains to the west. A large area of occurrence, but occurs in small populations, increasing the species's fragmentation in the landscape. Found in sandy soils in dry sclerophyll open forest, woodland and heath on sandstone. Usually present as isolated individuals or very small populations. Probably killed by fire (as other <i>Persoonia</i> spp. are) but will regenerate from seed.	Moderate	Low – no limiting habitat being modified or removed
<i>Persoonia nutans</i>	Nodding Geebung	E	-	E	Confined to aeolian and alluvial sediments and occurs in a range of sclerophyll forest and woodland vegetation communities, with the majority of individuals occurring within Agnes Banks woodland or Castlereagh Scribbly Gum woodland. Restricted to the Cumberland Plain in western Sydney, between Richmond in the north and Macquarie Fields in the south.	Low	Low
<i>Pimelea curviflora</i> var. <i>curviflora</i>		V	-	V	Confined to the coastal area of Sydney between northern Sydney in the south and Maroota in the north-west. Former range extended south to the Parramatta River and Port Jackson region including Five Dock, Bellevue Hill and Manly. Occurs on shaley-lateritic soils over sandstone and shale-sandstone transition soils on ridgetops and upper slopes amongst woodlands.	Low	Low
<i>Prostanthera densa</i>		V	-	V	Villous Mintbush is generally grows in sclerophyll forest and shrubland on coastal headlands and near coastal ranges, chiefly on sandstone, and rocky slopes near the sea.	Low	Low
<i>Pterostylis saxicola</i>	Sydney Plains Greenhood	E	-	E	Restricted to western Sydney between Freemans Reach in the north and Picton in the south. Most commonly found growing in small pockets of shallow soil in depressions on sandstone rock shelves above cliff lines. The vegetation communities above the shelves where <i>Pterostylis saxicola</i> occurs are sclerophyll forest or woodland on shale-sandstone transition soils or shale soils.	Low	Low
<i>Pultenaea aristata</i>		V	-	V	Grows in moist, dry sclerophyll woodland to heath on sandstone, specifically the drier areas of Upland Swamps. Restricted to the Woronora Plateau, a small area between Helensburgh, south of Sydney, and Mt Keira above Wollongong.	Known	Low – all known individuals will be demarcated and avoided during proposed works

Scientific Name	Common Name	BC Act	FM Act	EPBC Act	Habitat	Likelihood of Occurrence	Potential for impact
<i>Rhodamnia rubescens</i>	Scrub Turpentine	CE	-	-	Occurs in coastal districts north from Batemans Bay in New South Wales, approximately 280 km south of Sydney, to areas inland of Bundaberg in Queensland. Populations of <i>R. rubescens</i> typically occur in coastal regions and occasionally extend inland onto escarpments up to 600 m above sea level (a.s.l) in areas with rainfall of 1,000-1,600 mm. Found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest usually on volcanic and sedimentary soils.	Low	Low
<i>Syzygium paniculatum</i>	Magenta Lilly Pilly	E	-	V	Found only in NSW, in a narrow, linear coastal strip from Bulahdelah to Conjola State forest. On the South Coast the species occurs on grey soils over sandstone, restricted mainly to remnant stands of littoral rainforest. On the central coast it occurs on gravels, sands, silts and clays in riverside gallery rainforests and remnant littoral rainforest communities	Low	Low
<i>Thelymitra kangaloonica</i>	Kangaloon Sun Orchid	CE	-	CE	Thelymitra sp. Kangaloon is only known to occur on the Southern Tablelands of NSW in the Moss Vale - Kangaloon - Fitzroy Falls area at 550-700 m above sea level. It is known to occur at three swamps that are above the Kangaloon Aquifer. It is found in swamps in sedgeland over grey silty grey loam soils	Low	Low
<i>Thesium australe</i>	Austral Toadflax	V	-	V	Grows in very small populations scattered across eastern NSW, along the coast, and from the Northern to Southern Tablelands. It is also found in Tasmania and Queensland and in eastern Asia. Occurs in grassland or grassy woodland. Grows on kangaroo grass tussocks but has also been recorded within the exotic coolatai grass.	Low	Low
<i>Xerochrysum palustre</i>	Swamp Everlasting	-	-	V	Found in Kosciuszko National Park and the eastern escarpment south of Badja. Also found in eastern Victoria. Grows in swamps and bogs which are often dominated by heaths. Also grows at the edges of bog margins on peaty soils with a cover of shrubs or grasses.	Low	Low



## Annex 5 Assessment of Significance BC Act

### Coastal Upland Swamp in the Sydney Basin Bioregion EEC (Coastal Upland Swamp)

<p>Description</p>	<p>Coastal Upland Swamp is listed as an endangered ecological community (EEC) under Part 2 of Schedule 2 of the BC Act. The following description of Coastal Upland Swamp is from the <i>Final Determination</i> for the EEC (NSW Scientific Committee 2012):</p> <p><i>“Coastal Upland Swamp in the Sydney Basin Bioregion is the name given to the ecological community in the Sydney Basin bioregion associated with periodically waterlogged soils on Hawkesbury sandstone plateaus, generally where mean annual rainfall exceeds 950 mm. Coastal Upland Swamp is generally associated with soils that are acidic and vary from yellow or grey mineral sandy loams with a shallow organic horizon to highly organic spongy black peats with pallid subsoils. They vary in depth from a few centimetres to at least 4 metres. The vegetation is dominated by sclerophyll shrubs and/or sedges, with dynamic mosaics of structural forms that may include tall scrub, open heath and/or sedgeland. Although typically treeless, Coastal Upland Swamp may include scattered trees.”</i></p> <p>Extensive areas of Coastal Upland Swamp exist within the locality (303.8 hectares within five kilometres of the proposal according to NPWS 2003). No Coastal Upland Swamps will be significantly impacted by the proposed works, site 2020EX02 is located in the middle of an existing track within MU44 Upland swamps: sedgeland-heath complex.</p>
<p>In the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.</p>	<p>n/a</p>
<p>In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:</p> <p>Is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or</p> <p>Is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction</p>	<p><b>Extent and composition</b></p> <p>Approximately 303.8 hectares of Coastal Upland Swamp exists within five kilometres of the study area (NPWS 2003). This is considered to be the local occurrence of Coastal Upland Swamp in this instance. Of this local occurrence, none will be removed or modified by the proposal.</p> <p><b>Assessment</b></p> <p>No Coastal Upland Swamp will be removed or modified and, therefore, the action proposed is considered unlikely to have an adverse effect on either the extent or composition of the EEC such that its local occurrence of 303.8 hectares is placed at risk of extinction.</p>

<p>In relation to the habitat of a threatened species or ecological community: The extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.</p>	<p><b>Extent of impact on habitat</b> No clearing is proposed to be undertaken within areas of Coastal Upland Swamp, with impacts limited to walking through the edge of mapped swamp areas nearby the existing track and indirect impacts from the proposed borehole site works (Section 1.2.1) on existing cleared Fire Trail tracks. Therefore, the extent to which habitat is likely to be removed or modified as a result of the action proposed is considered to be negligible.</p> <p><b>Habitat fragmentation</b> As no Coastal Upland Swamp will be removed or modified, none of the EEC will be further fragmented as a result of the proposal.</p> <p>Importance of habitat to be impacted The proposal will have no direct impacts on Coastal Upland Swamp within the locality.</p>
<p>Whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),</p>	<p>Areas of Outstanding Biodiversity Value (AOBV) in NSW include:</p> <ul style="list-style-type: none"> <li>• Gould's Petrel- critical habitat declaration;</li> <li>• Little penguin population in Sydney's North Harbour;</li> <li>• Mitchell's Rainforest Snail in Stotts Island Nature Reserve; and</li> <li>• Wollemi Pine.</li> </ul> <p>None of these areas of AOBV will be affected by the proposal.</p>
<p>Whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.</p>	<p>There are no KTPs that will be significantly affected as a result of the proposal. In this case, the proposed works does not equate to a modification of native vegetation. The work is on an existing track and will not involve any clearing of native vegetation. This native vegetation constitutes the disturbed condition of Coastal Upland Swamp EEC along an existing Fire Trail and will have negligible direct effects.</p>
<p>Conclusion</p>	<p>The local occurrence Coastal Upland Swamp is unlikely to be significantly affected by the proposal as:</p> <ul style="list-style-type: none"> <li>• None of the local occurrence of the EEC will be removed or modified by the proposal;</li> <li>• The proposal is not inconsistent with a Recovery Plan or Threat Abatement Plan; and</li> <li>• The action proposed is unlikely to exacerbate a KTP to the extent that the EEC is at risk of extinction.</li> </ul>

**Red-crowned Toadlet (*Pseudophryne australis*) (Vulnerable)**

**Distribution**

The Red-crowned Toadlet has a restricted distribution. It is confined to the Sydney Basin, from Pokolbin in the north, the Nowra area to the south, and west to Mt Victoria in the Blue Mountains.

**Habitat requirements**

Occurs in open forests, mostly on Hawkesbury and Narrabeen Sandstones. Inhabits periodically wet drainage lines below sandstone ridges that often have shale lenses or cappings. Shelters under rocks and amongst masses of dense vegetation or thick piles of leaf litter. Breeding congregations occur in dense vegetation and debris beside ephemeral creeks and gutters. Red-crowned Toadlets have not been recorded breeding in waters that are even mildly polluted or with a pH outside the range 5.5 to 6.5. Eggs are laid in moist leaf litter, from where they are washed by heavy rain; a large proportion of the development of the tadpoles takes place in the egg. Disperses outside the breeding period, when they are found under rocks and logs on sandstone ridges and forage amongst leaf-litter. Red-crowned Toadlets are quite a localised species that appear to be largely restricted to the immediate vicinity of suitable breeding habitat. Red-crowned Toadlets are usually found as small colonies scattered along ridges coinciding with the positions of suitable refuges near breeding sites. Due to this tendency for discrete populations to concentrate at particular sites, a relatively small localised disturbance may have a significant impact on a local population if it occurs on a favoured breeding or refuge site.

**Assessment of significance:** An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

Criteria	Address of Criteria
<p>a. in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction</p>	<p>The proposed development or activity is unlikely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction. Due to the proposed activity being the modification of an existing track. The surrounding native vegetation will not be impacted as a result of this proposal.</p> <p>A probable Red-crowned Toadlet was heard calling within the study area during the current survey at site 2020EX02.</p> <p>Potential impacts for the species from this proposal are confined to indirect impacts which may adversely affect a very small proportion of breeding habitat within the locality. Controls will be implemented to avoid sedimentation of breeding habitat as outlined within this assessment.</p> <p>The action is unlikely to place the local population at risk of extinction.</p>
<p>b. in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:</p>	<p>iii.is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or</p> <p>iv.is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,</p>

<p>c. in relation to the habitat of a threatened species or ecological community:</p>	<p>iv.the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and v.whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and vi.the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality,</p>	<p>i.The extent of Red-crowned Toadlet habitat to be modified is zero hectares as a result of the proposed activity. The proposed activity is construction on a nearby Fire Trail. ii.The area of habitat is unlikely to become fragmented or isolated from other areas of habitat as a result of the proposed activity. Due to the tracks and associated impacts would not be sufficiently wide to act as a barrier to movement for the Red-crowned Toadlet. iii.Ephemeral creeks and associated habitat are important feature for Red-crowned Toadlet. However, the proposed exploration program largely avoids such habitat. Furthermore, any potential impacts would be mitigated by a suite of measures, which would assist in the prevention of impacts to any suitable habitat. Therefore, the negligible amount of habitat to be temporarily modified is of low importance to the long-term survival of the species in the locality.</p>
<p>d. whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),</p>		<p>No areas of Outstanding Biodiversity Value fell within the areas to be cleared or potentially impacted by the proposal after review of the Biodiversity Values Map (<a href="https://www.lmbc.nsw.gov.au/Maps/index.html?viewer=BVMap">https://www.lmbc.nsw.gov.au/Maps/index.html?viewer=BVMap</a>).</p>
<p>e. whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.</p>		<p>There are no KTPs that will be significantly affected as a result of the proposal. In this case, the proposed works does not equate to a modification of native vegetation. The work is on an existing track and will not involve any clearing of native vegetation.</p>
<p><b>Conclusion:</b> It is recommended that Metropolitan Coal adopts practises that minimise the potential for and manage risks of impacts from interactions e.g. waste disposal, cleaning equipment before mobilisation on site. The proposal is unlikely to result in a significant impact of Red-crowned Toadlet.</p>		

## Annex 6 Assessment of Significance EPBC Act

Coastal Upland Swamp		
Criteria for critically endangered and endangered ecological communities		Likelihood
<b>An action is likely to have a significant impact on a critically endangered or endangered ecological community if there is a real chance or possibility that it will:</b>		
<b>1. Reduce the extent of an ecological community;</b>		
	No areas of Coastal Upland swamp would be removed by the proposal. The proposed borehole site 2020EX02 has been designed to avoid areas supporting Coastal Upland Swamp. The local extent of Coastal Upland Swamp will not be reduced by the proposal.	None
<b>2. Fragment or increase fragmentation of an ecological community;</b>		
	As no areas of Coastal Upland Swamp would be removed by the proposal, the proposal would not fragment or increase fragmentation of Coastal Upland Swamp.	None
<b>3. Adversely affect habitat critical to the survival of an ecological community;</b>		
	<p>The following species are listed on the EPBC Act Register of Critical Habitat:</p> <ul style="list-style-type: none"> <li>• Wandering Albatross (<i>Diomedea exulans</i>) - Macquarie Island</li> <li>• <i>Lepidium ginninderrense</i> (Ginninderra peppercress) - Northwest corner Belconnen Naval Transmission Station, ACT</li> <li>• Black-eared Miner (<i>Manorina melanotis</i>) - Gluepot Reserve, Taylorville Station and Calperum Station.</li> <li>• Shy Albatross (<i>Thalassarche cauta</i>) - Albatross Island, The Mewstone, Pedra Branca</li> <li>• Grey-headed Albatross (<i>Thalassarche chrysostoma</i>) - Macquarie Island</li> </ul> <p>No critical habitat has been declared for Coastal Upland Swamp. Given no areas of Coastal Upland Swamp would be removed by the proposal, the proposal is not likely to adversely affect habitat critical to the survival of Coastal Upland Swamp.</p>	None
<b>4. Modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns;</b>		
	All potential impacts on abiotic factors will be ameliorated by a series of environmental safeguards and mitigation measures. The proposal is unlikely to modify or destroy abiotic factors necessary for the survival of Coastal Upland Swamp within the study area.	Unlikely
<b>5. Cause a substantial change in the species composition of an occurrence of an ecological community;</b>		
	Given no areas of Coastal Upland Swamp would be cleared as a result of the proposal, the proposal is not likely to cause a substantial change in the species composition of an occurrence of Coastal Upland Swamp.	None
<b>6. Cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to;</b>		
	<ul style="list-style-type: none"> <li>• Assisting invasive species, that are harmful to the listed ecological community, to become established, or</li> <li>• Causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community</li> </ul> <p>Coastal Upland Swamp will not be affected by the proposal and, therefore, the ecological processes required to enable the establishment of invasive species are unlikely to eventuate.</p> <p>On-site work will be tightly regulated and controlled by a series of mitigation measures and environmental safeguards to ensure against events such as the mobilisation of pollutants. These measures are described in detail in the relevant sections of the REF.</p>	Unlikely

<p><b>7. Interfere with the recovery of an ecological community.</b></p>	
<p>To date, there is no recovery plan or threat abatement plan for Coastal Upland Swamp. Management objectives have been identified for Coastal Upland Swamps under the Saving Our Species program:</p> <ul style="list-style-type: none"> <li>○ The extent and condition of this ecological community will be improved or maintained primarily via positive management consistent with Catchment Action Plans, water management plans, and by regulating clearing. Where it occurs on private lands, this ecological community will also benefit from voluntary agreements with landholders to manage the land for conservation purposes.</li> </ul> <p>Given the proposal would not result in any clearing of Coastal Upland Swamp, the proposal is not inconsistent with this management action.</p>	<p>Unlikely</p>
<p><b>Conclusion:</b> The proposed action is unlikely to have a significant impact on Coastal Upland Swamp.</p>	

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Mudgee  
Port Macquarie  
Brisbane  
Cairns



## Our services

### Ecology and biodiversity

Terrestrial  
Freshwater  
Marine and coastal  
Research and monitoring  
Wildlife Schools and training

### Heritage management

Aboriginal heritage  
Historical heritage  
Conservation management  
Community consultation  
Archaeological, built and landscape values

### Environmental management and approvals

Impact assessments  
Development and activity approvals  
Rehabilitation  
Stakeholder consultation and facilitation  
Project management

### Environmental offsetting

Offset strategy and assessment (NSW, QLD, Commonwealth)  
Accredited BAM assessors (NSW)  
Biodiversity Stewardship Site Agreements (NSW)  
Offset site establishment and management  
Offset brokerage  
Advanced Offset establishment (QLD)