



**METROPOLITAN COAL CONSTRUCTION MANAGEMENT PLAN**

**SURFACE WORKS ASSESSMENT FORM**

**GROUNDWATER MONITORING BOREHOLES, GAUGING STATIONS AND  
SURFACE WATER MONITORING ACCESS TRACKS**

**JANUARY 2020**

## Background

The subject Surface Works Assessment Form (SWAF) is submitted to Department of Planning, Industry & Environment (DPIE) and WaterNSW for the proposed vegetation clearance for access tracks, gauging stations (weirs), and installation of groundwater monitoring boreholes.

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

Groundwater monitoring boreholes will be installed in each swamp. One monitoring borehole will be drilled to a depth of approximately 10 m (within the underlying rock) while the other would be drilled to remain within the swamp sediment, approximately 100 millimetres (mm) above the underlying rock. Based on sediment depths measured during the swamp reconnaissance inspections, the shallower (i.e. swamp sediment) monitoring bore will be approximately 600 mm to 1 m deep.

As part of baseline data collection ahead of mining longwall (LW) 305 to 309, Metropolitan Coal has undertaken to install low flow monitoring flumes near the outlets of two swamps within the catchment of the Woronora Reservoir. The objective of the proposed flumes is to provide accurate flow data, particularly for low to moderate flows, in support of a hydrological assessment of the potential impacts of mining on outflows from swamps.

A summary of the groundwater monitoring boreholes, weirs, and access tracks proposed in this SWAF is provided in Table 1.

**Table 1**

Site	Piezometer Depth	Vegetation Clearance (ha)
76-1	1m	0.017
76-2	1m/10m	0.02
76-3	1m	0.007
77-1	1m	0.0012
77-2	1m/10m	0.017
77-3	1m	0.016
81	1m	0.006
82	1m	0.009
89	1m	0.009
92-1	1m	0.006
92-2	1m/10m	0.02
92-3	1m	0.006
Stream R	Access track	0.029
Stream P	Access track	0.021
Weir 76	Gauging Station	-
Weir 92	Gauging Station	-

The planned timing of the boreholes and access tracks is subject to approval of this SWAF. This SWAF provides details of construction and environmental management measures for the proposed as outlined in the Metropolitan Coal Construction Management Plan (ConMP) as 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.

## 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:** 15

**Site names:** *Swamps (76, 77, 81, 82, 89, and 92), Stream R and P and Weir 76 and 92*

**Site types:** *Environmental monitoring sites – groundwater monitoring boreholes, gauging stations and access tracks*

**Site co-ordinates (easting/northing):** *Coordinates in table below*

Site	Piezometer depth / Site type	Easting	Northing
76-1	1m	310371	6217651
76-2	1m/10m	310142	6217474
76-3	1m	310059	6207350
77-1	1m	310397	6216915
77-2	1m/10m	310269	6216732
77-3	1m	310114	6216572
81	1m	310993	6216619
82	1m	311104	6216658
89	1m	310769	6216216
92-1	1m	310515	6216166
92-2	1m/10m	310054	6216033
92-3	1m	309763	6215908
Stream R	Access track	310371	6217651
Stream P	Access track	310142	6217474
Weir 76	Gauging Station	310660	6217930
Weir 92	Gauging Station	310605	62161185

### **Expected duration of works:**

*Approximately one to two days per swamp for drilling, borehole installation, and weir construction. Access tracks would be cleared prior to the drilling.*

*The entire construction campaign is expected to take approximately three to five weeks, weather permitting.*

## **Works schedule:**

- Describe the activities (including timing) to be conducted during construction works.
- Risk Assessment
- Flora, Fauna and Archaeological Assessments
- Personnel training and awareness – prior to commencement of activities
- Establishment and implementation of pre-construction management measures (e.g. erosion and sediment controls, vegetation clearance)
- Delivery of equipment by ATV/quad bike, rubber-tracked remote access drill rig and by hand - approximately one to two days per site.
- Site clean-up (e.g. removal of equipment, materials and waste) - approximately half a day per site.
- Monitoring during and following completion of construction.

## Groundwater Monitoring Boreholes (Piezometers)

Twelve (12) borehole sites include nine (9) shallow sediment boreholes with piezometers to be installed to a depth of one meter (Swamp 76-1, 76-2, 76-3, 77-2, 77-3, 81, 82, 89, 92-1, 92-2, and 92-3); additionally at swamps 76-2, 77-2 and 92-2, one deep swamp borehole will be drilled to a depth of approximately ten meters (within the underlying rock). See Attachment 1.

Site preparation will involve:

- Use of existing tracks and fire trails
- Access to the monitoring bore construction sites will be from existing access roads. Narrow (0.5-1.2 m wide) tracks to each construction site will be slashed for pedestrian access and equipment and materials delivery/removal.
- Use of “trittering” attachment to mulch vegetation in-situ
- Prepare each borehole site (including a level drill pad and border set down and work area approximately 3 x 3 m for 1m boreholes, and 5 x 5 m for 10 m borehole sites)
- Erosion and sediment controls

Drilling of boreholes will involve:

- Drilling will occur during forecast dry weather wherever practicable.
- Delivery of drill rigs to site (including ancillary equipment).
- Water delivery (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.
- The deep (10m) and shallow (1m) boreholes will be drilled utilising open hole hammer techniques. Groundwater monitoring bores will have a diameter of up to 100 mm. The 10 m deep bores will be drilled using a small remote access drill rig or man portable drill rig, while the shallow swamp sediment bores will be drilled with a hand auger. An air compressor will be located on adjacent access trails with a pressure rated airline secured along the access track. Due to the shallow nature and moisture content of the bores dust generated during drilling is expected to be very minor, cuttings will be collected and disposed of offsite.
- The 10 m deep monitoring boreholes will be drilled in Hawkesbury Sandstone which will negate the need for chemicals to reduce swelling clays. Swelling clays are typically found in the Stanwell Park Claystone and the Wombarra Shale. Metropolitan Coal has drilled approximately 300 holes of similar depth in the Hawkesbury Sandstone and only water has been used to remove cuttings.
- PVC borehole screen (50 mm) with blank PVC casing will be installed and packed with a sand gravel mix sealed with bentonite and cement grout to surface. Each monitoring borehole to be protected by installation of a steel monument.
- Water level sensor and data logger will be installed within each borehole.

- *Revegetation (Brush Matting, planting and/or direct seeding)*
- *Site clean-up (e.g. removal of equipment, materials and waste) and rehabilitation will be in accordance with Metropolitan Coal's Rehabilitation Management Plan.*
- *Monitoring program associated with swamp groundwater will be incorporated into future Biodiversity Management Plans*

*Fuel management will involve:*

- *Large quantities of fuel will not be stored on site. Fuel will be transported in closed containers (e.g. jerry cans). 60 L plastic containers will be used to hold fuel cans after use. Re-fuelling will be conducted using an appropriately sized funnel. Refuelling of equipment will be completed before the equipment is transported to the drill site so as to reduce the requirement of transporting fuel. 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 and personnel will be trained in their use. 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*
- *Water NSW (via the incident Management Number 1800 061 069).*
- *The site supervisor and the Metropolitan Coal Environment & Community Superintendent will investigate any spills.*

#### Surface Water Monitoring Tracks to Stream R and P

- *Two (2) surface water monitoring tracks will be constructed. Narrow (0.5-1.2 m wide) tracks to each site will be slashed for pedestrian access.*
- *Use of a "trittering" attachment to mulch vegetation in-situ will be used.*

#### Gauging Stations (Weirs)

- *Establishment and implementation of pre-construction management measures (e.g. erosion and sediment controls).*
- *Two (2) low flow reinforced concrete weirs constructed in Swamp 76 and 92 to divert flows into the "H flume".*
- *Monitoring during construction – prior to, and following construction activities.*
- *Monitoring program associated with gauging stations will be incorporated into future Water Management Plans*

#### 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.*

#### Human Waste Water

- *A portable toilet will be located on a proximal access road near the construction sites. The toilet will be serviced fortnightly with a vacuum truck.*

**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**

*Thirteen threatened flora were considered to have a High or Moderate likelihood of occurrence in the study area prior to field survey: 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.*

*Many Pultenaea aristata individuals (approximately 320 individuals) were recorded during the survey of the proposed borehole sites and the species is known to be locally abundant.*

Are there records of known threatened fauna species in the general area? **No**

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

What vegetation type is present?

Sandstone gully apple-peppermint forest, exposed andstone scribbly gum woodland, Silvertop ash ironstone woodland, Sandstone heath-woodland, Rock pavement heath, Rock plate heath-mallee, Upland swamps: fringing eucalypt woodland, Upland swamps: banksia thicket; and Upland swamps: sedgeland-heath complex.

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**

### Threatened flora survey (refer Section 6.1.3 of the ConMP)

Date of survey for threatened flora.

*October 4,8,9,11 and 21<sup>st</sup> 2019*

Name of suitable qualified ecologist conducting survey

*Layne Holloway (Heritage Consultant), Sarah Hart (Ecologist) and Wade Goldwyer (Heritage Consultant), Niche Environment & Heritage*

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

*Pultenaea aristata individuals were recorded during the survey of the proposed borehole sites and the species is known to be locally abundant. All Pultenaea aristata within the proposed development area have been marked with pink flagging tape. P.aristata individuals at all sites will be made known to project personnel so they can be avoided and protected during works. Within dense areas of threatened plants the vegetation clearing will be reduced and completed by hand-held devices, this will ensure the proposed works avoid any individuals of P.aristata.*

*The proposed access tracks are narrow and can avoid any individuals of P.aristata by zig zagging through the vegetation to minimise impacts to P.aristata such that no direct impacts are expected.*

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 groundwater bore construction sites and access tracks have been located to avoid the known records of Pultenaea aristata.*

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? **Yes**

#### **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 – Swamp Piezometer Installation (Project No: 5410) attached as 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 proposal seeks to minimise disturbance by using previously developed tracks where possible. It would result in approximately 0.21 hectares of vegetation disturbance.*

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).

*An access track approximately 0.5-1.2m wide will be required from the nearest existing access road to each groundwater monitoring bore construction site. This access track will be used for pedestrian access and equipment and materials delivery/removal using an ATV/quad bike and a rubber-tracked remote access drill rig.*

Is vegetation clearing required for site access? If yes, describe the extent and method of clearing?

**Yes**

*The access track described above will be slashed above ground level with vegetation root mass left in situ. The access tracks will be created from the nearest existing access point (e.g. fire roads or public roads). Access tracks will be located to avoid disturbance to larger trees, with existing trails and cleared areas used for access where possible.*

### **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 native vegetation.*
- *Equipment will be transported to the construction site by hand and ATV/quad bike and rubber-tracked remote access drill rig to minimise impacts to vegetation from vehicles.*
- *Existing fire trails, tracks and exposed bedrock will be used for access and placement of equipment.*
- *Vegetation disturbance along access tracks will be kept to the minimum necessary.*
- *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**

Have the following been indicated on the Site Layout Plan?

- 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 indicative ground conditions within upland swamps and an example of an existing access track.*



*Photo showing exposed rock within swamps. No direct disturbance of exposed rock outcrop would be conducted. Exposed rock areas would be used for access and transport of materials where required.*



*Photo showing a swamp with less dense vegetation. Limited slashing would be required for access tracks in areas like this.*



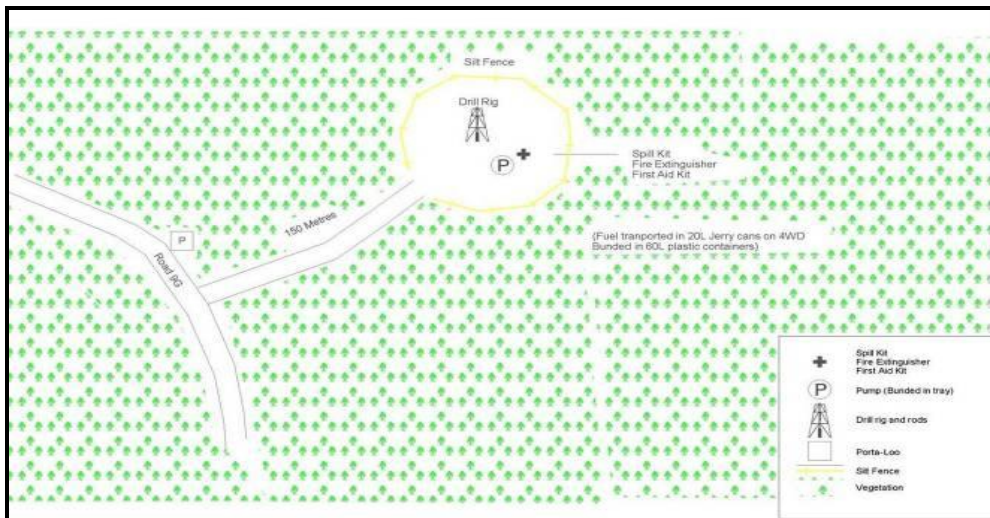
*Photo showing an existing access track within a swamp*



*Photo showing site access through woodland with flagged pink tape *P. aristate* to be avoided*



*Photo of a typical groundwater bore installation within a swamp. Note vegetation re-establishing within the cleared area following construction.*



*Indicative site layout plan of proposed groundwater monitoring sites. Access tracks are shown. A portable toilet will be located in an easily accessible location near the construction sites.*



*Proposed weir flume monitoring site at Swamp 76*



*Proposed weir flume monitoring site at Swamp 92*



*Typical "H flume" weir design and construction*

### **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 4<sup>th</sup>, 11<sup>th</sup> and 21<sup>st</sup> September 2019. An extensive search of the Aboriginal Heritage Information Management System (AIMS) was conducted on 18<sup>th</sup> October 2019.*

Name of suitably qualified archaeologist conducting survey

*Layne Holloway (heritage Consultant) and Wade Goldwyer (Heritage Consultant), Niche Environment & Heritage*

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

Description of recorded Aboriginal heritage sites.

*There are previously recorded Aboriginal cultural heritage sites within a 200m proximity to the proposed Subject Area of Stream P and Swamp site 89 access tracks. There are no sites within proximity to any other borehole sites or access tracks. 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.*

*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.*

Will works be relocated to avoid impacts on the Aboriginal heritage site? **Yes**

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.

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

*Niche Environment and Heritage's Aboriginal Heritage Due Diligence Assessment is attached as part of Attachment 1.*

### **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.

*The following recommendations are made:*

- Standard work procedures for protection and reporting of Aboriginal objects of Metropolitan Coal and sites be implemented*
- Project personnel to be made aware of the archaeological sites near swamp access track 89 and Stream P surface water monitoring track to avoid any disturbance outside the alignment of the 0.5 m track clearing*
- 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*

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

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

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

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

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

- |  |            |
|--|------------|
| - What hazardous materials are required to be used and how will they be stored on site?<br><i>If fuel (diesel or petrol) is required at the swamp drill site it will be stored on-site during construction works in bunded containers.</i> |            |
| - Are Materials Safety Data Sheets (MSDS) for hazardous materials located at the construction site?  | <b>Yes</b> |

### **Bushfire Preparedness and Management**

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

*As the Bushfire season has commenced, a Hot Work Permit will be used for any work that involves high temperatures and fire risk. This includes the use of chainsaws and other equipment associated with vegetation management. Metropolitan Coal will use the following measures when conducting any hot work:*

- *Presence of two 16 L Firefighting knapsacks and a 9L fire extinguisher.*
- *No works will be carried out on a Total Fire Ban day.*
- *A dedicated fire observer will be present at all times during hot works.*
- *A Water NSW hot works form will be completed before works commence each day.*



## **Groundwater Monitoring Borehole Installation Erosion and Sediment Control Plan**

This Erosion and Sediment Control Plan (ESCP) has been developed for the construction of groundwater monitoring bores within upland swamps. The purpose of this ESCP is to minimise the risks of the groundwater bore construction activities causing erosion or sedimentation. The construction activities will involve the use of a mobile drill rig to drill a shallow groundwater bore at approximately 10 m depth and hand augering of a swamp sediment bore to a depth of approximately 600 mm to 1 m. The construction of the bores is anticipated to take approximately one to two days per swamp. Construction will be conducted during dry weather wherever practicable.

Groundwater borehole construction sites have been selected to minimise the potential for erosion, such as locating the drilling site on flatter ground, away from drainage paths.

Boreholes will only be constructed when there is no flowing water within the drilling site to minimise the potential for sediment transport away from the construction site.

Sediment control measures will be implemented around the drill sites in accordance with the *Management Urban Stormwater: Soils and Construction Volumes 1 and 2A* as required.

All sediment, cuttings and drilling fluids will be collected and transferred off-site for disposal.

Given the construction works are only anticipated to take one day per swamp, all construction equipment and materials will be transported into and out of the swamp each day.

Weekly inspections of erosion and sediment control structures for structural integrity and effectiveness will be conducted by the Metropolitan Coal Environmental Coordinator or their delegate.

At the conclusion of the construction works all construction equipment and materials will be removed from site including all waste materials and sediment recovered from the construction area.

## **Attachment 1**

*Flora, Fauna and Archaeological Assessment Metropolitan Coal – Swamp Piezometer and Gauging Station Installation (Project No: 5410)*

## Flora, Fauna and Archaeological Assessment

### Metropolitan Coal - Swamp Piezometer and Gauging Station Installation

Helensburgh, NSW

Prepared for Metropolitan Coal Pty Ltd

Prepared by Niche Environment and Heritage | 17 January 2020



## Document control

Project number	Client	Project director	Project manager	LGA
5410	Metropolitan Coal	Matt Richardson	Renee Regal	Wollongong City Council

Version	Author	Review	Status	Date
D1	Sarah Hart	Simon Tweed	Draft	4 November 2019
R0	Sarah Hart and Layne Holloway	Sarah Webb	Draft	5 November 2019
D2	Sarah Hart and Layne Holloway	Kane Organ	Final	21 November 2019
R1	Sarah Hart and Layne Holloway	Stephen Love	Final	02 December 2019
R2	Sarah Hart, Layne Holloway, Richard Sheehan	Renée Regal	Variation draft	27 December 2019
R3	Sarah Hart, Richard Sheehan	Renée Regal	Variation final	16 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 12 proposed swamp piezometer groundwater monitoring sites by Metropolitan Coal. The piezometer sites are required to undertake groundwater monitoring within upland swamps in relation to potential mine induced subsidence impacts in order to meet Agency requirements.

Additionally, Niche has undertaken an assessment of the ecological and archaeological constraints and potential impacts associated with two access tracks to surface water monitoring locations (at Stream P and Stream R) and two gauging stations.

The 12 piezometer sites include nine shallow swamp sediment bore sites with piezometers to a depth of one metre (Sites 76-1, 76-2, 76-3, 77-1, 77-2, 77-3, 81, 82, 89, 92-1, 92-2 and 92-3 - Refer Figures 2 and 3); additionally at Sites 76-2, 77-2 and 92-2, one deep swamp sediment bore, drilled to a depth of approximately 10m (within the underlying rock).

The proposed sites have been inspected by Niche heritage consultants, Renée Regal, Layne Holloway, Wade Goldwyer and Niche ecologist Sarah Hart.

The relevant management measures as outlined in the Metropolitan Coal Construction Management Plan (Peabody Energy 2015) shall be implemented in order to avoid and minimise impacts to the environment. The proposal seeks to minimise disturbance by using previously developed tracks for the most part and clearing only to extent required. It would result in approximately 0.21 hectares of primary vegetation clearing inclusive of 0.08 ha of designated EEC.

Provided mitigation measures detailed within the management plan and this report are implemented, the proposal will not cause a 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).

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, access tracks and surface water access tracks (refer Annex 3).

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.

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## 1. Introduction

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### 1.1 Context

Niche Environment and Heritage (Niche) has undertaken an assessment of the ecological and archaeological constraints and potential impacts associated with the development of 12 proposed swamp piezometer groundwater monitoring sites and two water monitoring gauging stations by Peabody Energy Metropolitan Coal. The piezometer sites are required to undertake groundwater monitoring within upland swamps in relation to potential mine induced subsidence impacts in order to meet Agency requirements.

Additionally, Niche has undertaken an assessment of the ecological and archaeological constraints and potential impacts associated with two access tracks required to allow for safe access to surface water monitoring sites (at Stream P and Stream R), and two proposed flow gauging stations located near the outlets of swamp 76 and 92.

### 1.2 Proposed works

#### 1.2.1 Overview

The proposed monitoring sites are located in the Peabody Energy Metropolitan Colliery Mine lease area within the Woronora special area (drinking water catchment) managed by WaterNSW (Figure 1). Location details, site specific environmental constraints, safeguards, and access considerations are outlined in Section 2; Table 1. Site plans are provided in Annex 1 and site photos are provided in Annex 2.

The proposed activities include the installation, maintenance, use and decommissioning of 12 borehole sites, establishment of safe access via access tracks to these sites where required, the creation of two access tracks to two existing surface water monitoring points, and the installation of two flow gauging stations or weir flumes at Swamp 76 and Swamp 92 (GS-76 and GS-92).

#### 1.2.2 Piezometer Monitoring sites

The 12 piezometer sites (see Figures 2 and 3) include;

- nine shallow swamp sediment bore sites with piezometers to a depth of one metre (Sites 76-1, 76-2, 76-3, 77-1, 77-2, 77-3, 81, 82, 89, 92-1, 92-2 and 92-3 -);
- three deep swamp sediment bores, drilled to a depth of approximately 10 m (within the underlying rock) at Sites 76-2, 77-2 and 92-2 requiring access for the small remote access drill rig to facilitate the works.

Both shallow and deep swamp sediment bores will have a diameter of up to 100 mm. The shallow swamp sediment bores will be drilled with a hand auger, while the deep bores will be drilled using a small remote access drill rig.

The disturbance of each shallow bore will be approximately 3 x 3 m (9m<sup>2</sup>), while each deep bore site will be approximately 5 x 5 m (25 m<sup>2</sup>).

#### 1.2.3 Bore Casing Specifications

**10 metre monitoring bores:** PVC bore screen installed to approximately 5 m below ground level (mbgl) with blank PVC casing from 5 mbgl to the surface. A sand gravel pack to 4 mbgl, a bentonite seal to 3 mbgl and a cement grout to the surface.

**Swamp sediment monitoring bores:** PVC well screen installed to the full depth of the hole with a sand gravel pack to the surface.

The PVC screen and casing for each monitoring bore would be up to 50 mm in diameter.

Blank PVC casing would extend to a height of 1 m above the ground for each monitoring bore with a steel monument to protect the casing from damage.

#### **1.2.4 Flow gauging stations GS-76 and GS-92,**

The two flow gauging stations GS-76 and GS-92 required to be installed to monitor hydrogeological information on the outlet of the swamps, do not require access tracks or clearing include the installation of a weir, monitoring flume and a monitoring gauge. Their installation requires the construction of a reinforced concrete weir with an aluminium flume structure to a maximum height of 250mm, approximately 1m long, spanning the width of the waterway channel. See Annex 1 Figure 15 and Annex 2 Plate 29 for detail.

#### **1.2.5 Access tracks and Equipment Delivery**

Access to all sites will utilise and be from existing Fire Trails (9D, 9E and an unnamed track off to the west of 9D) (Figure 2).

Narrow tracks (approximately 0.5m wide) are required for the nine (9) shallow swamp piezometer groundwater monitoring sites and the two surface water monitoring sites. Slightly wider tracks (approximately 1.2 m wide) are required for the three (3) deeper swamp piezometer groundwater monitoring sites.

Tracks to each site will be slashed (or trittered using a mulching attachment) for pedestrian access, unless otherwise stated (See Section 3.2 for mitigation measures).

Equipment and materials will be delivered and removed using a 4x4 all-terrain vehicle (ATV or quad bike) and rubber-tracked remote access mini drill rig. The remote access mini drill rig will track to each swamp location along the nominated access tracks. All equipment and materials transported with the ATV will be securely restrained to the vehicle.

#### **1.2.6 Surface water monitoring tracks**

Two Surface water monitoring tracks include two walking tracks to Stream P and Stream R to facilitate access for water sampling and monitoring.

#### **1.2.7 Monitoring Equipment**

A water level sensor and data logger with remote telemetry will be installed within each bore.

An accurate and reliable water level sensor and logger would be required to be installed in a secure housing upstream of the weir in the weir pool to measure and record the water level.

### **1.3 Expected duration of works:**

Approximately one to two days per swamp for drilling and groundwater bore installation. Access tracks would be cleared prior to the drilling.

The entire construction campaign is expected to take approximately three to five weeks, weather permitting.

Monitoring is expected to be conducted as required for several years and hence site access as detailed for all sites is for the same duration.

## 2. Proposed Works locations and sites

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 photo Plates in Annex 2.

**Table 1: Location of proposed borehole sites**

Site	MGA56 Easting	MGA Northing	Access and Site Preparation Requirements	Depth to Rock	Plate (Annex 2)
76-1	310372	6217655	<p>Access to the site is off Fire trail 9D and will require primary clearing up to approximately 0.016 ha. This consists of 0.007 ha of MU34 - Sandstone heath-woodland, 0.001 ha of MU42 - Upland swamps: banksia thicket and 0.008 ha of MU44 - Upland swamps: sedgeland-heath complex.</p> <p>Piezometer 1m installation will require some additional primary clearing of up to approximately 0.001 ha of MU42 – Upland swamps: banksia thicket.</p>	>1m	Plate 1
76-2 (Deep bore/ drill rig)	310146	6217491	<p>Access to the site is off Fire trail 9D and will require primary clearing up to approximately 0.018 ha. This consists of 0.013 ha of MU34 - Sandstone heath-woodland and 0.005 ha of MU44 - Upland swamps: sedgeland-heath complex.</p> <p>Piezometer installation to 1m and 10m will require additional primary clearing of up to approximately 0.002 ha of MU44 - Upland swamps: sedgeland-heath complex.</p>	>1m	Plate 2 and Plate 3
76-3	310081	6217322	<p>Access to the site is off Fire trail 9D and will require primary clearing up to approximately 0.006 ha. This consists of 0.002 ha of MU34 - Sandstone heath-woodland, 0.001 ha of MU42 - Upland swamps: banksia thicket and 0.003 ha of MU44 - Upland swamps: sedgeland-heath complex.</p> <p>Piezometer 1m installation will require some additional primary clearing of up to approximately 0.001 ha MU44 - Upland swamps: sedgeland-heath complex.</p>	<0.9	Plate 4, Plate 5, Plate 6 and Plate 7
77-1	310399	6216911	<p>Access to the site is off Fire trail 9E and will require primary clearing up to approximately 0.011 ha. This consists of 0.008 ha of MU34 - Sandstone heath-woodland, 0.002 ha of MU44 - Upland swamps: sedgeland-heath complex and, 0.001 ha of MU45 – Upland swamps: fringing eucalypt woodland.</p> <p>Piezometer 1m installation will require some additional primary clearing of up to 0.001 ha MU44 - Upland swamps: sedgeland-heath complex.</p>	>1m	Plate 8 and Plate 9

Site	MGA56 Easting	MGA Northing	Access and Site Preparation Requirements	Depth to Rock	Plate (Annex 2)
77-2 (Deep bore/drill rig)	310273	6216731	<p>Access to the site is off Fire trail 9D and will require primary clearing up to approximately 0.015 ha. This consists of 0.012 ha of MU34 - Sandstone heath-woodland and 0.003 ha of MU42 - Upland swamps: banksia thicket.</p> <p>Piezometer 1m installation and piezometer 10m Installation will require some additional primary clearing of up to approximately 0.002 ha of MU42 - Upland swamps: banksia thicket.</p>	>1m	Plate 10, Plate 11 and Plate 12
77-3	310114	6216572	<p>Access to the site is off Fire trail 9E and will require primary clearing up to approximately 0.015 ha. This consists of 0.003 ha of MU34 - Sandstone heath-woodland, 0.008 ha of MU44 - Upland swamps: sedgeland-heath complex and 0.004 ha of MU45 - Upland swamps: fringing eucalypt woodland</p> <p>Piezometer 1m installation will require some additional primary clearing of up to 0.001 ha MU44 - Upland swamps: sedgeland-heath complex.</p>	>1m	Plate 13 and Plate 14
81	310995	6216622	<p>Access to the site is off Fire trail 9E and will require primary clearing up to approximately 0.005 ha. This consists of 0.004 ha of MU34 - Sandstone heath-woodland and 0.001 ha MU44 - Upland swamps: sedgeland-heath complex.</p> <p>Piezometer 1m installation will require some additional primary clearing of up to 0.001 ha MU34 - Sandstone heath-woodland.</p>	0.4m	Plate 15
82	311102	6216658	<p>Access to the site is off Fire trail 9E and will require primary clearing up to approximately 0.008 ha. This consists of 0.005 ha of MU34 - Sandstone heath-woodland and 0.003 ha MU44 - Upland swamps: sedgeland-heath complex.</p> <p>Piezometer 1m installation will require some additional primary clearing of up to 0.001 ha MU44 - Upland swamps: sedgeland-heath complex.</p>	0.64m	Plate 16
89	310763	6216217	<p>Access to the site is off Fire trail 9E and will require primary clearing up to approximately 0.008 ha. This consists of 0.002 ha of MU38 – Rock pavement heath, 0.003 ha MU39 – Rock plate heath-mallee and 0.003 ha in MU44 - Upland swamps: sedgeland-heath complex.</p> <p>Piezometer 1m installation will require some additional primary clearing of up to 0.001 ha MU44 - Upland swamps: sedgeland-heath complex.</p>	0.56m	Plate 17

Site	MGA56 Easting	MGA Northing	Access and Site Preparation Requirements	Depth to Rock	Plate (Annex 2)
92-1	310514	6216160	<p>Access to the site is off an unnamed Fire trail off Fire trail 9E and will require primary clearing up to approximately 0.021 ha.</p> <p>This consists of 0.005 ha of MU34 - Sandstone heath-woodland, 0.008 of MU42 – Upland swamps: banksia thicket, 0.002 of MU45 – Upland swamp: fringing eucalypt woodland and 0.006 ha of MU44 - Upland swamps: sedgeland-heath complex.</p> <p>Piezometer 1m installation will require some additional primary clearing of up to 0.001 ha MU42 - Upland swamps: banksia thicket.</p>	>1m	Plate 18 and Plate 19
92-2 (Deep bore/drill rig)	310053	6216031	<p>Access to the site is off an unnamed Fire trail off Fire trail 9E and will require primary clearing up to approximately 0.018 ha.</p> <p>This consists of 0.009 ha of MU34 - Sandstone heath-woodland, 0.003 ha of MU42 - Upland swamps: banksia thicket and 0.006 ha of MU44 Upland swamps: sedgeland-heath complex.</p> <p>Piezometer 1m installation and piezometer 10m Installation will require some additional primary clearing of up to approximately 0.002 ha of MU42 - Upland swamps: banksia thicket.</p>	>1m	Plate 20
92-3	309763	6215908	<p>Access to the site is off an unnamed Fire trail off Fire trail 9E and will require primary clearing up to approximately 0.005 ha.</p> <p>This consists of 0.001 of MU42 – Upland swamps: banksia thicket and 0.004 of MU44 - Upland swamps: sedgeland-heath complex.</p> <p>Piezometer 1m installation will require some additional primary clearing of up to 0.001 ha MU42 - Upland swamps: banksia thicket.</p>	>1m	Plate 21 and Plate 22
<b>Surface water monitoring tracks</b>					
Stream R	310371	6217651	<p>Access track for surface water monitoring site towards small tributary off Lake Woronora.</p> <p>Access to the site is off Fire trail off Fire trail 9E and will require primary clearing up to approximately 0.029 ha.</p> <p>This consists of 0.001 ha of MU25 – Sandstone gully apple-peppermint forest, 0.022 ha of MU29 – Exposed sandstone scribbly gum woodland and 0.006 ha of MU38 Rock pavement heath.</p>	N/A	Plate 25 and Plate 26

Site	MGA56 Easting	MGA Northing	Access and Site Preparation Requirements	Depth to Rock	Plate (Annex 2)
Stream P	310142	6217474	<p>Access track for surface water monitoring site towards Waratah Rivulet</p> <p>Access to the site is off an unnamed Fire trail off Fire trail 9E and will require primary clearing up to approximately 0.021 ha.</p> <p>This consists of 0.01 ha of MU29 – Exposed sandstone scribbly gum woodland and 0.011 ha of MU39 Rock plate heath- woodland.</p>	N/A	Plate 23 and Plate 24
<b>Gauging Stations</b>					
S92	310605	6216185	<p>Access to this site will utilise the swamp tracks will be pedestrian access only via access tracks as are to be installed above for the borehole monitoring sites 92-1 and 92-2.</p> <p>There will be no vegetation clearing required.</p>	N/A	Plate 27
S76	310660	6217930	<p>Access to the site will involve pedestrian access only via tracks as are to be installed above for the borehole monitoring sites 76-1 and 76-2</p> <p>Further access to the specific location is noted to be via approximately 400m of native vegetation, consisting of, MU33 Silvertop Ash Ironstone Woodland, MU39 Rock plate heath- woodland, MU42 Upland swamps: banksia thicket, MU44 Upland swamps: sedgeland-heath complex and MU45.</p> <p>There will be no vegetation clearing required.</p>	N/A	Plate 28

### 3. Environmental assessment

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#### 3.1 Site assessment

Site assessments were conducted across six field days (4, 8, 9, 11, 21 October and 18 December 2019) by heritage consultants Renée Regal, Layne Holloway, Wade Goldwyer and ecologist Sarah Hart.

The site assessment involved traversing the proposed areas of disturbance for all 12 borehole sites, associated access tracks and the water monitoring access track (Stream P, and Stream R) and two gauging stations. The field survey included assessing any environmental constraints, marking any constraints to be avoided in pink flagging tape and recording on GPS.

Additional activities associated with the works during both construction and operation were detailed following consultation with representatives.

#### 3.2 Flora and Fauna Impact assessment

##### 3.2.1 Flora Assessment

###### ***Database Review***

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). Further the specific study area has been previously mapped by NSW National Parks and Wildlife Service (NPWS) (*The native vegetation of the Woronora, O'Hares and Metropolitan Catchments*, 2003), see Figure 3 of Annex 1.

In particular the area of sensitive vegetation broadly described as 'swamps' has been mapped as a result of the Longwalls 301-303 *Upland Swamp Vegetation Mapping and Proposed Monitoring Program* (Eco Logical 2016), occur in the locality of the works - see Figure 8 of Annex 1.

###### ***Vegetation disturbance***

The vegetation disturbance associated with the proposed borehole sites is provided in

Table 4, and photos of each borehole site are provided in Annex 2 of this report. Native vegetation communities that will likely be impacted by the proposal include:

- Sandstone gully apple-peppermint forest (MU25),
- Exposed sandstone scribbly gum woodland (MU29),
- Silvertop ash ironstone woodland (MU33),
- Sandstone heath-woodland (MU34),
- Rock pavement heath (MU38),
- Rock plate heath-mallee (MU39),
- Upland swamps: banksia thicket (MU42)
- Upland swamps: sedgeland-heath complex (MU44) and;
- Upland swamps: fringing eucalypt woodland (MU45)

Of the nine vegetation communities two of these communities, (MU42 - Upland swamps: banksia thicket and (MU44 - Upland swamps: sedgeland-heath complex) align with the Threatened Ecological Communities (TEC) Coastal Upland Swamps.

### ***Threatened ecological communities***

Based on the database searches, one TEC exists near the study area; Coastal Upland Swamp (MU42, MU43 and MU44). Coastal Upland Swamp is listed as endangered, (i.e. an endangered ecological community (EEC) on both the NSW Biodiversity Conservation (BC) and Federal Environment and Biodiversity Conservation (EPBC) Acts.

### ***Survey Results***

The field survey confirmed the distribution and composition of the vegetation within the study area, was broadly in conformity with that mapped by NPWS and the Peabody Energy (2016) Biodiversity Management Plan, with minor differences in vegetation community boundaries. The vegetation communities listed above were confirmed to be subject to disturbance.

The Coastal Upland Swamps EEC was noted to occur within the area to be disturbed by the proposed works at all of the swamp monitoring sites (76-1, 76-2, 76-3, 77-1, 77-2, 77-3, 92-1, 92-2 and 92-3). Hence an impact assessment supported by assessments of significance was carried out in accordance with the BC Act (5-part test) (Annex 5) and Commonwealth Assessment of Significance (Annex 6).

### ***Impact Assessment***



Overall vegetation disturbance will be minimised to the smallest footprint required. Total disturbance It would result in approximately 0.21 hectares of vegetation disturbance (Table 3 and

Table 4). This is less than 1% of the total vegetation community within the 5km radius, and with the incorporation of measures such as minimising disturbance by using previously developed track wherever possible and minimising clearing only to the extent required the proposed works will not significantly impact any TEC's.

Specifically, in regard to the Coastal Upland Swamp EEC, approximately 498 hectares of the EEC exists within five kilometres of the study area. In comparison approximately a total impact of 0.08 ha of the Coastal Upland Swamp EEC would be modified by trittering/ slashing works for proposed clearing for borehole sites, establishment of access track and gauging stations (Assessment of *impact*

The outcome of this assessment as detailed in **Error! Not a valid bookmark self-reference.** considers typical impacts upon fauna noting 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 and include important features such as hollow bearing trees, stags, termite mounds, dense shrubs and mature trees have been avoided. The bushland immediately adjacent to and surrounding the study area is extensive and provides a variety of important habitat features. It is also noted that the current proposal will not remove any hollow bearing trees, stags or mature trees and will utilise wherever possible pre-existing tracks to minimise clearing required.

Specifically, regarding the in stream works the construction works and diversions are short term limited duration events only, and as noted in Annex 4 the sites present as unsuitable habitat. Although long term changes to the Red Crowned toadlet habitat are unlikely, and the weir may act to increased breeding habitat an assessment of significance was carried out under the under the NSW BC Act.

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

Table 6).

The subsequent assessment of significance under both assessments found the proposed clearing disturbance will not significantly impact the threatened ecological community.

After decommissioning, the borehole sites will be monitored, and actions taken as required to ensure no active erosion is occurring and that vegetation is re-establishing.

The small extent of impact associated with the vegetation clearing, in association with the management of residual impacts from the proposal, mean that the community would not be significantly impacted.

### ***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 and the EPBC Act Protected Matters Search tool.

The analysis (Annex 4) resulted in Thirteen threatened flora species considered to have a High or Moderate likelihood of occurrence in the study area prior to field survey. In particular the species *Pultenaea aristata* was known from previous surveys to be locally abundant. The list of threatened flora as detailed in the *Threatened Flora and Fauna likelihood of occurrence assessment* in Annex 4 and summarised in Table 2 below includes;

**Table 2: Affected threatened fauna (NSW and Commonwealth)**

Species	BC Act	EPBC Act	Likelihood of Occurrence	Potential to be affected by the proposal
<i>Acacia baueri</i> subsp. <i>aspera</i>			Moderate	Low – no limiting habitat being modified or removed. Not detected during survey.
<i>A. bynoeana</i> , <i>Astrotricha crassifolia</i> , Thick-leaf Star-hair			Moderate	Low – no limiting habitat being modified or removed. Not detected during survey.
<i>Callistemon linearifolius</i> ,			Moderate	Low – no limiting habitat being modified or removed. Not detected during survey.
<i>Callitris endlicheri</i> ,			Moderate	Low – no limiting habitat being modified or removed
<i>Cryptostylis hunteriana</i> , Leafless Tongue-orchid	V	V	Moderate	Surveys were conducted just outside the flowering period of <i>Cryptostylis hunteriana</i> (November to February). However only two previous records within 10 km radius of the study area (approx. 2.8 and 7 km) and associate orchids not recorded, they are considered unlikely to be present in the study area.
<i>Epacris purpurascens</i> var. <i>purpurascens</i> ,	V		Moderate	Low – no limiting habitat being modified or removed. Not detected during survey.
<i>Eucalyptus camfieldii</i> , Heart-leaved Stringybark	V		Moderate	Low – no limiting habitat being modified or removed. Not detected during survey.
<i>Genoplesium baueri</i> , Bauer's Midge Orchid	V	V	Moderate	Surveys were conducted just outside the flowering period of <i>Genoplesium baueri</i> (February and March). However only two previous records within 10 km radius of the study area (approx. 2.8 and 7 km) and associate orchids not recorded, they are considered unlikely to be present in the study area.
<i>Leucopogon exolasius</i> , Woronora Beard-heath	V	V	Moderate	Low – no limiting habitat being modified or removed
<i>Melaleuca deanei</i> , Deane's Paperbark	V	V	Moderate	Low – no limiting habitat being modified or removed. Not detected during survey.
<i>Persoonia hirsuta</i> Hairy Geebung	E	E	Moderate	Low – no limiting habitat being modified or removed. Not detected during survey.
<i>Pultenaea aristata</i> .	V	V	Known	<i>P. aristata</i> individuals at all sites will be marked, demarcated, and made known to project personnel so they can be protected and wherever possible avoided during works.  Clearing of <i>P. Arista</i> to be supervised by an appropriately qualified ecologist.

The threatened flora as listed above are relatively conspicuous and or were not detected during the current survey or previous surveys in the study area.

Specifically regarding the two orchid species, surveys were conducted just outside the flowering period of *Cryptostylis hunteriana* (November February) and *Genoplesium baueri* (February and March), however

with only two previous records within a 10 km radius of the study area (located between approximately 2.8 and 7 km from the study area) and associate orchids not recorded, they are considered unlikely to be present in the study area.

During the survey of the proposed sites many *Pultenaea aristata* individuals (approximately 320 individuals) were recorded. More specifically 209 individuals were recorded within a 5m buffer area on either side of the access tracks for sites 77-2, 81, 82, 89, Stream R and Stream P and the borehole sites 81 and 82 (**refer to tables 3 – 5, and Figure 7 - Figure 13 in Annex 1**). It is noted that during the survey a conservative approach was taken in the identification of this species due to the constraints such as the flowering period and that a reviewed to ensure the accuracy of the records would be carried out as outlined below before the works commence.

Whilst the access tracks have been revised to avoid vegetation clearing and specifically *P.aristata* individuals wherever possible, the proposed works to create access tracks are likely to require some clearing. Based on a worst case of clearing of 5m on either side of a center line of the proposed access tracks and 5m around the borehole total clearing based on the area recorded distribution is expected to be 0.08ha of primary habitat and 206 individuals. 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*.

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.

**Table 3: Proposed vegetation clearing for access tracks and gauging stations (ha)**

Note: the abbreviation MU or mapping units are as per s3.21 above, and the annotation of N/A being that the TEC was not present at the proposed site.

Sandstone gully apple-peppermint forest (MU25), Exposed sandstone scribbly gum woodland (MU29), Silvertop ash ironstone woodland (MU33), Sandstone heath-woodland (MU34), Rock pavement heath (MU38), Rock plate heath-mallee (MU39), Upland swamps: fringing eucalypt woodland (MU45), Upland swamps: banksia thicket (MU42); Upland swamps: sedgeland-heath complex (MU44).

Sites	Presence of <i>P. aristata</i>	MU 25	MU 29.	MU34	MU38	MU39	MU42	MU44	MU45	Total (ha)
							Costal Upland Swamps (EEC)			
<b>Access track</b>										
76-1	No	N/A	N/A	0.007	N/A	N/A	0.001	0.008	N/A	0.016
76-2 (Drill Rig)	No	N/A	N/A	0.013	N/A	N/A	0	0.005	N/A	0.018
76-3	No	N/A	N/A	0.002	N/A	N/A	0.001	0.003	N/A	0.006
77-1	No	N/A	N/A	0.008	N/A	N/A	0	0.002	0.001	0.011
77-2 (Drill Rig)	Yes, 1	N/A	N/A	0.012	N/A	N/A	0.003	0	N/A	0.015
77-3	No	N/A	N/A	0.003	N/A	N/A	0	0.008	0.004	0.015
81	Yes, 7	N/A	N/A	0.004	N/A	N/A	0	0.001	N/A	0.005
82	Yes, 19	N/A	N/A	0.005	N/A	N/A	0	0.003	N/A	0.008
89	Yes, 7	N/A	N/A	N/A	0.002	0.003	0	0.003	N/A	0.008
92-1	No	N/A	N/A	0.005	N/A	N/A	0.008	0.006	0.002	0.021
92-2 (Drill Rig)	No	N/A	N/A	0.009	N/A	N/A	0.003	0.006	N/A	0.018
92-3	No	N/A	N/A	N/A	N/A	N/A	0.001	0.004	N/A	0.005
<b>Gauging Station</b>										
S76	No	N/A	N/A	0	N/A	N/A	0	0	0	0

Sites	Presence of <i>P. aristata</i>	MU 25	MU 29.	MU34	MU38	MU39	MU42	MU44	MU45	Total (ha)
							Costal Upland Swamps (EEC)			
S92	No	N/A	N/A	0	N/A	N/A	0	0	0	0
<b>Surface monitoring tracks</b>										
R Stream	Yes, 21	0.001	0.022	N/A	0.006	N/A	N/A	N/A	N/A	0.029
P Stream	Yes, 151	N/A	0.010	N/A	N/A	0.011	N/A	N/A	N/A	0.021
Total impacts	Potential for clearing of 0.08ha of <i>P. aristata</i> habitat and up to 203 individuals  See threatened. flora assessment for more detail	0.001	0.032	0.068	0.008	0.014	0.017	0.049	0.007	0.196
							0.066			

**Table 4: Proposed TEC vegetation clearing for borehole sites (ha) and Threatened species presence**

Borehole Sites	Presence of <i>P.aristata</i>	MU 25	MU 29.	MU34	MU38	MU39	MU42	MU44	MU45	Total (ha)
							Coastal Upland Swamps (EEC)			
76-1	No	N/A	N/A	N/A	N/A	N/A	0.001	0	N/A	0.001
76-2 (Drill Rig)	No	N/A	N/A	N/A	N/A	N/A	0	0.002	N/A	0.002
76-3	No	N/A	N/A	N/A	N/A	N/A	0	0.001	N/A	0.001
77-1	No	N/A	N/A	N/A	N/A	N/A	0	0.001	N/A	0.001
77-2 (Drill Rig)	No	N/A	N/A	N/A	N/A	N/A	0.002	0	N/A	0.002
77-3	No	N/A	N/A	N/A	N/A	N/A	0	0.001	N/A	0.001
81	Yes, 1	N/A	N/A	0.001	N/A	N/A	0	0	N/A	0.001
82	Yes, 2	N/A	N/A	N/A	N/A	N/A	0	0.001	N/A	0.001
89	No	N/A	N/A	N/A	N/A	N/A	0	0.001	N/A	0.001
92-1	No	N/A	N/A	N/A	N/A	N/A	0.001	0	N/A	0.001
92-2 (Drill Rig)	No	N/A	N/A	N/A	N/A	N/A	0.002	0	N/A	0.002
92-3	No	N/A	N/A	N/A	N/A	N/A	0.001	0	N/A	0.001
<b>Total Impacts</b>	<b>3 individuals within 5m buffer of borehole sites</b>	N/A	N/A	0.001	NA	N/A	0.007	0.007	N/A	0.015



**Table 5: Summary of proposed vegetation clearing for borehole sites, access tracks (ha), and gauging stations**

Sites	Presence of <i>P. aristata</i>	MU 25	MU 29.	MU34	MU38	MU39	MU42	MU44	MU45	Total
							Costal Upland Swamps (EEC)			
Access tracks	Yes (77-2, 81, 89, P stream, R stream)	0.001	0.032	0.068	0.008	0.014	0.017	0.049	0.007	0.196
Borehole	No	0	0	0.001	0	0	0.007	0.007	0	0.015
Gauging stations	No	0	0	0	0	0	0	0	0	0
<b>Total Clearing</b>	Up to 0.08ha of <i>P. aristata</i> primary habitat to be cleared, and 206 individuals. <i>See Annex 4 threatened. Flora assessment below for more detail.</i>	<b>0.001</b>	<b>0.032</b>	<b>0.069</b>	<b>0.08</b>	<b>0.014</b>	<b>0.024</b>	<b>0.056</b>	<b>0.07</b>	<b>0.211</b>
							<b>0.08</b>			

### 3.2.2 Fauna Assessment

Vegetation communities within the study area provide a wide range of food and shelter for vertebrate fauna. Trees from the family Myrtaceae (mostly *Eucalyptus* spp.) generally dominate the canopy 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.

#### ***Threatened fauna***

A total of 71 threatened fauna have previously been recorded (Atlas of NSW Wildlife) or are predicted to have habitat (EPBC Act) within 10 km of the study area (Annex 4). The analysis (Annex 4) resulted in 26 threatened fauna being rated as having a moderate or high likelihood within the study area (Assessment of **impact**

The outcome of this assessment as detailed in **Error! Not a valid bookmark self-reference.** considers typical impacts upon fauna noting 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 and include important features such as hollow bearing trees, stags, termite mounds, dense shrubs and mature trees have been avoided. The bushland immediately adjacent to and surrounding the study area is extensive and provides a variety of important habitat features. It is also noted that the current proposal will not remove any hollow bearing trees, stags or mature trees and will utilise wherever possible pre-existing tracks to minimise clearing required.

Specifically, regarding the in stream works the construction works and diversions are short term limited duration events only, and as noted in Annex 4 the sites present as unsuitable habitat. Although long term changes to the Red Crowned toadlet habitat are unlikely, and the weir may act to increased breeding habitat an assessment of significance was carried out under the under the NSW BC Act.

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

Table 6).

The field survey outcome noted that no threatened fauna species were recorded. However, a precautionary approach was taken on the assessment of impact of candidate threatened species of fauna that may have potential foraging or move-through habitat within the study area in the proposed area based on the search above.

#### ***Assessment of impact***

The outcome of this assessment as detailed in **Error! Not a valid bookmark self-reference.** considers typical impacts upon fauna noting 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 and include important features such as hollow bearing trees, stags, termite mounds, dense shrubs and mature trees have been avoided. The bushland immediately adjacent to and surrounding the study area is extensive and provides a variety of important habitat features. It is also noted that the current proposal will not remove any hollow bearing trees, stags or mature trees and will utilise wherever possible pre-existing tracks to minimise clearing required.

Specifically, regarding the in stream works the construction works and diversions are short term limited duration events only, and as noted in Annex 4 the sites present as unsuitable habitat. Although long term changes to the Red Crowned toadlet habitat are unlikely, and the weir may act to increased breeding habitat an assessment of significance was carried out under the under the NSW BC Act.

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

**Table 6: 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	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 would be impacted. 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 would be impacted. 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.

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

Species	BC Act	EPBC Act	Likelihood of Occurrence	Potential to be affected by the proposal
Rosenberg's Goanna <i>Varanus rosenbergi</i>	V	-	High	Potential habitat for a variety of uses in small ephemeral drainages of the study area Low; no limiting foraging or breeding habitat within the study area. Termite mounds will not be impacted. Impacts are likely to be negligible.

### 3.2.3 Aboriginal Objects Due Diligence Assessment

There are a number of Aboriginal cultural heritage sites in the area surrounding the proposed sites, as such the proposed swamp piezometer sites and water gauging sites have been inspected by an archaeologist.

The review

A shelter with art -Flat Rock Creek 62 (AHIMS ID# 52-2-0399 duplicate of AHIMS ID#52-2-0415 and AHIMS ID# 52-2-0168), an axe Grinding Groove- Flat Rock Creek 164 (AHIMS# 52-2-0171) are mapped within 40 m of Stream P surface monitoring track (Figure 3). The proposed works associated with Stream P monitoring track will not harm these Aboriginal cultural heritage sites.

A further Axe Grinding Groove site, Flat Rock Creek 196; Blue Gum Forest (AHIMS ID# 52-2-0401) is located within close proximity to the Swamp 89 monitoring track. The grinding grooves could not be located during the site inspection due to leaf litter coverage. The grinding grooves are described to be in the southern edge of a sandstone pan. To ensure that the works do not impact on this Aboriginal cultural heritage site the proposed track alignment for the Swamp 89 monitoring track was diverted 10m to the west in order to avoid it. It is not anticipated that the proposed works associated with Swamp monitoring track 89 monitoring track will harm this Aboriginal cultural heritage site. (refer Annex 3).

### 3.2.4 Review of Construction Impacts

#### 3.2.4.1 Water Management and Cuttings Containment

Drilling will occur during forecast dry weather wherever practicable. Water will be used to clear the drill cuttings.

Swelling clays as are typically found in the Stanwell Park Claystone and the Wombarra Shale formations can require the use of additives to reduce the impact of the clays on the deep bores. However, as the 10 m deep monitoring bores will be drilled in Hawkesbury Sandstone, Metropolitan Coal anticipates from substantial experience gained in similar works (approximately 300 holes of similar depth in Hawkesbury Sandstone) that additives such as chemicals will not be needed.

Drill water will be supplied as necessary to each location by pumping it from an Intermediate Bulk Container located at the nearest vehicle access track to the drill site using a hose line. A 150 L drum may be used at the site to store contingency water if necessary.

The 10 m deep monitoring bores will be chipped from surface minimising the drill pad clearance requirements and to reduce manual handling associated with coring.

The deep and shallow monitoring bores will be drilled utilising open hole air hammer techniques with air supplied by an air compressor. The compressor will be located on adjacent access trails with a pressure rated airline secured along the access track.

Dust generation during drilling is expected to be very minor due to the shallow nature and moisture content of the bores, and any cuttings will be collected at the site for subsequent disposal of offsite in accordance with the Metropolitan Coal CMP.

## Gauging stations

The two flow gauging stations GS-76 and GS-92 at Swamp 76 and Swamp 92 will require temporary blockage or diversion to allow the works to proceed. To minimise impacts to the waterway associated with these works, they would proceed during periods of low flow, and any diversions to the waterway would be directed to a suitable location downstream in a manner that avoids scouring of the bank or bed of the waterway.

Operational impacts are not expected to result in any significant flow disruptions with the height of the weir and associated flume noted as being 250mm in height, and one meter in length

### 3.2.4.2 Fuel Management

Large quantities of fuel will not be stored on site, with only that fuel that is required transported to site in closed containers (e.g. jerry cans). 60 L plastic containers will be used to hold fuel cans after use.

Refuelling of equipment will be completed before the equipment is transported wherever possible to the drill site so as to reduce the requirement of transporting fuel. Care will be taken not to spill fuel including the use of an appropriately sized funnel. Oil/fuel absorbent materials as may be found in a spill kit or other containment/ treatment resources will be made available at the site to prevent contact with the surrounding environment. 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
- bag of rags.

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 and personnel will be trained in their use.

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
- Water NSW (via the incident Management Number 1800 061 069).

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

### 3.2.4.3 Facilities and Amenities

No formal office or amenity facilities are required to support these works. However a portable trailer mounted toilet will be located on a proximal access road near the construction sites during the construction or installation works only. The toilet will be serviced fortnightly or as required with a vacuum truck.

### 3.2.5 Site closure and rehabilitation

Construction sites will be rehabilitated in accordance with Section 6 of the Metropolitan Coal's Rehabilitation Management Plan. Site closure and rehabilitation would involve the following:

- For deep bores only:

- 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.
- Use of an excavator to scarify compacted soils to enhance the bed for seed and new vegetative growth, (only if required).
- Replacement of larger items (notably rocks and logs) back over the site (if required) in order to arrest water flow over the disturbed ground and provide a structure for emergent seedlings and other regenerating plants to shelter.

The access tracks will be maintained over time to allow safe access for personnel to revisit the borehole sites and water monitoring locations.

Given the limited nature of the disturbance footprint (narrow linear disturbance adjacent to Fire Trails) and the existence of high-quality native vegetation adjacent to each borehole site/track, it is not expected active revegetation measures (e.g. planting of tubestock) will be necessary.

### 3.3 Recommendations

The proposal aims to avoid disturbance to the following:

- Aboriginal cultural heritage sites
- Threatened flora and fauna
- Mature trees
- Hollow bearing trees and stag trees
- Rock outcrops
- Termite mounds
- Large hollow logs; and
- Bush-rock.

The following mitigation measures inclusive of those site-specific measures in Table 7 will be implemented to minimise the extent of any impact:

- Project personnel are to be notified of the Aboriginal cultural heritage sites (Flat Rock Creek 62 (AHIMS ID# 52-2-0399 duplicate of AHIMS ID#52-2-0415 and AHIMS ID# 52-2-0168), Flat Rock Creek 164 (AHIMS# 52-2-0171) and Flat Rock Creek 196; Blue Gum Forest (AHIMS # 52-2-0401) located within proximity of Swamp monitoring track 89 and Stream P monitoring. These Aboriginal cultural heritage sites must be avoided.
- Sediment controls to be implemented as appropriate on downslope sides of the site.
- Surface water diversions as per s3.2.4.1 and design as per Annex A, Figure 15 for the two gauging stations.
- To further minimise impacts to flora, fauna and their habitat, the management measures outlined in the Metropolitan Coal Construction Management Plan shall be adhered to (Peabody Energy 2015).
- The alignment for the track and borehole site boundaries are to be marked out with suitable flagging tape or similar to ensure vegetation disturbance will be minimised to the smallest footprint required
- Avoid hollow bearing trees and large fallen logs which occur throughout the general area (refer borehole site plans (Figure 7).

*Pultenea aristata* individuals as identified in the field survey at swamp 77, 81, 82, 89, within 5m of the centre line of the track or radius of the borehole potentially 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 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 to restrict any required clearing to only that for the access or the borehole installation works, wherever practicable individuals of *P.aristata* would be further avoided via implementation of a route through the vegetation that requires the least clearing of *P.aristata*.

Given the careful design of the proposed works, mitigation measures proposed within this document and within the Metropolitan Coal Construction Management Plan the proposed exploration program is considered unlikely to have a significant impact on the environment.



**Table 7: Proposed works location including site specific constraints and safeguards**

Site	MGA56 Easting	MGA Northing	Description of Proposed works	Depth to Rock	Plate (Annex 2)	Site-specific constraints and Environmental Safeguards
76-1	310372	6217655	<p>Access to the site is off Fire trail 9D and will require primary clearing up to approximately 0.016 ha. This consists of;</p> <ul style="list-style-type: none"> <li>• 0.007 ha of MU34 - Sandstone heath-woodland,</li> <li>• 0.001 ha of MU42 - Upland swamps: banksia thicket</li> <li>• 0.008 ha of MU44 - Upland swamps: sedgeland-heath complex.</li> </ul> <p>Piezometer 1m installation will require some additional primary clearing of up to approximately 0.001 ha of MU42 – Upland swamps: banksia thicket.</p>	>1m	Plate 1	<p>Vegetation disturbance will be minimised to the smallest footprint required.</p> <p>Avoid hollow bearing trees and large fallen logs which occur throughout the general area (refer borehole site plans (Figure 7).</p> <p>Sediment controls to be implemented as appropriate on downslope sides of the site.</p>
76-2 (Deep bore/drill rig)	310146	6217491	<p>Access to the site is off Fire trail 9D and will require primary clearing up to approximately 0.018 ha. This consists of;</p> <ul style="list-style-type: none"> <li>• 0.013 ha of MU34 - Sandstone heath-woodland</li> <li>• 0.005 ha of MU44 - Upland swamps: sedgeland-heath complex.</li> </ul> <p>Piezometer installation to 1m and 10m will require additional primary clearing of up to approximately 0.002 ha of MU44 - Upland swamps: sedgeland-heath complex.</p>	>1m	Plate 2 and Plate 3	<p>Vegetation disturbance will be minimised to the smallest footprint required.</p> <p>Avoid hollow bearing trees and large fallen logs which occur throughout the general area (refer borehole site plans (Figure 7).</p> <p>Sediment controls to be implemented as appropriate on downslope sides of the site.</p>

Site	MGA56 Easting	MGA Northing	Description of Proposed works	Depth to Rock	Plate (Annex 2)	Site-specific constraints and Environmental Safeguards
76-3	310081	6217322	<p>Access to the site is off Fire trail 9D and will require primary clearing up to approximately 0.006 ha.</p> <p>This consists of;</p> <ul style="list-style-type: none"> <li>• 0.002 ha of MU34 - Sandstone heath-woodland,</li> <li>• 0.001 ha of MU42 - Upland swamps: banksia thicket and</li> <li>• 0.003 ha of MU44 - Upland swamps: sedgeland-heath complex.</li> </ul> <p>Piezometer 1m installation will require some additional primary clearing of up to approximately 0.001 ha MU44 - Upland swamps: sedgeland-heath complex.</p>	<0.9	Plate 4, Plate 5, Plate 6 and Plate 7	<p>Vegetation disturbance will be minimised to the smallest footprint required.</p> <p>Avoid hollow bearing trees and large fallen logs which occur throughout the general area (refer borehole site plans (Figure 7)).</p> <p>Sediment controls to be implemented as appropriate on downslope sides of the site.</p>
77-1	310399	6216911	<p>Access to the site is off Fire trail 9E and will require primary clearing up to approximately 0.011 ha.</p> <p>This consists of;</p> <ul style="list-style-type: none"> <li>• 0.008 ha of MU34 - Sandstone heath-woodland,</li> <li>• 0.002 ha of MU44 - Upland swamps: sedgeland-heath complex and,</li> <li>• 0.001 ha of MU45 – Upland swamps: fringing eucalypt woodland.</li> </ul> <p>Piezometer 1m installation will require some additional primary clearing of up to 0.001 ha MU44 - Upland swamps: sedgeland-heath complex.</p>	>1m	Plate 8 and Plate 9	<p>Vegetation disturbance will be minimised to the smallest footprint required.</p> <p>Avoid hollow bearing trees and large fallen logs which occur throughout the general area (refer borehole site plans (Figure 8)).</p> <p>Sediment controls to be implemented as appropriate on downslope sides of the site.</p>

Site	MGA56 Easting	MGA Northing	Description of Proposed works	Depth to Rock	Plate (Annex 2)	Site-specific constraints and Environmental Safeguards
77-2 (Deep bore/d rill rig)	310273	6216731	<p>Access to the site is off Fire trail 9D and will require primary clearing up to approximately 0.015 ha.</p> <p>This consists of</p> <ul style="list-style-type: none"> <li>• 0.012 ha of MU34 - Sandstone heath-woodland and</li> <li>• 0.003 ha of MU42 - Upland swamps: banksia thicket.</li> </ul> <p>Piezometer 1m installation and piezometer 10m Installation will require some additional primary clearing of up to approximately 0.002 ha of MU42 - Upland swamps: banksia thicket.</p>	>1m	Plate 10, Plate 11 and Plate 12	<p>Vegetation disturbance will be minimised to the smallest footprint required.</p> <p>Avoid hollow bearing trees and large fallen logs which occur throughout the general area (refer borehole site plans (Figure 8).</p> <p>Sediment controls to be implemented as appropriate on downslope sides of the site.</p> <p>Avoid <i>Pultenaea aristata</i> as marked by pink flagging tape.</p> <p>Clearing to be supervised by botanist.</p> <p>Clearing will be reduced and completed by hand for areas of dense threatened flora (see Figure 12). Vegetation disturbance will be minimised to the smallest footprint required.</p>
77-3	310114	6216572	<p>Access to the site is off Fire trail 9E and will require primary clearing up to approximately 0.015 ha.</p> <p>This consists of;</p> <ul style="list-style-type: none"> <li>• 0.003 ha of MU34 - Sandstone heath-woodland,</li> <li>• 0.008 ha of MU44 - Upland swamps: sedgeland-heath complex and</li> <li>• 0.004 ha of MU45 - Upland swamps: fringing eucalypt woodland</li> </ul> <p>Piezometer 1m installation will require some additional primary clearing of up to 0.001 ha MU44 - Upland swamps: sedgeland-heath complex.</p>	>1m	Plate 13 and Plate 14	<p>Vegetation disturbance will be minimised to the smallest footprint required.</p> <p>Avoid hollow bearing trees and large fallen logs which occur throughout the general area (refer borehole site plans (Figure 8).</p> <p>Sediment controls to be implemented as appropriate on downslope sides of the site.</p>

Site	MGA56 Easting	MGA Northing	Description of Proposed works	Depth to Rock	Plate (Annex 2)	Site-specific constraints and Environmental Safeguards
81	310995	6216622	<p>Access to the site is off Fire trail 9E and will require primary clearing up to approximately 0.005 ha.</p> <p>This consists of;</p> <ul style="list-style-type: none"> <li>0.004 ha of MU34 - Sandstone heath-woodland and</li> <li>0.001 ha MU44 - Upland swamps: sedgeland-heath complex.</li> </ul> <p>Piezometer 1m installation will require some additional primary clearing of up to 0.001 ha MU34 - Sandstone heath-woodland.</p>	0.4m	Plate 15	<p>Vegetation disturbance will be minimised to the smallest footprint required.</p> <p>Avoid hollow bearing trees and large fallen logs which occur throughout the general area (refer borehole site plans (Figure 9)).</p> <p>Sediment controls to be implemented as appropriate on downslope sides of the site.</p> <p>Avoid <i>Pultenaea aristata</i> at marked by pink flagging tape. Clearing to be supervised by botanist.</p> <p>Clearing will be reduced and completed by hand for areas of dense threatened flora (see Figure 12). Vegetation disturbance will be minimised to the smallest footprint required.</p>
82	311102	6216658	<p>Access to the site is off Fire trail 9E and will require primary clearing up to approximately 0.008 ha.</p> <p>This consists of;</p> <ul style="list-style-type: none"> <li>0.005 ha of MU34 - Sandstone heath-woodland and</li> <li>0.003 ha MU44 - Upland swamps: sedgeland-heath complex.</li> </ul> <p>Piezometer 1m installation will require some additional primary clearing of up to 0.001 ha MU44 - Upland swamps: sedgeland-heath complex.</p>	0.64m	Plate 16	<p>Vegetation disturbance will be minimised to the smallest footprint required.</p> <p>Avoid hollow bearing trees and large fallen logs which occur throughout the general area (refer borehole site plans (<b>Error! Reference source not found.</b>)).</p> <p>Sediment controls to be implemented as appropriate on downslope sides of the site.</p> <p>Avoid <i>Pultenaea aristata</i> at marked by pink flagging tape. Clearing to be supervised by botanist.</p> <p>Clearing will be reduced and completed by hand for areas of dense threatened flora (see Figure 12). Vegetation disturbance will be minimised to the smallest footprint required.</p>

Site	MGA56 Easting	MGA Northing	Description of Proposed works	Depth to Rock	Plate (Annex 2)	Site-specific constraints and Environmental Safeguards
89	310763	6216217	<p>Access to the site is off Fire trail 9E and will require primary clearing up to approximately 0.008 ha.</p> <p>This consists of</p> <ul style="list-style-type: none"> <li>• 0.002 ha of MU38 – Rock pavement heath,</li> <li>• 0.003 ha MU39 – Rock plate heath-mallee and</li> <li>• 0.003 ha in MU44 - Upland swamps: sedgeland-heath complex.</li> </ul> <p>Piezometer 1m installation will require some additional primary clearing of up to;</p> <ul style="list-style-type: none"> <li>• 0.001 ha MU44 - Upland swamps: sedgeland-heath complex.</li> </ul>	0.56m	Plate 17	<p>Vegetation disturbance will be minimised to the smallest footprint required.</p> <p>Avoid hollow bearing trees and large fallen logs which occur throughout the general area (refer borehole site plans (Figure 10).</p> <p>Sediment controls to be implemented as appropriate on downslope sides of the site.</p> <p>Avoid <i>Pultenaea aristata</i> at marked by pink flagging tape.</p> <p>Clearing to be supervised by botanist.</p> <p>Clearing will be reduced and completed by hand for areas of dense threatened flora (see Figure 12). Vegetation disturbance will be minimised to the smallest footprint required.</p> <p>Project personnel to be made aware of;</p> <ul style="list-style-type: none"> <li>• Axe Grinding Groove site Flat Rock Creek 196; Blue Gum Forest (AHIMS # 52-2-0401) which is to be avoided.</li> </ul>
92-1	310514	6216160	<p>Access to the site is off an unnamed Fire trail off Fire trail 9E and will require primary clearing up to approximately 0.021 ha.</p> <p>This consists of;</p> <ul style="list-style-type: none"> <li>• 0.005 ha of MU34 - Sandstone heath-woodland,</li> <li>• 0.008 of MU42 – Upland swamps: banksia thicket,</li> <li>• 0.002 of MU45 – Upland swamp: fringing eucalypt woodland and</li> <li>• 0.006 ha of MU44 - Upland swamps: sedgeland-heath complex.</li> </ul> <p>Piezometer 1m installation will require some additional primary clearing of up to 0.001 ha MU42 - Upland swamps: banksia thicket.</p>	>1m	Plate 18 and Plate 19	<p>Vegetation disturbance will be minimised to the smallest footprint required.</p> <p>Avoid hollow bearing trees and large fallen logs which occur throughout the general area (refer borehole site plans (Figure 11).</p> <p>Sediment controls to be implemented as appropriate on downslope sides of the site.</p>

Site	MGA56 Easting	MGA Northing	Description of Proposed works	Depth to Rock	Plate (Annex 2)	Site-specific constraints and Environmental Safeguards
92-2 (Deep bore/d rill rig)	310053	6216031	<p>Access to the site is off an unnamed Fire trail off Fire trail 9E and will require primary clearing up to approximately 0.018 ha.</p> <p>This consists of;</p> <ul style="list-style-type: none"> <li>• 0.009 ha of MU34 - Sandstone heath-woodland,</li> <li>• 0.003 ha of MU42 - Upland swamps: banksia thicket and</li> <li>• 0.006 ha of MU44 Upland swamps: sedgeland-heath complex.</li> </ul> <p>Piezometer 1m installation and piezometer 10m Installation will require some additional primary clearing of up to approximately 0.002 ha of MU42 - Upland swamps: banksia thicket.</p>	>1m	Plate 20	<p>Vegetation disturbance will be minimised to the smallest footprint required.</p> <p>Avoid hollow bearing trees and large fallen logs which occur throughout the general area (refer borehole site plans (Figure 11).</p> <p>Sediment controls to be implemented as appropriate on downslope sides of the site.</p>
92-3	309763	6215908	<p>Access to the site is off an unnamed Fire trail off Fire trail 9E and will require primary clearing up to.</p> <p>This consists of;</p> <ul style="list-style-type: none"> <li>• approximately 0.005 ha MU42 – Upland swamps: banksia thicket and</li> <li>• 0.004 of MU44 - Upland swamps: sedgeland-heath complex.</li> </ul> <p>Piezometer 1m installation will require some additional primary clearing of up to 0.001 ha MU42 - Upland swamps: banksia thicket.</p>	>1m	Plate 21and Plate 22	<p>Vegetation disturbance will be minimised to the smallest footprint required.</p> <p>Avoid hollow bearing trees and large fallen logs which occur throughout the general area (refer borehole site plans (Figure 11).</p> <p>Sediment controls to be implemented as appropriate on downslope sides of the site.</p>

Site	MGA56 Easting	MGA Northing	Description of Proposed works	Depth to Rock	Plate (Annex 2)	Site-specific constraints and Environmental Safeguards
<b>Surface water monitoring tracks</b>						
Stream R	310371	6217651	<p>Access track for surface water monitoring site towards small tributary off Lake Woronora.</p> <p>Access to the site is off Fire trail off Fire trail 9E and will require primary clearing up to approximately 0.029 ha.</p> <p>This consists of;</p> <ul style="list-style-type: none"> <li>• 0.001 ha of MU25 – Sandstone gully apple-peppermint forest,</li> <li>• 0.022 ha of MU29 – Exposed sandstone scribbly gum woodland and</li> <li>• 0.006 ha of MU38 Rock pavement heath.</li> </ul>	N/A	Plate 25 and Plate 26	<p>Avoid <i>Pultenaea aristata</i> at marked by pink flagging tape. Clearing to be supervised by botanist.</p> <p>Clearing will be reduced and completed by hand for areas of dense threatened flora (see Figure 12).</p> <p>Vegetation disturbance will be minimised to the smallest footprint required.</p>
Stream P	310142	6217474	<p>Access track for surface water monitoring site towards Waratah Rivulet</p> <p>Access to the site is off an unnamed Fire trail off Fire trail 9E and will require primary clearing up to approximately 0.021 ha.</p> <p>This consists of;</p> <ul style="list-style-type: none"> <li>• 0.01 ha of MU29 – Exposed sandstone scribbly gum woodland and</li> <li>• 0.011 ha of MU39 Rock plate heath- woodland.</li> </ul>	N/A	Plate 23 and Plate 24	<p>Avoid <i>Pultenaea aristata</i> at marked by pink flagging tape. Clearing to be supervised by botanist. Clearing will be reduced and completed by hand for areas of dense threatened flora (see Figure 13). Vegetation disturbance will be minimised to the smallest footprint required.</p> <p>Project personnel to be made aware of the archaeological heritage sites</p> <ul style="list-style-type: none"> <li>• Axe Grinding Groove site Flat Rock Creek 164 (AHIMS# 52-2-0171)</li> <li>• shelter with art site Flat Rock Creek 62 (AHIMS ID# 52-2-0399 duplicate of AHIMS ID#52-2-0415 and AHIMS ID# 52-2-0168) which are to be avoided.</li> </ul>

Site	MGA56 Easting	MGA Northing	Description of Proposed works	Depth to Rock	Plate (Annex 2)	Site-specific constraints and Environmental Safeguards
<b>Gauging Station</b>						
S92	310605	6216185	<p>Access to this site will utilise the swamp tracks will be pedestrian access only via access tracks as are to be installed above for the borehole monitoring sites 92-1 and 92-2.</p> <p>There will be no vegetation clearing required.</p>	N/A		<p>Any temporary vegetation disturbance such as trampling that may be required will be minimised to the smallest footprint required.</p> <p>Sediment controls to be implemented as appropriate on downslope sides of the site.</p> <p>Spill management, material containment, materials handling as per s3.2.4.</p> <p>Water diversions as per s3.2.4.1 and design as per Annex A, Figure 15.</p>
S76	310660	6217930	<p>Access to the site will involve pedestrian access only via tracks as are to be installed above for the borehole monitoring sites 76-1 and 76-2</p> <p>Further access to the specific location is noted to be via approximately 400m of native vegetation, consisting of,</p> <ul style="list-style-type: none"> <li>• MU33 Silvertop Ash Ironstone Woodland, MU39 Rock plate heath- woodland,</li> <li>• MU42 Upland swamps: banksia thicket,</li> <li>• MU44 Upland swamps: sedgeland-heath complex and</li> <li>• MU45 Upland swamps: fringing eucalypt woodland</li> </ul> <p>There will be no vegetation clearing required.</p>	N/A		<p>Temporary vegetation disturbance such as trampling will be minimised to the smallest footprint required.</p> <p>Sediment controls to be implemented as appropriate on downslope sides of the site.</p> <p>Spill management, material containment, materials handling as per s3.2.4.</p> <p>Water diversions as per s3.2.4.1 and design as per Annex A, Figure 15.</p>



## 4. Conclusion

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The proposed borehole sites access tracks, surface water access tracks and gauging stations will result in up to approximately 0.21 ha of primary vegetation clearing inclusive of 0.08ha of EEC.

With the proposed mitigation measures in place, the proposal will not result in a significant impact on any TEC, or threatened species listed under the BC Act and/or EPBC Act.

The Aboriginal cultural heritage sites have been assessed 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 and surface water access tracks (refer Annex 3).

The relevant management measures as outlined in Section 6 of 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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DECCW 2010, *Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales*, produced for the Department of Environment Climate Change and Water, NSW.

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.

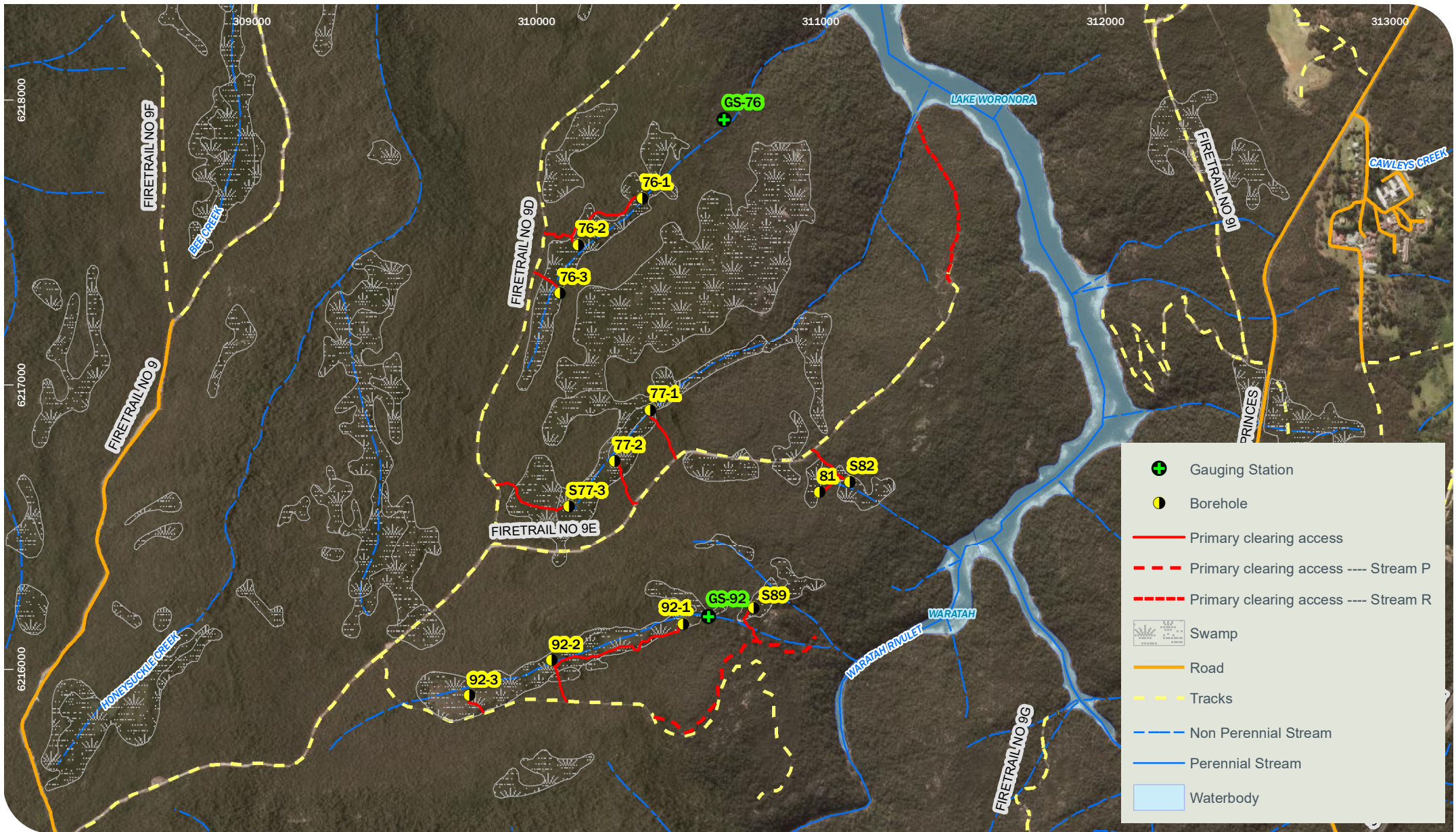
OEH (2019b) OEH Threatened Species Profiles Database, accessed October 2019. Also provides access to threatened species Final Determinations by the NSW Scientific Committee.

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

## Annex 1 Figures

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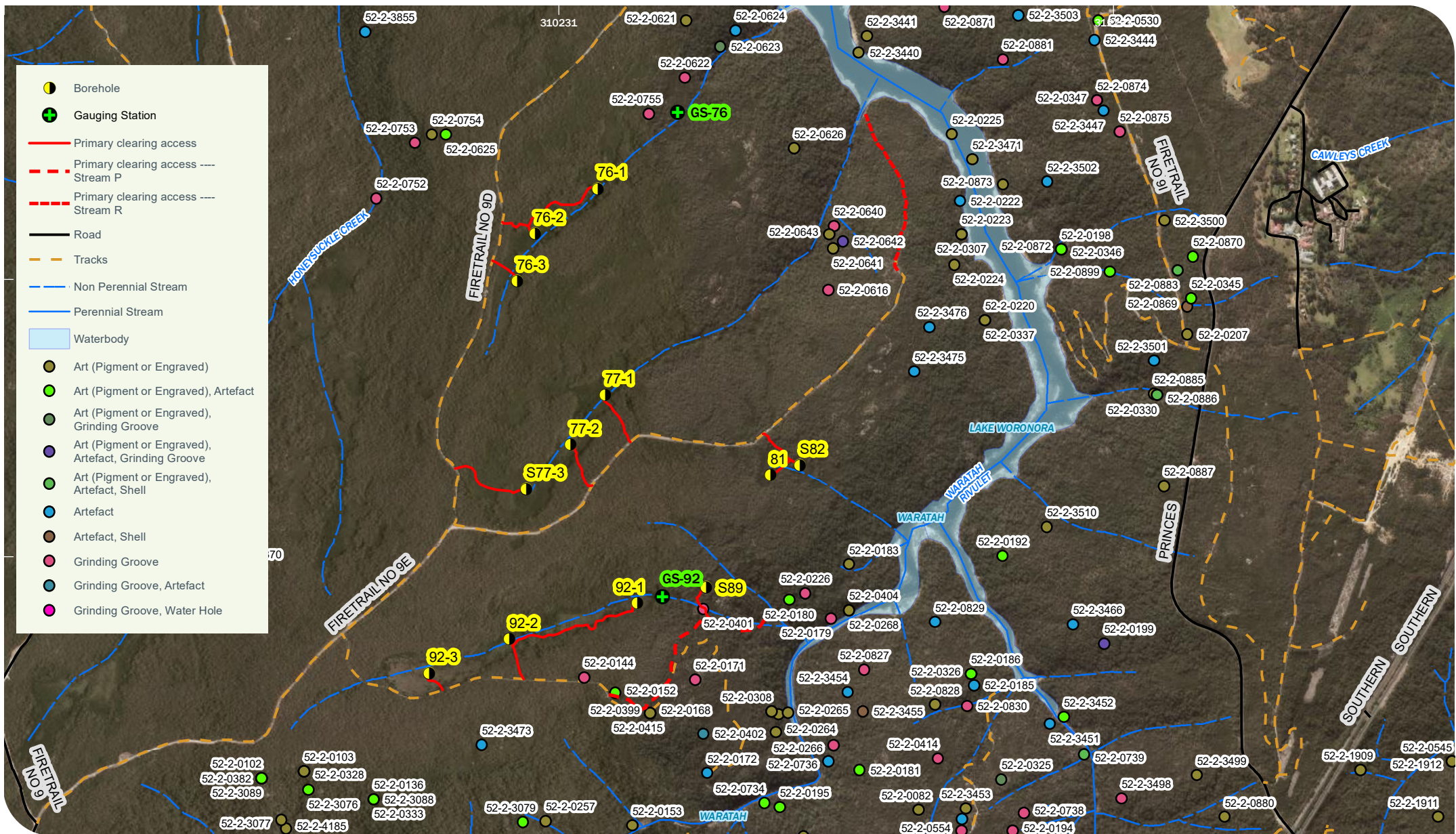




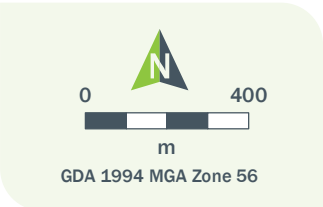
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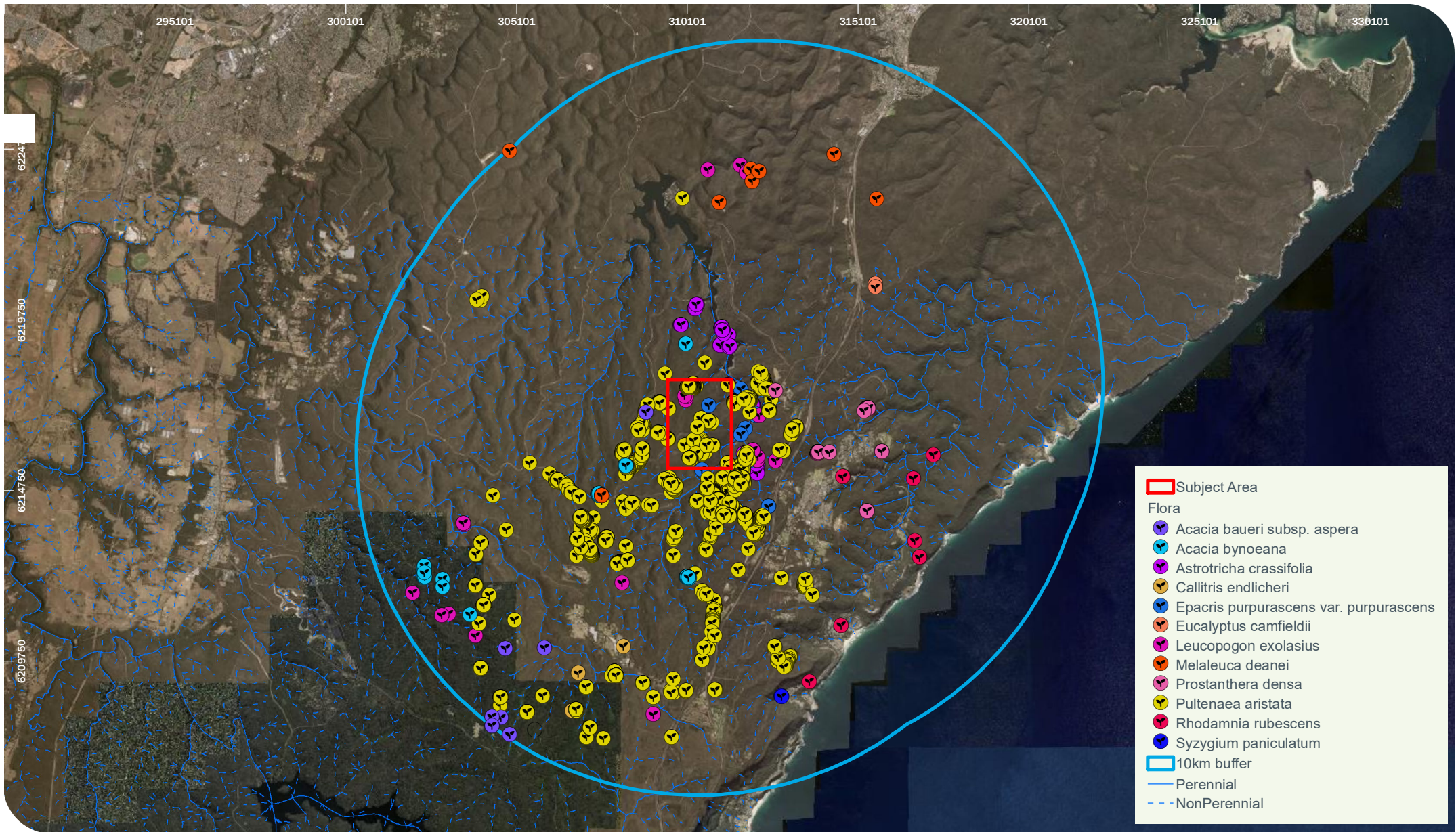
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**Location of AHIMS Sites**  
 Metropolitan Colliery Surface Works Assessment - Upland Swamp and Water Monitoring Tracks

Niche PM: Renée Regal  
 Niche Proj. #: 5410  
 Client: Peabody Energy

**Figure 4**



**Subject Area**

**Flora**

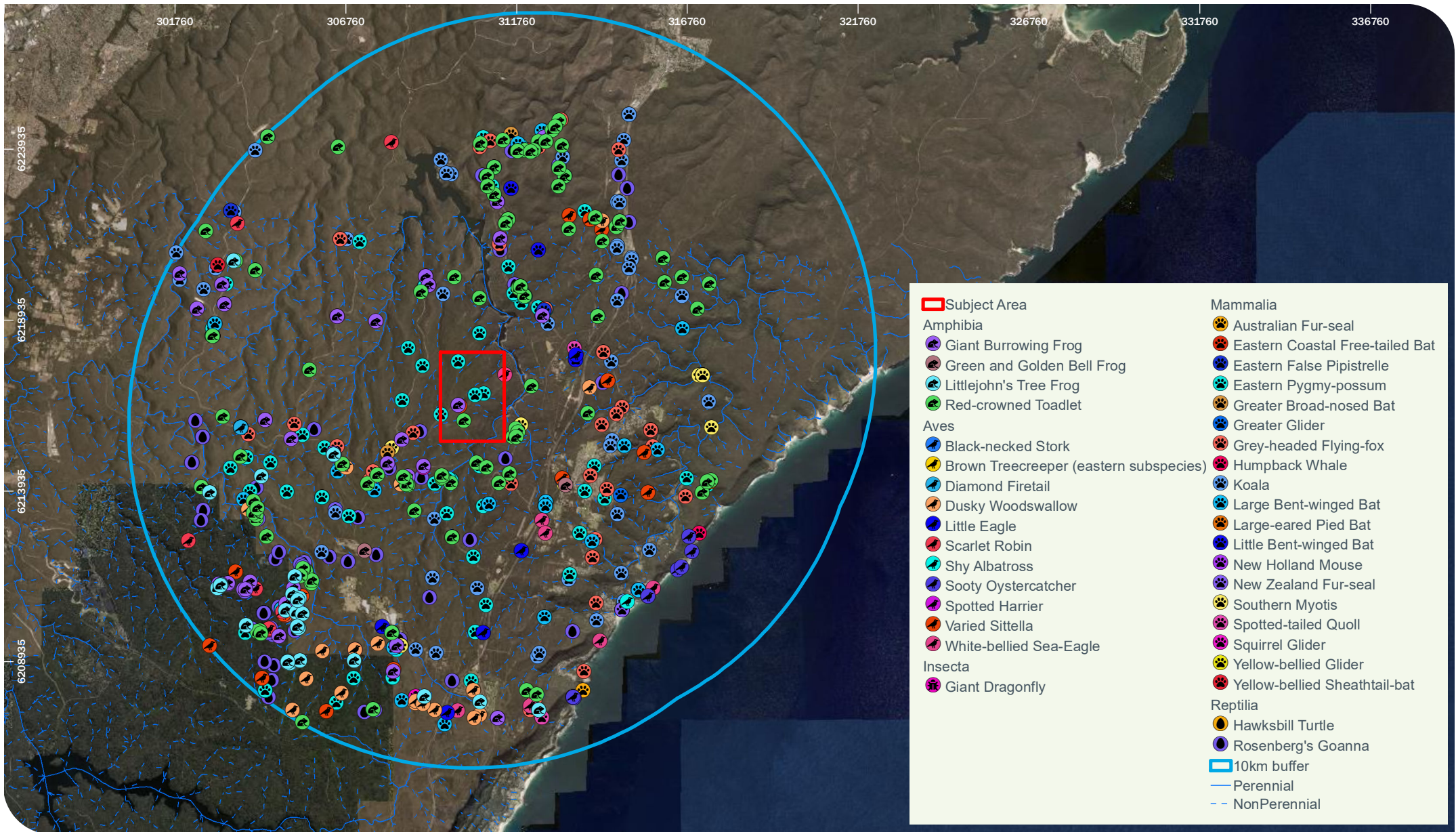
- Acacia baueri* subsp. *aspera*
- Acacia bynoeana*
- Astrotricha crassifolia*
- Callitris endlicheri*
- Epacris purpurascens* var. *purpurascens*
- Eucalyptus camfieldii*
- Leucopogon exolasius*
- Melaleuca deanei*
- Prostanthera densa*
- Pultenaea aristata*
- Rhodamnia rubescens*
- Syzygium paniculatum*

10km buffer

Perennial

NonPerennial

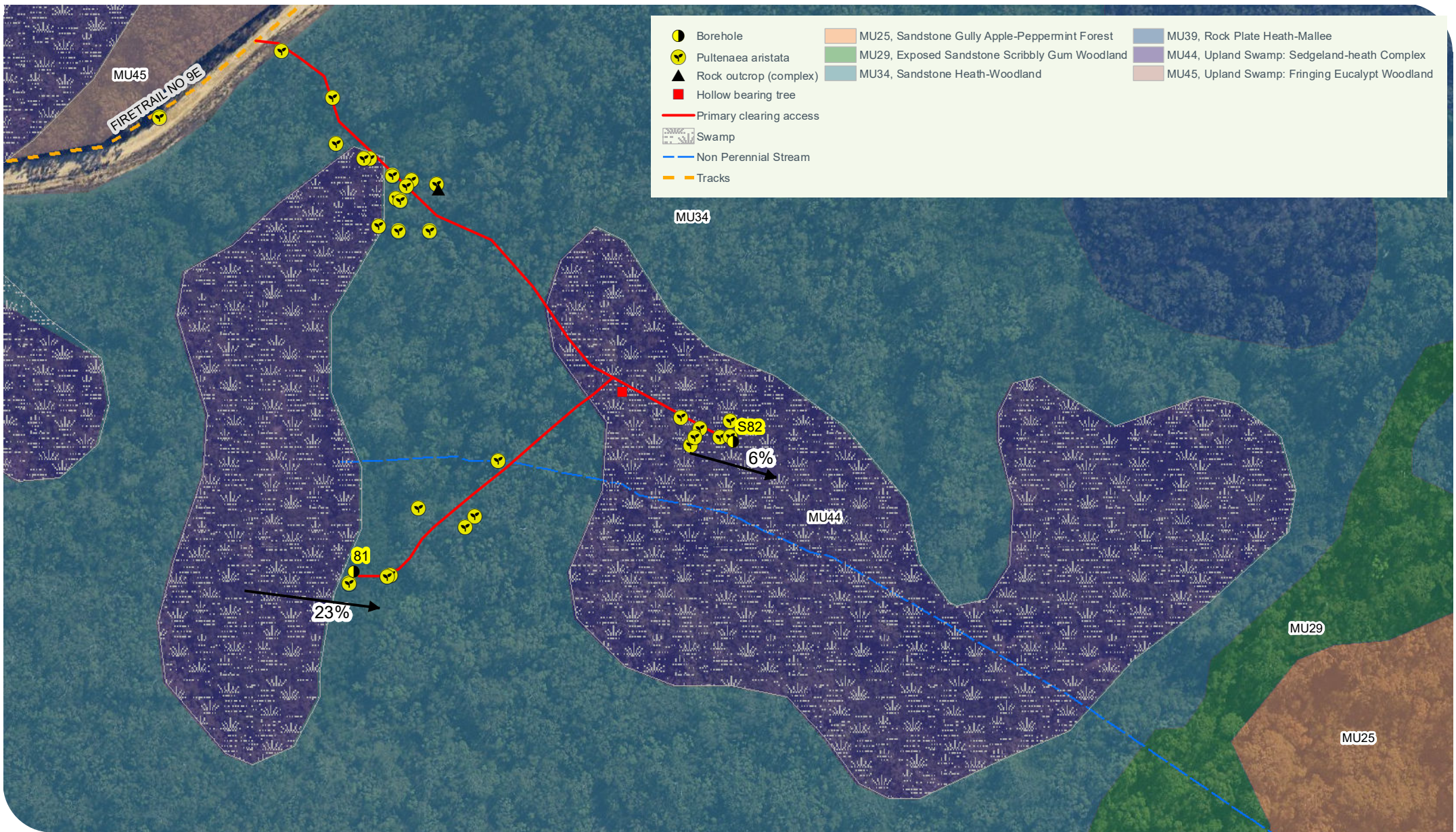




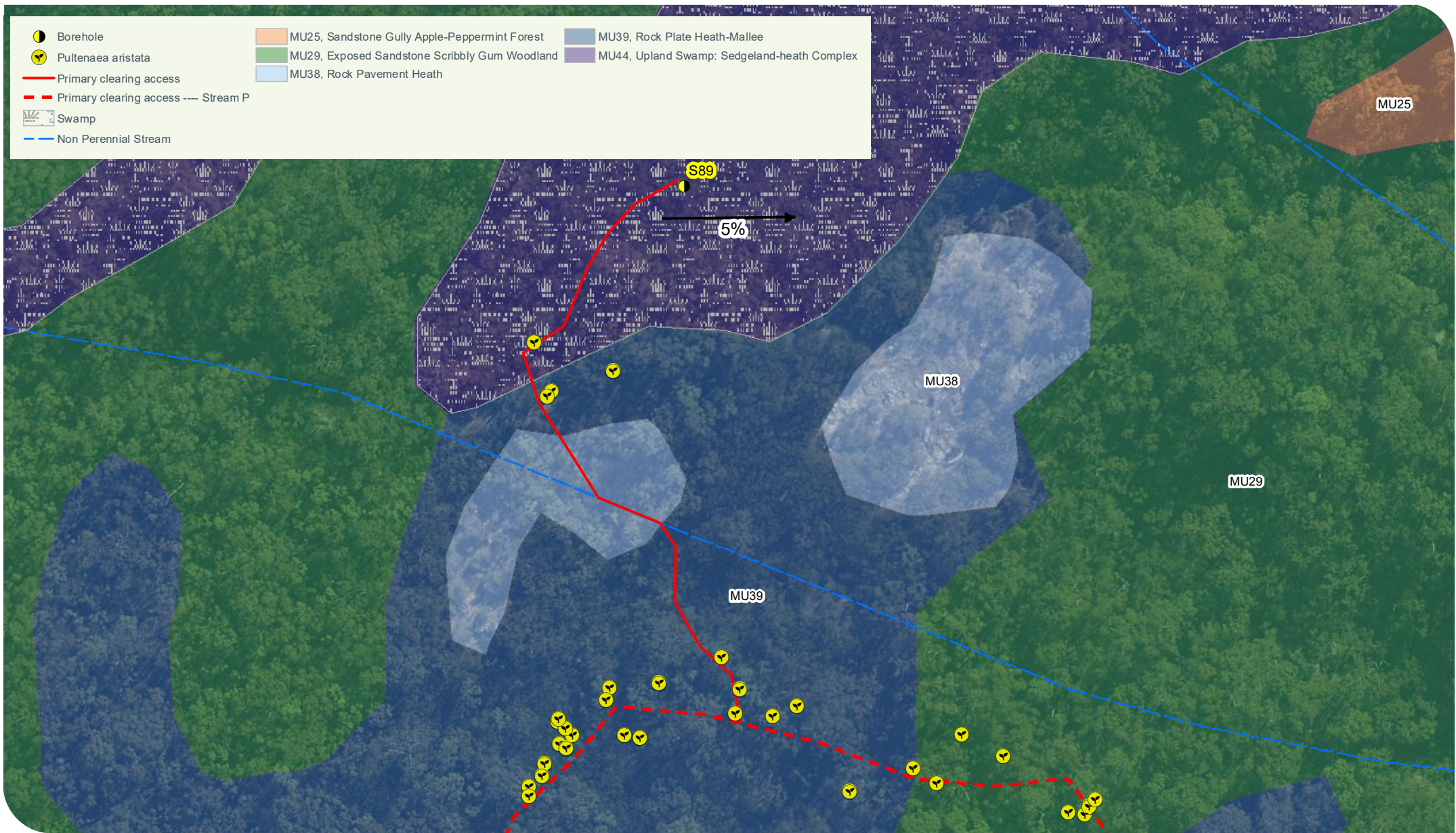
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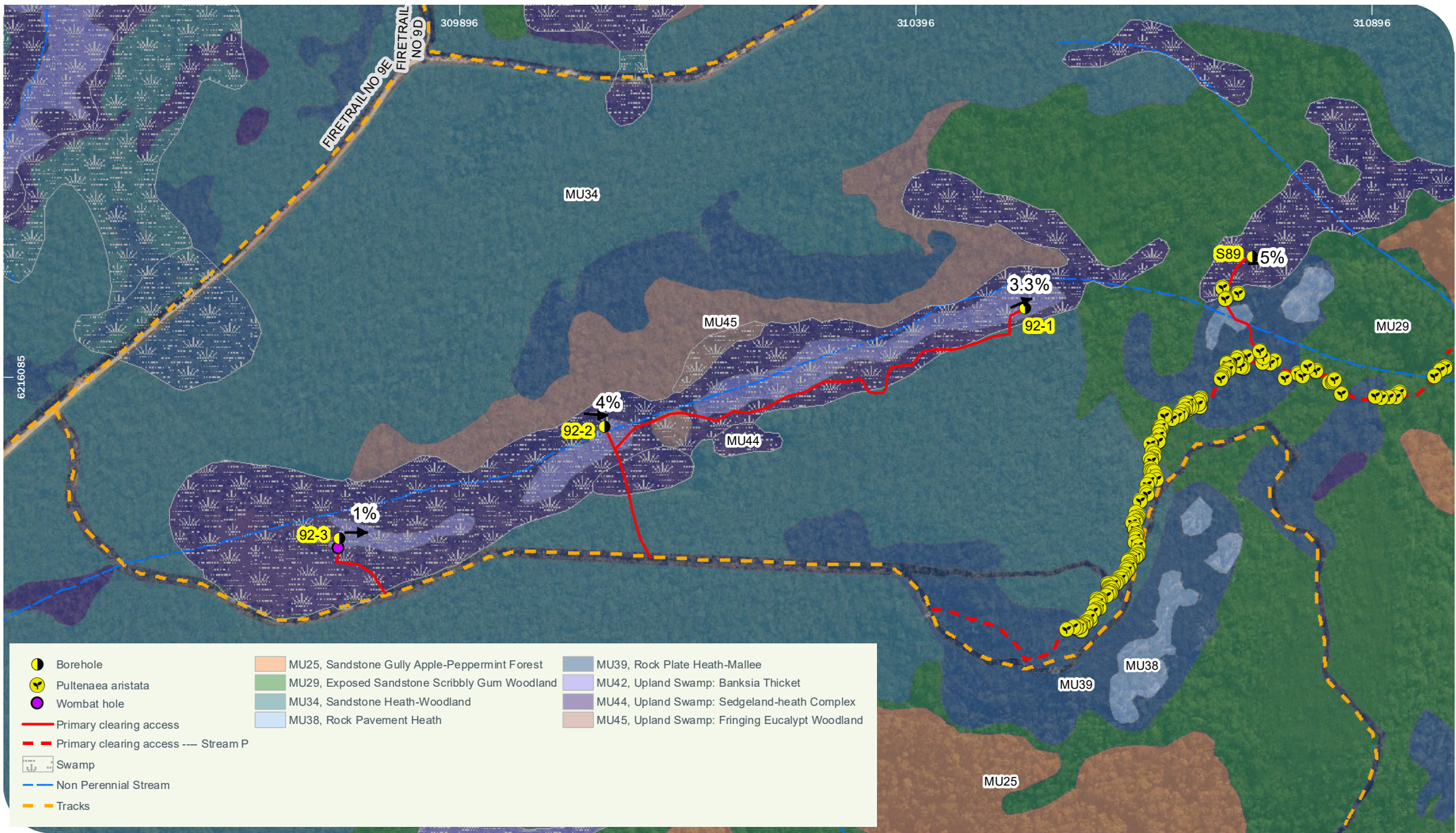




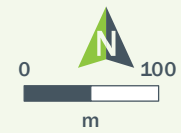
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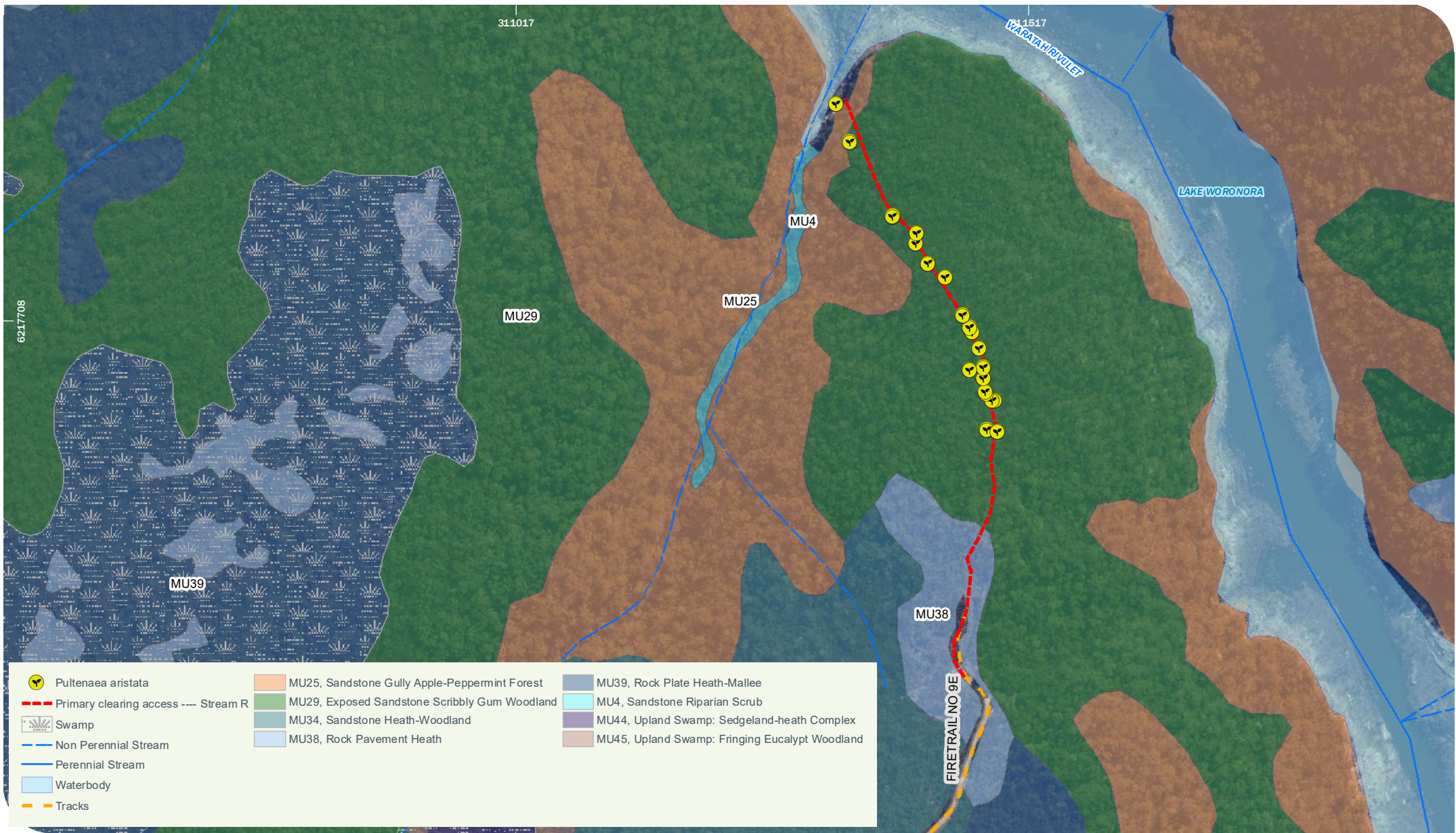


GDA 1994 MGA Zone 56

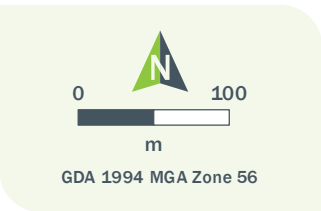
Niche PM: Renee Regal  
Niche Proj. #: 5410  
Client: Peabody Energy

## Swamp 92 Site Plan Metropolitan Coal Upland Swamps and Water Monitoring tracks

Figure 11



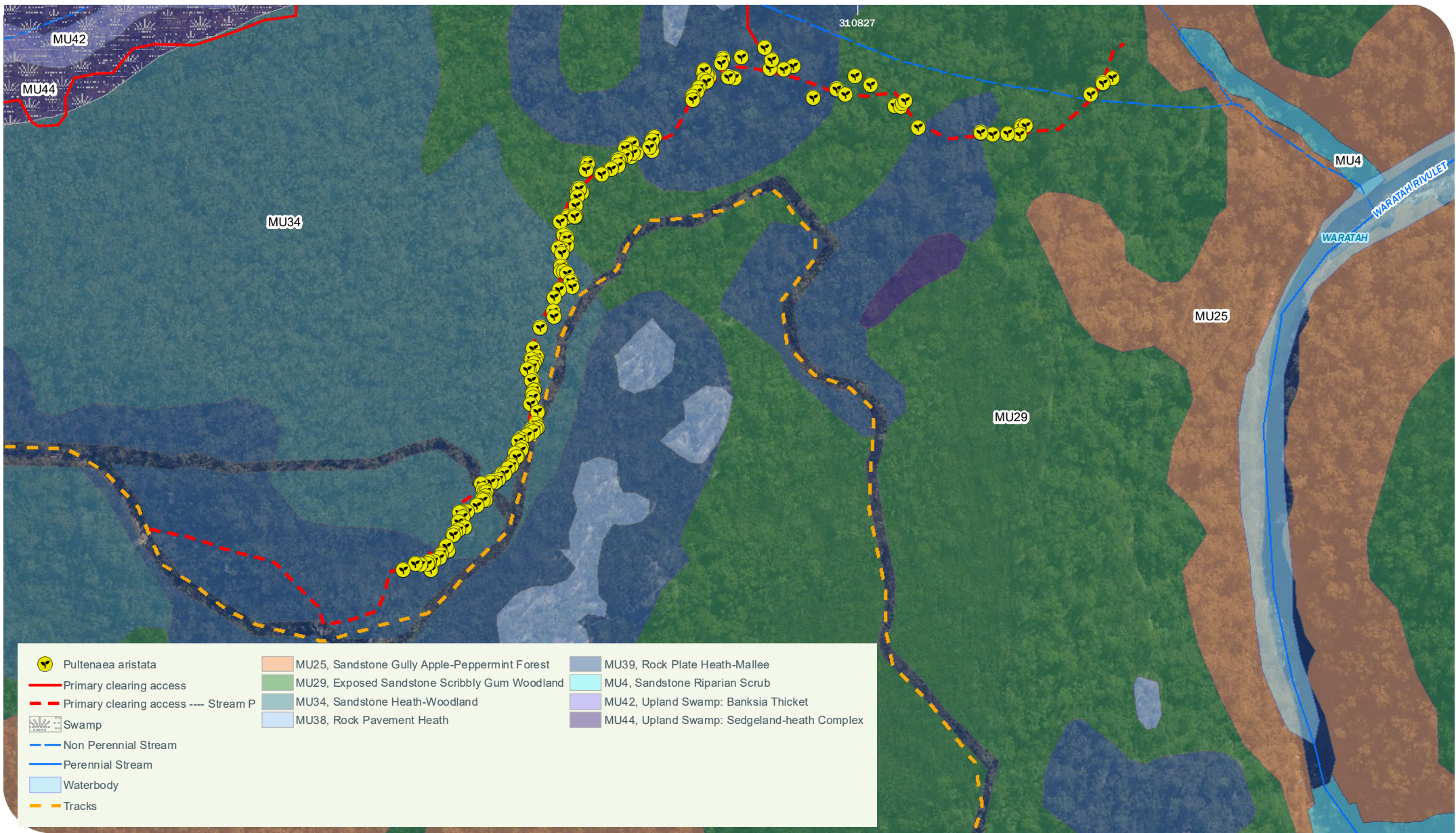
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Niche PM: Renee Regal  
Niche Proj. #: 5410  
Client: Peabody Energy

**Stream R Site Plan**  
Metropolitan Coal Upland Swamps and Water Monitoring tracks

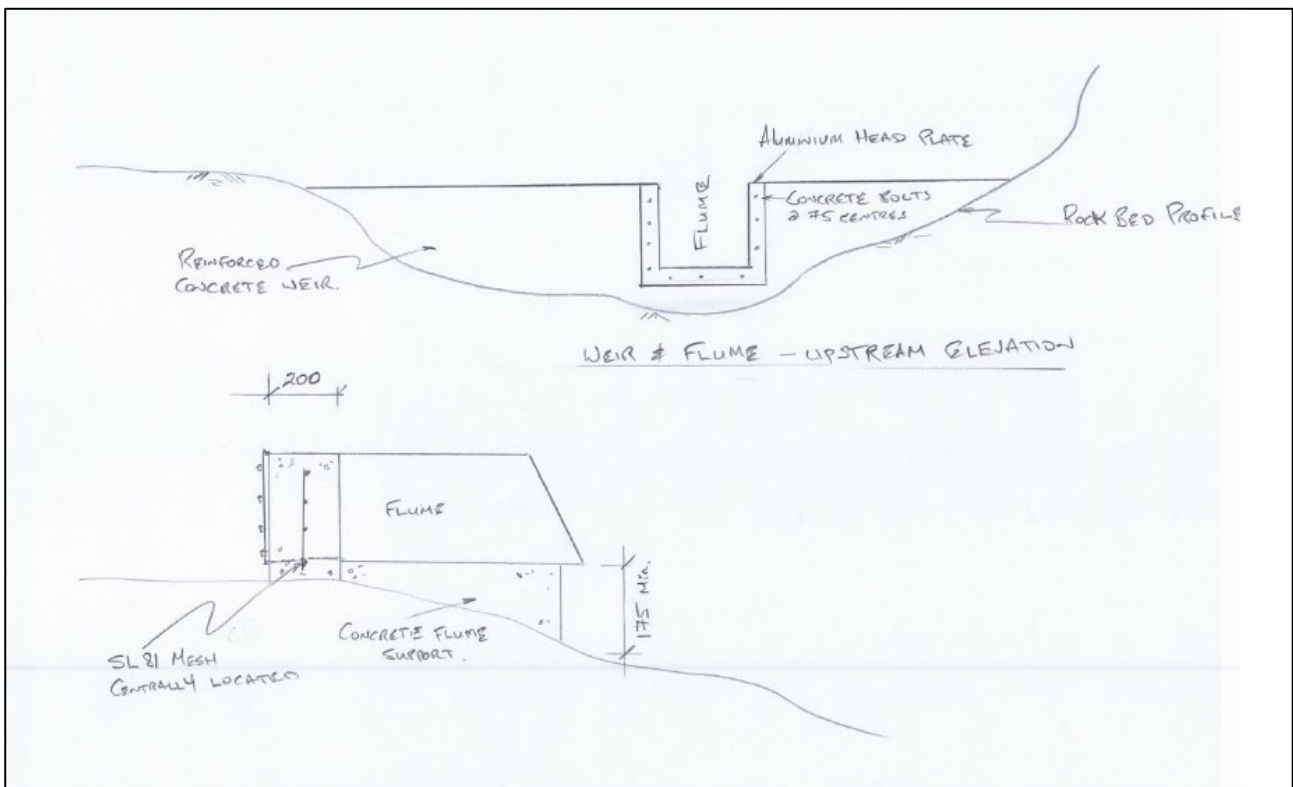
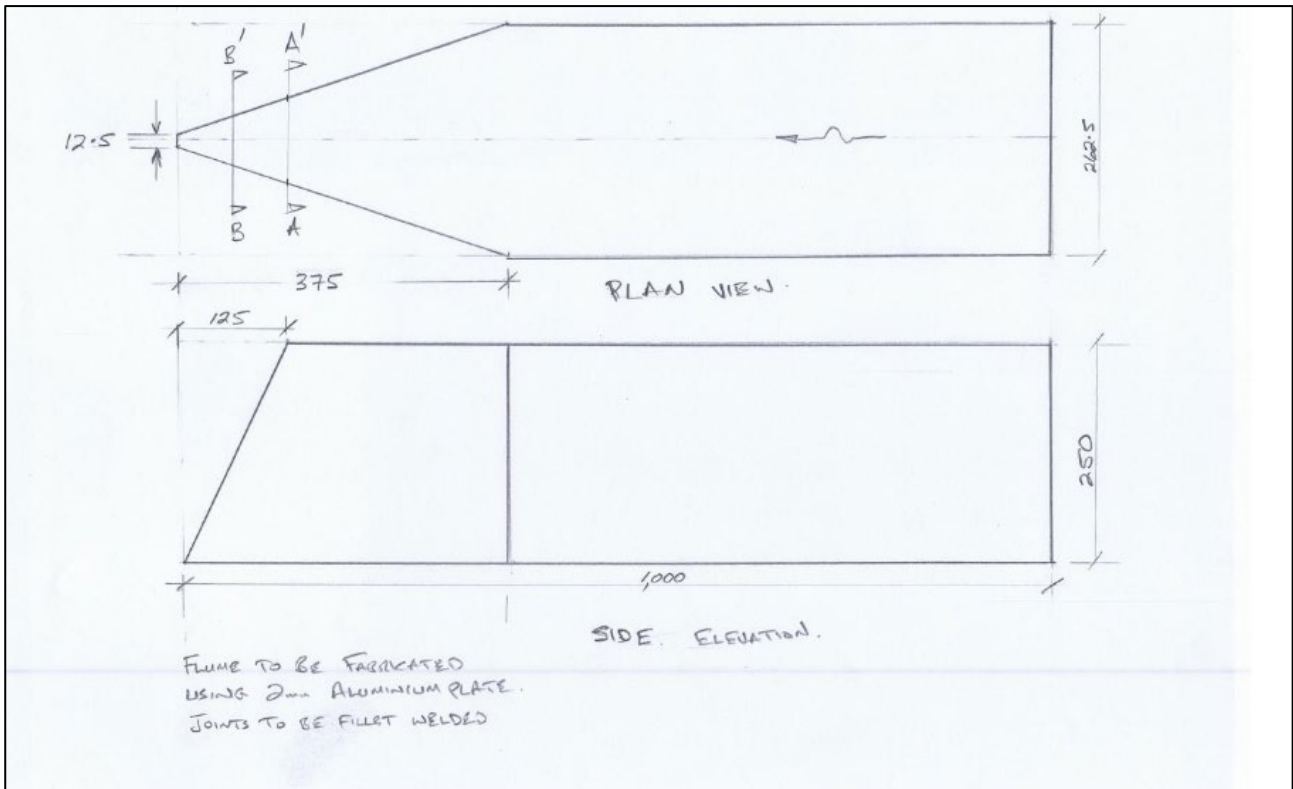
**Figure 12**



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Figure 14: Gauging Stations - Flume and Weir Design



## Annex 2 Plates



Plate 1: Site 76-1 – shallow swamp sediment bore sites and access track through swamp vegetation.



Plate 2: Site 76-2 – deep swamp sediment bore sites.



Plate 3: Site 76-2 – part of access track through woodland community.



Plate 4: Site 76-3 – shallow swamp sediment bore sites and access track through swamp vegetation.



Plate 5: Site 76-3 part of access track through swamp community.



Plate 6: Site 76-3 Ecological constraint, hollow-bearing tree.



Plate 7: Site 76-3 - part of access track through woodland community.



Plate 8: Site 77-1 – shallow swamp sediment bore sites and access track through swamp vegetation.



Plate 9: Site 77-1 part of access track through woodland community.



Plate 10: Site 77-2 – deep swamp sediment bore sites.



Plate 11: Site 77-2 access through swamp edges.



Plate 12: Site 77-2 access through Hakea and Banksia thickets.



Plate 13: Site 77-3 shallow swamp sediment bore sites and access track through swamp vegetation.



Plate 14: Site 77-3 part of access track through swamp community.



Plate 15: Site Swamp 82 – shallow swamp sediment bore sites and access track through swamp vegetation.



Plate 16: Site Swamp 82 – shallow swamp sediment bore sites and access track through swamp vegetation.



Plate 17: Site Swamp 89 – shallow swamp sediment bore sites and access track through swamp vegetation.



Plate 18: Site 92-1 – shallow swamp sediment bore sites and access track through swamp vegetation.



Plate 19: Site 92-1 access through swamp edges.



Plate 20: site 92-2 – deep swamp sediment bore sites.



Plate 21: Site 92-3 shallow swamp sediment bore sites and access track through swamp vegetation.



Plate 22: Site 92-3 access through swamp.



Plate 23: Site Stream P – access through woodland.



Plate 24: Site Stream P – access through woodland, rocky constraints.



Plate 25: Site Stream R – access with flagged pink *P. aristata* to be avoided.



Plate 26: Site Stream R – access through woodland with flagged pink *P. aristata* to be avoided.



Plate 27: Proposed Weir/Flume Monitoring Site Swamp 76



Plate 28: Proposed Weir/Flume Monitoring Site Swamp 92



Plate 29: Weir Flume Design Concept

## 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: Flora, Fauna and Archaeological Assessment Metropolitan Coal - Swamp Piezometer Installation (Niche ref: #5410)**

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 twelve proposed swamp piezometer groundwater monitoring sites with access tracks (Table 1) and two access tracks to surface water monitoring locations (Table 1). The proposed Subject Areas are located of the Princes Highway Helensburgh NSW, within the Peabody Energy Metropolitan Colliery Mine lease area (Figures 1 -3 of the Review of Environmental Factors). 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.’

**Table 1: Proposed Metropolitan Coal Upland Swamp and Water Monitoring Tracks**

Area	Site	Figure Number	Proposed works
Swamp S76	S76-1	7	<ul style="list-style-type: none"> <li>One access track 0.5 m wide</li> <li>One Monitoring point 3m x 3m</li> <li>Confirm depth of rock under swamp</li> </ul>
	S76-2 (Drill Rig)	7	<ul style="list-style-type: none"> <li>One access track 1.2 m wide</li> <li>One Monitoring point 5m x 5m</li> <li>Confirm depth of rock under swamp</li> </ul>
	S76-3	7	<ul style="list-style-type: none"> <li>One access track 0.5 m wide</li> <li>One Monitoring point 3m x 3m</li> </ul>
Swamp S77	S77-1	8	<ul style="list-style-type: none"> <li>One access track 0.5 m wide</li> <li>One Monitoring point 3m x 3m</li> <li>Confirm depth of rock under swamp</li> </ul>
	S77-2 (Drill Rig)	8	<ul style="list-style-type: none"> <li>One access track 1.2 m wide</li> <li>One Monitoring point 5m x 5m</li> <li>Confirm depth of rock under swamp</li> </ul>
	S77-3	8	<ul style="list-style-type: none"> <li>One access track 0.5 m wide</li> <li>One Monitoring point 3m x 3m</li> </ul>
S81 and S82	S81	9	<ul style="list-style-type: none"> <li>One access track 0.5 m wide</li> <li>One Monitoring point 3m x 3m</li> </ul>
	S82	9	<ul style="list-style-type: none"> <li>One access track 0.5 m wide</li> <li>One Monitoring point 3m x 3m</li> </ul>
92-1, 92-2, 92-3, and 89	S92-1	11	<ul style="list-style-type: none"> <li>One access track 0.5 m wide</li> <li>One Monitoring point 3m x 3m</li> <li>Confirm depth of rock under swamp</li> </ul>
	S92-2 (Drill Rig)	11	<ul style="list-style-type: none"> <li>One access track 1.2 m wide</li> <li>One Monitoring point 5m x 5m</li> </ul>



Area	Site	Figure Number	Proposed works
	S92-3	11	<ul style="list-style-type: none"> <li>One access track 0.5 m wide</li> <li>One Monitoring point 3m x 3m</li> <li>Confirm depth of rock under swamp</li> </ul>
	S89	10	<ul style="list-style-type: none"> <li>One access track 0.5 m wide</li> <li>One Monitoring point 3m x 3m</li> </ul>
Access track to Stream P (from end of Fire Road E)	Stream R	12	<ul style="list-style-type: none"> <li>One access track 0.5 m wide</li> </ul>
Track to Waratah Rivulet (Rain Gauge) with access track flagged from PV06 / 2020EX01	Stream P	13	<ul style="list-style-type: none"> <li>One access track 0.5 m wide</li> </ul>

**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 previously recorded Aboriginal cultural heritage sites within a 200m proximity to the proposed Subject Area of Stream P and Swamp site 89 access tracks. There are no sites within proximity to any other borehole sites or access tracks. Aboriginal cultural heritage site information is outlined in Table 2.

**Table 2: AHIMS sites within 200 m proximity of work zones**

AHIMS ID	Near Subject Areas	Site Name	Site type
52-2-0152	Stream P - surface water monitoring track	Flat Rock Creek 61	Shelter with Art
52-2-0168 duplicate of 52-2-0399 and 52-2-0415	Stream P - surface water monitoring track	Flat Rock Creek 62	Axe Grinding Groove
52-2-0171	Stream P - surface water monitoring track	Flat Rock Creek 164	Axe Grinding Groove
52-2-0399 duplicate of 52-2-0415	Stream P - surface water monitoring track	Flat Rock Creek 62	Shelter with Art
52-2-0401	Swamp site 89	Flat Rock Creek 196; Blue Gum Forest	Axe Grinding Groove
52-2-0415 duplicate of 52-2-0399	Stream P - surface water monitoring track	Flat Rock Creek 62	Shelter with Art

Flat Rock Creek 62 (AHIMS ID# 52-2-0399 duplicate of AHIMS ID#52-2-0415 and AHIMS ID# 52-2-0168) 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 firetrail 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 represented by AHIMS ID# 52-2-0399 which is located approximately 120 m from the proposed Subject Area of stream P, therefore, the data point representing AHIMS ID# 52-2-0415 is not valid. The proposed works associated with Stream P monitoring track will not harm this Aboriginal cultural heritage site.

Flat Rock Creek 164 (AHIMS ID# 52-2-0171) is an axe grinding groove site located 1.3 km of fire trail 9E. The site is located 100 m east of the track on a large pan on level sandstone. Four grooves are present at this site with an average size of 26 x 7 x 1.5 cm. The Subject Area is located approximately 40 m north of Flat Rock Creek 164 (AHIMS ID# 52-2-0171). The proposed works associated with Stream P monitoring track will not harm this Aboriginal cultural heritage site.

Flat Rock Creek 196; Blue Gum Forest (AHIMS # 52-2-0401) is an axe grinding groove site located off unnamed fire trail 1.6 km east of firetrail 9E. The grinding grooves could not be located during the site inspection and may be covered by leaf litter. The grinding grooves are described to be in the southern edge of a sandstone pan. The proposed track alignment for swamp monitoring track 89 was diverted 10 m to the west to avoid this site. The proposed works associated with Stream P monitoring track will not 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 Layne Holloway (Heritage Consultant) on the 4<sup>th</sup> to the 11<sup>th</sup> September 2019 and Wade Goldwyer (Heritage Consultant) on the 21<sup>st</sup> 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 the twelve proposed swamp piezometer groundwater monitoring sites with access tracks and two access tracks to surface water monitoring tracks. 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 swamp access track 89 and stream P surface water monitoring track to avoid any disturbance outside the alignment of the 0.5 m track clearing;
- 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 breeding 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 and for basking sites. Individuals can be found sheltering and overwintering under debris or in vegetation immediately adjacent to the breeding sites.	Low	Low

Scientific Name	Common Name	BC Act	FM Act	EPBC Act	Habitat	Likelihood of Occurrence	Potential for impact
<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 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</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. 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 groundcover of grasses or sedges and fallen woody debris.	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>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>Callocephalon 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 <i>Allocasuarina</i> spp. Tends to prefer drier forest types with a middle stratum of <i>Allocasuarina</i> below <i>Eucalyptus</i> or <i>Angophora</i> . 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.	<b>Moderate</b>	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.	<b>Moderate</b>	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.	<b>Moderate</b>	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.	<b>Moderate</b>	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</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

Scientific Name	Common Name	BC Act	FM Act	EPBC Act	Habitat	Likelihood of Occurrence	Potential for impact
<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 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.	Low	Low
<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</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

Scientific Name	Common Name	BC Act	FM Act	EPBC Act	Habitat	Likelihood of Occurrence	Potential for impact
<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 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.	Low	Low
<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.. 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	None
<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 .	<b>Moderate</b>	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.	<b>Moderate</b>	Low – no limiting habitat being modified or removed
<i>Dasyurus 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.	<b>Moderate</b>	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.	<b>Moderate</b>	Low – no limiting habitat being modified or removed
<i>Isoodon 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

Scientific Name	Common Name	BC Act	FM Act	EPBC Act	Habitat	Likelihood of Occurrence	Potential for impact
<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 Bent-wing Bat has a preference for moist eucalypt forest, rainforest or dense coastal banksia scrub where it forages below the canopy for insects.	Moderate	Low – no limiting habitat being modified or removed
<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

Scientific Name	Common Name	BC Act	FM Act	EPBC Act	Habitat	Likelihood of Occurrence	Potential for impact
<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
<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.	<b>Moderate</b>	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.	<b>Moderate</b>	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 – no habitat within study area	None

Scientific Name	Common Name	BC Act	FM Act	EPBC Act	Habitat	Likelihood of Occurrence	Potential for impact
<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 – no habitat within study area	None
<b>Fish</b>							
<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	None – no habitat within study area	None
<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.	<b>Moderate</b>	Low – no limiting habitat being modified or removed. Not detected during survey.
<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.	<b>Moderate</b>	Low – no limiting habitat being modified or removed. Not detected during survey.

Scientific Name	Common Name	BC Act	FM Act	EPBC Act	Habitat	Likelihood of Occurrence	Potential for impact
<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 brownii</i> , <i>Themeda australis</i> and <i>Xanthorrhoea minor</i> .	Low	Low
<i>Astrotricha crassifolia</i>	Thick-leaf Star-hair	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. Not detected during survey.
<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. Not detected during survey.
<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



Scientific Name	Common Name	BC Act	FM Act	EPBC Act	Habitat	Likelihood of Occurrence	Potential for impact
<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
<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. Not detected during survey.
<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. Not detected during survey.
<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

Scientific Name	Common Name	BC Act	FM Act	EPBC Act	Habitat	Likelihood of Occurrence	Potential for impact
<i>Haloragis exalata</i> <i>subsp. 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.	<b>Moderate</b>	Low – no limiting habitat being modified or removed. Not detected during survey.
<i>Melaleuca deanei</i>	Deane's Paperbark	V	-	V	Grows in wet heath on sandstone in coastal districts from Berowra to Nowra.	<b>Moderate</b>	Low – no limiting habitat being modified or removed. Not detected during survey.
<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' 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.	<b>Moderate</b>	Low – no limiting habitat being modified or removed. Not detected during survey.
<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> <i>var. 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

Scientific Name	Common Name	BC Act	FM Act	EPBC Act	Habitat	Likelihood of Occurrence	Potential for impact
<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.	<b>Known</b>	Low – all known individuals will be marked and demarcated to allow for the access and or borehole works to avoid wherever possible.
<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

Scientific Name	Common Name	BC Act	FM Act	EPBC Act	Habitat	Likelihood of Occurrence	Potential for impact
<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 (5-part test) (BC Act)

Coastal Upland Swamp in the Sydney Basin Bioregion EEC (Coastal Upland Swamp)	
Description	<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 (498 hectares within five kilometres of the proposal according to NPWS 2003).</p> <p>A maximum of 0.08 hectares of Coastal Upland Swamps will be impacted by the proposed works via clearing. All of the 12 proposed swamp piezometer groundwater monitoring sites are within either MU42 Upland swamps: Banksia thicket or MU44 Upland swamps: sedgeland-heath complex.</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.	N/A
<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 498 hectares of Coastal Upland Swamp exists within five kilometres of the study area (NPWS 2003), which is considered to be the local occurrence of Coastal Upland Swamp in this instance. Of this local occurrence, 0.08 ha will be removed or modified by the proposal.</p> <p><b>Assessment</b></p> <p>0.08 ha of Coastal Upland Swamp will be removed or modified. With mitigation measures for soil and vegetation 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 498 ha is placed at risk of extinction.</p>

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

<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>          Minimal clearing is proposed to be undertaken within areas of Coastal Upland Swamp, with impacts limited to trittering of 0.08 ha for access track and borehole site clearing to access the swamp areas to install piezometers. Therefore, the extent to which habitat is likely to be removed or modified as a result of the action proposed is considered to be minimal.</p> <p><b>Habitat fragmentation</b>          As minimal Coastal Upland Swamp will be modified, habitat is not likely to become fragmented or isolated from other areas of habitat as a result of the proposed activity.</p> <p><b>Importance of habitat to be impacted</b>          Approximately 498 hectares of Coastal Upland Swamp exists within five kilometres of the study area and approximately 0.08 ha of Coastal Upland Swamp would be modified by trittering 0.5 m wide or 1.2m wide access tracks and 25 m<sup>2</sup> or 9m<sup>2</sup> borehole sites. Habitat to be removed is typical of habitat for this community and representative sub-communities within the locality and is not considered to be of any special importance in regard to the long-term survival of the community.          The proposal is unlikely to have a significant impact 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>The only KTP that will be affected as a result of the proposal is the clearing of native vegetation. In this case, the proposed program effectively equates to clearing of native vegetation structure of 0.08 ha. The proposed development is not likely to significantly increase the impact of this key threatening process.</p>
<p>Conclusion</p>	<p>The local occurrence Coastal Upland Swamp is unlikely to be significantly affected by the proposal.</p>

***Pultenaea aristata* (Prickly bush-pea) (Vulnerable)**

**Description**

*Pultenaea aristata* (Fabaceae) is listed as a vulnerable species on the BC Act.

*P. aristata* is restricted to the Woronora Plateau area between Helensburgh, south of Sydney, and Mt Kiera above Wollongong. The species occurs in either dry sclerophyll woodland, upland swamp or wet heath on sandstone. Extensive areas of potential habitat occur within and on the margins of Coastal Upland Swamps which exist within the study area.

*P. aristata* was recorded in the study area at the following locations:

- Swamp 77, on the access track to site 77-2
- Swamp 81, on the access track common to site 81 and 82, and the access track to site 82.
- Swamp 82, on the access track to the borehole site
- Swamp 89, on the access track to the borehole site
- Stream R, on the access track.
- Stream P, on the access track.

Overall, it is likely that there are many hundreds of plants of *P. aristata* within the multiple areas of suitable habitat in the study area. Areas of the preferred habitat for the species (Upland Swamps and their margins) are unavoidable by the proposal. Mitigation measures as described in the report above such as demarcation, and specific individual marking will be implemented to protect individual plants so impacts to *P. aristata* would be minimal. However, given the density of the species where it occurs, there is the potential that the proposal would impact individuals during construction through direct clearing, trampling or damage to the root zone. An estimate of this number without implementation of specific mitigation measures determined that 206 individuals would potentially be impacted. To minimise this impact, an ecologist would be on site prior to the proposed clearing of the species at the locations where the species has been mapped as occurring to inform the workers, review controls implemented and identification of species made during the survey to ensure the vast majority of plants are not impacted.

a. In the case of a threatened species, whether the action proposed 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

**Viable local population**

*Pultenaea aristata* is known extensively from the locality and probably has a population in the tens of thousands (N. Smith pers. com.). The species was recorded in the study area at numerous locations as described above.

All *Pultenaea aristata* have been marked with pink flagging tape. *P. aristata* individuals at all sites will be made known to project personnel in site specific training so they can be avoided and protected during works. Within dense areas of threatened plants the vegetation clearing will be reduced and completed by hand-held devices, this will ensure the proposed works avoid direct clearing of any individuals of *P. aristata* wherever practicable.

***Pultenaea aristata* (Prickly bush-pea) (Vulnerable)**

	<p><b>Life cycle factors</b></p> <p>The following description has been paraphrased from Benson and MacDougall (1996).  <i>Pultenaea aristata</i> is a small erect shrub to one metre high and lives for five to 20 years. Peak flowering is in September and fruits mature in December. The seed is hard coated with a high germination rate after being scarified, suggesting that recruitment is mainly after fire. Fire kills the mature plants.</p> <p><b>Assessment</b></p> <p>There is the potential that some 206 individuals of <i>Pultenaea aristata</i> will be affected by the proposal given the density of the species in the vicinity of the works. To minimise the impacts of the proposal, the species preferred habitat on the margins of Coastal Upland Swamps will be avoided by selection of a path of least impact on the species, demarcation of the track path, and marking the species with pink flagging tape. In addition, an ecologist would be attend site prior to the clearing operations to train the workers in identification of the species and the mitigation measures such as flagging applied, ensure that the track demarcation and species flagging remains intact and accurate, and impacts are minimised. Therefore, the action proposed is unlikely to have an adverse effect on the life cycle of <i>Pultenaea aristata</i> such that a viable local population of the species is likely to be placed at risk of extinction.</p>
<p>b. In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction</p>	<p>N/A</p>
<p>c. In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:</p> <ul style="list-style-type: none"> <li>i. 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</li> <li>ii. 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</li> </ul>	<p>N/A</p>
<p>d. In relation to the habitat of a threatened species, population or ecological community:</p>	<p><b>i. Extent of impact on habitat</b></p>



<b><i>Pultenaea aristata</i> (Prickly bush-pea) (Vulnerable)</b>	
<p>i. The extent to which habitat is likely to be removed or modified as a result of the action proposed, and</p> <p>ii. Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and</p> <p>iii. 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>The extent of <i>Pultenaea aristata</i> potential habitat including direct and adjacent indirect habitat to be modified is 0.21 hectares as a result of the proposed activity. The proposed activity is clearing to create walking and access tracks to surface water monitoring locations and to allow for installation of ground water borehole site.</p> <p><b>ii. Habitat fragmentation</b> The proposal will result in the primary clearing of 0.08 ha of habitat, none of which presents a hostile barrier to the movement of pollinators or the dispersal of seed. Habitat for <i>Pultenaea aristata</i> would not be fragmented as a result of the proposal.</p> <p><b>iii. Importance of habitat to be impacted</b> The proposal will have no impact on the extent of habitat for <i>Pultenaea aristata</i> within the locality and none will be fragmented.</p>
<p>e. Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly)</p>	<p>Critical habitat declarations 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 critical habitat will be affected by the proposal.</p>
<p>f. Whether the action proposed is consistent with the objectives or actions of a Recovery Plan or Threat Abatement Plan</p>	<p>This species has been assigned to the Keep-watch species management stream under the Saving our Species (SoS) program (OEH 2019). A number of state-wide conservation actions have also been identified for this threatened species, which can be viewed by clicking the link below:</p> <ul style="list-style-type: none"> <li>• Confirm location details of existing records.</li> <li>• Review fire management requirements and apply.</li> <li>• Provide map of known occurrences to Rural Fire Service and seek inclusion of mitigative measures on Bush Fire Risk Management Plan(s), risk register and/or operation map(s).</li> <li>• Reserve Fire Management Strategy to include operational guidelines to protect this species from fire.</li> </ul> <p>The proposal is not likely to interfere with the recovery of <i>Pultenaea aristata</i>.</p>
<p>g. Whether the action proposed constitutes or is part of a Key Threatening Process (KTP) or is likely to result in the operation of, or increase the impact of, a KTP</p>	<p>The only KTP that will be affected as a result of the proposal is the clearing of native vegetation. In this case, the proposed vegetation clearing of native vegetation is approximately 0.08 hectares. This is less than 1% of the total community within the 5km radius and therefore will not significantly impact the population.</p>
<p><b>Conclusion</b></p>	<p>A viable local population of <i>Pultenaea aristata</i> is unlikely to be significantly affected by the proposal as:</p> <ul style="list-style-type: none"> <li>• an ecologist would be on site prior to the proposed clearing of the species at the locations where the species has been mapped as occurring to inform the workers, review controls implemented and identification of species made during the survey to ensure the vast majority of plants are not impacted.</li> <li>• The habitat potentially affected by the proposal is likely to be of little or no importance to the long-term survival of the species in the locality;</li> </ul>

***Pultenaea aristata* (Prickly bush-pea) (Vulnerable)**

- The proposal is consistent with Keep-watch species management stream under the SoS program; and
- The proposal would not exacerbate KTPs in the long term.

**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. No individuals of Red-crowned Toadlet was heard calling within the study area during the current surveys. Potential impacts for the species from this proposal are confined to indirect impacts across drainage line 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. 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 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>N/A</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 approximately 0.08 hectares of swamps as a result of the proposed activity. The proposed activity is clearing of access tracks no wider than 1.2m wide 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>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>

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.

The only KTP that will be affected as a result of the proposal is the clearing of native vegetation. In this case, the proposed vegetation clearing of native vegetation is approximately 0.08 hectares. This is less than 1% of the total community within the 5km radius and therefore will not significantly impact the population.

**Conclusion:** 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, appropriate flow diversion, implementation of site design, before mobilisation on site. The proposal is unlikely to result in a significant impact of Red-crowned Toadlet.

## Annex 6 Assessment of Significance (EPBC Act)

Coastal Upland Swamp in the Sydney Basin Bioregion EEC (Coastal Upland Swamp)	
Criteria for critically endangered and endangered ecological communities	Likelihood
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>1. Reduce the extent of an ecological community;</b>	
Approximately 0.08 ha of Coastal Upland swamp would be temporarily modified by the proposal. The proposed boreholes sites and access tracks have been designed to avoid needing to clear large areas supporting Coastal Upland Swamp. The local extent of Coastal Upland Swamp will not be significantly reduced by the proposal.	None
<b>2. Fragment or increase fragmentation of an ecological community;</b>	
As minimal areas of Coastal Upland Swamp would be removed by the proposal, the proposal would not significantly fragment or significantly 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 peppergrass) - 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 the relatively minimal areas of Coastal Upland Swamp to be modified 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

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

- 6. Cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to;**
- **Assisting invasive species, that are harmful to the listed ecological community, to become established, or**
  - **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**

<p>The ecological processes required to enable the establishment of invasive species are unlikely to eventuate. Vehicle quarantining procedures will mitigate against this.</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 the Metropolitan Coal Construction Management Plan.</p>	<p>Unlikely</p>
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**7. Interfere with the recovery of an ecological community.**

<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> <p>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.</p> <p>Given the proposal would not result in significant clearing of Coastal Upland Swamp, the proposal is not inconsistent with this management action.</p>	<p>Unlikely</p>
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**Conclusion: The proposed action is unlikely to have a significant impact on Coastal Upland Swamp.**

Pultenaea aristata (Prickly Bush-pea) (Vulnerable)	
Criteria for vulnerable species	Likelihood
An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:	
<b>1. Lead to a long-term decrease in the size of an important population of a species;</b>	
Overall, it is likely that there are many <i>Pultenaea aristata</i> in the locality and probably has a population in the tens of thousands (N. Smith pers. com.) within suitable habitat in the study area. The preferred habitat for the species (Upland Swamps and their margins) has been avoided by the proposal and so impacts to <i>Pultenaea aristata</i> would be minimal. However, given the density of the species where it occurs, there is the potential that the proposal would impact on a few individuals during construction.  All <i>Pultenaea aristata</i> have been marked with pink flagging tape. <i>P.aristata</i> individuals at all sites will be made known to project personnel so they can be avoided and protected during works. Within dense areas of threatened plants the vegetation clearing will be reduced and completed by hand-held devices, this will ensure the proposed works avoid any individuals of <i>P.aristata</i> .	Unlikely
<b>2. Reduce the area of occupancy of an important population;</b>	
The proposal is unlikely to reduce the area of occupancy of an important population of <i>Pultenaea aristata</i> as, immediately prior to construction, areas where the species has been recorded would be made known to personnel and flagged with pink flagging tape to ensure impacts to the species are minimised.	Unlikely
<b>3. Fragment an existing important population into two or more populations;</b>	
The proposal will result in the modification of a negligible amount of habitat (0.08), none of which presents a hostile barrier to the movement of pollinators or the dispersal of seed. Habitat for <i>Pultenaea aristata</i> would not be fragmented as a result of the proposal.	Unlikely
<b>4. Adversely affect habitat critical to the survival of a species;</b>	
The following species are listed on the EPBC Act Register of Critical Habitat: <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> No critical habitat has been declared for <i>Pultenaea aristata</i> .  Habitat critical to the survival of <i>Pultenaea aristata</i> is not likely to be impacted by the proposal known individuals would be avoided as far as practicable during clearing operations, with an ecologist on site to mark exclusion zones.	Unlikely
<b>5. Disrupt the breeding cycle of an important population;</b>	

<p>There is the potential for a few individuals of <i>Pultenaea aristata</i> to be affected by the proposal, but this impact would be minimised by having an ecologist on site prior to clearing works to ensure impacts are minimised. Therefore, the action proposed is unlikely to have an adverse effect on the breeding cycle of an important population of <i>Pultenaea aristata</i>.</p>	None
<p><b>6. Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline;</b></p>	
<p>The modification of native vegetation that represents potential habitat for the species is unlikely to have long-term negative consequences for <i>Pultenaea aristata</i> as impacts on the species will be marked with pink flagging tape. <i>P.aristata</i> individuals at all sites will be made known to project personnel and avoided during clearing.</p>	Unlikely
<p><b>7. Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat;</b></p>	
<p>The proposal will introduce tracks into relatively pristine habitat, which generally increases the potential for invasive predators to move into new areas. However the proposed tracks are minor in nature and the tracks will be rehabilitated. The risk of introducing invasive species would be ameliorated through vehicle quarantining procedures. The proposal is not likely to lead to the introduction of invasive species in <i>Pultenaea aristata</i> habitat.</p>	Unlikely
<p><b>Introduce disease that may cause the species to decline, or</b></p>	
<p>Whilst there is some potential for works plant and machinery to transport and disperse soil pathogens throughout the study area, this risk will be managed through the use of vehicle quarantining procedures. It is considered unlikely that the proposed action will introduce disease that may cause the <i>Pultenaea aristata</i> to decline.</p>	Unlikely
<p><b>Interfere substantially with the recovery of the species.</b></p>	
<p>To date, there is no recovery plan or threat abatement plan for <i>Pultenaea aristata</i>. No recovery programs are known to occur within the study area. A number of state-wide conservation actions have also been identified for this species under the Saving Our Species program:</p> <ul style="list-style-type: none"> <li>• Confirm location details of existing records.</li> <li>• Review fire management requirements and apply.</li> <li>• Provide map of known occurrences to Rural Fire Service and seek inclusion of mitigative measures on Bush Fire Risk Management Plan(s), risk register and/or operation map(s).</li> <li>• Reserve Fire Management Strategy to include operational guidelines to protect this species from fire.</li> </ul> <p>The proposal is not likely to interfere with the recovery of <i>Pultenaea aristata</i>.</p>	Unlikely
<p><b>Conclusion: The proposed action is unlikely to have a significant impact on <i>Pultenaea aristata</i>.</b></p>	



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## Our services

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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)