

**Construction Management Plan
Surface Works Assessment Form**

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

Date: 23 October 2018

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

Register number (i.e. Number 1, 2, etc.): 13

RMP register number:

Site name: Swamps 60, 62, 64, 72, 133 and 134

Site type: Environmental monitoring sites - groundwater monitoring bores.

Site co-ordinates (easting/northing): Coordinates for paired piezometer installation sites in table below.

Swamp	Easting	Northing
60	312754	6218443
62	312011	6218339
64	312269	6218118
72	312239	6217938
133	312513	6218988
134	312682	6218760

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.

Works schedule:

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

Two adjacent groundwater monitoring bores will be installed in each swamp. One monitoring bore 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.

Access and Equipment Delivery

Access to the monitoring bore construction sites will be from existing access roads. Narrow (approximately 1.5 m wide) tracks to each construction site will be slashed for pedestrian access and equipment and materials delivery/removal 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. Where the use of a remote access mini drill rig is not feasible, a man portable rig will be used for drilling activities. The man portable system will be broken down into manageable components (Drill mast, hydraulic drive unit, drill and drill rods) and transported to each swamp location along the access tracks by hand or with the ATV. All equipment and materials transported with the ATV will be securely restrained to the vehicle.

Drilling

Groundwater monitoring bores will have a diameter of up to 125 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.

Water Management and Cuttings Containment

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

The 10 m deep monitoring bores 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.

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.

Where access allows the use of the remote access mini drill rig the monitoring bores will be drilled with utilising open hole air hammer techniques. 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.

Where access is restricted the man portable drill rig will be required and rotary drilling techniques will be adopted. The collar of the bore will have a t-section installed to allow sediment to be deposited directly into a baffled tank for collection. At the conclusion of drilling at each location the water from the baffled tank will be pumped to a location outside of the swamp area and filtered using a geotextile to capture sediment. Sediment and cuttings will be collected and removed offsite for disposal.

Bore Casing

Deeper monitoring bores (10m depth): 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 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 (Class 18) 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.

Monitoring Equipment

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

Construction Site Rehabilitation

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

Fuel Management

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.

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.

Indicative Works Schedule

An indicative works schedule for groundwater monitoring bore installation is provided below:

- Personnel training and awareness - prior to commencement of activities.
- Establishment and implementation of pre-construction management measures (e.g. vegetation clearance) - approximately one day per site.
- Delivery of equipment by ATV/quad bike, rubber-tracked remote access drill rig and by hand, drilling of bores and construction of monitoring bores/installation of monitoring equipment - 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.

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**

Several individuals of Pultenea aristata (threatened flora under the BC and EPBC Acts) were identified during the survey along the proposed access track to Swamp 62. These have been flagged with orange flagging tape and GPS waypoints recorded.

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?

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

Site 72 was relocated further north on the northern margin of the swamp to avoid three archaeological sites in the vicinity

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.

3 and 25 September 2018

Name of suitable qualified ecologist conducting survey

Alex Christie, Niche Environment & Heritage

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

Yes

Pultenaea aristata was identified during the upland swamp investigations. These have been flagged with orange flagging tape and GPS waypoints recorded (refer borehole site plan Swamp 62). With supervision by a botanist these individuals can be avoided during clearing for the access track although, due to their density, there will be a residual risk of inadvertently clearing some unidentified or un-flagged individuals. With this mitigation measure in place, significant impacts on the local population would be avoided.

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]

LW 304-306 Swamp piezometer Installation, Ecology and Archaeological Assessment" dated October 2018 (Project No: 4536) attached.

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. m²) and method of clearing (e.g. slashing/lopping branches/removal)? **Yes**

An area of approximately 25 m² is required to be cleared at each groundwater bore construction site to allow for safe operation and manoeuvrability of the drill rig and drilling equipment. Vegetation cuttings will be placed in a random pattern to brush matt areas of 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 1.5 m 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 of a typical groundwater bore installation within a swamp. Note vegetation re-establishing within the cleared area following construction.

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

Date of pre-clearance survey for Aboriginal heritage sites.

3 and 25 September 2018

Name of suitably qualified archaeologist conducting survey

Renee Regal & Kathleen Tannahill (Archeologists)

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

Description of recorded Aboriginal heritage sites.

The proposed sites have been inspected by an archaeologist. Site 72 was relocated further north on the northern margin of the swamp to avoid three archaeological sites in the vicinity. 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

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.

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 proposed sites have been inspected by an archaeologist. Site 72 was relocated further north on the northern margin of the swamp to avoid three archaeological sites in the vicinity. 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.

Erosion or sediment control measures required?

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

Fuel and spill management measures required?

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

List Hazardous Materials and Storage Requirements

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

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

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

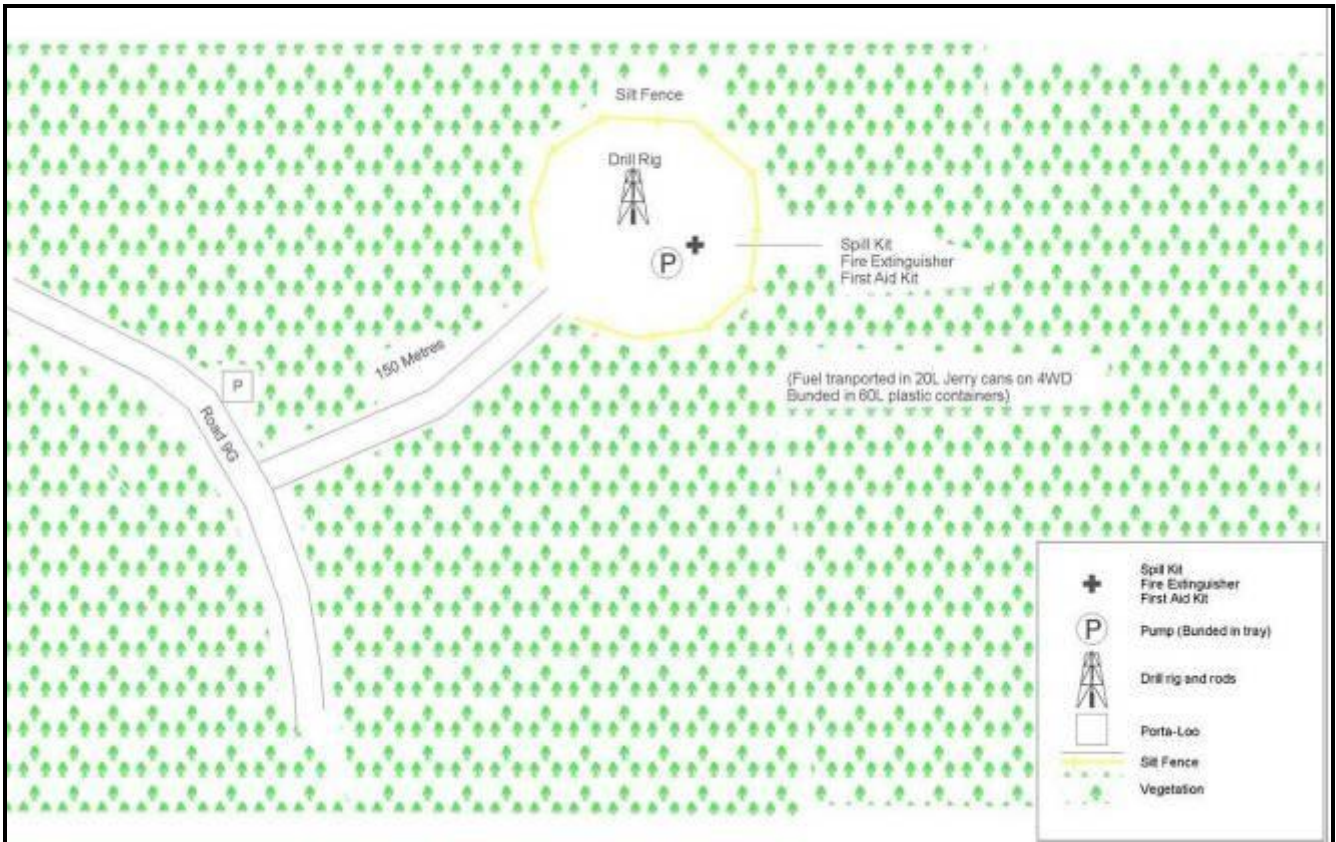
Bushfire Preparedness and Management

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

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.*

INDICATIVE SITE LAYOUT PLAN



Notes:

1. A portable toilet will be located in an easily accessible location near the construction sites.
2. Proposed groundwater monitoring sites for each swamp and indicative access tracks are shown on the attached plans.

Upland Swamp Groundwater Monitoring Bore 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 paired bores is anticipated to take approximately one to two days per swamp. Construction will be conducted during dry weather wherever practicable.

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

Bores 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.

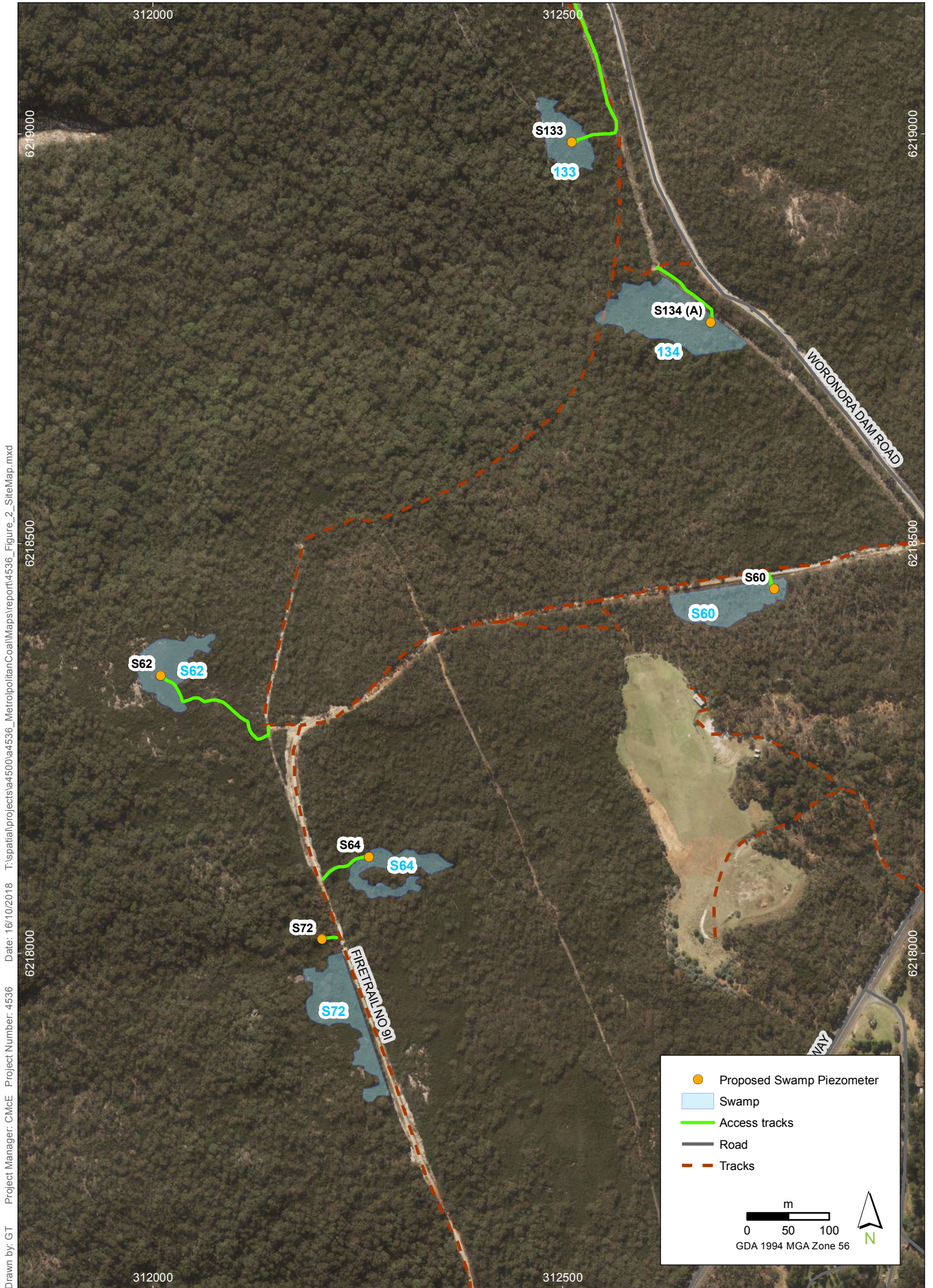
Vegetation will be cleared using a brush cutter to create an access track (approximately 1.5 m wide) and a maximum cleared construction area approximately 25 m². Felled vegetation will be left on the ground to minimise ground disturbance and associated soil erosion.

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.

Site Layout Plans



Drawn by: GT Project Manager: CMcE Project Number: 4536 Date: 16/10/2018 T:\spatial\projects\4500\4536_MetropolitanCoal\Maps\report\4536_Figure_2_SiteMap.mxd

Subject Area

LW304-306 Swamp Piezometer Installation Environmental Assessment

FIGURE 2

Imagery: (c) LPI 2016-05-03

Attachment 1

“LW 304-306 Swamp piezometer Installation, Ecology and Archaeological Assessment” dated October 2018 (Project No: 4536).



LW 304-306 Swamp Piezometer Installation

Ecology and Archaeological Assessment

Prepared for Metropolitan Coal

October 2018

Document control

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Project office:	Wollongong
Document description:	Metropolitan Coal LW 304-306 Swamp Piezometer Installation Environmental Assessment. Flora, and Archaeological Assessment
Project Director:	Matt Richardson
Project Manager:	Chris McEvoy
Authors:	Alex Christie, Renee Regal, Chris McEvoy
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Cover photograph: Swamp 60 Piezometer site.

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Locations

Sydney
Central Coast
Illawarra
Armidale
Newcastle
Mudgee
Port Macquarie
Brisbane
Cairns

Executive summary

Niche Environment and Heritage (Niche) has undertaken an assessment of the ecological and archaeological constraints and potential impacts associated with the development of six 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 impacts from longwall mining of Longwalls 304-306, in order to meet Agency requirements.

The proposal includes six “paired” groundwater investigation borehole sites (Sites 60, 62, 64, 72, 133 and 134a). Two adjacent groundwater monitoring bores would be installed at each site. At each site, one monitoring bore 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, above the underlying rock.

Access to the monitoring bore construction sites will be from existing Fire Trails or power easements. Narrow (approximately 1.5 m wide) tracks to each construction site will be slashed for pedestrian access and equipment and materials delivery/removal using a 4x4 all-terrain vehicle (ATV or quad bike) and rubber-tracked remote access mini drill rig. The disturbance of each site will be approximately 5 x 5 m (25 m²). The proposed activity includes the installation, maintenance, use, decommissioning and rehabilitation of the borehole sites.

The proposal seeks to minimise disturbance by using previously developed tracks where possible. It would result in approximately 0.09 hectares of vegetation disturbance, of which 0.04 ha is secondary clearing on the existing power easement.

Several individuals of *Pultenea aristata* (threatened flora under the BC and EPBC Acts) were identified during the survey along the proposed access track to Swamp 62. These have been flagged with orange flagging tape and GPS waypoints recorded (refer borehole site plan Swamp 62). With supervision by a botanist these individuals can be avoided during clearing for the access track although, due to their density, there will be a residual risk of inadvertently clearing some unidentified or un-flagged individuals. With this mitigation measure in place, significant impacts on the local population would be avoided.

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

The proposed sites have been inspected by an archaeologist. Site 72 was relocated further north on the northern margin of the swamp to avoid three archaeological sites in the vicinity. An Aboriginal Objects Due Diligence Assessment has concluded there will be no adverse effects to Aboriginal cultural heritage sites as a result of the proposed borehole sites and access tracks (refer Annex 3).

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

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

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1. Introduction

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 six 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 impacts from longwall mining of Longwalls 304-306, in order to meet Agency requirements.

1.2 Proposed works

1.2.1 Overview

The proposed groundwater monitoring sites are located in the Woronora special area (drinking water catchment) managed by WaterNSW (Figure 1). Location details, including site specific environmental constraints, safeguards, and access considerations are outlined below in Table 1. Site plans are provided in Annex 1 and site photos are provided in Annex 2.

The proposal includes six “paired” groundwater investigation borehole sites (Sites 60, 62, 64, 72, 133 and 134a). Refer Figures 2 and 3.

Two adjacent groundwater monitoring bores would be installed at each site. At each site, one monitoring bore 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.

The proposed activity includes the installation, maintenance, use, decommissioning and rehabilitation of the borehole sites.

1.2.2 Access and Equipment Delivery

Access to the monitoring bore construction sites will be from existing Fire Trails (9I) or the power easement (Figure 2). Narrow (approximately 1.5 m wide) tracks to each construction site will be slashed (or trittered using a mulching attachment) for pedestrian access and equipment and materials delivery/removal 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.

1.2.3 Drilling

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, while the shallow swamp sediment bores will be drilled with a hand auger. The disturbance of each site will be approximately 5 x 5 m (25 m²).

1.2.4 Water Management and Cuttings Containment

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

The 10 m deep monitoring bores 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.

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 monitoring bores will be drilled with utilising open hole air hammer techniques. 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.

1.2.5 Bore Casing

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.

1.2.6 Monitoring Equipment

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

1.2.7 Fuel Management

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 appropriate 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.

1.2.8 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.

1.2.9 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 for several years.

1.2.10 Site closure and rehabilitation

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

- Sealing the borehole to the surface with a cement/bentonite mix as per the standard requirements of Division of Resources and Geoscience (DRG).
- Capping and reporting the sealed borehole to the standards required by the DRG.
- Use of an excavator to scarify compacted soils to enhance the bed for seed and new vegetative growth, (only if required).
- Placement 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.

Given the limited nature of the disturbance footprint (narrow linear disturbance adjacent to Fire Trails), the existence of high quality native vegetation adjacent to each borehole site/track, and the vigorous regrowth normally observed in these swamps, it is not expected active revegetation measures will be necessary.

2. Proposed borehole locations

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

Table 1. Location, Access, Site Preparation and Environmental Constraints of proposed boreholes

Borehole Site	Location (UTM Format)	Access and Site Preparation Requirements	Site-specific constraints and Environmental Safeguards
60	312754 6218443	<ul style="list-style-type: none"> Access to the borehole site would utilise Fire Trail 9I from Woronora Dam Road A 20 m access track will be required from Fire Trail 9I to site requiring primary clearing (trittering) of MU44, Upland Swamp: Sedgeland-heath Complex (0.0024 ha). The borehole site requires the primary clearing of approximately 25 m² (0.0025 ha) of native vegetation (MU44, Upland Swamp: Sedgeland-heath Complex). 	
62	312011 6218339	<ul style="list-style-type: none"> Access to the borehole site would utilise Fire Trail 9I from Woronora Dam Road A 175 m access track will be required from Fire Trail 9I to site requiring primary clearing (trittering) of MU44, Upland Swamp: Sedgeland-heath Complex (0.005 ha) and MU34, Sandstone Heath-Woodland (0.0156 ha). The borehole site requires the primary clearing of approximately 25 m² (0.0025 ha) of native vegetation (MU44, Upland Swamp: Sedgeland-heath Complex). 	<ul style="list-style-type: none"> Avoid <i>Pultenea aristata</i> at marked by orange flagging tape. Clearing to be supervised by botanist. Avoid hollow bearing trees.
64	312269 6218118	<ul style="list-style-type: none"> Access to the borehole site would utilise Fire Trail 9I from Woronora Dam Road. A 20 m access track will be required from Fire Trail 9I to site requiring primary clearing (trittering) of MU34, Sandstone Heath-Woodland (0.0012 ha). The borehole site requires the primary clearing of approximately 25 m² (0.0025 ha) of native vegetation (MU44, Upland Swamp: Sedgeland-heath Complex). 	
72	312206 6218016	<ul style="list-style-type: none"> Access to the borehole site would utilise Fire Trail 9I from Woronora Dam Road A 20 m access track will be required from Fire Trail 9I to site requiring primary clearing (trittering) of MU25, Sandstone Gully Apple-Peppermint (0.0012 ha) and MU44, Upland Swamp: Sedgeland-heath Complex (0.0012 ha). The borehole site requires the primary clearing of approximately 25 m² (0.0025 ha) of native vegetation (MU44, Upland Swamp: Sedgeland-heath Complex). 	<ul style="list-style-type: none"> Avoid trees adjacent Fire Trail. The piezometer site has been relocated to avoid harm to the three archaeological sites to the west. Project personnel to be notified of the Aboriginal sites in the vicinity of swamp 72 and must be avoided.

Borehole Site	Location (UTM Format)	Access and Site Preparation Requirements	Site-specific constraints and Environmental Safeguards
133	312513 6218988	<ul style="list-style-type: none"> • Access to the borehole site would utilise the power easement from Woronora Dam Road. • Trittering of the power easement (secondary clearing) will be required for 265 m (MU34, Sandstone Heath-Woodland (0.016 ha) and MU29, Exposed Sandstone Scribbly Gum Woodland 0.0156 ha). • A 50 m access track will be required from Fire Trail 9I to site requiring primary clearing (trittering) of MU29, Exposed Sandstone Scribbly Gum Woodland 0.0030 ha) and MU44, Upland Swamp: Sedgeland-heath Complex (0.0030 ha). • The borehole site requires the primary clearing of approximately 25 m² (0.0025 ha) of native vegetation (MU44, Upland Swamp: Sedgeland-heath Complex). 	<ul style="list-style-type: none"> • Avoid hollow bearing trees.
134a	312682 6218760	<ul style="list-style-type: none"> • Access to the borehole site would utilise the power easement from Woronora Dam Road. • Trittering of the power easement (secondary clearing) will be required for 80 m MU29, Exposed Sandstone Scribbly Gum Woodland 0.01 ha). • A 15 m access track will be required from the easement to site requiring primary clearing (trittering) of MU44, Upland Swamp: Sedgeland-heath Complex (0.002 ha). • The borehole site requires the primary clearing of approximately 25 m² (0.0025 ha) of native vegetation (MU44, Upland Swamp: Sedgeland-heath Complex). 	<ul style="list-style-type: none"> • A shelter with deposit (AHIMS #52-2-3518) referred to as NEW22 was mapped close to the Swamp 134 site (Figure 3). The shelter was relocated in the field and its actual location at 312495E 6218627N was determined to be over 200 m south west of the proposed piezometer site. • Project personnel to be notified of the Aboriginal site in the vicinity of swamp 134 and must be avoided.

3. Environmental assessment

3.1 Site assessment

Site assessments were conducted on 3rd September 2018 by Alex Christie (Botanist) and Kathleen Tannahill (Archaeologist), and 25 September by Chris McEvoy (Principal Approvals) and Renee Regal (Heritage Team Leader) of Niche. The site assessment involved traversing the proposed areas of disturbance for each of the Piezometer sites and access tracks. The field survey included assessing any environmental constraints, marking any constraints to be avoided in orange flagging tape and recording on GPS.

3.2 Impact assessment

Vegetation disturbance

Vegetation mapping of the study area is included in the Biodiversity Management Plan for Longwalls 301-303 (Peabody Energy 2016). The vegetation mapping is provided in Figure 3. The distribution and composition of the vegetation within the study area, as observed in the field, was broadly in conformity with that mapped in the Peabody Energy (2016) Biodiversity Management Plan, with minor differences in vegetation community boundaries.

The proposal seeks to minimise disturbance by using previously developed tracks where possible. It would result in approximately 0.09 hectares of vegetation disturbance, of which approximately 0.04 ha is secondary clearing on the existing power easement.

The vegetation disturbance associated with the proposed borehole sites is provided in Table 2, and photos of each borehole site are provided in Annex 2 of this report. Native vegetation communities that will be impacted by the proposal include: Exposed Sandstone Scribbly Gum Woodland, Sandstone Gully Apple-Peppermint Forest, Sandstone Heath-Woodland and Upland Swamp: Sedgeland-heath Complex

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

Threatened ecological communities

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

Based on the database searches, two (TECs) exist near the study area; Coastal Upland Swamp (MU44) and O'Hares Creek Shale Forest (MU17). Coastal Upland Swamp in the Sydney Basin Bioregion is listed as endangered on both the BC and EPBC Acts. O'Hares Creek Shale Forest is listed as endangered on the BC Act.

Based on the results of the field survey and vegetation mapping, approximately 0.03 ha of Coastal Upland Swamp will be cleared either by the borehole site or access tracks (Table 2). Formal assessments of the significance of the impact of the proposal on Coastal Upland Swamp TEC are included in Annex 5 and 6. The assessment is required by the BC Act (the Five Part Test) and the EPBC Act (the Significant Impact Criteria) due to the presence of known occurrences and habitat impacted by the proposal. The assessments concluded the proposal will not have a significant impact on the TEC. Therefore, no further assessment of TECs is required.

Table 2. Vegetation disturbance

Site	MU44, Upland Swamp: Sedgeland-heath Complex (Primary clearing – borehole site)	MU44, Upland Swamp: Sedgeland-heath Complex (Primary clearing – access track)	Exposed sandstone scribbly gum woodland (Primary clearing – access track)	MU34, Sandstone Heath-Woodland (Primary clearing - borehole site)	MU25, Sandstone Gully Apple-Peppermint (Primary clearing – Access Track)	Exposed sandstone scribbly gum woodland (Secondary clearing –access track)	MU34, Sandstone Heath-Woodland (Secondary clearing - borehole site)	Total (ha)
60	0.0025	0.0024						0.0049
62	0.0025	0.005		0.0156				0.0231
64	0.0025			0.0012				0.0037
72	0.0025	0.0012			0.0012			0.0049
133	0.0025	0.003	0.003			0.0156	0.016	0.0401
134a	0.0025	0.002				0.01		0.0145
Total	0.015	0.0136	0.003	0.0168	0.0012	0.0256	0.016	0.0912

Threatened flora

A total of 41 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.

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

Several individuals of *Pulteneae aristata* were identified during the survey along the proposed access track to Swamp 62. These have been flagged with orange flagging tape and GPS waypoints recorded (refer borehole site plan Swamp 62). With supervision by a botanist these individuals can be avoided during clearing for the access track although, due to their density, there will be a residual risk of inadvertently clearing some unidentified or un-flagged individuals. With this mitigation measure in place, significant impacts on the local population would be avoided.

Formal assessments of the significance of the impact of the proposal on *Pulteneae aristata* are included in Annex 5 and 6. The assessment is required by the BC Act (the five Part test) and the EPBC Act (The significant impact criteria) due to the presence of known occurrences and habitat potentially impacted by the proposal. The assessments concluded the proposal will not have a significant impact on *Pulteneae aristata*.

Most of the other species are relatively conspicuous and were not detected during the current survey or previous surveys in the study area.

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

Fauna

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

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

Threatened fauna

No threatened fauna species were recorded during the current survey.

A total of 87 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 (Table 3).

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

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

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

All these species may have potential foraging habitat within the study area, however the bushland immediately adjacent to the study area is extensive and likely to provide a variety of habitat features, such as hollow bearing trees, stags, termite mounds, dense shrubs and mature trees. Furthermore, the current proposal will not remove any hollow bearing trees, stags or mature trees and occur in part on pre-existing tracks. It is therefore unlikely that the proposal will result in a significant loss of habitat or direct impact to any threatened fauna species. Seven Part Tests and Significant Impact Criteria Assessments are therefore not required.

Table 3. Affected threatened fauna (NSW and Commonwealth)

Species	BC Act	EPBC Act	Likelihood of Occurrence	Potential to be affected by the proposal
Red-crowned Toadlet <i>Pseudophryne australis</i>	V	-	Moderate	Potential habitat for a variety of uses in small ephemeral drainages of the study area. No impacts likely as no drainage lines would be impacted.
Barking Owl <i>Ninox connivens</i>	V	-	Moderate	None; no limiting foraging or breeding habitat within the study area. Hollow bearing trees will be avoided and thus impacts are likely to be negligible.
Dusky Woodswallow <i>Artamus cyanopterus cyanopterus</i>	V	-	Moderate	None; no limiting foraging or breeding habitat within the study area. Impacts are likely to be negligible.
Eastern Bristlebird <i>Dasyornis brachypterus</i>	E	E	Moderate	None; no limiting foraging or breeding habitat within the study area. Impacts are likely to be negligible.
Gang-gang Cockatoo <i>Callocephalon fimbriatum</i>	V	-	High	None; no limiting foraging or breeding habitat within the study area. Hollow bearing trees will be avoided and thus impacts are likely to be negligible.
Glossy Black-Cockatoo <i>Calyptorhynchus lathami</i>	V	-	Moderate	None; no limiting foraging or breeding habitat within the study area. Hollow bearing trees will be avoided and thus impacts are likely to be negligible.
Little Eagle <i>Hieraaetus morphnoides</i>	V	-	Moderate	None; no limiting foraging or breeding habitat within the study area. Impacts are likely to be negligible.
Powerful Owl <i>Ninox strenua</i>	V	-	High	None; no limiting foraging or breeding habitat within the study area. Hollow bearing trees will be avoided and thus impacts are likely to be negligible.
Sooty Owl <i>Tyto tenebricosa</i>	V	-	Moderate	None; no limiting foraging or breeding habitat within the study area. Hollow bearing trees will be avoided and thus impacts are likely to be negligible.

Species	BC Act	EPBC Act	Likelihood of Occurrence	Potential to be affected by the proposal
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. 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	Known	None; no limiting foraging or breeding habitat within the study area. 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 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.
Spotted-tailed Quoll <i>Dasyurus maculatus maculatus</i>	V	E	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.

Species	BC Act	EPBC Act	Likelihood of Occurrence	Potential to be affected by the proposal
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 T6 though will be largely avoided. Impacts are likely to be negligible.
Rosenberg's Goanna <i>Varanus rosenbergi</i>	V	-	High	Potential habitat for a variety of uses in small ephemeral drainages of the study area None; no limiting foraging or breeding habitat within the study area. Termite mounds will not be impacted. Impacts are likely to be negligible.

3.3 Aboriginal Objects Due Diligence Assessment

There are numerous aboriginal sites in the area. The proposed swamp piezometer sites have been inspected by an archaeologist. A shelter with deposit (AHIMS #52-2-3518) referred to as NEW22 was mapped close to the Swamp 134(A) site (Figure 3). However, the shelter was relocated in the field and its actual location at 312495E 6218627N was determined to be over 200 m south west of the proposed piezometer site. There is no risk of harm at such a distance.

The Swamp 72 site was relocated further north on the northern margin of the swamp to avoid three archaeological sites in the vicinity. The proposed site is approximately 50 m north east of the nearest aboriginal site (AHIMS# 52-2-0874). An Aboriginal Objects Due Diligence Assessment has concluded there will be no adverse effects to Aboriginal cultural heritage sites as a result of the proposed borehole sites and access tracks (refer Annex 3).

3.4 Recommendations

The proposal aims to avoid disturbance to the following:

- Large trees and stags
- Hollow bearing trees
- Rock outcrops
- Termite mounds
- Large hollow logs.

It is recommended the following mitigation measures are implemented:

- *Pultenea aristata* individuals in Swamp 60 be demarcated with barrier fence and their location made known to project personnel so they can be avoided and protected during works.
- When undertaking access track clearing, an ecologist should be present to ensure no threatened plants are impacted.
- Project personnel be notified of the Aboriginal sites in the vicinity of swamp 72 and 134 and must be avoided.

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.

4. Conclusion

Niche Environment and Heritage (Niche) has undertaken an assessment of the ecological and archaeological constraints and potential impacts associated with the development of six 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 impacts from longwall mining of Longwalls 304-306, in order to meet Agency requirements.

The proposal seeks to minimise disturbance by using previously developed tracks where possible. It would result in approximately 0.108 hectares of vegetation disturbance, of which 0.0416 ha is secondary clearing on the existing power easement.

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 proposed sites have been inspected by an archaeologist. Site 72 was relocated further north on the northern margin of the swamp to avoid three archaeological sites in the vicinity. An Aboriginal Objects Due Diligence Assessment has concluded there will be no adverse effects to Aboriginal cultural heritage sites as a result of the proposed borehole sites and access tracks (refer Annex 3).

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

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

References

Atlas of NSW Wildlife, NSW Office of Environment and Heritage (OEH), Goulburn St, Sydney.

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

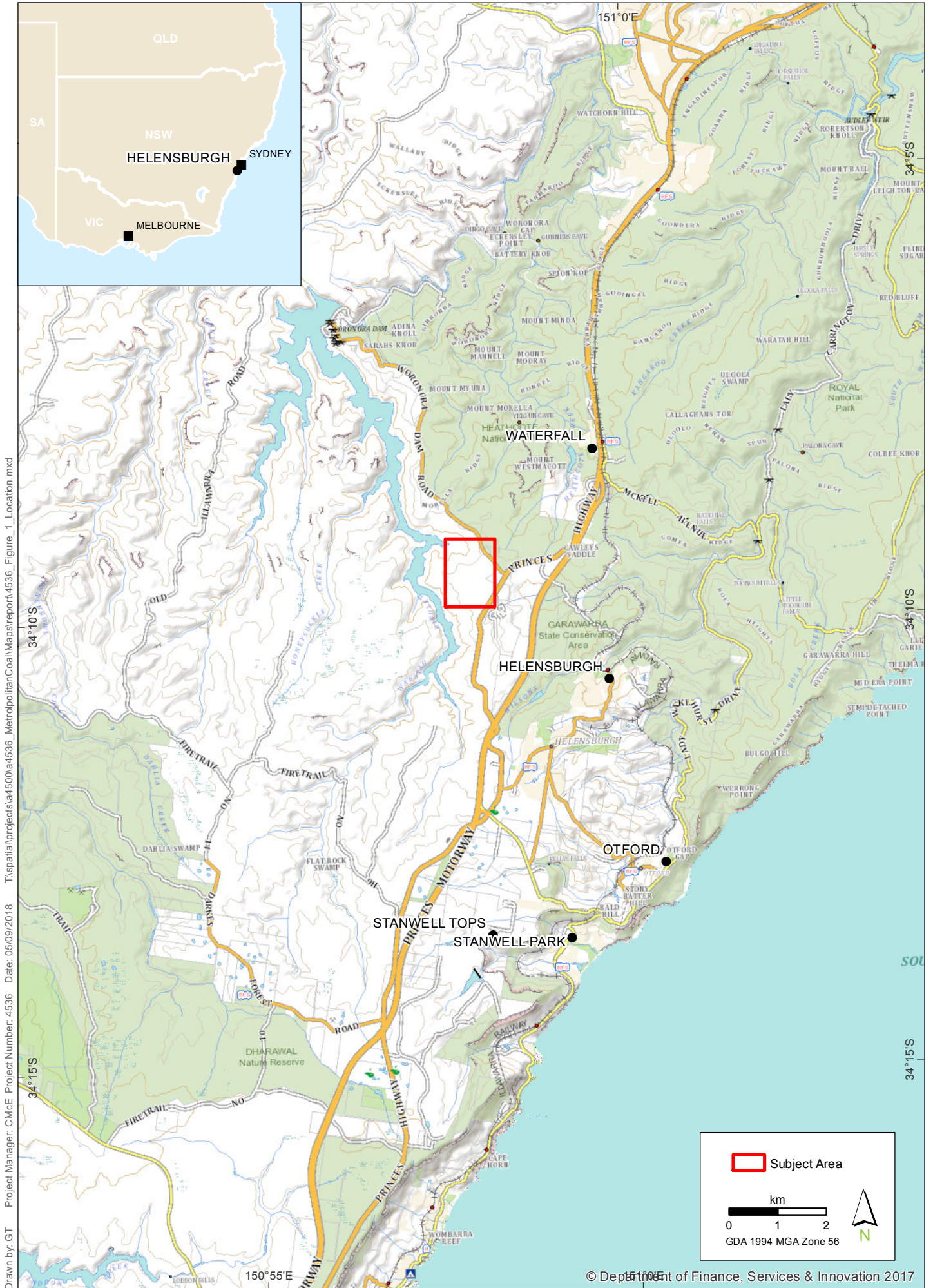
OEH Threatened Species Profiles Database, and, cited as OEH (2018). Also provides access to threatened species Final Determinations by the NSW Scientific Committee.

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

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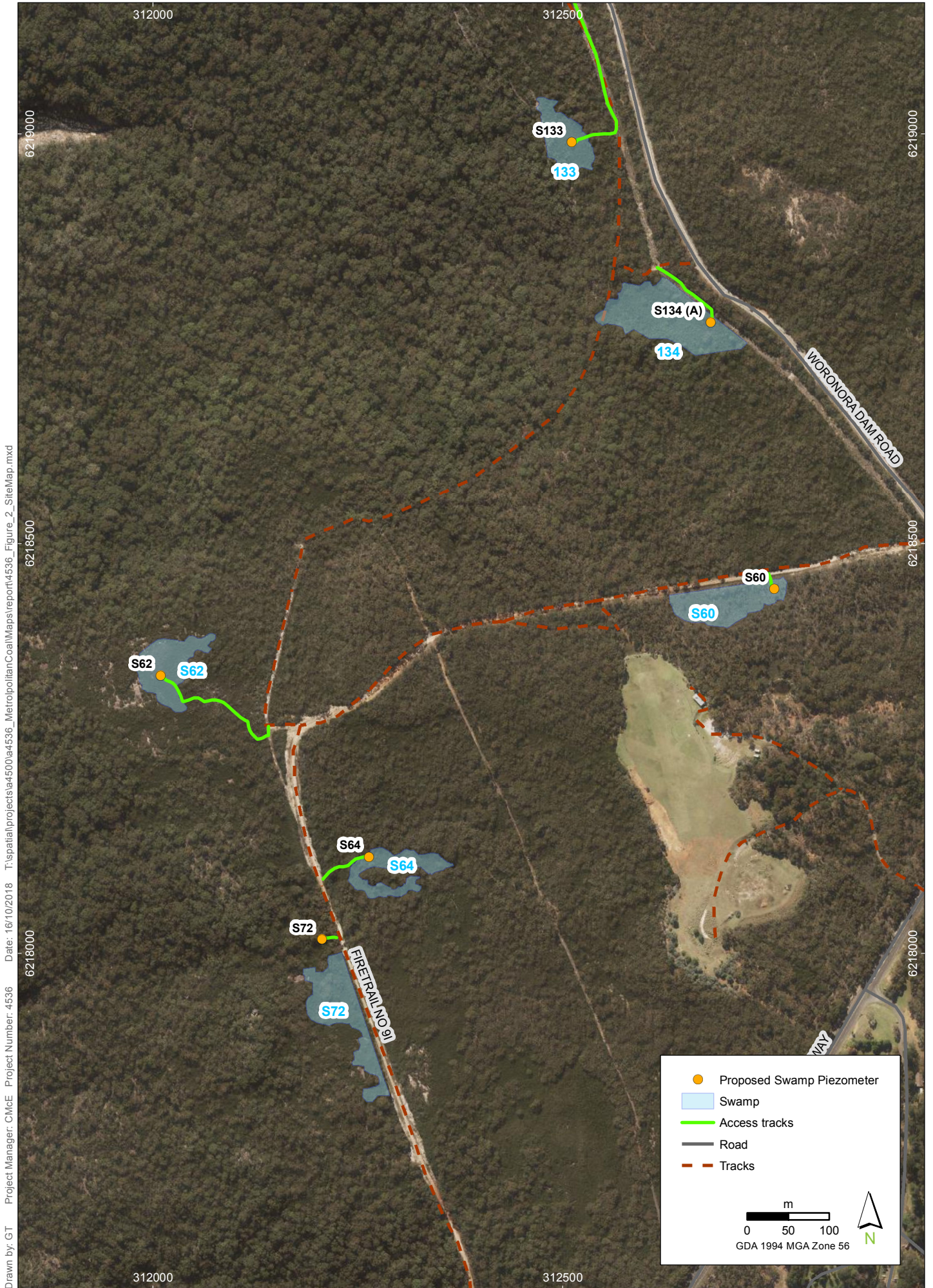
SPRAT Database and Protected Matters Search Tool, <http://www.environment.gov.au/>, Commonwealth Department of Sustainability, Environment, Water, Population and Communities. Provides access to threatened species profiles, recovery plans and final determinations by the Commonwealth Scientific Committee.

Annex 1 Figures



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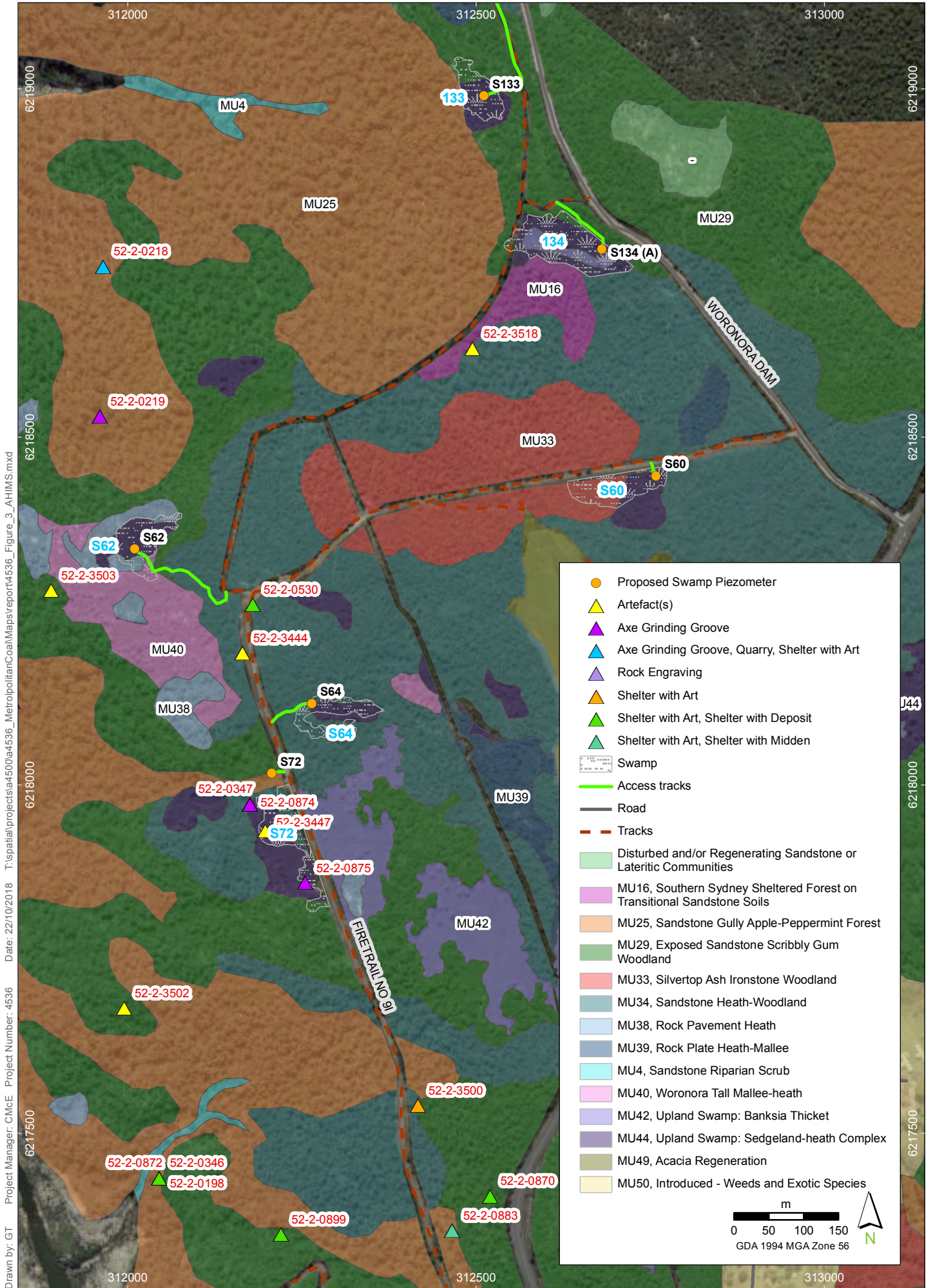
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Subject Area

LW304-306 Swamp Piezometer Installation Environmental Assessment

FIGURE 2

Imagery: (c) LPI 2016-05-03



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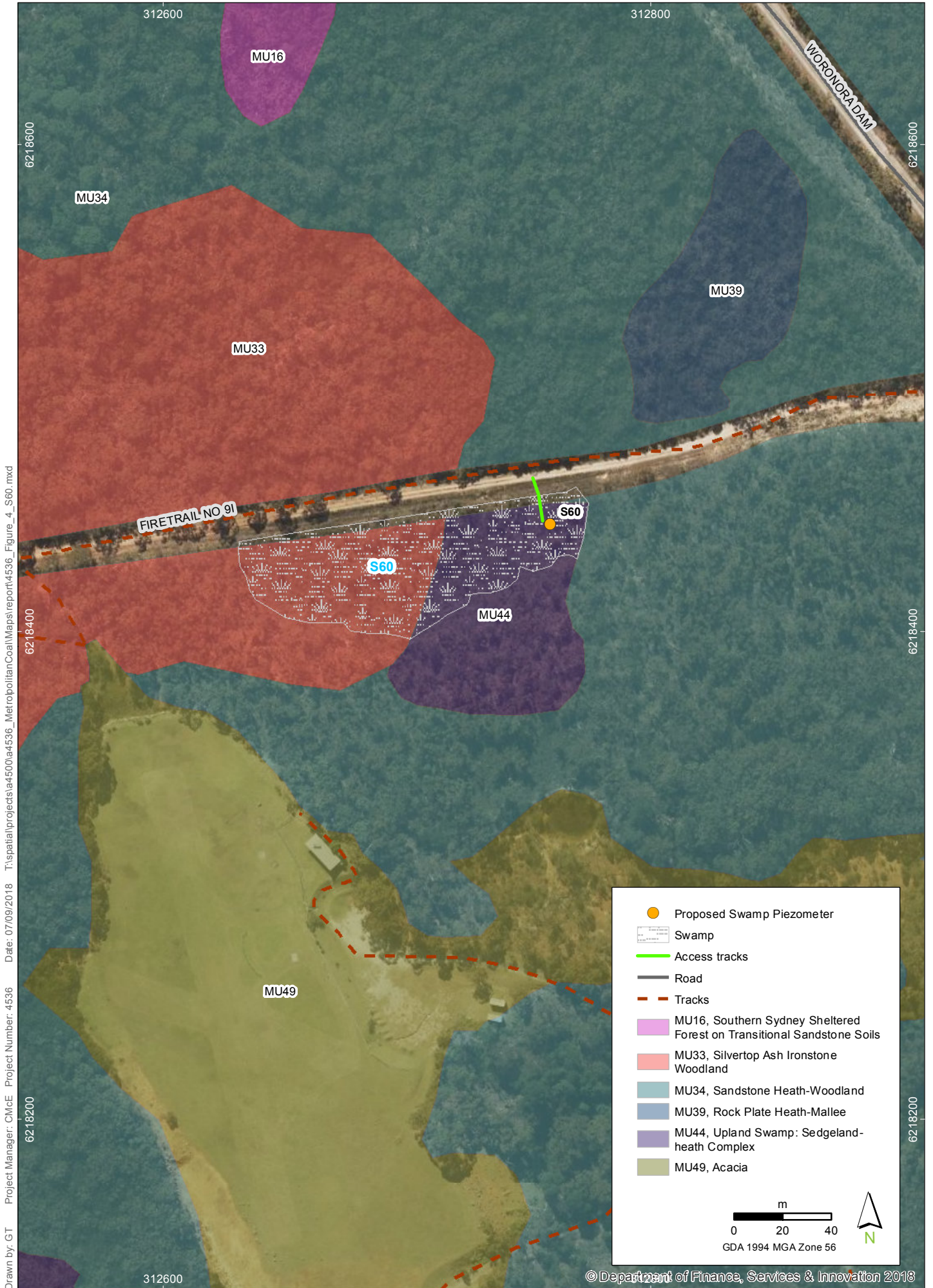
Vegetation and AHIMS

LW304-306 Swamp Piezometer Installation Environmental Assessment



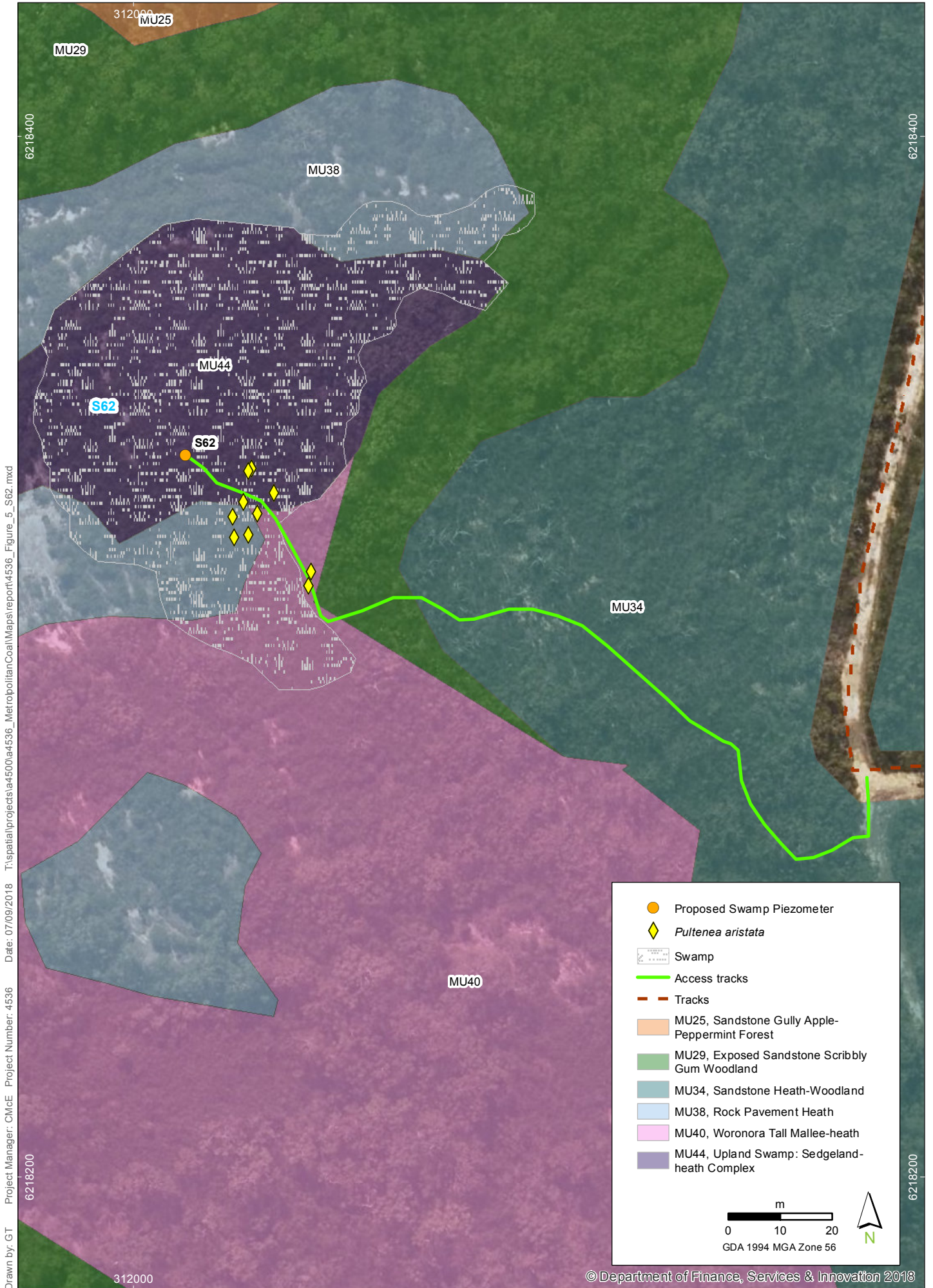
FIGURE 3

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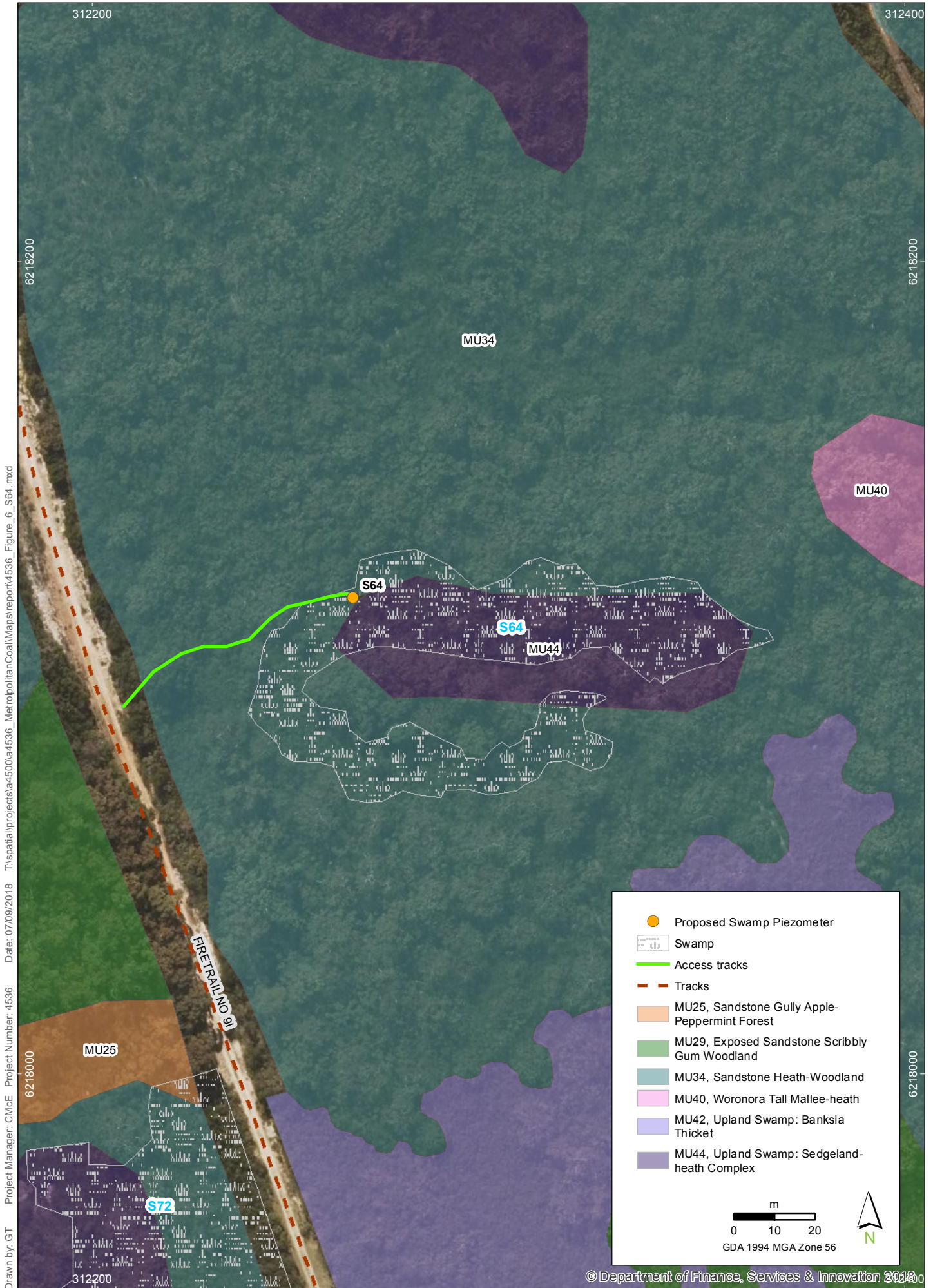
S60

LW304-306 Swamp Piezometer Installation Environmental Assessment



S62

LW304-306 Swamp Piezometer Installation Environmental Assessment



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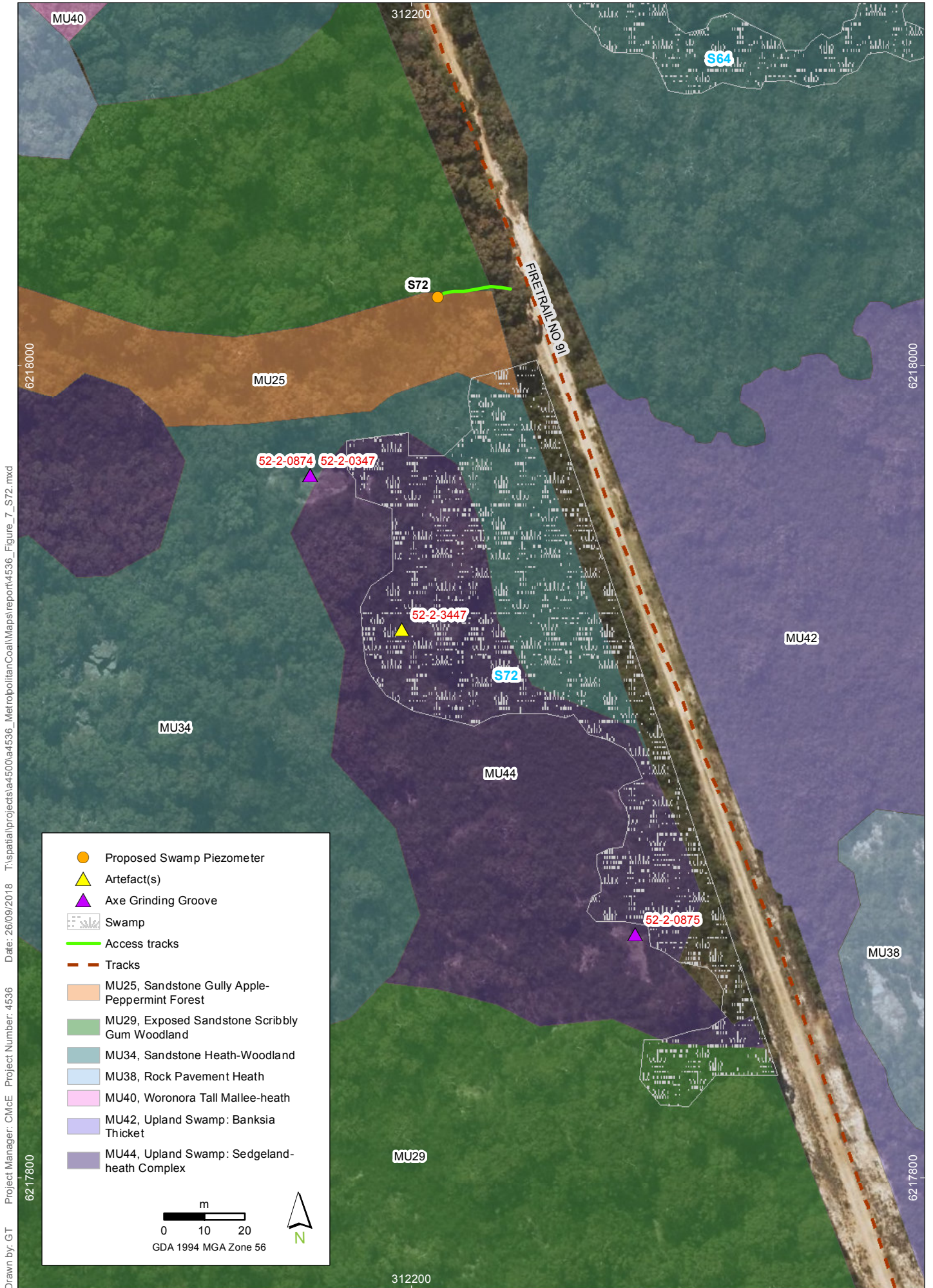
Project Manager: CMoE Project Number: 4536

Drawn by: GT

	Proposed Swamp Piezometer
	Swamp
	Access tracks
	Tracks
	MU25, Sandstone Gully Apple-Peppermint Forest
	MU29, Exposed Sandstone Scribbly Gum Woodland
	MU34, Sandstone Heath-Woodland
	MU40, Woronora Tall Mallee-heath
	MU42, Upland Swamp: Banksia Thicket
	MU44, Upland Swamp: Sedgeland-heath Complex

GDA 1994 MGA Zone 56

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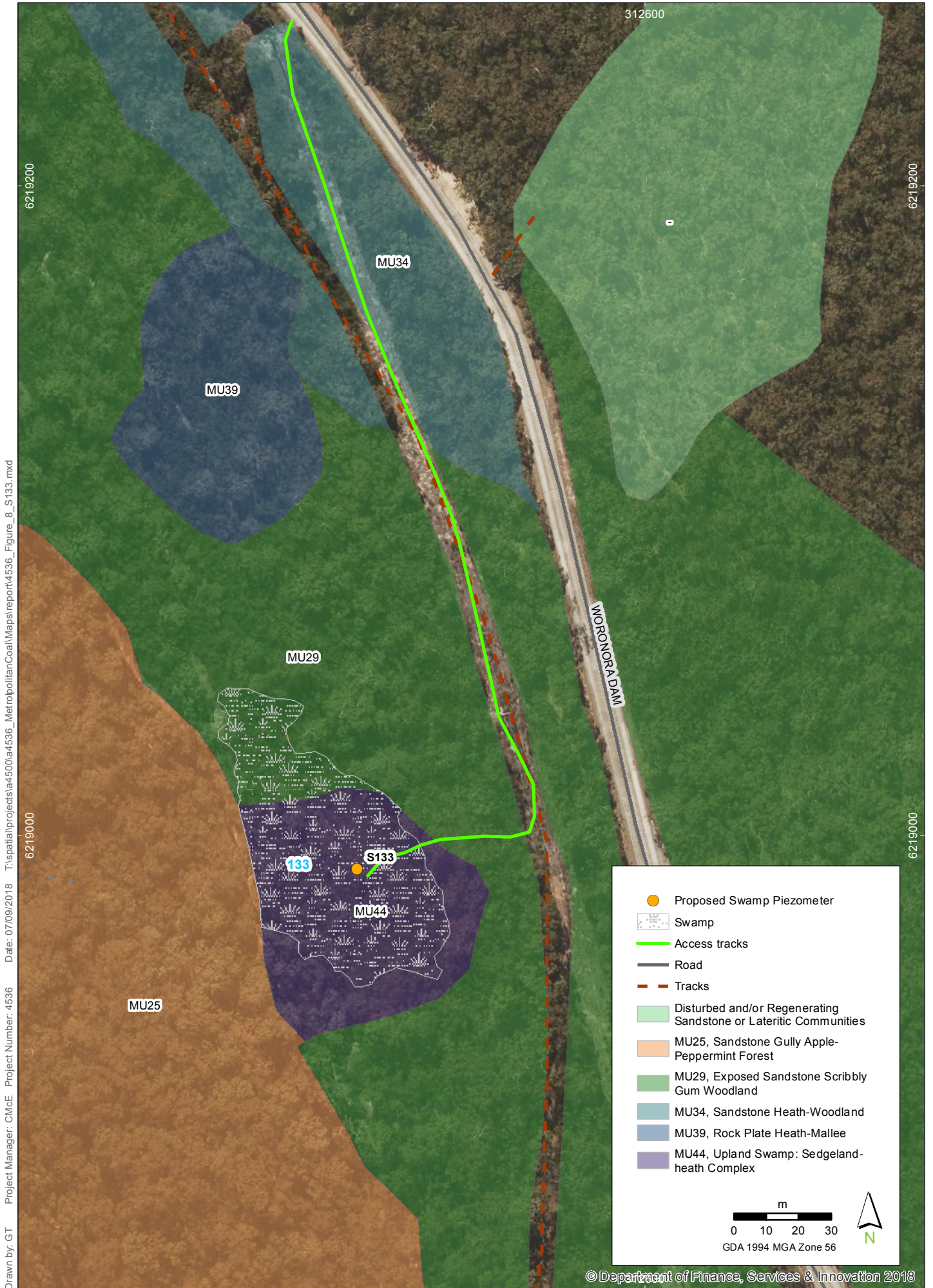
S72

LW304-306 Swamp Piezometer Installation Environmental Assessment



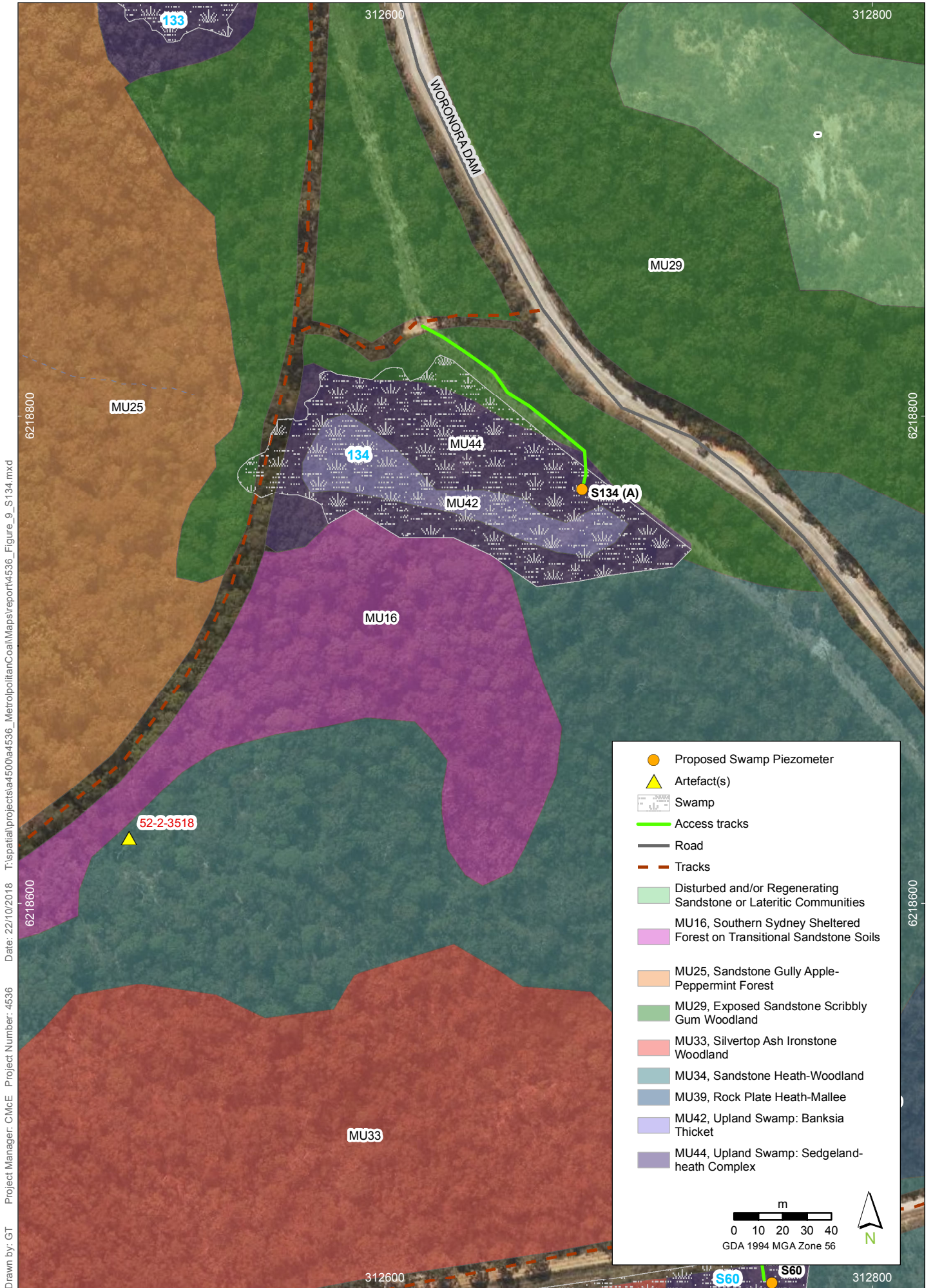
FIGURE 7

Imagery: (c) LPI 2016-05-03



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 Project Manager: CMcE Project Number: 4536
 Drawn by: GT

S134

LW304-306 Swamp Piezometer Installation Environmental Assessment

Annex 2 Piezometer Site Photos



Swamp 72



Swamp 64



Swamp 62



Swamp 60



Swamp 134 (A)



Swamp 133

Annex 3 Aboriginal Objects Due Diligence Assessment

22 October 2018

Mr Stephen Love
Metropolitan Coal - Peabody Energy Australia Pty Ltd
PO Box 402
HELENSBURGH NSW 2508
via email: slove@peabodyenergy.com

Dear Mr Love,

Re: LW 304-306 Swamp piezometer installation Environmental Assessment – Aboriginal Due Diligence Assessment

Niche Environment and Heritage (Niche) was commissioned by Metropolitan Coal to determine the potential impact of the proposed swamp piezometer installation works on Aboriginal cultural heritage sites and objects in the WaterNSW Woronora Special Area (Figure 1 and Figure 2).

This assessment has been undertaken in accordance with the *NSW Minerals Industry Due Diligence Code for the protection of Aboriginal Objects* (NSW Minerals Council 2010).

Step 1. Check for records of Aboriginal Objects and Places in the area of the proposed activity

A search of the Aboriginal Heritage Information Management System (AHIMS) of the Subject Area was conducted on 10 July 2018 (AHIMS Client ID: 356636). There are several registered sites mapped within less than 200 m of the proposed works (Figure 3).

A shelter with deposit (AHIMS #52-2-3518) referred to as NEW22 was mapped close to the Swamp 134(A) site (Figure 3). The shelter was relocated in the field and its actual location at 312495E 6218627N was determined to be over 200 m south west of the proposed piezometer site. There is no risk of harm at such a distance.

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

No.

The proposed vegetation clearance works are not low impact activity as defined by the NPW Regulation.

Step 3. Are there any landscape features on undisturbed land that like likely to indicate the presence of Aboriginal Objects?

Yes.

NSW Minerals Council 2010 identifies a number of landscape features, which are of archaeological interest and require further consideration. Specifically areas that are:

- Within 200m of water, or
- Located within a sand dune system, or
- Located on a ridge top, ridge line or headland, or
- Located within 200 m below or above a cliff face, or

- Within 20 m of or in a cave, rock shelter , or a cave mouth
- And is on land that is not disturbed land.

The soil landscape in which the Subject Area is situated in comprises of the Hawkesbury soil landscape (Figure 4). The Hawkesbury soil landscape is defined as comprising of steep, rugged slopes and ridges of the Woronora Plateau consisting of rolling to very steep hills with frequent sandstone outcrops and floaters. The soils of this landscape are extremely shallow, stony and highly permeable. This soils landscape is suitable for rock overhangs and sandstone platforms that preserve shelters with evidence of occupation (in the form of stone artefacts), Shelter's with Art and Axe Grinding Groove sites. Open Camps Sites and Isolated Finds are unlikely to be preserved within this soil landscape as the primary form of landscape development is mass movement and unsuitable for accumulating and preserving Aboriginal objects in open environments.

Culturally modified trees may be likely to occur within the Subject Area due to the intact bushland.

Step 4: Does a desktop assessment and visual inspection confirm that there are Aboriginal objects present or likely to be present?

Yes.

From the desktop assessment it can be concluded that Aboriginal objects may be likely to occur due to the numerous records in the subject area. Shelters with Art, and/ or deposit as well as sandstone platforms with axe grinding grooves or engravings are typical for this region and especially the Hawkesbury soil landscape. This coupled with the Subject Area being located within undisturbed bushland meaning that further Aboriginal objects may be present.

From the visual inspection it can be confirmed Aboriginal objects are unlikely within or near to the disturbance footprint except for the originally proposed site in Swamp 72. Note that the Subject Area is covered in thick vegetation making the ground visibility generally 0%.

A shelter with deposit (AHIMS #52-2-3518) referred to as NEW22 was mapped close to the Swamp 134(A) site (Figure 3). The shelter was relocated in the field and its actual location at 312495E 6218627N was determined to be over 200 m south west of the proposed piezometer site. There is no risk of harm at such a distance.

A shelter with deposit (AHIMS #52-2-3447), and an axe grinding groove (AHIMS# 52-2-0874/ 52-2-0347) were relocated in close proximity to a proposed piezometer site in Swamp 72. The proposed piezometer site was relocated on the northern margin on the swamp to avoid harm to these sites (Figure 3).

Step 5: Can the activity be relocated away from the known/likely area for Aboriginal objects.

Yes.

The Swamp 72 site was relocated further north on the northern margin of the swamp to avoid three archaeological sites in the vicinity. The proposed site is approximately 50 m north east of the nearest aboriginal site (AHIMS# 52-2-0874).

Step 5. Further investigations and impact assessment

The assessment has identified Aboriginal heritage constraints for the proposed activity in the vicinity of Swamp 72 and the piezometer site has been relocated further to the north to avoid harm. No further investigation or impact assessment is required

There will be no adverse effects to Aboriginal cultural heritage sites as a result of the proposed borehole sites and access tracks (refer Annex 3).

The *NSW Minerals Industry Due Diligence Code for the protection of Aboriginal Objects* (NSW Minerals Council 2010) state that where a desktop and visual inspection has occurred and concluded that Aboriginal objects are unlikely to occur further assessment is not necessary. The proposed activity may proceed with caution. Niche recommends that:

- Project personnel be notified of the Aboriginal sites in the vicinity of swamp 72 and Swamp 134 and must be avoided.
- In the unlikely event that any Aboriginal objects are found, stop work and notify Niche.
- In the unlikely event that human remains are found, stop work, secure the site and notify the NSW Police and the Office of Environment and Heritage

Please do not hesitate to contact me should you have any questions or would like to discuss this assessment further.

Yours sincerely



Renée Regal
Heritage Team Leader
Niche Environment and Heritage

Annex 4 Threatened flora and fauna likelihood of occurrence

Species	BC Act	EPBC Act	Habitat	Likelihood of Occurrence
Frogs				
Giant Burrowing Frog <i>Heleioporus australiacus</i>	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.	Low
Green and Golden Bell Frog <i>Litoria aurea</i>	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 unshaded, free of predatory fish such as Plague Minnow, have a grassy area nearby and diurnal sheltering sites available.	Low
Littlejohn's Tree Frog <i>Litoria littlejohni</i>	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
Red-crowned Toadlet <i>Pseudophryne australis</i>	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
Southern Bell Frog <i>Litoria raniformis</i>	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.	None

Species	BC Act	EPBC Act	Habitat	Likelihood of Occurrence
Stuttering Frog <i>Mixophyes balbus</i>	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
Birds				
Australasian Bittern <i>Botaurus poiciloptilus</i>	E	E	The Australasian Bittern 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
Australian Painted Snipe <i>Rostratula australis</i>	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.	None
Barking Owl <i>Ninox connivens</i>	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
Barred Cuckoo-shrike <i>Coracina lineata</i>	V	-	Rainforest, eucalypt forests and woodlands, clearings in secondary growth, swamp woodlands and timber along watercourses. They are usually seen in pairs or small flocks foraging among foliage of trees for insects and fruit. They are active birds, frequently moving from tree to tree.	Low
Beach Stone-curlew <i>Esacus neglectus</i>	CE	-	Beach Stone-curlews are found exclusively along the coast, on a wide range of beaches, islands, reefs and in estuaries, and may often be seen at the edges of or near mangroves. They forage in the intertidal zone of beaches and estuaries, on islands, flats, banks and spits of sand, mud, gravel or rock, and among mangroves. Beach Stone-curlews breed above the littoral zone, at the backs of beaches, or on sandbanks and islands, among low vegetation of grass, scattered shrubs or low trees; also among open mangroves.	None

Species	BC Act	EPBC Act	Habitat	Likelihood of Occurrence
Black Falcon <i>Falco subniger</i>	V	-	Widely, but sparsely, distributed in NSW, mostly occurring in inland regions. In NSW there is assumed to be a single population that is continuous with a broader continental population, given that falcons are highly mobile, commonly travelling hundreds of kilometres. The Black Falcon inhabits woodland, shrubland and grassland in the arid and semi-arid zones, especially wooded watercourses and agricultural land with scattered remnant trees.	Low
Black-faced Monarch <i>Monarcha melanopsis</i>	-	M	Found along the coast of eastern Australia, becoming less common further south. Inhabits rainforests, eucalypt woodlands, coastal scrub and damp gullies. It may be found in more open woodland when migrating.	Low
Brown Treecreeper <i>Climacteris picumnus victoriae</i>	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
Bush Stone-curlew <i>Burhinus grallarius</i>	E	-	The Bush Stone-curlew is found throughout Australia except for the central southern coast and inland, the far south-east corner, and Tasmania. Only in northern Australia is it still common however and in the south-east it is either rare or extinct throughout its former range. Inhabits open forests and woodlands with a sparse grassy ground layer and fallen timber. Largely nocturnal, being especially active on moonlit nights.	Low
Cattle Egret <i>Ardea ibis</i>	-	M	The Cattle Egret is found in grasslands, woodlands and wetlands, and is not common in arid areas. It also uses pastures and croplands, especially where drainage is poor.	Low
Curlew Sandpiper <i>Calidris ferruginea</i>	E	CE, M	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	None
Diamond Firetail <i>Stagonopleura guttata</i>	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

Species	BC Act	EPBC Act	Habitat	Likelihood of Occurrence
Dusky Woodswallow <i>Artamus cyanopterus cyanopterus</i>	V	-	Often reported in woodlands and dry open sclerophyll forests, usually dominated by eucalypts, including mallee associations. It has also been recorded in shrublands and heathlands and various modified habitats, including regenerating forests; very occasionally in moist forests or rainforests.	Moderate
Eastern Bristlebird <i>Dasyornis brachypterus</i>	E	E	Found in coastal woodlands, dense scrub and heathlands, particularly where it borders taller woodlands.	Moderate
Eastern Curlew <i>Numenius madagascariensis</i>	-	CE, 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.	Low
Eastern Ground Parrot <i>Pezoporus wallicus wallicus</i>	V	-	Currently inhabits south-eastern Australia from southern Queensland through NSW to western Victoria. In NSW populations have been recorded on the north coast (Broadwater, Bundjalung, Yuraygir NPs); Myall Lakes on the central coast; south coast, particularly Barren Grounds NR, Budderoo NP, the Jervis Bay area, Nadgee NR, Morton and Ben Boyd NP. 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).	Low
Flame Robin <i>Petroica phoenicea</i>	V	-	Flame Robins are found in a broad coastal band from southern Queensland to just west of the South Australian border. The species is also found in Tasmania. The preferred habitat in summer includes eucalyptus forests and woodland, whilst in winter prefers open woodlands and farmlands. It is considered migratory. The Flame Robin breeds from about August to January.	Low
Fork-tailed Swift <i>Apus pacificus</i>	-	M	The Fork-tailed Swift is almost exclusively aerial, flying from less than one metre to at least 300 metres above ground and probably much higher.	Low
Gang-gang Cockatoo <i>Callocephalon fimbriatum</i>	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.	Moderate
Glossy Black-Cockatoo <i>Calyptorhynchus lathami</i>	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

Species	BC Act	EPBC Act	Habitat	Likelihood of Occurrence
Great Egret <i>Ardea alba</i>	-	M	Great Egrets prefer shallow water, particularly when flowing, but may be seen on any watered area, including damp grasslands.	Low
Latham's Snipe <i>Gallinago hardwickii</i>	-	M	Latham's Snipe is a non-breeding migrant to the south east of Australia including Tasmania, passing through the north and New Guinea on passage. Latham's Snipe breed in Japan and on the east Asian mainland. Seen in small groups or singly in freshwater wetlands on or near the coast, generally among dense cover. They are found in any vegetation around wetlands, in sedges, grasses, lignum, reeds and rushes and also in saltmarsh and creek edges on migration.	None
Little Eagle <i>Hieraaetus morphnoides</i>	V	-	Most abundant in lightly timbered areas with open areas nearby. Often recorded foraging in grasslands, crops, treeless dune fields, and recently logged areas. May nest in farmland, woodland and forest in tall trees.	Moderate
Little Lorikeet <i>Glossopsitta pusilla</i>	V	-	Distributed in forests and woodlands from the coast to the western slopes of the Great Dividing Range in NSW, extending westwards to the vicinity of Albury, Parkes, Dubbo and Narrabri. Mostly occur in dry, open eucalypt forests and woodlands. They feed primarily on nectar and pollen in the tree canopy. Nest hollows are located at heights of between 2 m and 15 m, mostly in living, smooth-barked eucalypts. Most breeding records come from the western slopes.	Low
Masked Owl <i>Tyto novaehollandiae</i>	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
Orange-bellied Parrot <i>Neophema chrysogaster</i>	CE	CE, M	The Orange-bellied Parrot breeds in the south-west of Tasmania and migrates in autumn to spend the winter on the mainland coast of south-eastern South Australia and southern Victoria. There are occasional reports from NSW, with the most recent records from Shellharbour and Maroubra in May 2003. It is expected that NSW habitats may be more frequently utilised than observations suggest. Typical winter habitat is saltmarsh and strandline-foredune vegetation communities either on coastlines or coastal lagoons. Spits and islands are favoured but they will turn up anywhere within these coastal regions. The species can be found foraging in weedy areas associated with these coastal habitats or even in totally modified landscapes such as pastures, seed crops and golf courses.	Low
Oriental Cuckoo <i>Cuculus optatus, Cuculus saturatus</i>	-	M	Mainly inhabits coniferous, deciduous and mixed forests. Breeds in northern hemisphere. Brood parasite, laying eggs in nests of other birds.	Low

Species	BC Act	EPBC Act	Habitat	Likelihood of Occurrence
Osprey <i>Pandion cristatus, Pandion haliaetus</i>	V	M	Ospreys are found right around the Australian coast line, except for Victoria and Tasmania. They are common around the northern coast, especially on rocky shorelines, islands and reefs. The species is uncommon to rare or absent from closely settled parts of south-eastern Australia. Favour coastal areas, especially the mouths of large rivers, lagoons and lakes. Feed on fish over clear, open water.	None
Painted Honeyeater <i>Grantiella picta</i>	V	V	The Painted Honeyeater is nomadic and occurs at low densities throughout its range. The greatest concentrations of the bird and almost all breeding occurs on the inland slopes of the Great Dividing Range in NSW, Victoria and southern Queensland. During the winter it is more likely to be found in the north of its distribution. Inhabits boree, brigalow and box-gum woodlands and box-ironbark forests.	None
Pied Oystercatcher <i>Haematopus longirostris</i>	E	-	Inhabits marine littoral habitats, including islands. It occupies muddy, sandy, stony or rocky estuaries, inlets and beaches, particularly intertidal mudflats and sandbanks in large marine bays.	None
Pink Robin <i>Petroica rodinogaster</i>	V	-	Found in Tasmania and the uplands of eastern Victoria and far south-eastern NSW, almost as far north as Bombala. On the mainland, the species disperses north and west and into more open habitats in winter, regularly as far north as the ACT area, and sometimes being found as far north as the central coast of NSW. Inhabits rainforest and tall, open eucalypt forest, particularly in densely vegetated gullies.	None
Powerful Owl <i>Ninox strenua</i>	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
Rainbow Bee-eater <i>Merops ornatus</i>	-	M	Found throughout mainland Australia most often in open forests, woodlands and shrublands, and cleared areas, usually near water. It will be found on farmland with remnant vegetation and in orchards and vineyards. It will use disturbed sites such as quarries, cuttings and mines to build its nesting tunnels.	Low
Regent Honeyeater <i>Anthochaera phrygia</i>	CE	E,M	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. 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

Species	BC Act	EPBC Act	Habitat	Likelihood of Occurrence
Rose-crowned Fruit-dove <i>Ptilinopus regina</i>	V	-	Coast and ranges of eastern NSW and Queensland, from Newcastle to Cape York. Vagrants are occasionally found further south to Victoria. Rose-crowned Fruit-doves occur mainly in sub-tropical and dry rainforest and occasionally in moist eucalypt forest and swamp forest, where fruit is plentiful.	None
Rufous Fantail <i>Rhipidura rufifrons</i>	-	M	Found along the east coast of Australia from far northern Queensland to Tasmania, including south-eastern South Australia. Inhabits tall forests, preferring wetter habitats such as heavily forested gullies, but not rainforests.	None
Satin Flycatcher <i>Myiagra cyanoleuca</i>	-	M	Mainly recorded in eucalypt forests, especially wet sclerophyll forest, often dominated by eucalypts such as Brown Barrel, <i>Eucalypt fastigata</i> , Mountain Gum, <i>E. dalrympleana</i> , Mountain Grey Gum, Narrow-leaved Peppermint, Messmate or Manna Gum, or occasionally Mountain Ash, <i>E. regnans</i> . Such forests usually have a tall shrubby understorey of tall acacias, for example Blackwood, <i>Acacia melanoxylon</i> . In higher altitude Black Sallee, <i>E. stellulata</i> , woodlands, they are often associated with tea-trees and tree-ferns. They sometimes also occur in dry sclerophyll forests and woodlands, usually dominated by eucalypts such as Blakely's Red Gum, <i>E. blakelyi</i> , Mugga Ironbark, <i>E. sideroxylon</i> , Yellow Box, White Box, <i>E. albens</i> , Manna Gum or stringybarks, including Red Stringybark, <i>E. macrorhyncha</i> and Broad-leaved Stringybark, usually with open understorey.	None
Scarlet Robin <i>Petroica boodang</i>	V	-	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
Sooty Owl <i>Tyto tenebricosa</i>	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
Sooty Oystercatcher <i>Haematopus fuliginosus</i>	V	-	Occupies rocky headlands, reefs and offshore islands along the entire coast, apparently as a single continuous population.	None
Speckled Warbler <i>Chthonicola sagittata</i>	V	-	Lives in a wide range of eucalypt dominated communities that have a grassy understorey, often on rocky ridges or in gullies. Typical habitat would include scattered native tussock grasses, a sparse shrub layer, some eucalypt regrowth and an open canopy.	None
Spectacled Monarch <i>Monarcha trivirgatus</i>	-	M	Coastal north-eastern and eastern Australia, including coastal islands, from Cape York, Queensland to Port Stephens, New South Wales. Prefers thick understorey in rainforests, wet gullies and waterside vegetation, as well as mangroves.	None

Species	BC Act	EPBC Act	Habitat	Likelihood of Occurrence
Spotted Harrier <i>Circus assimilis</i>	V	-	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.	None
Square-tailed Kite <i>Lophoictinia isura</i>	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 ² . 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
Superb Fruit-dove <i>Ptilinopus superbus</i>	V	-	Occurs principally from north-eastern in Queensland to north-eastern NSW. It is much less common further south, where it is largely confined to pockets of suitable habitat as far south as Moruya. There are records of vagrants as far south as eastern Victoria and Tasmania. Inhabits rainforest and similar closed forests where it forages high in the canopy, eating the fruits of many tree species such as figs and palms. It may also forage in eucalypt or acacia woodland where there are fruit-bearing trees.	None
Swift Parrot <i>Lathamus discolor</i>	E	E	Occurs in woodlands and forests of NSW from May to August, where it feeds on eucalypt nectar, pollen and associated insects. The Swift Parrot is dependent on flowering resources across a wide range of habitats in its wintering grounds in NSW. This species is migratory, breeding in Tasmania and also nomadic, moving about in response to changing food availability.	Moderate
Turquoise Parrot <i>Neophema pulchella</i>	V	-	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
Varied Sittella <i>Daphoenositta chrysoptera</i>	V	-	Inhabits wide variety of dry eucalypt forests and woodlands, usually with either shrubby under storey or grassy ground cover or both, in all climatic zones of Australia. Usually in areas with rough-barked trees, such as stringybarks or ironbarks, but also in paperbarks or mature Eucalypts with hollows.	Moderate
White-bellied Sea-Eagle <i>Haliaeetus leucogaster</i>	-	M	Inhabits coastal and near coastal areas, building large stick nests, and feeding mostly on marine and estuarine fish and aquatic fauna.	Low
White-fronted Chat <i>Epthianura albifrons</i>	V	-	Low vegetation in salty coastal and inland areas and crops. Runs along ground and is found in local flocks in Winter.	Low

Species	BC Act	EPBC Act	Habitat	Likelihood of Occurrence
White-throated Needletail <i>Hirundapus caudacutus</i>	-	M	An aerial species found in feeding concentrations over cities, hilltops and timbered ranges.	Low
Yellow Wagtail <i>Motacilla flava</i>	-	M	Breeds in temperate Europe and Asia. The Yellow Wagtail is a regular wet season visitor to northern Australia. Increasing records in NSW suggest this species is an occasional but regular summer visitor to the Hunter River region. The species is considered a vagrant to Victoria, South Australia and southern Western Australia. Habitat requirements for the Yellow Wagtail are highly variable, but typically include open grassy flats near water. Habitats include open areas with low vegetation such as grasslands, airstrips, pastures, sports fields; damp open areas such as muddy or grassy edges of wetlands, rivers, irrigated farmland, dams, waterholes; sewage farms, sometimes utilise tidal mudflats and edges of mangroves.	None
Fish				
Australian Grayling <i>Prototroctes maraena</i>	-	V	Historically, this species occurred in coastal streams from the Grose River Valley, southwards through NSW, Vic. and Tas. It also occasionally occurred high upstream in the Snowy R. A single juvenile specimen was collected from Lake Macquarie in 1974. This species spends only part of its lifecycle in freshwater. The Tambo River population inhabits a clear, gravel-bottomed stream with alternating pools and riffles, and granite outcrops. It has also been associated with clear, gravel-bottomed habitats in the Mitchell & Wonnangatta Rivers but was present in a muddy-bottomed, heavily silted habitat in the Tarwin R.	Low
Macquarie Perch <i>Macquaria australasica</i>	E (FM Act)	E	Found in the Murray-Darling Basin (particularly upstream reaches) of the Lachlan, Murrumbidgee and Murray rivers, and parts of south-eastern coastal NSW, including the Hawkesbury and Shoalhaven. Macquarie perch are found in both river and lake habitats, especially the upper reaches of rivers and their tributaries.	Low
Murray Cod <i>Maccullochella peelii peelii</i>	-	V	Found in a wide range of warm water habitats, from clear, rocky streams to slow-flowing turbid rivers and billabongs. Generally, they are found in waters up to 5 m deep and in sheltered areas with cover from rocks, timber or overhanging banks. The species is highly dependent on wood debris for habitat, using it to shelter from fast-flowing water.	Low
Silver Perch <i>Bidyanus bidyanus</i>	V	-	Once widespread and abundant throughout most of the Murray-Darling river system. Only one remaining secure and self sustaining population occurs in NSW in the central Murray River downstream of Yarrawonga weir, as well as several anabranches and tributaries. Silver perch seem to prefer fast-flowing, open waters, especially where there are rapids and races, however they will also inhabit warm, sluggish water with cover provided by large woody debris and reeds. They are omnivorous, feeding on small aquatic insects, molluscs, earthworms and green algae.	Low

Species	BC Act	EPBC Act	Habitat	Likelihood of Occurrence
Trout Cod <i>Maccullochella macquariensis</i>	-	E	Endemic to the southern Murray-Darling river system, including the Murrumbidgee and Murray Rivers, and the Macquarie River in central NSW. The species was once widespread and abundant in these areas but has undergone dramatic declines in its distribution and abundance over the past century. The last known reproducing population of Trout Cod is confined to the Murray River below Yarrowonga downstream to Tocumwal.	Low
Mammals				
Brush-tailed Rock-wallaby <i>Petrogale penicillata</i>	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
Eastern Bentwing-bat <i>Miniopterus schreibersii oceanensis</i>	V	-	Eastern Bent-wing Bats occur along the east and north-west coasts of Australia. Caves are the primary roosting habitat, but also use derelict mines, storm-water tunnels, buildings and other man-made structures. Form discrete populations centred on a maternity cave that is used annually in spring and summer for the birth and rearing of young.	Moderate
Eastern False Pipistrelle <i>Falsistrellus tasmaniensis</i>	V	-	Inhabit sclerophyll forests, preferring wet habitats where trees are more than 20 m high. Two observations have been made of roosts in stem holes of living eucalypts. There is debate about whether or not this species moves to lower altitudes during winter, or whether they remain sedentary but enter torpor. This species also appears to be highly mobile and records showing movements of up to 12 km between roosting and foraging sites.	Moderate
Eastern Freetail-bat <i>Mormopterus norfolkensis</i>	V	-	Most records are from dry eucalypt forests and woodlands to the east of the Great Dividing Range. Appears to roost in trees, but little is known of this species' habits.	Moderate
Eastern Pygmy-possum <i>Cercartetus nanus</i>	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.	High
Eastern Quoll <i>Dasyurus viverrinus</i>	E	-	No recent sightings of this species in NSW. Occurs in dry sclerophyll forest, scrub, heathland and cultivated land. Opportunistic carnivore with insects as it's most important prey.	Low
Golden-tipped Bat <i>Kerivoula papuensis</i>	V	-	Distributed along the east coast of Australia in scattered locations from Cape York Peninsula in Queensland to Bega in southern NSW. Found in rainforest and adjacent sclerophyll forest. Roost in abandoned hanging Yellow-throated Scrubwren and Brown Gerygone nests located in rainforest gullies on small first- and second-order streams.	Low

Species	BC Act	EPBC Act	Habitat	Likelihood of Occurrence
Greater Broad-nosed Bat <i>Scoteanax rueppellii</i>	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
Greater Glider <i>Petauroides volans</i>	-	V	The greater glider is restricted to eastern Australia, occurring from the Windsor Tableland in north Queensland through to central Victoria. It is typically found in highest abundance in taller, montane, moist eucalypt forests with relatively old trees and abundant hollows.	Low
Grey-headed Flying-fox <i>Pteropus poliocephalus</i>	V	V	A canopy-feeding frugivore and nectarivore of rainforests, open forests, woodlands, melaleuca swamps and banksia woodlands. Bats commute daily to foraging areas, usually within 15 km of the day roost although some individuals may travel up to 70 km.	Moderate
Koala <i>Phascolarctos cinereus</i>	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.	High
Large-eared Pied Bat <i>Chalinolobus dwyeri</i>	V	V	Located in a variety of drier habitats, including the dry sclerophyll forests and woodlands to the east and west of the Great Dividing Range. Can also be found on the edges of rainforests and in wet sclerophyll forests. This species roosts in caves and mines in groups of between 3 and 37 individuals.	Moderate
Little Bentwing-bat <i>Miniopterus australis</i>	V	-	Coastal north-eastern NSW and eastern Queensland. Little Bent-wing Bat is an insectivorous bat that roosts 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 hundreds of kilometres 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
New Holland Mouse <i>Pseudomys novaehollandiae</i>	-	V	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.	Moderate
Southern Brown Bandicoot (eastern) <i>Isodon obesulus obesulus</i>	E	-	Prefers sandy soils with scrubby vegetation and-or areas with low ground cover that are burnt from time to time. A mosaic of post fire vegetation is important for this species.	Low
Southern Myotis <i>Myotis macropus</i>	V	-	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

Species	BC Act	EPBC Act	Habitat	Likelihood of Occurrence
Spotted-tailed Quoll <i>Dasyurus maculatus maculatus</i>	V	E	Found on the east coast of NSW, Tasmania, eastern Victoria and north-eastern Queensland. Only in Tasmania is it still considered common. Recorded across a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline.	Moderate
Squirrel Glider <i>Petaurus norfolcensis</i>	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
Yellow-bellied Glider <i>Petaurus australis</i>	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
Yellow-bellied Sheath-tail-bat <i>Saccolaimus flaviventris</i>	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
Invertebrates				
Cumberland Plain Land Snail <i>Meridolum corneovirens</i>	E	-	The species is a shale-influenced habitat specialist, which occurs in low densities along the northwest fringes of the Cumberland Plain on shale-sandstone transitional landscapes.	None
Giant Dragonfly <i>Petalura gigantea</i>	E	-	Found along the east coast of NSW from the Victorian border to northern NSW. It is not found west of the Great Dividing Range. There are known occurrences in the Blue Mountains and Southern Highlands, in the Clarence River catchment, and on a few coastal swamps from north of Coffs Harbour to Nadgee in the south. Live in permanent swamps and bogs with some free water and open vegetation. Adults emerge from late October and are short-lived, surviving for one summer after emergence.	Low
Reptiles				
Broad-headed Snake <i>Hoplocephalus bungaroides</i>	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.	High

Species	BC Act	EPBC Act	Habitat	Likelihood of Occurrence
Rosenberg's Goanna <i>Varanus rosenbergi</i>	V	-	This species is a Hawkesbury-Narrabeen sandstone outcrop specialist. Occurs in coastal heaths, humid woodlands and both wet and dry sclerophyll forests.	High
Plants				
<i>Acacia baueri</i> subsp. <i>baueri</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.	High
<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.	High
<i>Acacia pubescens</i>	V	V	Concentrated around the Bankstown-Fairfield-Rookwood area and the Pitt Town area, with outliers occurring at Barden Ridge, Oakdale and Mountain Lagoon. Occurs on alluviums, shales and at the intergrade between shales and sandstones. The soils are characteristically gravelly soils, often with ironstone. Grows in open woodland and forest, in a variety of plant communities, including Cooks River-Castlereagh Ironbark forest, Shale-Gravel Transition forest and Cumberland Plain woodland.	None
<i>Allocasuarina diminuta</i> subsp. <i>mimica</i>	EP	-	The endangered population occurs along sandstone ridges and upper hillsides in the region northwest from Heathcote, towards Menai and Holsworthy, in heathy and low open woodland communities. It is restricted to the Local Government Areas listed in this instance (Sutherland and Liverpool).	None
<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.	None
<i>Asterolasia elegans</i>	E	E	Occurs north of Sydney, in the Baulkham Hills, Hawkesbury and Hornsby local government areas. Also likely to occur in the western part of Gosford local government area. Known from only seven populations, only one of which is wholly within a conservation reserve. Occurs on Hawkesbury sandstone in sheltered forests on mid- to lower slopes and valleys, e.g. in or adjacent to gullies which support sheltered forest.	None
<i>Astrotricha crassifolia</i>	V	V	Occurs near Patonga (Gosford LGA), and in Royal NP and on the Woronora Plateau (Sutherland and Campbelltown LGAs). There is also a record from near Glen Davis (Lithgow LGA). Also in Victoria. Occurs in dry sclerophyll woodland on sandstone.	High

Species	BC Act	EPBC Act	Habitat	Likelihood of Occurrence
<i>Caladenia tessellata</i> Thick-lip spider orchid	E	V	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
<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
<i>Callitris endlicheri</i>	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.	Moderate
<i>Chorizema parviflorum</i>	EP	-	This endangered population has been recorded from between Austinmer and Albion Park in the local government areas of Wollongong and Shellharbour. All known sites (excluding the site at Austinmer) occupy woodland or forest dominated by <i>Eucalyptus tereticornis</i> and-or <i>E. longifolia</i> . At Austinmer, the species is recorded from a coastal headland.	None
<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
<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.	None
<i>Daphnandra johnsonii</i> Illawarra socketwood	E	E	Occupies the rocky hillsides and gullies of the Illawarra lowlands, occasionally extending onto the upper escarpment slopes.	None
<i>Darwinia biflora</i>	V	V	Recorded in Ku-ring-gai, Hornsby, Baulkham Hills and Ryde local government areas. The northern, southern, eastern and western limits of the range are at Maroota, North Ryde, Cowan and Kellyville, respectively. Occurs on the edges of weathered shale-capped ridges, where these intergrade with Hawkesbury Sandstone. The vegetation structure is usually woodland, open forest or scrub-heath.	None
<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

Species	BC Act	EPBC Act	Habitat	Likelihood of Occurrence
<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. 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
<i>Eucalyptus nicholii</i> Narrow-leaved Black Peppermint	V	V	Typically grows in dry grassy woodland, on shallow soils of slopes and ridges. Found primarily on infertile soils derived from granite or metasedimentary rock. Seedling recruitment is common, even in disturbed soils, if protected from grazing and fire.	Low
<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'Hare's, Metropolitan and Warragamba Catchments.	Moderate
<i>Grammitis stenophylla</i> Narrow-leaf Finger Fern	E	-	Moist places, usually near streams, on rocks or in trees, in rainforest and moist eucalypt forest.	Low
<i>Grevillea parviflora</i> subsp. <i>parviflora</i> Small-flowered Grevillea	V	V	Grows in sandy or light clay soils usually over thin shales. Occurs in a range of vegetation types from heath and shrubby woodland to open forest. Found over a range of altitudes from flat, low-lying areas to upper slopes and ridge crests. Often occurs in open, slightly disturbed sites such as along tracks.	Low
<i>Haloragis exalata</i> subsp. <i>exalata</i> Square raspwort	V	V	Occurs in 4 widely scattered localities in eastern NSW. It is disjunctly distributed in the central coast, south coast and north-western slopes botanical subdivisions of NSW. The species appears to require protected and shaded damp situations in riparian habitats.	Low
<i>Leucopogon exolasius</i> Woronora beard-heath	V	V	Grows in woodland on sandstone. Restricted to the Woronora and Grose Rivers and Stokes Creek, Royal National Park.	Moderate
<i>Melaleuca biconvexa</i> Biconvex paperbark	V	V	Grows in damp places, often near streams or low-lying areas on alluvial soils of low slopes or sheltered aspects. Scattered and dispersed populations found in the Jervis Bay area in the south and the Gosford-Wyong area in the north.	None
<i>Melaleuca deanei</i> Deane's paperbark	V	V	Grows in wet heath on sandstone in coastal districts from Berowra to Nowra.	Moderate

Species	BC Act	EPBC Act	Habitat	Likelihood of Occurrence
<i>Pelargonium sp. striatellum</i> Omeo's stork's-bill	E	E	Flowering occurs from October to March. Occurs in habitat usually located just above the high water level of irregularly inundated or ephemeral lakes. During dry periods, the species is known to colonise exposed lake beds. The species is known to form clonal colonies by rhizomatous propagation.	None
<i>Persoonia bargoensis</i> Bargo geebung	E	V	The Bargo Geebung occurs in woodland or dry sclerophyll forest on sandstone and on heavier, well drained, loamy, gravelly soils.	Low
<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.	Moderate
<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
<i>Pimelea curviflora</i> var. <i>curviflora</i>	V	V	Confined to the coastal area of Sydney between northern Sydney in the south and Maroota in the north-west. Former range extended south to the Parramatta River and Port Jackson region including Five Dock, Bellevue Hill and Manly. Occurs on shale-lateritic soils over sandstone and shale-sandstone transition soils on ridgetops and upper slopes amongst woodlands.	Low
<i>Pimelea spicata</i> Spiked rice-flower	E	E	Once widespread on the Cumberland Plain, the Spiked Rice-flower occurs in two disjunct areas; the Cumberland Plain (Narellan, Marayong, Prospect Reservoir areas) and the Illawarra (Lansdowne to Shellharbour to northern Kiama). In both the Cumberland Plain and Illawarra environments this species is found on well-structured clay soils. On the inland Cumberland Plain sites it is associated with grey box and Ironbark. In the coastal Illawarra it occurs commonly in Coast Banksia open woodland with a better developed shrub and grass understorey.	Low
<i>Pomaderris adnata</i>	E	-	Known only from one site at Sublime Point, north of Wollongong. Occurs near the edge of the plateau behind the Illawarra escarpment. Associated vegetation is silver-top ash - red bloodwood forest. Soil is a sandy loam over sandstone.	Low
<i>Pomaderris brunnea</i> Brown Pomaderris	V	V	The species is expected to live for 10 - 20 years, while the minimum time to produce seed is estimated to be 4 - 6 years. Found in a very limited area around the Colo, Nepean and Hawkesbury Rivers, including the Bargo area. It also occurs at Walcha on the New England Tableland and in far eastern Gippsland in Victoria.	Low

Species	BC Act	EPBC Act	Habitat	Likelihood of Occurrence
<i>Prostanthera densa</i>	V	V	Generally grows in sclerophyll forest and shrubland on coastal headlands and near coastal ranges, chiefly on sandstone, and rocky slopes near the sea.	Low
<i>Prostanthera marifolia</i>	CE	CE	Occurs in localised patches in or in close proximity to the endangered Duffys forest ecological community. Located on deeply weathered clay-loam soils associated with ironstone and scattered shale lenses, a soil type which only occurs on ridge tops and has been extensively urbanised.	Low
<i>Pterostylis gibbosa</i>	E	E	Grows in open forest or woodland, on flat or gently sloping land with poor drainage. Known from a small number of populations in the Hunter region (Milbrodale), the Illawarra region (Albion Park and Yallah) and the Shoalhaven region (near Nowra).	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
<i>Pultenaea aristata</i> (prickly bush-pea)	V	V	Grows in moist, dry sclerophyll woodland to heath on sandstone, specifically the drier areas of Upland Swamps. Restricted to the Woronora Plateau, a small area between Helensburgh, south of Sydney, and Mt Keira above Wollongong.	Known
<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	None
<i>Thelymitra kangaloonica</i> Kangaloon sun orchid	CE	CE	Found in swamps in sedgeland over grey silty grey loam soils.	None
<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.	None

Annex 5 – Five Part Tests (Biodiversity Conservation Act 2016)

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 (approximately 910 hectares within five kilometres of the proposal according to OEH 2013). Approximately 0.03 ha Coastal Upland Swamps will be impacted by the proposed works..</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.	n/a
b) In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed: <ul style="list-style-type: none"> 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 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 	<p>Extent and composition</p> <p>Approximately 910 hectares of Coastal Upland Swamp exists within five kilometres of the study area (NPWS 2003). This is considered to be the local occurrence of Coastal Upland Swamp in this instance. Of this local occurrence, approximately 0.03 ha will be modified by the proposal, however the clearing of access tracks to the sites will be kept to the bare minimum required to allow the access of personnel and equipment and will therefore have no significant impact on native vegetation.</p> <p>Assessment</p> <p>Approximately 0.03 ha of Coastal Upland Swamp will be modified and, therefore, the action proposed is considered unlikely to have an adverse effect on either the extent or composition of the EEC such that its local occurrence of 910 hectares is placed at risk of extinction.</p>

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

<p>c) In relation to the habitat of a threatened species or ecological community:</p> <ul style="list-style-type: none"> i. The extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and ii. 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 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>Extent of impact on habitat</p> <p>Minimal clearing is proposed to be undertaken within areas of Coastal Upland Swamp, with impacts limited to trittering of 0.03 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 negligible.</p> <p>Habitat fragmentation</p> <p>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>Importance of habitat to be impacted</p> <p>Approximately 0.03 ha of Coastal Upland Swamp would be modified by trittering 1.5 m wide access tracks and 25 m² borehole sites. The proposal will have no significant impact on Coastal Upland Swamp within 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"> • Gould's Petrel - critical habitat declaration; • Little penguin population in Sydney's North Harbour; • Mitchell's Rainforest Snail in Stotts Island Nature Reserve; and • Wollemi Pine. <p>None of these areas of AOBV will be affected by the proposal.</p>
<p>e) Whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.</p>	<p>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 a temporary modification of native vegetation structure of 0.03 ha which will regenerate, as opposed to permanent clearing. 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 as:</p> <ul style="list-style-type: none"> • A small amount of the local occurrence of the EEC will be removed or modified by the proposal; • The proposal is not inconsistent with a Recovery Plan or Threat Abatement Plan; and • The action proposed is unlikely to exacerbate a KTP to the extent that the EEC is at risk of extinction.

***Pultenaea aristata* (prickly bush-pea)**

Description

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

Pultenaea aristata is restricted to the Woronora Plateau, a small 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 that exist within the study area.

Pultenaea aristata was recorded in the study area at the following locations:

- Near the proposed access track to the Swamp 62 piezometer site.
- Numerous individuals (10) were found near the proposed access track in the upland swamp. Refer Figure 5.

Overall, it is likely that there are many hundreds of plants of *Pultenaea aristata* within suitable habitat in the study area. Given the density of the species where it occurs, there is the potential that the proposal would impact on a few individuals during construction. To minimise this impact, an ecologist would be on site during proposed clearing in the vicinity of known locations of the species to ensure the vast majority of plants are not impacted.

- 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

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 ear the proposed access track to the Swamp 62 piezometer site. Refer Figure 5.
For the locations where known records for the species exists, an ecologist will be present on site immediately prior to works to resurvey for the species presence and demarcate a construction exclusion zone around any occurrences of the species such that any potential impact is minimised.

Life cycle factors

The following description has been paraphrased from Benson and MacDougall (1996).

Pultenaea aristata 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.

Assessment

There is the potential that some individuals of *Pultenaea aristata* will be affected by the proposal given the density of the species where it occurs. To minimise the impacts of the proposal, an ecologist would be on site during clearing operations (for swamp 62) to ensure impacts are minimised. Therefore, the action proposed is unlikely to have an adverse effect on the life cycle of *Pultenaea aristata* such that a viable local population of the species is likely to be placed at risk of extinction.

Pultenaea aristata (prickly bush-pea)	
<p>b) In the case of an endangered ecological community or critically endangered ecological community, whether the proposed development:</p> <p>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</p> <p>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</p>	<p>n/a</p>
<p>c) In relation to the habitat of a threatened species, population or ecological community:</p> <p>i. The extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, 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 development or activity, 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>i. Extent of impact on habitat</p> <p>Extensive areas of Coastal Upland Swamp, as habitat for <i>Pultenaea aristata</i>, exists within five kilometres of the study area (NPWS 2003). Minimal areas of this habitat (0.03 ha) will be removed or modified by the proposal, however the Swamp 62 access track will modify a small amount of native vegetation in the vicinity of some <i>Pultenaea aristata</i> individuals. There will be negligible impact on the extent of <i>Pultenaea aristata</i> habitat.</p> <p>ii. Habitat fragmentation</p> <p>The proposal will result in the temporary modification of a negligible amount of habitat, none of which presents a hostile barrier to the movement of pollinators or the dispersal of seed. Further, the proposed clearing is temporary and would be regenerated post works. Habitat for <i>Pultenaea aristata</i> would not be fragmented or isolated as a result of the proposal.</p> <p>iii. Importance of habitat to be impacted</p> <p>The small amount of habitat to be modified for the proposal has no specific importance to the long-term survival of the species. The proposal will have negligible impact on the extent of habitat for <i>Pultenaea aristata</i> within the locality.</p>
<p>d) Whether the proposed development or activity 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"> • Gould's Petrel - critical habitat declaration; • Little penguin population in Sydney's North Harbour; • Mitchell's Rainforest Snail in Stotts Island Nature Reserve; and • Wollemi Pine. <p>None of these areas of critical habitat will be affected by the proposal.</p>
<p>e) Whether the proposed development or activity 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 program effectively equates to a temporary modification of native vegetation structure of 0.108 hectares, which will regenerate over time after decommissioning and rehabilitation.</p>

***Pultenaea aristata* (prickly bush-pea)**

Conclusion

A viable local population of *Pultenaea aristata* is unlikely to be significantly affected by the proposal as:

- An ecologist would be on site during proposed clearing works in the vicinity of known and previous records of the species to ensure impacts are minimised;
- The action proposed is unlikely to have an adverse effect on the life cycle of the species;
- The proposal would result in the temporary modification of a negligible amount of habitat, which would regenerate after decommissioning and rehabilitation;
- 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;
- The proposal would not exacerbate KTPs in the long term.

Annex 6 – EPBC Act Significant Impact Criteria

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:	
1. Reduce the extent of an ecological community;	
Approximately 0.03 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
2. Fragment or increase fragmentation of an ecological community;	
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
3. Adversely affect habitat critical to the survival of an ecological community;	
The following species are listed on the EPBC Act Register of Critical Habitat: <ul style="list-style-type: none"> Wandering Albatross (<i>Diomedea exulans</i>) - Macquarie Island <i>Lepidium ginninderrense</i> (Ginninderra peppercress) - Northwest corner Belconnen Naval Transmission Station, ACT Black-eared Miner (<i>Manorina melanotis</i>) - Gluepot Reserve, Taylorville Station and Calperum Station. Shy Albatross (<i>Thalassarche cauta</i>) - Albatross Island, The Mewstone, Pedra Branca Grey-headed Albatross (<i>Thalassarche chrysostoma</i>) - Macquarie Island 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.	None
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;	
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
5. Cause a substantial change in the species composition of an occurrence of an ecological community;	
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
6. Cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to;	
<ul style="list-style-type: none"> 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 	
The ecological processes required to enable the establishment of invasive species are unlikely to eventuate. Vehicle quarantining procedures will mitigate against this. 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.	Unlikely
7. Interfere with the recovery of an ecological community.	

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:

- 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.

Given the proposal would not result in significant clearing of Coastal Upland Swamp, the proposal is not inconsistent with this management action.

Unlikely

Conclusion: The proposed action is unlikely to have a significant impact on Coastal Upland Swamp.

<i>Pultenaea aristata</i> (Prickly Bush-pea)	
<i>Criteria for vulnerable species</i>	<i>Likelihood</i>
An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:	
1. Lead to a long-term decrease in the size of an important population of a species;	
Overall, it is likely that there are many hundreds of plants of <i>Pultenaea aristata</i> within suitable habitat in the study area. 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. It is considered unlikely that the proposed action would lead to a long term decrease in the size of an important population of <i>Pultenaea aristata</i> as known locations of the species will be avoided and clearing will be supervised by an ecologist to ensure impacts to plants are minimised.	None
2. Reduce the area of occupancy of an important population;	
The proposal is unlikely to reduce the area of occupancy of an important population of <i>Pultenaea aristata</i> as, as known locations of the species will be avoided and clearing will be supervised by an ecologist to ensure impacts to plants are minimised.	None
3. Fragment an existing important population into two or more populations;	
The proposal will result in the temporary modification of a negligible amount of habitat, none of which presents a hostile barrier to the movement of pollinators or the dispersal of seed. Further, the proposed clearing is temporary and would be regenerated post works. Habitat for <i>Pultenaea aristata</i> would not be fragmented as a result of the proposal.	None
4. Adversely affect habitat critical to the survival of a species;	
The following species are listed on the EPBC Act Register of Critical Habitat: <ul style="list-style-type: none"> • Wandering Albatross (<i>Diomedea exulans</i>) - Macquarie Island • <i>Lepidium ginninderrense</i> (Ginninderra peppercress) - Northwest corner Belconnen Naval Transmission Station, ACT • Black-eared Miner (<i>Manorina melanotis</i>) - Gluepot Reserve, Taylorville Station and Calperum Station. • Shy Albatross (<i>Thalassarche cauta</i>) - Albatross Island, The Mewstone, Pedra Branca • Grey-headed Albatross (<i>Thalassarche chrysostoma</i>) - Macquarie Island 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
5. Disrupt the breeding cycle of an important population;	
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 supervising 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> .	None
6. Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline;	
The temporary 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 avoided by having clearing supervised by an ecologist. Further, any proposed clearing would be regenerated after decommissioning.	Unlikely
7. Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat;	
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.	Unlikely
8. Introduce disease that may cause the species to decline, or	
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.	Unlikely

<i>Pultenaea aristata</i> (Prickly Bush-pea)	
9. Interfere substantially with the recovery of the species.	
<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.</p> <p>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"> • Confirm location details of existing records. • Review fire management requirements and apply. • 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). • Reserve Fire Management Strategy to include operational guidelines to protect this species from fire. <p>The proposal is not likely to interfere with the recovery of <i>Pultenaea aristata</i>.</p>	Unlikely
Conclusion: The proposed action is unlikely to have a significant impact on <i>Pultenaea aristata</i> .	

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