



Springvale Water Treatment Project

State Significant Development 7592
Environmental Impact Statement
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EnergyAustralia



Centennial Coal

Appendix I

Biodiversity Inventory and EPBC Act Assessment (RPS 2016)



Springvale Water Treatment Project

Biodiversity Inventory and EPBC Act Assessment

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Terms & Abbreviations

Abbreviation	Description
API	Aerial Photograph Interpretation
CEEC	Critically Endangered Ecological Community
DBH	Diameter at Breast Height
DEC	NSW Department of Environment and Conservation – now known as OEH
DECC	NSW Department of Environment and Climate Change – now known as OEH
DECCW	NSW Department of Environment, Climate Change and Water– now known as OEH
DLWC	Former NSW Department of Land and Water Conservation
DoE	Commonwealth Department of the Environment
EEC	Endangered Ecological Community
EIS	Environmental Impact Statement
EP&A Act	NSW <i>Environmental Planning and Assessment Act 1979</i>
EPBC Act	Commonwealth <i>Environment Protection and Biodiversity Conservation Act 1999</i>
GDE	Groundwater Dependent Ecosystem
GIS	Geographic Information System
GPS	Global Positioning System
KTP	Key Threatening Process
LGA	Local Government Area
MU	Map Unit
NES	National Environmental Significance
NPWS	NSW National Parks and Wildlife Services
NSW Fisheries	NSW Department of Industry & Investment - Fisheries
OEH	NSW Office of Environment and Heritage
PFC	Projected Foliage Cover
ROTAP	Rare or Threatened Australian Plants
RPS	RPS Australia East Pty Ltd
SEPP	State Environmental Planning Policy
TEC	Threatened Ecological Community
TSC Act	NSW <i>Threatened Species Conservation Act 1995</i>

Summary

Introduction

RPS Australia East Pty Ltd (RPS) has been engaged by Springvale Coal Pty Limited to undertake a Biodiversity Assessment Report (BAR) inclusive of a Biodiversity Inventory and EPBC Act Assessment Report (this report) for the proposed Springvale Water Treatment Project (the Project). The Project comprises a 20 m wide linear pipeline corridor extending between the existing Gravity Tank on Newnes Plateau and the Water Treatment Plant location within the Mount Piper Power Station (MPPS) site, the existing Gravity Tank site compound, the water treatment plant location at MPPS and a network of pipelines from the water treatment plant to the Springvale Coal Services Site and the cooling towers at MPPS.

Two potential pipeline alignments on Newnes Plateau have been investigated for the pipeline section traversing between the Gravity Tank and the existing Springvale Mine's licensed discharge point (LDP) 009; a northern and southern alignment. In this report the study area with the northern pipeline alignment is referred to as the Northern Study Area while study area with the southern pipeline alignment is referred to as the Southern Study Area. The Northern and Southern Study Areas are collectively referred to as the Study Area.

An improved environmental outcome is proposed in the Project through the transfer of water from existing underground mine dewatering facilities for treatment within the water treatment plant and subsequent reuse at the MPPS's cooling towers. Treated water that is not able to be used at MPPS will be discharged into Wangcol Creek, within the upper catchment of the Cocks River.

Objectives

This report aims to describe the biodiversity values within the Study Area as part of an BAR performed in accordance with the Framework for Biodiversity Assessment (FBA). The FBA assessment is to consider threatened species, populations or ecological communities listed under the NSW *Threatened Species Conservation Act 1995* (TSC Act) and Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). This report also provides an assessment of the Matters of National Environmental Significance (MNES) and any other matters such as relevant State Environmental Planning Policies (SEPPs) which are currently not assessed under the FBA.

Key Vegetation and Flora Findings

There were 15 vegetation types in accordance with DEC (2006) identified within the Study Area. Those listed forming part of a listed ecological community are listed below:

- MU 11 corresponds to Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland in the South Eastern Highlands, Sydney Basin, South East Corner and NSW South Western Slopes Bioregions Endangered Ecological Community (EEC) listed under the TSC Act; and
- MU 53 corresponds to Montane Peatlands and Swamps of the New England Tableland, NSW North Coast, Sydney Basin, South East Corner, South Eastern Highlands and Australian Alps bioregions EEC listed under the TSC Act.

A total of 174 flora species were identified within the Study Area. Three threatened flora species were detected within the Northern Study Area, whilst two threatened flora were detected within the Southern Study Area, as listed below:

- *Caesia parviflora* var. *minor* (Small Pale Grass Lily) (Northern and Southern Study Areas);
- *Persoonia hindii* (Northern and Southern Study Area); and

- *Veronica blakelyi* (Northern Study Area).

Additionally, two threatened flora species were detected immediately adjacent both Study Areas, including:

- *Eucalyptus aggregata* (Black Gum); and
- *Eucalyptus cannonii* (Capertee Stringybark).

Key Fauna Findings

A total of 98 fauna species were detected within the Study Areas during field surveys, including 23 mammals, 70 birds, three reptiles and two frog species. Eleven threatened fauna species listed under the TSC Act and/or EPBC Act were detected during RPS surveys across both the Northern and Southern Study Areas:

- Scarlet Robin (*Petroica boodang*);
- Little Eagle (*Hieraaetus morphnoides*);
- Gang-gang Cockatoo (*Callocephalon fimbriatum*);
- Glossy Black-Cockatoo (*Calyptorhynchus lathami*);
- Powerful Owl (*Ninox strenua*) (Northern Study Area only);
- Brown Treecreeper (eastern subsp.) (*Climacteris picumnus victoriae*);
- Large-eared Pied Bat (*Chalinolobus dwyeri*);
- Yellow-bellied Sheath-tail Bat (*Saccolaimus flaviventris*);
- Greater Glider (*Petauroides volans*);
- Speckled Warbler (*Chthonicola sagittata*) (Southern Study Area only); and
- Little Lorikeet (*Glossopsitta pusilla*) (Southern Study Area only).

Assessment

Assessments performed in accordance with the *Significant Impact Guidelines 1.1 - Matters of National Environmental Significance* (DoE 2013a) have assessed Matters of National Environmental Significance (MNES) listed under the EPBC Act with the potential to be impacted by the Project. These assessments have concluded that the Project is not likely to have a significant impact on MNES. The State listed threatened biodiversity have been assessed in accordance with the FBA and are provided in the BAR.

1.0 Introduction

1.1 Background

This Biodiversity Inventory and EPBC Act Assessment Report is an appendix to the BAR, which forms part of the Environmental Impact Statement (EIS) for the Springvale Water Treatment Project (hereafter referred to as the 'Project'). The Project aims to improve environmental outcomes and water quality in the upper Coxs River catchment through water transfers from existing underground mine dewatering facilities for reuse at the Mount Piper Power Station (MPPS) rather than discharge into the catchment.

The Project components comprise a linear 10 m wide impact footprint located within a 20 m wide corridor, and a water treatment plant, shown in **Figure 1**. Two pipeline alignments are assessed separately in this report; a northern alignment (Northern Study Area: **Figure 2**) and a southern alignment (Southern Study Area: **Figure 3**), however, only one alignment will ultimately be selected for final placement of the proposed pipeline between the existing Gravity Tank on Newnes Plateau and the water treatment plant at MPPS. The Northern and Southern Study Areas are collectively referred to as the Study Area. Biodiversity investigations have been performed within the Study Area to determine the alignment with the least impact.

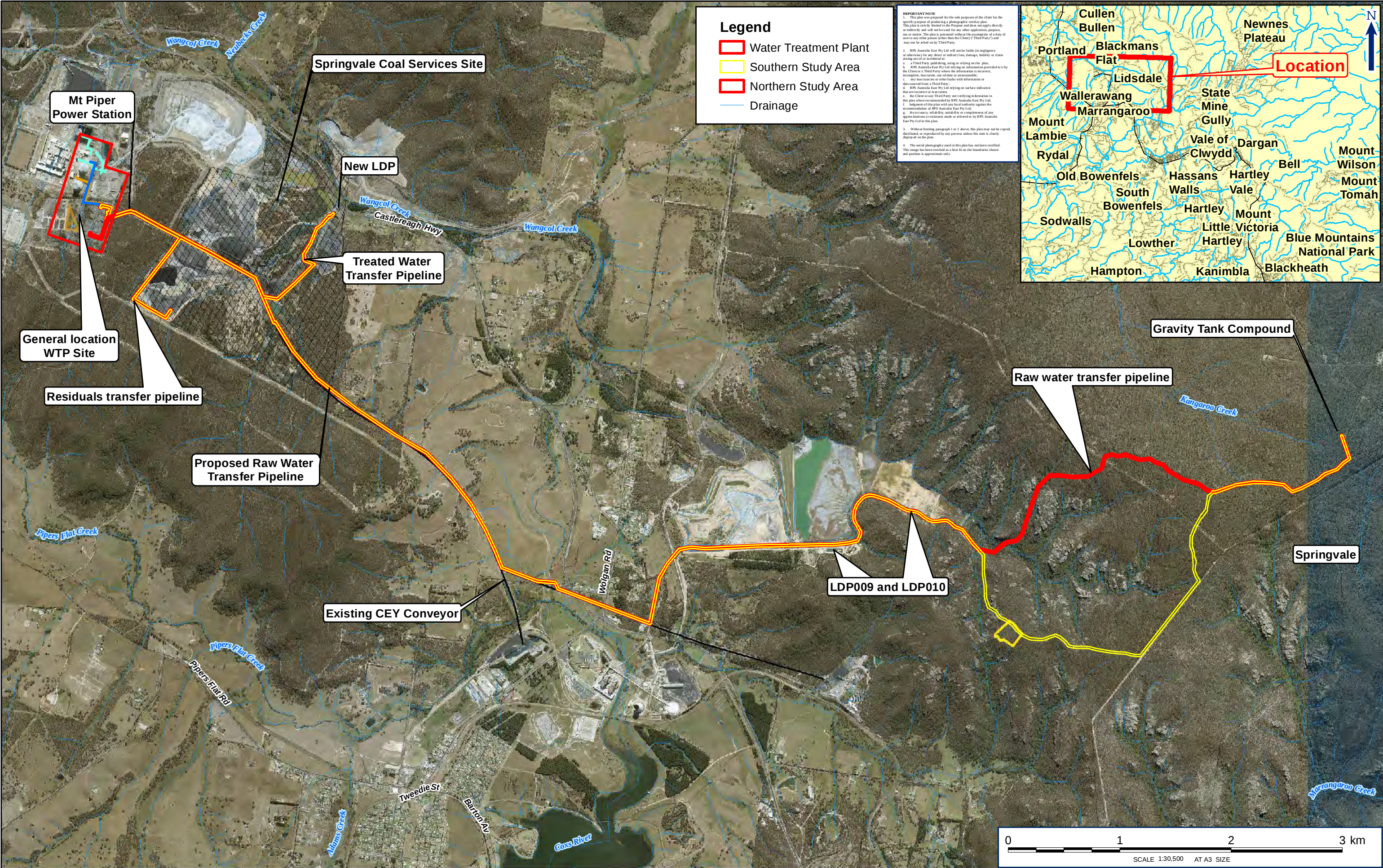
1.2 Project Description

Springvale Mine and Angus Place Colliery operate a water management scheme, referred to as the Springvale Delta Water Transfer Scheme (SDWTS), for the management of safe water levels in the underground workings at both mines. The SDWTS incorporates a network of trenched pipelines connecting the dewatering bore facilities on the Newnes Plateau to Springvale Mine's licensed discharge points (LDP) 009 and LDP010, where the mine water is currently discharged to Coxs River via the Swayers Swamp Creek.

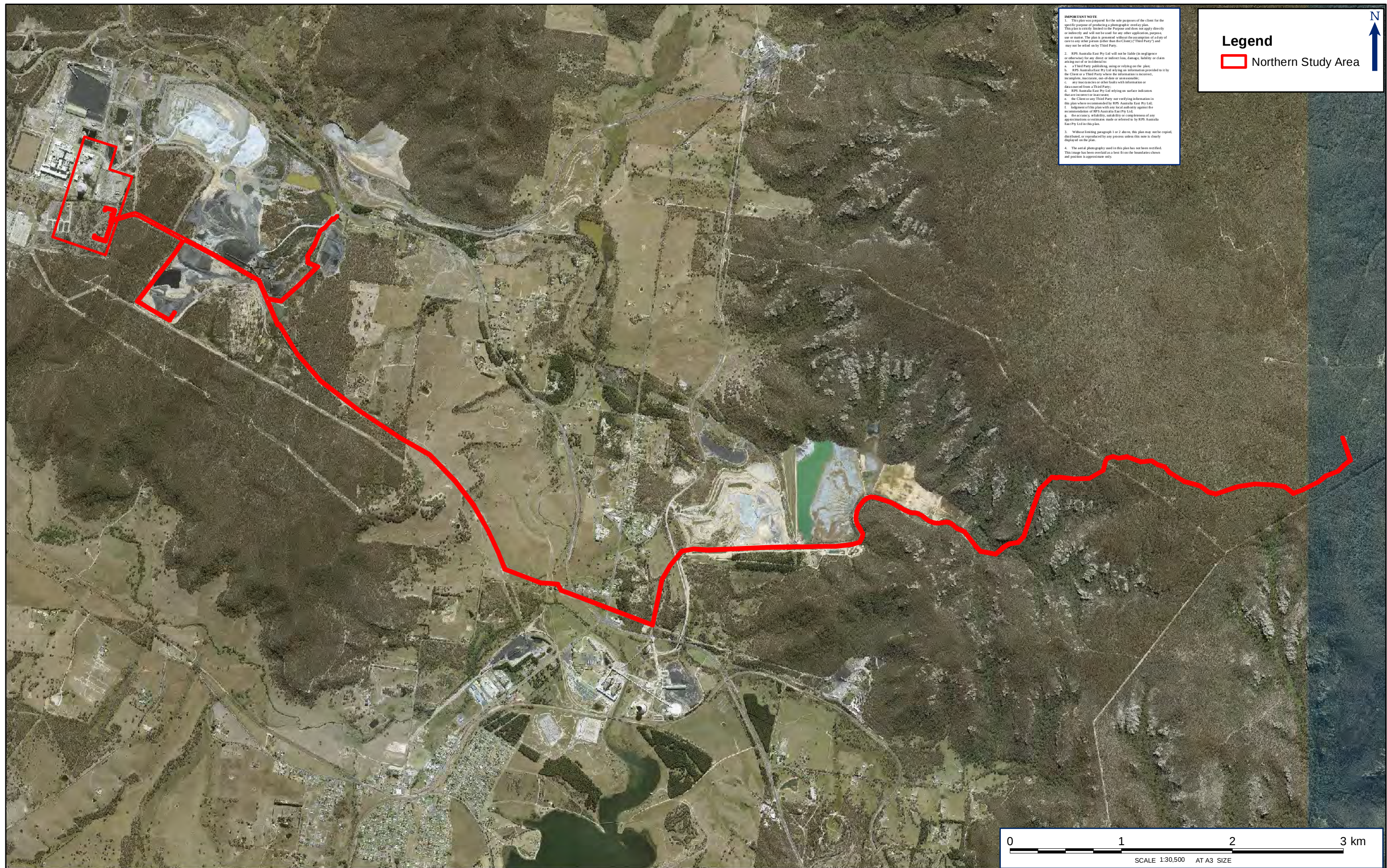
EnergyAustralia owns and operates the MPPS, about eight kilometres west of the Springvale Mine pit top. MPPS has a high demand for make-up water for use in the cooling tower system. Water is currently drawn from the Coxs River and Fish River water supply schemes. MPPS operates as a zero discharge site with no release of water or by-products (e.g. brine) from the cooling tower system to receiving waters. MPPS has an existing brine management system for the treatment and disposal of brine on site.

The Project involves establishing a pipeline and ancillary facilities to transfer water from existing dewatering facilities on the Newnes Plateau for treatment and reuse at MPPS. An overview of the Project components is shown on **Figure 1** and includes the following major elements:

- A system to transfer up to 36 ML/day of dewatered mine water from the existing approved gravity tank (Springvale Mine dewatering facilities) on the Newnes Plateau, to a new water treatment plant at MPPS;
- A new water treatment plant incorporating desalination processes to reduce the salinity in mine water to a standard suitable for either industrial reuse or environmental release;
- transfer of treated water from the water treatment plant to the MPPS cooling tower to contribute to the demand for make-up water;
- Transfer of any excess treated water to the Springvale Coal Services site (Western Coal Services Project, SSD 5579) for direct environmental release to Wangcol Creek via a new licensed discharge point;
- transfer of the saline brine stream from the water treatment plant to the MPPS cooling tower blowdown system for integration with existing treatment and brine disposal practices;
- installation of a crystalliser to provide further treatment of the additional salt load generated within the MPPS cooling tower blowdown system; and
- A truck turning bay and pipeline storage area along the southern alignment only.



TITLE : FIGURE 1: STUDY AREA	LOCATION : SPRINGVALE	DATUM:GDA 1994	DATE : 17/08/2016	VERSION (PLAN BY): AA A3 (Natalie.Wood)
		PROJECTION: GDA 1994 MGA Zone 56	PURPOSE: ECOLOGY	PATH: J:\OBS\Centennial\All Jobs\131758 JV Energy Australia Springvale\10 - Drafting\Arcgis Map Documents\EcolReport Figures\131758 Figure 1 Location B A3 20160809.mxd

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Legend

 Northern Study Area

TITLE : FIGURE 2: NORTHERN STUDY AREA

LOCATION : **SPRINGVALE**

DATUM:GDA 1994

DATE : 17/08/2016

VERSION (PLAN BY): B A3 (Natalie.Wood)

PROJECTION: GDA 1994 MGA Zone 56

PURPOSE: **ECOLOGY**

PATH: J:\JOBS\Centennial\All Jobs\131758 JV Energy Australia Springvale\10 - Drafting\Arcgis Map Documents\EcolReport Figures\131758 Figure 2 North B A3 20160812.mxd

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1.3 Study Area

The location and extent of the Study Area is shown in **Figure 1**. The Study Area has an area of approximately 98 ha comprising two pipeline corridors of 20 m width, which are separately referred to as the:

- Northern Study Area; and
- Southern Study Area.

Survey effort, desktop analysis and results have been considered for the entire Study Area, whilst the disturbance or impact footprint is referred to when considering the Project's direct impacts. The preferred route, termed the Project Application Area, is described in the Stage 3 section of the Biodiversity Assessment Report following a detailed consideration of the impacts within the Northern Study Area and Southern Study Area.

1.4 Impact Footprint

For the purposes of this assessment the impact area or disturbance footprint is defined by the extent of native vegetation removal within the preferred route. Native vegetation removal will be restricted to a 10 m wide corridor along the preferred route within which all construction works associated with pipeline installation are to be contained. Two potential disturbance footprints, these being the Northern and Southern Study Areas, have been mapped. The native vegetation footprint for each study area is calculated below:

- Northern Study Area (~27.84 ha of native vegetation cover); and
- Southern Study Area (~31.44 ha of native vegetation cover).

1.5 Purpose

The purpose of this report is to:

- Document the biodiversity values of the Study Area specifically:
 - » The extent of native vegetation cover and condition; and
 - » Presence of threatened species, populations, ecological communities and their habitats (i.e. threatened biodiversity) listed under the *Threatened Species Conservation Act 1995* (TSC Act) and/ or *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act); and
- Provide information compatible with the assessment requirements specified in the Secretary's Environmental Assessment Requirements (SEARs), which includes:
 - » Framework for Biodiversity Assessment (FBA) (OEH 2014); and
 - » BioBanking Assessment Methodology 2014 (BBAM 2014).
- Provide an assessment of the Matters of National Environmental Significance (MNES) and any other matters such as relevant State Environmental Planning Policies (SEPPs) which are currently not assessed under the FBA.

1.6 Investigation Scope

The investigation scope is listed below:

- Undertake an assessment of the likely biodiversity impacts of the project in accordance with the FBA (OEH 2014);
- Identify and map the vegetation communities and areas to be cleared within the Study Area;
- Assess the status of identified plant species and vegetation communities under relevant legislation;

- Identify existing habitat types within the Study Area and assess the habitat potential for threatened species, populations, or ecological communities known from the proximate area;
- Identify potential threatened terrestrial fauna and flora within the Study Area;
- Identify potential threatened aquatic fauna and flora within the Study Area;
- Assess the potential of the project to have a significant impact on any threatened species, populations or ecological communities identified during field surveys or as having potential habitat in the Study Area; and
- Provide recommendations and measures to avoid, reduce or mitigate impacts on biodiversity.

1.7 Site Particulars

Locality	The pipeline extends from Springvale Mine on the Newnes Plateau westwards to the Mount Piper Power Station in the Lithgow Local Government Area.
Boundaries	The western portion of the Study Area is surrounded by industrial and agricultural lands accommodating infrastructure, cleared lands and road networks. The Newnes State Forest occurs to the eastern end of the Study Area and bounds the north, east and the southeast of the Study Area.
Current Land Use	Part of the Study Area is contained within Newnes State Forest which is managed by Forestry Corporation of NSW. Other portions of the Study Area are situated within Centennial owned lands, private lands and EnergyAustralia lands with uses such as mining related activities, forestry, pastoral farming and energy resources.
Topography	The landscape in this region ranges from flat to gently inclined rises on broad (>300 m) valley floors away from drainage lines. The local relief is <25 m with a slope gradient typically <10% (King 1993). The main drainage line is the Wangcol Creek, to the north of the western portion of the Study Area, orientated on an approximate east-west axis. The Study Area traverses the Coss River at Lidsdale, within the central portion of the Study Area.
Geology and Soils	The Study Area extends from Mount Piper Power Station on the west near Blackmans Flat to the existing Gravity Tank in the east on the Newnes Plateau in the Blue Mountains. The Newnes Plateau surface is gently to moderately inclined covered by friable Narrabeen Group sandstones and pagoda rock formations on the plateau margins. Vertical sandstone cliffs descend from the edge of the plateau in the eastern part of the Study Area. The western part of the Study Area is characterised by gently undulating to rolling hills on the Permian and Devonian sedimentary sequences and minor Carboniferous granites (King 1993: 2-3). Much of the Study Area is in disturbed terrain. The geology for the Study Area is primarily an undifferentiated mix of sandstone, shale and tuff, formed on the Narrabeen Group, laid down in the Triassic period. This is bounded by nearby deposits of the Illawarra Coal Measures (Pi) laid down in the Permian period, comprising shale, sandstone, conglomerate and chert, with coal and seams of torbanite and a quaternary alluvium of gravel, sand, silt and clay, found mainly along watercourses (Bryan, 1966).
Vegetation	Vegetation within the Study Area is dominated by three distinct vegetation types; dense low swamp shrubby vegetation along the drainage lines; eucalypt forest and

woodland vegetation on the slopes and flats; and ridges and dry rocky heath along cliffs and ridgetops.

1.8 Regulatory context

1.8.1 NSW Environmental Planning and Assessment Act 1979

The Project is declared as a State Significant Development under the *State Environmental Planning Policy (State and Regional Development)* 2011, which requires consent under Part 4 Division 4.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). The FBA applies as specified in the SEARs issued for the Project. This report aims to supplement Stage 1 of the FBA assessment by examining the likelihood of occurrence of threatened species, populations or ecological communities (i.e. threatened biodiversity) listed under the TSC Act and EPBC Act.

1.8.2 Framework for Biodiversity Assessment

A Biodiversity Assessment Report (BAR) prepared in accordance with the FBA for SSD is based on an application of the NSW BioBank Assessment Methodology 2014 (BBAM 2014) (OEH 2014b). The FBA provides a dual assessment process for the developments impact and evaluation of suitable biodiversity offset options within a three stage investigation as listed below:

Stage 1 – Biodiversity Assessment;

Stage 2 – Impact Assessment (Biodiversity Values); and

Stage 3 – Biodiversity Offset Strategy.

This Ecological Assessment report forms an appendix to the BAR, which has the purpose of defining the biodiversity values of the Study Area. In addition to the BAR this report provides an assessment of the MNES and any other matters such as relevant SEPPs which are currently not assessed under the FBA.

1.8.3 Commonwealth Environment Protection and Biodiversity Conservation Act 1999

The Commonwealth EPBC Act provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places, defined in the EPBC Act as MNES. MNES identified in the Act include:

- World heritage properties.
- National heritage places.
- Wetlands of international importance (listed under the Ramsar Convention).
- Threatened species and communities (Section 18 and 18A).
- Migratory species protected under international agreements.
- Commonwealth marine areas.
- The Great Barrier Reef Marine Park.
- Nuclear Actions.
- A water resource, in relation to coal seam gas development and large coal mining development (the water trigger).

The first step in considering MNES protected under the EPBC Act (e.g. threatened species and communities listed under Section 18 and 18A) is a self assessment performed in accordance with the *Significant Impact*

Guidelines 1.1 - Matters of National Environmental Significance (DoE 2013). This is performed to determine if there is likelihood for a proposed action to have a significant impact on MNES. Regulatory approval from the Commonwealth Minister for the Environment is required for actions that have, or are likely to have, a significant impact on MNES. The decision to refer a proposed action must have due regard for directions specified under Section 68 of the Act.

1.8.4 NSW Threatened Species Conservation Act 1995

The TSC Act provides legal status for biota of conservation significance in NSW. The Act aims to, *inter alia*, 'conserve biological diversity and promote ecologically sustainable development'. It provides for:

- The listing of 'threatened species, endangered populations and EECs' under Schedule 1.
- 'Critically endangered' species and Critically Endangered Ecological Communities (CEEC) listed under Schedule 1A.
- Vulnerable species and communities listed under Schedule 2.
- 'Key Threatening Processes' listed under Schedule 3.
- The preparation and implementation of Recovery Plans and Threat Abatement Plans.
- Requirements, or otherwise, for the preparation of a SIS.

The lists of threatened species, populations and ecological communities gazetted under the TSC Act are relevant to this assessment and have been considered in the preparation of this constraints report.

1.8.5 NSW National Parks and Wildlife Act 1974

Part 8A of the *National Parks and Wildlife Act 1974* (NPW Act) regulates the undertaking of activities which may impact on threatened species, populations and ecological communities listed under the TSC Act and their habitats. The NPW Act provides that a person must not harm any animal that is a threatened species, population or ecological community; pick any plant which is part of a threatened species, population or ecological community; damage any critical habitat; or damage any habitat of a threatened species, population or ecological community without a licence being obtained under the NPW Act or TSC Act or unless another exception applies.

1.8.6 State Environmental Planning Policy (SEPP) No. 44 (Koala Habitat Protection)

Schedule 2 of State Environmental Planning Policy (SEPP) No. 44 – 'Koala Habitat Protection' aims to encourage the conservation and management of areas of natural vegetation that provide habitat for koalas to ensure a permanent free-living population over their present range, and reverse the current state trend of koala population decline. SEPP 44 applies to the Lithgow Local Government Area (LGA).

1.8.7 NSW Noxious Weeds Act 1993

The *NSW Noxious Weeds Act 1993* provides for the identification and classification for noxious weeds in each NSW LGA. The Act imposes obligations on occupiers of land to control noxious weeds declared for their LGA.

1.8.8 Groundwater Dependent Ecosystems Policy 2002

The definitions for Groundwater Dependent Ecosystems (GDEs) have been adopted based on the following three literature sources:

- The NSW State Groundwater Dependent Ecosystems Policy (Department of Land and Water Conservation 2002) defines GDEs as: '*Ecosystems which have their species composition and their natural ecological process determined by groundwater*' (ARNCANZ & ANZECC, 1996 as cited in DLWC,

2002).

- Identifying groundwater dependent ecosystems, a guide for land and water managers (Eamus 2009) defines GDEs as: '*ecosystems whose current composition, structure and function are reliant on a supply of groundwater*'.
- Risk assessment guidelines for groundwater dependent ecosystems (Serov et al. 2012) defines GDEs as: '*any ecosystem that uses groundwater at any time or for any duration in order to maintain its composition and condition*'.

As defined by Eamus (2009) GDEs are; 'ecosystems whose current composition, structure and function are reliant on a supply of groundwater. This reliance might be expressed every day of the year, or only for a few months every few years, but the reliance becomes apparent when the supply of groundwater is removed for a sufficient length of time that changes in plant function (typically rates of water use decline first) are observable'.

Vegetation within the Study Area that is dependent on sub-surface flows (i.e. have rooting zones which overlap the sub-surface water interface such as floodplain vegetation) or are located such that surface flows originate from sub-surface flows (i.e. areas of impeded drainage) are all classified as GDEs.

1.8.9 Guidelines for developments adjoining land managed by the Office of Environment and Heritage (2013)

The goal of these guidelines is to guide consent and planning authorities when assessing development applications that adjoin land managed by OEH. The aim of this advice is to avoid and minimise any direct or indirect adverse impacts on this land. The guidelines will also be of assistance to planning authorities in the development of environmental planning instruments (such as local environmental plans) applying to land adjoining, or in the vicinity of, land managed by OEH. The Study Area does not directly adjoin any OEH estate. However, reference has been made to it because it was in the SEARS.

1.9 Qualifications

This report was written by Mrs Lauren Eather BSc. and reviewed by Mr Mark Aitkens BSc. of RPS.

1.10 Licensing

Research was conducted under the following licences:

- NSW National Parks and Wildlife Scientific Investigation Licence S100536 (Valid 30 November 2016);
- Animal Research Authority (Trim File No: 16/361) issued by NSW Department of Primary Industries (Valid 21 March 2017);
- Animal Care and Ethics Committee Certificate of Approval (Trim File No: 16/361) issued by NSW Department of Primary Industries (Valid 21 March 2019);
- Certificate of Accreditation of a Corporation as an Animal Research Establishment (Trim File No: 01/1522 & Ref No: AW2001/014) issued by NSW Agriculture (Valid 22 May 2017); and
- Forestry Corporation of NSW Forest Permit – Research (Licence number PB54359) (Valid 01 July 2016).

2.0 Methodology

Investigation methods, including desktop information sources and survey methods, are detailed in the following sections.

2.1 Guidelines and standards

2.1.1 Survey Guidelines

Surveys were performed using methods outlined in relevant guidelines as listed below:

- Threatened biodiversity survey and assessment: guidelines for development and activities - Working Draft (NSW Department of Environment and Conservation, 2004);
- Threatened Species Survey and Assessment Guidelines: Field Survey Methods for Fauna – Amphibians (DECC 2009);
- NSW BioBanking Assessment Methodology (OEH 2016b), including the consideration of An operational method to assess impacts of land clearing on terrestrial biodiversity (BioMetric) (Gibbons et al. 2009)
- Survey guidelines for Australia's threatened mammals (DEWHA, 2011a);
- Survey guidelines for Australia's threatened birds (DEWHA, 2010b);
- Survey guidelines for Australia's threatened bats (DEWHA, 2010c);
- Survey guidelines for Australia's threatened reptiles (DEWHA, 2011b); and
- Survey guidelines for Australia's threatened frogs (DEWHA, 2010a).

Amendments to the BBAM (OEH 2014b), as introduced by the FBA for assessing development under Part 4 Division 4.1 of the EP&A Act (State Significant Development), is also recognised and has been referred to in preparing this report. Some methods have been varied, where necessary, to suit species, populations and communities identified as relevant to the Project.

2.1.2 Identification guidelines

The following documents were used to identify the presence of listed threatened ecological communities (TECs) within the site:

- Approved Conservation Advice (including listing advice) for the Natural Temperate Grassland of the South Eastern Highlands (Threatened Species Scientific Committee 2016);
- Approved Conservation Advice (including listing advice) for the Upland Basalt Eucalypt Forests of the Sydney Basin Bioregion (Threatened Species Scientific Committee 2011);
- Commonwealth listing advice and conservation advice on White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland (TSSC 2006);
- EPBC Act policy statement 3.5 - White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grasslands (DEH 2006a);
- EPBC Act policy statement 3.5 - White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grasslands: Species list (DEH 2006b);
- Identification Guidelines for Endangered Ecological Communities: Tableland Basalt Forest in the Sydney Basin and South Eastern Highland Bioregions (DECCW 2010);
- Identification Guidelines for Endangered Ecological Communities: Montane Peatlands and Swamps of the New England Tableland, NSW North Coast, Sydney Basin, South East Corner, South Eastern

Highlands and Australian Alps bioregions (DECC 2008); and

- Newnes Plateau Shrub Swamp in the Sydney Basin Bioregion - endangered ecological community listing (NSW Scientific Committee Final determination 2005);
- Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland in the South Eastern Highlands, Sydney Basin, South East Corner and NSW South Western Slopes Bioregions - endangered ecological community listing (NSW Scientific Committee Final determination 2011).

2.1.3 Data Recording

A hand held Trimble differential global positioning system (D-GPS), accurate to less than one metre, was used to record the location of survey methodologies along with notable results including the location of threatened flora and/or fauna species.

2.1.4 Nomenclature

2.1.4.1 Plant taxonomy

Plant taxonomy used was consistent with the nomenclature of the Flora of NSW (Harden 1990-1993; 2000; 2002), except where more recent revisions have been published in recognised scientific journals and National Herbarium of New South Wales website (PlantNet web site <http://plantnet.rbgsyd.nsw.gov.au/>).

2.1.4.2 Fauna Taxonomy

Taxonomy and common names of fauna in this report were from the following sources.

- Mammals: Menkhorst and Knight (2010), Churchill (2008), Pennay et al. (2004).
- Birds: Simpson and Day (2010).
- Reptiles: Wilson and Swan (2010).
- Frogs: Tyler and Knight (2009).

2.1.4.3 Plant Community Types (PCTs)

The assigning of PCTs to describe mapped vegetation cover was in accordance with the NSW Vegetation Types Database (OEH 2016a). Published scientific literature, where available, was used to aid in the interpretation of this database (e.g. referenced source documents).

2.2 Desktop Assessment

2.2.1 Literature

Gray literature was reviewed in preparing the background analysis of the sites biodiversity values. Information sources reviewed are listed below:

- RPS (2011) Flora and Fauna Assessment for Proposed Longwalls 416 and 417. Prepared for Springvale Coal Pty Limited;
- RPS (2012) Flora and Fauna Assessment for Proposed Surface Mine Dewatering Facility Bore 8. Prepared for Springvale Coal Pty Limited;
- RPS (2014a) Springvale to Mount Piper Conveyor Duplication Project: Impact Assessment. Draft report.
- RPS (2014b) Flora and Fauna Assessment for Proposed Springvale Mine Extension Project. Prepared for Springvale Coal Pty Limited;

- Fauna monitoring reports for the subsidence management plan area at Springvale Colliery (2004 - 2012). Unpublished reports to Springvale Coal Pty Limited from Mount King Ecological Surveys (MKES) (2004 - 2008) and Biodiversity Monitoring Services (BMS) (2009 - 2012);
- Fauna monitoring within the subsidence management plan area at Angus Place Colliery from 2004 to 2012. Unpublished reports to Centennial Coal by Mount King Ecological Surveys (2004-2009) and Biodiversity Monitoring Services (BMS) (2010-2012);
- Fauna monitoring within the subsidence management plan area at Clarence Colliery from 2004 to 2012. Unpublished reports to Centennial Coal by Mount King Ecological Surveys (2008) and Biodiversity Monitoring Services (2009-2010);
- Unpublished results from flora and fauna surveys conducted partly along this Study Area; and
- Vegetation of the Western Blue Mountains – including the Capertee, Coxs, Jenolan and Gurnang Areas (DEC 2006).

2.2.2 Biodiversity Databases

A review of relevant information was performed to gain an understanding of ecological values occurring or potentially occurring within the site. Information sources reviewed for a 10 km radius of the site (i.e. locality) included:

- Fauna and flora records contained in the Office of Environment and Heritage (OEH) Atlas of NSW Wildlife that may occur within the locality (OEH 2016); and
- Fauna and flora records contained in the Department of the Environment (DoE) Protected Matters Search tool that may occur within the locality (DoE 2016a).

The results of these database searches formed the basis for a preliminary 'likelihood of occurrence' assessment. This assessment was used as a framework for determining investigation methods necessary for performing adequate site investigation (i.e. determine target species and appropriate investigation methods).

2.2.3 Spatial Datasets

The following spatial datasets were interrogated to evaluate landscape condition of the Study Area:

- Geographic Information System (GIS) data including (but not limited to) aerial photography, topographic maps and Soil Landscapes;
- Mitchell Landscapes (NPWS 2003);
- IBRA Region and subregion mapping (IBRA7); and
- Vegetation of the Western Blue Mountains – including the Capertee, Coxs, Jenolan and Gurnang Areas (DEC 2006).

In addition, the latest aerial photography was inspected to qualitatively appreciate the currency / accuracy of these spatial datasets.

2.3 Survey Design

2.3.1 Survey Stratification

Biological data was systematically collected through surveys performed in accordance with a stratified sampling regime (DEC, 2004), which is described by the NSW Office of Environment and Heritage (OEH) as:

"A logical, objective and efficient method of undertaking surveys and ensures that the full range of potential habitats and vegetation types will be systematically sampled" (OEH 2014).

Stratification units were determined through aerial photography interpretation; a visual method commonly used to objectively identify areas of homogenous land cover suitable for classification purposes (e.g. woodland, open woodland, shrubland and grassland).

2.3.2 Timing

Surveys were performed in 2015 and 2016 for both proposed pipeline alignments from 7-13 December 2015, 4 January 2016, 11-14 January 2016, 18-22 April 2016 and 2-6 May 2016.

2.4 Likelihood of Occurrence

A preliminary likelihood of occurrence analysis was performed prior to field surveys for the purpose of guiding investigation methods and effort. This analysis was reviewed and updated following the completion of field investigations. Four 'likelihood of occurrence' categories were attributed to threatened biodiversity as outlined in **Table 1**.

Table 1 Likelihood of Occurrence Criteria

Likelihood Rating	Threatened Flora Criteria	Threatened and Migratory Fauna Criteria
Known	The species was observed within the Study Area.	The species was observed within the Study Area.
Likely	PCT and micro-habitat conditions present. Habitat condition moderate to high. Species recorded within locality.	PCT and micro-habitat conditions present. Habitat condition moderate to high and likely to support important lifecycle processes such as breeding. Species recorded within locality.
May	Based on broad habitat predictor (i.e. PCT). Habitat condition low (i.e. micro-habitat conditions either disturbed or of limited suitability). Species records may not occur within locality.	Based on broad habitat predictor (i.e. PCT). Habitat condition low (i.e. micro-habitat conditions either disturbed or of limited suitability). Species records may not occur within locality. If present, the species would likely be a transient visitor and unlikely to rely on habitat for important lifecycle processes.
Unlikely	Habitat unsuitable for the species.	Habitat unsuitable for the species.

Habitat descriptions for each species were generally obtained from the online Threatened Species Profile Database (OEH 2016).

2.5 Flora Surveys

2.5.1 Vegetation Mapping

DECC (2006) was used as the basis for guiding preliminary vegetation mapping and survey stratification (i.e. flora and fauna) for the Study Area. This vegetation mapping was updated where improved vegetation boundary and/or classification accuracy is available (i.e. prior RPS surveys). Preliminary vegetation was field validated using BioBanking plots, transects and random meanders and updated where necessary to produce vegetation zones as described in the BBAM (OEH 2014b).

2.5.2 Field Investigation Techniques

2.5.2.1 BioBanking Plots

Vegetation plots and transects were undertaken in accordance with BioBanking Assessment Methodology (OEH 2014b), as amended by FBA (OEH 2014), to delineate vegetation zones and corresponding plant community type (PCT). BioBanking plots comprise a detailed investigation of a 50 m X 20 m area (i.e. 1,000 m²) to measure 10 variables, as indicated below:

- Native plant species richness (NPSR);

- Native Overstorey Cover;
- Native Midstorey Cover;
- Native Groundcover Grasses;
- Native Groundcover Shrubs;
- Native Groundcover Other;
- Exotic Species;
- Overstorey Regeneration;
- Fallen Log Length; and
- Number of Hollow-bearing Trees.

Survey effort was performed in accordance with BBAM 2014 as detailed in **Table 2**.

Table 2 BioBanking Plot Survey Effort

Vegetation Community	Northern Alignment	Southern Alignment	Total Number of BB Plots*
MU 7 Newnes Plateau Narrow-leaved Peppermint - Mountain Gum - Brown Stringybark Layered Forest	1	2	2
MU 8 Newnes Sheltered Peppermint – Brown Barrel Shrubby Forest	1	1	2
MU 11 Tableland Gully Snow Gum - Ribbon Gum Montane Grassy Forest	2	1	2
MU 26 Newnes Plateau Narrow-leaved Peppermint - Silver-top Ash Layered Open Forest	3	3	4
MU 28 Sandstone Plateau and Ridge Scribbly Gum – Silvertop Ash Shrubby Woodland	-	2	2
MU 29 Sandstone Slopes Sydney Peppermint Shrubby Forest	-	1	1
MU 33 Tableland Broad-leaved Peppermint - Brittle Gum - Red Stringybark Grassy Open Forest	1	1	1
MU 35 Tableland Gully Mountain Gum – Broad-leaved Peppermint Grassy Forest	0	0	0
MU 37 Cox's Permian Red Stringybark - Brittle Gum Woodland	2	2	2
MU 43 Pagoda Rock Sparse Shrubland	0	1	1
MU 44 Sandstone Plateaux Tea Tree - Dwarf Sheoak - Banksia Rocky Heath	0	1	1
MU 53 Mountain Hollow Grassy Fen	1	1	1
MU 58 Acacia Thickets	4	4	4
MU 59 Non-native Vegetation – Pine Plantation / Woodlot / Shelter	0	0	0
MU 62 Cleared/disturbed lands	1	1	1
Total	16	21	24

*Note that some plots are overlapping due to the northern and southern alignments covering the same area.

2.5.2.2 [Flora Inventory](#)

NPSR and exotic plant species were recorded within a 400 m² plot nested within the 1,000 m² BioMetric plot. Cover abundance for each plant species was estimated and recorded, as outlined below in **Table 3**.

Table 3 Floristic Survey Data Collected within the Flora Quadrat

Attribute	Survey Requirement
Stratum (& layer)	Stratum & layer in which each species occurs
Growth form	Growth form for each recorded species
Species name	Scientific name and common name
Cover	A measure or estimate of the appropriate cover measure for each recorded species; recorded from 1–5% and then to the nearest 5%. If the cover of a species is less than 1% and the species is considered important, then the estimated cover should be entered (e.g. 0.4)
Abundance rating	A relative measure of the number of individuals or shoots of a species within the plot. Use the following intervals; numbers above about 20 are estimates only: 1,2,3,4,5,6,7,8,9,10,20,50,100,500,1000 or specify a number greater than 1000 if required

2.5.2.3 Targeted Surveys

Targeted searches for flora species of conservation significance were performed within potential habitat using the *Random Meander Technique* (Cropper 1993). Plant specimens of unknown or significant status were collected for later identification or lodgement with the National Herbarium in Sydney.

2.5.3 Site Value Scores

Table 4 below provides a qualitative description for site value scores generated from BioBanking plot data for mapped vegetation zones.

Table 4 Descriptions of Site Value Scores

Site Value Score	Condition	Description
0-34	Low condition	Woody vegetation that is likely to have no overstorey or mid-storey. Weed cover is likely to be high. Native plant species richness is low. Requires substantial and sustained management for regeneration/ recovery. Scores below 20 are likely to represent vegetation and habitat that is no longer characteristic of a native plant community type.
>34-45	Moderate/ good (poor)	Vegetation and habitat demonstrating impaired condition with clear evidence of effects from past or present impacts/ threats. Requires routine, landscape wide management to assist regeneration/ recovery (e.g. management of weeds and feral fauna).
>45-69	Moderate/ good (medium)	Vegetation and habitat demonstrating resilient condition capable for recovering without assistance other than for the removal of threats. Generally requires targeted management to facilitate improved condition (e.g. targeted weed removal).
>70-100	Moderate/ good (high)	Vegetation and habitat close to benchmark condition. Limited ecological benefit would be gained through management.

2.6 Fauna Surveys

Fauna surveys were conducted within the Study Area using formal and informal survey techniques. Fauna surveys included:

- Terrestrial and arboreal Elliott trapping;
- Hair tube trapping;
- Infrared camera surveys;
- Microbat echolocation call recording;
- Avifauna surveys; herpetofauna surveys;
- Call playback;
- Spotlighting;
- Secondary indications (e.g. scats, scratches and diggings); and
- Incidental observations.

Surveys were conducted on foot and by vehicle, with all species observations and evidence of fauna presence recorded. A description of survey timing, effort and methods is provided in the following sections.

2.6.1 Survey Dates and Weather Conditions

Fauna surveys were undertaken over three weeks from 7-11 December 2015, 18-22 April 2016 and 2-6 May 2016. Survey dates, methods and weather conditions is provided in **Table 5**.

Table 5 Survey Dates, Methods, Weather Conditions, Sunrise/ Sunset and Methods

Date	Temp Min-Max (°C)	Rain (24 hrs to 9:00am) (mm)	Sun Rise - Sun Set	Surveys Undertaken							
				Vegetation & Targeted Flora Surveys	Elliott and Hair Traps	Infra Red Camera	AnaBat	Bird Census	Spotlighting	Call Playback	General Fauna / Opportunistic Surveys
7 Dec 2015	8.5-27.6	0	04:42-18:59	x	x	x	x				x
8 Dec 2015	12.0-26.7	0	04:42-19:00	x	x	x	x	x	x	x	x
9 Dec 2015	16.6-28.6	5.6	04:43-19:00	x	x	x	x	x	x	x	x
10 Dec 2015	13.9-28.9	8.8	04:43-19:01	x	x	x	x	x			x
11 Dec 2015	11.9-26.8	0	04:43-19:02	x	x	x	x				x
12 Dec 2015	7.0-24.5	0	04:43-19:03	x							x
13 Dec 2015	12.1-26.3	0	04:43-19:03	x							x
4 Jan 2016	12.9-17.4	9.2	04:45-19:13	x							x
11 Jan 2016	14.5-32.0	0	05:01-19:13	x							x
12 Jan 2016	15.0-31.5	0.4	05:02-19:13	x							x
13 Jan 2016	12.1-33.8	0	05:03-19:13	x							x
14 Jan 2016	21.2-32.5	0	05:04-19:13	x							x
18 April 2016	10.9-18.5	0.2	06:24-17:34		x	x	x				x
19 April 2016	12.0-20.7	0.6	06:25-17:32		x	x	x	x	x	x	x
20 April 2016	7.1-22.0	0	06:25-17:31		x	x	x	x	x	x	x
21 April 2016	8.1-23.8	0	06:26-17:30		x	x	x	x			x
22 April 2016	5.5-20.2	0	06:27-17:29		x	x	x				x

Date	Temp Min-Max	Rain (24 hrs to 9:00am)	Sun Rise - Sun Set	Surveys Undertaken							
2 May 2016	4.0-18.3	0	06:34-17:18	x	x	x	x			x	x
3 May 2016	6.9-17.7	0	06:35-17:18	x	x	x	x	x	x	x	x
4 May 2016	10.4-18.2	0	06:36-17:17	x	x	x	x	x			x
5 May 2016	0.1-19.6	0	06:37-17:16	x	x	x	x	x			x
6 May 2016	2.5-NA	0	06:37-17:15	x	x	x	x				x

Source: BOM (2016) <http://www.bom.gov.au/climate/dwo/201605/html/IDCJDW2075.201605.shtml>

Geoscience Australia (2016):

http://www.ga.gov.au/bin/geodesy/run/gazmap_sunrise?placename=Lithgow&placetype=0&state=0#loc

2.6.2 Survey Effort

In total, seven survey sites were selected in different stratification units as shown in **Figures 5** and **6** for the Northern and Southern Study Area respectively. Targeted surveys were also performed to map hollow-bearing trees. Survey effort for the northern and southern alignments is provided in **Tables 6** and **7** respectively.

2.6.3 Field Investigation Techniques

2.6.3.1 Terrestrial Trapping

Terrestrial traps targeted small terrestrial mammals such as dasyurids (e.g. Antechinus and Dunnarts) and rodents (e.g. rats and mice). Elliott traps were baited with a mixture of rolled oats, peanut butter and honey. Traps were checked within two hours of sunrise each morning, with any captures identified and released at point of capture and any traps re-baited. The locations of the trap lines focused on stratification units as well as areas consisting of understorey that would provide protection for terrestrial mammal species.

2.6.3.2 Arboreal Trapping

Arboreal traps targeted arboreal mammals such as the threatened Squirrel Glider (*Petaurus norfolcensis*) which has been previously recorded from the surrounding area. Traps were mounted on brackets set at approximately two metres high on trees with a diameter at breast height greater than 30 cm. Traps were baited with a rolled oats, peanut butter and honey mixture and the tree trunks were sprayed liberally with a brown sugar and water mix each day in the late afternoon. Similarly to terrestrial trapping efforts, traps were checked within two hours of sunrise each morning.

2.6.3.3 Hair Tubes

Surveys were undertaken using Faunatech Hair Tubes within the designated traplines, baited with rolled oats, peanut butter and honey. A combination of 10 terrestrial hair tubes and 10 arboreal hair tubes were set. Hair tubes targeted small-medium sized mammals such as dasyurids (e.g. antechinus and dunnarts), rodents (e.g. rats and mice), gliders and bandicoots.

Table 6 Survey Effort and Stratification Units for Northern Alignment

Fauna Stratification Unit	Vegetation Community	Area (Ha) of Fauna Stratification Unit	Number of Terrestrial Elliot A and B Trap Nights	Number of Arboreal Trap Nights	Number of Hair Tube Trap Nights	Anabats (nights)	Infrared Camera (nights)	Call Playback	Bird Census	Spot Lighting (hours)
Group 1	MU 7 Newnes Plateau Narrow-leaved Peppermint - Mountain Gum - Brown Stringybark Layered Forest	6.56	0 ¹	0 ¹	0 ¹	0 ¹	0 ¹	0 ¹	0 ¹	0 ¹
	MU 26 Newnes Plateau Narrow-leaved Peppermint - Silver-top Ash Layered Open Forest									
	MU 29 Sandstone Slopes Sydney Peppermint Shrubby Forest									
Group 2	MU 8 Newnes Sheltered Peppermint – Brown Barrel Shrubby Forest	1.43	200	24	80	2	4	1	2	4
Group 3	MU 11 Tableland Gully Snow Gum - Ribbon Gum Montane Grassy Forest	1.60	400	48	160	4	4	1	1	2
Group 4	MU 33 Tableland Broad-leaved Peppermint - Brittle Gum - Red Stringybark Grassy Open Forest	31.03	200	24	80	2	4	1	2	6
	MU 35 Tableland Gully Mountain Gum – Broad-leaved Peppermint Grassy Forest									
	MU 37 Cocks Permian Red Stringybark - Brittle Gum Woodland									
	MU 58 Acacia Thickets									
	MU 62 Cleared/Disturbed Lands	44.85	0	0	0	0	0	0	0	4
Total			800	96	320	8	12	5	5	16

¹ See **Table 7** for survey effort performed in this stratification unit

Table 7 Survey Effort and Stratification Units for Southern Alignment

Fauna Stratification Unit	Vegetation Community	Area (Ha) of Fauna Stratification Unit	Number of Terrestrial Elliot A and B Trap Night	Number of Arboreal Trap Nights	Number of Hair Tube Trap Nights	Anabats (nights)	Infrared Camera (nights)	Call Playback	Bird Census	Spot Lighting (hours)
Group 1	MU 7 Newnes Plateau Narrow-leaved Peppermint - Mountain Gum - Brown Stringybark Layered Forest	7.35	200	24	80	4	8	1	3	4
	MU 26 Newnes Plateau Narrow-leaved Peppermint - Silver-top Ash Layered Open Forest									
	MU 29 Sandstone Slopes Sydney Peppermint Shrubby Forest									
Group 2	MU 8 Newnes Sheltered Peppermint – Brown Barrel Shrubby Forest	0.38	0 ²	0	0	0	0	0	0	0
Group 3	MU 11 Tableland Gully Snow Gum - Ribbon Gum Montane Grassy Forest	1.68	200	24	80	2	4	0	1	6
Group 4	MU 33 Tableland Broad-leaved Peppermint - Brittle Gum - Red Stringybark Grassy Open Forest	31.16	200	24	80	2	4	1	1	6
	MU 35 Tableland Gully Mountain Gum – Broad-leaved Peppermint Grassy Forest									
	MU 37 Cocks Permian Red Stringybark - Brittle Gum Woodland									
	MU 58 Acacia Thickets									
Group 5	MU 28 Sandstone Plateau and Ridge Scribbly Gum – Silvertop Ash Shrubby Woodland	4.47	200	24	80	2	8	1	1	0
Group 6	MU 43 Pagoda Rock Sparse Shrubland	0.37	200	24	80	2	4	1	2	0
	MU 44 Sandstone Plateaux Tea Tree - Dwarf Sheoak - Banksia Rocky Heath									
	MU 62 Cleared and Disturbed Lands	47.10	0	0	0	0	0	0	1	0
Total			1000	120	400	12	28	4	9	16

² See **Table 6** for survey effort performed in this stratification unit

2.6.3.4 [Bat Echolocation Call Recording](#)

Microbat echolocation calls were recorded using an Anabat II Detector and CF ZCAIM unit at each Elliott trapline. Recorders were set in potential flyways to remotely record the echolocation calls of microchiropteran bats for the entire night (6pm to 6am). Recordings were analysed by microbat specialist Dr Anna McConville from Echo Ecology. Each call sequence ('pass') was assigned to one of three categories, according to the confidence with which identification could be made, being:

- Definite - pass identified to species level and could not be confused with another species;
- Probable - pass identified to species level and there is a low chance of confusion with another species; or
- Possible - pass identified to species level, but short duration or poor quality of the pass increases the chance of confusion with another species.

2.6.3.5 [Diurnal Avifauna Survey](#)

The observation of avifauna within the Study Area was via systematic diurnal censuses and opportunistic surveys during all field work. During a systematic census, all birds occurring at that location were identified during a 20 minute period. Birds were identified by direct observation, recognition of calls or through detection of distinctive features such as nests, feathers, and owl regurgitation pellets. The potential for threatened avifauna to use the Study Area was also assessed by identification of habitat attributes and their capacity to support threatened species that are known to occur in the wider locality.

2.6.3.6 [Herpetofauna Survey](#)

Targeted and opportunistic herpetofauna searches were conducted within the Study Area across a diverse range of habitats. Herpetofauna searches involved inspecting rock crevices, caves and overhangs, raking leaf litter and turning logs, rocks and other debris. Where present, water bodies were inspected diurnally and nocturnally for the presence of amphibians.

2.6.3.7 [Spotlighting](#)

Spotlighting was undertaken across the Study Area to identify roosting birds or active nocturnal birds and mammals. Ecologists used 75-Watt hand-held spotlights and head torches during walking and/or from a vehicle moving at a speed of 1km/hour.

2.6.3.8 [Call Playback](#)

Pre-recorded calls of owl and nocturnal mammal species with the potential to occur across the Study Area were broadcast during the surveys in an effort to elicit vocal responses or to attract fauna to the playback site. The calls were broadcast through an amplification system (loud hailer) designed to Project the sound for at least 1 km under still night conditions.

As described by Kavanagh and Peake (1993) and Debus (1995), the call of each species was broadcast for at least five minutes, followed by five minutes of listening, and stationary spotlighting. Following the final broadcast and listening, the area was spotlighted on foot. Species targeted included the Powerful Owl (*Ninox strenua*), Barking Owl (*N. connivens*), Sooty Owl (*Tyto tenebricosa*) and Masked Owl (*T. novaehollandiae*).

2.6.3.9 [Infrared Camera Surveys](#)

Infrared cameras were set up in suitable habitat within the Study Area. The cameras are designed to detect motion and take photographs when movement triggers the sensor. Each camera is secured to a tree approximately 1.5 m from the ground. Tinned cat food was placed approximately 1 m in front of the camera on

the ground as bait. Camera traps have been used to replace cage traps as they are considered to be less invasive and more successful. Target species included the Spotted-tailed Quoll (*Dasyurus maculatus maculatus*).

2.6.3.10 Secondary Indications and Incidental Observations

Opportunistic sightings of secondary indications of resident fauna were noted. The following indicators were sought during surveys:

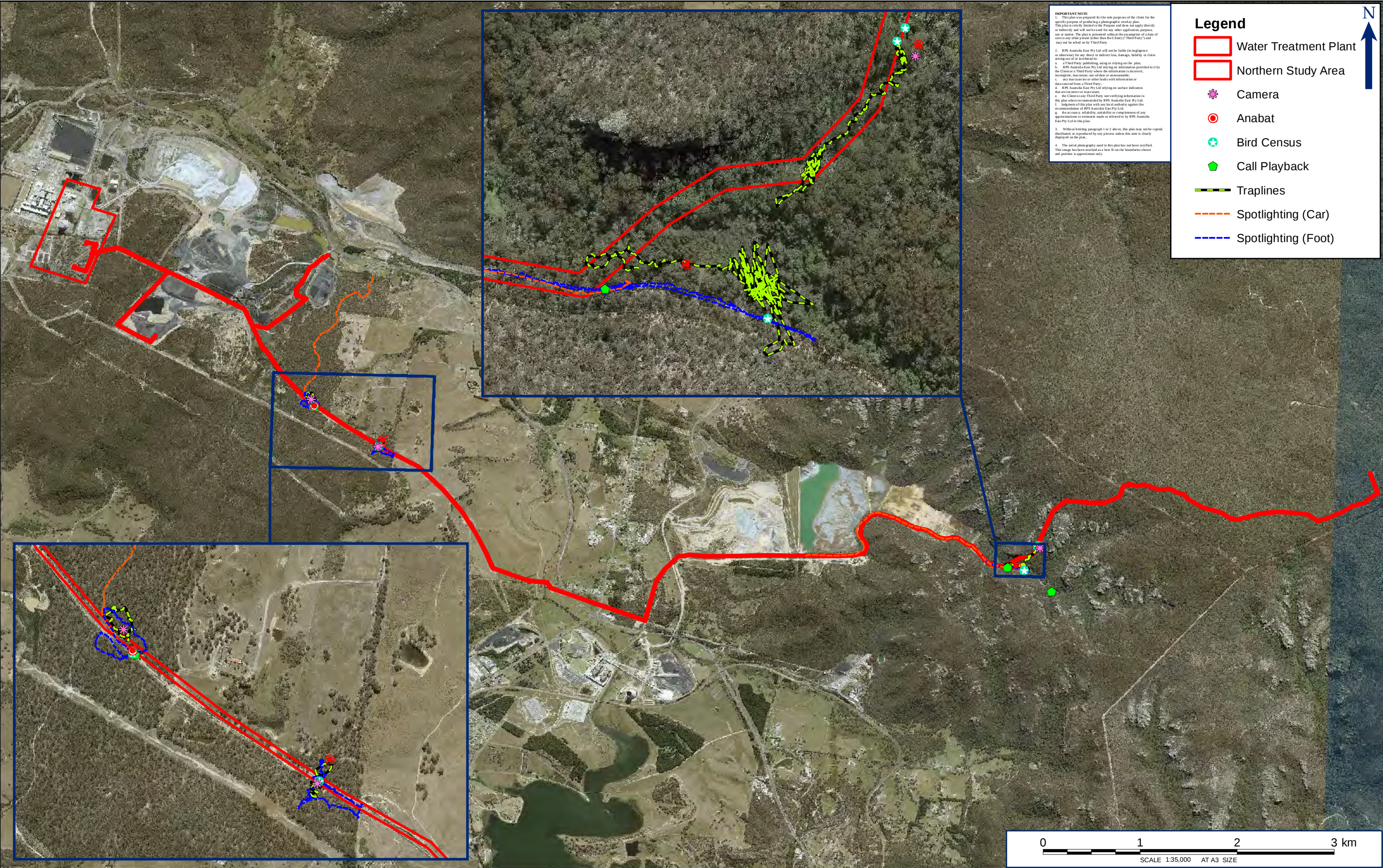
- Distinctive scats and scents left by mammals;
- Burrows;
- Feather, fur remains, skin and skeletal material of vertebrate fauna ;
- Tracks, scratches or diggings;
- Nests made by various guilds of birds;
- Whitewash, regurgitation pellets and prey remains from owls;
- Chewed she-oak (*Allocasuarina* spp.) cones indicative of feeding by Glossy Black-Cockatoo (*Calyptorhynchus lathamii*); and
- Chewed fruit remains indicative of past feeding by frugivorous birds such as fruit-doves.

2.6.4 **Habitat Assessment**

An assessment of the relative habitat value present within the Study Area was undertaken. This assessment focused primarily on the identification of specific habitat types and resources in the Study Area favoured by known threatened species from the region. The assessment also considered the potential value of the Study Area (and surrounds) for all major guilds of native flora and fauna. Habitat assessment included:

- Presence, size and types of tree hollows;
- Presence of rocks, logs, caves, rocky outcrops, leaf litter, overhangs and crevices;
- Vegetation complexity, structure and quality;
- Presence of freshwater or estuarine aquatic habitats, noting permanency;
- Connectivity to adjacent areas of habitat;
- Extent and types of disturbance;
- Presence of foraging opportunities such as flowering eucalypts, fruits, seeds or other nectar bearing native plants; and
- Presence and abundance of various potential prey species.

Habitat assessment was based on the specific habitat requirements of each threatened fauna species in regards to home range, feeding, roosting, breeding, movement patterns and corridor requirements. Consideration was given to contributing factors including topography, soil, light and hydrology for threatened flora and assemblages.



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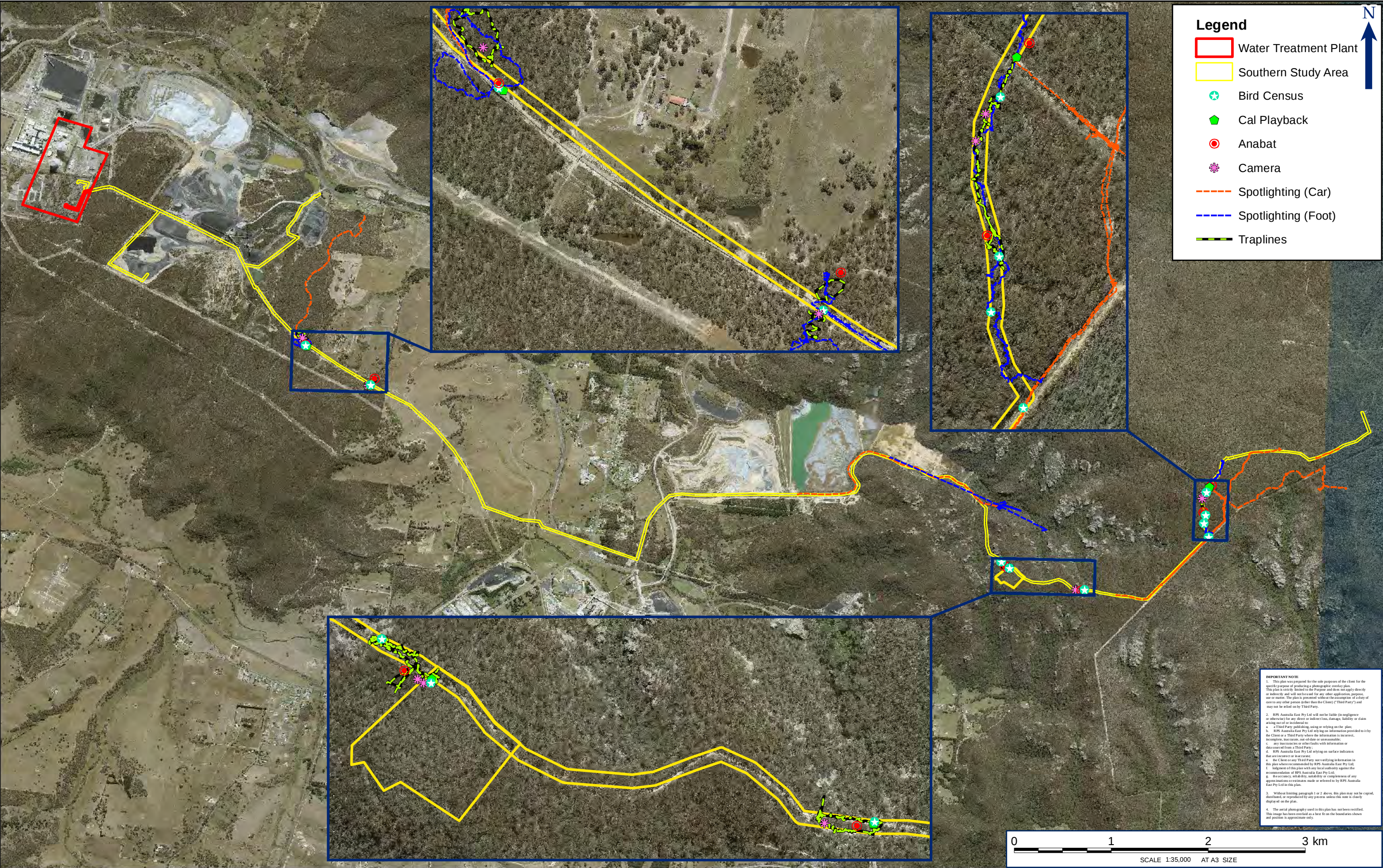
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- Legend**
- Water Treatment Plant
 - Northern Study Area
 - Camera
 - Anabat
 - Bird Census
 - Call Playback
 - Traplines
 - Spotlighting (Car)
 - Spotlighting (Foot)



Legend

- Water Treatment Plant
- Southern Study Area
- Bird Census
- Cal Playback
- Anabat
- Camera
- Spotlighting (Car)
- Spotlighting (Foot)
- Traplines

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2.7 Survey Limitations

2.7.1 Seasonality

The effects of seasonality have been addressed, where possible, through a review of relevant literature and through a likelihood of occurrence analysis. Identification of potential habitats for flora and fauna species and assessment of the potential for targeted species to occur on the Study Area based on:

- Previous records;
- The type and condition of habitats present;
- The land use throughout the Study Area and surrounds; and
- The landscape context.

The precautionary principle was applied where marginal habitat was identified or predicted to occur or where species are migratory or nomadic and were therefore likely to utilise habitat components at some stage during their life cycle.

2.7.1.1 Flora

Survey timing is important for detecting cryptic plant species, such as annuals, which are present in the seed bank for much of the year. Other plant species are perennial but are inconspicuous or difficult to identify unless flowering. The survey timing and flowering period for targeted threatened flora species is shown in **Table 8**.

Table 8 Threatened Flora Species with Potential to Occur within the Study Area, Flowering Periods (shaded) and Recommended Survey Timing (seasonality)

Threatened Flora Species	Recommended Survey Time	Flowering Period in Months of the Year											
		January	February	March	April	May	June	July	August	September	October	November	December
<i>Acacia meiantha</i>	Survey Anytime												
<i>Caesia parviflora</i> var. <i>minor</i>	Survey During Flowering	*											*
<i>Veronica blakelyi</i>	Survey Anytime	*											*
<i>Dillwynia tenuifolia</i>	Survey Anytime	*											*
<i>Eucalyptus cannonii</i>	Survey Anytime	*				*							*
<i>Eucalyptus aggregata</i>	Survey Anytime	*				*							*
<i>Eucalyptus cannonii</i>	Survey Anytime	*											
<i>Eucalyptus pulverulenta</i>	Survey Anytime												
<i>Genoplesium superbum</i>	Survey During Flowering	*											*
<i>Leucopogon fletcheri</i> subsp. <i>fletcheri</i>	Survey Anytime												
<i>Lastreopsis hispida</i>	Survey Anytime	*				*							*
<i>Leucochrysum albicans</i> var. <i>tricolor</i>	Survey Anytime	*											*
<i>Persoonia acerosa</i>	Survey Anytime	*				*							*
<i>Persoonia hindii</i>	Survey Anytime	*											
<i>Persoonia marginata</i>	Survey Anytime	*				*							*
<i>Prostanthera cryptandroides</i> subsp. <i>cryptandroides</i>	Survey Anytime	*				*							*
<i>Thesium australe</i>	Survey Anytime	*											*

Note: * = Timing of flora surveys

2.7.1.2 Fauna

Similarly, some fauna species that have been recorded in the local area occur on a seasonal or migratory basis, may be absent from the locality for much of the year. Fauna behaviours may have also affected detection; species that are easily disturbed or cryptic may not have been detected during surveys. It is possible that a number of flora and fauna species occurring in the Study Area were not detected during the current survey due to the above factors.

2.7.2 **Data Availability and Accuracy**

The accuracy and reliability of threatened flora and fauna species records for the region, as provided by NSW Atlas of Wildlife Database or BioNet (OEH 2016) is variable. 'Reliable' data extracted from BioNet was limited to records with a reported accuracy of less than 100 m. Data with positional accuracy exceeding 100 m was used at a landscape scale. Data recorded by RPS during the survey period, has been gathered with a Trimble Differential GPS unit, which is capable of sub-metre accuracy following post processing.

3.0 Results

3.1 Desktop Review

3.1.1 Database Searches

The results of database searches using the OEH Atlas of NSW Wildlife (Accessed May 2016) and the EPBC Protected Matters Search (Accessed April 2016) identified 29 threatened flora species, 52 threatened fauna species and seven Endangered Ecological Communities (EECs) within the locality. These species are listed in **Table 9** below.

Table 9 Threatened Flora and Fauna within 10km of the Study Area

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Record within 10 km
Flora					
Anthericaceae	<i>Caesia parviflora</i> var. <i>minor</i>	Small Pale Grass-lily	E	-	24
Araucariaceae	<i>Wollemia nobilis</i>	Wollemi Pine	CE	E	0
Asteraceae	<i>Leucochrysum albicans</i> var. <i>tricolor</i>	Hoary Sunray	-	E	0
Dryopteridaceae	<i>Lastreopsis hispida</i>	Bristly Shield Fern	E	-	1
Ericaceae	<i>Leucopogon fletcheri</i> subsp. <i>fletcheri</i>	-	E	-	7
Fabaceae (Faboideae)	<i>Acacia bynoeana</i>	Bynoe's Wattle	E	V	0
	<i>Acacia meiantha</i>	-	E	-	0
	<i>Dillwynia tenuifolia</i>	-	V	-	2
	<i>Pultenaea glabra</i>	Smooth Bush-pea	V	V	0
Geraniaceae	<i>Pelargonium</i> sp. <i>Striatellum</i> (G.W.Carr 10345)	Omeo Stork's-bill	-	E	0
Lamiaceae	<i>Prostanthera cryptandroides</i> subsp. <i>Cryptandroides</i>	Wollemi Mint-bush	V	V	1
Myrtaceae	<i>Eucalyptus aggregata</i>	Black Gum	V	V	211
	<i>Eucalyptus cannonii</i>	Capertee Stringybark	V	-	488
	<i>Eucalyptus pulverulenta</i>	-	V	V	3
	<i>Eucalyptus robertsonii</i> subsp. <i>Hemisphaerica</i>	Robertson's Peppermint	V	V	0
	<i>Homoranthus darwinoides</i>	-	V	V	0
Orchidaceae	<i>Cryptostylis hunteriana</i>	Leafless Tongue-orchid	V	V	0
	<i>Genoplesium superbum</i>	Superb Midge Orchid	E	-	13
	<i>Microtis angusii</i>	Angus's Onion Orchid	E	E	0
	<i>Prasophyllum petilum</i>	Tarengo Leek Orchid	E	E	0
	<i>Prasophyllum</i> sp. <i>Wybong</i> (C. Phelps ORG 5269)	-	-	CE	0
Orobanchaceae	<i>Euphrasia arguta</i>	-	CE	CE	0
Plantaginaceae	<i>Veronica blakelyi</i>	-	V	-	1410
Proteaceae	<i>Persoonia acerosa</i>	Needle Geebung	V	V	1
	<i>Persoonia hindii</i>	-	E	-	3560
	<i>Persoonia marginata</i>	Clandulla Geebung	V	V	78

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Record within 10 km
Rutaceae	<i>Asterolasia elegans</i>	-	E	E	0
	<i>Boronia deanei</i>	Deane's Boronia	V	V	192
Santalaceae	<i>Thesium australe</i>	Austral Toadflax	V	V	4
Amphibians					
Myobatrachidae	<i>Heleioporus australiacus</i>	Giant Burrowing Frog	V	V	0
	<i>Mixophyes balbus</i>	Stuttering Frog	E	V	1
	<i>Pseudophryne australis</i>	Red-crowned Toadlet	V	-	0
Hylidae	<i>Litoria booroolongensis</i>	Booroolong Frog	E	E	0
	<i>Litoria littlejohni</i>	Littlejohn's Tree Frog	V	V	4
Reptiles					
Elapidae	<i>Hoplocephalus bungaroides</i>	Broad-headed Snake	E	V	1
Pygopodidae	<i>Aprasia parapulchella</i>	Pink-tailed Worm-lizard	V	V	0
Scincidae	<i>Eulamprus leuraensis</i>	Blue Mountains Water Skink	E	E	276
Varanidae	<i>Varanus rosenbergi</i>	Rosenberg's Monitor	V	-	1
Birds					
Anatidae	<i>Oxyura australis</i>	Blue-billed Duck	V	-	10
Accipitridae	<i>Hieraaetus morphnoides</i>	Little Eagle	V	-	8
	<i>Lophoictinia isura</i>	Square-tailed Kite	V	-	1
Cacatuidae	<i>Callocephalon fimbriatum</i>	Gang-gang Cockatoo	V	-	345
	<i>Calyptorhynchus lathami</i>	Glossy Black-Cockatoo	V	-	13
Psittacidae	<i>Glossopsitta pusilla</i>	Little Lorikeet	V	-	7
	<i>Lathamus discolor</i>	Swift Parrot	E	E	0
Strigidae	<i>Ninox connivens</i>	Barking Owl	V	-	6
	<i>Ninox strenua</i>	Powerful Owl	V	-	43
Tytonidae	<i>Tyto novaehollandiae</i>	Masked Owl	V	-	2
	<i>Tyto tenebricosa</i>	Sooty Owl	V	-	2
Climacteridae	<i>Climacteris picumnus victoriae</i>	Brown Treecreeper	V	-	80
Acanthizidae	<i>Chthonicola sagittata</i>	Speckled Warbler	V	-	3
Meliphagidae	<i>Anthochaera phrygia</i>	Regent Honeyeater	CE	CE	0
	<i>Grantiella picta</i>	Painted Honeyeater	V	-	1
	<i>Melithreptus gularis gularis</i>	Black-chinned Honeyeater (eastern subspecies)	V	-	2
Pomatostomidae	<i>Pomatostomus temporalis temporalis</i>	Grey-crowned Babbler (eastern subspecies)	V	-	4
Neosittidae	<i>Daphoenositta chrysoptera</i>	Varied Sittella	V	-	56
Petroicidae	<i>Melanodryas cucullata cucullata</i>	Hooded Robin	V	-	9
	<i>Petroica boodang</i>	Scarlet Robin	V	-	328
	<i>Petroica phoenicea</i>	Flame Robin	V	-	478
Rostratulidae	<i>Rostratula australis</i>	Australian Painted Snipe	E	V	0
Estrildidae	<i>Stagonopleura guttata</i>	Diamond Firetail	V	-	1

Family	Scientific Name	Common Name	TSC Act	EPBC Act	Record within 10 km
Mammals					
Dasyuridae	<i>Dasyurus maculatus maculatus</i>	Spotted-tailed Quoll	V	E	8
Peramelidae	<i>Isodon obesulus obesulus</i>	Southern Brown Bandicoot	E	E	0
Phascolarctidae	<i>Phascolarctos cinereus</i>	Koala	V	V	5
Burramyidae	<i>Cercartetus nanus</i>	Eastern Pygmy-possum	V	-	16
Petauridae	<i>Petaurus australis</i>	Yellow-bellied Glider	V	-	2
	<i>Petaurus norfolcensis</i>	Squirrel Glider	V	-	6
	<i>Petauroides volans</i>	Greater Glider	-	V	225
Macropodidae	<i>Petrogale penicillata</i>	Brush-tailed Rock-wallaby	E	V	1
Molossidae	<i>Mormopterus norfolkensis</i>	Eastern Freetail-bat	V	-	1
Muridae	<i>Pseudomys novaehollandiae</i>	New Holland Mouse	-	V	1
Pteropodidae	<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	V	V	0
Emballonuridae	<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail-bat	V	-	7
Vespertilionidae	<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	V	V	22
	<i>Nyctophilus corbeni</i>	Corben's Long-eared Bat,	V	V	0
	<i>Falsistrellus tasmaniensis</i>	Eastern False Pipistrelle	V	-	20
	<i>Miniopterus schreibersii oceanensis</i>	Eastern Bentwing-bat	V	-	33
	<i>Scoteanax rueppellii</i>	Greater Broad-nosed Bat	V	-	7
	<i>Vespadelus troughtoni</i>	Eastern Cave Bat	V	-	5
Insects					
Lycaenidae	<i>Paralucia spinifera</i>	Bathurst Copper Butterfly	E	V	1892
Petaluridae	<i>Petalura gigantea</i>	Giant Dragonfly	E	-	38
Ecological Communities					
Montane Peatlands and Swamps of the New England Tableland, NSW North Coast, Sydney Basin, South East Corner, South Eastern Highlands and Australian Alps bioregions			E	-	NA
Newnes Plateau Shrub Swamp in the Sydney Basin Bioregion			E	-	
Natural Temperate Grassland of the South Eastern Highlands			-	CE	
Temperate Highland Peat Swamps on Sandstone			-	E	
Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland in the South Eastern Highlands, Sydney Basin, South East Corner and NSW South Western Slopes Bioregions			E	-	
Tableland Basalt Forest in the Sydney Basin and South Eastern Highland Bioregions (TSC Act)/ Upland Basalt Eucalypt Forests of the Sydney Basin Bioregion (EPBC Act)			E	E	
White Box – Yellow-box – Blakely's Red Gum Grassy Woodland (TSC Act) White Box – Yellow-box – Blakely's Red Gum Grassy Woodland and Derived native Grassland (EPBC Act)			E	CE	

Notes: V = Vulnerable Species
E = Endangered Species
CE = Critically Endangered Species
- = Not listed

Migratory terrestrial and wetland species listed under the EPBC Act have also been considered under this assessment. A Protected Matters Search was undertaken (accessed April 2016) which lists potential migratory species. **Table 10** displays the potentially occurring migratory species within a 10 km radius of the Study Area.

Table 10 Potentially Occurring Migratory Species within a 10 km Radius of the Study Area

Scientific Name	Common Name	EPBC Act Status
<i>Ardea alba</i>	Great Egret	M
<i>Ardea ibis</i>	Cattle Egret	M
<i>Gallinago hardwickii</i>	Latham's Snipe	M
<i>Hirundapus caudacutus</i>	White-throated Needletail	M
<i>Merops ornatus</i>	Rainbow Bee-eater	M
<i>Monarcha melanopsis</i>	Black-faced Monarch	M
<i>Motacilla flava</i>	Yellow Wagtail	M
<i>Myiagra cyanoleuca</i>	Satin Flycatcher	M
<i>Pandion haliaetus</i>	Eastern Osprey	M
<i>Rhipidura rufifrons</i>	Rufous Fantail	M

Key:

M Migratory

CE Critically Endangered

3.1.2 Landscape Context

The Study Area is located within the Wollemi and Capertee subregions of the Sydney Basin Interim Biogeographic Regionalisation for Australia (IBRA). Both subregions are generically described below:

Wollemi Subregion

“Geology consists of Hawkesbury Sandstone and equivalent quartz sandstones of Narrabeen Group, sub-horizontal bedding, strong vertical joint patterns with a few volcanic necks. Characteristic landforms include being the highest part of the Blue Mountains. Sandstone plateau with benched rock outcrops. Creek direction controlled by jointing deep gorge of the Capertee and Wolgan Rivers. Soils consist of thin sands or deep yellow earths on plateau, thin texture contrast soils on shale benches. Organic sands in swamps and joint crevices, bouldery slope debris below cliffs, sandy alluvium in pockets along streams.

Vegetation on plateaus and heaths includes the following tree species: *Corymbia gummiifera* (Red Bloodwood), *Corymbia eximia* (Yellow Bloodwood), *Angophora floribunda* (Rough-barked Apple), *Angophora costata* (Smooth-barked Apple), *Eucalyptus sclerophylla* (Hard-leaved Scribbly Gum), and *Eucalyptus punctata* (Grey Gum). *Angophora costata* (Smooth-barked Apple), *Eucalyptus piperita* (Sydney Peppermint), *Eucalyptus agglomerata* (Blue-leaved Stringybark) and *Syncarpia glomulifera* (Turpentine) occur in gully rainforest and canyon heads. Ribbon gum and *Eucalyptus blaxlandii* (Blaxland's Stringybark) occur on Basalt with *Casuarina cunninghamiana* (River Oak) occurring along main streams” (Morgan 2011 in OEH 2016b).

Capertee Subregion

“Geology consists of Permian shoalhaven Group conglomerates. Sandstones and shales with coal at the base of the Sydney Basin and exposure of underlying Devonian shale, siltstone or quartzite. Eastern margin of Narrabeen sandstone on cliffs. Characteristic landforms include wide valleys, low rolling hills below sandstone cliffs with isolated flat top mountains in the valleys formed as pinnacles or remnant pieces

of plateau. Steep, boulder debris slope below cliffs. Shoulder slopes with stone pillars or 'pagodas' above steep canyons on tributary streams falling into gorges. Low gradient swampy stream lines. Soils are typically shallow stony texture contrast profiles, usually with gritty well drained A horizons over touch yellow or grey poorly drained soils. Bouldery debris with clay matrix below cliffs. Organic sands in swamps and red brown structured loams on basalts.

Woodlands support *Angophora floribunda* (Rough-barked Apple), *Eucalyptus macrorhyncha* (Red Stringybark), *Eucalyptus polyanthemos* (Red Box), *Eucalyptus melliodora* (Yellow Box), *Eucalyptus blakelyi* (Blakely's Red Gum) with a shrubby understorey and *Austrodanthonia* sp. (Wallaby Grass) in open valleys. *Eucalyptus sclerophylla* (Hard-leaved Scribbly Gum), *Eucalyptus macrorhyncha* (Red Stringybark), *Eucalyptus polyanthemos* (Red Box) and *Eucalyptus fibrosa* (Broad-leaved Ironbark) occur on talus slopes. Black Ash, and *Eucalyptus piperita* (Sydney Peppermint) occur on sandstone peaks with *Allocasuarina defungens* (Dwarf Casuarina), *Leptospermum* sp. (Tea Tree) and sedge occurring on pagoda margins " (Morgan 2011 in OEH 2016) " (Morgan 2011 in OEH 2016b).

Regional vegetation mapping (DEC 2006) identifies the native vegetation types or mapping units (MU) listed in **Table 11** as occurring within the Study Area. Plant Community Type (PCT) and TEC equivalents are also provided.

Table 11 Regional Vegetation Types and PCT Equivalent

Vegetation (DEC 2006)	PCT	TEC
MU 7 Newnes Plateau Narrow-leaved Peppermint - Mountain Gum - Brown Stringybark Layered Forest	HN558 Narrow-leaved Peppermint - Mountain Gum - Brown Barrel moist open forest on high altitude ranges, northern South Eastern Highlands	-
MU 8 Newnes Sheltered Peppermint – Brown Barrel Shrubby Forest	HN599 Sydney Peppermint - Narrow-leaved Peppermint shrubby open forest on sheltered slopes of the Newnes Plateau, Sydney Basin	-
MU 11 Tableland Gully Snow Gum - Ribbon Gum Montane Grassy Forest	HN572 Ribbon Gum - Snow Gum grassy forest on damp flats, eastern South Eastern Highlands	Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland in the South Eastern Highlands, Sydney Basin, South East Corner and NSW South Western Slopes Bioregions
MU 26 Newnes Plateau Narrow-leaved Peppermint - Silver-top Ash Layered Open Forest	HN600 Sydney Peppermint - Silvertop Ash heathy open forest on sandstone ridges of the upper Blue Mountains, Sydney Basin	-
MU 28 Sandstone Plateau and Ridge Scribbly Gum – Silvertop Ash Shrubby Woodland	HN600 Sydney Peppermint - Silvertop Ash heathy open forest on sandstone ridges of the upper Blue Mountains, Sydney Basin	-
MU 29 Sandstone Slopes Sydney Peppermint Shrubby Forest	HN600 Sydney Peppermint - Silvertop Ash healthy open forest on sandstone ridges of the upper Blue Mountains, Sydney Basin	-
MU 33 Tableland Broad-leaved Peppermint - Brittle Gum - Red Stringybark Grassy Open Forest	HN514 Broad-leaved Peppermint - Red Stringybark grassy open forest on undulating hills, South Eastern Highlands	-
MU 35 Tableland Gully Mountain Gum – Broad-leaved Peppermint Grassy Forest	HN590 Snow Gum - Mountain Gum tussock grass-herb forest of the South Eastern Highlands	-

Vegetation (DEC 2006)	PCT	TEC
MU 37 Cocks Permian Red Stringybark - Brittle Gum Woodland	HN570 Red Stringybark - Brittle Gum - Inland Scribbly Gum dry open forest of the tablelands, South Eastern Highland	-
MU 43 Pagoda Rock Sparse Shrubland	HN508 Blue Mountains Mallee Ash - Dwarf Casuarina heath of the upper Blue Mountains, Sydney Basin	-
MU 44 Sandstone Plateaux Tea Tree - Dwarf Sheoak - Banksia Rocky Heath	HN508 Blue Mountains Mallee Ash - Dwarf Casuarina heath of the upper Blue Mountains, Sydney Basin	-
MU 53 Mountain Hollow Grassy Fen	HN602 Tableland swamp meadow on impeded drainage sites of the western Sydney Basin and South Eastern Highlands	Montane Peatlands and Swamps of the New England Tableland, NSW North Coast, Sydney Basin, South East Corner, South Eastern Highlands and Australian Alps bioregions
MU 58 Acacia Thickets	HN 570 Red Stringybark - Brittle Gum - Inland Scribbly Gum dry open forest of the tablelands, South Eastern Highland	-
MU 59 Non-native Vegetation – Pine Plantation / Woodlot		-
MU 62 Cleared/disturbed lands		-

3.1.3 Potential Groundwater Dependent Ecosystems

One vegetation type within the Study Area (falls within the alignment for both the Northern and Southern Study Area) was found to fall into the category of a GDE, namely:

- MU 53 Mountain Hollow Grassy Fen.

Groundwater and surface water flow are important in sustaining this community (DEC 2006). A small portion of this MU is mapped in **Figure 9**.

3.2 Likelihood of Occurrence

Desktop investigations performed in **Sections 3.1 to 3.2** culminated in a list of 16 threatened flora species and 42 threatened fauna species that may occur within the Study Area (**Table 12**). The field validated likelihood of occurrence analysis is provided in **Appendix 1**.

Table 12 Threatened Species likely to occur

Scientific Name	Common Name	TSC Act	EPBC Act
Flora			
<i>Caesia parviflora</i> var. <i>minor</i>	Small Pale Grass-lily	E	-
<i>Leucochrysum albicans</i> var. <i>tricolor</i>	Hoary Sunray	-	E
<i>Lastreopsis hispida</i>	Bristly Shield Fern	E	-
<i>Leucopogon fletcheri</i> subsp. <i>fletcheri</i>	-	E	-
<i>Acacia meiantha</i>	-	E	-
<i>Dillwynia tenuifolia</i>	-	V	-
<i>Prostanthera cryptandroides</i> subsp. <i>Cryptandroides</i>	Wollemi Mint-bush	V	V
<i>Eucalyptus aggregata</i>	Black Gum	V	V
<i>Eucalyptus cannonii</i>	Capertee Stringybark	V	-
<i>Eucalyptus pulverulenta</i>	-	V	V

Scientific Name	Common Name	TSC Act	EPBC Act
<i>Genoplesium superbum</i>	Superb Midge Orchid	E	-
<i>Veronica blakelyi</i>	-	V	-
<i>Persoonia acerosa</i>	Needle Geebung	V	V
<i>Persoonia hindii</i>	-	E	-
<i>Persoonia marginata</i>	Clandulla Geebung	V	V
<i>Thesium australe</i>	Austral Toadflax	V	V
Amphibians			
<i>Heleioporus australiacus</i>	Giant Burrowing Frog	V	V
<i>Pseudophryne australis</i>	Red-crowned Toadlet	V	-
<i>Litoria littlejohni</i>	Littlejohn's Tree Frog	V	V
Reptiles			
<i>Hoplocephalus bungaroides</i>	Broad-headed Snake	E	V
<i>Varanus rosenbergi</i>	Rosenberg's Monitor	V	-
Birds			
<i>Hieraaetus morphnoides</i>	Little Eagle	V	-
<i>Lophoictinia isura</i>	Square-tailed Kite	V	-
<i>Callocephalon fimbriatum</i>	Gang-gang Cockatoo	V	-
<i>Calyptorhynchus lathamii</i>	Glossy Black-Cockatoo	V	-
<i>Glossopsitta pusilla</i>	Little Lorikeet	V	-
<i>Ninox connivens</i>	Barking Owl	V	-
<i>Ninox strenua</i>	Powerful Owl	V	-
<i>Tyto novaehollandiae</i>	Masked Owl	V	-
<i>Tyto tenebricosa</i>	Sooty Owl	V	-
<i>Climacteris picumnus victoriae</i>	Brown Treecreeper	V	-
<i>Chthonicola sagittata</i>	Speckled Warbler	V	-
<i>Anthochaera phrygia</i>	Regent Honeyeater	CE	CE
<i>Grantiella picta</i>	Painted Honeyeater	V	-
<i>Meliphreptus gularis gularis</i>	Black-chinned Honeyeater (eastern subspecies)	V	-
<i>Pomatostomus temporalis temporalis</i>	Grey-crowned Babbler (eastern subspecies)	V	-
<i>Daphoenositta chrysoptera</i>	Varied Sittella	V	-
<i>Melanodryas cucullata cucullata</i>	Hooded Robin	V	-
<i>Petroica boodang</i>	Scarlet Robin	V	-
<i>Petroica phoenicea</i>	Flame Robin	V	-
<i>Stagonopleura guttata</i>	Diamond Firetail	V	-
Mammals			
<i>Dasyurus maculatus maculatus</i>	Spotted-tailed Quoll	V	E
<i>Isodon obesulus obesulus</i>	Southern Brown Bandicoot	E	E
<i>Phascolarctos cinereus</i>	Koala	V	V
<i>Cercartetus nanus</i>	Eastern Pygmy-possum	V	-
<i>Petaurus australis</i>	Yellow-bellied Glider	V	-
<i>Petaurus norfolcensis</i>	Squirrel Glider	V	-
<i>Petauroides volans</i>	Greater Glider	-	V

Scientific Name	Common Name	TSC Act	EPBC Act
<i>Petrogale penicillata</i>	Brush-tailed Rock-wallaby	E	V
<i>Mormopterus norfolkensis</i>	Eastern Freetail-bat	V	-
<i>Pseudomys novaehollandiae</i>	New Holland Mouse	-	V
<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheathtail-bat	V	-
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	V	V
<i>Falsistrellus tasmaniensis</i>	Eastern False Pipistrelle	V	-
<i>Miniopterus schreibersii oceanensis</i>	Eastern Bentwing-bat	V	-
<i>Scoteanax rueppellii</i>	Greater Broad-nosed Bat	V	-
<i>Vespadelus troughtoni</i>	Eastern Cave Bat	V	-
<i>Paralucia spinifera</i>	Bathurst Copper Butterfly	E	V
Vegetation Communities			
Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland in the South Eastern Highlands, Sydney Basin, South East Corner and NSW South Western Slopes Bioregions		E	
Montane Peatlands and Swamps of the New England Tableland, NSW North Coast, Sydney Basin, South East Corner, South Eastern Highlands and Australian Alps bioregions		E	

3.3 Flora Survey

3.3.1 Northern Study Area

BioBanking plots resulted in the detection of 157 flora species, comprising 129 native species, 28 exotic species. Three threatened flora species were positively identified within the eastern portion of Study Area on Newnes Plateau during current and previous (RPS 2014) field survey, specifically:

- *Caesia parviflora* var. *minor* (Small Pale Grass Lily) - approximately three individuals (RPS 2016);
- *Persoonia hindii* – approximately seven individuals (current surveys, RPS 2016 and RPS 2014); and
- *Veronica blakelyi* – one individual (RPS 2014).

Two additional species were detected immediately adjacent to the Study Area, with potential juvenile species occurring within the Study Area, specifically:

- *Eucalyptus aggregata* (Black Gum) – two individuals (central portion of the Study Area); and
- *Eucalyptus cannonii* (Capertee Stringybark) – approximately 26 (western portion of the Study Area).

Eucalyptus cannonii and *V. blakelyi* are listed as vulnerable under the TSC Act and *Persoonia hindii* and *C. parviflora* var. *minor*, is listed as endangered under the TSC Act. *Eucalyptus aggregata* is listed as vulnerable under both the TSC Act and EPBC Act. A substantial quantum of *Caesia parviflora* var. *minor* was also detected in the immediate surrounding areas adjacent to the Study Area. The locations of recorded individuals are displayed in **Figure 7**. A full list of recorded flora is contained in **Appendix 2**.

3.3.2 Southern Study Area

BioMetric plots resulted in the detection of 186 flora species, comprising 159 native species, 27 exotic species. Two threatened flora species were positively identified within the Study Area during current and previous (RPS 2014 and RPS 2016) field surveys, specifically:

- *Caesia parviflora* var. *minor* (Small Pale Grass Lily) - approximately two individuals (RPS 2016); and
- *Persoonia hindii* – approximately seven individuals (current surveys, RPS 2016 and RPS 2014).

Two additional species were detected immediately adjacent to the Study Area, with potential juvenile species occurring within the Study Area, including:

- *Eucalyptus aggregata* (Black Gum) – approximately 2 individuals (central portion of the Study Area); and
- *Eucalyptus cannonii* (Capertee Stringybark) – approximately 26 individuals (western portion of the Study Area).

Eucalyptus cannonii is listed as vulnerable under the TSC Act and *Persoonia hindii* and *C. parviflora* var. *minor*, is listed as endangered under the TSC Act. *Eucalyptus aggregata* is listed as vulnerable under both the TSC Act and EPBC Act. It should be noted that targeted surveys for *Caesia parviflora* var. *minor* were not conducted within the Southern Study Area during the flowering period, and given the known abundance of records along the northern pipeline alignment on Newnes Plateau, it is likely to occur on this alignment. The locations of recorded individuals are displayed in **Figure 8**. A full list of recorded flora is contained in **Appendix 2**.

3.4 Vegetation Communities

3.4.1.1 Existing Vegetation Mapping

Vegetation types of the Study Area were previously mapped and described in *The Vegetation of the Western Blue Mountains* (DEC 2006). DEC (2006) mapped 15 vegetation communities within the Study Area, as listed below:

- MU 7 Newnes Plateau Narrow-leaved Peppermint - Mountain Gum - Brown Stringybark Layered Forest;
- MU 8 Newnes Sheltered Peppermint – Brown Barrel Shrubby Forest;
- MU 11 Tableland Gully Snow Gum - Ribbon Gum Montane Grassy Forest;
- MU 26 Newnes Plateau Narrow-leaved Peppermint - Silver-top Ash Layered Open Forest;
- MU 28 Sandstone Plateau and Ridge Scribbly Gum – Silvertop Ash Shrubby Woodland;
- MU 29 Sandstone Slopes Sydney Peppermint Shrubby Forest;
- MU 33 Tableland Broad-leaved Peppermint - Brittle Gum - Red Stringybark Grassy Open Forest;
- MU 35 Tableland Gully Mountain Gum – Broad-leaved Peppermint Grassy Forest;
- MU 37 Cocks Permian Red Stringybark - Brittle Gum Woodland;
- MU 43 Pagoda Rock Sparse Shrubland;
- MU 44 Sandstone Plateaux Tea Tree - Dwarf Sheoak - Banksia Rocky Heath;
- MU 58 Acacia Thickets;
- MU 59 Non-native Vegetation – Pine Plantation / Woodlot / Shelter;
- MU 61 Unclassified; and
- MU 62 Cleared and Severely Disturbed Lands.

This regional scale mapping is subject to accuracy limitations at the site scale and has accordingly been used as a guide in determining the spatial extent of vegetation types within the Study Area.

3.4.1.2 Groundtruthed Vegetation Mapping

Revised native vegetation mapping following ground truthing within the Northern and Southern Study Areas is outlined in **Table 13** and displayed on **Figure 9**.

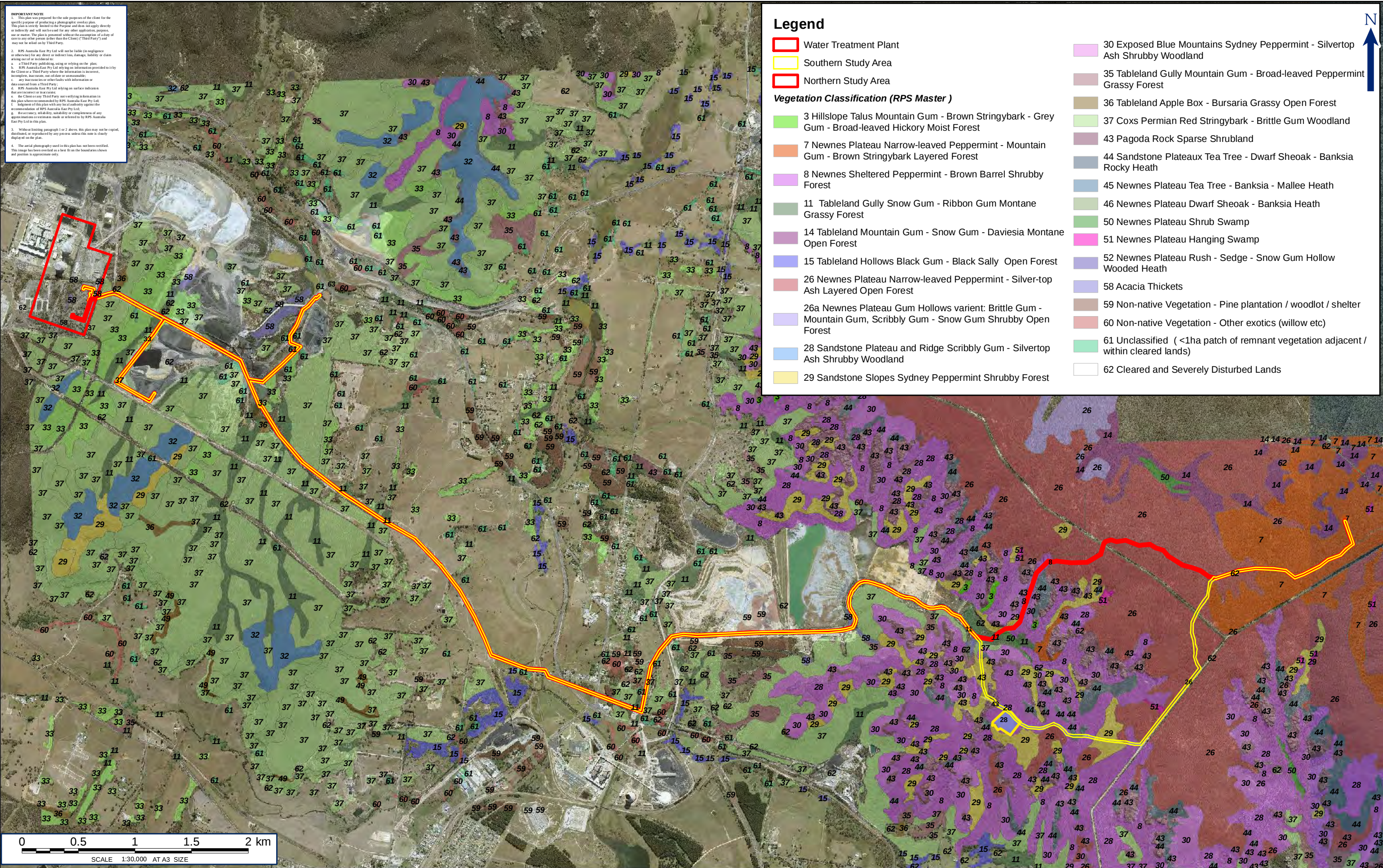
Table 13 Native Vegetation Cover of the Study Area

Vegetation Map Unit Number (MU) and Description	Northern Total Area (ha)	Southern Total Area (ha)
MU 7 Newnes Plateau Narrow-leaved Peppermint - Mountain Gum - Brown Stringybark Layered Forest	2.63	2.88
MU 8 Newnes Sheltered Peppermint – Brown Barrel Shrubby Forest	1.43	0.38
MU 11 Tableland Gully Snow Gum - Ribbon Gum Montane Grassy Forest	1.60	1.68
MU 26 Newnes Plateau Narrow-leaved Peppermint - Silver-top Ash Layered Open Forest	3.70	3.42
MU 28 Sandstone Plateau and Ridge Scribbly Gum – Silvertop Ash Shrubby Woodland	0.00	4.47
MU 29 Sandstone Slopes Sydney Peppermint Shrubby Forest	0.22	1.06
MU 33 Tableland Broad-leaved Peppermint - Brittle Gum - Red Stringybark Grassy Open Forest	1.65	1.65
MU 35 Tableland Gully Mountain Gum – Broad-leaved Peppermint Grassy Forest	0.00	0.11
MU 37 Coxs Permian Red Stringybark - Brittle Gum Woodland	8.33	8.33
MU 43 Pagoda Rock Sparse Shrubland	0.00	0.12
MU 44 Sandstone Plateaux Tea Tree - Dwarf Sheoak - Banksia Rocky Heath	0.00	0.21
MU 53 Mountain Hollow Grassy Fen	0.02	0.02
MU 58 Acacia Thickets	21.04	21.06
MU 59 Non-native Vegetation – Pine Plantation / Woodlot / Shelter	0.01	0.01
MU 62 Cleared/disturbed lands	47.11	44.85
Total	92.51	85.48

Two of these communities are listed as Endangered Ecological Communities, as listed below:

- MU 11 corresponds to Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland in the South Eastern Highlands, Sydney Basin, South East Corner and NSW South Western Slopes Bioregions EEC listed under the TSC Act; and
- MU 53 corresponds to Montane Peatlands and Swamps of the New England Tableland, NSW North Coast, Sydney Basin, South East Corner, South Eastern Highlands and Australian Alps bioregions EEC listed under the TSC Act.

Profiles for each vegetation community in which a BioBanking plot was undertaken are detailed below.



TITLE : FIGURE 9: VEGETATION COMMUNITIES	LOCATION : SPRINGVALE	DATUM:GDA 1994	DATE : 17/08/2016	VERSION (PLAN BY): B A3 (Natalie.Wood)
PROJECTION: GDA 1994 MGA Zone 56		PURPOSE: ECOLOGY		PATH: J:\JOBS\Centennial\All Jobs\131758 JV Energy Australia Springvale\10 - Drafting\Arcgis Map Documents\EcolReport Figures\131758 Figure 9 Veg B A3 20160812.mxd

MU 7 – Newnes Plateau Narrow-leaved Peppermint – Mountain Gum – Brown Stringybark Layered Forest

Plate 1 Newnes Plateau Narrow-leaved Peppermint – Mountain Gum – Brown Stringybark Layered Forest

- Description:** A tall to very tall forest with a relatively open understorey.
- Canopy Layer:** 22 to 38 m – 44% Percentage Foliage Cover (PFC). Dominant species include: *Eucalyptus radiata* (Narrow-leaved Peppermint), *Eucalyptus oreades* (Blue Mountains Ash) and *Eucalyptus dalrympleana* (Mountain Gum). Other non-dominant species include: *Eucalyptus sieberi* (Silvertop Ash).
- Shrub Layer:** 1 to 2 m – 60 PFC. Dominant shrub species included: *Daviesia latifolia* (Hop Bitter-pea) and *Leucopogon lanceolatus* (Lance-leaf Beard-heath). Other non-dominant species include *Hakea dactyloides* (Broad-leaved Hakea) and *Acacia dorothea* (Dorothy's Wattle).
- Ground Layer:** 0 to 0.5 m – 33 PFC. Dominant species included: *Poa sieberiana* var. *cyanophylla*, *Monotoca scoparia* (Crinkle Bush), *Joycea pallida* (Silvertop Wallaby Grass), *Patersonia sericea* (Silky Purple Flag), *Lomandra longifolia* (Spiny-headed Mat-rush) and *Pteridium esculentum* (Bracken).
- Classification:** Not commensurate with any TSC Act or EPBC Act listed EEC.

MU 8 – Newnes Sheltered Peppermint - Brown Barrel Shrubby Forest

Plate 2 Newnes Sheltered Peppermint - Brown Barrel Shrubby Forest

- Description:** This vegetation forms open woodlands with moderately dense understorey vegetation on the more sheltered lower slopes of hills, typically in association with gullies and the slopes above drainage lines.
- Canopy Layer:** 22 to 40 m – 31 PFC. The overall dominant species was *Eucalyptus fastigata* (Brown Barrel).
- Shrub Layer:** 1 to 2 m – 75 PFC. Dominant shrub species included: *Maytenus silvestris* (Orange Bush), *Leptospermum polygalifolium* subsp. *polygalifolium* (Tantoon), *Cassinia aculeata* (Dolly Bush), *Acacia obtusifolia* (Blunt-leaf Wattle) and *Acacia falciformis* (Broad-leaved Hickory).
- Ground Layer:** 0 to 1 m – 60 PFC. Dominant species included: *Lomandra longifolia* (Mat Rush), *Pteridium esculentum* (Bracken), *Coronidium scorpioides* (Button Everlasting), *Blechnum cartilagineum* (Gristle Fern), *Oxalis perrenans*, *Centella asiatica* (Indian Pennywort) and *Gonocarpus teuroides* (Raspwort).
- Classification:** Not commensurate with any TSC Act or EPBC Act listed EEC.

MU 11 – Tableland Gully Snow Gum - Ribbon Gum Montane Grassy Forest**Plate 3 Tableland Gully Snow Gum - Ribbon Gum Montane Grassy Forest**

- Description:** This vegetation community occurs as a tall forest with a dense grassy groundcover. Occupies lower slopes, gullies and flats on a range of geological substrates.
- Canopy layer:** 20 to 40 m – 20-50 PFC. Dominant species include: *Eucalyptus rubida* subsp. *rubida* (Candlebark) and *E. viminalis* (Ribbon Gum).
- Shrub Layer:** 1 to 2 m – 10-40 PFC. Dominant shrub species included: *Acacia implexa* (Hickory Wattle), *Leptospermum obovatum*, *Leptospermum polygalifolium* (Tantoon), *Acacia dealbata* (Silver Wattle) and *Cassinia aculeata* (Dolly Bush).
- Ground layer:** 0 to 0.5 m – 5-20 PFC. Dominant species included: *Cynodon dactylon* (Common Couch), *Microlaena stipoides* (Weeping Grass), *Echinopogon ovatus* (Forest Hedgehog Grass), *Centella asiatica* (Indian Pennywort) and *Blechnum cartilagineum* (Gristle Fern).
- Classification:** This community corresponds to the TSC Act listed EEC *Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland in the South Eastern Highlands, Sydney Basin, South East Corner and NSW South Western Slopes Bioregions*.

MU 26 – Newnes Plateau Narrow-leaved Peppermint – Silvertop Ash Layered Open Forest

Plate 4 Newnes Plateau Narrow-leaved Peppermint – Silvertop Ash Layered Open Forest

- Description:** This vegetation community forms tall woodlands on the ridgetops and central plateaux. This vegetation community was generally open in structure with a sparse shrub layer.
- Canopy Layer:** 12 to 30 m – 30 PFC. Dominant species included: *Eucalyptus sieberi* (Silvertop Ash), *Eucalyptus radiata* (Narrow-leaved Peppermint) and *Eucalyptus blaxlandii* (Red Stringybark). Non dominant species included *E. dalrympleana* (Mountain Gum) and *E. oreades*.
- Shrub Layer:** 1 to 4 m – 2 to 25 PFC. Dominant shrub species included: *Daviesia latifolia* (Hop Bitter-pea), *Acacia dorothea* (Dorothy's Wattle), *Persoonia levis* (Broad-leaved Geebung), and *Pteridium esculentum* (Bracken).
- Ground Layer:** 0 to 1 m – 30 PFC. Dominant species included: *Lomatia silaifolia* (Crinklebush), *Poa sieberiana* var. *cyanophylla*, *Rytidosperma pallida* (Silvertop Wallaby Grass), *Microlaena stipoides* (Weeping Grass), *Lomandra glauca* (Pale Mat-rush), *Lomandra multiflora* (Many-flowered Mat-rush) and *Entolasia stricta* (Wiry Panic).
- Classification:** Not commensurate with any TSC Act or EPBC Act listed EEC.

MU 28 – Sandstone Plateau and Ridge Scribbly Gum - Silvertop Ash Shrubby Woodland

Plate 5 Sandstone Plateau and Ridge Scribbly Gum – Silvertop Ash Shrubby Woodland

- Description:** A community found on the shallow soils and rocky sites within the eastern section of the Study Area. Usually an open forest or woodland characterised by a diverse midstratum that may be quite dense.
- Canopy Layer:** 7 to 20 m – 25 to 35% PFC. Dominant species include: *Eucalyptus sclerophylla* (Hard-leaved Scribbly Gum) and *Eucalyptus sieberi* (Silver-top Ash).
- Shrub Layer:** 0.5 to 6.0 m – 3 to 15% PFC. Dominant shrub species included: *Acacia dorothea* (Dorothy's Wattle), *Acacia terminalis* (Sunshine Wattle), *Banksia spinulosa* var. *collina* (Hairpin Banksia), *Hakea dactyloides* (Broad-leaved Hakea), *Daviesia squarrosa*, *Monotoca scoparia* and *Persoonia myrtilloides* (Myrtle Geebung).
- Ground Layer:** 0 to 1.0 m – 30 to 65% PFC. *Platysace linearifolius*, *Phyllota squarrosa* (Dense Phyllota), *Joycea pallida* (Silvertop Wallaby Grass), *Lomandra glauca* (Pale Mat-rush), *Caustis flexuosa* (Curly Wig), *Dampiera stricta* (Blue Dampiera), *Persoonia laurina* (Laurel Geebung) and *Hibbertia obtusifolia* (Hoary Guinea Flower).
- Classification:** Not commensurate with any TSC Act or EPBC Act listed EEC.

MU 29 – Sandstone Slopes Sydney Peppermint Shrubby Forest

Plate 6 Sandstone Slopes Sydney Peppermint Shrubby Forest

- Description:** This vegetation community occurs on semi sheltered sandstone slopes and deeper soils on ridges.
- Canopy Layer:** 15.5 to 35 m - 35 to 70% PFC. The dominant species were *Eucalyptus radiata* (Narrow-leaved Peppermint) with less dominant occurrences of *Eucalyptus sclerophylla* (Hard-leaved Scribbly Gum), *Eucalyptus blaxlandii* (Blaxland's Stringybark) and *Eucalyptus sieberi* (Silvertop Ash).
- Shrub Layer:** 0.4 to 10 m – 5 to 60% PFC. Dominant shrub species included: *Daviesia Squarrosa*, *Acacia caesiella* (Tableland Wattle), *Acacia dorothea* (Dorothy's Wattle), *Acacia buxifolia* (Box-leaf Wattle), *Monotoca scoparia*, *Leptomeria acida* (Native Currant), *Acacia obtusifolia*, *Hakea dactyloides* (Broad-leaved Hakea), *Leucopogon* sp. and *Lissanthe strigosa* (Peach Heath).
- Ground Layer:** 0 to 1.0 m – 5 to 40% PFC. Dominant species included: *Patersonia sericea*, *Platysace linearifolius*, *Joycea pallida* (Wallaby Grass), *Pteridium esculentum* (Bracken), *Dianella revoluta* (Blue Flax Lily), *Lomandra glauca* (Pale Mat-rush), *Boronia microphylla* (Small-flower Boronia), *Hibbertia obtusifolia* (Hoary Guinea Flower) and *Amperea xiphioclada*.
- Classification:** Not commensurate with any TSC Act or EPBC Act listed EEC.

MU 33 – Tableland Broad-leaved Peppermint - Brittle Gum - Red Stringybark Grassy Open Forest

Plate 7 Tableland Broad-leaved Peppermint – Brittle Gum – Red Stringybark Grassy Open Forest

- Description:** This community is a low open forest and woodland community occurring on the flats of the western portions of the Study Area.
- Canopy Layer:** 16 to 18 m – 30% PFC. Dominant species include *Eucalyptus mannifera* (Brittle Gum) and *E. pauciflora* (Snow Gum). Other non-dominant species include *E. dalrympleana* (Mountain Gum).
- Shrub Layer:** 1 to 3 m – 5% PFC. Shrub layer consisted of *Cassinia arcuata* (Sifton Bush) and *Acacia dealbata* (Silver Wattle).
- Ground Layer:** 0 to 1.2 m – 85% PFC. A largely native groundcover existed in this community, dominated by the grasses, *Aristida ramosa* (Spear Grass), *Echinopogon caespitosus* (Hedgehog Grass), *P. sieberiana*, *Joycea pallida* (Wallaby Grass) along with herbs including *Coronidium scorpioides* (Button Everlasting) and *Lomandra glauca* (Pale Mat-rush). Weeds were also present in this community, including *Plantago lanceolata* (Lambs Tongue), *Conyza bonariensis* (Fleabane) and *Senecio madagascariensis* (Fireweed).
- Classification:** Not commensurate with any TSC Act or EPBC Act listed EEC.

MU 37 – Coxs Permian Red Stringybark - Brittle Gum Woodland**Plate 8 Coxs Permian Red Stringybark - Brittle Gum Woodland**

- Description:** This vegetation community occurs on low slopes above finer-grained Permian age sediments, ranging in altitude from 840 to 1,020 metres above sea level. Open understorey and little groundcover beneath a woodland to open forest canopy of brittle gum.
- Canopy Layer:** 7 to 15 m – 20-40 PFC. Dominant species include; *Eucalyptus radiata* (Sydney peppermint), with lesser occurrences of *E. mannifera* (Brittle Gum) *E. dives* (Broad-leaved Peppermint) and *E. rossii* (Inland Scribbly Gum).
- Shrub Layer:** 0.6 to 2 m – 5 to 10 PFC. Dominant shrub species included *Monotoca scoparia*, *Acacia buxifolia* (Box-leaf Wattle), *Exocarpos cupressiformis* (Native Cherry), *Podolobium ilicifolium* (Prickly Shaggy Pea), *Leucopogon lanceolata*, *Lissanthe strigosa*, and *Acacia obtusifolia* (Blunt-leaf Wattle).
- Ground Layer:** 0 to 0.8 m – 5 to 70 PFC. Dominant species included; *Poa sieberiana*, *Dianella revoluta* (Blue Flax Lily), *Joycea pallida* (Wallaby Grass), *Gonocarpus tetragynus*, *Lomandra longifolia* (Mat Rush), *Billardiera scandens* (Apple berry), *Lomandra filiformis* (Wattle Mat-rush).
- Classification:** Not commensurate with any TSC Act or EPBC Act listed EEC.

MU 43 – Pagoda Rock Sparse Shrubland;**Plate 9 Pagoda Sparse Rock Shrubland**

- Description:** This vegetation community occurs in many small patches primarily in the far eastern end of the Study Area along the edge of the Newnes Plateau. It is found along the upper and middle reaches of steep slopes associated with drainages or the plateau edge. Low heath forms around pagoda rock formations and on shallow soils fringing slabs of bare sandstone. The density of vegetation varies with soil depth, with patches of dense vegetation occupying the soils collected in bowls or fissures in the rock formations, interspersed with patchy and sometimes extensive unvegetated areas of bare rock.
- Canopy Layer:** Absent.
- Shrub Layer:** 1 to 3 m – 5 to 50% PFC. Dominant shrub species included: *Allocasuarina littoralis* (Black She-oak), *Leptospermum parvifolium*, *Leucopogon muticus* (Blunt Beard-heath), *Acacia caesiella* (Tableland Wattle), *Pomaderris ledifolia* (Sydney Pomaderris) and *Cassinia arcuata* (Sifton bush).
- Ground Layer:** 0.1 to 1 m – 3% PFC. Dominant species included: *Entolasia stricta* (Wiry Panic), *Joycea pallida* (Wallaby Grass), *Lomandra filiformis* (Mat Rush), *Dianella revoluta* (Blue Flax Lily), *Cheilanthes sieberi* (Rock Fern), *Pomax umbellata* and *Amperea xiphoclada*.
- Classification:** Not commensurate with any TSC Act or EPBC Act listed EEC.

MU 44 – Sandstone Plateaux Tea Tree – Dwarf Sheoak – Banksia Rocky Heath**Plate 10 Sandstone Plateaux Tea Tree – Dwarf Sheoak – Banksia Rocky Heath**

- Description:** This vegetation community occurs in small parts of the eastern portions of the Study Area. It occurs in pockets amongst areas of exposed rock outcrops and above gullies on the exposed sandstone escarpments.
- Canopy Layer:** 4 to 6 m with 2% PFC. Dominated by *Eucalyptus piperita* (Sydney Peppermint) and *Eucalyptus sclerophylla* (Hard-leaved Scribbly Gum).
- Shrub Layer:** 2 to 4 m – 80 to 90% PFC. Dominant species included: *Allocasuarina nana* (Dwarf Sheoak), *Pomaderris ledifolia* (Sydney Pomaderris), *Acacia obtusifolia*, *Comesperma ericinum* (Pyramid Flower), *Isopogon anemonifolius* (Flat-leaved Drumsticks), *Leptospermum arachnoides*, *Petrophile pulchella* (Conesticks), *Banksia spinulosa* var. *collina* (Hairpin Banksia), *Platysace linearifolia* (Narrow-leaved Platysace), *Acacia terminalis*, and *Podolobium ilicifolium* (Prickly Shaggy Pea).
- Ground Layer:** 0.1 to 1 m – 23% average PFC. *Caustis flexuosa*, *Epacris reclinata*, *Entolasia stricta* (Wiry Panic), *Lomandra confertifolia* (Mat-rush), *Dampiera stricta* (Blue Dampiera) and *Lomandra glauca* (Pale Mat-rush).
- Classification:** Not commensurate with any TSC Act or EPBC Act listed EEC.

MU 53 – Mountain Hollow Grassy Fen**Plate 11 Mountain Hollow Grassy Fen**

- Description:** This community consists primarily of ground covers, existing as a tussock grassy swamp. It is strongly dominated by *Poa labillardierei* (tussock grass) and *Carex gaudichaudiana*. Other wetland species include *Juncus usitatus* (Common Rush), *Juncus sarophorus*, *Isachne globosa* (Swamp Millet), *Myriophyllum pedunculatum* (Water-milfoil) and *Panicum effusum* (Hairy Panic). A range of exotic species have also infiltrated this community including *Juncus acutiflorus*, *Cyperus Eragrostis* (Umbrella Sedge), *Cirsium vulgare* (Spear Thistle) and *Conyza sumatrensis* (Tall Fleabane).
- Classification:** This vegetation is commensurate with the TSC Act listed EEC *Montane Peatlands and Swamps of the New England Tableland, NSW North Coast, Sydney Basin, South East Corner, South Eastern Highlands and Australian Alps bioregions*.

MU 58 – Acacia Thickets**Plate 12 Acacia Thickets**

- Description:** This vegetation community generally occurs as a result of recovery from past disturbance. This MU may also be considered as a component of severely disturbed native vegetation (MU 62). Wattle thickets are usually composed of a single dominant canopy species with occasional emergent eucalypts.
- Canopy Layer:** 4 to 16 m – 10 to 60 PFC. Canopy species are typically absent, with the tallest layer being emergent Acacia species.
- Shrub Layer:** 0.6 to 6 m – 70 PFC. Dominant shrub species included; *Acacia buxifolia* (Box-leaf Wattle), *A. dealbata* (Silver Wattle), *A. longifolia* (Sydney Golden Wattle), *Cassinia arcuata* (Sifton bush), *Verbena bonariensis* (Purpletop), and *Rubus fruticosus* (Blackberry).
- Ground Layer:** 0 to 0.5 m – 20 to 40 PFC. Dominant species included; *Austrostipa scabra*, *Cynodon dactylon* (Couch), *Plantago lanceolata* (Lamb's Tongue), *Panicum effusum* (African Lovegrass), *Senecio madagascariensis* (Fireweed), *Pennisetum clandestinum* (Kikuyu), *Paspalum dilatatum*, *Oxalis perrenans*, and *Juncus* sp..
- Classification:** Not commensurate with any TSC Act or EPBC Act listed EEC.

MU 62 – Cleared and Severely Disturbed lands

Plate 13 Cleared and Severely Disturbed Lands

- Description:** This vegetation community occurs along the more western portions of the Study Area, including farming lands, power-line easements, tracks and mine sites. The canopy layer has been removed along with all or most of the shrub layer. These areas are mostly void of native vegetation, and are largely affected by weed invasion due to previous or repeated disturbance.
- Canopy Layer:** Generally absent.
- Shrub Layer:** Highly variable 0.5 – 2 m in height with 5 to 60% PFC. Species include those species growing in native vegetation in proximity such as *Cassinia arcuata* (Sifton Bush) with weeds such as *Conyza bonariensis* (Fleabane).
- Ground Layer:** Highly variable 0 –1.5 m tall with 10 to 90% PFC. Dominant species include species similar to those found in adjacent native vegetation communities such as *Rytidosperma tenuius*, *Panicum effusum* (Hairy Panic), *Eragrostis leptostachya* (Paddock Lovegrass), *Cynodon dactylon* (Couch). There is also a high likelihood of increased exotic species due to the previous disturbance including *Plantago lanceolata* (Lamb's Tongue), *Eragrostis curvula* (African Lovegrass) and *Hypochaeris radicata* (Catsear).
- Classification:** Not commensurate with any TSC Act or EPBC Act listed EEC.

3.5 Northern Study Area Fauna Survey

This section details results from the Northern Study Area only. A total of 89 fauna species were detected during surveys, including 64 bird species, 22 mammal species, one reptile species and two amphibian species. Of these, eight species are listed as Vulnerable under the TSC Act, including the Scarlet Robin (*Petroica boodang*), Little Eagle (*Hieraaetus morphnoides*), Gang-gang Cockatoo (*Callocephalon fimbriatum*), Glossy Black-Cockatoo (*Calyptorhynchus lathami*), Powerful Owl (*Ninox strenua*), Brown Treecreeper (eastern subsp.) (*Climacteris picumnus victoriae*), Large-eared Pied Bat (*Chalinolobus dwyeri*) and Yellow-bellied Sheathtail Bat (*Saccolaimus flaviventris*). Additionally, two species, namely the Greater Glider (*Petauroides volans*) and Large-eared Pied Bat (*Chalinolobus dwyeri*) are listed as Vulnerable under the EPBC Act. Locations of all threatened fauna species are displayed on **Figure 10**. A list of all recorded fauna is contained in **Appendix 3**.

Threatened fauna records from previous RPS surveys (RPS 2016) have been displayed on **Figure 10** and have aided the likelihood of occurrence table in **Appendix 1**.

3.5.1 Terrestrial Mammals

During terrestrial trapping the Common Dunnart (*Sminthopsis murina*) (refer to **Plate 14**), Brown Antechinus (*Antechinus stuartii*), Bush Rat (*Rattus fuscipes*) and Swamp Rat (*Rattus lutreolus*) were caught and released. No hair samples were recovered from the Hair Tubes.



Plate 14 Common Dunnart

Three common macropod species were observed during surveys, namely the Eastern Grey Kangaroo (*Macropus giganteus*), Red-necked Wallaby (*Macropus rufogriseus*) and Swamp Wallaby (*Wallabia bicolor*), with numerous macropod scats also found within the Study Area. In addition, one Common Wombat

(*Vombatus ursinus*) was observed. Two introduced species, the European Red Fox (*Vulpes Vulpes*) and European Rabbit (*Oryctolagus cuniculus*) were observed within the Study Area. A full list of mammals detected within the Study Area is provided in **Appendix 3**.

3.5.2 Arboreal Mammals

A total of four arboreal mammal species were detected within the Study Area during spotlighting or arboreal trapping, specifically the Common Brushtail Possum (*Trichosurus vulpecula*), Greater Glider (*Petauroides volans*), Common Ringtail Possum (*Pseudocheirus peregrinus*) and the Sugar Glider (*Petaurus breviceps*). The Greater Glider is listed as Vulnerable under the EPBC Act.

3.5.3 Bats

A total of eight species were confidently identified from the Anabat recordings including:

- Yellow-bellied Sheathtail Bat (*Saccolaimus flaviventris*);
- Large-eared Pied Bat (*Chalinolobus dwyeri*);
- Gould's wattled bat (*Chalinolobus gouldii*);
- Chocolate wattled bat (*Chalinolobus morio*);
- Eastern horseshoe bat (*Rhinolophus megaphyllus*);
- White-striped free-tailed bat (*Tadarida australis*);
- *Nyctophilus* sp; and
- Large forest bat (*Vespadelus darlingtoni*).

A further seven species were identified as possible or within a species group including:

- Eastern falsistrelle (*Falsistrellus tasmaniensis*);
- Eastern bentwing bat (*Miniopterus schreibersii oceanensis*);
- Eastern Freetail Bat (*Mormopterus ridei*);
- Greater broad-nosed bat (*Scoteanax rueppellii*);
- Eastern broad-nosed bat (*Scotorepens orion*);
- Southern forest bat (*Vespadelus regulus*); and
- Little forest bat (*Vespadelus vulturnus*).

Of these species, two are listed as Vulnerable under the TSC Act, namely Yellow-bellied Sheathtail Bat and Large-eared Pied Bat. The Large-eared Pied Bat is also listed as Vulnerable under the EPBC Act. The Anabat Report is contained in **Appendix 4**.

3.5.4 Avifauna Survey

A total of 64 bird species were detected within the Study Area during the survey period. The most commonly detected species included: Eastern Yellow Robin (*Eopsaltria australis*), White-throated Treecreeper (*Cormobates leucophaea*), Pied Currawong (*Strepera graculina*) and Striated Pardalote (*Pardalotus striatus*). A full list of bird species detected during surveys is provided in **Appendix 3**.

During the survey periods six species listed as vulnerable under the TSC Act 1995 were detected, including the Scarlet Robin (*Petroica boodang*), Little Eagle (*Hieraaetus morphnoides*) Gang-gang Cockatoo (*Callocephalon fimbriatum*), Glossy Black-Cockatoo (*Calyptorhynchus lathami*) (refer to **Plate 15**), Powerful

Owl (*Ninox strenua*) (refer to **Plate 16**) and Brown Treecreeper (eastern subsp.) (*Climacteris picumnus victoriae*).



Plate 15 Glossy-black Cockatoo



Plate 16 Powerful Owl

3.5.5 Reptiles

Targeted and opportunistic surveys were conducted for reptiles within the Study Area. The only reptile detected within the Study Area was the Red-bellied Black Snake (*Pseudechis porphyriacus*).

3.5.6 Amphibians

A total of two common amphibian species were detected, including the Common Eastern Froglet (*Crinia signifera*) and Peron's Tree Frog (*Litoria peronii*). These species were either seen or heard calling within riparian vegetation or damp, low-lying areas.

3.5.7 Koala Survey

Schedule 2 of State Environmental Planning Policy (SEPP) No. 44 – ‘Koala Habitat Protection’ lists 10 tree species that are considered indicators of ‘Potential Koala Habitat’. The presence of any of the species listed on a site proposed for development triggers the requirement for an assessment for ‘Potential Koala Habitat’. SEPP 44 defines potential Koala Habitat as:

“areas of native vegetation where the trees of the types listed in Schedule 2 constitute at least 15% of the total number of trees in the upper or lower strata of the tree component”.

One species, specifically *Eucalyptus viminalis* (Ribbon Gum) was detected in MU 11 within the Study Area, however its total cover did not exceed 15%. Therefore, habitat within the Study Area does not constitute Potential Koala Habitat as defined by the SEPP.

3.6 Southern Study Area Fauna Survey

This section details results from the Southern Study Area only. A total of 93 fauna species were detected during surveys, including 67 bird species, 21 mammal species, three reptile species and two amphibian species. Of these, nine species are listed as Vulnerable under the TSC Act, including the Scarlet Robin (*Petroica boodang*), Little Eagle (*Hieraaetus morphnoides*) Gang-gang Cockatoo (*Callocephalon fimbriatum*), Glossy Black-Cockatoo (*Calyptorhynchus lathami*), Little Lorikeet (*Glossopsitta pusilla*), Brown Treecreeper (eastern subsp.) (*Climacteris picumnus victoriae*), Speckled Warbler (*Chthonicola sagittata*), Large-eared Pied Bat (*Chalinolobus dwyeri*) and Yellow-bellied Sheathtail Bat (*Saccolaimus flaviventris*). Additionally, two species, namely the Greater Glider (*Petauroides volans*) and Large-eared Pied Bat (*Chalinolobus dwyeri*) are listed as Vulnerable under the EPBC Act.

Locations of all threatened fauna species are displayed on **Figure 11** including records from previous RPS surveys (RPS 2016). A list of all recorded fauna is contained in **Appendix 3**.

3.6.1 Terrestrial Mammals

During terrestrial trapping the Brown Antechinus (*Antechinus stuartii*) and Bush Rat (*Rattus fuscipes*) (refer to **Plate 17**) were caught and released. No hair samples were recovered from the Hair Tubes.



Plate 17 Bush Rat in an Elliot B trap

Three common macropod species were observed during surveys, namely the Eastern Grey Kangaroo (*Macropus giganteus*), Red-necked Wallaby (*Macropus rufogriseus*) and Swamp Wallaby (*Wallabia bicolor*), with numerous macropod scats also found within the Study Area. In addition, one Common Wombat (*Vombatus ursinus*) was observed. Three introduced species, the European Red Fox (*Vulpes Vulpes*), European Rabbit (*Oryctolagus cuniculus*) and Wild Dog (*Canis lupus familiaris*) were observed within the Study Area. A full list of mammals detected within the Study Area is provided in **Appendix 3**.

3.6.2 Arboreal Mammals

A total of four arboreal mammal species were detected within the Study Area during spotlighting or arboreal trapping, specifically the Common Brushtail Possum (*Trichosurus vulpecula*), Greater Glider (*Petauroides volans*), Common Ringtail Possum (*Pseudocheirus peregrinus*) and the Sugar Glider (*Petaurus breviceps*). The Greater Glider is listed as Vulnerable under the EPBC Act.

3.6.3 Bats

A total of seven species were confidently identified from the Anabat recordings including:

- Yellow-bellied Sheath-tail Bat (*Saccolaimus flaviventris*);
- Large-eared Pied Bat (*Chalinolobus dwyeri*);
- Gould's wattled bat (*Chalinolobus gouldii*);
- Chocolate wattled bat (*Chalinolobus morio*);
- Eastern horseshoe bat (*Rhinolophus megaphyllus*);
- White-striped free-tailed bat (*Tadarida australis*); and
- Large forest bat (*Vespadelus darlingtoni*).

A further eight species were identified as possible or within a species group including:

- *Nyctophilus* sp
- Eastern falsistrelle (*Falsistrellus tasmaniensis*);
- Eastern bentwing bat (*Miniopterus schreibersii oceanensis*);
- Eastern Freetail Bat (*Mormopterus ridei*);
- Greater broad-nosed bat (*Scoteanax rueppellii*);
- Eastern broad-nosed bat (*Scotorepens orion*);
- Southern forest bat (*Vespadelus regulus*); and
- Little forest bat (*Vespadelus vulturnus*).

Of these species, two are listed as Vulnerable under the TSC Act, namely Yellow-bellied Sheath-tail Bat and Large-eared Pied Bat. The Large-eared Pied Bat is also listed as Vulnerable under the EPBC Act. The Anabat Report is contained in **Appendix 4**.

3.6.4 Avifauna Survey

A total of 67 bird species were detected within the Study Area during the survey period. The most commonly detected species included: Eastern Yellow Robin (*Eopsaltria australis*), White-throated Treecreeper (*Cormobates leucophaea*), Pied Currawong (*Strepera graculina*) and Striated Pardalote (*Pardalotus striatus*). A full list of bird species detected during surveys is provided in **Appendix 3**.

Eight species listed as vulnerable under the TSC Act were detected, including Scarlet Robin (*Petroica boodang*), Little Eagle (*Hieraaetus morphnoides*) Gang-gang Cockatoo (*Callocephalon fimbriatum*), Glossy Black-Cockatoo (*Calyptrorhynchus lathamii*), Little Lorikeet (*Glossopsitta pusilla*), Brown Treecreeper (eastern subsp.) (*Climacteris picumnus victoriae*) and Speckled Warbler (*Chthonicola sagittata*).

3.6.5 Reptiles

Targeted and opportunistic surveys were conducted for reptiles within the Study Area. The Red-bellied Black Snake (*Pseudechis porphyriacus*), White's Skink (*Liopholis whitii*) and Dark-flecked Garden Sunskink (*Lampropholis delicata*) were detected during the survey period.

3.6.6 Amphibians

A total of two common amphibian species were detected, including the Common Eastern Froglet (*Crinia signifera*) and Peron's Tree Frog (*Litoria peronii*). These species were either seen or heard calling within riparian vegetation or damp, low-lying areas.

3.6.7 Koala Survey

Schedule 2 of State Environmental Planning Policy (SEPP) No. 44 – 'Koala Habitat Protection' lists 10 tree species that are considered indicators of 'Potential Koala Habitat'. The presence of any of the species listed on a site proposed for development triggers the requirement for an assessment for 'Potential Koala Habitat'. SEPP 44 defines potential Koala Habitat as:

"areas of native vegetation where the trees of the types listed in Schedule 2 constitute at least 15% of the total number of trees in the upper or lower strata of the tree component".

One species, specifically *Eucalyptus viminalis* (Ribbon Gum) was detected in MU 11 within the Study Area, however its total cover did not exceed 15%. Therefore, habitat within the Study Area does not constitute Potential Koala Habitat as defined by the SEPP.

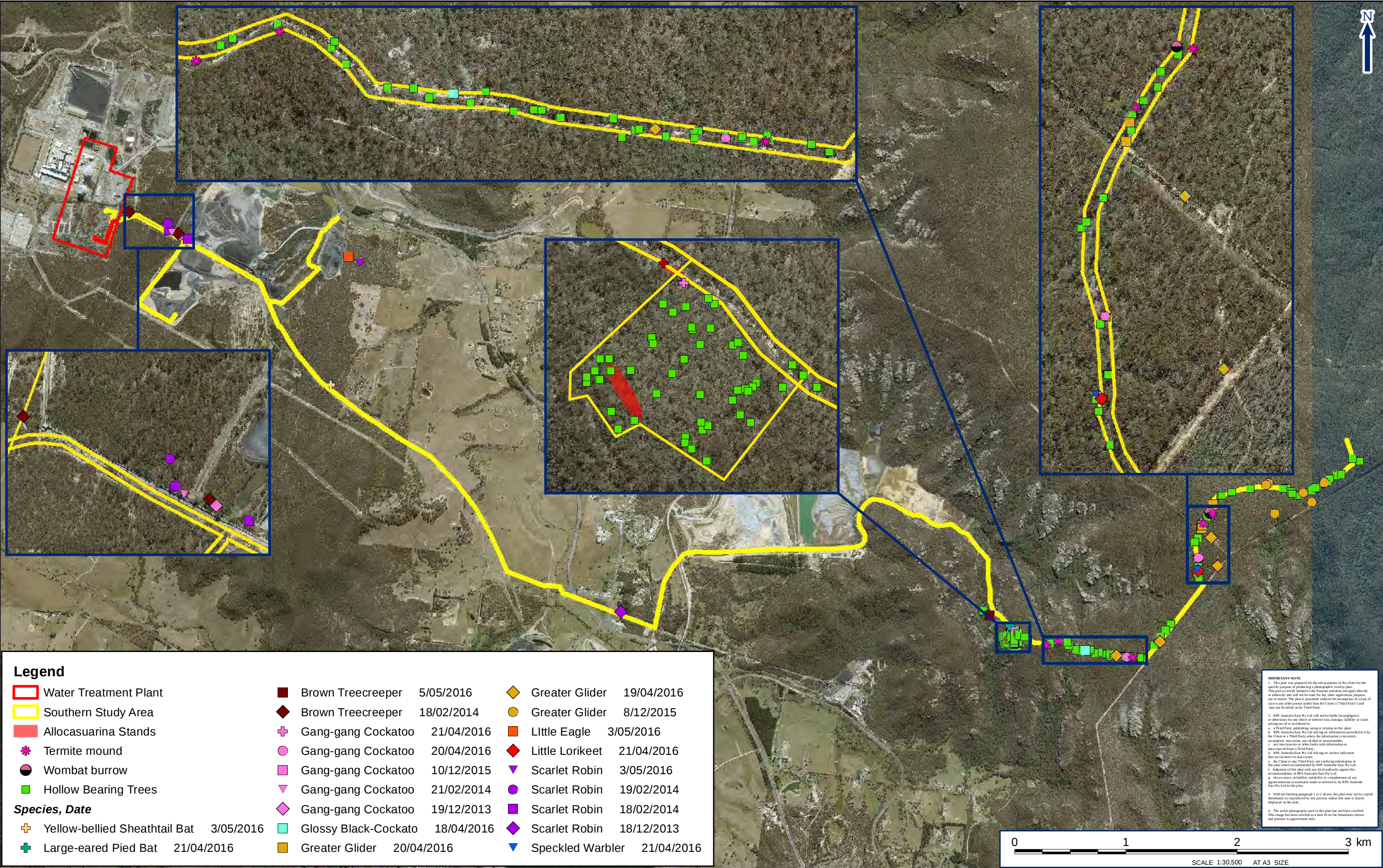
3.7 Habitat Survey

3.7.1 Terrestrial Habitats

Habitats within both the Northern and Southern Study Area were assessed for their potential to support native fauna species including threatened fauna for which records occur within the wider locality. Broad habitat types detected within both Study Areas included open forest/woodland areas, wet sclerophyll areas and cleared/disturbed areas.

Forest habitats cover under half of the area within the Study Area being portions of lands within the northern and southern pipeline alignment routes on Newnes Plateau. A varied understorey layer of native shrubs provides ground cover for small mammals and reptiles as well as foraging opportunities for woodland birds. Ground cover is further enhanced by woody debris and leaf litter, which is most abundant in gullies, low depressions, and recently logged areas. Small mammals utilise hollows and fissures in fallen logs, while reptiles shelter underneath logs and dense leaf litter.

A total of 67 hollow-bearing trees were identified in the Northern Study Area as shown in **Figure 10**. A total of 149 hollow bearing trees were identified within the Southern Study Area with 47 occurring in the laydown area (refer to **Figure 11**). The number of hollows observed is likely to support in an abundance of arboreal mammal species as evidenced by the survey results, which encourages the presence of large predatory birds such as the Powerful Owl (refer to **Plate 18**).



Legend

- Water Treatment Plant
- Southern Study Area
- Allocasuarina Stands
- Termite mound
- Wombat burrow
- Hollow Bearing Trees

Species, Date

Yellow-bellied Sheathtail Bat	3/05/2016	Brown Treecreeper	5/05/2016	Greater Glider	19/04/2016
Large-eared Pied Bat	21/04/2016	Brown Treecreeper	18/02/2014	Greater Glider	8/12/2015
		Gang-gang Cockatoo	21/04/2016	Little Eagle	3/05/2016
		Gang-gang Cockatoo	20/04/2016	Little Lorikeet	21/04/2016
		Gang-gang Cockatoo	10/12/2015	Scarlet Robin	3/05/2016
		Gang-gang Cockatoo	21/02/2014	Scarlet Robin	19/02/2014
		Gang-gang Cockatoo	19/12/2013	Scarlet Robin	18/02/2014
		Glossy Black-Cockato	18/04/2016	Scarlet Robin	18/12/2013
		Greater Glider	20/04/2016	Speckled Warbler	21/04/2016

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Plate 18 Large hollow in MU 8 of the Northern Study Area

Grasses comprise a significant portion of the ground vegetation in many areas and support grazing macropods and wombats. Open woodlands with sparse understoreys, particularly in close proximity to tracks and disturbed areas are suitable habitats for the threatened plant *P. hindii* and *C. parviflora* var. *minor*, which has been detected across both the Study Areas.

Ridgetops often feature rock piles and exposed sandstone where terrestrial fauna can shelter in cracks and under loose slabs. Sandstone outcrops provide ideal conditions for many reptiles which shelter under slabs and bask on exposed rock. The dense heath covering the skeletal soils that surround exposed rocky areas provides additional cover and foraging opportunities for reptiles, birds and small mammals. Macropods often shelter beneath overhangs amongst larger rock formations.

The Cleared/Disturbed areas occurring within the Study Area are of low value in terms of providing habitat for native fauna species aside from providing foraging habitat along the ecotone between cleared and forested areas (such as foraging by microchiropteran bat species and owls).

3.7.2 Vegetation Corridors and Remnant Vegetation Linkages

The Study Area are partially situated within the Newnes State Forest, extending from the east on Newnes Plateau to west into lower lying vegetated and disturbed lands. In these portions of the Study Area connected vegetation occurs for a distance of greater than 2km to the north, east and south-east of both Study Areas. Being a State Forest in these portions of land, the native vegetation is periodically selectively logged but there are no areas of clear-felling of native vegetation. This creates small and temporary disconnectedness between vegetation communities within the Newnes State Forest, however, overall connectedness currently remains intact.

The Newnes State Forest is connected to the Gardens of Stone National Park and Wollemi National Park to the north, Blue Mountains National Park to the east and Ben Bullen State Forest to the north-west. As a result of the almost complete vegetative cover within and external to the Study Area, the habitat linkages both throughout and surrounding are sufficient for faunal movement and are of high quality.

The western half of both Study Areas is situated on largely disturbed lands due to existing farming lands, roads, easements and mining lands. Remnant vegetation exists to the south of the pipeline which tentatively connects to the northern side. Castlereagh Highway creates a wide disconnection between vegetation tracts further north, and that situated to the north these western portions of the Study Area.

4.0 Impact Analysis

4.1 Direct Impacts

The Project would result in the removal of native vegetation and habitat suitable for threatened flora and fauna species. The specific impacts of the proposed vegetation removal are discussed below.

4.1.1 Vegetation

Native vegetation loss in the Northern and Southern Study Areas is quantified in **Table 14**. The net difference in native vegetation loss is 3.60 ha with the least impact occurring within the Northern Study Area. The impact footprint (as defined in Section 1.5) of the Project will be defined by the alignment (northern versus southern) that will be selected for the installation of the pipeline on Newnes Plateau.

Table 14 Native Vegetation Loss within the Northern and Southern Study Area.

Vegetation Community	Northern (ha)	Southern (ha)
MU 7 Newnes Plateau Narrow-leaved Peppermint - Mountain Gum - Brown Stringybark Layered Forest	1.11	1.24
MU 8 Newnes Sheltered Peppermint – Brown Barrel Shrubby Forest	0.73	0.19
MU 11 Tableland Gully Snow Gum - Ribbon Gum Montane Grassy Forest	0.63	0.61
MU 26 Newnes Plateau Narrow-leaved Peppermint - Silver-top Ash Layered Open Forest	1.56	1.50
MU 28 Sandstone Plateau and Ridge Scribbly Gum – Silvertop Ash Shrubby Woodland	0.00	3.58
MU 29 Sandstone Slopes Sydney Peppermint Shrubby Forest	0.10	0.49
MU 33 Tableland Broad-leaved Peppermint - Brittle Gum - Red Stringybark Grassy Open Forest	0.47	0.47
MU 35 Tableland Gully Mountain Gum – Broad-leaved Peppermint Grassy Forest	0.05	0.00
MU 37 Cocks Permian Red Stringybark - Brittle Gum Woodland	1.49	1.49
MU 43 Pagoda Rock Sparse Shrubland	0.00	0.06
MU 44 Sandstone Plateaux Tea Tree - Dwarf Sheoak - Banksia Rocky Heath	0.00	0.11
MU 53 Mountain Hollow Grassy Fen	0.02	0.02
MU 58 Acacia Thickets	21.22	21.22
MU XX <i>Phragmites australis</i> wetland	0.46	0.46
Total	27.84	31.44

4.1.2 Flora

Three threatened flora species (*Caesia parviflora* var. *minor*, *Persoonia hindii* and *Veronica blakelyi*) were recorded within the Northern and Southern Study Areas. *Persoonia hindii* and *Veronica blakelyi* are both easily detected throughout the year and as such it is considered that survey results would produce an accurate impact estimate for these species. Impact avoidance measures are proposed for *Persoonia hindii* or *Veronica blakelyi* specimens.

The endangered herb *Caesia parviflora* var. *minor* was also identified within both the Northern and Southern Study Area (n=3), with two specimens observed in the eastern 'in common' section. Notwithstanding, it should be noted that survey timing for this species along the Southern Study Area was outside the flowering period and as such is likely to have underestimated impacts along this part of the Study Area.

Potential habitat is present for *Lastreopsis hispida* within the moist sheltered gully habitat of MU 8 Newnes Sheltered Peppermint - Brown Barrel Shrubby Forest. This vegetation community was recorded along both

the Northern and Southern Study Areas. The groundcover of this vegetation community was dominated by ferns including *Pteridium esculentum* and *Blechnum nudum*. However, this species was not detected despite the undertaking of appropriately timed targeted surveys. Impacts on this species and its habitat are expected to be negligible.

Suitable habitat for *Acacia bynoeana* occurs throughout the Newnes Plateau. If present it is likely that a local population would extend throughout the heaths and woodlands that occur on sandy soils. No specimens of this species were observed despite the performing of appropriately timed targeted surveys. Impacts on this species and its habitat are expected to be negligible.

Genoplesium superbum has been recorded within one location within 10 km of the Study Area. The habitat of the local occurrence of this species can be generally described as shrubby woodland on a slope. Habitats within the Study Area therefore have potential to support this species. If present, there is a high likelihood that a local population would extend outside the Study Area, given the large areas of commensurate habitat in the surrounding landscape. No specimens of this species were observed despite the performing of appropriately timed targeted surveys. Impacts on this species and its habitat are expected to be negligible.

4.1.3 Fauna

The Study Area does not include expansive areas of particularly rocky habitats, such as large rock platforms or cliffs, however it will pass through some areas considered suitable for the Broad-headed Snake. Caves or similar structures that may be used by cave dwelling microbats were recorded in close proximity to the Study Area. Loss of caves or similar structures is not expected as a consequence of the Project.

The loss of mid-storey and canopy trees would remove nesting and foraging habitat for threatened bird species, as well as foraging habitats for threatened arboreal mammals, microbats and hunting habitat for the Broad-headed Snake. Specific foraging habitat niches within the proposed surface infrastructure footprint include *Banksia* species used by the Eastern Pygmy Possum, *Allocasuarina* species used by Glossy Black-Cockatoos and nectar producing trees and shrubs used by nectivorous birds and mammals. A primary Koala feed tree (*Eucalyptus viminalis*) only occurs within a small section of the alignment. This feed tree is a component of MU 11 only and is thus not abundant within the Northern Study Area. Therefore, the Koala is unlikely to be significantly impacted upon.

Hollow sizes recorded included some capable of supporting roosting large forest owls and cockatoo species. The Project will therefore constitute a loss to potential roosting or nesting trees for the Gang-Gang Cockatoo, Glossy Black-Cockatoo and threatened owls. It is noted, however, that the threatened Barking Owl, Powerful Owl and Masked Owl have specific preferences regarding hollow types, which involve hollows developing from the main stem of the tree. These hollows are less prevalent; however one suitable hollow was detected in MU 8 of the Northern Study Area. The Sooty Owl prefers moist tall forests and therefore a small amount of preferred habitat for this species.

Habitat for the Regent Honeyeater and Swift Parrot occurs within the region, with areas of high importance located within Capertee Valley to the north. Both species are periodically observed within the locality with the most recent Regent Honeyeater observation in October 2015 along the Coxs River at Little Hartley. Habitat critical to the survival of these species within the locality is generally associated with various box species, particularly White Box (*Eucalyptus albens*) and Yellow Box (*Eucalyptus melliodora*). Neither of these species was observed within the Study Area. In addition, there were few mistletoe occurrences; another indicator of habitat suitability. While the Study Area is located nearby important Regent Honeyeater and Swift Parrot habitat areas (i.e. Capertee Valley), it is considered that the absence of important habitat values such as box species substantially limits the Study Area's value for these species.

No potential breeding habitat would be removed for the Giant Burrowing Frog, Red-crowned Toadlet or Littlejohn's Tree Frog; however, the Project will run alongside an ephemeral drainage line for approximately 1 km. The proposed clearing may therefore cause a loss of potential foraging habitat for these species.

The eastern portion of the Northern Study Area on Newnes Plateau is surrounded by large areas containing contiguous forest, woodland, heath, swamp and rocky habitats. These habitats continue throughout the Newnes State Forest and into the Gardens of Stone National Park, Blue Mountains National Park and Wollemi National Park. For those more mobile species, including the threatened birds, bats, arboreal mammals and terrestrial mammals, which are likely to be impacted upon by the Project, local populations of these species would extend into these adjacent protected habitats.

4.1.4 Groundwater Dependent Ecosystems

As discussed in **Section 3.1.2**, MU 53 may have some degree of dependence on groundwater for its ecological function and therefore may constitute a GDE. The Project would result in the removal of 0.02 ha of this vegetation with the post developed landscape allowing the potential rehabilitation of this vegetation. Limited potential exists for this impact to adversely affect adjoining areas of this vegetation over the medium to long term, although it is recognised that short term impacts may occur.

4.1.5 Project Application Area

This report provides survey results and impact assessments for both the Northern and Southern Study areas. A comparison of potential impacts for the two study areas is included in **Section 4.1**. The comparison concluded the Southern Study Area would likely have a greater impact on biodiversity. The vegetation clearing within the Northern Study Area is less than the vegetation clearing (31.44 ha) required for the Southern Study Area.

The Northern Study Area, as shown in **Figure 2**, has been selected as the preferred route and is hereafter referred to as the Project Application Area as shown in **Figure 13**. Consequently, the Southern Study Area is not discussed any further in this report.

The Project Application Area corresponds to the area surveyed and assessed within the Northern Study Area described in **Section 3.5**, and includes the northern pipeline route on Newnes Plateau. This option has been selected based on the BAR (RPS (2016) in conjunction with geomorphological assessments undertaken for the two study areas. Vegetation clearing within the Project Application Area will be 27.84 ha and corresponds to the disturbance footprint noted in **Section 4.1** for the Northern Study Area.

4.2 Indirect Impacts

Indirect impacts associated with the Project may include:

- Fragmentation;
- Introduction of exotic flora and fauna species;
- An increase in runoff from disturbed areas of land; and
- Hydrocarbons pollution from construction activities (e.g. oil spills).

The following sections discuss the potential indirect impacts associated with the Project.

4.2.1 Edge Effects

The 'edge effect' describes a collection of factors and processes that influence the presence and abundance of species at a boundary, whether they are natural boundaries (e.g. ecotones) or a disturbance of some kind

(e.g. cleared lands). Edges can occur naturally within ecosystems and include situations such as the common boundary between two ecological communities (i.e. ecotones) or the boundary between burnt and unburnt vegetation.

Bali (2005) identifies the following main factors and processes that operate at a disturbed edge of an ecological community: □

- Microclimate (e.g. localised changes in temperature, wind, light, humidity). □
- Hydrology (i.e. localised changes in surface and subsurface water flows). □
- Altered fire frequency and intensity. □
- Invasion by exotic plant and animal species. □
- Alteration of soil conditions (e.g. increased sedimentation and nutrient availability). □
- Alteration of vegetation structure (e.g. tree death and increased shrub densities).

While biodiversity, as a collective, can adapt to the effects of an edge, some species are partially or wholly reliant on edge effects; thus resulting in 'winners' and 'losers' in such circumstances. Species that benefit from edges are generally characterised as pioneer species, a category that often includes many exotic/ weed species. Native plant species of this classification include wattles and many grasses.

On average, edge effects have been estimated to occur up to 50 metres from a road edge (Bali 2005), although much greater distances have been recorded in some road studies (Forman et al. 2003). Edge effects are particularly pronounced in patches where a large edge to area ratio exists (i.e. small vegetation patches with a proportionally large perimeter). Such conditions often result in the simplification of biodiversity values in favour of generalists or edge specialist species. These impacts already exist in the smaller more isolated vegetation patches of the study area. The Project is unlikely to have any substantial incremental edge effects on these smaller isolated patches over and above existing conditions.

Edge effects can influence ecological process by altering the flows of energy, moisture, temperature, materials or organisms and by providing access to spatially separated resources (Fletcher et al. 2007). In turn, this indirectly leads to changes in population structure, species interaction and community structure near edges (Fletcher et al. 2007).

The greatest potential for indirect impacts on native vegetation and habitat is in areas where the Project traverses through large stands of vegetation. Such impacts are either new (i.e. Northern Study Area) or associated with the shifting of edge effects into vegetation previously unaffected by these impacts (i.e. Southern Study Area). Potential edge effects in these areas may include: □

- Establishment of weeds along boundaries between native vegetation and cleared lands and potential for weed incursions into adjacent native vegetation; □
- Modification of habitat attributes, through increased light and noise levels, and changes to vegetation structure, soil nutrient levels and plant species diversity; □
- Changes to fauna assemblages, including alteration of woodland and forest bird assemblages by edge specialists; □
- Increased predation of birds, small mammals, reptiles and frogs by species that use forest edges for foraging; and □
- Increased nest predation of small insectivorous birds at forest edges.

Although the area to be cleared within Newnes Plateau is not likely to fragment two or more patches of vegetation, it will increase the available edges for ecological changes to occur. "New road works through

bushland will increase sunlight and air temperature, which raises soil temperature and decreases soil moisture. This may prevent seeds of shade-tolerant species from germinating and favour other place species (i.e. those that thrive on increased light)" (Rowley et al. 1999:1). Additionally, vehicles utilising this road network have the potential to spread exotic flora species that will have an increased surface area in which to establish themselves.

4.2.2 Fragmentation

Fragmentation is the process of reducing what was once a continuous area of vegetation or habitat into smaller divided and discrete patches of vegetation in isolation. Fragmentation of landscapes reduces a species' ability to adapt to climatic conditions (NWCPAG 2012). Many fauna species are implicated by the process of fragmentation, including experiencing severe population declines (Robertson and Radford 2009). The overall ecology of fragmented patches may be detrimentally altered which influences flora and fauna assemblages (Lindenmayer et al. 1999).

Indirectly, fragmentation can put stress on native flora and fauna by increasing the amount of competition for resources and space of remaining fragments (Fischer and Lindenmayer 2007). Direct clearing can impact immobile organisms such as plants (and also mobile organisms that do not escape efficiently) leaving mobile animals to traverse to other surrounding environments that could be smaller remnants. This can result in overcrowding of an already overpopulated patch, interbreeding, and increased competition (Fischer and Lindenmayer 2007).

Seed dispersal for flora is also not expected to be hindered by the areas of clearing. Although the area of direct occupancy will be reduced marginally for a select few species that exist within the surface infrastructure footprint, they are not expected to be restricted in their ability to disperse naturally within the immediate surrounding environments.

4.2.3 Exotic Flora

There is the potential for the introduction of weeds where the Project traverses intact stands of native vegetation across the entire Study Area. Further, without the use of appropriate weed management protocols, the Project has the potential to facilitate the spread of weeds into adjoining native vegetation. Mitigation measures to be implemented during the construction and operational phases of the Project are recommended to manage and control the incidence and effect of noxious and environmental weeds on the receiving environment. Matters at greatest risk of being impacted by this factor are EECs and threatened flora species.

4.2.4 Noise

Vehicle, plant and construction equipment used for the construction activities of the Project would temporarily increase noise pollution within the Study Area and the surrounds. This can cause disruption to normal fauna activity and often lead to the departure of species from an area. Minor operational noise is expected to occur at the Gravity Tank which will involve the installation and operation of pumping equipment as well as minor noise pollution at the water treatment plant at MPPS. Short term non-permanent impacts through the construction period and minor impacts through operations of the Gravity Tank and treatment water plant at MPPS are expected with minor impacts limited to highly mobile species such as woodland birds (e.g. Regent Honeyeater, Scarlet Robin and Varied Sittella).

4.2.5 Storm-water Runoff

The removal of vegetation, including both trees and grasses will increase the risk of storm-water run-off. Operational activities also increase pollution risk within the environment, specifically the spillage of mine

water. Matters at greatest risk of being impacted by this indirect impact are threatened plant species and EECs.

4.2.6 Vehicle Strike

The Project would, in places, establish a temporary trafficable surface for vehicles thus increasing the exposure of fauna to a vehicle hazard. As a consequence, it is considered that the risk of fauna being struck by vehicles would increase. Vehicle movements would be during the day and would be controlled by speed limits imposed by a construction management plan and actual conditions. Fauna species considered most at risk of this impact are slow moving species such as reptiles and amphibians. Nocturnal species are unlikely to be impacted by the construction traffic.

4.3 Key Threatening Processes

Key Threatening Processes (KTPs) are listed under Schedule 3 of the TSC Act. There are five KTPs that have the potential to affect the study area as a consequence of the Project, being:

- Aggressive exclusion of birds from woodland and forest habitat by abundant Noisy Miners (*Manorina melanocephala*);
- Loss of hollow-bearing trees;
- Removal of dead wood and dead trees;
- Clearing of native vegetation;
- Anthropogenic climate change;
- Degradation of native riparian vegetation along NSW watercourses; and
- Invasion of native plant communities by exotic perennial grasses.

“Aggressive exclusion of birds from woodland and forest habitat by abundant Noisy Miners (*Manorina melanocephala*)”

The removal of 27.84 ha of native vegetation for the Project may contribute to the increased dispersal of Noisy Miners into the surrounding vegetation. Although the Project may increase their dispersal, it is likely, given the heavy vegetated condition of surrounding areas, that Noisy Miners would not exhibit high abundance hence aggressive behaviour within the Project Application Area (PAA) or locality.

“Loss of hollow-bearing trees”

The Project will require the removal of 67 hollow-bearing trees and as such will contribute to the KTP “Removal of Hollow-bearing Trees”. The avoidance of hollow-bearing trees during construction is recommended to minimise impacts on this habitats feature.

“Removal of dead wood and dead trees”

The Project will require the removal of 27.84 ha of native vegetation which includes dead trees or ground debris and as such will contribute to the KTP “Removal of Dead Wood and Dead Trees”. The avoidance/relocation of dead wood and trees during construction are recommended to minimise impacts on this habitats feature.

“Clearing of Native Vegetation”

The Project will require the removal of 27.84 ha native vegetation and as such will contribute to the KTP “Clearing of Native Vegetation”.

“Anthropogenic Climate Change”

The Project will contribute to the KTP “Human Caused Climate Change”. The Project will involve the removal of 27.84 ha of native vegetation which is known to be a cause of increase heating of the earth (DECCW 2010b). Notwithstanding, the contribution and impact from the Project is considered to be insignificant.

“Degradation of native riparian vegetation along NSW watercourses”

Vegetation adjacent to riparian environments is proposed for removal and as such the Project may incrementally contribute to the KTP ‘Degradation of native riparian vegetation along NSW watercourses’. It is considered that the Project is unlikely to result in a large impact in accordance with this KTP; however, it is prudent to consider impact minimisation and mitigation where possible to limit the effects of this KTP.

Invasion of native plant communities by exotic perennial grasses

The Project is unlikely to directly contribute to the KTP “Invasion of native plant communities by exotic perennial grasses” due to the retention of a majority of the native grass layer and only a small area of surface vegetation to be removed for the Project. However, some disturbed areas within the Project Application Area already contain exotic perennial grasses. The Project will provide an opportunity to enact a weed control program to ameliorate this KTP.

5.0 Avoidance, Minimisation and Mitigation

It is recommended that the Project incorporate impact avoidance and minimisation strategies, where possible, in recognition of the Project's propensity to directly/ indirectly biodiversity values (e.g. presence of threatened species and TECs) and activation of KTPs (**Section 4.3**). Suggested impact avoidance and minimisation strategies are outlined in the following sections.

5.1 Impact Avoidance

Impact avoidance aims to minimise impacts on threatened species and ecological communities primarily through Project design. Avoidance of potential impacts has also been considered by the utilisation of existing disturbance areas such as pipelines and tracks. Relevant impact avoidance criteria are discussed in **Table 15**.

Table 15 Impact Avoidance Criteria

Biodiversity Value	Project Application Area versus Southern Study Area
Native vegetation	The clearing of native vegetation within the PAA would result in at least 3.60 ha being avoided by comparison to the Southern Study Area.
Hollow-bearing trees	A total of 67 hollow-bearing trees were identified in the PAA compared with 149 hollow-bearing trees within the Southern Study Area. The loss of hollow-bearing trees is a KTP. The greater loss of hollow-bearing trees would have a greater impact on the Glossy-black Cockatoo, Powerful Owl, Varied Sittella, Brown Tree-creeper and microchiropteran bats.
Threatened species	The PAA would result in a greater impact on threatened species than the Southern Study Area. Additional <i>Caesia parviflora</i> ssp. <i>minor</i> and <i>Veronica blakelyi</i> would be impacted within the Northern Study Area. A large, pure stand of <i>Allocasuarina littoralis</i> utilised by the Glossy-black Cockatoo occurs in the Southern Study Area. No impacts of this nature would occur within the PAA. No areas of <i>Bursaria spinosa</i> subsp. <i>lasiophylla</i> (Bathurst Copper butterfly habitat) were observed, however, potential exists for this plant species to occur as individual plants along the western portion of the Study Area. Sandstone escarpment suitable for the Large-eared Pied Bat exists in the Southern Study Area. No such sandstone escarpment occurs within the PAA, although occurs in close proximity to the alignment. Foraging habitat for this species occurs within both the PAA and the Southern Study Area. Potential Powerful Owl roost trees occur on both the PAA and the Southern Study Area, with the Powerful Owl observed in the PAA.
Threatened Ecological Communities (including both MU 11 and MU 53)	The PAA would result in the loss of 0.65 ha of EEC compared with a 0.63 ha loss of EEC in the Southern Study Area.
Groundwater Dependant Ecosystems	Neither Study Area has a greater impact on GDEs.
Patch integrity	The Southern Study Area is expected to have a lower impact on patch integrity as the pipeline is proposed to align with existing areas of disturbance (i.e. existing pipeline/ tracks). Impacts within the Southern Study Area would require the establishment of new disturbance areas due to the layover area and growth of vegetation on existing pipeline areas.

As indicated in **Table 15** and **Section 4.3** (KTPs), it is evident that the Southern Study Area would likely have a greater impact on biodiversity despite the PAA having a greater impact on TECs and additional edge effects. With regards to threatened species and habitat it is recommended that impact avoidance outcomes be achieved through pre-clearance surveys and careful construction techniques for *P. hindii*, *C. parviflora* var. *minor*, *E. cannonii*, hollow-bearing trees and patches of *Bursaria spinosa* subsp. *lasiophylla* (Bathurst Copper butterfly habitat).

5.2 Impact minimisation

Both the PAA and the Southern Study Area would result in the removal of threatened plant species and hollow-bearing trees. However, by observing careful Project construction techniques (i.e. use of pre-clearance surveys and minor route adjustment); opportunity exists to avoid impacts on individual threatened plants and hollow-bearing trees.

The extent of impact avoidance is not currently known as site specific construction constraints may limit an absolute avoidance outcome. As such, it is not possible to conclusively say that all threatened species and hollow-bearing trees would be avoided. Thus, impact assumptions have been established to aid impact assessment for both the PAA and the Southern Study Area, as outlined below:

- Zero loss of *Persoonia hindii* (averting the loss of seven observed individuals);
- Three individuals of *Caesia parviflora* var. *minor*; and
- Three individuals of *Eucalyptus cannonii*.

The above impact assumptions would be confirmed prior to construction to validate offsetting requirements.

5.3 Mitigation

It is recommended that mitigation measures be outlined in a Construction Environmental Management Plan (CEMP). The following mitigation measures are recommended for inclusion in the CEMP to reduce the impacts of clearing, construction and operation of the proposed development:

- The clearing of native vegetation should be minimised as far as is practicable. Unnecessary vegetation clearing should be minimised by fencing the clearing limit;
- All contractors will be specifically advised of the designated work area. The following activities are not to occur outside of designated work areas to minimise impacts on native vegetation:
 - » Vehicle movements;
 - » Storage and mixing of materials;
 - » Vehicle parking;
 - » Liquid disposal;
 - » Machinery repairs and/or refueling;
 - » Combustion of any material;
 - » Inappropriate stockpiling of soil, rubble or debris; and/or
 - » Any filling or excavation including trenching, topsoil skimming and/or surface excavation.
- All construction and operational vehicles/machinery will use designated access tracks. Speeds will be limited to 20 kilometres per hour to reduce the potential of fauna strike and to reduce dust generation;
- Plant and machinery will be cleaned of any foreign soil and propagative material prior to being transported to the construction areas to prevent the spread of weeds and potential importation of *Phytophthora*;
- If machinery is transported from an area of confirmed infection of *Phytophthora* or Chytrid fungus to the construction areas, stringent wash down will be completed before leaving the area, removing all soil and vegetative material from cabins, trays, and under carriages;
- To minimise potential impacts on adjacent conservation lands and wetland habitats all liquids (fuel, oil, cleaning agents, drilling liquids etc.) will be stored appropriately and disposed of at suitably licensed facilities. Spill management procedures will be implemented as required. Rubbish will be collected and

removed from the PAA;

- Appropriate erosion and sediment control measures will be managed via the implementation of an erosion and sediment control plan, in accordance with best management practices, such as the:
 - » Best Practice Erosion and Sediment Control Guidelines (IECA, 2008); and
 - » Managing Urban Stormwater: Soils and Construction 4th Ed. 'The Blue Book' (Landcom 2004).

It is imperative that the plan ensures that any offsite discharge of stormwater (freshwater) does not significantly impact upon the adjoining aquatic environments;

- Construction personnel will be trained adequately in pest management and hygiene procedures;
- Weed management procedures will be implemented to prevent the spread of weeds both inside the Project Application Area and outside. Ongoing weed monitoring to be implemented and potential weed infestations appropriately managed to minimise the spread of weeds in the PAA. Management of noxious weeds are to be undertaken in accordance with the *Noxious Weeds Act* 1993. Weed monitoring should occur throughout the construction and operation phase and weed removal will be carried out as necessary;
- Where possible, clearing activities should be timed to avoid removal of hollow-bearing trees during breeding season of threatened species (avoiding winter and spring);
- A qualified ecologist is to perform pre-clearance surveys with the construction manager to identify key areas of impact avoidance including threatened;
- A qualified ecologist is to be present to supervise hollow-bearing tree clearing within the PAA and that vegetation clearing is undertaken in the following manner:
 - » Hollow-bearing trees are to be clearly marked (spray paint or flagging tape) by a qualified ecologist within the impact area prior to any vegetation clearing commencing;
 - » Non habitat vegetation should be removed at least one day prior to felling of hollow-bearing trees to encourage resident fauna to self relocate before felling of remaining habitat trees;
 - » Immediately prior to the felling of hollow-bearing trees, trees should be given two sharp taps with the machinery arm/bucket to encourage fauna to escape. After waiting 1–2 minutes after tapping the tree, the hollow-bearing tree should be felled as gently as possible;
 - » An ecologist is to inspect each felled hollow-bearing tree (once safe) to recover any injured fauna and seek appropriate treatment, and relocate uninjured fauna into vegetation to be retained within the PAA; and
 - » Felled timber is to be left in place for one night after all other vegetation is removed to allow any remaining fauna to vacate hollows.

6.0 EPBC Act Matters of National Environmental Significance

6.1 World Heritage Properties and National Heritage Properties

The western boundary of the NSW Greater Blue Mountains Area (GBMA) is located approximately 15 km to the east of the PAA and approximately 20 km to the north. The GBMA is a World Heritage Property and National Heritage Place DoE (2013a) provides significant impact assessment criteria for World Heritage Properties and National Heritage Places. Those assessment criteria relevant to biodiversity are considered below.

As per DoE (2013a), an action is likely to have a significant impact on natural heritage values of a World Heritage property if there is a real chance or possibility that the action will:

- Reduce the diversity or modify the composition of plant and animal species in all or part of a World Heritage property;
- Fragment, isolate or substantially damage habitat important for the conservation of biological diversity in a World Heritage property;
- Cause a long-term reduction in rare, endemic or unique plant or animal populations or species in a World Heritage property; and
- Fragment, isolate or substantially damage habitat for rare, endemic or unique animal populations or species in a World Heritage property.

An action is likely to have a significant impact on natural heritage values of a National Heritage place if there is a real chance or possibility that the action will:

- Modify or inhibit ecological processes in a National Heritage place;
- Reduce the diversity or modify the composition of plant and animal species in a National Heritage place;
- Fragment or damage habitat important for the conservation of biological diversity in a National Heritage place;
- Cause a long-term reduction in rare, endemic or unique plant or animal populations or species in a National Heritage place; and
- Fragment, isolate or substantially damage habitat for rare, endemic or unique animal populations or species in a National Heritage place.

Activities required for the Project are limited to surface works within the proposed PAA. Given that the area to be impacted is outside the GBMA, no impacts are expected to occur on the GBMA.

6.2 Wetlands of International Importance (declared Ramsar wetlands)

The closest Ramsar listed wetland is approximately 300-400 km upstream of the PAA, namely The Macquarie Marshes. Given the distance from the PPA, it is unlikely that the project will impact upon this Ramsar Wetland.

6.3 The Great Barrier Reef Marine Park

The Great Barrier Reef Marine Park does not occur within or adjacent to the PAA, therefore, the Project will not impact upon any areas of the Great Barrier Reef Marine Park.

6.4 Commonwealth Marine Area

The PAA is not a Commonwealth Marine Area, and is not in close proximity to any such area. Therefore, the Project will not impact upon any Commonwealth Marine Area.

6.5 Listed threatened Ecological Communities

No listed threatened Ecological Communities exist within or adjacent to the PAA.

6.6 Nationally Listed Threatened and Migratory Species

Nationally listed threatened species and ecological communities that are considered to have potential to be impacted upon by the Project are assessed in **Appendix 5**. These are listed below:

Threatened Flora

- Eucalyptus aggregata (Black Gum);
- Eucalyptus pulverulenta (Silver-leaved Gum);
- Prostanthera cryptandroides subsp. cryptandroides (Wollemi Mintbush);
- Persoonia acerosa (Needle Geebung);
- Persoonia marginata; and
- Thesium australe (Austral Toadflax).

Threatened Fauna

- Bathurst Copper Butterfly (*Paralucia spinifera*);
- Giant Burrowing Frog (*Heleioporus australiacus*);
- Littlejohn's Tree Frog (*Litoria littlejohni*);
- Broad-headed Snake (*Hoplocephalus bungaroides*);
- Regent Honeyeater (*Anthochaera phrygia*);
- Spotted-tailed Quoll (*Dasyurus maculatus maculatus*);
- Southern Brown Bandicoot (*Isodon obesulus obesulus*);
- Koala (*Phascolarctos cinereus*);
- Greater Glider (*Petauroides volans*);
- Brush-tailed Rock-wallaby (*Petrogale penicillata*);
- New Holland Mouse (*Pseudomys novaehollandiae*); and
- Large-eared Pied Bat (*Chalinolobus dwyeri*).

The assessment conclusions presented in Appendix 5 indicate that the Project is not likely to have a significant impact on matters listed under Section 18 and 18A of the EPBC Act.

Table 9 lists the migratory species identified from database searches. Due to the high mobility of these migratory species, in relation to the low level impacts predicted to potential habitats, the impact upon these migratory species are unlikely to be significant.

6.7 All Nuclear Actions

No type of nuclear activity is proposed for the PAA.

6.8 Water resource, in Relation to Coal Seam Gas Development and Large Coal Mining Development

Not assessed in this report.

7.0 Conclusion

This Ecological Assessment has detailed the methods and results of ecological surveys conducted for the Springvale Water Treatment Project. Surveys were conducted in accordance with the FBA and considered species populations and EECs listed under the NSW TSC Act and Commonwealth EPBC Act.

Flora surveys detected three threatened flora species, including:

- *Caesia parviflora* var. *minor* (Small Pale Grass Lily) (Northern and Southern Study Areas);
- *Persoonia hindii* (Northern and Southern Study Area); and
- *Veronica blakelyi* (Northern Study Area).

Additionally, two threatened flora species were detected immediately adjacent both Study Areas, including:

- *Eucalyptus aggregata* (Black Gum); and
- *Eucalyptus cannonii* (Capertee Stringybark).

Two EECs were detected including:

- MU 11 corresponds to Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland in the South Eastern Highlands, Sydney Basin, South East Corner and NSW South Western Slopes Bioregions EEC listed under the TSC Act; and
- MU 53 corresponds to Montane Peatlands and Swamps of the New England Tableland, NSW North Coast, Sydney Basin, South East Corner, South Eastern Highlands and Australian Alps bioregions EEC listed under the TSC Act.

Eleven threatened fauna species listed under the TSC Act and/or EPBC Act were detected during RPS surveys across both the Northern and Southern Study Areas:

- Scarlet Robin (*Petroica boodang*);
- Little Eagle (*Hieraaetus morphnoides*);
- Gang-gang Cockatoo (*Callocephalon fimbriatum*);
- Glossy Black-Cockatoo (*Calyptorhynchus lathamii*);
- Powerful Owl (*Ninox strenua*) (Northern Study Area only);
- Brown Treecreeper (eastern subsp.) (*Climacteris picumnus victoriae*);
- Large-eared Pied Bat (*Chalinolobus dwyeri*);
- Yellow-bellied Sheath-tail Bat (*Saccolaimus flaviventris*);
- Greater Glider (*Petauroides volans*);
- Speckled Warbler (*Chthonicola sagittata*) (Southern Study Area only); and
- Little Lorikeet (*Glossopsitta pusilla*) (Southern Study Area only).

The impacts outlined in this report have been assessed in relation to the important ecological matters detected during surveys conducted for the Project, in the overarching BAR. Refer to the BAR in which this report is appended for impact assessment outcomes.

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Appendix I

Likelihood of Occurrence Table

Threatened flora and fauna species (listed under the TSC Act 1995 and/or EPBC Act 1999) that have been gazetted and recorded within a 10 km radius of the Study Areas have been considered within this assessment. EECs known from the broader area have also been addressed. Additional species that were known from the region that did not arise in searches were also considered. Each species / community is considered for its potential to occur within the Study Areas.

This assessment deals with the following heads of consideration in tabulated form (refer to **Table 1** overleaf):

‘Species / Community’/ Population’ – Lists each threatened species / population / EEC known from the vicinity. The status of each threatened species under the TSC Act 1995 and EPBC Act 1999 are also provided.

‘Habitat Description’ – Provides a brief account of the species / community / population and the preferred habitat attributes required for the existence / survival of each species / community.

‘Likelihood of Occurrence within the Study Areas’ – Assesses the likelihood of each species / community to occur along or within the immediate vicinity of the Northern and Southern Study Areas in terms of the aforementioned habitat description and taking into account local habitat preferences, results of current field investigations, data gained from various sources (such as OEH Atlas of NSW Wildlife) and previously gained knowledge via fieldwork undertaken within other ecological assessments in the locality.

‘Potential for Impact’ – Assesses the potential of each species/community/population to be impacted within the Study Areas for EPBC Act listed species only. The associated BAR will assess potential impacts for those species listed under the TSC Act.

Table 1 Assessment of Likelihood of Occurrence of Threatened Species and Communities and Assessment of Potential Impacts

Species / Community	Habitat Description	Likelihood of Occurrence	Potential Impact
Flora			
<i>Boronia deanei</i> Deane's Boronia (V, V*)	Occurs in wet heath appearing to prefer the margins of open forest where it adjoins swamps and streams. It is known to occur in the Blue Mountains in the upper Kangaroo River near Carrington falls, the Endrick River near Nerriga and on the Nalbaugh Plateau.	A high number of records occur within a 10km radius of the Study Areas for this species, however no MU 50 or MU 51 in which this species inhabits, occurs within the area to be impacted upon. It is considered unlikely to occur.	This species is unlikely to occur within the Study Areas or within any habitats that may be directly or indirectly affected and is therefore unlikely to be impacted.
<i>Caesia parviflora</i> var. <i>minor</i> (E)	Occurs in damp places in open forest on sandstone. This variety may be more common than currently known, as Pale Grass-lilies are often not identified to variety level (OEH 2013). Two other larger varieties of <i>C. parviflora</i> have been described and are more common and widespread. A small or stunted <i>C. parviflora</i> of another variety may potentially be mistaken for <i>C. parviflora</i> var. <i>minor</i> .	This species was recorded within the Study Areas.	The species is known to occur within the Study Area. Therefore, it has the potential to be impacted.
<i>Veronica blakelyi</i> (V)	This species occurs in moist areas of eucalypt forest. It is known to occur in the Western Blue Mountains near Clarence, near Mt Horrible, Nullo Mountain and in the Coricudgy Range.	This species has been recorded within the Northern Study Area in previous studies (RPS 2014).	The species is known to occur within the Northern Study Area. Therefore, it has the potential to be impacted.
<i>Dillwynia tenuifolia</i> (V)	Occurs in scrubby/dry heath areas within Castlereagh Ironbark Forest and Shale Gravel Transition Forest on tertiary alluvium or laterised clays and less commonly on sandy loam over sandstone, or on Wiannamatta shale or laterite (DoE 2016). May also be common in transitional areas where these communities adjoin Castlereagh Scribbly Gum Woodland (OEH 2016).	The species was not detected during the surveys in the Study Area. There are 2 existing records within 10 km of the Study Area. One of the records is located within a kilometre of the proposed works. There are some dry/scrubby heath and transitional areas on sandstone in and adjacent to the Study Area. Therefore this species may occur.	Habitat for this species is absent from the Study Area. This species is unlikely to occur within the Study Areas or within any habitats that may be directly or indirectly affected and is therefore unlikely to be impacted.

Species / Community	Habitat Description	Likelihood of Occurrence	Potential Impact
<i>Eucalyptus aggregata</i> Black Gum (V, V*)	Occurs on the central and southern tablelands of NSW. Grows in grassy woodlands on alluvial soils in moist sites along creeks, flats and hollows. Associated plants include <i>Eucalyptus rubida</i> (Candlebark), <i>E. viminalis</i> (Ribbon Gum) and <i>E. pauciflora</i> (Snow Gum) and <i>Poa labillardierei</i> (River Tussock) as an understorey grass.	This species was recorded within the Study Area.	The species is known to occur within the Study Area. Therefore, it has the potential to be impacted.
<i>Eucalyptus cannonii</i> Capertee Stringybark (V)	The altitude range of <i>Eucalyptus cannonii</i> is from about 460 m to 1040 m. Within the range, the species appears to tolerate most situations except the valley floors. Recorded from Tablelands Grassy Woodland Complex communities and Talus Slope Woodland, and in Winburndale Nature Reserve within woodland dominated by Red Stringybark.	This species was recorded within the Study Area.	The species is known to occur within the Study Area. Therefore, it has the potential to be impacted.
<i>Eucalyptus pulverulenta</i> Silver-leaved Gum (V, V*)	This species occur on the crests or upper slopes of moderately steep hillsides or mountains. Locally, it can be found in shallow soils as an understorey plant in open forest, typically dominated by Brittle Gum (<i>Eucalyptus mannifera</i>), Red Stringybark (<i>E. macrorhyncha</i>), Broad-leaved Peppermint (<i>E. dives</i>), Silvertop Ash (<i>E. sieberi</i>) and Apple Box (<i>E. bridgesiana</i>).	As this species can occur on steep terrain, there is potential that individuals could occur within the Study Area. However such areas could not be accessed to be recorded. This species may occur.	Potential habitat for this species occurs within the Study Area. Therefore, it has the potential to be impacted. An Assessment of Significance (AoS (EPBC Act)) has been prepared in Appendix 5 .
<i>Eucalyptus robertsonii</i> subsp. <i>Hemisphaerica</i> Robertson's Peppermint (V, V*)	A 30m tall tree with grey to grey-brown shortly fibrous bark which is persistent along the trunk. Found east and south-east of Orange in NSW. Known to occur north and north-east of Mullion Creek, Glengowan, Upper Meroo, west of Bocoble Mountain and Burruga. Locally common with a limited extent of occurrence. Found in closed grassy woodland in locally sheltered sites. Associated species include <i>Eucalyptus macrorhyncha</i> (Red Stringy Bark), <i>E. rossii</i> (Scribbly Gum), <i>E. dives</i> (Broad-leaved Peppermint), <i>E. mannifera</i> (Brittle Gum) and <i>E. dalrympleana</i> (Mountain Gum).	This species was not detected during surveys and no records occur within 10km of the Study Area. Although some associated species do occur within the Study Area, the Study Area is outside the current known distribution of this species. It is unlikely to occur.	This species is unlikely to occur within the Study Area or within any habitats that may be directly or indirectly affected and is therefore unlikely to be impacted.
<i>Genoplesium superbum</i> (E)	<i>Genoplesium superbum</i> has been recorded from 2 locations near Nerriga, c. 20 km apart, and north of Wallerawang. <i>Genoplesium superbum</i> occurs predominantly in wet heathland on shallow soils above a sandstone cap but has also been found in open woodland interspersed with heath. This species can only be seen when in flower (December - March). Further details were sought from OEH with regard to the local habitat preferences of this species. OEH confirmed that the record was made in a woodland environment on a slope.	This species was not detected during surveys; however 13 records occur within 10km of the Study Area. Given the diversity of habitats it has been found in, some habitats within the Study Area may be suitable. This species may occur.	Potential habitat for this species occurs within the Study Area. Therefore, it has the potential to be impacted.

Species / Community	Habitat Description	Likelihood of Occurrence	Potential Impact
<i>Lastreopsis hispida</i> Bristly Shield Fern (E)	This species ranges from Victoria to NSW within moist humus-rich soils in wet forest and rainforest gullies of the Blue Mountains, where it grows on rotting logs.	Records in the locality are typically restricted to the Mt Wilson area. However, this species can be difficult to differentiate between similar <i>Lastreopsis</i> species and its distribution may therefore extend further. Potentially suitable wet forest habitats occur at the western end of the proposed works in gullies of the Study Area. This species may occur.	Potential habitat for this species occurs within the Study Area. Therefore, it has the potential to be impacted.
<i>Leucopogon fletcheri</i> subsp. <i>fletcheri</i> (E)	Occurs in dry eucalypt woodland or in shrubland on clayey lateritic soils, generally on flat to gently sloping terrain along ridges and spurs (OEH 2016). The species is thought to respond slowly to fire.	The species was not detected during surveys in the Study Area. Seven records exist within a 10km radius of the Study Area. Suitable habitat occurs within the Study Area. Therefore this species may occur.	Potential habitat for this species occurs within the Study Area. Therefore, it has the potential to be impacted.
<i>Leucochrysum albicans</i> var. <i>tricolor</i> (E*)	Occurs in a wide variety of woodland and forest habitats, generally on relatively heavy soils. In NSW and ACT, <i>Leucochrysum albicans</i> var. <i>Tricolor</i> (Hoary Sunray occurs in grasslands, grassy areas in woodlands and dry open forests, and modified habitats, on a variety of soil types including clays, clay loams, stony and gravelly soil (DoE 2016).	The species was not detected during surveys and the right soil types were absent in the Study Area, which mostly consists of sandy soils. However the species has a notably wide range of potential habitat, including open woodlands similar to the Study Area. Therefore this species may occur.	Potential habitat for this species occurs within the Study Area. Therefore, it has the potential to be impacted. An AoS (EPBC Act) has been prepared in Appendix 5 .
<i>Acacia bynoeana</i> Bynoe's Wattle (V, V*)	This species has been recorded in the Blue Mountains NP, Royal NP, Marramatta NP and Tarlo River NP, among other conservation areas. Grows in heath and dry sclerophyll forest, commonly in open woodland with a heath understorey or open woodland with a sparse shrub cover and a grass/sedge ground cover. Can be found in disturbed locations such as trail margins and road sides. Associated overstorey species include <i>Eucalyptus gummifera</i> , <i>E. haemastoma</i> , <i>E. parramattensis</i> , <i>E. sclerophylla</i> , <i>Banksia serrata</i> and <i>Angophora bakeri</i> . Associated shrubs include <i>Banksia spinulosa</i> , <i>Acacia oxycedrus</i> , <i>A. myrtifolia</i> and <i>Kunzea</i> spp.	This species was not detected during surveys and no records occur within 10km of the Study Area. It is generally a more coastal species. It is considered unlikely to occur.	This species is unlikely to occur within the Study Area or within any habitats that may be directly or indirectly affected and is therefore unlikely to be impacted.

Species / Community	Habitat Description	Likelihood of Occurrence	Potential Impact
<i>Acacia meiantha</i> (V)	This species is endemic to NSW. Three disjunct populations occur within the Central Tablelands within 100km of each other. The Clarence population covers approximately 1 ha between Lithgow and Bell on Crown and Railway Corridor land. Populations occur on different geologies and in different plant communities with dissimilar species associations. The Clarence population occurs in open eucalypt forest in association with <i>E. dives</i> and <i>E. sieberi</i> and in an adjacent area of mostly shrubs where the overstorey was cleared for power lines.	This species was not detected during surveys and no records occur within 10km of the Study Area. Records are known from Clarence Colliery and suitable habitat occurs onsite. Therefore this species may occur.	Potential habitat for this species occurs within the Study Area. There is potential for the habitat of this species to be impacted.
<i>Pultenaea glabra</i> Smooth Bush-pea (V, V*)	Grows in swamp margins, hillslopes, gullies and creek banks and occurs within dry sclerophyll forest and tall damp heath on sandstone. In NSW it is confined to the higher Blue Mountains (Katoomba-Hazelbrook and Mount Victoria).	This species has a restricted distribution within the higher Blue Mountains. The distribution does not incorporate the Study Area. This species is unlikely to occur.	This species is unlikely to occur within the Study Area or within any habitats that may be directly or indirectly affected and is therefore unlikely to be impacted.
<i>Pelargonium</i> sp. Striatellum (G.W. Carr 10345) (E*)	Occupies a narrow habitat that is usually just above the high-water level of irregularly inundated or ephemeral lakes, in the transition zone between surrounding grasslands or pasture and the wetland or aquatic communities. Extent possibly driven by inundation regimes and topography of lakes.	The species habitat does not occur within the Study Area. There are no Atlas records of the plant within 10 km of the Study Area. This species is unlikely to occur.	This species is unlikely to occur within the Study Area or within any habitats that may be directly or indirectly affected and is therefore unlikely to be impacted.
<i>Prostanthera cryptandroides</i> subsp. <i>cryptandroides</i> Wollemi Mintbush (V, V*)	Known from Glen Davis to Capertee and extending to the Goulburn River Valley in NSW. Occurs within the Hawkesbury-Nepean, Central West, Hunter-Central Rivers and Lachlan Natural Resource Management Regions. Found in dry sclerophyll forested slopes and gullies in rocky areas, particularly at the base of scree slopes and sandstone boulders, and in shallow sandy loam.	Scree slopes and forested gullies in MU 43 and MU 44 may provide potential habitat for this species within the Southern Study Area. There is one Atlas record within 10 km of the Study Area. Therefore this species may occur.	Potential habitat for this species occurs within the Southern Study Area. There is potential for the habitat of this species to be impacted. An AoS (EPBC Act) has been applied to this species in Appendix 5 .
<i>Cryptostylis hunteriana</i> Leafless Tongue-orchid (E, V*)	Occupies swamp heath, but also in sclerophyll forest and woodland, often on sandy soils. Typically found in communities containing <i>Eucalyptus haemastoma</i> , <i>E. capitellata</i> and <i>Corymbia gummiifera</i> . Its distribution in NSW is primarily coastal.	The Study Area is outside its known distribution of <i>Cryptostylis hunteriana</i> . This species is unlikely to occur.	This species is unlikely to occur within the Study Areas or within any habitats that may be directly or indirectly affected and is therefore unlikely to be impacted.

Species / Community	Habitat Description	Likelihood of Occurrence	Potential Impact
<i>Microtis angusii</i> Angus's Onion Orchid (E, E*)	<i>M. angusii</i> is endemic to NSW and is currently only known from its type locality at Ingleside in the north of the Sydney metropolitan area. Known habitats have not been described as this species was discovered in a highly disturbed location. The dominant species at this disturbed site were Coolatai Grass (<i>Hyparrhenia hirta</i>) and <i>Acacia saligna</i> .	This species is extremely rare, being known only from one location, and these records are not within 10km of the Study Area. Suitable habitat is also not found onsite. This species is unlikely to occur.	This species is unlikely to occur within the Study Area or within any habitats that may be directly or indirectly affected and is therefore unlikely to be impacted.
<i>Prasophyllum petilum</i> Tarengo Leek Orchid (E, E*)	Endemic to NSW and known to occur on relatively fertile soils in grassy woodland or natural grassland in open eucalypt woodland and grassland. It also occurs on flat or gently sloping sites on plains and rolling hills. Soils are usually loams, clay loams or sandy clays.	The Study Area is outside of the known distribution of this species. It is unlikely to occur.	This species is unlikely to occur within the Study Area or within any habitats that may be directly or indirectly affected and is therefore unlikely to be impacted.
<i>Prasophyllum</i> sp. Wybong (C. Phelps ORG 5269) a leek-orchid (CE*)	Now included in <i>Prasophyllum petilum</i> from DoE SPRAT profile (accessed 20 January 2016).	The Study Area is outside of the known distribution of this species. It is unlikely to occur.	This species is unlikely to occur within the Study Area or within any habitats that may be directly or indirectly affected and is therefore unlikely to be impacted.
<i>Euphrasia arguta</i> (CE, CE*)	This species is known from Nundle State Forest and adjacent private land in NSW in an area estimated to be 26 km ² (NSW DPI 2008). Previously known from Bathurst to Sydney and north to Walcha. Occurs in eucalypt forest with a mixed grass understorey within Nundle State Forest. Historic records describe the habitat as grassy areas near rivers at elevations up to 700 m above sea level.	This species is extremely rare and potentially locally extinct, historic records indicate a habitat that is not represented within the Study Area. This species is unlikely to occur.	This species is unlikely to occur within the Study Area or within any habitats that may be directly or indirectly affected and is therefore unlikely to be impacted.
<i>Homoranthus darwinioides</i> (V, V*)	A spreading shrub 1-1.5m high. Occurs between Dubbo and Denman on the western slopes and central tablelands of New South Wales. Occurs in various woodland habitats with shrubby understoreys, usually in gravelly sandy soils. Recorded growing on flat sunny ridge tops with shrubby woodland, sloping ridges, gentle south-facing slopes and a slight depression on a roadside with loamy sand. Associated species include Black Cypress-pine (<i>Callitris endlicheri</i>), Narrow-leaved Ironbark (<i>E. crebra</i>), Red Ironbark (<i>E. fibrosa</i>), Brown Bloodwood (<i>E. trachyphloia</i>), Scribbly Gum (<i>E. rossii</i>), Broom Honey-myrtle (<i>Melaleuca uncinata</i>), Fringe Myrtle (<i>Calytrix tetragona</i>) and <i>Allocasuarina</i> spp.	This species was not detected within the Study Area, and no records occur within 10km of the Study Area. Additionally, the associated species composition does not occur within the Study Area. It is unlikely to occur.	This species is unlikely to occur within the Study Area or within any habitats that may be directly or indirectly affected and is therefore unlikely to be impacted.

Species / Community	Habitat Description	Likelihood of Occurrence	Potential Impact
<i>Persoonia acerosa</i> Needle Geebung (V, V*)	Known from the Blue Mountains in the Newnes Plateau south through Kings Tableland to Hilltop and east to the lower Mountains. Occurs in dry sclerophyll forest, scrubby low-woodland and heath, generally on clayey sandstone and laterites of the Narrabeen Group (NPWS 2000). This species is strongly associated with disturbance margins such as road and trail verges.	Only one record occurs within a 10km radius of the Study Area, however this species is known from the Newnes Plateau region. Suitable habitat does occur. Therefore this species may occur.	Potential habitat for this species occurs within the Study Area. There is potential for the habitat of this species to be impacted. An AoS (EPBC Act) has been applied to this species in Appendix 5 .
<i>Persoonia hindii</i> (E)	Distribution is limited to the Newnes plateau in the Upper Blue Mountains where it occurs in dry forest habitats.	This species was not detected within the Study Area; however previous surveys have recorded it in very close proximity to the eastern portion of the Study Area. Approximately 3560 records occur within 10km of the Study Area, and suitable habitat also occurs. Therefore this species may occur.	Potential habitat for this species occurs within the Study Area. There is potential for the habitat of this species to be impacted.
<i>Persoonia marginata</i> Clandulla Geebung (V, V*)	Distributed in the Capertee district in the Rylstone LGA (Harden 1991). Known from 11 different locations with the majority occurring in the Clandulla State Forest, west of Kandos. Also known from Ben Bullen State Forest. Found in dry woodland communities associated with Shoalhaven Group sediments.	Although this species was not detected during surveys, suitable habitat exists for <i>Persoonia marginata</i> within the Study Area. Therefore this species may occur.	Potential habitat for this species occurs within the Study Area. Therefore, There is potential for the habitat of this species to be impacted. An AoS (EPBC Act) has been applied to this species in Appendix 5 .
<i>Asterolasia elegans</i> (E, E*)	This species is endemic to, and has a disjunct distribution within, the hills of north Sydney (OEH 2011b). The species current known distribution equates to a linear range of less than 37 km and an extent of occurrence of approximately 22 km ² . All populations exist within the Hawkesbury/Nepean Catchment Management Authority boundary (OEH 2011b). Occurs on Hawkesbury sandstone amongst rocky outcrops and boulders (OEH 2011b). Grows in wet sheltered sclerophyll forests from 2 to 40 m above the creek line (OEH 2011b).	The Study Area is outside its known distribution of <i>Asterolasia elegans</i> . This species is unlikely to occur.	This species is unlikely to occur within the Study Area or within any habitats that may be directly or indirectly affected and is therefore unlikely to be impacted.

Species / Community	Habitat Description	Likelihood of Occurrence	Potential Impact
<i>Wollemia nobilis</i> Wollemi Pine (CE, E*)	This species is a relict species confined to remota canyons in Wollemi National Park west of Sydney NSW. Known stands occur in deep gorge composed of Narrabeen Group Triassic sandstone. The Wollemi Pine is known from one population of fewer than 100 adult trees in several stands and about 200-300 juvenile/seedlings within the Wollemi NP and the Greater Blue Mountains World Heritage Area. Occurs in warm temperate rainforest and rainforest margins in a Eucalypt forest/woodland. Associated vegetation includes Coachwood (<i>Ceratopetalum apetalum</i>), Sassafras (<i>Doryphora sassafras</i>), <i>Acmena smithii</i> , <i>Backhousia myrtifolia</i> , <i>Quintinia sieberi</i> , <i>Angophora floribunda</i> , <i>Dicksonia antarctica</i> , <i>Cyathea australis</i> , <i>Eupomatia laurina</i> , <i>Lepidosperma urophorum</i> , <i>Sticherus flabellatus</i> , <i>Todea barbara</i> , <i>Cissus hypoglauca</i> , <i>Clematis aristata</i> , <i>Pandorea pandorana</i> and <i>Parsonsia straminea</i> .	This species is known only from a single population which does not occur within the Study Area. It is considered unlikely to occur.	This species is unlikely to occur within the Study Area or within any habitats that may be directly or indirectly affected and is therefore unlikely to be impacted.
<i>Thesium australe</i> Austral Toadflax (V, V*)	This species occurs in grassland or grassy woodland and is often found in damp sites in association with kangaroo grass (<i>Themeda australis</i>). This species is a root parasite that takes water and some nutrient from other plants, especially kangaroo grass.	There is limited potential for this species to occur within low-lying areas in the west of the Study Area. Therefore this species may occur.	Potential habitat for this species occurs within the Study Area. There is potential for the habitat of this species to be impacted. An AoS (EPBC Act) has been applied to this species in Appendix 5 .
Invertebrates			
<i>Paralucia spinifera</i> Bathurst Copperwing Butterfly (E, V*)	Restricted to an area within the Central Tablelands of NSW between Oberon, Hartley and Bathurst. Found in open woodland or open forest with a sparse understorey that is dominated by <i>Bursaria spinosa</i> subsp. <i>lasiophylla</i> (Blackthorn), which is used as the larval food plant. Found above 850 m, where direct sunlight reaches the habitat, with a south-west to north-west aspect. These areas come with extreme cold cycles such as frost or winter snowfalls. In 2011, this species was found at 29 sites throughout the Blue Mountains (CSIRO 2002 in DoE 2014).	A total of 1,892 records occur within 10km of the Study Area for this species. Suitable habitat occurs on the flats where <i>B. spinosa</i> subsp. <i>lasiophylla</i> has been recorded. Therefore this species may occur.	Potential habitat for this species occurs within the Study Area. There is potential for the habitat of this species to be impacted. An AoS (EPBC Act) has been applied to this species in Appendix 5 .
<i>Petalura gigantea</i> Giant Dragonfly (E)	<i>Petalura gigantea</i> can be found along the east coast of NSW, from the Victorian border to northern NSW. There are only a handful of known locations in NSW. They occur in permanent swamps and bogs with some water and open vegetation.	No suitable swamp habitat occurs within the Study Area for this species. It is considered unlikely to occur.	This species is unlikely to occur within the Study Area or within any habitats that may be directly or indirectly affected and is therefore unlikely to be impacted.

Species / Community	Habitat Description	Likelihood of Occurrence	Potential Impact
Amphibians			
<i>Heleioporus australiacus</i> Giant Burrowing Frog (V, V*)	Confined to the eastern slopes of the Great Divide in south-east coastal NSW and into Victoria (Tyler and Knight 2011). Occurs in Hawkesbury sandstone areas where it burrows near water (Tyler and Knight 2011). Appears to be dependent on areas with native vegetation. Has been recorded in hanging swamps, sandstone ridges supporting heath vegetation and dry sclerophyll forests that support wet habitats.	This species was not detected during surveys, and no records occur within 10km of the Study Area. Records are known from the Newnes Plateau and suitable habitat does occur in the eastern parts of the Study Area. Therefore this species may occur.	Potential habitat for this species occurs within the Study Area. There is potential for the habitat of this species to be impacted. An AoS (EPBC Act) has been applied to this species in Appendix 5 .
<i>Mixophyes balbus</i> Stuttering Frog (E, V*)	Found in rainforest and wet, tall open forest in the foothills and escarpment on the eastern side of the Great Dividing Range, at elevations of 20 to 1100 m (Tyler and Knight 2011). Breeds in streams during summer after heavy rain, outside the breeding season adults live in deep leaf litter and thick understorey vegetation on the forest floor. Eggs are laid on rock shelves or shallow riffles in small, flowing streams.	This species was not detected during surveys, and only a single record exists within 10km of the Study Area. Suitable rainforest vegetation surrounding permanent streams does not occur within the Study Area. Therefore this species may occur.	This species is unlikely to occur within the Study Area or within any habitats that may be directly or indirectly affected and is therefore unlikely to be impacted.
<i>Litoria booroolongensis</i> Booroolong Frog (E, E*)	This species has drastically declined in NSW and is now restricted to two or three isolated areas (Tyler and Knight 2011). Areas of occupancy are closely related to permanent rocky streams and cobble bank habitats with fringing vegetation such as ferns, sedges and grasses (Tyler and Knight 2011). Previously known occurrences in the Blue Mountains are no longer able to be located.	Although streamside habitat occurs near the Study Area, the specific requirements for this species such as rocky or cobble bank habitats do not occur within the Study Area. This species is unlikely to occur.	This species is unlikely to occur within the Study Area or within any habitats that may be directly or indirectly affected and is therefore unlikely to be impacted.
<i>Litoria littlejohni</i> Littlejohn's Tree Frog (V, V*)	The distribution of this species extends from Newcastle along the NSW coast to eastern Victoria occurring in patchy fragments (Tyler and Knight 2011). Habitats include forest, coastal woodland and heath; occurs at low altitudes on hills and mountains: with rocky streams, and semi-permanent dams being required for breeding periods (Tyler and Knight 2011).	Whilst surveys and ongoing monitoring have not detected this species, it is regarded as being one of the least known and least frequently encountered frogs in New South Wales. One record exists for this species within 10 km of the Study Area. Therefore this species may occur.	Potential habitat for this species occurs within the Study Area. There is potential for the habitat of this species to be impacted. An AoS (EPBC Act) has been applied to this species in Appendix 5 .
<i>Pseudophryne australis</i> Red-crowned Toadlet (V)	The distribution of this species extends from Newcastle along the NSW coast to eastern Victoria occurring in patchy fragments (Tyler and Knight 2011). Habitats include forest, coastal woodland and heath, with rocky streams, and semi-permanent dams being required for breeding periods (Tyler and Knight 2011).	This species was not detected during surveys; however numerous individuals have been recorded during previous RPS surveys across the Newnes Plateau in Sandstone habitats. Therefore this species may occur.	Potential habitat for this species occurs within the Study Area. There is potential for the habitat of this species to be impacted.

Species / Community	Habitat Description	Likelihood of Occurrence	Potential Impact
Reptiles			
<i>Hoplocephalus bungaroides</i> Broad-headed Snake (E, V*)	Largely confined to Triassic sandstones, including the Hawkesbury, Narellan and Shoalhaven formations, within the coast and ranges. Occurs in the Sydney basin within a 200 km radius of Sydney (Cogger et al. 1993). Occurs on rocky outcrops and adjacent sclerophyll forest and woodland (Cogger et al. 1993). The most suitable habitats occur on sandstone ridgetops. Nocturnal, sheltering by day in rock crevices and under flat sandstone rocks on exposed cliff edges during autumn, winter and spring. Broad-headed Snakes select refuge based on seasonal temperature differences, preferring cooler tree hollows on top of plateaus and below cliffs during summer and warmer sun-exposed sandstone slabs and exfoliations during winter.	Targeted searches did not detect this species within the Study Area. One record for this species exists within a 10 km radius of the Study Area. Suitable habitat in the form of sandstone outcrops with adjacent forest vegetation does occur within the Study Area. Therefore this species may occur.	Potential habitat for this species occurs within the Study Area. There is potential for the habitat of this species to be impacted. An AoS (EPBC Act) has been applied to this species in Appendix 5 .
<i>Aprasia parapulchella</i> Pink-tailed Worm-lizard (V, V*)	This species has a patchy distribution along the foothills of the western slopes of the Great Divide. Habitats are described as primary and secondary grassland, grassy woodland and woodland communities including mallee, and box-ironbark forest. They shelter under small rocks, with the recorded rock geology being Silurian acid volcanics, porphyritic granite, granite, metasedimentary and laterite.	This species has a more western distribution than the Study Area. Additionally the grassy habitats and the rock types typically associated with this species is not present. This species is unlikely to occur.	This species is unlikely to occur within the Study Area or within any habitats that may be directly or indirectly affected and is therefore unlikely to be impacted.
<i>Eulamprus leuraensis</i> Blue Mountains Water Skink (E, E*)	This species is restricted to the Blue Mountains and Newnes Plateau in NSW (Wilson and Swan 2010). Occurs in high elevated habitats generally in shrub or hanging swamps but can also occur in open forest, open scrub or heath. Larger, wetter swamps in close proximity to other inhabited swamps are more likely to be occupied by this species.	Although a high number of records occur for this species within 10km of the Study Area (n=276), no suitable swamp habitats occur within the Study Area. It is considered unlikely to occur.	This species is unlikely to occur within the Study Area or within any habitats that may be directly or indirectly affected and is therefore unlikely to be impacted.
<i>Varanus rosenbergi</i> Rosenberg's Goanna (V)	In NSW this species occurs on the Sydney Sandstone in Wollemi NP to the north-west of Sydney, in the Goulburn and ACT regions and near Cooma in the south. Habitats include heath, open forest and woodlands that contain termite mounds for which this species requires to lay eggs inside.	One record for this species exists within a 10 km radius of the Study Area and is therefore unlikely to occur commonly in the area. Suitable habitat does however exist. Therefore this species may occur.	Potential habitat for this species occurs within the Study Area. There is potential for the habitat of this species to be impacted.
Birds			
<i>Oxyura australis</i> Blue-billed Duck (V)	Endemic to Australia occurring in temperate wetlands and large deep, open freshwater dams and lakes. Seldom seen on land.	No suitable bodies of water exist within the Study Area for this species. There are only 10 records within 10 km of the Study Area. It is considered unlikely to occur.	This species is unlikely to occur within the Study Area or within any habitats that may be directly or indirectly affected and is therefore unlikely to be impacted.

Species / Community	Habitat Description	Likelihood of Occurrence	Potential Impact
<i>Rostratula australis</i> Australian Painted Snipe (E, E*)	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.	No suitable aquatic habitats occur within the Study Area for this species and no records occur within 10km of the Study Area. It is considered unlikely to occur.	This species is unlikely to occur within the Study Area or within any habitats that may be directly or indirectly affected and is therefore unlikely to be impacted.
<i>Hieraaetus morphnoides</i> Little Eagle (V)	Widespread over mainland Australia, including NSW, but not near the coast (Marchant and Higgins 2007). Most resident birds occupy inland Australia (Marchant and Higgins 2007). Habitats include wooded and forested lands and open country particularly timbered areas such as wooded farmland, gallery forest and wooded floodplains along watercourses (Marchant and Higgins 2007). Requires mature living trees in open woodland for nesting purposes.	This species has been recorded within the Study Area.	Known habitat for this species occurs within the Study Area. There is potential for the habitat of this species to be impacted.
<i>Lophoictinia isura</i> Square-tailed Kite (V)	Widespread across Australia along coastal and sub-coastal areas. Scattered through NSW except inland treeless parts and the highest alpine areas, as a single population (NSW Scientific Committee 2009). Found in a variety of timbered habitats including dry woodlands and open forests; showing a preference for timbered watercourses (OEH 2014).	The various habitats of the Study Area are not consistent with the particular habitat preference of wooded watercourses. However there has been one record within 10 km of the Study Area. Therefore this species may occur.	Whilst this species has potential to occur, the Study Area provides little if any areas of preferred habitat for this species. It is unlikely that this species would be impacted upon.
<i>Callocephalon fimbriatum</i> Gang-Gang Cockatoo (V)	Gang-gang Cockatoos are restricted to the south-eastern coast and highlands, from the lower Hunter and northern Blue Mountains to the South-western Slopes (NSW Scientific Committee 2008a). Found in the summer months in tall mountain forests and woodlands, and mature wet sclerophyll forests. In winter, may occur at lower altitudes in drier more open Eucalypt forests and woodlands, and often found in urban areas in some districts.	This species has been recorded within the Study Area.	Known habitat for this species occurs within the Study Area. There is potential for the habitat of this species to be impacted.
<i>Calyptorhynchus lathami</i> Glossy Black-Cockatoo (V)	Glossy-black Cockatoos are distributed in eastern NSW from the coast to the tablelands with populations in the western slopes and plains (NSW Scientific Committee 2008b). The species is known from the following local government areas: Cobar, Carrathool, Narrandera, Leeton, Griffith, Bland, Lockhart, Wagga Wagga and Lachlan (NSW Scientific Committee 2008b). Occurs in forests and woodlands where it forages predominantly on Allocasuarina cones, particularly those of <i>A. littoralis</i> , <i>A. torulosa</i> and at times <i>A. distyla</i> (NSW Scientific Committee 2008b). Requires large Eucalypt tree hollows for nesting.	This species has been recorded within the Study Area.	Known habitat for this species occurs within the Study Area. Therefore, it has the potential to be impacted.

Species / Community	Habitat Description	Likelihood of Occurrence	Potential Impact
<i>Glossopsitta pusilla</i> Little Lorikeet (V)	The distribution of the Little Lorikeet ranges from Cairns in QLD to Adelaide along the east coast of Australia (NSW Scientific Committee 2011). Commonly found in dry, open eucalypt forests and woodlands and can be found in roadside vegetation to woodland remnants (NSW Scientific Committee 2011). In the western parts of its range, Yellow Box (<i>Eucalyptus melliodora</i>) and White Box (<i>E. albens</i>) form important food sources for Little Lorikeets (Courtney & Debus 2006).	This species has been recorded within the Study Area.	Known habitat for this species occurs within the Study Area. Therefore, it has the potential to be impacted.
<i>Lathamus discolor</i> Swift Parrot (E, CE*)	Swift Parrots Breed only in Tasmania during Summer and migrate north to mainland Australia during Winter (Saunders and Tzaros 2011). In NSW occupied habitat includes dry forests and woodlands of the box-ironbark type on the inland slopes of the Great Dividing Range (Saunders and Tzaros 2011). Coastal regions tend to be more favourable during drought periods in the west (Saunders and Tzaros 2011).	This species predominantly prefers coastal woodlands and forests of New South Wales, preferring eucalypt species typically not found on the Newnes Plateau or the lower lying lands in which the Study Area occurs. This species is unlikely to occur.	This species is unlikely to occur within the Study Area or within any habitats that may be directly or indirectly affected and is therefore unlikely to be impacted.
<i>Ninox connivens</i> Barking Owl (V)	In Australia Barking Owls occur in WA, NT QLD, NSW and Victoria (NPWS 2003). Throughout NSW, it is widespread on the coastal plain and foothills and the inland slopes and plains (NPWS 2003). Habitats include forests and woodlands of tropical, temperate and semi-arid zones, typically dominated by eucalypts, often red gum species and in the tropics, paperbarks <i>Melaleuca</i> species (NPWS 2003). Roosts in dense foliage in large trees including rainforest species of streamside gallery forests.	This species was not detected during surveys; however six records occur within 10km of the Study Area. Suitable foraging and roosting habitat occurs throughout the Study Area. Therefore this species may occur.	Potential habitat for this species occurs within the Study Area. Therefore, it has the potential to be impacted.
<i>Ninox strenua</i> Powerful Owl (V)	Occurs in coastal and adjacent ranges of eastern Australia, in the eastern quarter of NSW (NSW Scientific Committee 2008c). Occurs in sclerophyll forests and woodlands, gallery rainforest and inland riverine woodland (NSW Scientific Committee 2008c). Often roosts and nests in dense gully eucalypt forest. Occurs throughout the Blue Mountains and Gardens of Stone National Park (OEH Atlas of NSW Wildlife Data 2013).	This species has been recorded in very close proximity to the Study Area, and known habitat occurs in the form of various eucalypt woodlands and forests throughout the Study Area. It is considered likely to occur.	Potential habitat for this species occurs within the Study Area. Therefore, it has the potential to be impacted.
<i>Tyto novaehollandiae</i> Masked Owl (V)	In NSW, Masked Owls are distributed throughout the length of the Great Dividing Range and extends from the coast to the western slopes (Kavanagh 2002). Occupies a range of environments from tall, wet Eucalypt forest to dry woodland, and often, but not always, at the ecotone with cleared land.	This species was not detected during surveys; however it has been recorded in the surrounding areas of the Newnes Plateau. Therefore this species may occur.	Potential habitat for this species occurs within the Study Area. Therefore, it has the potential to be impacted.

Species / Community	Habitat Description	Likelihood of Occurrence	Potential Impact
<i>Tyto tenebricosa</i> Sooty owl (V)	Occupies the easternmost one-eighth of NSW, occurring patchily on the coast, coastal escarpment and eastern tablelands. There is no seasonal variation in its distribution. Often occurs in tall old-growth montane forests, including temperate and subtropical rainforest (Higgins 1999). Occurring mostly in uplands. Can occur in rainforest in moist sheltered gullies surrounded by sclerophyll forests, or in tall open wet sclerophyll forests (Higgins 1999).	This species was not detected during surveys; however it has been recorded in the surrounding areas of the Newnes Plateau. Therefore this species may occur.	Potential habitat for this species occurs within the Study Area. Therefore, it has the potential to be impacted.
<i>Climacteris picumnus victoriae</i> Brown Treecreeper (eastern subsp.) (V)	Brown Treecreepers are endemic to eastern Australia (OEH 2012b). They frequent drier eucalypt forests and woodlands, particularly open woodland lacking a dense understorey, in the inland plains and slopes of the Great Dividing Range (OEH 2012b). The eastern subspecies lives in eastern NSW in eucalypt woodlands through central NSW and in coastal areas with drier open woodlands such as the Snowy River Valley, Cumberland Plains, Hunter Valley and parts of the Richmond and Clarence Valleys (OEH 2012b). Can be found in grasslands in proximity to wooded areas where there are sufficient logs, stumps and dead trees nearby.	This species has been recorded in very close proximity to the Study Area, and known habitat occurs in the form of various eucalypt woodlands and forests throughout the Study Area. It is considered likely to occur.	Potential habitat for this species occurs within the Study Area. Therefore, it has the potential to be impacted.
<i>Chthonicola sagittata</i> Speckled Warbler (V)	This species has a patchy distribution from south-east Queensland to the eastern half of NSW and into Victoria (OEH 2012). Occupies Eucalypt and Cypress woodlands in drier areas and on the western/eastern slopes of the Great Dividing Range. More commonly found on the western slopes, mainly due to habitat. Lives in a wide range of Eucalypt dominated vegetation that has a grassy and shrubby understorey often on rocky ridges or gullies (Garnett et al. 2000). Typical habitat would include scattered native tussock grasses, a sparse shrub layer, some eucalypt regrowth and an open canopy (OEH 2012).	This species has been recorded within the Study Area.	Known habitat for this species occurs within the Study Area. Therefore, it has the potential to be impacted.
<i>Anthochaera phrygia</i> Regent Honeyeater (CE, CE*)	Regent Honeyeaters are endemic to South-east Australia, extending from south-east Queensland to central Victoria. This distribution is, however, extremely segmented (SEWPAC 2013a). Preferred habitat includes Box-Ironbark eucalypt woodland and dry sclerophyll forest (SEWPAC 2013a). Seasonal movements appear to be dictated by the flowering of various species of Eucalyptus sp. that are characteristic of the dry forests and woodlands of South-Eastern Australia.	Occurs in the Capertee area with recent records on the Coxs River individuals are recorded in more easterly habitat, particularly in areas characterised by winter flowering <i>Eucalyptus</i> ssp. when westerly habitats are experiencing extended dry periods. As such this species may occur in Newnes Plateau forests on an intermittent basis. Therefore this species may occur.	Potential habitat for this species occurs within the Study Area. Therefore, it has the potential to be impacted. An AoS (EPBC Act) has been supplied in Appendix 5 .

Species / Community	Habitat Description	Likelihood of Occurrence	Potential Impact
<i>Grantiella picta</i> Painted Honeyeater (V)	This species occurs in scattered locations through eastern and mid NSW north to QLD and south to central Victoria (Higgins et al. 2001). In NSW this species is widespread on and west of the Great Dividing Range scattered from Tenterfield, Glen Alice, Canberra and Kosciusko NP (Higgins et al. 2001). Generally occurs on dry open woodlands and forest that are strongly associated with mistletoes (Higgins et al. 2001). Woodlands including species such as Red Ironbark, Mugga, Yellow Box, Broad-leaved Peppermint with drooping <i>Amyema pendulum</i> and <i>A. miquelii</i> mistletoes are preferred (Higgins et al. 2001).	This species was not detected within the Study Area and only one record exists within a 10 km radius of the Study Area (OEH Atlas of NSW Wildlife 2015). There is an abundance of mistletoe within the Study Area amongst suitable habitat for this species. Therefore this species may occur.	Potential habitat for this species occurs within the Study Area. Therefore, it has the potential to be impacted.
<i>Melithreptus gularis</i> Black-chinned Honeyeater (V)	This species extends from central Queensland, south through NSW and into Victoria to south-eastern South Australia (OEH 2015). Widespread in NSW with records from the tablelands and western slopes of the Great Dividing Range to the north-west and central-west plains and the Riverina (OEH 2015). Occurs in dry open forests or woodlands dominated by box and ironbark eucalypts where it spends its time in the upper canopies (OEH 2015). Habitat species include Mugga Ironbark (<i>E. sideroxylon</i>), White Box (<i>E. albens</i>), Inland Grey Box (<i>E. microcarpa</i>), Yellow Box (<i>E. melliodora</i>), Blakely's Red Gum (<i>E. blakelyi</i>) and Forest Red Gum (<i>E. tereticornis</i>).	This species was not detected during surveys, however two records occur within 10km and it is known from the Newnes Plateau. Therefore this species may occur.	Potential habitat for this species occurs within the Study Area. Therefore, it has the potential to be impacted.
<i>Pomatostomus temporalis temporalis</i> Grey-crowned Babbler (V)	In NSW, this species is widespread west of the Great Divide. East of the Great Divide they are widespread also but scattered to the Hunter Region including coastal areas (Higgins and Peter 2002). Occupies open forests and woodlands especially on inland plains (Higgins and Peter 2002). Requires an open shrub layer with sparse ground cover and fallen timber and leaf-litter.	This species was not detected during surveys, however four records occur within 10km and it is known from the Newnes Plateau. Therefore this species may occur.	Potential habitat for this species occurs within the Study Area. Therefore, it has the potential to be impacted.
<i>Daphoenositta chrysoptera</i> Varied Sittella (V)	This species occurs across most of the Australian Mainland, with nearly a continuous distribution in NSW from the coast to the far west (OEH 2012c). This species inhabits eucalypt forests and woodlands, especially rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland (Pizzey and Knight 2007).	This species was not detected within the Study Area; however it has been recorded in very close proximity during recent surveys. It is considered likely to occur.	Known habitat for this species occurs within the Study Area. Therefore, it has the potential to be impacted.

Species / Community	Habitat Description	Likelihood of Occurrence	Potential Impact
<i>Melanodryas cucullata</i> Hooded Robin (V)	Hooded Robins occur widely across Australia aside from driest deserts and wetter coastal areas. (OEH 2014b). In NSW it occurs across the entire state aside from the far north and south-western corners (OEH 2014b). Favoured habitats include lightly wooded country, usually open eucalypt woodland, acacia shrub and mallee near clearings and open areas (OEH 2014b). This species does require structurally diverse habitats that feature mature eucalypts, saplings, small shrubs and diverse tall grasses (OEH 2014b).	This species was not detected during surveys, however nine records occur within 10km and it is known from the Newnes Plateau. Therefore this species may occur.	Potential habitat for this species occurs within the Study Area. Therefore, it has the potential to be impacted.
<i>Petroica boodang</i> Scarlet Robin (V)	Scarlet Robins are located in south-eastern Australia and south-west western Australia (Higgins and Peter 2002). In NSW, it occupies open forests and woodlands from the coast to the inland slopes and it breeds in drier eucalypt forests and temperate woodlands (Higgins and Peter 2002).	This species has been recorded within the Study Area.	Known habitat for this species occurs within the Study Area. Therefore, it has the potential to be impacted.
<i>Petroica phoenicea</i> Flame Robin (V)	Flame Robins are found in south-eastern Australia from the QLD border to Tasmania. In NSW they are sparsely scattered from east of the Great Divide in coastal areas from Northern Rivers to the South Coast, but are more widely spread west of the Great Divide (Higgins and Peter 2002). During Spring-Summer (breeding season) they are found mainly upland, wet to moist eucalypt forests and woodlands, usually on slopes and ridges and with an open understorey or in clearings (Higgins and Peter 2002). During Autumn-Winter, they occur more often in open areas at lower altitudes in drier more open habitats particularly native and introduced grasslands and farmlands and in dry sclerophyll forests and woodlands (Higgins and Peter 2002).	This species has been recorded within the Study Area.	Known habitat for this species occurs within the Study Area. Therefore, it has the potential to be impacted.
<i>Stagonopleura guttata</i> Diamond Firetail (V)	Endemic to South-eastern Australia, extending from central QLD to the Eyre Peninsula in South Australia (OEH 2015b). Widespread in NSW with most records occurring on the inland slopes of the Great Divide (Garnett et al. 2000). Not commonly found in coastal districts, though there are records from near Sydney, the Hunter Valley and the Bega Valley (OEH 2015b). Habitats include grassy eucalypt woodland, including box-gum woodlands and Snow Gum (<i>E. pauciflora</i>) woodlands (OEH 2015b). Can also be found in mallee, natural temperate grassland, riparian areas and lightly wooded farmland (OEH 2015b).	This species was not recorded within the Study Area during fieldwork and only one record for this species exists within a 10 km radius of the Study Area. Some suitable habitat does occur within the Study Area, in the more western areas where open woodlands with grassy understorey occurs. Therefore this species may occur.	Potential habitat for this species occurs within the Study Area. Therefore, it has the potential to be impacted.

Species / Community	Habitat Description	Likelihood of Occurrence	Potential Impact
Mammals			
<i>Dasyurus maculatus maculatus</i> Spotted-tailed Quoll (V, E*)	In NSW, this species is largely confined to within 200 km of the coast and ranges from the QLD border to Kosciuszko NP including areas such as the Hunter Valley, Taree, Port Macquarie, and coastal national parks. Disjunct populations have been recorded between the Border Ranges and the Blue Mountains area. Has a preference for mature wet forest habitat, particularly in areas with rainfall approximate to 600 mm/year. Known habitats include temperate and subtropical rainforests, wet sclerophyll forest, lowland forest, open and closed eucalypt woodlands, inland riparian and River Red Gum, dry 'rainshadow' woodland, sub-alpine woodlands and coastal heathlands.	Suitable habitat for this species does occur within the Study Area. Therefore this species may occur.	Potential habitat for this species occurs within the Study Area. Therefore, it has the potential to be impacted. An AoS (EPBC Act) has been applied to this species in Appendix 5 .
<i>Isoodon obesulus obesulus</i> Southern Brown Bandicoot (E, E*)	In NSW, this species is distributed along the coastal fringe of the state from the southern side of the Hawkesbury River in the north, to the Victorian border in the south. Two main populations are from Ku-ring-gai Chase NP north of Sydney and in the far south-east corner of the state in Ben Boyd NP, East Boyd NP and multiple state forests. This species has been recorded in small numbers in the Blue Mountains NP (NSW DEC 2006). Occurs in a variety of habitats including heathland, shrubland, dry sclerophyll forest with heathy understorey, sedgeland and woodland (NSW DEC 2006). A dense understorey is a general feature that this species prefers.	This species was not detected during current or previous surveys, and no records exist within a 10 km radius of the Study Area. However, this species is known to occur within the Blue Mountains National Park. Suitable habitat for this species does occur within the Study Area. Therefore this species may occur.	Potential habitat for this species occurs within the Study Area. Therefore, it has the potential to be impacted. An AoS (EPBC Act) has been applied to this species in Appendix 5 .
<i>Phascolarctos cinereus</i> Koala (V, V*)	Occurs along the east coast of Australia and extends into Woodland, Mulga and River Red Gum forests west of the Great Dividing Range (DECC 2008b). The range of the Koala covers all such suitable areas of NSW. Populations in NSW now exist in fragmented and isolated habitats (DECC 2008b). In drier forested areas, Koalas are generally observed as individuals in low densities. Two individual Koalas were recorded in the lower Blue Mountains at Glenbrook in 1998 and 1999. However, continuous surveys have failed to record more Koalas in the lower Blue Mountains since (DECC 2008b). Koalas inhabit a variety of eucalypt woodlands and forests including coastal forests, the woodlands of the tablelands and western slopes, and the riparian communities of the western plains (DECC 2008b). They have also been known to frequent isolated paddock trees and roadside remnant vegetation (DECC 2008b).	This species was not detected during surveys, and only a single feed tree listed under Schedule 2 of SEPP 44 occurs within the Study Area. Five records occur within a 10km radius of the Study Area. Therefore this species may occur.	Potential habitat for this species occurs within the Study Area. Therefore, it has the potential to be impacted. An AoS (EPBC Act) has been applied to this species in Appendix 5 .

Species / Community	Habitat Description	Likelihood of Occurrence	Potential Impact
<i>Cercartetus nanus</i> Eastern Pygmy Possum (V)	Found in south-eastern Australia, from southern Queensland to eastern Australia, from southern QLD to eastern SA and in Tasmania (OEH 2014c). In NSW, it extends from the coast inland as far as the Pillaga, Dubbo, Parkes and Wagga Wagga on the western slopes (OEH 2014c). Found in a broad range of habitats from rainforest through sclerophyll (including Box-Ironbark) forest and woodland to heath, but in most areas, woodlands and heath appear to be preferred — except in north-eastern NSW, where they are most frequently encountered in rainforest (OEH 2014c).	This species was not detected during surveys, however records are known from the Newnes Plateau. Suitable habitat occurs throughout the Study Area. Therefore this species may occur.	Potential habitat for this species occurs within the Study Area. Therefore, it has the potential to be impacted.
<i>Petaurus australis</i> Yellow-bellied Glider (V)	Has a patchy distribution across a wide range of eastern and south-eastern Australia (NPWS 2003a). It is generally a coastal species in NSW extending inland to adjacent ranges (NPWS 2003a). Occurs in a range of habitat types but generally is associated with tall, mature eucalypt forest in regions of high rainfall.	This species was not recorded within the Study Area during fieldwork. Two records exist for this species within a 10 km radius of the Study Area. Chance of occurrence is low, but cannot be entirely discounted. Therefore this species may occur.	Potential habitat for this species occurs within the Study Area. Therefore, it has the potential to be impacted.
<i>Petaurus norfolcensis</i> Squirrel Glider (V)	The Squirrel Glider is sparsely distributed along the east coast and immediate inland districts from western Victoria to north Queensland (NPWS 1999). Individuals have been recorded in a diverse range of vegetation communities, including Blackbutt Forest, Red Gum and Red Bloodwood Forests, Coastal Banksia heathland and Grey Gum / Spotted Gum / Grey Ironbark dry hardwood forests of the Central NSW Coast (Quin, 1995). Important habitat includes areas where one or more Eucalypt species occur that flower heavily in winter, or the presence of good stands of winter-flowering Banksias (Quin 1995).	This species was not recorded within the Study Area during fieldwork. Six records exist for this species within a 10 km radius of the Study Area. Chance of occurrence is low, but cannot be entirely discounted. Therefore this species may occur.	Potential habitat for this species occurs within the Study Area. Therefore, it has the potential to be impacted.
<i>Petauroides volans</i> Greater Glider (V*)	The Greater Glider is Australia's largest gliding species. Their distribution extends from coastal Queensland through NSW and into Victoria along the east coast. It has adapted to feed almost exclusively on eucalypt leaves, but will consume eucalypt flowers and buds also. Occurs in a range of habitats including tall open woodland, eucalypt forests and low woodlands. Their home range extends between 0.7-3 hectares.	This species was recorded within the Study Area.	Known habitat for this species occurs within the Study Area. Therefore, it has the potential to be impacted.

Species / Community	Habitat Description	Likelihood of Occurrence	Potential Impact
<i>Petrogale penicillata</i> Brush-tailed Rock-wallaby (E,V*)	Historically, this species was spread over much of NSW aside from the arid west. It is now absent west of the Great Divide aside from one population in the Warrumbungle Ranges. The largest population exists in the north-eastern part of its range (ACT Government 1999). This species inhabits cliffs and other steep rocky areas that have an association with shelters, overhangs and/or caves (ACT Government 1999).	This species was not recorded during fieldwork and only one record for this species exists within a 10 km radius of the Study Area. Steep rocky areas do occur within the Study Area, offering potential habitat for this species. Therefore this species may occur.	Potential habitat for this species occurs within the Study Area. Therefore, it has the potential to be impacted. An AoS (EPBC Act) has been applied to this species in Appendix 5 .
<i>Pseudomys novaehollandiae</i> New Holland Mouse (V*)	Distributed across Tasmania, Victoria, NSW and QLD, with records in NSW being from Royal NP, the Kangaroo Valley, Ku-ring-gai Chase NP and Port Stephens to Evans Head. The New Holland Mouse has been found from coastal areas and up to 100 km inland on sandstone country. Inhabits communities such as open heathland, open woodland with heathland understorey and vegetated sand dunes.	This species was not recorded within the Study Area during fieldwork. There is one record of this species within 10 km of the Study Area. Suitable habitat exists for this species within the Study Area. Therefore this species may occur.	Potential habitat for this species occurs within the Study Area. Therefore, it has the potential to be impacted. An AoS (EPBC Act) has been applied to this species in Appendix 5 .
<i>Pteropus poliocephalus</i> Grey-headed Flying-fox (V, V*)	The Grey-headed Flying Fox is endemic to Australia and presently occurs along the east coast from Bundaberg in Queensland to Melbourne, Victoria. Regular movements have been recorded over the Great Dividing Range to the western slopes of NSW and QLD. A blossom-eater, frugivore and nectarivore of habitats such as rainforests, open forests, woodlands, Melaleuca swamps and Banksia woodlands. Also known to feed on commercial fruit crops.	This species was not detected within the Study Area during current or previous surveys, and no records exist within a 10 km radius of the Study Area. This species is unlikely to inhabit areas of high-altitudes such as those within the Study Area. This species is unlikely to occur.	This species is unlikely to occur within the Study Area or within any habitats that may be directly or indirectly affected and is therefore unlikely to be impacted.
<i>Saccolaimus flaviventris</i> Yellow-bellied Sheathtail Bat (V)	Wide-ranging across Australia, covering the whole state of NSW (Churchill 2009). Occurs in almost all habitat types from wet and dry sclerophyll forest, open woodland, acacia shrubland, mallee, grasslands and desert (Churchill 2009). In NSW requires small hollows in trees to roost.	This species was recorded in the Study Area.	Known habitat for this species occurs within the Study Area. Therefore, it has the potential to be impacted.
<i>Mormopterus norfolkensis</i> Eastern Freetail-bat (V)	This species is distributed south of Sydney extending north into south-eastern Queensland. There are no records west of the Great Dividing Range. Most records of this species have been reported from dry Eucalypt forest and woodland. It is expected that open forested areas and the cleared land adjacent to bushland, constitutes important habitat for this species. It is a predominantly tree-dwelling species, roosting in hollows or behind loose bark in mature Eucalypts. Widely distributed across the Lower Hunter Region.	This species was not detected confidently within the Study Area; however there was a potential call that could represent this species. Suitable habitat occurs within the Study Area, and known records occur in the surrounding area. Therefore this species may occur.	Potential habitat for this species occurs within the Study Area. Therefore, it has the potential to be impacted.

Species / Community	Habitat Description	Likelihood of Occurrence	Potential Impact
<i>Chalinolobus dwyeri</i> Large-eared Pied Bat (V, V*)	Distributed from south-east QLD to NSW, from the coast to the western slopes of the Great Divide (Churchill 2009). In NSW, the known distribution occurs in Coolah Tops, Mt Kaputar and Warrumbungle National Parks, the Sydney Basin and the western slopes and plains including Pilliga Nature Reserve (DERM 2011). This species is dependent on the presence of diurnal roosts for shelter which include disused mine shafts, caves, overhangs and abandoned fairy martin (<i>Hirundo ariel</i>) nests (DERM 2011). These roosts are generally in close proximity to fertile woodland valley habitats in which this species forages (DERM 2011). Foraging habitats include dry and wet sclerophyll forest, grassy woodland, <i>Callitris</i> dominated forest, tall open eucalypt forest with rainforest understorey, sub-alpine woodland and sandstone outcrop country (DERM 2011).	This species was recorded within the Study Area.	Known habitat for this species occurs within the Study Area. Therefore, it has the potential to be impacted. An AoS (EPBC Act) has been applied to this species in Appendix 5 .
<i>Falsistrellus tasmaniensis</i> Eastern False Pipistrelle (V)	This species is distributed from south-east QLD south along the NSW coast into Victoria and Tasmania (Churchill 2009). This species is found in a variety of forest types such as open forests, woodlands and wetter sclerophyll forests (usually with trees >20m) (OEH 2014d). Generally they roost in hollow trunks of eucalypt species in colonies (Churchill 2009).	This species was not detected confidently within the Study Area, however there was a potential call that could represent this species. Suitable habitat occurs within the Study Area, and known records occur in the surrounding area. Therefore this species may occur.	Potential habitat for this species occurs within the Study Area. Therefore, it has the potential to be impacted.
<i>Miniopterus schreibersii</i> subsp. <i>oceanensis</i> Eastern Bentwing Bat (V)	Occurs along the east and north coasts of Australia. This species utilises a range of habitats for foraging, including rainforest, wet and dry sclerophyll forests, woodlands and open grasslands. Requires caves or similar structures for roosting habitat such as derelict mines, disused buildings and storm-water tunnels (Churchill 2009).	This species was not detected confidently within the Study Area, however there was a potential call that could represent this species. Suitable habitat occurs within the Study Area, and known records occur in the surrounding area. Therefore this species may occur.	Potential habitat for this species occurs within the Study Area. Therefore, it has the potential to be impacted.
<i>Nyctophilus corbeni</i> South-eastern Long-eared Bat (V, V*)	The South-eastern Long-eared Bat has a limited distribution that is restricted around the Murray-Darling Basin in south-eastern Australia (SEWPAC 2013c). It is distributed throughout inland NSW except in the north-west area which is dominated by treeless plains. They can occur in a range of habitat types including but not limited to Box, Ironbark, Bulloak, Brigalow, Belah, Smooth-barked Apple and Cypress Pine woodlands (SEWPAC 2013c).	This species was not detected within the Study Area during current or previous surveys, and no records exist within a 10 km radius of the Study Area. This species is typically a more western species. This species is unlikely to occur.	This species is unlikely to occur within the Study Area or within any habitats that may be directly or indirectly affected and is therefore unlikely to be impacted.

Species / Community	Habitat Description	Likelihood of Occurrence	Potential Impact
<i>Scoteanax rueppellii</i> Greater Broad-nosed Bat (V)	Occurs only along the eastern coastal strip of Queensland and NSW, where it is restricted to the coast and adjacent areas of the Great Dividing Range. In NSW, it extends as far south as the Bega Plain. Forages in moister gullies and wet sclerophyll forests as well as in lightly wooded areas and open spaces/ecotones, most commonly found in tall wet forest (Churchill 2009). Open woodland and habitat and dry open forest suits the direct flight of this species as it searches for beetles and other larvae. This species roosts in tree hollows, although has been recorded in buildings.	This species was not detected confidently within the Study Area, however there was a potential call that could represent this species. Suitable habitat occurs within the Study Area, and known records occur in the surrounding area. Therefore this species may occur.	Potential habitat for this species occurs within the Study Area. Therefore, it has the potential to be impacted.
<i>Vespadelus troungtoni</i> Eastern Cave Bat (V)	A cave dweller, known from wet sclerophyll forest and tropical woodlands from the coast and Dividing Range to the drier forests of the semi-arid zone. It has been found roosting in small groups in sandstone overhangs, in mine tunnels and occasionally in buildings. In all situations, the roost sites are frequently in reasonably well-lit areas. The distribution of this species is largely to the north of the Hunter Region (Strahan 1995).	This species was not detected confidently within the Study Area, however there was a potential call that could represent this species. Suitable habitat occurs within the Study Area, and known records occur in the surrounding area. Therefore this species may occur.	Potential habitat for this species occurs within the Study Area. Therefore, it has the potential to be impacted.
Threatened Ecological Communities			
Newnes Plateau Shrub Swamp in the Sydney Basin Bioregion (EEC)	This community occurs in the headwaters of water courses draining the Newnes Plateau. It occurs where low slope gradients and vegetation impede water flow in headwater valleys and is dominated by sedges and shrubs that favour poorly drained sites. The community occurs at higher elevations than Blue Mountains sedge swamps and in the Bell and Clarence area the transition between these communities occurs at approximately 850-950 m. Newnes Plateau Shrub Swamp has a greater dominance of shrubs when compared to Blue Mountains Sedge Swamps.	This community does not occur within the Study Area.	This community is unlikely to occur within the Study Area or within any habitats that may be directly or indirectly affected and therefore unlikely to be impacted.

Species / Community	Habitat Description	Likelihood of Occurrence	Potential Impact
Natural Temperate Grassland of the South Eastern Highlands (CEEC*)	This community is primarily found within the South Eastern Highlands bioregion with some patches occurring in areas immediately adjacent. It occurs in the following LGA Bathurst, Bega Valley, Blayney, Bombala, Boorowa, Cabonne, Cooma-Monaro, Cowra, Eurobodalla, Goulburn Mulwarree, Gundagai, Lithgow, Oberon, Orange, Palerang, Queanbeyan, Shoalhaven, Snowy River, Tumbarumba, Tumut, Upper Lachlan and Yass Valley. Occurs at altitude up to around 1200m in some areas, but as low as 250m in others. It is a naturally treeless or sparsely treed community characterised by a dominance of native perennial tussock grasses, the tallest of which is typically up to 0.1m in height. Dominant species include <i>Themeda triandra</i> , <i>Poa sieberiana</i> , <i>Poa labillardierei</i> , <i>Austrostipa bigeniculata</i> , <i>Austrostipa scabra</i> var. <i>falcata</i> , <i>Bothriochloa macra</i> , and <i>Pennisetum alopecuroides</i> .	This community does not occur within the Study Area.	This community is unlikely to occur within the Study Area or within any habitats that may be directly or indirectly affected and therefore unlikely to be impacted.
Temperate Highland Peat Swamps on Sandstone (EEC*)	The Temperate Highland Peat Swamps on Sandstone ecological community comprises temporary or permanent swamps with a substrate of peat over sandstone, and vegetation characterised by the presence of sedges, graminoids (grass-like plants) and forbs (herbaceous non-grass or grass-like plants) with or without shrubs (TSSC 2005). The swamps generally occur at altitudes from around 600 to 1200 m above sea level and are restricted to the South Eastern Highlands and Sydney Basin Interim Biogeographic Regionalisation of Australia (IBRA) (see Environment Australia 2000) regions in New South Wales.	This community does not occur within the Study Area.	This community is unlikely to occur within the Study Area or within any habitats that may be directly or indirectly affected and therefore unlikely to be impacted.
Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland in the South Eastern Highlands, Sydney Basin, South East Corner and NSW South Western Slopes Bioregions (EEC)	Occurs as an open-forest, woodland or open woodland. This community may also occur as a secondary grassland where the trees have been removed, but the groundlayer remains. The main tree species are <i>Eucalyptus pauciflora</i> (Snow Gum), <i>E. rubida</i> (Candlebark), <i>E. stellulata</i> (Black Sallee) and <i>E. viminalis</i> (Ribbon Gum), either alone or in various combinations. The trees may occur as pure stands, mixtures of the four species or in mixtures with other trees, including wattles. The community commonly occurs on valley floors, margins of frost hollows and on foot slopes and undulating hills. It occurs between approximately 600 and 1400 m in altitude on a variety of substrates, including basalt, sediments, granite, colluvium and alluvium.	This community has been recorded within the Study Area.	A small area of this community occurs within the Study Area. Therefore, it has the potential to be impacted.

Species / Community	Habitat Description	Likelihood of Occurrence	Potential Impact
Montane Peatlands and Swamps of the New England Tableland, NSW North Coast, Sydney Basin, South East Corner, South Eastern Highlands and Australian Alps bioregions (EEC)	Montane Peatlands and Swamps comprises a dense, open or sparse layer of shrubs with soft-leaved sedges, grasses and forbs. It is the only type of wetland that may contain more than trace amounts of <i>Sphagnum</i> spp., the hummock peat-forming mosses. Small trees may be present as scattered emergents or absent. The community typically has an open to very sparse layer of shrubs, 1-5 m tall, (eg. <i>Baeckea gunniana</i> , <i>B. utilis</i> , <i>Callistemon pityoides</i> , <i>Leptospermum juniperinum</i> , <i>L. lanigerum</i> , <i>L. myrtifolium</i> , <i>L. obovatum</i> , <i>L. polygalifolium</i>). Species of <i>Epacris</i> (eg. <i>E. breviflora</i> , <i>E. microphylla</i> , <i>E. paludosa</i>) and <i>Hakea microcarpa</i> are also common shrubs. In some peatlands and swamps, particularly those with a history of disturbance to vegetation, soils or hydrology, the shrub layer comprises dense thickets of <i>Leptospermum</i> species. In other peatlands and swamps with a history of grazing by domestic livestock, the shrub layer may be very sparse or absent. Montane Peatlands typically have a dense groundcover of sedges, grasses and forbs, except where a dense cover of tall shrubs casts deep shade. Soft-leaved species of <i>Carex</i> (eg. <i>C. appressa</i> , <i>C. fascicularis</i> , <i>C. gaudichaudiana</i>) and <i>Poa</i> (eg. <i>P. costiniana</i> , <i>P. labillardierei</i>) typically make up most of the groundcover biomass, while other common sedges include <i>Baloskion</i> spp., <i>Baumea rubiginosa</i> , <i>Empodisma minus</i> , <i>Juncus</i> spp. and <i>Schoenus apogon</i> .	This community has been recorded within the Study Area. *It should be noted that although this vegetation community can coincide with numerous EPBC Act listed vegetation communities, the floristics and soil substrates do not align with any EPBC Act listed community.	A small area of this community occurs within the Study Area. Therefore, it has the potential to be impacted.

Species / Community	Habitat Description	Likelihood of Occurrence	Potential Impact
Tableland Basalt Forest in the Sydney Basin and South Eastern Highland Bioregions (EEC) Upland Basalt Eucalypt Forests of the Sydney Basin Bioregion (EEC*)	Occurs in areas of high rainfall ranging from 950 to 1600 mm/year on igneous rock, in or adjacent to, the Sydney Basin Bioregion. Generally occurs at elevations between 650 and 1050 m above sea level. A tall open forest with a sparse dense layer of shrubs and vines, and a diverse understorey of native grasses, forbs, twiners and ferns (Keith 2004). Dominant eucalypt sp include <i>E. fastigata</i> (Brown Barrel), <i>E. viminalis</i> (Ribbon Gum) and <i>E. radiata</i> subsp. <i>radiata</i> (Narrow-leaved Peppermint). <i>E. oreades</i> (Blue Mountains Ash) and <i>E. blaxlandii</i> (Blaxland's stringybark) are prevalent in the Blue Mountains forms. Common shrub species include <i>Polyscias sambucifolia</i> (Elderberry Panax), <i>Coprosma quadrifida</i> (Prickly Currant Bush), <i>Senecio linearifolius</i> (Fireweed Groundsel) <i>Daviesia ulicifolia</i> (Gorse Bitter Pea) and <i>Leucopogon lanceolatus</i> (Lance Beard Heath). Vines and Scramblers include <i>Tylophora barbata</i> (Bearded Tylophora), <i>Eustrephus latifolius</i> (Wombat Berry), <i>Smilax australis</i> (Lawyer Vine) and <i>Clematis</i> spp. The ground layer generally comprises native grasses, forbs and ferns including <i>Dichondra repens</i> (Kidney Weed), <i>Viola</i> spp, <i>Geranium</i> spp, <i>Lomandra longifolia</i> (Spiny-headed Mat-rush), <i>Dianella</i> spp, <i>Blechnum cartilagineum</i> (Gristle Fern), <i>Pteridium esculentum</i> (Bracken) and <i>Poa</i> spp.	This community does not occur within the Study Area.	This community is unlikely to occur within the Study Area or within any habitats that may be directly or indirectly affected and therefore unlikely to be impacted.
White Box – Yellow-box – Blakely's Red Gum Grassy Woodland and Derived native Grassland (EEC, CEEC*)	This woodland is found on fertile soils on the tablelands and western slopes of NSW. The distribution of the community spreads between NSW North Coast, New England Tableland, Nandewar, Brigalow Belt, South, Sydney Basin, South Eastern Highlands and NSW South Western Slopes Bioregions. The characteristic species for this woodland are <i>Eucalyptus albens</i> , <i>Eucalyptus melliodora</i> or <i>Eucalyptus blakelyi</i> . Grass and herbaceous species generally characterise the ground layer. In some locations canopy species may be entirely absent due to clearing. Shrubs are generally sparse or absent.	This community does not occur within the Study Area.	This community is unlikely to occur within the Study Area or within any habitats that may be directly or indirectly affected and therefore unlikely to be impacted.

Notes:

- (V) = Vulnerable Species listed under the NSW TSC Act
- (E) = Endangered Species listed under the NSW TSC Act
- (CE) = Critically Endangered Species listed under the NSW TSC Act
- (V*) = Vulnerable Species listed under the Commonwealth EPBC Act
- (E*) = Endangered Species listed under the Commonwealth EPBC Act
- (CE*) = Critically Endangered Species listed under the Commonwealth EPBC Act