Western Coal Services Project

Ecological Assessment

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Approval for Issue

Name	Signature	Date
Paul Hillier		29-07-13

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Summary

RPS Australia East (RPS) was engaged by Centennial Coal (Springvale) Pty Ltd to undertake an Ecological Assessment as part of the Western Coal Services Project – Blackmans Flat site. This Ecological Assessment will ultimately be integrated into an overall Environmental Impact Statement (EIS) which will support an application for Development Approval (DA) under Part 4 Division 4.1 of the Environmental Planning and Assessment Act 1979 (EP&A Act 1979).

This assessment also aims to examine the likelihood of the proposal to have a significant effect on any threatened species, populations or ecological communities listed under the NSW *Threatened Species Conservation Act 1995* (TSC Act 1995). This report recognises the relevant requirements of the *Environmental Planning and Assessment Act 1979* (EP&A Act 1979) as amended by the *Environmental Planning and Assessment Amendment Act 1997*. Assessment is also made with regard to those threatened entities listed federally under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act 1999).

The primary purpose of the Western Coal Services Project is to develop suitable infrastructure to enable flexibility to supply both domestic and export markets from nominated mines within the Western Coalfield. Specifically, the Western Coal Services Project involves:

- Upgrading the existing washery, workshops and infrastructure within the site by constructing a new washery adjacent to the existing facility that will remain operational to provide a total processing capacity of up to 7 Mtpa.
- Construction of processing infrastructure such as additional conveyors and transfer points and other coal handling requirements to cater for the upgraded washery facility within the existing disturbance footprint of the site.
- Extending and enlarging an existing reject emplacement area to enable sufficient reject disposal capacity for a 25 year life.
- Increasing the utilisation of the return side of the existing overland conveyor system to enable up to 6.3 Mtpa of coal to be delivered to Lidsdale Siding.
- Constructing a private haul road linking the site with the existing private haul road from Angus Place Colliery to Mt Piper Power Station. This private road will cross a section of the existing Pine Dale Mine operation and over the Castlereagh Highway.
- Improving the current water management systems on the site by separating clean and dirty water streams prior to either reuse or discharge off site.
- Integrating the existing approved transport and processing of coal at Springvale Coal Mine and Angus Place Colliery into the one consent.
- Integrating the remaining rehabilitation, monitoring, water management and reporting requirements associated with the Lamberts Gully Mine which occupies the site.
- Continued use of all existing approved infrastructure, facilities and activities associated with the transport and processing of coal from each mine gate and the point of delivery to the site. This infrastructure includes the existing conveyors, private haul roads, Kerosene Vale Stockpile area, reject emplacement areas, services, access roads, car parks and buildings.

There are two proposal options for the new haul road, requiring approximately 0.8 ha or 0.9 ha of native vegetation to be cleared for option 1 or 2, respectively. The proposed REA will require the removal of 40.4 ha of native vegetation, which is inclusive of 30.1 ha replanted vegetation. The proposed new washery will require an additional cutting into the adjacent hillside. Whilst the hill has some areas of native vegetation at its peak the area required for the cutting is highly disturbed.

Four threatened bat species, four threatened bird species, one threatened flora species and one Endangered Ecological Community (EEC) have been recorded within the site during the surveys undertaken between 2010 and 2012 although habitat is considered suitable for a number of other threatened fauna, which may use the site on at least an intermittent basis.

This assessment has also examined the likelihood of the proposal to have a significant effect on any threatened species, populations or ecological communities listed under the TSC Act 1995 (**Appendix 3**) and EPBC Act 1999 (**Appendix 4**). These assessments have concluded that no significant impacts are likely to relevant threatened species or EECs listed under the TSC Act 1995, or MNES.

The following mitigation measures have been recommended to minimise potential impacts of the proposal:

- The minimum amount of clearing should take place as a general objective of the project;
- It is recommended that measures be implemented to avoid impacts upon waterways and associated vegetation resulting from soil disturbance, namely adequate erosion and sedimentation controls with regular monitoring to ensure their functionality and condition;
- It is recommended that ongoing weed monitoring be instituted and potential weed infestations be appropriately managed to ensure surrounding communities are protected from invasive species; and
- It is recommended that *Eucalyptus cannonii* is used in the planting mix for rehabilitation, following the decommissioning of the REA.

1.0 Introduction

1.1 Background

RPS Australia East (RPS) was engaged by Centennial Coal (Springvale) Pty Ltd, a subsidiary of Centennial Coal (Western Operations) to undertake an Ecological Assessment over the site, approximately 18 km north of Lithgow in NSW, herewith referred to as 'the site'. This Ecological Assessment will ultimately be integrated into an overall Environmental Impact Statement (EIS) which will support an application for Development Approval (DA) under Part 4 Division 4.1 of the Environmental Planning and Assessment Act 1979 (EP&A Act 1979).

This report covers the site which is an area that contains the existing Springvale Coal Services facility and proposed infrastructure at Blackmans Flat.

Springvale Coal Pty Ltd owns or has access to the majority of the site although the reject emplacement area (REA) partly enters into Crown Land and Ben Bullen State Forest. The area of proposed development is largely within Consolidated Coal Lease 733 and is restricted to the site. Although the Project Application Area (PAA) which encapsulates the site has been represented in this report, it is important to note that the Ecological Assessment is restricted to the site itself because all other areas will not be impacted by development works. The location of the site and PAA is shown in **Figure 1**.

This assessment aims to examine the likelihood of the proposal to have a significant effect on any threatened species, populations or ecological communities listed under the NSW *Threatened Species Conservation Act 1995* (TSC Act 1995). The report recognises the relevant requirements of the *Environmental Planning and Assessment Act 1979* (EP&A Act 1979) as amended by the *Environmental Planning and Assessment Amendment Act 1997*. Assessment is also made with regard to those threatened entities listed federally under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act 1999).

1.2 Western Coal Services Project Overview

Coal Services has developed a long term 25 year strategy for its future operations, which is centred on the transport and processing of coal from both Springvale Coal Mine and Angus Place Colliery. A key element of the project is the integration of the transportation and processing infrastructure into a single development consent which will cover the infrastructure upgrades and coal transport from each mine gate to the site. The fruition of this project will ultimately enable Centennial to supply either Mount Piper or Wallerawang Power Station or the export market via Lidsdale Siding with a viable quantity and quality of coal in order to meet future market expectations.

In order to provide flexibility to meet future market demands, both export and domestic, Centennial is seeking approval to upgrade its existing facilities. Specifically, the Western Coal Services Project involves:

- Upgrading the existing washery, workshops and infrastructure within the site by constructing a new washery adjacent to the existing facility that will remain operational to provide a total processing capacity of up to 7 Mtpa.
- Construction of processing infrastructure such as additional conveyors and transfer points and other coal handling requirements to cater for the upgraded washery facility within the existing disturbance footprint of the site.
- Extending and enlarging an existing reject emplacement area to enable sufficient reject disposal capacity for a 25 year life.
- Increasing the utilisation of the return side of the existing overland conveyor system to enable up to 6.3

Mtpa of coal to be delivered to Lidsdale Siding.

- Constructing a private haul road, approximately 1.3 km in length, linking the site with the existing private haul road from Angus Place Colliery to Mt Piper Power Station. This private road will cross a section of the existing Pine Dale Mine operation and over the Castlereagh Highway.
- Improving the current water management systems on the site by separating clean and dirty water streams prior to either reuse or discharge off site.
- Integrating the existing approved transport and processing of coal at Springvale Coal Mine and Angus Place Colliery into the one consent.
- Integrating the remaining rehabilitation, monitoring, water management and reporting requirements associated with the Lamberts Gully Mine which occupies the site.
- Continued use of all existing approved infrastructure, facilities and activities associated with the transport and processing of coal from each mine gate and the point of delivery to the site. This infrastructure includes the existing conveyors, private haul roads, Kerosene Vale Stockpile area, reject emplacement areas, services, access roads, car parks and buildings.

Key elements of the upgrade to the existing facilities and infrastructure for the site, including two options for a proposed Haul Link Road within the site, are depicted in **Figure 2**.

1.3 Site Particulars

Locality The site is located at Blackmans Flat between the villages of Portland and Lidsdale in the NSW Western Coalfield.

LGA Lithgow.

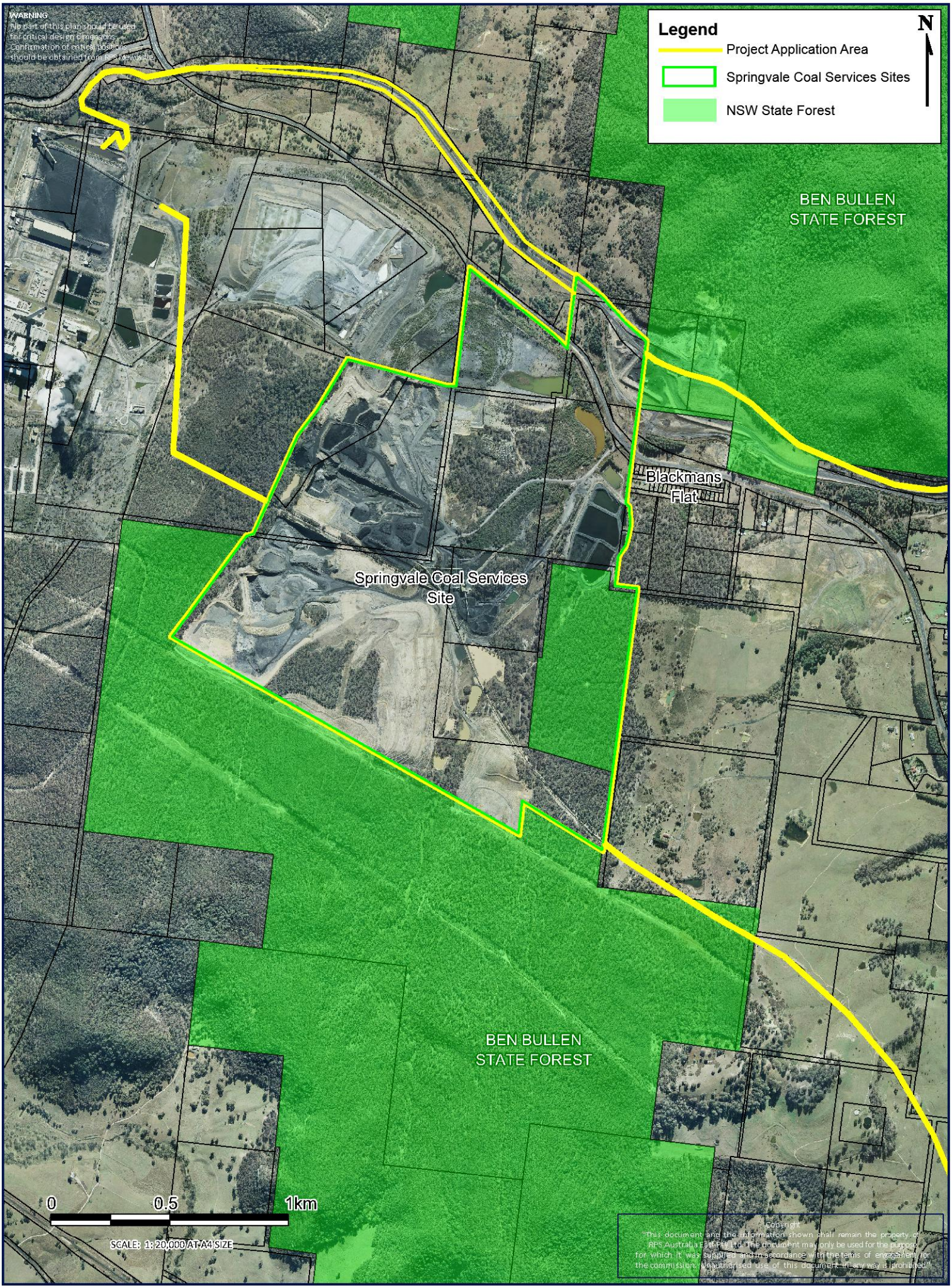
Area The total area of the site is approximately 296.71 ha.

Boundaries The site is bordered on the North-eastern side by Castlereagh Highway. The immediate surroundings consist largely of cleared paddock landscapes with some residential properties occurring.

Current Land Use The current land use of the site is a Coal servicing facility owned and run by Centennial Coal. The site currently consists of coal handling, processing, reject disposal, a centralised communication and control room and support infrastructure and services. The site also includes the Lamberts Gully Open Cut Mine.

Topography The landscape in this region ranges from flat to gently inclining rises on broad valley floors (<300 m). Elevation in the area is between 800 m – 1000 m (King 1993). Two major topographic landscapes dominate the region: the Cullen Bullen and the Pipers Flat landscape. Slopes range from 10-15%. Localised outcrops occur at low scarps.

Soils The site is largely set on the Illawarra Coal Measures and the Berry Formation. These formations are embedded with horizontal sheets of shale, sandstone, siltstone, and conglomerates (King 1992). A variety of soil types dominate the landscape - the most common include the dull yellowish-brown sandy loam, the dark reddish-brown clay loam and the hard setting bleached sandy loam. Angular blocky clay is the dominant subsoil, which is characterised by a reddish-brown to bright yellowish-brown colour. Texturally, the subsoil is clayish and forms massive angular blocks when wet. Soil fertility is relatively low whilst the hard-setting topsoil restricts deep root penetration (King 1993). In terms of shrink-swell capacity, the shrinkage can reach depths of up to 35 cm (King 1992).



TITLE: FIGURE 1: SITE LOCALITY

LOCATION: BLACKMANS FLAT

DATUM: (GDA 94)
PROJECTION: MGA ZONE 56

DATE: 11/03/2013
PURPOSE: REPORT FIGURE

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LAYOUT REF: Report Figures
VERSION (PLAN BY): C A4 (PH)

CLIENT: CENTENNIAL COAL
JOB REF: 105704

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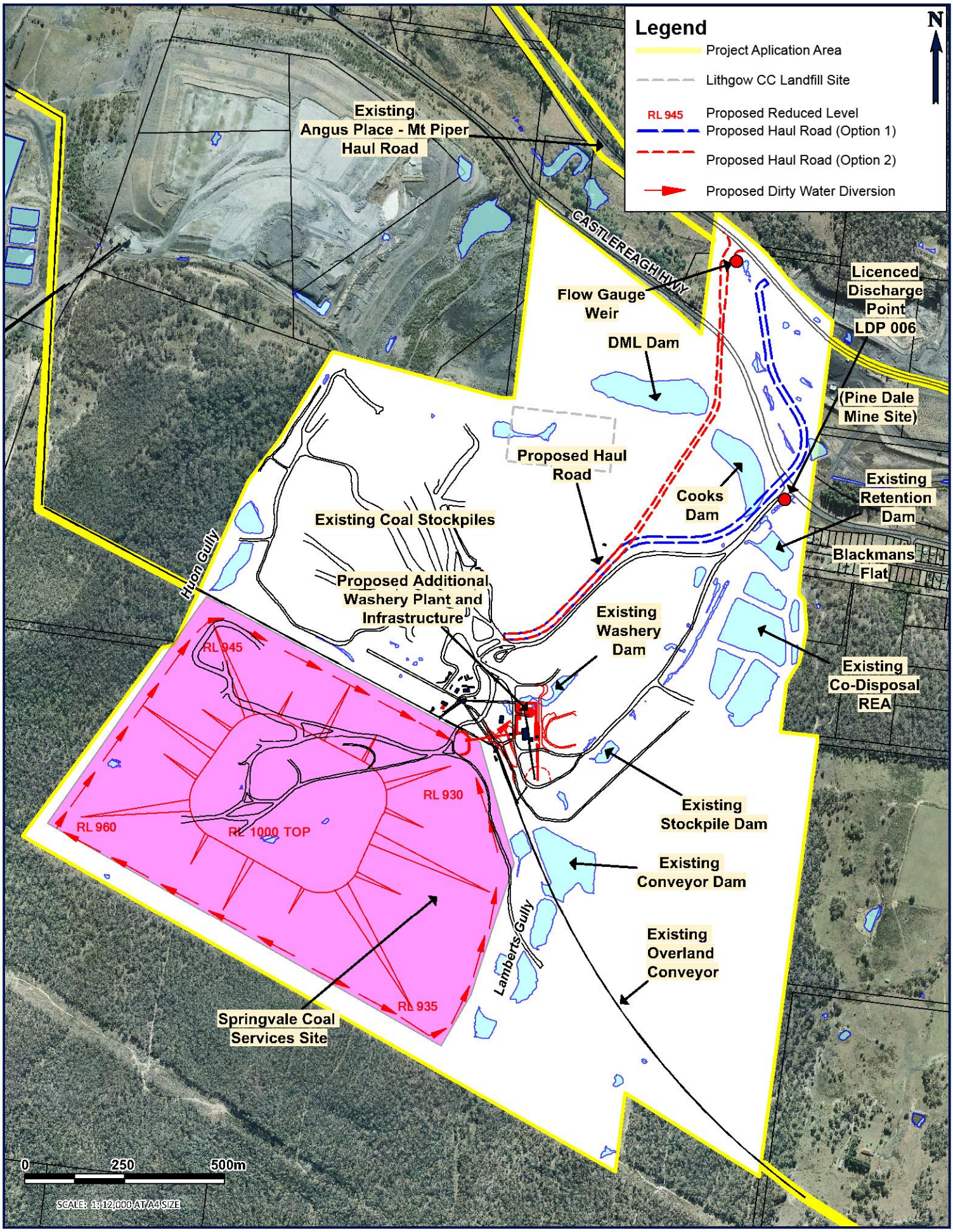

TITLE: FIGURE 2:
PROPOSED INFRASTRUCTURE
SPRINGVALE COAL SERVICES SITE

LOCATION: MOUNT PIPER
WALLERAWANG

DATUM: (GDA 94)
PROJECTION: MGA ZONE 56

DATE: 5/04/2013
PURPOSE: REPORT FIGURE

LAYOUT REF: J:\JOBS\Centennial\All Jobs\105704 Neubecks - Blackmans Flat\10- Drafting\Coal Services\Report Figures
VERSION (PLAN BY): B A4 (RS-NW)

CLIENT: CENTENNIAL COAL
JOB REF: 105704

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1.4 Scope of the Study

The scope of this ecological assessment is to:

- identify vascular plant species found on the site;
- identify and map existing vegetation communities;
- assess the status of identified plant species and vegetation communities under relevant legislation;
- identify existing habitat types on the site and assess the habitat potential for threatened species, populations, or ecological communities known from the proximate area;
- identify threatened fauna potentially using the site; and
- assess the potential of the proposal to have a significant impact on any threatened species, populations or ecological communities identified during field surveys or as having potential habitat on the site.

The purpose of this report is to:

- ensure planning, management and development decisions are based on sound scientific information and advice by documenting the presence of any biodiversity components or potential significant impacts that may exist on the site;
- provide information to enable compliance with applicable assessment requirements contained within the TSC Act 1995, EP&A Act 1979, the EPBC Act 1999, and any other relevant state, regional and local environmental planning instruments; and

  enable the provision and analysis of ecological data that is comparable with data for other sites within the region to ensure continuity and consistency for survey and results.

1.5 Director-General's Environmental Assessment Requirements

Environmental Assessment Requirements were issued for the Project by the Director-General for the Department of Planning and Infrastructure (DP&I) on 6 November 2012. **Table 1** below details the Director-General's Requirements (DGRs) relevant to this assessment and where they have been addressed.

Table 1 Western coal Services Project – Director-General's Requirements

Agency	Requirements	Addressed in this Report
Director - General	Measures that would be taken to avoid, reduce or mitigate impacts on biodiversity;	Section: 9.0
	Accurate estimates of proposed vegetation clearing;	Section: 5.1
	A detailed assessment of potential impacts of the development on any: ▪ Terrestrial or aquatic threatened species or populations and their habitats, endangered ecological communities and groundwater dependent ecosystems; and ▪ regionally significant remnant vegetation, or vegetation corridors;	▪ Section: 5.0 ▪ Section 4.6.5 ▪ Section: 4.6.4
	an offset strategy to ensure the development maintains or improves the terrestrial and aquatic biodiversity values of the region in the medium to long term, having regard to any provisions for biodiversity enhancement under existing consents or approvals for the site;	Section: 9.0
Policies, Guidelines and Plans	Threatened Species Survey and Assessment Guidelines: Field Survey Methods for Fauna - Amphibians DECCW 2009)	Section: 3.4.5

Agency	Requirements	Addressed in this Report
	Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities - Working Draft (DEC 2004)	Section: 3.0
	The Threatened Species Assessment Guideline - The Assessment of Significance (DEC 2007)	Section: 6.0
	NSW State Groundwater Dependent Ecosystem Policy (DLWC)	Section: 4.6.5
	Policy & Guidelines - Aquatic Habitat Management and Fish Conservation (NSW Fisheries)	Section: 4.6.2
	State Environmental Planning Policy No. 44 - Koala Habitat Protection	Section: 8.1.1

2.0 Qualifications and Licensing

2.1 Qualifications

This report was written by Paul Hillier B.Env.Sc., Andrew Smith PhD B.Sc and Lauren Vanderwyk B.Sc. with input from Matt Doherty (B.LMC) of RPS.

2.2 Licensing

Research was conducted under the following licences:

- NSW National Parks and Wildlife Service Scientific Investigation Licence S100536 (Valid 31 December 2012);
- Animal Research Authority (Trim File No: 01/1142) issued by NSW Agriculture (Valid 12 March 2013);
- Animal Care and Ethics Committee Certificate of Approval (Trim File No: 01/1142) issued by NSW Agriculture (Valid 12 March 2013); and
- 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 2014).

2.3 Certification

As the principal author, I, Paul Hillier, make the following certification:

- The results presented in the report are, in the opinion of the principal author and certifier, a true and accurate account of the species recorded, or considered likely to occur within the site;
- Commonwealth, state and local government policies and guidelines formed the basis of project surveying methodology, or where the survey work has been undertaken with specified departures from industry standard guidelines, details of which are discussed and justified in **Section 3**; and
- All research workers have complied with relevant laws and codes relating to the conduct of flora and fauna research, including the *Animal Research Act 1995*, *National Parks and Wildlife Act 1974* and the *Australian Code of Practice for the Care and Use of Animals for Scientific Purposes*.

Principal Author and Certifier:

Paul Hillier
Senior Ecologist / Project Manager
July 2013

3.0 Methodology

Ecological surveys within the designated search areas were carried out by two ecologists from RPS on the 13–17 December 2010, 29–30 August 2011, 28–29 September 2011 and 6 and 8 February 2012. An additional site visit was made on 24 August 2012 to survey the two options for the Haul Road alignment. The surveys included site inspections to identify initial constraints to inform project design; vegetation community surveys and various fauna survey methods including Elliot trapping, diurnal bird and herpetological surveys, bat echolocation recording, spotlighting/call playback, opportunistic sightings and habitat assessments. Targeted searches for threatened flora and fauna species were also undertaken.

3.1 Literature Review

A literature review was undertaken to assist in identifying distributions, suitable habitats and known records of threatened species so that field investigations could more efficiently focus survey effort. Information sources included:

- Aerial Photograph Interpretation (API) and literature reviews to determine the broad categorisation of vegetation within the site;
- Review of the OzArc (2005). *Flora / Fauna and Heritage Assessment: open cut coal Mine Extension Lamberts Gully, NSW. August 2005* report;
- Review of the Vegetation of the Western Blue Mountains – including the Capertee, Coxs, Jenolan and Gurnang Areas (DEC 2006);
- Review of the SKM (2010) *Mount Piper Power Station Ash Placement Project Appendix E: Flora and Fauna Impact Assessment* report.
- Review of the R. W. Corkery & Co. (2011) *Documentation Supporting an Application for Director-Generals Requirements for the Pine Dale Coal Mine – Stage 2 Extension*
- Review of the RPS (2012) *Ecological Assessment: Lidsdale Siding Upgrade Project* report;
- Review of the RPS (2013) *Ecological Inventory Report: Neubeck Project* report;
- Review of fauna and flora records contained in the Office of Environment and Heritage (OEH) Atlas of NSW Wildlife (accessed February 2012) within a 10km radius of the site;
- Department of Sustainability, Environment, Population and Communities (SEWPaC) EPBC Act 1999 Protected Matters Search (accessed February 2012) within a 10km radius of the site;
- OEH Threatened Species, Populations and Ecological Communities website (*http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/*);
- NSW Department of Primary Industries: Threatened Species http://pas.dpi.nsw.gov.au/Species/Species_byRegionResult.aspx?Region=Hawkesbury/Nepean.
- A review of Geographic Information System (GIS) data including (but not limited to) aerial photography, topographic maps, State Environmental Planning Policy (SEPP) Mapping, Soil Landscapes and Acid Sulphate Soil Potential; and
- Collective knowledge gained from extensive work in the area.

3.2 Flora Survey

3.2.1 Vegetation Mapping

Flora surveys and vegetation mapping carried out on the site has been undertaken as follows:

- Review of the Vegetation of the Western Blue Mountains – including the Capertee, Coxs, Jenolan and

Gurnang Areas (DEC 2006);

- Review of the SKM (2010) *Mount Piper Power Station Ash Placement Project Appendix E: Flora and Fauna Impact Assessment* report;
- Confirmation of the community type(s) present on site via the undertaking of flora quadrats;
- Consideration was given to the potential for the derived vegetation communities to constitute 'Endangered Ecological Communities' (EECs) as listed under the TSC Act 1995 and/or EPBC Act 1999; and
- Map the type and general extent of the communities present into definable map units where appropriate using a combination of Air Photo Interpretation (API) and ground truthing surveys.

3.2.2 Threatened Flora Survey

A list of potentially occurring significant flora species from the locality (10km radius) was compiled, which included threatened species (Critically Endangered, Endangered or Vulnerable) and EECs listed under the TSC Act 1995 and/or EPBC Act 1999.

Two ecologists undertook targeted flora searches on all visits between 2010 and 2012. In line with methodology such as the "Random Meander Technique" described by Cropper (1993) targeted searches were conducted across the site. Searches for threatened flora species were also undertaken during traverses throughout the wider areas of the site, which were undertaken to delineate vegetation community boundaries within the site.

Particular intensive targeted flora surveys were undertaken within habitats potentially suitable for *Eucalyptus aggregata* (Black Gum), *Eucalyptus cannonii* (Capertee Stringybark), *Thesium australe* (Austral Toadflax) and *Derwentia blakelyi*, as these species are known to occur in the immediate locality of the site. However, all additional flora species listed in Section 3 were afforded consideration during surveys. Habitats situated in all areas proposed to be impacted upon by infrastructure were included in targeted threatened flora surveys. Whilst the GPS tracks were not captured for all areas, these areas were extensively surveyed.

The locations of any threatened flora species that were found within close proximity to the site were recorded by the use of Trimble differential GPS units with sub-metre accuracy.

3.3 Habitat Survey

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

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.

3.4 Fauna Survey

The fauna survey methodology initially consisted of the production of an observed and expected fauna species list for the area and an assessment of the potential use of the site by threatened fauna species (as listed under the TSC Act 1995 and/or EPBC Act 1999) identified from the vicinity of the site. This was achieved by undertaking literature and database reviews followed by confirmation through field surveys, and any additional species observed were noted on the list.

Field surveys included: Elliot trapping, Bat Echolocation Call Recording, Avifauna Surveys, Herpetofauna Surveys, Spotlighting / Call Playback, Secondary Indications and Incidental Observations.

The location and effort of each fauna survey methodology (as shown in Figure 3) was determined based on the fauna habitat located within the site via stratification of the site into habitat types. The main fauna survey techniques were undertaken in areas of the site that had the highest potential to detect as many fauna species as possible. Targeted survey techniques, such as trapping was therefore not undertaken in areas of regrowth or planted vegetation, as any potentially occurring fauna species had greater chance of occurring in more intact areas of woodland. Where specific targeted surveys were not undertaken, such as on land potentially affected by the Link Haul Road, the potential for fauna species to occur within available habitats was afforded consideration.

3.4.1 Terrestrial Elliot Trapping

Terrestrial trapping was undertaken using Elliott A, Elliott B and cage traps set in four transects for four nights. The Elliott traps were baited with a mixture of rolled oats, peanut butter and honey. Cage traps were baited with chicken necks or chicken thighs. Traps were checked early each morning, with any captures identified and released at point of capture. Traps were re-baited where necessary. The location of each trap line is shown in **Figure 3**.

Terrestrial traps targeted small terrestrial mammals such as dasyurids (e.g. antechinus and dunnarts) and rodents (eg. rats and mice). A total of four trapping transects were undertaken within the site over four nights. One trap line had seven terrestrial Elliot A and seven terrestrial Elliot B traps, with the remaining three trap lines containing size of each. All four trap lines contained one cage trap. The overall trapping effort resulted in a total of 100 Elliot A trap nights, 100 Elliot B trap nights and 12 cage trap nights within the site.

3.4.2 Arboreal Elliot Trapping

Arboreal trapping was undertaken using Elliott B size traps set for four nights. Traps were mounted on brackets set at approximately 2m height on trees with a DBH greater than 30cm. 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. Traps were checked early each morning. The location of each trap line is shown on **Figure 3**.

Arboreal traps targeted arboreal mammal species such as gliders (e.g. squirrel and sugar gliders) and possums (eg. ringtails). A total of 4 trapping transects were undertaken within the site, containing five traps within each, resulting in a total of 80 arboreal trap nights within the site.

3.4.3 Bat Echolocation Call Recording

Bat echolocation calls were recorded using two Anabat II Detector units set to remotely record for the entire night. Anabat surveys were undertaken on the 13th, 14th and 15th of December 2010. On each survey night two bat detectors were left out for the full night, resulting in approximately 72 hours of bat surveys. The location of each bat call survey site is shown on **Figure 3**.

Bat call analysis was undertaken by Anna McConville who is experienced in the analysis of bat echolocation calls.

3.4.4 Avifauna Survey

The presence of avifauna on the site was undertaken via targeted diurnal and nocturnal surveys and by opportunistic observations during field surveys. Birds were identified by direct observation, by recognition of calls or through recognition of distinctive features such as nests, feathers, and owl regurgitation pellets etc.

The potential for threatened avifauna to use the site was also assessed by identification of habitat attributes occurring within the site and their capacity to support threatened species that are known to occur in the wider locality.

Nocturnal surveys undertaken during spotlighting, attempted to identify roosting birds in a similar fashion to methods employed during diurnal surveys. Pre-recorded calls of owl species with the potential to occur within the site were broadcast in an effort to elicit vocal responses from the owls or to attract an owl to the playback site. The calls were broadcast through an amplification system (a hand held megaphone) designed to project the sound for at least 1km 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 broadcasted included *Ninox strenua* (Powerful Owl), *Ninox connivens* (Barking Owl), *Tyto tenebricosa* (Sooty Owl) and *Tyto novaehollandiae* (Masked Owl).

A total of five nights of call playback were undertaken within the site (15th and 16th December 2010, 29th and 30th August 2011, 28th September 2011 and 6th February 2012). Call playback was undertaken in two specific elevated locations during each visit, with the exception of one play back being undertaken to the south of the site in the State Forest and one in the north of the site. The locations of the call playback sites are shown in **Figure 3**.

Opportunistic diurnal bird surveys were undertaken on each site visit between 2010 and 2012.

3.4.5 Herpetofauna Survey

Opportunistic and targeted herpetofauna (amphibian and reptile) searches were conducted during fauna surveys encompassing a diversity of habitats across the site. Known occurrences of threatened herpetofauna species from the region were taken into account during assessment of onsite habitat, to determine the potential for the site to support such species.

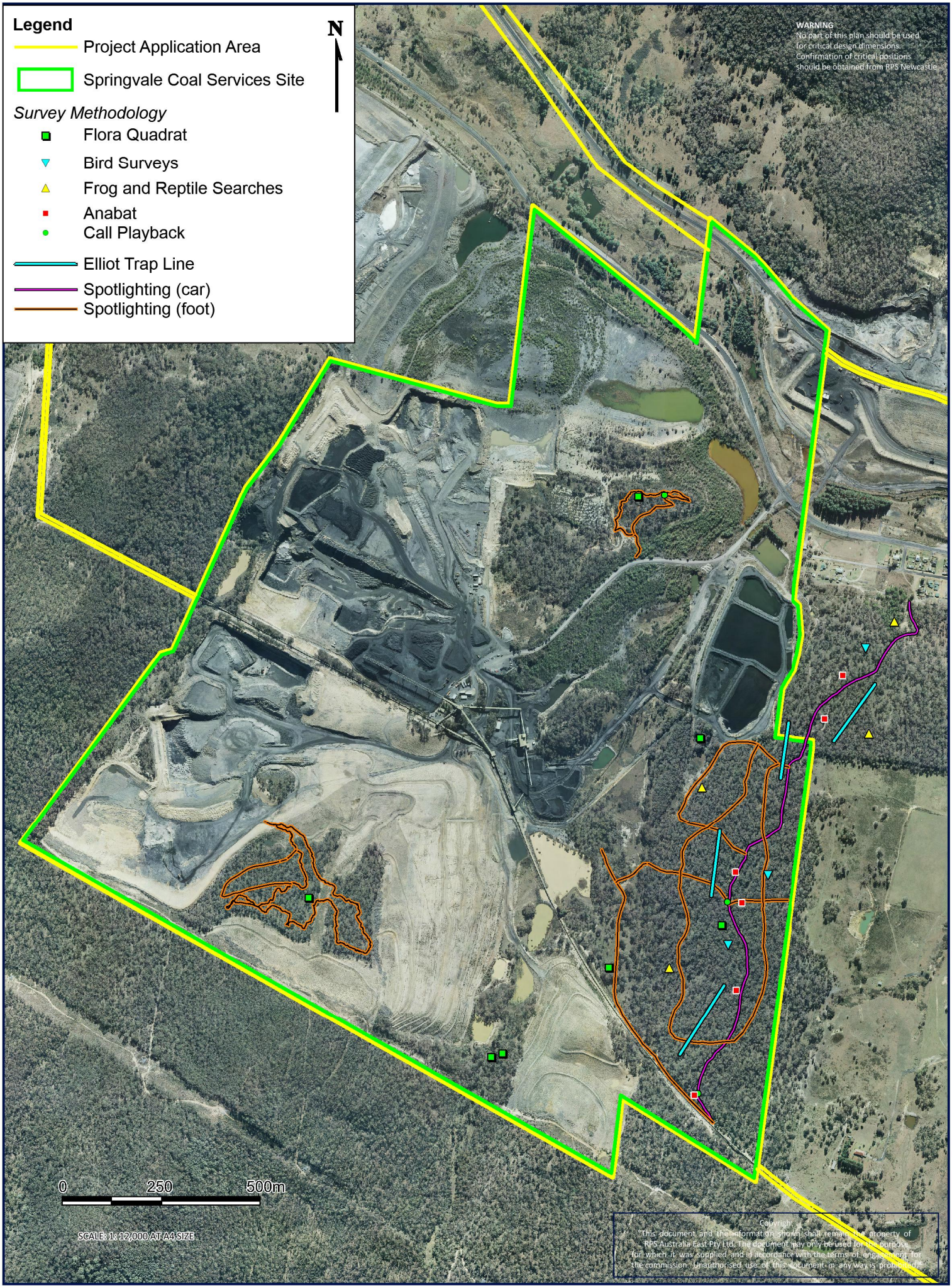
3.4.6 Spotlighting

Spotlighting was undertaken across the site via the use of 75-Watt hand-held spotlights and head torches during walking. A total of approximately 36 person hours of spotlighting was undertaken over six nights (15th and 16th December 2010, 29th and 30th August 2011, 28th September 2011 and 6th February 2012) within the site (**Figure 3**). The methodology discussed in **Section 3.4.4** for call playback was also undertaken during spotlighting.

3.4.7 Secondary Indications and Incidental Observations

Opportunistic sightings of secondary indications (scratches, scats, diggings, tracks etc.) of resident fauna were noted. Such indicators included:

- Distinctive scats and scents left by mammals;
- Collection of predator scats for analysis;
- Nests made by various guilds of birds;
- Whitewash, regurgitation pellets and prey remains from Owls;
- Skeletal material of vertebrate fauna;
- The calls of fauna; and
- Footprints left by mammals.



TITLE: FIGURE 3: FLORA AND FAUNA SURVEY LOCATIONS

LOCATION: BLACKMANS FLAT

DATUM: (GDA 94)
PROJECTION: MGA ZONE 56

DATE: 5/04/2013
PURPOSE: REPORT FIGURE

LAYOUT REF: J:\JOBS\Centennial\All Jobs\105704 Neubecks - Blackmans Flat\10- Drafting\Coal Services\ Report Figures
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3.5 Survey Limitations

The limitations associated with this Ecological Assessment Report are presented herewith. The limitations have been taken into account specifically in relation to threatened species assessments, results and conclusions.

In instances where surveys were not able to reliably detect a particular species or guild, a precautionary approach has been adopted; as such 'assumed presence' of known and expected threatened species, populations and ecological communities has been made where relevant and scientifically justified to ensure a holistic assessment.

3.5.1 Data Availability and Accuracy

The collated threatened flora and fauna species records provided by the Office of Environment and Heritage (OEH) (2011) for the region are known to vary in accuracy and reliability. Traditionally this is due to the reliability of information provided to OEH for collation and/or the need to protect specific threatened species locations. During the review of threatened species records sourced from the Atlas of NSW Wildlife (2011) by OEH, consideration has been given to the date and accuracy of each threatened species record in addition to an assessment of habitat suitability within the site.

Similarly EPBC Protected Matters Searches provide a list of threatened species and communities that have been recorded within 10km, or which have suitable habitat within the wider area and are subject to the same inherent inaccuracy issues as State derived databases.

In order to address these limitations in respect to data accuracy, threatened species records have been used to provide a guide only to the types of species which occur within the locality of the site. As a consequence habitat assessment and the results of surveys conducted within the site have been used to assess the likelihood of occurrence of threatened species, populations and ecological communities to occur within the site.

3.5.2 Fauna Species

The presence of fauna within a particular area is not static over time and may be seasonal in response to the availability of resources. The environmental conditions during which fauna surveys are undertaken greatly influence the species which are recorded. In terms of herpetofauna, conditions such as humidity, rainfall, temperature and barometric pressure can greatly affect the detectability of certain species. As such, where survey effort, targeting particular threatened fauna species, has not specifically met guidelines recommended by DEC 2004, habitat assessment and prediction of the occurrence of threatened fauna species has been applied. Furthermore, a precautionary approach has been adopted for species which potentially occur on site.

Flowering and fruiting plant species, which attract some nomadic or migratory threatened species, often fruit or flower in cycles spanning a number of years. Furthermore, these resources might only be accessed in some areas during years when resources otherwise more accessible to threatened species fail. As a consequence threatened species may be absent from some areas even where potential habitat exists for extended periods.

Nevertheless, it is considered that the combined survey effort and dataset from all of the investigations undertaken in the region to date provide a substantial picture of the fauna species and habitat values occurring within the site.

3.5.3 Flora Species / Communities

The seasonality of the surveys places limits on the number of flora species identified on the site. Whilst seasonal surveys have been undertaken, the cryptic nature of a number of flora species means that surveys may not have been able to detect species, despite potentially being present. There is a range of common albeit cryptic plant species that have a brief flowering period and hence small 'window' of effective 'detectability'. Therefore, some threatened species not detected cannot be discounted off-hand due to seasonality and other factors, and are therefore addressed in terms of their potential for occurrence within the site based on survey effort, timing and ecological factors.

Table 2 provides an indication of the recommended survey times and flowering periods of threatened species previously recorded within 10km of the site (the locality) and/or have potential habitat within the site.

Table 2 Flowering Period and Recommended Survey Times for Threatened Flora Species

Threatened Flora Species	Recommended Survey Time	Flowering Period in Months of the Year											
		J	F	M	A	M	J	J	A	S	O	N	D
Asterolasia elegans	Survey Anytime												
Boronia deanei	Survey Anytime												
Derwentia blakelyi	Survey Anytime (easiest when flowering)												
Eucalyptus aggregata	Survey Anytime												
Eucalyptus cannonii	Survey Anytime												
Eucalyptus pulverulenta	Survey Anytime												
Genoplesium superbum	**Survey Only During Flowering**												
Microtis angusii	**Survey Only During Flowering**												
Persoonia marginata	Survey Anytime												
Prasophyllum sp. Wybong	**Survey Only During Flowering**												
Pultenaea glabra	Survey Anytime												
Thesium australe	Survey Anytime												

Despite the ability to survey the majority of threatened species listed above at any time of year, several cryptic orchid species including *Genoplesium superbum, Microtis angusii* and *Prasophyllum* sp. Wybong are only identifiable during flowering periods. Targeted flora surveys within the site have occurred between early spring (August) and late summer (February) to reflect these flowering periods and ensure maximum likelihood of detecting any cryptic threatened flora species present on the site.

4.0 Results

4.1 Literature Review

In addition to the surveys presented within this report, several other ecological surveys have occurred within the Springvale Coal Services site and its locality. These include surveys within the site at Lamberts Gully (SKM 2010) along with assessments conducted within the proposed Neubeck Project Area (RPS 2013) directly north-west of the site and at Lidsdale Siding approximately 2.1km south-east of the site (RPS 2012). Surveys that have been conducted within the locality of the site have been utilised to provide a higher degree of confidence in predicting the likelihood of occurrence of threatened species within the site.

A series of methods have been used to collect monitoring data. **Table 3** provides a cumulative analysis of selected survey techniques and effort undertaken both within the site and its locality.

Table 3 Survey Effort within the Site and Surrounds

Target Species	Method	Value	RPS Surveys 2010 - 2012	RPS (2012) – Lidsdale Siding	RPS (2013) – Neubeck Project Area	SKM (2010)	Total
Small mammals	Terrestrial A	Trap Nights	100	100	1400	-	1600
Medium sized mammals	Terrestrial B		100	72	1400	-	1572
Large mammals	Cage		12	12	312	-	336
Arboreal mammals	Arboreal B		80	60	312	-	454
Various sized mammals	Hair Tube Station Terrestrial		-	-	240	-	480
	Hair Tube Station Arboreal		-	-	240		
Bats	Harp trap		-	-	56	-	56
	Ultrasonic detection	Hours	72	72	432	Undertaken, however effort not specified	>576
Various nocturnal mammals and birds	Spotlighting		36	30	80	Undertaken, however effort not specified	>146
	Call Playback (mammals)		-	-	19	Undertaken, however effort not specified-	>19
	Call Playback (birds) Using the minimum for Masked Owl		5	5	19	Undertaken, however effort not specified-	>29
	Bird Census (Targeted)		3	3	3.5	Undertaken, however effort not specified	>9.5
Reptiles	Habitat Search		2	1.5	3.5	Undertaken, however effort not specified	>7
Amphibians	Habitat Search		2	1.5	3.5	Undertaken, however effort not specified	>7

Target Species	Method	Value	RPS Surveys 2010 - 2012	RPS (2012) – Lidsdale Siding	RPS (2013) – Neubeck Project Area	SKM (2010)	Total
Plants	Quadrat	Sites	7	4	12	3	26
	Threatened Flora Searches	Hours	64	56	>64	Undertaken, however effort not specified	>184

4.2 Weather Conditions

The prevailing weather conditions during the survey period are presented in **Table 4** below.

Table 4 Prevailing Weather Conditions

	Temperature Min-Max (ºC)	Rain (24 hrs to 9:00am)	Sun Rise (AEST)	Sun Set (AEST)	Moon Rise (AEST)	Moon Set (AEST)
13th Dec 2010	6.8-23.9	0	0515	1916	1129	2347
14th Dec 2010	11.1-21.8	0	0512	1927	1223	N/A
15th Dec 2010	13.2-26.2	0	0512	1928	1317	0015
16th Dec 2010	14.4-25.2	1.8mm	0512	1929	1413	0043
17th Dec 2010	12.2-19.1	19.8mm	0512	1930	1511	0115
29th Aug 2011	3.4-16.2	0	0512	1937	0557	1753
30th Aug 2011	0.6-15.2	0	0603	1925	0634	1902
28th Sep 2011	5.7-14.5	0	0603	1924	0541	1900
29th Sep 2011	10.0-12.4	19.6mm	0604	1923	0622	2013
6th Feb 2012	13.4-26.6	0	0605	1922	1736	0325
7th Feb 2012	14.4-18.9	0	0606	1920	1817	0428
8th Feb 2012	13.2-16.7	1.8mm	0615	1909	1854	0532
24th Aug 2012	2.8-10.7	10.0mm	0627	1737	1021	N/A

Source: Bureau of Meteorology website: http://www.bom.gov.au/climate/dwo/IDCJDW2075.latest.shtml information for Lithgow, and the Geoscience website: http://www.ga.gov.au/bin/geodesy/run/gazmap_sunrise?placename=lidsdale&placetype=0&state=0

4.3 Vegetation Community Mapping

The Vegetation of the Western Blue Mountains – including the Capertee, Coxs, Jenolan and Gurnang Areas (DEC 2006) has mapped eight vegetation communities within the site, namely:

- Map Unit (MU) 11 – Tableland Gully Snow Gum – Ribbon Gum Grassy Forest;
- MU 33 – Tableland Broad-leaved Peppermint - Brittle Gum - Red Stringybark Grassy Open Forest;
- MU 36 – Tableland Apple Box - Bursaria Grassy Open Forest;
- MU 37 – Coxs Permian Red Stringybark - Brittle Gum Woodland;
- MU 58 – Acacia Thickets;
- MU 60 – Non-native Vegetation - Other exotics (willow etc);
- MU 61 – Unclassified (<1ha patch of remnant vegetation adjacent / within cleared lands); and
- MU 62 – Cleared and Severely Disturbed Lands.

Fine-scale mapping of areas within the site at Lamberts Gully (SKM 2010) distinguished four vegetation communities. These communities were classified independently of regional mapping communities identified by DEC (2006) and included:

- MU 1: Brittle Gum – Red Stringybark Woodland;
- MU 2: Scribbly Gum Woodland;
- MU 3: Ribbon Gum Woodland; and
- MU 4: Rehabilitation Areas.

Analysis of the floral composition of these communities as identified by SKM (2010) has determined that the Brittle Gum – Red Stringybark Woodland (MU1), Scribbly Gum Woodland (MU2) and Ribbon Gum Woodland (MU3) are all localised variants of Cox's Permian Red Stringybark – Brittle Gum Woodland (MU 37) as mapped by DEC (2006). These communities have subsequently been considered as commensurate with MU37 to allow for RPS mapping across the site to conform to DEC (2006) mapping where possible.

Ground truthing of vegetation of the site by RPS ecologists confirmed the presence of six vegetation communities, namely:

- MU 11 – Tableland Gully Snow Gum – Ribbon Gum Grassy Forest;
- MU 15 – Tableland Hollows Black Gum - Black Sally Open Forest;
- MU 37 – Coxs Permian Red Stringybark - Brittle Gum Woodland;
- MU 59 – Non-native Vegetation - Pine plantation / woodlot / shelter;
- MU 62 – Cleared and Severely Disturbed Lands;
- Planted / Regenerating Vegetation (no equivalent community within DEC (2006)); and
- Phragmites Wetland (no equivalent community within DEC (2006)).

The area of each vegetation community has been calculated and is outlined in **Table 5**. In addition, the areas of predicted vegetation removal have been calculated and provided below. The locations of each community are shown in **Figure 4**.

Table 5 Areas of Vegetation Communities on Site

Vegetation Community	Area (ha) on site	Area (ha) within proposed REA footprint	Area (ha) within Haul Road Option 1	Area (ha) within Haul Road Option 2
MU 11 Tableland Gully Snow Gum - Ribbon Gum Montane Grassy Forest	9.65	-	-	0.05
MU15 Tableland Hollows Black Gum – Black Sally Open Forest	0.56	-	-	-
MU 37 Coxs Permian Red Stringybark - Brittle Gum Woodland	57.24	10.35	0.12	0.27
MU 59 – Non-native Vegetation - Pine plantation / woodlot / shelter	1.24	-	0.03	0.05
Planted / Regenerating Vegetation	71.73	30.13	0.65	0.54
Phragmites Wetland	1.99	-	0.12	-
Sub-Total (Vegetated)	**142.41**	**40.48**	**0.92**	**0.91**
MU 62 – Cleared and Severely Disturbed Lands	154.30	31.82	1.16	0.74
Total	**296.71**	**72.30**	**2.08**	**1.65**

In addition to the above, the proposed washery upgrade will require an extension of an existing cutting into the adjacent hillside. Whilst the hill has some areas of native vegetation at its peak, the area required for the cutting is highly disturbed.

The flora species composition of each vegetation community is provided within the following sections.

MU 11 - Tableland Gully Snow Gum – Ribbon Gum Grassy Forest

Plate 1 Tableland Gully Snow Gum – Ribbon Gum Grassy Forest

Description: A tall forest with a dense grassy undercover that occupies lower slopes of the site's south-east. An additional area also occurs as remnant road side vegetation along the Castlereagh Highway. Wattles, mainly *Acacia dealbata* (Silver Wattle), can be found as occasional plants, or sometimes as a dense stand. The ground cover is usually dominated by cool-climate grasses with a range of herbs. Covers approximately 9.65 ha of the site.

Canopy Layer: Dominated by *Eucalyptus viminalis* (Ribbon Gum) and *Eucalyptus pauciflora* (Snow Gum). *Eucalyptus sclerophylla* (Hard-leaved Scribbly Gum) was also recorded scattered throughout the community.

Sub Canopy Layer: Dominated by juvenile canopy species.

Shrub Layer: Dominated by *A. dealbata* but consisting also of *Cassinia aculeata* (Dolly Bush), *Lomandra longifolia* (Spiny-headed Mat-rush) and *Ozothamnus diosmifolius* (Rice Flower).

Ground Layer: Dominated by *Poa sieberiana* (Snowgrass) and *Themeda australis* (Kangaroo Grass) with a range of herbs including *Dichondra repens* (Kidney Weed), *Glycine clandestina* (Twining Glycine), *Hibbertia obtusifolia* (Hoary Guinea Flower), *Poranthera microphylla, Wahlenbergia stricta* (Australian Bluebell) and *Desmodium varians* (Slender Tick-trefoil).

Classification: Classified as an EEC under the TSC Act 1995 as 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 15 - Tableland Hollows Black Gum – Black Sally Open Forest

Plate 2 Tableland Hollows Black Gum – Black Sally Open Forest

Description: A tall open-forest, woodland or open woodland that transitions into grassland at low tree cover. The ground layer is dominated by grasses and other herbaceous species. This community is found on the deep soils of alluvial flats in the Cox's and Gurnang areas. Covers approximately 0.56 ha of the site.

Canopy Layer: Dominated by *E. aggregata* and *E. viminalis*.

Sub Canopy Layer: Dominated by juvenile canopy species.

Shrub Layer: Dominated by *A. dealbata*.

Ground Layer: Dominated by *Poa labillardieri var. labillardieri* (Tussock Grass) with a range of introduced herbaceous species including *Centaurium erythraea* (Pink Stars), *Anagallis arvensis* (Scarlet Pimpernel), *Conyza* sp and *Hypochaeris radicata* (Cats Ears).

Classification: Classified as an EEC under the TSC Act 1995 as 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 37 – Cox's Permian Red Stringybark – Brittle Gum Woodland

Plate 3 Cox's Permian Red Stringybark – Brittle Gum Woodland

Description: Cox's Permian Red Stringybark- Brittle Gum Woodland occurs on the Permian escarpment slopes and exposed ridges and is a low (~12m) open woodland. Covers approximately 57.24 ha of the site.

Canopy Layer: Dominated by *Eucalyptus mannifera* (Brittle Gum) and *Eucalyptus macrorhyncha* (Red Stringybark) with some presence of *Eucalyptus sieberi* (Silvertop Ash).

Sub Canopy Layer: Dominated by juvenile canopy species.

Shrub Layer: Dominated by *Cassinia arcuata* (Sifton Bush), *O. diosmifolius* and *A. dealbata*. Presence of other species such as *Leptospermum continentale* (Prickly Tea-tree) and *Acacia buxifolia* (Box-leaf Wattle) were also recorded.

Ground Layer: Dominant species include *T. australis*, *P. seiberiana*, and *Lomandra filiformis* (Wattle Mat Rush). Other native and exotic species of grass and herbs include *H. obtusifolia*, *H. radicata*, *Centaurium erythraea*, *Coronidium scorpioides* (Button Everlasting) and *Austrodanthonia tenuior*.

MU 59-Exotic/Pine Forest

Plate 4 Exotic/Pine Forest

Description: This community occurs as a large stand within the Pinedale Site and as screen plantings along a short length in the north of the site. This community is dominated by mature *Pinus Radiata* (Radiata Pine). Covers approximately 1.24 ha of the site.

MU 62 - Cleared and Severely Disturbed Land

Description: These areas of the site are generally bare of vegetation due to the high amounts of traffic as part of site operations. Covers approximately 154.30 ha of the site.

Planted Regenerating Vegetation

Plate 5 Planted Regenerating Vegetation

Description: These areas of the site are mostly comprised of young *Eucalyptus* and *Acacia* species, planted as part of rehabilitation efforts over the site. Covers approximately 71.73 ha of the site.

Phragmites Wetland

Plate 6 Phragmites Wetland

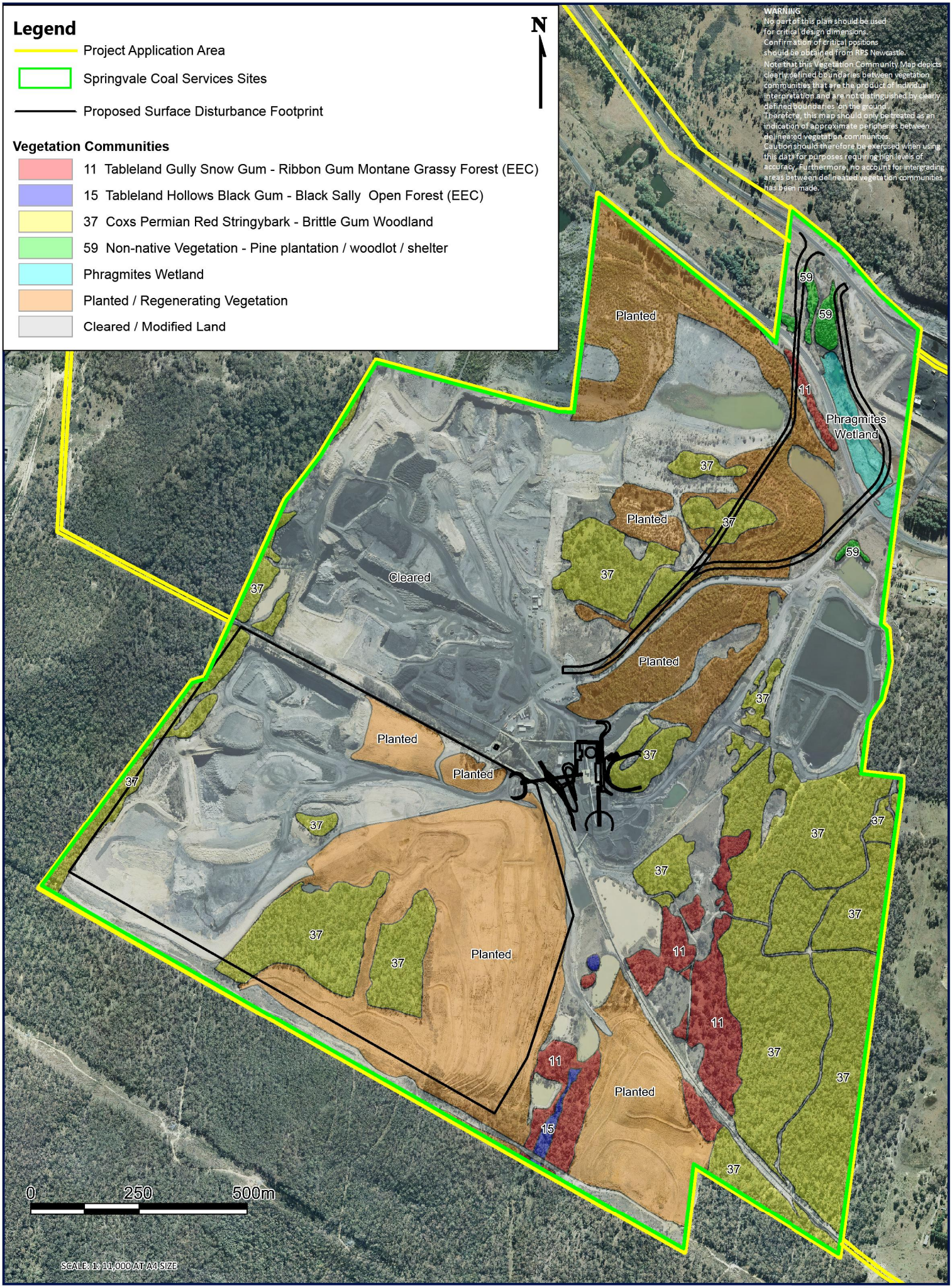
Description: This community occurs along a stretch of Wangcol Creek within the Pinedale Site. Covers approximately 1.99 ha of the site.

Canopy Layer: Dominated by a small number of *Salix fragilis* (Crack Willow) on the edge of the wetland.

Sub Canopy Layer: No visible small tree or large shrub layer present.

Shrub Layer: No visible shrub layer present.

Ground Layer: Dominated by *Phragmites australis* (Common Reed), with some *Typha orientalis* (Broadleaf Cumbungi) also present.



TITLE: FIGURE 4: VEGETATION COMMUNITIES

LOCATION: BLACKMANS FLAT

DATUM: (GDA 94)
PROJECTION: MGA ZONE 56

DATE: 26/06/2013
PURPOSE: REPORT FIGURE

LAYOUT REF: J:\JOBS\Centennial\All Jobs\105704 Neubecks - Blackmans Flat\10- Drafting\Coal Services\ Report Figures
VERSION (PLAN BY): PH

CLIENT: CENTENNIAL COAL
JOB REF: 105704

RPS AUSTRALIA EAST PTY LTD (ABN 44 140 292 762)
241 DENISON STREET BROADMEADOW PO BOX 428 HAMILTON NSW 2303
T: 02 4940 4200 F: 02 4961 6794 www.rpsgroup.com.au

4.4 Flora Surveys

In total, 118 species of flora were recorded during quadrat surveys, targeted flora searches and opportunistically across the site, including one threatened species, namely *Eucalyptus aggregata* (Black Sally). Despite comprehensive surveys targeting the potential habitat of *Eucalyptus cannonii* (Capertee Stringybark) and *Thesium australe*, no individuals were recorded on the site. Only five *E. aggregata* trees were found in the Tablelands Gum – Peppermint woodland to the east of the dam that occurs within Lamberts Gully. This area was cleared in January 2007. The trees were felled and left for seed harvesting prior to being windrowed. Over half a kilogram of seed was harvested and some has been used in seeding of the rehabilitation program within the site and some has been retained for future use. It is expected that this will assist with the retention of this species within the immediate locality (see **Section 4.4.1**). A list of all recorded flora species is provided in **Appendix 2**.

4.4.1 Threatened Flora

4.4.1.1 Literature Review

The results of database searches (NPWS Atlas of NSW Wildlife and EPBC Protected Matters Search) and recent surveys conducted on the site or within 10km of the site (its locality) indicated that twelve threatened flora species have been previously recorded and/or have potential habitat within the site. The threatened flora species that have been recorded within the locality of the site include:

Table 6 Threatened Flora previously recorded on the Study Site or within the locality

Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Number of Records				
				SKM (2010)	RPS (2012)*	RPS (2013)ł	NPWS Atlas Records (2013)	Total
Asterolasia elegans		-	E*	0	0	0	0	0
Boronia deanei	Deane's Boronia	V	V*	0	0	0	0	0
Derwentia blakelyi	-	V	-	0	0	0	81	81
Eucalyptus aggregata	Black Gum	V	-	0	37	282	14	333
Eucalyptus cannonii	Capertee Stringybark	V	-	3	0	114	45	162#
Eucalyptus pulverulenta	Silver-leafed Gum	V	V	0	0	0	1	1
Genoplesium superbum	Superb Midge Orchid	E	-	0	0	0	2	2
Microtis angusii	Angus's Onion Orchid	E	E	0	0	0	0	0
Persoonia marginata	-	V	-	0	0	0	13	13
Prasophyllum sp. Wybong	a leek-orchid	-	V	0	0	0	0	0
Pultenaea glabra	Smooth Bush-pea	V	V	0	0	0	0	0
Thesium australe	Austral Toadflax	V	V	0	0	56	0	56

*Records collected at Lidsdale Siding approximately 2.1km south-east of the site
łRecords collected within Neubeck Project Area directly north-west of the site
#An additional 21 records of this species was recorded north of the site within the Ben Bullen State Forest (RPS pers. obs. 2011)
(V) = Vulnerable Species Listing (E) = Endangered Species Listing

4.4.1.2 Targeted Searches

Targeted searches were undertaken for threatened flora species potentially occurring on site, with particular emphasis on surveying potential habitat available on site for those species recorded at nearby locations (RPS 2012; 2013) and recorded within NPWS Atlas records (2013). Targeted threatened flora surveys by RPS identified one threatened flora species within the site, namely *E. aggregata* (see **Figure 5**), which is listed as Vulnerable under the TSC Act 1995. No additional threatened flora species were recorded on site, however it is noted that one plant species listed as Vulnerable under the TSC Act 1995 and EPBC Act 1999 has previously been recorded, namely *E. cannonii* (SKM 2010). Only five *E. aggregata* trees were found in the Tablelands Gum – Peppermint woodland to the east of the dam that occurs within Lamberts Gully. This area was cleared in January 2007. The trees were felled and left for seed harvesting prior to being windrowed. Over half a kilogram of seed was harvested and some has been used in seeding of the rehabilitation program and some has been retained for future use.

Notably, in addition to the targeted searches undertaken by this survey, the main area of the proposed footprint (proposed for the REA) was also surveyed by SKM (2010), referred to by SKM as “Lamberts South”. Those ecological surveys were undertaken as part of the Mt Piper Ash Placement consent (application 09_0186) held by Delta Electricity. No additional threatened flora species were recorded by SKM (2010). The Mt Piper Ash Placement project was approved on 16 February 2012.

4.5 Fauna Survey

4.5.1 Threatened Fauna

4.5.1.1 Literature Review

The results of database searches (NPWS Atlas of NSW Wildlife, EPBC Protected Matters Search and a DPI threatened aquatic species search) and recent surveys conducted on the site or within 10km of the site (its locality) indicated that 42 threatened fauna species have been previously recorded and/or have potential habitat within the site. The threatened fauna species that have been recorded within the locality of the site include:

Table 7 Threatened Fauna records within 10km of the Study Site

Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Number of Records				
				SKM (2010)	RPS (2012)*	RPS (2013)‡	NPWS Atlas Records (2013)	Total
Heleioporus australiacus	Giant Burrowing Frog	V	V	0	0	0	0	0
Litoria booroolongensis	Booroolong Frog	E	E	0	0	0	0	0
Litoria littlejohni	Littlejohn's Tree Frog	V	V	0	0	0	0	0
Eulamprus leuraensis	Blue Mountains Water skink	E	E	0	0	0	2	2
Hoplocephalus bungaroides	Broad-headed Snake	E	V	0	0	0	1	1
Hieraaetus morphnoides	Little Eagle	V	-	0	0	0	5	5
Callocephalon fimbriatum	Gang-gang Cockatoo	V	-	0	2	4	38	46
Calyptorhynchus lathami	Glossy Black-Cockatoo	V	-	0	0	0	5	5
Anthochaera phrygia	Regent Honeyeater	CE	E	0	0	0	0	0
Lathamus discolour	Swift Parrot	E	E	0	0	0	0	0
Leipoa ocellata	Malleefowl	E	V	0	0	0	0	0
Rostratula australis	Australian Painted Snipe	E	V	0	0	0	0	0
Ninox strenua	Powerful Owl	V	-	0	0	0	16	16
Ninox connivens	Barking Owl	V	-	0	0	0	6	6
Climacteris picumnus	Brown Treecreeper	V	-	0	0	2	24	26
Pyrrholaemus saggitatus	Speckled Warbler	V	-	0	0	0	3	3
Melithreptus gularis gularis	Black-chinned Honeyeater (eastern subspecies)	V	-	0	0	0	1	1

Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Number of Records				
				SKM (2010)	RPS (2012)*	RPS (2013)ǂ	NPWS Atlas Records (2013)	Total
Grantiella picta	Painted Honeyeater	V	-	0	0	0	1	1
Daphoenositta chrysoptera	Varied Sittella	V	-	0	0	6	10	16
Petroica phoenicea	Flame Robin	V	-	0	0	2	21	23
Petroica boodang	Scarlet Robin	V	-	0	0	17	45	62
Melanodryas cucullata	Hooded Robin	V	-	0	0	0	4	4
Stagonopleura guttata	Diamond Firetail	V	-	0	0	0	2	2
Dasyurus maculatus	Spotted-tailed Quoll	V	E	0	0	0	2	2
Phascolarctos cinereus	Koala	V	V	0	0	0	2	2
Potorous tridactylus tridactylus	Long-nosed Potoroo	V	V	0	0	0	0	0
Pseudomys fumeus	Smoky Mouse	CE	E	0	0	0	0	0
Pseudomys novaehollandiae	New Holland Mouse	-	V	0	0	0	0	0
Pteropus poliocephalus	Grey-headed Flying-fox	V	V	0	0	0	0	0
Petrogale penicillata	Brush-tailed Rock-wallaby	E	V	0	0	0	0	0
Petaurus norfolcensis	Squirrel Glider	V	-	0	0	0	1	1
Falsistrellus tasmaniensis	Eastern False Pipistrelle	V	-	0	0	0	9	9
Nyctophilus timoriensis	Greater Long-eared Bat	V	V	0	0	0	0	0
Miniopterus schreibersii oceanensis	Eastern Bentwing-bat	V	-	0	3	0	8	11
Mormopterus norfolkensis	Eastern Freetail-bat	V	-	0	0	0	1	1
Chalinolobus dwyeri	Large-eared Pied Bat	V	V	0	1	1	4	6
Scoteanax rueppellii	Greater Broad-nosed Bat	V	-	0	0	0	3	3
Paralucia spinifera	Bathurst Copper Butterfly	E	V	0	0	10	59	69
Petalura gigantea	Giant Dragonfly	E	-	0	0	0	2	2
Maccullochella peelii peelii	Murray Cod	-	V	0	0	0	0	0

Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Number of Records				
				SKM (2010)	RPS (2012)*	RPS (2013)ǂ	NPWS Atlas Records (2013)	Total
Macquaria australasica	Macquarie Perch	-	E	0	0	0	0	0
Prototroctes maraena	Australian Grayling	-	V	0	0	0	0	0

*Records collected at Lidsdale Siding approximately 2.1km south-east of the site
ǂRecords collected within Neubeck Project Area directly north-west of the site
(V) = Vulnerable Species listing
(E) = Endangered Species listing
(CE) = Critically Endangered Species listing

4.5.2 Arboreal Mammals

Canopy tree species and understorey proteaceous shrubs provide abundant foraging resources such as foliage, seeds pollen, nectar and invertebrates for possums, gliders and bats. Two arboreal mammal species, being the *Pseudocheirus peregrinus* (Common Ringtail Possum) and *Trichosurus vulpecula* (Common Brushtail Possum) were identified during spotlighting on site.

No other arboreal mammals were recorded during spotlighting surveys.

4.5.3 Terrestrial Mammals

Open forest communities containing grassy understorey components provide suitable habitat for a number of terrestrial mammals. One species of macropod was observed within the site, namely the *Macropus giganteus* (Eastern Grey Kangaroo). Evidence in the form of burrows and scats were observed for the *Vombatus ursinus* (Common Wombat), although no individuals were recorded. Two introduced mammal species were recorded on the site, being the *Vulpes vulpes* (Red Fox) and *Oryctolagus cuniculus* (Rabbit). During Elliott trapping no small terrestrial mammals (eg Dasyurids or Rodents) were captured.

A full list of terrestrial mammals recorded within the site is provided in **Appendix 1**.

4.5.4 Bats

Eleven species of microchiropteran bat were positively identified from Anabat echolocation call recording within the site. Of these four species are listed as threatened under the TSC Act 1995. These included the *Chalinolobus dwyeri* (Large-eared Pied Bat), *Falistrellus tasmaniensis* (Eastern Falsistrelle), *Miniopterus schreibersii oceanensis* (Eastern Bent Wing Bat) and *Saccolaimus flaviventris* (Yellow Bellied Sheathtail Bat). Their locations are provided in **Figure 5**. Common species identified on the site included the *Austronomus australis* (White Striped Freetail Bat), *Mormopterus* Species 2 (Eastern Freetail Bat), *Chalinolobus gouldii* (Gould's Wattled Bat), *Chalinolobus morio* (Chocolate Wattled Bat), *Vespadelus darlingtoni* (Large Forest Bat), *Vespadelus regulus* (Southern Forest Bat) and *Vespadelus vulternus* (Little Forest Bat).

Additional bat species that are known to exist within the locality of the site, but could not be confidently identified to species level (those classified as possible or as a species group), include:

- *Mormopterus norfolkensis* (East-coast freetail bat);
- *Myotis macropus* (Large-footed Myotis);
- *Nyctophilus geoffroyi* (Lesser long-eared bat);

- *Nyctophilus gouldi* (Gould's long-eared bat);
- *Scoteanax rueppellii* (Greater broad-nosed bat); and
- *Scotorepens orion* (Eastern broad-nosed bat).

A full list of bat species recorded within the site is provided in **Appendix 1**.

4.5.5 Avifauna Survey

A moderate diversity of common open forest birds including those characterising elevated habitats were observed across the site. Four threatened species, being *Hieraaetus morphnoides* (Little Eagle), *Petroica boodang* (Scarlet Robin), *Callocephalon fimbriatus* (Gang Gang Cockatoo) and *Climacteris picumnus victoriae* (Brown Treecreeper) were recorded on the site (see **Figure 5**). Bird species recorded on the site are summarised in **Appendix 1**.

Although no forest owl species were observed during targeted surveys it is likely that the site represents a portion of the local foraging range of both *Ninox connivens* (Barking Owl) and *Ninox strenua* (Powerful Owls) and *Tyto novaehollandiae* (Masked Owl), due to the presence or likely presence of small terrestrial mammals and arboreal mammals, which are the prey of these owl species. Due to the low abundance of large hollow bearing trees on the site, it is less likely that these species breed on the site.

4.5.6 Herpetofauna

Consideration of the available habitats with regard to threatened reptile and amphibian species found that no threatened herpetofauna species listed under the TSC Act 1995 and/or EPBC Act 1999 were likely to occur within the site (see Section 4.6.1 and 4.6.2). As no potentially suitable habitats for threatened herpetofauna were located on site, the use of opportunistic sightings and surveys targeting specific sites (see Section 4.5.7) were considered sufficient.

Six common reptilian species were recorded, including the *Lampropholis delicata* (Garden Sun Skink), *Chelodina longicollis* (Eastern Long-necked Turtle), *Egernia whitii* (White's Skink) and *Saiphos equalis* (Three-toed Skink).

A total of nine species of amphibian were identified within the site. Several common species were recorded including the *Litoria dentata* (Bleating Tree Frog), *Uperoleia laevigata* (Smooth Toadlet), *Lymnodynastes peronii* (Striped Marsh Frog), *Lymnodynastes tasmaniensis* (Spotted Grass Frog) and *Crinia signifera* (Common Eastern Froglet).

4.5.7 Secondary and Incidental Observations

During fauna surveys macropod and wombat scats were evident, in addition some scratches on tree trunks were observed. The tree trunk scratches were most likely attributable to those arboreal mammals recorded during spotlighting surveys (see **Section 3.4.6**). No other secondary indications or incidental observations of note occurred.

4.6 Habitat Survey

Habitats within the site were assessed for their potential to support native fauna species including threatened fauna for which records occur within the wider locality. Broad habitat types recorded within the site included open forest areas and cleared lands.

4.6.1 Terrestrial Habitats

The Tableland Hollows Black Gum- Black Sally Grassy Open Forest consists of a grassy understorey which provide suitable habitat for a number of terrestrial mammals, including macropods and wombats. The understorey structure in this community is generally lower than in other communities due to the natural absence of a shrub layer. The Red Stringybark- Brittle Gum woodland supports a more complex understorey and would also provide suitable habitat for a range of species utilizing shrubs for nesting and/or foraging.

Understorey structure is generally characterised with sufficient structural diversity and debris to provide foraging opportunities for a range of common and threatened woodland bird species which may be occasional visitors to the site due to its connectivity to adjoining State Forest.

The Red Stringybark- Brittle Gum woodland provides suitable habitat for the threatened flora species *E. cannonii*. The Tableland Hollows Black Gum - Black Sally Grassy Open Forest provides the most suitable habitat for the threatened *E. aggregata*. Areas containing *Themeda australis* (Kangaroo Grass) were discovered within the grassy understory of the Pine Forest in the north of the site. These areas provide suitable habitat for the threatened *Thesium australe*, which is known to be a root parasite of *Themeda australis.*

The shrub *Bursaria spinosa* subsp. *lasiophylla* (Blackthorn) is the larval food plant of the threatened Bathurst Copper Butterfly (*Paralucia spinifera*). As a result, areas of *B. spinosa* subsp. *lasiophylla* provide critical habitat for the Bathurst Copper Butterfly. Given that records for both *B. spinosa* subsp. *lasiophylla* and the Bathurst Copper Butterfly exist within the sites locality (see **Section 4.5** below), targeted searches for this shrub were conducted across the site. However, no *B. spinosa* subsp. *lasiophylla* individuals were recorded on the site, and it was therefore determined that it was unlikely that the site represents potential habitat for the Bathurst Copper Butterfly.

4.6.2 Aquatic Habitats

The Lamberts Gully watercourse is a perennial watercourse and threatened aquatic flora and fauna species are not expected due to the combination of a limited catchment resulting in a non-permanent water flow and the lack of separation between upper sub-catchment runoff water and process water management structures within the middle and lower sub-catchments.

Wangool Creek is a watercourse which contains some semi-permanent ponds and low diversity fringing habitat suitable for some aquatic species. The proposal involves a bridge crossing over Wangool Creek for the haul road, regardless of which option is taken. Wangool Creek is classified as ‘Class 2 – Moderate Fish Habitat’ under the DPI Fisheries Stream classification scheme and is considered to provide suitable habitat for freshwater fish, plants and macroinvertebrates that utilise upper reaches of pools and streams.

It was concluded that the proposed upgrade works coupled with improved site water management measures and creek riparian and stream bank stabilisation and vegetation management measures will result in an overall improvement of water quality and aquatic habitat condition for the benefit of the aquatic biota residing in the creek adjacent to the site and for fish passage past the site (Marine Pollution Research 2013).

4.6.3 Arboreal Habitats

On the site, numerous hollows occurred at a moderate density, reflecting the presence of hollow dependent arboreal mammal species. The presence of arboreal mammal populations on the site suggests that there are sufficient foraging opportunities to support forest owls, although a general paucity of large hollows places constraints upon breeding opportunities for these species.

4.6.4 Corridors and Habitat Linkages

The site is located in the edge of the Ben Bullen State Forest with the larger portion of the state forest (~500ha) reoccurring to the northeast of the site. Castlereagh Highway and Boulder Road divide a remnant patch of forest surrounding the site that connects to Ben Bullen State Forest; however terrestrial animals are still physically able to cross these roads when traffic is not heavy.

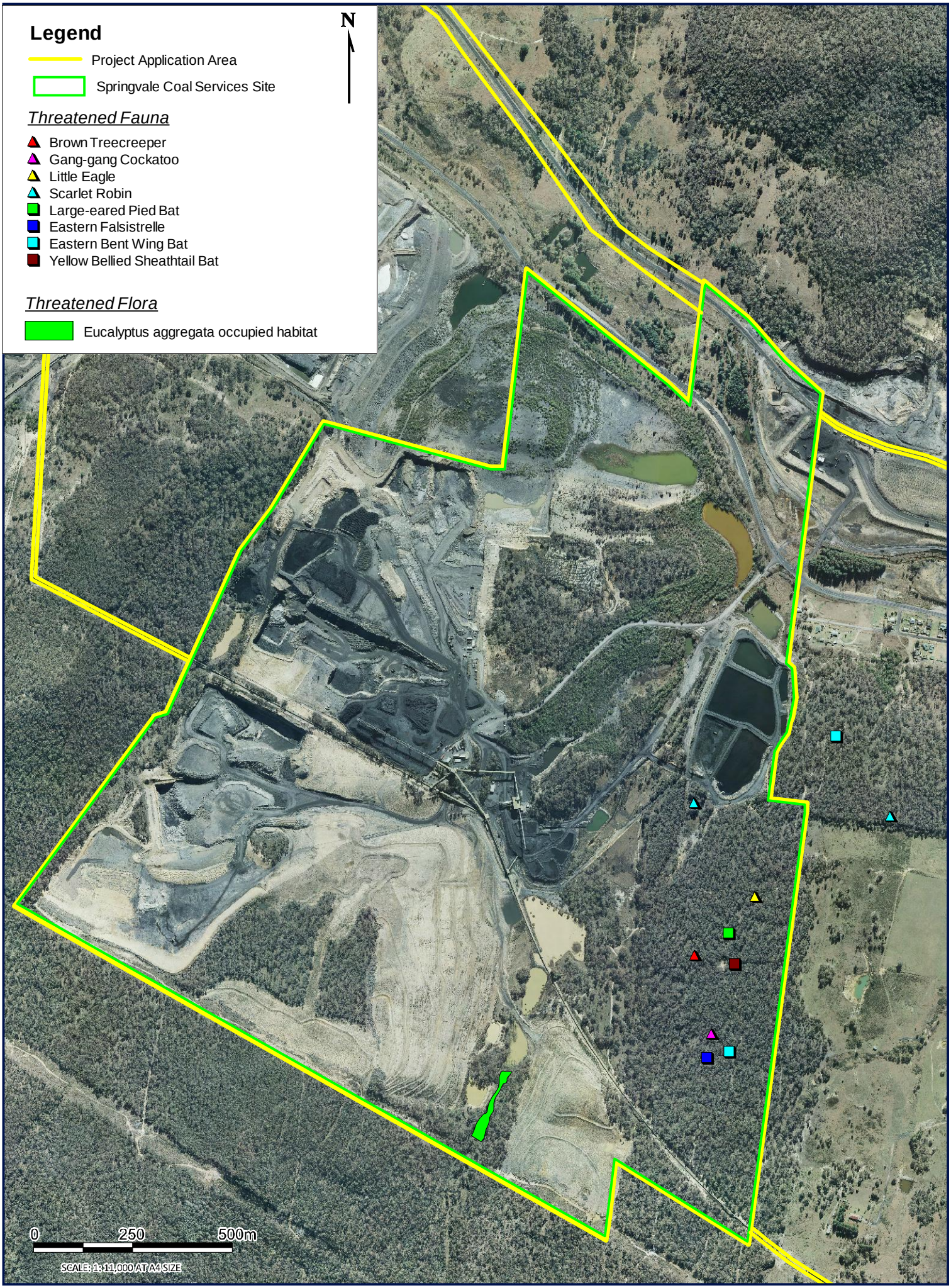
In the broader regional context the village of Portland separates the vegetation on the site from a larger remnant area of vegetation in the Sunny Corner State Forest to the west. Falnash State Forest is a small remnant patch of vegetation situated to the south west which has no connectivity to the vegetation on site, and Lidsdale State Forest is disconnected to the site vegetation to the south by the town of Wallerawang and Lake Wallace.

4.6.5 Groundwater Dependent Ecosystems

The watercourse associated with Lambert's Gully is intermittent and does not support any riparian vegetation. Wangcool Creek is a mostly permanent creek with some riffles and semi-permanent pools. In the vicinity of the proposed works Wangcool Creek is underlain at a depth of approximately 0 to 3 metres by a coal seam. This is the same coal seam being mined by the Pine Dale mine immediately to the north of the site.

Wangcool Creek is a surface flow and the vegetation surrounding the creek within the site and surrounding areas is highly disturbed vegetation which has been mostly cleared and is characterised by the presence of exotic trees such as willows and pines with a pasture understorey. Due to the above factors it is considered that the site does not contain any Groundwater Dependent Ecosystems as defined by the DLWC (2002).

There are no surface aquatic ecosystems that are totally or substantially dependent on groundwater (GDEs) in Wangool Creek or within the sub-catchment drainages through or in the vicinity of the upgrade site (Marine Pollution Research 2013).



TITLE: FIGURE 5: LOCATIONS OF THREATENED FLORA AND FAUNA SPECIES

LOCATION: BLACKMANS FLAT

DATUM: (GDA 94)
PROJECTION: MGA ZONE 56

DATE: 5/04/2013
PURPOSE: REPORT FIGURE

LAYOUT REF: J:\JOBS\Centennial\All Jobs\105704 Neubecks - Blackmans Flat\10- Drafting\Coal Services\ Report Figures
VERSION (PLAN BY):C A4 (PH)

CLIENT: CENTENNIAL COAL
JOB REF: 105704

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RPS

5.0 Predicted Impacts

5.1 Vegetation

The potential impacts to native vegetation is summarised in **Table 8** below.

Table 8 Areas of Native Vegetation Communities that may be removed or modified

Native Vegetation Community	Area (ha) inclusive of Haul Road Option 1	Area (ha) inclusive of Haul Road Option 2
MU 11 Tableland Gully Snow Gum - Ribbon Gum Montane Grassy Forest	0	0.05
MU15 Tableland Hollows Black Gum – Black Sally Open Forest	0	0
MU 37 Coxs Permian Red Stringybark - Brittle Gum Woodland	10.47	10.62
Planted / Regenerating Vegetation	30.78	30.67
Phragmites Wetland	0.12	-
Total	**41.37**	**41.34**

It is noted that a road side remnant of the EEC Tableland Gully Snow Gum – Ribbon Gum Montane Grassy Woodland has the potential to be impacted upon due to the positioning of one of the proposed routes of the services haul road (Option 2). The area to potentially be lost is in the form of a small (0.05ha) young stand of mostly *E. pauciflora*. This community exists as modified remnant roadside vegetation, which is only tentatively connected to other areas of commensurate vegetation. With consideration of the principle of avoidance and mitigation, Option 1 may achieve this. However, due to the proximity to Option 1 haul road to the nearby village of Blackmans Flat, achieving a suitable balance between the needs of the local community and the project indicates that Option 1 may not be possible. Notwithstanding, due to the low quality of this vegetation, as listed above, with better quality examples of this community retained within the Study Area, the loss of 0.05 ha of modified Tableland Gully Snow Gum – Ribbon Gum Montane Grassy Woodland is not considered to be a significant impact.

5.1.1.2 Flora

Flora surveys have detected one threatened flora species, namely *E. aggregata*. This species is outside the reject emplacement area and is not likely to be impacted upon as a result of the proposed actions. Surveys within the site did not detect any further threatened flora species, however two are considered to have potential to occur, namely *E. cannonii* and *T. australe*.

Eucalyptus aggregata (Black Gum)

This species was recorded within the Tableland Hollows Black Gum – Black Sally Open Forest. This community or the *E. aggregata* are not expected to be impacted upon by the proposal.

Eucalyptus cannonii (Capertee Stringybark)

Whilst not recorded, despite targeted surveys, this species is known to have been used in tree plantings as part of the revegetation works and therefore may exist as juvenile trees within the planted/regenerating vegetation recorded within the proposed disturbance footprint. *E. cannonii* may also occur within the Cox's Permian Red Stringybark – Brittle Gum Woodland community, however was not recorded, despite several targeted surveys undertaken.

E. cannonii can only be identified separately from *E. macrorhyncha* by the fruit shape. Due to the young age of the vegetation within the rehabilitation areas, identifying this species separately to the closely related *E.*

macrorhyncha was difficult during this survey. During targeted field surveys within the Cox's Permian Red Stringybark – Brittle Gum Woodland, only the fruit of *E. macrorhyncha* was recorded. If present within the woodland, *E. cannonii* is therefore likely to occur in low numbers.

A local population of *E. cannonii* is known to occur throughout the neighbouring Ben Bullen State Forest and surrounds to the north and north-east of the site. 114 records were collected for this species during surveys of the Neubeck site directly north-east of the site (RPS 2013), and an additional 21 individuals were recorded within the Ben Bullen State Forest, representing only a portion of the actual population size present within the state forest (RPS pers. obs. 2011). It is likely that this species also exists within the areas of Ben Bullen State Forest that occur to the south of the site. Whilst it is considered likely that individuals of this species will be removed as part of the Planted/Regenerating Vegetation, these are deliberately planted individuals that are not yet mature. The Coxs Permian Red Stringybark – Brittle Gum Woodland also represents potential habitat for this species. However, despite targeted surveys, none were recorded therein. The total habitat area for this species within the site is approximately 128.97 ha, with the area of potential habitat to be impacted upon totalling 41.25 ha or 41.29ha for Link Haul Road Option 1 or Link Haul Road Option 2 respectively.

A potentially large local population of *E. cannonii* is known to occur throughout the neighbouring Ben Bullen State Forest to the north of the site. In addition, within the site, approximately 80% of the Cox's Permian Red Stringybark – Brittle Gum Woodland and approximately 50% of the planted vegetation will be retained within the site. It is therefore considered that the proposal is unlikely to have an adverse effect on the life cycle of the *E. cannonii* such that a viable local population of the species is likely to be placed at risk of extinction.

Thesium australe (Austral Toadflax)

T. australe has not been recorded within the site, however a population has been recorded in grasslands within the Neubeck site to the north-east of the site and is known to occur within the Pine Dale Coal Mine Stage 2 Extension Area, which is located to the immediate north of the site. 56 individual *Thesium australe* plants were recorded at Neubeck (RPS 2013) and 99 individual *T. australe* plants from 26 survey plots were recorded by Eco Logical Australia (2011). The *T. australe* plants at Neubeck were recorded within previously cleared grasslands dominated by the closely associated *Themeda australis* (Kangaroo Grass) whilst the species was observed by Eco Logical Australia within derived grassland of Stringybark / Scribbly Gum open forest. This vegetation community is a low open forest or woodland with an open understorey of sclerophyll shrubs, and sparse ground layer of grasses and forbs. This vegetation community is not represented within the Coal Services site.

Suitable habitat for *T. australe*, in the form of *T. australis* dominated grassland in low-lying areas was recorded within the site. Based on known nearby habitat attributes, the low lying cleared land, adjacent to the Pine plantations, mapped within the far north-west of the Study Area, contains potentially suitable habitat for this species. Despite targeted surveys, *T. australe* was not recorded, however it is noted that populations are subject to quite extreme fluctuations from year to year (Victoria, Department of Sustainability and Environment, 2003). Option 2 haul road may therefore impact upon a small area (approximately 0.21ha) of potential habitat for *T. australe*, albeit marginal. This potential habitat quality and potential for presence of *T. australe* is lessened by the past land use as pine plantation and the encroachment of *Rubus fruticosus* (Blackberry) within this area.

Plate 7 Marginal potential *Thesium australe* habitat in the north of the site

5.2 Habitat and Fauna

The proposal is expected to result in the removal of woodland/forest (both native and planted Pine), totalling approximately 10.5 ha for Option 1 or 10.67 ha for Option 2. These areas are considered to be suitable for the majority of fauna present, or potentially present within the site. The majority of this impacted vegetation occurs as highly fragmented parcels of vegetation within the south of the site. Additional foraging habitat, particularly for woodland birds may be found within the planted / regenerating vegetation. The area of this vegetation totals 30.78 ha and 30.67 ha for Option 1 and Option 2 respectively.

The surrounding state forests provide large areas of consolidated habitat for common and threatened fauna, considered to have potential to occur within the locality. Whilst the removal of the vegetation on site is considered to constitute a loss of habitat for threatened fauna, given the large amounts of neighbouring habitat, the proposal is not considered to constitute a significant reduction of habitat to locally occurring fauna.

5.3 Cumulative Impacts

This section provides the additional information in relation to the potential cumulative impacts of projects in the locality. A comparative and cumulative assessment of the impacts of each project to date on threatened species and TEC's and the potential impacts predicted to occur as a result of the additional projects currently being considered are addressed herewith. Due to uncertainty about the environmental effects of some schemes and the lack of attainable information available for review, a broad identification of what the key effects might be is addressed in this section.

1. Lidsdale Siding Upgrade project, to be proposed by Centennial;

This project involves an upgrade to the Lidsdale Siding rail loading facility by automating the train loading facility. The detailed description of the proposed modifications notes that the upgrade comprises a diversion chute, auxiliary stockpile, elevated conveyor, train loading bin, ground conveyor, spillage pit, control room, track extension to existing rail siding, water supply and reticulation upgrade, new transformer, fence erection and refuelling and storage infrastructure. This equates to approximately 40ha. The total area of the study area is approximately 108.1ha.Thirty seven individual *Eucalyptus aggregata* trees and approximately 0.25ha of occupied habitat may potentially be removed or modified by the Lidsdale Siding Upgrade Project.

A creekline that passes through the study area will be protected by the correct use of storage ponds for excess water produced by the facility and ongoing monitoring of these ponds will ensure their functionality and condition. After due consideration against the relevant key thresholds assessment criteria as set out within Draft Guidelines for Threatened Species Assessment for Part 3A Applications, the proposal is not expected to have a significant impact on the ecology of the Lidsdale Siding Upgrade study area, including threatened flora, threatened fauna or endangered ecological communities that are known or expected to occur therein. The low potential for impact is due to the habitats of the project area being heavily disturbed, providing limited opportunities for those threatened species considered as having potential to occur within the wider study area.

2. Mount Piper power station including:

- Application for a Western Rail Coal Unloader (06_0271) approved in June 2009;
- Application for a new Base Load Power Station (MP 09_0119) approved in January 2010; and
- Application for the Ash Emplacement project under part 3A (MP 09_0186) not yet determined.

Delta Electricity received approval in June 2009 to construct a rail coal unloader facility north of Mt Piper and Wallerawang Power Stations, near Lithgow. The proposed facilities include a rail loop, connecting to the Mudgee rail line branch, a rail unloader and a conveyor to transport the coal to the power station.

SKM (2007) determined that approximately 2.5 ha of remnant vegetation would require removal to allow the construction of the conveyor, however the placement of the conveyor within disturbed/regenerating areas would reduce the amount of clearing required. The vegetation communities to be affected by the conveyor were named in SKM (2007) as Ribbon Gum – Apple Box – Snow Gum Woodland, Brittle Gum – Scribbly Gum – Stringybark Woodland and Regenerating Vegetation. One threatened species was recorded by SKM, namely Capertee Stringybark. Up to 50 Capertee Stringybark individuals may be removed as a result of this development.

The 2.5 ha of vegetation to be removed is considered to potentially affect woodland habitats, suitable for a number of woodland dependent fauna, including the threatened fauna species listed in **Section 4.5**.

3. Angus Place Mine

Angus Place is an existing underground longwall mining operation located in the NSW Western Coalfield, approximately 120 km west-northwest of Sydney. In 2010 Angus Place sought to modify its existing NSW Part 3A Project Approval under Section 75 W of the NSW Environmental Planning and Assessment Act 1979 (**EP&A Act**), which included the addition of two longwall panels, 910 (Options 1 and 2) and 900 W. Angus Place also referred this project to the Department of Sustainability, Environment, Water, Population and Communities (SEWPAC). Approval under the NSW EP&A Act for the two longwalls was granted on 29 August 2011. Preliminary documentation has been produced by RPS for the proposed longwalls 910 and 900W, following a controlled action decision by SEWPAC under the EPBC Act.

The main potential impacts to local ecology as a result of the proposed longwalls are from potential changes in surface and groundwater hydrology as a result of mine subsidence and horizontal surface cracking. Those ecological communities and species that may be affected include groundwater dependent ecosystems, including the hanging swamps and shrub swamp communities and flora and fauna species dependent on those habitats, including Deane's Boronia and the Blue Mountains Water Skink. Those rare habitats and species that may potentially be affected by the proposed Angus Place longwall panels considered unlikely to occur within the Lidsdale study area. Given that the Angus Place project does not occur in similar ecological environs to the project, the project will not cumulatively impact ecological characteristics relevant to those operations.

4. Springvale Mine including longwalls 415 to 417

Springvale Coal is a joint venture company owned in equal share by Centennial Springvale Pty Ltd (a wholly owned subsidiary of Banpu Minerals Ltd), and Springvale SK Kores Pty Limited. In 1992, Springvale Coal obtained Development Consent to produce up to 3.4 million tonnes per annum (Mtpa) of Run of Mine (ROM) coal, and longwall mining commenced in 1995.

Springvale Coal was required to obtain an approved Subsidence Management Plan (SMP) in place prior to the commencement of mining. In 2006, Springvale Coal obtained SMP Approval to extract LWs 411 to 418. Springvale Coal has now sought to obtain approval under the EPBC Act for the proposed LW's 415 to 417. LW's 415 to 417 are located beneath the Newnes State Forest north of Lithgow. Preliminary documentation has been produced by RPS for the proposed longwalls 415 and 417, following a controlled action decision by SEWPAC under the EPBC Act.

The main potential impacts to local ecology as a result of the proposed longwalls are from potential changes in surface and groundwater hydrology as a result of mine subsidence and horizontal surface cracking. Those ecological communities and species and that may be affected include groundwater dependent ecosystems, including the hanging swamps and shrub swamp communities and flora and fauna species dependent on those habitats, including Deane's Boronia and the Blue Mountains Water Skink. Those rare habitats and species that may potentially be affected by the proposed Springvale longwall panels considered unlikely to occur within the Lidsdale study area. Given that the Springvale project does not occur in similar ecological environs to the Lidsdale site, the project will not cumulatively impact ecological characteristics relevant to those operations.

5. A Part 3A application (10_0041) for an open cut mining extension to the Pine Dale Coal Mine (Yarraboldy Extension) and Stage 2 Extension;

Pine Dale Coal Mine Stage 2 Extension project aims to extend the original Pine Dale Coal Mine (approximately 82ha) and Yarraboldy Extension Area (approximately 27ha) by approximately 210ha. The components of the proposal include:

- Crushing, stockpiling and maintenance area;
- Office, amenities and parking area;
- Railway line, spur and rail load-out area;
- Internal access roads and private haul road crossing; and
- Explosive magazine and/or reload area.

Approximately 210 ha of state forest vegetation is required to be removed for this project, comprising three vegetation types, namely:

- Stringybark (*Eucalyptus sparsifolia, E. macrorhyncha*) – Scribbly Gum (*E. rossii*) Forest;
- Rocky Outcrop Complex;

- Mountain Gum (*Eucalyptus dalrympleana*) Forest; and
- Open Cleared Lowlands.

Survey work has identified the NSW listed Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland in the South Eastern Highlands, Sydney Basin, South East Corner and NSW South eastern Slopes Bioregions EEC is present with the Stage 2 Extension Area. In addition, one threatened flora species, namely *T. australe* has been recorded within the Stage 2 Extension Area. *T. australe* is listed as Vulnerable under the TSC Act 1995 and EPBC Act 1999. A total of 99 individual of *T. australe* plants from 26 survey plots were recorded by Eco Logical Australia. The Stage 1 extension area was modified to retain the recorded *T. australe* population, however Stage 2 has sought to provide a provisional exclusion area to provide for the development of an offset strategy targeting this species (R.W. Corkery & Co., 2011). There is therefore potential for this local population to be impacted upon if appropriate offsets cannot be found.

In addition, despite the threatened *Eucalyptus cannonii* being previously considered to have no likelihood of occurrence within the Pine Dale Stage 2 Extension Area (Enhance Place 2012), considerations of the vegetation communities located within the extension area and the records for this species within the locality suggests that there is a high likelihood that this species occurs. *E. cannonii* is listed as Vulnerable under the TSC Act 1995 and EPBC Act 1999. The likelihood of the species occurring within the Stage 2 Extension Area suggests that there is potential for a local population to be impacted upon if the species is omitted from mitigation and/or offset considerations for this proposal. Given that the Western Coal Services project will also impact upon areas known or likely to contain *E. cannonii* individuals, there is potential for cumulative impacts to occur upon this species.

The Pine Dale extension will remove habitat for a number of threatened fauna. In particular it is recognised as habitat for listed forest and woodland birds, with Scarlet Robin and Gang-gang Cockatoo being recorded within the Stage 1 area (Ecotone Ecological Consultants, 2010) and Scarlet Robin, Varied Sitella and White-bellied Eagle being recorded during surveys for the Stage 2 area (R.W. Corkery & Co., 2011). The Pine Dale extension area also provides habitat for Squirrel Glider, which was potentially recorded, however the sighting could not be confidently identified as this species by Ecotone Ecological Consultants. In addition, the site provides habitat for microchiropteran bat species, with three threatened bat species being potentially recorded with a 'probable' or 'possible' level of confidence, namely Eastern Bent-wing Bat, Eastern Cave Bat, Large-eared Pied Bat and Yellow-bellied Sheath-tailed Bat (Ecotone Ecological Consultants, 2010). Habitat also exists within the extension areas for other locally occurring threatened fauna species such as the Regent Honeyeater and Spotted-tailed Quoll (Enhance Place 2012).

The Bathurst Copper Butterfly was recorded in several patches of its larval food plant, *Bursaria spinosa* subsp. *lasiophylla*, both within and adjacent to the proposed Stage 2 Extension Area during surveys by Ecotone Ecological Consultants in 2009, 2010 and 2012. The proposal would directly impact upon 1.55ha of known Bathurst Copper Butterfly habitat, within which a total of 36 individual butterflies have been identified during surveys (Enhance Place 2012).

Cumulative impacts from the Pine Dale Coal Mine Stage 2 Extension project and Western Coal Services project would primarily occur upon those fauna species potentially utilising the woodland habitats proposed to be removed by both projects. This would include the threatened species listed above, with the exception of the Bathurst Copper Butterfly, which was determined to have limited potential to exist on the Western Coal Services site given a lack of *Bursaria spinosa* subsp. *lasiophylla* patches. A total of approximately 251 ha of woodland habitat will be impacted upon by the combined proposals, however both projects are surrounded by large, forested areas within the Ben Bullen State Forest that provide commensurate habitat, enabling the persistence of local populations of threatened fauna species subjected to these cumulative impacts, including woodland birds and arboreal mammals, whilst providing potential habitat for threatened flora species including *Eucalyptus cannonii*. Additionally, the Pine Dale Coal Mine Stage 2 Extension project proposes that biodiversity offset would be implemented in order to meet or improve principles for biodiversity

values. Given that potential habitat for threatened species potentially subjected to cumulative impacts will be retained within adjacent areas and provided that offsets implemented for the Pine Dale Coal Mine Stage 2 Extension serve to maintain the biodiversity values of the area, the cumulative impacts of these proposed projects are considered to constitute low impacts to threatened species, known or potentially occurring within these respective sites.

6. Additional developments:

- Wallerawang power station including approval for a Development Application (024/11DA) in July 2011 for new storage silos;
- Blackmans Flat Waste Management Facility; and
- Western Matrix Mobile Resource Recovery Mill (011/11DA).

The combined impact of these projects within the surrounding locale contribute to the ecological pressures placed on threatened flora and fauna species and endangered ecological communities within the area.

Summary

Consideration of the above listed developments within the locality of the site shows that there are cumulative impacts upon those ecological values that may also be incrementally impacted upon within the site. The site is situated at the northern edge of a large area of intact native vegetation associated with Ben Bullen State Forest. Those ecological entities, including the threatened species recorded within the site are likely to be well represented within the neighbouring forested areas. Therefore, whilst the proposal is likely to contribute to the accumulation of impacts known to be occurring within the locality of the site, it is considered that the proposed action is not of a high degree, such that it would significantly impact upon the local populations of those threatened species or ecological communities known or expected to occur in the locality.

6.0 Identification of Subject Species and Communities

Threatened flora and fauna species (listed under the TSC Act 1995 and/or the EPBC Act 1999) that have been gazetted and recorded within a 10km radius of the site have been considered within this assessment. Endangered Ecological Communities (EECs) known from the broader area have also been addressed. Each species/community is considered for its potential to occur on the site and the likely level of impact as a result of the proposal. This assessment deals with each species/community separately and identifies the ecological parameters of significance associated with the proposal.

Those species/communities that have been identified as having potential to be impacted by the proposal have been subject to further assessment and comment in **Appendix 3** and **Appendix 4**.

This assessment deals with the following heads of consideration in tabulated form (refer to **Table 9** overleaf):

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

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

'Likelihood of Occurrence on Site' – Assesses the likelihood of each species/community to occur on or within the immediate vicinity of the site 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 NPWS Atlas of NSW Wildlife, herbariums, NSW Bird Atlas etc.) and previously gained knowledge via fieldwork undertaken within other ecological assessments in the locality.

'Potential for Impact – Assesses the likelihood that impacts to each species/community would result from the proposed development, taking into account direct and indirect short and long-term impacts.

Table 9 Assessment of Likelihood of Occurrence of Threatened Species and Communities and Assessment of Potential Impacts

Species / Community	Habitat Description	Likelihood of Occurrence	Potential for Impact
Plants			
Asterolasia elegans (E*)	Occurs north of Sydney, in the Baulkham Hills, Hawkesbury and Hornsby local government areas. Also likely to occur in the western part of Gosford local government area. Known from only seven populations, only one of which is wholly within a conservation reserve. Occurs on Hawkesbury sandstone.	This species was not recorded on site during field surveys. This species has a limited distribution and none of its preferred habitat, namely Hawkesbury sandstone occurs on site. It is therefore considered **unlikely** to occur.	Due to this species being unlikely to occur, it is considered **unlikely** to be impacted upon by this proposal.
Boronia deanei 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.	No areas of wet heath were observed within the site and this conspicuous species was not recorded. It is therefore considered **unlikely** to occur.	Due to this species being unlikely to occur, it is considered **unlikely** to be impacted upon by this proposal.
Derwentia blakelyi (V)	Occurring in small numbers, often in moister areas of Eucalypt forest, this species flowers in summer and is known from fewer than 20 locations. It is known to occur in the Western Blue Mountains near Clarence, near Mt Horrible, Nullo Mountain and in the Coricudgy Range.	This species was not recorded on site. However this species has been recorded (n=81) within a 10km radius of the site (NSW Wildlife Atlas, 2013). This species is conspicuous and readily identifiable in the field; however none were located within the site despite targeted surveys. It is therefore considered **unlikely** to occur.	Due to this species being unlikely to occur, it is considered **unlikely** to be impacted upon by this proposal.
Eucalyptus aggregata Black Gum (V)	In NSW it occurs in the South Eastern Highlands Bioregion and on the western fringe of the Sydney Basin Bioregion. It grows in the lowest parts of the landscape on alluvial soils, on cold, poorly-drained flats and hollows adjacent to creeks and small rivers.	This species was **recorded** on site.	This species has been recorded on site, however no activities are proposed within the area occupied by this species. Notwithstanding, a **7-part test of significance (TSC Act)** has been applied to this species**.**
Eucalyptus cannonii Capertee Stringybark (V, V*)	The altitude range of *Eucalyptus cannonii* 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 (*E. macrorhyncha*) and Long-leaved Box (*E. goniocalyx*). Associated species are similarly diverse: *E. viminalis*, *E. mannifera*, *E. polyanthemos*, *E. rossii*, *E. blakelyi*, *E. oblonga*, *E. sparsifolia*, *E. bridgesiana*, *E. dalrympleana*, *E. melliodora*, *E. dives* and *Angophora floribunda*.	This species has been **recorded** on the site during previous surveys (SKM 2010) and has been recorded on multiple occasions within a 10km radius of the site (NSW Wildlife Atlas 2013; RPS 2012, 2013). Suitable habitat within the vicinity of the site (Grassy Woodland) is structurally suitable for this species and *E. macrorhyncha* (a co occurring species of *E. cannonii*) also occurs on the site.	This species has been previously recorded on site and is likely to exist on the site in low numbers within the area proposed for the REA. As a result, a **7-part test of significance (TSC Act)** and **EPBC Act Assessment of Significance** has been applied to this species**.**
Eucalyptus pulverulenta Silver-leafed Gum (V, V*)	Grows in shallow soils as an understorey plant in open forest, typically dominated by Brittle Gum (*Eucalyptus mannifera*), Red Stringybark (E. *macrorhyncha*), Broad-leafed Peppermint (*E. dives*), Silvertop Ash (*E. sieberi*) and Apple Box (*E. bridgesiana*). Occurs on the crests or upper slopes of moderately steep hillsides or mountains, at altitudes of 800–1000 m, usually on well-drained skeletal soils with frequent rock outcrops.	This species was not detected during targeted field surveys and only one (n=1) record exists within a 10km radius of the site (NSW Wildlife Atlas 2013). The preferred steep rocky habitats were not observed within the site. It is therefore considered **unlikely** to occur.	Due to this species being unlikely to occur, it is considered **unlikely** to be impacted upon by this proposal.
Genoplesium superbum Superb Midge Orchid (E)	A terrestrial orchid restricted to the southern tablelands of NSW where it has been recorded from two locations near Nerriga, approximately 20 km apart. The species occurs predominantly in wet heathland on shallow soils above a sandstone cap but has also been found in open woodland interspersed with heath. Flowers – Sep to Mar.	This species was not detected during targeted field surveys. Although the species has been recorded within the locality (n=2), no wet heath habitat occurs on site. Therefore, it is **unlikely** to occur within the site.	As this species has a low likelihood of occurring on site, it is considered **unlikely** to be impacted on by this development.
Microtis angusii Angus's Onion Orchid (E, E*)	This is a terrestrial orchid known from only one site at Ingleside, north of Sydney. Preferred habitat is unknown due to the disturbed nature of the habitat in which they were first recorded.	This species was not recorded on site. Due to the rare number of records and the unknown nature of its preferred habitat, it is considered **unlikely** to occur on site.	As this species has a low likelihood of occurring on site, it is considered **unlikely** to be impacted on by this development.

Species / Community	Habitat Description	Likelihood of Occurrence	Potential for Impact
Persoonia marginata (V)	This species is known from only four locations on the Central Tablelands and Central Coast. One of these locations is to the south of the Ben Bullen State Forest. Prefers dry sclerophyll forest and woodland communities on sandstone.	This species was not recorded during field surveys but has been recorded (n=13) within a 10km radius of the site. Given that targeted surveys within potential habitat for this species on site failed to identify this species, it is considered **unlikely** to occur on site.	As this species has a low likelihood of occurring on site, it is considered **unlikely** to be impacted on by this development.
Prasophyllum sp. Wybong (CE*)	It is known from seven populations in open eucalypt woodland and grassland in New South Wales. The species' area of occupancy is estimated to be 1.5 km^2 with an estimated population size based on surveys in 2006 of 460 mature individuals. This species occurs within the Sydney Basin, New England Tablelands, Brigalow Belt South and NSW South Western Slopes IBRA Bioregions and the Border Rivers–Gwydir, Namoi, Hunter–Central Rivers and Central West Natural Resource Management Regions.	This species was not detected during comprehensive targeted field surveys. Also, this species has not been previously detected within 10km of the site. Therefore, it is **unlikely** to occur within the site.	As this species has a low likelihood of occurring on site, it is considered **unlikely** to be impacted on by this development.
Pultenaea glabra Smooth Bush-pea (V, V*)	Restricted to the higher Blue Mountains and has been recorded from the Katoomba-Hazelbrook and Mount Victoria areas, with unconfirmed sightings in the Mount Wilson and Mount Irvine areas. All known populations occur within the Blue Mountains Local Government Area. Grows in swamp margins, hillslopes, gullies and creekbanks and occurs within dry sclerophyll forest and tall damp heath on sandstone. Flowers September to November, fruit matures October to December.	This species was not detected during targeted field surveys and is outside its known distribution. Therefore, it is **unlikely** to occur within the site.	As this species has a low likelihood of occurring on site, it is considered **unlikely** to be impacted on by this development.
Thesium australe Austral Toadflax (V, V*)	Grows in grassland or woodland, often in damp sites in association with Kangaroo Grass (*Themeda australis*).	This species was not detected during targeted field surveys on the site despite intensive surveys in suitable habitat aimed to specifically locate it. Suitable habitat occurs for the species within the grassy understorey that characterises much of the vegetated area on site. One area with the suitable damp grassy habitat and containing patches of *Themeda australis* occurs within the Pine Plantations in the north of the site. This area is within 240m of known *T. australe* plants. As a result, despite no records being found on site, there is still **potential** for the species to occur on the site.	Targeted searches within suitable areas, including the most suitable detected habitat in the north of the site, did not detect this species. However, due to the close proximity to known records, there is considered to be a **loss of potential habitat** the construction of the Haul Road (Option 2 only). Therefore, a **7-part test of significance (TSC Act)** and **EPBC Act Assessment of Significance** has been applied to this species**.**
Herpetofauna			
Eulamprus leuraensis Blue Mountains Water Skink (E, E*)	Occurs at high elevations between 560 m and 1060 m from the Newnes plateau to just south of Hazelbrook. It is restricted to an isolated and naturally fragmented habitat of sedge and shrub swamps that have boggy soils and appear to be permanently wet. The vegetation in these swamps typically takes the form of a sedgeland interspersed with shrubs, but may occur as a dense shrub thicket.	No suitable areas of habitat occur for this species. Therefore it is considered **unlikely** to occur.	As this species has a low likelihood of occurring on site, it is considered **unlikely** to be impacted on by this development.
Heleioporus australiacus Giant Burrowing Frog (V, V*)	The current distribution of *H. australiacus* is south-eastern NSW to Vic. Locally it occurs north to Jervis Bay (Daly 1996), and is mostly restricted to sandy creek banks, often in association with crayfish burrows in this area (Robinson, M. 1996). The northern population has a marked preference for sandstone ridge-top habitat and broader upland valleys. In these locations the frog is associated with small headwater creek lines and along slow flowing to intermittent creek-lines. *H. australiacus* is grey to dark chocolate brown or black above with a white belly, a few yellow spots along the flanks. During the summer, males call like an owl hoot, from burrows within creek banks. Females lay eggs in a foamy nest in the burrow, and the developing tadpoles are washed from the burrows into the creeks during heavy rain.	This species was not detected during targeted field surveys and is associated with sandstone vegetation communities. The western distribution is considered to be Newnes State Forest, to the east of the site. Subsequently the species is considered **unlikely** to occur.	As this species has a low likelihood of occurring on site, it is considered **unlikely** to be impacted on by this development.
Hoplocephalus bungaroides Broad-headed Snake (E, V*)	Largely confined to Triassic sandstones, including the Hawkesbury, Narellan and Shoalhaven formations, within the coast and ranges. Nocturnal, sheltering by day in rock crevices and under flat sandstone rocks on exposed cliff edges during autumn, winter and spring. In summer it is known to become semi-arboreal in its search for prey including geckos and skinks, and will shelter in hollows in large trees within 200 m of rocky escarpments. The Broad-headed Snake is regarded as potentially dangerous, although it has not been attributed to any human fatalities. Destruction of habitat, particularly the removal of sandstone slabs has lead to a decline in numbers.	This species was not detected during targeted field surveys. The preferred exfoliating sandstone habitat of this species does not occur within the site. Therefore, it is **unlikely** to occur.	As this species has a low likelihood of occurring on site, it is considered **unlikely** to be impacted on by this development.

Species / Community	Habitat Description	Likelihood of Occurrence	Potential for Impact
Litoria booroolongensis Booroolong Frog (E, E*)	Live along permanent streams with some fringing vegetation cover such as ferns, sedges or grasses. Adults occur on or near cobble banks and other rock structures within stream margins. Shelter under rocks or amongst vegetation near the ground on the stream edge. Sometimes bask in the sun on exposed rocks near flowing water during summer. Breeding occurs in spring and early summer and tadpoles metamorphose in late summer to early autumn. Eggs are laid in submerged rock crevices and tadpoles grow in slow-flowing connected or isolated pools.	This species was not detected during targeted field surveys. No suitable shelter, stream-side rocky or cobble bank habitats favoured by this species are present on site. Therefore, it is **unlikely** to occur.	As this species has a low likelihood of occurring on site, it is considered **unlikely** to be impacted on by this development.
Litoria littlejohni Little John's Tree Frog (V, V*)	Occurs on the plateaus and eastern plains of the Great Dividing Range from scattered locations between the Watagan Mountains NSW south to Buchan in Victoria. It is pale brown dark speckles. Occurs along permanent rocky creeks with thick fringing vegetation associated with eucalypt woodlands and heaths among sandstone outcrops. Despite its very large distribution there are very few records of the *Litoria littlejohni*. It is known to call through most of the year with a peak in Summer. Clusters of up to 60 eggs are attached to submerged twigs, stems or branches, often near the banks of still pools or clear, slowly flowing streams. Metamorphosis occurs mostly in the months of December and January.	No records occur of this species in the Lithgow area. Although this species is known to occur in open woodland habitat, due to the absence of records from the site, it is considered **unlikely** to occur.	As this species has a low likelihood of occurring on site, it is considered **unlikely** to be impacted on by this development.
Insects			
Paralucia spinifera Bathurst Copper Butterfly (E, V*)	A small sized butterfly with a wingspan of 20–30mm, occurring on the Central Tablelands of NSW in an area approximately bounded by Oberon, Hartley and Bathurst. This species is known at 35 locations, all within the Greater Lithgow, Bathurst Regional and Oberon local government areas. It favours sites with a southwest to north-west aspect, usually where direct sunlight reaches the habitat, and with extremes of cold such as regular winter snowfalls or heavy frosts. Its lifecycle relies on a mutualistic relationship with the ant, *Anonychomyra itinerans*, and on the presence of *B. spinosa* subsp. *lasiophylla* which is used as the larval food	This species was not observed on site. The preferred larval feed plant of this butterfly, *Bursaria spinosa* subsp. *lasiophylla* (Native Blackthorn) does not occur on site. Therefore the species is considered **unlikely** to occur.	As this species has a low likelihood of occurring on site, it is considered **unlikely** to be impacted on by this development.
Petalura gigantea Giant Dragonfly (E)	*Petalura gigantea* 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.	This species prefers swamps and bogs as its preferred habitat. No swamps or bogs occur on site, therefore it is considered **unlikely** to occur.	As this species has a low likelihood of occurring on site, it is considered **unlikely** to be impacted on by this development.
Avifauna			
Anthochaera phrygia Regent Honeyeater (CE, E*)	Occurs in temperate woodlands and open forest, including forest edges. 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. The Regent Honeyeater prefers to forage on large-flowered Eucalypts. They also forage on mistletoe and Banksia flowers, and arthropods. Nesting occurs mainly between November and January, but breeding has been recorded in all months between July and February.	This species was not detected during targeted field surveys. Well known as occurring in the Capertee area, individuals are recorded in more easterly habitat, particularly in areas characterised by winter flowering Eucalyptus ssp. when westerly habitats are experiencing extended dry periods. As such this species may occur on the study site as a migratory visitor. Therefore, this species could **potentially** occur.	As this species has potential to occur on site it is considered that there is **potential** for impact upon habitat for this species. A **7-part test of significance (TSC Act)** and **EPBC Act Assessment of Significance** has been applied to this species**.**
Lathamus discolor Swift Parrot (E, E*)	Breeds in Tasmania during spring and summer, migrating in the autumn and winter months to south-eastern Australia from Victoria and the eastern parts of South Australia to south-east Queensland. In NSW mostly occurs on the coast and south west slopes. Favoured feed trees include winter flowering species such as Swamp Mahogany *Eucalyptus robusta*, Spotted Gum *Corymbia maculata*, Red Bloodwood *C. gummifera*, Mugga Ironbark *E. sideroxylon*, and White Box *E. albens*.	This species was not recorded on site during field surveys. The dominant Eucalypt species within the site are predominantly Summer and Autumn flowering, which is unlikely to coincide with the migratory patterns of the Swift Parrot. Therefore the species is considered **unlikely** to occur.	As this species has a low likelihood of occurring on site, it is considered **unlikely** to be impacted on by this development.

Species / Community	Habitat Description	Likelihood of Occurrence	Potential for Impact
Leipoa ocellata Malleefowl (E, V*)	The stronghold for this species in NSW is the mallee in the south west centred on Mallee Cliffs NP and extending east to near Balranald and scattered records as far north as Mungo NP. Occasional records have been made in the Pilliga forests (most recently 1999), around Cobar (1991) and Goulburn River NP (1989). Predominantly inhabit mallee communities, preferring the tall, dense and floristically-rich mallee found in higher rainfall (300 - 450 mm mean annual rainfall) areas. Less frequently found in other eucalypt woodlands, such as Inland Grey Box, Ironbark or Bimble Box Woodlands with thick understorey, or in other woodlands such dominated by Mulga or native Cypress Pine species. Prefers areas of light sandy to sandy loam soils and habitats with a dense but discontinuous canopy and dense and diverse shrub and herb layers.	This species was not recorded on site. Habitat that consists of dense, high diversity understorey does not exist on site. No records exist within the wider locality. Therefore it is **unlikely** to occur.	As this species has a low likelihood of occurring on site, it is considered **unlikely** to be impacted on by this development.
Rostratula australis Australian Painted Snipe (E, V*)	In NSW, this species has been recorded at the Paroo wetlands, Lake Cowal, 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.	This species was not recorded on site during field surveys. Suitable aquatic habitats in the form of swamps and marshes do not occur on site. Therefore it is considered **unlikely** to occur.	As this species has a low likelihood of occurring on site, it is considered **unlikely** to be impacted on by this development.
Callocephalon fimbriatum Gang-gang Cockatoo (V)	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 was **recorded** on the site during fieldwork.	Due to this species being recorded on the site there is **potential** for impact on this species habitat. A **7-part test of significance (TSC Act)** has been applied to this species**.**
Calyptorhynchus lathami Glossy Black-Cockatoo (V)	Occurs in forests and woodlands where it forages predominantly on Allocasuarina cones, particularly those of *A. littoralis*, A. torulosa and at time A. distyla. Requires large Eucalypt tree hollows for nesting. Local records occur on the Newnes Plateau.	This species was not detected during targeted field surveys. Also no preferred habitat, Allocasuarina species (*A. littoralis*, *A. torulosa* and/or *A. distyla*), were observed within the site and there are limited hollow-bearing trees to represent breeding opportunities for this species. Therefore the site is **unlikely** to represent suitable habitat for this species.	As this species has a low likelihood of occurring on site, it is considered **unlikely** to be impacted on by this development.
Chthonicola sagittata Speckled Warbler (V)	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. Requires a grassy understorey, a sparse shrub layer and an open canopy. Most foraging takes place on ground around tussocks, around bushes and trees. Appears unable to persist in districts where no forested fragments larger than 100 ha remain.	This species was not detected during targeted field surveys however there are three records (n=3) of this species within 10km of the site (NSW Wildlife Atlas 2013). This species is a dry open woodland bird favouring habitats with dense understorey areas, it is possible that this species utilises the site occasionally. Therefore, this species could **potentially** occur.	Suitable habitat for this species occurs on site and with the removal of vegetation due to the proposal; it is considered that there is **potential** for impact upon this species. A **7-part test of significance (TSC Act)** has been applied to this species**.**
Climacteris picumnus victoriae Brown Treecreeper (V)	Frequents drier forests and woodlands, particularly open woodland lacking a dense understorey. Also found in grasslands in proximity to wooded areas where there are sufficient logs, stumps and dead trees nearby. Feeds on invertebrate larvae and small insects, particularly ants. Utilises hollows for roosting/nesting. Appears not to persist in remnants less than 200ha. A number of records exist on the Newnes Plateau to the northwest of the sites.	This species was not detected during this study, however there are a large number of records (n=26) of the species within the locality (NSW Wildlife Atlas 2013; RPS 2013) and potential habitat occurs on site. Therefore, this species could **potentially** occur.	Suitable habitat for this species occurs on site and with the removal of vegetation due to the proposal; it is considered that there is **potential** for impact upon this species. A **7-part test of significance (TSC Act)** has been applied to this species**.**
Daphoenositta chrysoptera Varied Sittella (V)	A canopy species occurring across a wide variety of wooded habitats including wet and dry forests / woodlands and in some areas, tall heathlands. Forages for a range of invertebrate prey and differs from treecreeper species in foraging in both up and down orientations on trunks and branches. Occurs widely across mainland Australia in suitable habitat.	This species was not detected during targeted field surveys. However there are multiple records within 10km of the site (NSW Wildlife Atlas 2013; RPS 2013) and the presence of rough barked trees on the study site suggest that the species may be an occasional visitor to the site. Therefore, this species could **potentially** occur.	Suitable habitat for this species occurs on site and with the removal of vegetation due to the proposal; it is considered that there is **potential** for impact upon this species. A **7-part test of significance (TSC Act)** has been applied to this species**.**
Hieraaetus morphnoides Little Eagle (V)	The Little Eagle is found throughout the Australian mainland excepting the most densely forested parts of the Dividing Range escarpment. It occurs as a single population throughout NSW. Occupies open eucalypt forest, woodland or open woodland. Sheoak or acacia woodlands and riparian woodlands of interior NSW are also used. Nests in tall living trees within a remnant patch, where pairs build a large stick nest in winter. Lays two or three eggs during spring, and young fledge in early summer. Preys on birds, reptiles and mammals, occasionally adding large insects and carrion (DECCW 2010).	This species was **recorded** flying over the site during fieldwork.	Due to this species being recorded on the site there is **potential** for impact on this species habitat. A **7-part test of significance (TSC Act)** has been applied to this species**.**
Melanodryas cucullata Hooded Robin (V)	Primarily known from Eucalypt forest, woodland and scrub, although has been known to use cleared paddocks with regrowth or stumps in close proximity to wooded areas. Favours areas with sparse shrub cover and fallen timber. Appears unable to persist in remnants less than 100-200ha.	This species was not recorded within the site during fieldwork however four records (n=4) exist within a 10km radius of the site (NSW Wildlife Atlas 2013). This species is generally a western woodland species, occurring in open woodlands with a diverse understorey. The species has a defined home range of up to 30 hectares, which, due to the extensive area of the site, could include vegetation communities on site. Therefore the site is considered as having **potential** to support this species.	Due to the removal of potential suitable habitat for this species, it is considered that there is **potential** for impact upon this species. A **7-part test of significance (TSC Act)** has been applied to this species**.**

Species / Community	Habitat Description	Likelihood of Occurrence	Potential for Impact
Melithreptus gularis gularis Black-chinned Honeyeater (V)	In NSW this species occurs in eastern Australia, along the inland slopes of the Great Dividing Range, extending to the coast between Sydney and Newcastle, NSW, Occupies dry Eucalypt woodland within an annual rainfall range between 400-700 mm, particularly within associations containing Ironbark and Box species (Garnett et al, 2000). It is estimated that the Black-chinned Honeyeater spends 60% of its time searching foliage for such food as insects, nectar and lerps.	This species was not recorded within the site during fieldwork and only one record (n=1) exists within 10km of the site (NSW Wildlife Atlas 2013). However, the preferred Ironbark or Box Woodland habitats are not present. Therefore the site is **unlikely** to represent suitable habitat for this species.	As this species has a low likelihood of occurring on site, it is considered **unlikely** to be impacted on by this development.
Ninox connivens Barking Owl (V)	Occurs mainly in dry sclerophyll woodland. Nests in large Eucalypt hollows, and roosts in hollows or thick vegetation. Can be found roosting in dense Acacia sp. and Casuarina sp. or the dense clumps of Eucalypt trees. More commonly found west of the divide and on the slopes. Favours tree lined watercourses, with hollow bearing tress. Hunts a range of prey species including birds and both terrestrial and arboreal mammals.	This species was not recorded within the site during fieldwork however records (n=6) have been made within 10km of the site (NSW Wildlife Atlas 2013). This species is generally a western species, individuals are occasionally recorded in more easterly habitat, particularly those areas characterised by large expanses of wooded habitat. The species has a large home range and subsequently may occupy the site on an intermittent basis. Therefore the site is considered as having **potential** to support this species.	Due to the removal of potential suitable habitat for this species, it is considered that there is **potential** for impact upon this species. A **7-part test of significance (TSC Act)** has been applied to this species**.**
Ninox strenua Powerful Owl (V)	Occurs in coastal and adjacent ranges of eastern Australia in sclerophyll forests and woodlands where suitable prey species occur (being predominantly arboreal mammals such gliders and flying foxes, but also preys on birds). Requires large and specific hollow characteristics for nesting. Pairs appear to mate for life and occupy exclusive territories in the order of 1000 ha in size.	This species was not recorded within the site during fieldwork. It is likely that the site occurs within the foraging range and perhaps the breeding territory of locally occurring Powerful Owls. Sixteen records exist for this species within 10km of the site (NSW Wildlife Atlas 2013). Therefore the site is considered as having **potential** to support this species.	Due to the removal of potential suitable habitat for this species, it is considered that there is **potential** for impact upon this species. A **7-part test of significance (TSC Act)** has been applied to this species**.**
Tyto novaehollandiae Masked Owl (V)	Found in a range of habitats, more commonly found in dry eucalypt forests and woodlands. A forest owl which often hunts on forest edges and also roadsides. Requires large Eucalypt hollows for nesting and these hollows are also preferred for roosting sites. Breeding has also been recorded in caves.	This species was not recorded within the site during fieldwork. Despite a lack of records for the species within the locality, it is possible that the site occurs within the foraging range and perhaps the breeding territory of locally occurring Masked Owls. Therefore the site is considered as having **potential** to support this species.	Due to the removal of potential suitable habitat for this species, it is considered that there is **potential** for impact upon this species. A **7-part test of significance (TSC Act)** has been applied to this species**.**
Petroica boodang Scarlet Robin (V)	A woodland and open forest species, which forages in the mid to lower storeys on a variety of invertebrate prey. Generally an altitudinal migrant the Scarlet Robin spends the warmer months in the ranges and winters in lowland dry open forests and woodland. Occurs patchily in eastern Australia across wooded habitats.	This species was **recorded** on the site during fieldwork.	Due to the removal of potential suitable habitat for this species, it is considered that there is **potential** for impact upon this species. A **7-part test of significance (TSC Act)** has been applied to this species**.**
Petroica phoenicea Flame Robin (V)	A woodland and open forest species, which prefers the wooded edges of open areas and forages in the lower storey on a variety of invertebrate prey. Generally an altitudinal migrant the Flame Robin, like a number of other robin species spends the warmer months in the ranges and winters in more lowland open country and woodlands. Usually encountered in high altitudinal areas including above snowline habitat in some regions.	This species was not recorded on the site during fieldwork, however 19 records (n=23) exist within 10km of the site (NSW Wildlife Atlas; RPS 2013). This species prefers a range of woodlands habitats and is found throughout the Blue Mountains region, thus this species could **potentially** occur within the site.	Due to the removal of potential suitable habitat for this species, it is considered that there is **potential** for impact upon this species. A **7-part test of significance (TSC Act)** has been applied to this species**.**
Stagonopleura guttata Diamond Firetail (V)	Occupies open woodlands / forests and associated habitats with grassy understorey. Generally found west of the Divide or in drier semi-coastal areas such as the upper Hunter Valley. Appears unable to persist in remnants less than 200ha.	This species was not recorded within the site during fieldwork. Generally a western species, occurring in open woodlands with grassy understorey strata. Therefore the species is considered **unlikely** to occur.	The proposal is likely to modify only a small proportion of the habitat in the site. Therefore, this species is **unlikely** to be significantly impacted upon by this development.
Grantiella picta Painted Honeyeater (V)	This is a nomadic species that occurs in highest densities around the inland slopes of the Great Dividing Range. Inhabits Boree, Brigalow and Box-Gum Woodlands and Box-Ironbark Forests. A specialist feeder on the fruits of mistletoes growing on woodland eucalypts and acacias.	This species was not detected during this study, however a dated record exists for this species within the site (OzArc 2005). Despite this record, comprehensive surveys have not recorded mistletoe on Eucalypt species throughout the site. In the absence of their core diet, it is **unlikely** that they would occur on a regular basis.	As this species has a low likelihood of having a continuous occurrence on site, it is considered **unlikely** to be impacted on by this development.
Mammals			
Mormopterus norfolkensis Eastern Freetail-bat (V)	This species roosts in tree hollows generally in hollow spouts extending from dead branches of mature trees. They have been known to roost in houses and similar structures and may also roost in exfoliating bark on trees. Dry eucalypt forest and woodland on the coastal side of the Great Dividing Range is where most records for this species occur. They show a preference for open spaces and forage commonly over larger rather than smaller waterways.	This species was not recorded on site and only one record (n=1) exists within a 10km radius of the site. This species tends to forage and be most active along larger waterways, which are not present on site. However, roosting habitat in the form of small hollows could potentially exist on site, and it is therefore considered as having **potential** to occur.	Due to the removal of potential suitable habitat for this species, it is considered that there is **potential** for impact upon this species. A **7-part test of significance (TSC Act)** has been applied to this species**.**
Falsistrellus tasmaniensis Eastern False Pipistrelle (V)	This species is found in a variety of forest types such as open forests, woodlands and wetter sclerophyll forests (usually with trees >20m). This species roosts in tree hollows. Hunts beetles, moths, weevils and other flying insects below or just above the canopy.	This species was **recorded** during Anabat surveys by RPS.	Due to the removal of potential suitable habitat for this species, it is considered that there is **potential** for impact upon this species. A **7-part test of significance (TSC Act)** has been applied to this species**.**

Species / Community	Habitat Description	Likelihood of Occurrence	Potential for Impact
Saccolaimus flaviventris Yellow Bellied Sheathtail Bat (V)	Range of habitats from rainforest to arid shrubland, roosts in tree-hollows, sometimes roosts in mammal burrows when no hollows available. Seasonal movements are unknown, may migrate to southern Australia in summer. Feeds by foraging for insects over the canopy, but flys low in arid shrubland.	This species was **recorded** during Anabat surveys by RPS.	Due to the removal of potential suitable habitat for this species, it is considered that there is **potential** for impact upon this species. A **7-part test of significance (TSC Act)** has been applied to this species**.**
Scoteanax rueppellii Greater Broad-nosed Bat (V)	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. 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 recorded within the site during fieldwork, although potential foraging and roosting habitat are widespread within the locality. Also due to its mobility, it has the **potential** to occur within the site on at least an intermittent basis.	Due to the removal of potential suitable habitat for this species, it is considered that there is **potential** for impact upon this species. A **7-part test of significance (TSC Act)** has been applied to this species**.**
Nyctophilus timoriensis (SE form) Greater Long-eared Bat (V, V*)	Overall, the distribution of the south eastern form coincides approximately with the Murray Darling Basin with the Pilliga Scrub region being the distinct stronghold for this species. Inhabits a variety of vegetation types, including mallee, bulloke *Allocasuarina leuhmanni* and box eucalypt dominated communities, but it is distinctly more common in box/ironbark/cypress-pine vegetation that occurs in a north-south belt along the western slopes and plains of NSW and southern Queensland. Roosts in tree hollows, crevices, and under loose bark.	This species was not recorded within the site during fieldwork, although potential foraging and roosting habitat are widespread within the locality. Given the high mobility of the species, it has the **potential** to occur within the site on at least an intermittent basis.	As this species has potential to occur on site it is considered that there is **potential** for impact upon habitat for this species. A **7-part test of significance (TSC Act)** and **EPBC Act Assessment of Significance** has been applied to this species**.**
Miniopterus schreibersii subsp. oceanensis Eastern Bentwing Bat (V)	Prefers to forage in well-vegetated areas, such as within wet and dry sclerophyll forests and rainforests and also dense coastal Banksia scrub. Requires caves or similar structures for roosting habitat. Occasionally roost in tree hollows. Largely confined to more coastal areas.	This species was **recorded** during Anabat surveys by RPS.	Due to the removal of potential suitable habitat for this species, it is considered that there is **potential** for impact upon this species. A **7-part test of significance (TSC Act)** has been applied to this species**.**
Chalinolobus dwyeri Large-eared Pied Bat (V, V*)	Found in well-timbered areas containing gullies. The relatively short, broad wing combined with the low weight per unit area of wing indicates manoeuvrable flight. This species probably forages for small, flying insects below the forest canopy. It roosts in caves, crevices in cliffs and mines.	This species was **recorded** during Anabat surveys by RPS.	As this species has potential to occur on site it is considered that there is **potential** for impact upon habitat for this species. A **7-part test of significance (TSC Act)** and **EPBC Act Assessment of Significance** has been applied to this species**.**
Dasyurus maculatus maculatus Spotted-tailed Quoll (V, E*)	Found in a variety of forested habitats from sclerophyll forests, rainforests and coastal woodlands. This species creates a den in fallen hollow logs or among rocky outcrops. Generally does not occur in otherwise suitable habitats that are in close proximity to urban development. A number of records occur across the Newnes Plateau (Atlas of NSW Wildlife data). It is an opportunistic hunter of a variety of prey.	This species was not recorded within the site during fieldwork. However it has been recorded twice (n=2) within the locality (NSW Wildlife Atlas 2013). As suitable habitat for foraging occurs within the site, it is considered as having **potential** to occur.	Although this species has some potential to be an infrequent visitor to the site, the amount of suitable foraging habitat to be removed is small and is **unlikely** to have a significant impact on this species. A **7-part test of significance (TSC Act)** and **EPBC Act Assessment of Significance** has been applied to this species**.**
Petaurus norfolcensis Squirrel Glider (V)	Occurs in eucalypt forests and woodlands where it feeds on sap exudates and blossoms. In these areas tree hollows are utilised for nesting sites. Also requires winter foraging resources when the availability of normal food resources may be limited, such as winter-flowering shrub and small tree species.	This species was not recorded within the site during fieldwork, however due to the presence of hollow bearing trees on the site, the species has the **potential** to occur.	Due to the removal of potential suitable habitat for this species, it is considered that there is **potential** for impact upon this species. A **7-part test of significance (TSC Act)** has been applied to this species**.**
Phascolarctos cinereus Koala (V, V*)	Occurs in forests and woodlands where it requires suitable feed trees (particular Eucalyptus spp.) and habitat linkages. Will occasionally cross open areas, although it becomes more vulnerable to predator attack and road mortality during these excursions. Records from the Upper Hunter are largely confined to substantial woodland and forest habitat within reserves.	This species was not recorded within the site during fieldwork. Two records (n=2) exist within the 10km of the site. Only marginal foraging habitat for this species occurs on site and is highly fragmented as a result of the disturbed nature of the site. As a result, it is considered **unlikely** to occur therein.	Although this species has potential to occur on site, the amount of suitable habitat to be removed is small and is **unlikely** to have a significant impact on this species.
Pseudomys fumeus Smoky Mouse (CE, E*)	Currently limited to a small number of sites in south-eastern NSW. There are few records existing in NSW for this species, ranging from Kosciuszko National Park, Bondo and Ingbyra State Forests, Mt Poole, Nullica State Forest and the adjoining S. E. Forests National Park. Prefers heath habitat on ridge top communities and slopes in sclerophyll forest, heathland and open forest. Can also occur in fern gullies.	This species was not detected during comprehensive targeted field surveys. Also, this species has not been previously detected within 10km of the site. Therefore, it is **unlikely** to occur within the site.	As this species has a low likelihood of occurring on site, it is considered **unlikely** to be impacted on by this development.
Pseudomys novaehollandiae New Holland Mouse (V*)	This species has a clumped distribution throughout Australia. It has been found at coastal areas to up to 100km inland on sandstone habitats. Requires deep soils for digging burrows. Across their range they are known from open heathland, open woodland with a heathland understorey and vegetated sand dunes. Also prefer communities high in species diversity as their diet requires a high amount of legumes.	Sandstone habitats, heathland and communities with a well vegetated understorey do not occur on site. Depth of soil is likely to be adequate however the communities on site are relatively low in floristic diversity. The required habitat attributes required by this species do not persist on site; therefore it is **unlikely** to occur.	As this species has a low likelihood of occurring on site, it is considered **unlikely** to be impacted on by this development.

Species / Community	Habitat Description	Likelihood of Occurrence	Potential for Impact
Pteropus poliocephalus Grey-headed Flying-fox (V, V*)	Forages over a large area for nectar / fruits etc. Occurs across subtropical and temperate forest, sclerophyll forest and woodlands, heaths, swamps, urban gardens and cultivated crops. Frequently observed to forage in flowering Eucalypts. Seasonally roosts in communal base camps situated within wet sclerophyll forests or rainforest. These camps are usually located within 20km's of their food source. Frequently observed to forage in flowering Eucalypts.	This species was not recorded during field surveys and no records exist within 10km of the site. This species is considered **unlikely** to occur.	As this species has a low likelihood of occurring on site, it is considered **unlikely** to be impacted on by this development.
Potorous tridactylus tridactylus Long-nosed Potoroo (SE mainland) (V*)	Prefers cool rainforest, wet sclerophyll forest and heathland. Essentially, requires dense understorey with occasional open areas. These open areas most likely consist of sedges, ferns, heath or grass-trees. Sleeps by day in a nest on the ground, and digs for succulent roots, tubers, fungi and subterranean insects. Some diggings seemingly attributable to this species may belong to *Isoodon macrourus* (Northern Brown Bandicoot). Generally east of the divide, hides by day in dense vegetation, sometimes feeds during winter during daylight hours during overcast or low light conditions.	This species was not recorded during field surveys. Suitable habitat in the form of rainforest, wet sclerophyll and heathlands do not occur on site. Shrub layers with sufficient vegetation for nesting and protection are also minimal on site. It is therefore **unlikely** to occur.	As this species has a low likelihood of occurring on site, it is considered **unlikely** to be impacted on by this development.
Petrogale penicillata Brush-tailed Rock-wallaby (E, V*)	An agile inhabitant of rocky slopes of south-eastern Queensland and northern NSW with remnant populations in Victoria and western NSW. The sites occupied by *P. penicillata* mostly have a northerly aspect, so as to allow the animals to sun themselves in the early morning and late afternoon.	This species was not recorded on site. Rocky outcrops do not exist on site however some outcrops do persist at the edge of the site towards the south west, which could allow this species to forage or travel on site. Therefore it is considered as having **potential** to occur.	As the proposal is not removing habitat preferred by this species, it is considered **unlikely** to be impacted on by this development.
Fish			
Maccullochella peelii peelii Murray Cod (V*)	Found extensively throughout the Murray Darling Basin in the south-eastern region of Australia. It is the largest freshwater fish in Australia, growing up to 1.8m in length.	This species was not recorded on site, and suitable rivers large enough to accommodate this species do not occur on site. Therefore it is considered **unlikely** to occur.	As this species has a low likelihood of occurring on site, it is considered **unlikely** to be impacted on by this development.
Macquaria australasica Macquarie Perch (E*)	Occurs throughout the Murray Darling River System and in the Hawkesbury / Nepean system. This schooling species of fish prefers habitats with deep, clear water, dense vegetation and rocky bottoms. Overhanging vegetation also provides protection for this species.	This species was not recorded on site. Wangool Creek on site does have adequate water depth and clarity which this species prefers. The closest record of this species to the subject site is located at Blackheath and dates from 1967 (Atlas of Living Australia). Therefore it is considered **unlikely** to occur.	As this species has a low likelihood of occurring on site, it is considered **unlikely** to be impacted on by this development.
Prototroctes maraena Australian Grayling (V*)	On mainland Australia, this species has been recorded from rivers flowing E and S of the main dividing ranges. It is absent from the inland Murray-Darling system. Prefers clear water with gravel bottoms.	This species was not recorded on site during field surveys. The creek on site does not provide adequate conditions suitable for this species in terms of bottom substrate and water clarity. Therefore it is **unlikely** to occur.	As this species has a low likelihood of occurring on site, it is considered **unlikely** to be impacted on by this development.
Threatened Ecological Communities			
Newnes Plateau Shrub Swamp in the Sydney Basin Bioregion (E)	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 metres. Newnes Plateau shrub swamp has a greater dominance of shrubs when compared to Blue Mountains Sedge Swamps.	Vegetation mapping has occurred throughout the site and no vegetation communities commensurate with this community were recorded. It is therefore **unlikely** that this community occurs in the site.	Due to the low likelihood of occurrence within the site, it is considered that this vegetation community is **unlikely** to be impacted on by the proposal.
Temperate Highland Peat Swamps on Sandstone (E*)	Components of the Temperate Highland Peat Swamps on Sandstone ecological community are either temporary or permanent swamps. These swamps are found in a range of locations in the landscape, from hanging swamps in the Blue Mountains to the valley and watercourse swamps of Wingecarribee Swamp and the Paddy's River Swamps. Hanging swamps are especially notable in the landscape as they occur on steep valley sides in wet areas created by water exiting the ground at joins between sandstone and claystone layers of rock. The other swamps in this ecological community occur in depressions in the landscape, or along watercourses. Newnes Plateau Shrub Swamp and Newnes Plateau Hanging Swamp are inclusive of this EEC.	Vegetation mapping has occurred throughout the site and no vegetation communities commensurate with this community were recorded. It is therefore **unlikely** that this community occurs in the site.	Due to the low likelihood of occurrence within the site, it is considered that this vegetation community is **unlikely** to be impacted on by the proposal.

Species / Community	Habitat Description	Likelihood of Occurrence	Potential for 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 (E)	This community is associated with accumulated peaty or organic-mineral sediments on poorly drained flats in the headwaters of streams. It occurs on undulating tablelands and plateaus, above 400-500 m elevation, generally in catchments with basic volcanic or fine-grained sedimentary substrates or, occasionally, granite. It 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 *Sphagnum* spp., the hummock peat-forming mosses. This community is known to occur within the Lithgow LGA.	Vegetation mapping has occurred throughout the site and no vegetation communities commensurate with this community were recorded. It is therefore **unlikely** that this community occurs in the site.	Due to the low likelihood of occurrence within the site, it is considered that this vegetation community is **unlikely** to be impacted on by the proposal.
White Box – Yellow Box – Blakeley's Red Gum Grassy Woodland and derived native Grassland (E, CE*)	This community is dominated by *Eucalyptus albens*, *E. melliodora* and *E. blakelyi* and has an open grassy understorey with sparsely scattered shrubs. It can also take the form of grassland wherever the trees have been removed.	The vegetation composition used to determine the presence of this ecological community was not found to occur within the site. Therefore, it is considered **unlikely** to occur.	Due to the low likelihood of occurrence within the site, it is considered that this vegetation community is **unlikely** to be impacted on by the proposal.
Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland (E)	This community is dominated by Snow Gum/ Black Sallee/ Candlebark and/ or Ribbon Gum throughout the Central West NSW at higher altitudes. The forest and woodland of this community is usually grassy with a sparse native understorey.	Vegetation communities commensurate with this EEC, specifically MU11 and MU15 (DEC 2006) was **recorded** on site. It is therefore known that this EEC occurs.	Approximately 0.05 ha of this EEC occurs within the proposed haul Road (option 2) A **7-part test of significance (TSC Act)** and **EPBC Act Assessment of Significance** has therefore been applied to this community**.**

Notes: (V) = Vulnerable Species listed under the *Threatened Species Conservation Act 1995*.
(E) = Endangered Species listed under the *Threatened Species Conservation Act 1995*.
(CE) = Critically Endangered Species listed under the *Threatened Species Conservation Act 1995*.
(V*) = Vulnerable Species listed under the *Commonwealth EPBC Act 1999*.
(E*) = Endangered Species listed under the *Commonwealth EPBC Act 1999*.
(CE*) = Critically Endangered Species listed under the *Commonwealth EPBC Act 1999*.

7.0 Key Threatening Processes

Key Threatening Processes (KTPs) are listed under Schedule 3 of the TSC Act 1995. There are five KTPs that have the potential to affect the site as a consequence of the proposal, being:

- Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands;
- Anthropogenic climate change;
- Clearing of Native Vegetation;
- Invasion of native plant communities by exotic perennial grasses;
- Competition and grazing by the feral European Rabbit;
- Loss of hollow-bearing trees; and
- Removal of dead wood and dead trees.

"Alteration of the natural flow regimes of rivers, streams, floodplains and wetlands"

The adjacent creek could be affected by the proposal if mitigation measures are not implemented to ensure the safe storage and control of excess water flows from the site.

Monitoring of storage ponds is essential to ensure that the creek is not affected by the proposed works and that each pond is serving its purpose to hold excess water with no spills. The extent to which the proposal could contribute to this process is considered unlikely to be significant, as long as precautionary measures are implemented and monitored regularly.

Overall the development will provide opportunity to improve drainage with improved containment and reuse of water from worked areas and containment of sediments from worked and rehabilitated as well as natural/forested areas. Should the project proceed, it is likely to be beneficial for downstream receiving water bodies as the amount of worked water leaving the site will be reduced. The total amount of sediment leaving the site will also be reduced as the separation of clean and worked water is made effective and the reuse of worked water increases. It is therefore considered that the project will reduce worked water flows and increase clean water flows, with zero dirty/treated water discharge the future goal (RPS Aquaterra 2013).

"Anthropogenic Caused Climate Change"

The proposal is likely to contribute to the Key Threatening Process "Anthropogenic Caused Climate Change" as a result of clearing of native and non-native planted vegetation. This process affects all threatened species that occur or potentially occur on site as the distribution of most species, populations and communities is determined, at least at some spatial scale, by climate. There is evidence that modification of the environment by humans may result in future climate change. Such anthropogenic change to climate may occur at a faster rate than has previously occurred naturally. Climate change may involve both changes in average conditions and changes to the frequency of occurrence of extreme events (OEH 2011). An extract of the Air Quality Impact and Greenhouse Gas Assessment (PAE Holmes 2013) is provided below.

> *'Centennial Coal would prepare a Greenhouse Gas management plan. The plan will include standards to minimise energy usage and GHG emissions from the Project's operations. The plan will include objectives, commitments, procedures and responsibilities for:*
>
> - *Assisting in researching and promoting low emission coal technologies.*
> - *Improving energy use and efficiency.*
> - *Consideration of the use of alternative fuels where economically and practically feasible.*

- *Review of mining practices to minimise double handling of materials and ensuring that coal and overburden haulage is undertaken using the most efficient routes.*
- *Ongoing scheduled and preventative maintenance to ensure that diesel and electrically powered plants operate efficiently.*
- *Develop targets for greenhouse gas emissions and energy use and monitor and report against these.*
- *Implementation of a detailed energy monitoring programme. This would include monitoring the electricity and diesel usage on-site to identify the main sources of greenhouse gas emissions and apply appropriate reduction mechanisms where possible.*
- *Regular maintenance of diesel powered equipment to ensure operation at peak efficiency.*
- *Conduct baseline study of energy use.*
- *Assess lighting plant efficiency.*

The effectiveness of these reasonable and feasible measures to reduce GHG emissions (and energy consumption) will be monitored, as Centennial Coal will annually estimate GHG emissions and energy consumption in accordance with National Greenhouse and Energy Reporting and Energy Efficiency Operations requirements.'

The relatively small extent to which the proposal could contribute to this process is considered unlikely to be significant however is considered as a cumulative impact.

"Clearing of Native Vegetation"

Clearing of native vegetation is recognised as a major factor contributing to loss of biological diversity. The proposed upgrade will require the removal of a maximum of approximately 41.37 ha of native vegetation and as such will incrementally contribute to the Key Threatening Process "Clearing of Native Vegetation". This key threatening process is likely to affect most woodland fauna species, specifically the Gang-gang Cockatoo, Speckled Warbler and Brown Treecreeper as "Clearing of Native Vegetation" is listed as a key threatening process to their survival. Even though this process is considered to be detrimental to a number of threatened species in the site's local vicinity, the extent to which the proposal could contribute to this process is considered unlikely to be significant. It should however be considered as a cumulative impact in regards to other projects occurring in the district.

"Invasion of native plant communities by exotic perennial grasses"

Exotic perennial grasses have the potential to adversely affect native plant communities and native species. This KTP is potentially relevant to *T. australe*, the Speckled Warbler and the EEC Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland. This KTP may be exacerbated along the edges of those areas proposed to be cleared, however none of the EEC is proposed to be cleared. Additionally no populations of *T. australe* or Speckled Warbler have been recorded on site. Therefore the extent to which the proposal could contribute to this process is considered unlikely to be significant.

"Competition and grazing by the feral European Rabbit"

The European Rabbit (*Oryctolagus cuniculus*) is known to degrade and negatively impact native vegetation and compete with native fauna for resources such as food where niches with native species overlap (OEH 2011). The threatened plant *T. australe* is regarded to be negatively affected by competition of the European Rabbit as it reduces survival and recruitment of seedlings. By removing above-ground and below-ground vegetation, feral rabbits contribute to erosion and loss of topsoil by wind and rain. This form of land degradation reduces the chance of successful establishment of indigenous plants, and increases the susceptibility of many indigenous vertebrates to predation from feral predators (Morton 1990; Dickman 1993). The proposal is however unlikely to contribute to the KTP as the increased activity within the site

would act as a deterrent and reduce available habitat for Rabbits. Therefore the extent to which the proposal could contribute to this process is considered unlikely to be significant.

"Loss of hollow-bearing trees"

A number of threatened fauna species identified to potentially occur within 10km of the site are reliant upon hollow-bearing trees for roosting and breeding purposes, including the Squirrel Glider, threatened forest owls and hollow-dependent insectivorous bats. Although the vegetation on site is lacking in large hollows considered most suitable for larger fauna species including the Powerful Owl, the proposal will result in the removal of between 10.47 and 10.62 ha of vegetation (depending on haul road option chosen), that includes smaller hollow-bearing trees and as a result will contribute to this KTP.

"Removal of dead wood and dead trees"

The removal of dead wood and dead trees can result in the diminishing of habitat for shelter and foraging for several threatened species. Most relevant to the Project may be Brown Treecreeper (eastern subspecies), which use this habitat feature for foraging. The Project will require the removal of 10.47 and 10.62 ha of vegetation (depending on haul road option chosen), which includes dead trees or ground debris and as such will contribute to the KTP "Removal of Dead Wood and Dead Trees" in a small capacity.

8.0 Other Legislative Considerations

8.1 State Environmental Planning Policies (SEPPs)

8.1.1 SEPP 44 - Koala Habitat Protection

8.1.1.1 First Consideration – is the Land subject to SEPP-44?

The subject site is located within Greater Lithgow LGA which is listed within Schedule 1 of State Environmental Planning Policy 44 (SEPP 44) – 'Koala Habitat Protection'. Therefore SEPP-44 applies to the land.

8.1.1.2 Second Consideration – is the Land 'Potential Koala Habitat'?

Schedule 2 of the State Environmental Planning Policy 44 (SEPP 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 Schedule 2 feed tree species (*Eucalyptus viminalis*) was recorded within the site at densities of less than 15% of the total number of trees, therefore the site does not constitute Potential Koala Habitat and no further provisions of this policy apply. Additionally, no Koalas or evidence of Koalas were recorded during surveys. Importantly, given the nature of the proposal and likelihood of impacts on vegetation and in turn habitat, it is considered unlikely that impacts to the Koala would result.

8.2 Considerations under the *Environment Protection and Biodiversity Conservation Act 1999*

Considerations have been made under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act 1999). An EPBC Act Protected Matters Search was undertaken within the SEWPaC on-line database (accessed 2012) to generate a list of those Matters of National Environmental Significance (MNES) from within 10km of the site, which may have the potential to occur within the site. This data, combined with other local knowledge and records, was utilised to assess whether the type of activity proposed on the site will have, or is likely to have a significant impact upon a matter of NES, or on the environment of Commonwealth land.

World Heritage Properties

The site is not a World Heritage Property. The Greater Blue Mountains Area of NSW (a World Heritage Property) is located approximately 22km to the east of the subject site. It is expected that the proposal will not have a significant impact upon The Greater Blue Mountains Area of NSW.

National Heritage Places

The site is not a National Heritage Place. The Greater Blue Mountains Area of NSW (a National Heritage Place) is located approximately 22km to the east of the subject site. It is expected that the proposal will not have a significant impact upon The Greater Blue Mountains Area of NSW.

Wetlands protected by international treaty (the Ramsar convention).

There are no wetlands protected by international treaty (the Ramsar convention) arising from the EPBC Act Protected Matters Report generated for an area within 10km of the site.

Great Barrier Reef Marine Park

There are no Great Barrier Reef Marine Parks arising from the EPBC Act Protected Matters Report generated for an area within 10km of the site.

Commonwealth Marine Areas

There are no Commonwealth Marine Areas arising from the EPBC Act Protected Matters Report generated for an area within 10km of the site.

Nationally listed threatened species and ecological communities

A total of 29 threatened species and one ecological community listed under the EPBC Act 1999 have been recorded or have suitable habitat within a 10km radius of the site. Consideration of these species' potential to occur (Table 7) have revealed that two flora species and four fauna species have potential to occur within the site (see **Table 10** below).

Table 10 Threatened Species that have potential to be affected by the proposal

Scientific Name	Common Name	EPBC Act 1999
Threatened Flora		
Eucalyptus cannonii	Capertee Stringybark	V
Thesium australe	Austral Toadflax	V
Threatened Fauna		
Anthochaera phrygia	Regent Honeyeater	E
Nyctophilus timoriensis	Greater Long-eared Bat	V
Chalinolobus dwyeri	Large-eared Pied Bat	V
Dasyurus maculatus maculatus	Spotted-tailed Quoll	E

The above species are given further consideration in **Appendix 4**. This assessment concluded that the proposal is unlikely to have a significant impact upon MNES.

Nationally listed migratory species

A total of 15 migratory species listed under the EPBC Act 1999 have been recorded or have suitable habitat within a 10km radius of the site. The proposal is unlikely to substantially modify, destroy or isolate an area of important habitat, result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat or seriously disrupt the lifecycle of an ecologically significant proportion of the population of a migratory species.

Summary Statement:

With consideration of the above and **Appendix 4**, proposal is considered to not significantly impact on matters of NES. Therefore, a referral is not considered necessary.

9.0 Proposed Biodiversity Strategy

The majority of proposed clearing is within existing rehabilitation areas, which will be rehabilitated taking into consideration the vegetation communities in the surrounding Ben Bullen State Forest, as per the existing and revised rehabilitation strategy for the Project.

A small portion of the Ben Bullen State Forest, approximately 30 hectares, is within the Project Application Area boundary. The Project will undertake the following land management activities within this portion of State Forest:

- Manage weeds and feral animals;
- Exclude grazing, if relevant; and
- Establish and maintain suitable fencing for the exclusion of stock.

In addition, the Project will to undertake a comprehensive rehabilitation program for the riparian areas along Lamberts Gully and Wangcol Creek where the terrestrial and aquatic ecology assessments have determined that rehabilitation will improve vegetation and water quality in these creek systems.

Centennial will undertake research over the life of the project into the management practices that could be undertaken to enhance the EEC Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland which is located within and adjacent to the Lamberts Gully drainage line.

The combination of a land management strategy, rehabilitation strategy and research program is anticipated to achieve biodiversity outcomes in a heavily modified environment commensurate with the impacts proposed by the Project.

10.0 Conclusion

The proposal may potentially remove approximately 41.37 ha (Option 1) or 41.34 ha (Option 2) of native vegetation in order to provide infrastructure associated with the proposal. The proposed reject emplacement area has been designed based on minimum impact to significant surface features. This assessment examined the likelihood of the proposal to have a significant effect on any threatened species, populations or ecological communities listed under the TSC Act 1995 (**Appendix 3**) and EPBC Act 1999 (**Appendix 4**). These assessments have concluded that no significant impacts are likely to relevant threatened species or EECs listed under the TSC Act 1995, or MNES (EPBC Act 1999).

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Appendix 1

Fauna Species List

Fauna Species List

Below is a list of fauna species that could be *reasonably* expected to be found within the site at some occurrence. Such an approach has been taken given the unlikelihood to record *all* potentially occurring species within an area during formal fauna surveys (due to seasonality, climatic limitations, crypticism etc).

Family sequencing and taxonomy follow for each fauna class:

Birds – Christidis and Boles (1994).

Herpetofauna – Cogger (1996).

Mammals – Strahan (ed.) (1995) and Churchill (1998).

✓ - Species observed or indicated by scats, tracks etc. on site during this investigation.

* - Indicates an introduced species

Known and Expected Bird List

Appendix Key: **1** = Results of ecological investigations conducted within the site
✓ = Species Detected
* = introduced species
(C) = listed as CAMBA species
(J) = listed as JAMBA species
(E) = listed as Endangered in NSW.
(V) = listed as Vulnerable in NSW.
(EV) = Species listed under the Commonwealth EPBC Act as Vulnerable
(EE) = Species listed under the Commonwealth EPBC Act as Endangered
(EM) = Species listed under the Commonwealth EPBC Act as Migratory
(EMa) = Species listed under the Commonwealth EPBC Act as Marine
Species indicated in **BOLD** font are those threatened species known from within Lithgow LGA (Atlas of NSW Wildlife data)

Data Source: ✓ = Species recorded during this survey

Family Name	*Scientific Name*	Common Name	Recorded
Acanthizidae	*Acanthiza chrysorrhoa*	Yellow-rumped Thornbill	
	Acanthiza lineata	Striated Thornbill	
	Acanthiza nana	Yellow Thornbill	
	Acanthiza pusilla	Brown Thornbill	
	Acanthiza reguloides	Buff-rumped Thornbill	✓
	Aphelocephala leucopsis	Southern Whiteface	
	Calamanthus pyrrhopygius	Chestnut-rumped Heathwren	
	Gerygone fusca	Western Gerygone	
	Gerygone mouki	Brown Gerygone	
	Gerygone olivacea	White-throated Gerygone	✓
	Origma solitaria	Rockwarbler	
	Pycnoptilus floccosus	Pilotbird	
	Pyrrholaemus saggitatus	**Speckled Warbler (V)**	
	Sericornis citreogularis	Yellow-throated Scrubwren	
	Sericornis frontalis	White-browed Scrubwren	✓
	Sericornis magnirostris	Large-billed Scrubwren	
	Smicrornis brevirostris	Weebill	
Accipitridae	*Accipiter cirrocephalus*	Collared Sparrowhawk	
	Accipiter fasciatus	Brown Goshawk	
	Accipiter novaehollandiae	Grey Goshawk	
	Hieraaetus morphnoides	**Little Eagle (V)**	✓
	Aquila audax	Wedge-tailed Eagle	
	Elanus axillaris	Black-shouldered Kite	
	Haliaeetus leucogaster	White-bellied Sea-Eagle	
	Haliastur sphenurus	Whistling Kite	
	Lophoictinia isura	**Square-tailed Kite (V)**	
Aegothelidae	*Aegotheles cristatus*	Australian Owlet-nightjar	
Alaudidae	*Alauda arvensis**	Eurasian Skylark	
	Mirafra javanica	Horsfield's Bushlark	

Family Name	*Scientific Name*	Common Name	Recorded
Alcedinidae	*Alcedo azurea*	Azure Kingfisher	
	Dacelo novaeguineae	Laughing Kookaburra	✓
	Todiramphus sanctus	Sacred Kingfisher	
Anatidae	*Anas gracilis*	Grey Teal	
	Anas rhynchotis	Australasian Shoveler	
	Anas superciliosa	Pacific Black Duck	
	Aythya australis	Hardhead	
	Biziura lobata	Musk Duck	
	Chenonetta jubata	Australian Wood Duck	✓
	Cygnus atratus	Black Swan	
	Malacorhynchus membranaceus	Pink-eared Duck	
	Oxyura australis	**Blue-billed Duck (V)**	
Apodidae	*Hirundapus caudacutus*	White-throated Needletail (EM)	
Ardeidae	*Ardea pacifica*	White-necked Heron	
	Egretta novaehollandiae	White-faced Heron	✓
	Nycticorax caledonicus	Nankeen Night Heron	
Artamidae	*Artamus cinereus*	Black-faced Woodswallow	
	Artamus cyanopterus	Dusky Woodswallow	
	Artamus leucorynchus	White-breasted Woodswallow	
	Artamus superciliosus	White-browed Woodswallow	
	Cracticus nigrogularis	Pied Butcherbird	
	Cracticus torquatus	Grey Butcherbird	
	Gymnorhina tibicen	Australian Magpie	
	Strepera graculina	Pied Currawong	✓
	Strepera versicolor	Grey Currawong	✓
Cacatuidae	*Cacatua galerita*	Sulphur-crested Cockatoo	
	Cacatua sanguinea	Little Corella	
	Callocephalon fimbriatum	**Gang-Gang Cockatoo (V)**	✓
	Calyptorhynchus funereus	Yellow-tailed Black-Cockatoo	✓
	Calyptorhynchus lathami	**Glossy Black-Cockatoo (V)**	
	Eolophus roseicapillus	Galah	
Campephagidae	*Coracina novaehollandiae*	Black-faced Cuckoo-shrike	✓
	Coracina papuensis	White-bellied Cuckoo-shrike	
	Coracina tenuirostris	Cicadabird	
	Lalage tricolor	White-winged Triller	
Caprimulgidae	*Eurostopodus mystacalis*	White-throated Nightjar	
Charadriidae	*Elseyornis melanops*	Black-fronted Dotterel	
	Vanellus miles	Masked Lapwing	
Cisticolidae	*Cisticola exilis*	Golden-headed Cisticola	
Climacteridae	*Climacteris erythrops*	Red-browed Treecreeper	
	Climacteris picumnus victoriae	**Brown Treecreeper (eastern subspecies) (V)**	✓

Family Name	*Scientific Name*	Common Name	Recorded
	Cormobates leucophaea	White-throated Treecreeper	✓
Columbidae	*Geopelia cuneata*	Diamond Dove	
	Geopelia humeralis	Bar-shouldered Dove	
	Geopelia placida	Peaceful Dove	
	Leucosarcia melanoleuca	Wonga Pigeon	
	Macropygia amboinensis	Brown Cuckoo-Dove	
	Ocyphaps lophotes	Crested Pigeon	
	Phaps chalcoptera	Common Bronzewing	
	Phaps elegans	Brush Bronzewing	
Coraciidae	*Eurystomus orientalis*	Dollarbird	
Corcoracidae	*Corcorax melanorhamphos*	White-winged Chough	✓
Corvidae	*Corvus coronoides*	Australian Raven	
	Corvus mellori	Little Raven	
Cuculidae	*Cacomantis flabelliformis*	Fan-tailed Cuckoo	
	Cacomantis variolosus	Brush Cuckoo	
	Chalcites basalis	Horsfield's Bronze-Cuckoo	✓
	Chalcites lucidus	Shining Bronze-Cuckoo	
	Chalcites osculans	Black-eared Cuckoo	
	Cuculus pallidus	Pallid Cuckoo	
	Cuculus saturatus	Oriental Cuckoo	
	Eudynamys orientalis	Pacific Koel	
	Scythrops novaehollandiae	Channel-billed Cuckoo	
Dicaeidae	*Dicaeum hirundinaceum*	Mistletoebird	
Dicruridae	*Grallina cyanoleuca*	Magpie-lark	
	Monarcha melanopsis	Black-faced Monarch	
	Monarcha trivirgatus	Spectacled Monarch	
	Myiagra cyanoleuca	Satin Flycatcher	
	Myiagra inquieta	Restless Flycatcher	
	Myiagra rubecula	Leaden Flycatcher	
	Rhipidura albiscapa	Grey Fantail	
	Rhipidura leucophrys	Willie Wagtail	✓
	Rhipidura rufifrons	Rufous Fantail	
Estrildidae	*Lonchura castaneothorax*	Chestnut-breasted Mannikin	
	Neochmia modesta	Plum-headed Finch	
	Neochmia temporalis	Red-browed Finch	
	Stagonopleura bella	Beautiful Firetail	
	Stagonopleura guttata	**Diamond Firetail (V)**	
	Taeniopygia bichenovii	Double-barred Finch	
	Taeniopygia guttata	Zebra Finch	
Eupetidae	*Cinclosoma punctatum*	Spotted Quail-thrush	
	Psophodes olivaceus	Eastern Whipbird	
Falconidae	*Falco berigora*	Brown Falcon	
	Falco cenchroides	Nankeen Kestrel	

Family Name	*Scientific Name*	Common Name	Recorded
	Falco longipennis	Australian Hobby	
	Falco peregrinus	Peregrine Falcon	
	Falco subniger	Black Falcon	
Fringillidae	*Carduelis carduelis**	European Goldfinch	
Hirundinidae	*Cheramoeca leucosterna*	White-backed Swallow	
	Hirundo neoxena	Welcome Swallow	
	Petrochelidon ariel	Fairy Martin	✓
	Petrochelidon nigricans	Tree Martin	
Laridae	*Larus novaehollandiae*	Silver Gull	
Maluridae	*Malurus cyaneus*	Superb Fairy-wren	✓
	Malurus lamberti	Variegated Fairy-wren	
	Stipiturus malachurus	Southern Emu-wren	
Megapodiidae	*Alectura lathami*	Australian Brush-turkey	
Meliphagidae	*Acanthagenys rufogularis*	Spiny-cheeked Honeyeater	
	Acanthorhynchus tenuirostris	Eastern Spinebill	
	Anthochaera carunculata	Red Wattlebird	
	Anthochaera chrysoptera	Little Wattlebird	
	Entomyzon cyanotis	Blue-faced Honeyeater	
	Epthianura albifrons	**White-fronted Chat (V)**	
	Gliciphila melanops	Tawny-crowned Honeyeater	
	Grantiella picta	**Painted Honeyeater (V)**	
	Lichenostomus chrysops	Yellow-faced Honeyeater	
	Lichenostomus fuscus	Fuscous Honeyeater	
	Lichenostomus leucotis	White-eared Honeyeater	
	Lichenostomus melanops	Yellow-tufted Honeyeater	
	Lichenostomus penicillatus	White-plumed Honeyeater	
	Manorina melanocephala	Noisy Miner	
	Manorina melanophrys	Bell Miner	
	Meliphaga lewinii	Lewin's Honeyeater	
	Melithreptus brevirostris	Brown-headed Honeyeater	
	Melithreptus gularis gularis	**Black-chinned Honeyeater (eastern subspecies) (V)**	
	Melithreptus lunatus	White-naped Honeyeater	
	Myzomela sanguinolenta	Scarlet Honeyeater	
	Philemon citreogularis	Little Friarbird	
	Philemon corniculatus	Noisy Friarbird	
	Phylidonyris niger	White-cheeked Honeyeater	✓
	Phylidonyris novaehollandiae	New Holland Honeyeater	
	Phylidonyris pyrrhoptera	Crescent Honeyeater	
	Plectorhyncha lanceolata	Striped Honeyeater	
	Anthochaera phrygia	**Regent Honeyeater (CE, E*)**	
Menuridae	*Menura novaehollandiae*	Superb Lyrebird	
Meropidae	*Merops ornatus*	Rainbow Bee-eater	

Family Name	*Scientific Name*	Common Name	Recorded
Motacillidae	*Anthus australis*	Australian Pipit	
Muscicapidae	*Turdus merula**	Eurasian Blackbird	
	Zoothera lunulata	Bassian Thrush	
Neosittidae	***Daphoenositta chrysoptera***	**Varied Sittella (V)**	
Oriolidae	*Oriolus sagittatus*	Olive-backed Oriole	
Pachycephalidae	*Colluricincla harmonica*	Grey Shrike-thrush	✓
	Falcunculus frontatus	Eastern Shrike-tit	
	Pachycephala pectoralis	Golden Whistler	
	Pachycephala rufiventris	Rufous Whistler	✓
Pardalotidae	*Pardalotus punctatus*	Spotted Pardalote	
	Pardalotus striatus	Striated Pardalote	✓
Passeridae	*Passer domesticus**	House Sparrow	
Pelecanidae	*Pelecanus conspicillatus*	Australian Pelican	
Petroicidae	*Eopsaltria australis*	Eastern Yellow Robin	✓
	Melanodryas cucullata	**Hooded Robin (V)**	
	Microeca fascinans	Jacky Winter	
	Petroica boodang	**Scarlet Robin (V)**	✓
	Petroica goodenovii	Red-capped Robin	
	Petroica phoenicea	**Flame Robin (V)**	
	Petroica rosea	Rose Robin	
Phalacrocoracidae	*Phalacrocorax carbo*	Great Cormorant	
	Phalacrocorax melanoleucos	Little Pied Cormorant	
	Phalacrocorax sulcirostris	Little Black Cormorant	
	Phalacrocorax varius	Pied Cormorant	
Phasianidae	*Coturnix pectoralis*	Stubble Quail	
	Coturnix ypsilophora	Brown Quail	
Podargidae	*Podargus strigoides*	Tawny Frogmouth	
Podicipedidae	*Podiceps cristatus*	Great Crested Grebe	
	Poliocephalus poliocephalus	Hoary-headed Grebe	
	Tachybaptus novaehollandiae	Australasian Grebe	
Pomatostomidae	*Pomatostomus superciliosus*	White-browed Babbler	
	Pomatostomus temporalis temporalis	**Grey-crowned Babbler (eastern subspecies) (V)**	
Psittacidae	*Alisterus scapularis*	Australian King-Parrot	
	Glossopsitta concinna	Musk Lorikeet	
	Glossopsitta pusilla	**Little Lorikeet (V)**	
	Lathamus discolor	**Swift Parrot (E,E*)**	
	Melopsittacus undulatus	Budgerigar	
	Neophema pulchella	**Turquoise Parrot (V)**	
	Platycercus adscitus eximius	Eastern Rosella	
	Platycercus elegans	Crimson Rosella	✓
	Psephotus haematonotus	Red-rumped Parrot	
	Trichoglossus chlorolepidotus	Scaly-breasted Lorikeet	

Family Name	*Scientific Name*	Common Name	Recorded
	Trichoglossus haematodus	Rainbow Lorikeet	
Ptilonorhynchidae	*Ptilonorhynchus violaceus*	Satin Bowerbird	
Pycnonotidae	*Pycnonotus jocosus**	Red-whiskered Bulbul	
Rallidae	*Fulica atra*	Eurasian Coot	
	Gallinula tenebrosa	Dusky Moorhen	
	Gallirallus philippensis	Buff-banded Rail	
	Porphyrio porphyrio	Purple Swamphen	
	Pozana fluminea	Australian Spotted Crake	
	Pozana pusilla	Baillon's Crake	
	Pozana tabuensis	Spotless Crake	
	Rallus pectoralis	Lewin's Rail	
Scolopacidae	*Calidris acuminata*	Sharp-tailed Sandpiper (EM)	
	Gallinago hardwickii	Latham's Snipe (EM)	
Strigidae	*Ninox boobook*	Southern Boobook	
	Ninox connivens	**Barking Owl (V)**	
	Ninox strenua	**Powerful Owl (V)**	
Sturnidae	*Acridotheres tristis**	Common Myna	
	*Sturnus vulgaris**	Common Starling	
Sylviidae	*Acrocephalus australis*	Australian Reed-Warbler	
	Cincloramphus cruralis	Brown Songlark	
	Cincloramphus mathewsi	Rufous Songlark	
	Megalurus gramineus	Little Grassbird	
Threskiornithidae	*Platalea flavipes*	Yellow-billed Spoonbill	
	Platalea regia	Royal Spoonbill	
	Threskiornis molucca	Australian White Ibis	
	Threskiornis spinicollis	Straw-necked Ibis	
Turnicidae	*Turnix varia*	Painted Button-quail	
Tytonidae	*Tyto alba*	Barn Owl	
	Tyto novaehollandiae	**Masked Owl (V)**	
	Tyto tenebricosa	**Sooty Owl (V)**	
Zosteropidae	*Zosterops lateralis*	Silvereye	

Known and Expected Mammal List

Appendix Key: **1** = Results of ecological investigations conducted within the site
✓ = Species Detected
* = introduced species
(E) = listed as Endangered in NSW.
(V) = listed as Vulnerable in NSW.
(EV) = Species listed under the Commonwealth EPBC Act as Vulnerable
(EE) = Species listed under the Commonwealth EPBC Act as Endangered
Species indicated in **BOLD** font are those threatened species known from within Lithgow LGA (Atlas of NSW Wildlife)

Data Source: ✓ = Species recorded during this survey

Family Name	*Scientific Name*	Common Name	Recorded
Acrobatidae	*Acrobates pygmaeus*	Feathertail Glider	
Bovidae	*Bos taurus**	European Cattle	
	*Capra hircus**	Goat	
Burramyidae	***Cercartetus nanus***	**Eastern Pygmy-possum (V)**	
Canidae	*Canis lupus familiaris**	Dog	
	*Canis lupus**	Dingo, domestic dog	
	*Vulpes vulpes**	Fox	
Cervidae	*Cervus sp.**	Deer	
Dasyuridae	*Antechinus agilis*	Agile Antechinus	
	Antechinus flavipes	Yellow-footed Antechinus	
	Antechinus stuartii	Brown Antechinus	
	Antechinus swainsonii	Dusky Antechinus	
	Antechinus/Sminthopsis sp.	unidentified 'Marsupial Mouse'	
	Dasyurus maculatus	**Spotted-tailed Quoll (V, V*)**	
Emballonuridae	***Saccolaimus flaviventris***	**Yellow-bellied Sheathtail-bat (V)**	✓
Equidae	*Equus caballus**	Horse	
Felidae	*Felis catus**	Cat	
Leporidae	*Lepus capensis**	Brown Hare	
	*Oryctolagus cuniculus**	Rabbit	
Macropodidae	*Macropus giganteus*	Eastern Grey Kangaroo	✓
	Macropus robustus	Common Wallaroo	
	Macropus rufogriseus	Red-necked Wallaby	
	Petrogale penicillata	**Brush-tailed Rock-wallaby (E, V*)**	
	Wallabia bicolor	Swamp Wallaby	✓
Molossidae	*Mormopterus "Species 2"*	Undescribed Freetail Bat	✓
	Mormopterus norfolkensis	**Eastern Freetail-bat (V)**	
	Mormopterus planiceps	Little Mastiff-bat	
	Mormopterus sp.	Mastiff-bat	
	Austronomus australis	White-striped Freetail-bat	✓
Muridae	*Hydromys chrysogaster*	Water-rat	

Family Name	*Scientific Name*	Common Name	Recorded
	*Mus musculus**	House Mouse	
	Rattus fuscipes	Bush Rat	
	Rattus lutreolus	Swamp Rat	
	*Rattus rattus**	Black Rat	
Ornithorhynchidae	*Ornithorhynchus anatinus*	Platypus	
Peramelidae	*Isoodon/Perameles sp.*	unidentified Bandicoot	
Petauridae	***Petaurus australis***	**Yellow-bellied Glider (V)**	
	Petaurus breviceps	Sugar Glider	
	Petaurus norfolcensis	**Squirrel Glider (V)**	
Phalangeridae	*Trichosurus caninus*	Short-eared Possum	
	Trichosurus sp.	Brushtail Possum	
	Trichosurus vulpecula	Common Brushtail Possum	✓
Phascolarctidae	***Phascolarctos cinereus***	**Koala (V, V*)**	
Potoroidae	*Bettongia gaimardi*	Tasmanian Bettong	
Pseudocheiridae	*Petauroides volans*	Greater Glider	
	Pseudocheirus peregrinus	Common Ringtail Possum	✓
Rhinolophidae	*Rhinolophus megaphyllus*	Eastern Horseshoe-bat	
Suidae	*Sus scrofa**	Pig	
Tachyglossidae	*Tachyglossus aculeatus*	Short-beaked Echidna	
Vespertilionidae	***Chalinolobus dwyeri***	**Large-eared Pied Bat (V, V*)**	✓
	Chalinolobus gouldii	Gould's Wattled Bat	✓
	Chalinolobus morio	Chocolate Wattled Bat	✓
	Falsistrellus tasmaniensis	**Eastern False Pipistrelle (V)**	✓
	Miniopterus australis	**Little Bentwing-bat (V)**	
	Miniopterus schreibersii oceanensis	**Eastern Bentwing-bat (V)**	✓
	Myotis adversus	**Large-footed Myotis (V)**	
	Nyctophilus geoffroyi	Lesser Long-eared Bat	
	Nyctophilus gouldi	Gould's Long-eared Bat	
	Nyctophilus sp.	Long-eared bat	
	Scoteanax rueppellii	**Greater Broad-nosed Bat (V)**	
	Scotorepens balstoni	Inland Broad-nosed Bat	
	Scotorepens orion	Eastern Broad-nosed Bat	
	Vespadelus darlingtoni	Large Forest Bat	✓
	Vespadelus pumilus	Eastern Forest Bat	
	Vespadelus regulus	Southern Forest Bat	✓
	Vespadelus vulturnus	Little Forest Bat	✓
Vombatidae	*Vombatus ursinus*	Common Wombat	

Known and Expected Reptile List

Appendix Key: **1** = Results of ecological investigations conducted within the site
✓ = Species Detected
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(EE) = Species listed under the Commonwealth EPBC Act as Endangered
(EMa) = Species listed under the Commonwealth EPBC Act as Marine
Species indicated in **BOLD** font are those threatened species known from within Lithgow LGA (Atlas of NSW Wildlife)

Data Source: ✓ = Species recorded during this survey

Family Name	*Scientific Name*	Common Name	Recorded
Agamidae	*Amphibolurus muricatus*	Jacky Lizard	
	Amphibolurus nobbi	Nobbi	
	Physignathus lesueurii	Eastern Water Dragon	
	Pogona barbata	Bearded Dragon	
	Rankinia diemensis	Mountain Dragon	
Chelidae	*Chelodina longicollis*	Eastern Snake-necked Turtle	✓
Elapidae	*Austrelaps ramsayi*	Highland Copperhead	
	Austrelaps superbus	Lowland Copperhead	
	Cryptophis nigrescens	Eastern Small-eyed Snake	
	Drysdalia rhodogaster	Mustard-bellied Snake	
	Furina diadema	Red-naped Snake	
	Hoplocephalus bungaroides	**Broad-headed Snake (E, V*)**	
	Notechis scutatus	Tiger Snake	
	Parasuta dwyeri	Dwyer's Snake	
	Parasuta spectabilis	Mallee Black-headed Snake	
	Pseudechis guttatus	Spotted Black Snake	
	Pseudechis porphyriacus	Red-bellied Black Snake	
	Pseudonaja textilis	Eastern Brown Snake	
	Vermicella annulata	Bandy-bandy	
Gekkonidae	*Diplodactylus vittatus*	Wood Gecko	
	Oedura lesueurii	Lesueur's Velvet Gecko	
	Phyllurus platurus	Broad-tailed Gecko	
	Underwoodisaurus milii	Thick-tailed Gecko	
Pygopodidae	*Pygopus lepidopodus*	Common Scaly-foot	
Scincidae	*Acritoscincus duperreyi*	Eastern Three-lined Skink	
	Acritoscincus platynota	Red-throated Skink	
	Carlia tetradactyla	Southern Rainbow-skink	
	Cryptoblepharus virgatus	Cream-striped Shinning-skink	
	Ctenotus robustus	Robust Ctenotus	
	Ctenotus taeniolatus	Copper-tailed Skink	
	Egernia cunninghami	Cunningham's Skink	

Family Name	*Scientific Name*	Common Name	Recorded
	Egernia saxatilis	Black Rock Skink	
	Egernia saxatilis intermedia		
	Egernia striolata	Tree Skink	
	Egernia whitii	White's Skink	✓
	Eulamprus heatwolei	Yellow-bellied Water-skink	
	Eulamprus leuraensis	**Blue Mountains Water skink (E, E*)**	
	Eulamprus quoyii	Eastern Water-skink	
	Eulamprus tenuis	Barred-sided Skink	
	Eulamprus tympanum	Southern Water-skink	
	Hemiergis decresiensis	Three-toed Earless Skink	
	Lampropholis delicata	Dark-flecked Garden Sunskink	✓
	Lampropholis guichenoti	Pale-flecked Garden Sunskink	
	Lampropholis sp.	unidentified grass skink	
	Lerista bougainvillii	South-eastern Slider	
	Lygisaurus foliorum	Tree-base Litter-skink	
	Morethia boulengeri	South-eastern Morethia Skink	
	Pseudemoia entrecasteauxii	Tussock Cool-skink	
	Pseudemoia pagenstecheri	Tussock Skink	
	Saiphos equalis	Three-toed Skink	✓
	Saproscincus mustelinus	Weasel Skink	
	Tiliqua nigrolutea	Blotched Blue-tongue Lizard	
	Tiliqua scincoides	Eastern Blue-tongue Lizard	
Typhlopidae	*Ramphotyphlops nigrescens*	Blackish Blind Snake	
Varanidae	***Varanus rosenbergi***	**Rosenberg's Goanna (V)**	
	Varanus sp.	Unidentified Goanna	
	Varanus varius	Lace Monitor	

Known and Expected Frog List

Appendix Key: **1** = Results of ecological investigations conducted within the site
✓ = Species Detected
* = introduced species
(E) = listed as Endangered in NSW.
(V) = listed as Vulnerable in NSW.
(EV) = Species listed under the Commonwealth EPBC Act as Vulnerable
(EE) = Species listed under the Commonwealth EPBC Act as Endangered
Species indicated in **BOLD** font are those threatened species known from Within Lithgow LGA (Atlas of NSW Wildlife)
Data Source: ✓ = Species recorded during this survey

Family Name	*Scientific Name*	Common Name	Recorded
Hylidae	***Litoria booroolongensis***	**Booroolong Frog (E, E*)**	
	Litoria caerulea	Green Tree Frog	
	Litoria citropa	Blue Mountains Tree Frog	
	Litoria dentata	Bleating Tree Frog	✓
	Litoria ewingii	Brown Tree Frog	
	Litoria fallax	Eastern Dwarf Tree Frog	
	Litoria latopalmata	Broad-palmed Frog	
	Litoria lesueuri	Lesueur's Frog	
	Litoria peronii	Peron's Tree Frog	
	Litoria phyllochroa	Leaf-green Tree Frog	
	Litoria sp.	Unidentified Tree Frog	
	Litoria verreauxii	Verreaux's Frog	
	Litoria wilcoxii		
Myobatrachidae	*Crinia parinsignifera*	Eastern Sign-bearing Froglet	
	Crinia signifera	Common Eastern Froglet	✓
	Heleioporus australiacus	**Giant Burrowing Frog (V, V*)**	
	Limnodynastes dumerilii	Eastern Banjo Frog	
	Limnodynastes fletcheri	Long-thumbed Frog	
	Limnodynastes ornatus	Ornate Burrowing Frog	
	Limnodynastes peronii	Striped Marsh Frog	✓
	Limnodynastes tasmaniensis	Spotted Grass Frog	✓
	Mixophyes balbus	**Stuttering Frog (E, V*)**	
	Neobatrachus sudelli	Sudell's Frog	
	Pseudophryne australis	**Red-crowned Toadlet (V)**	
	Pseudophryne bibronii	Bibron's Toadlet	
	Pseudophryne sp.		
	Uperoleia laevigata	Smooth Toadlet	✓
	Uperoleia fusca	Dusky Toadlet	

Appendix 2

Flora Species List

Flora Species List

Family	Scientific Name	Common Name
Fabaceae/faboideae/Mimosoideae	*Acacia buxifolia*	Box-leaf Wattle
Fabaceae/faboideae/Mimosoideae	*Acacia dealbata*	Silver Wattle
Fabaceae/faboideae/Mimosoideae	*Acacia myrtifolia*	Red Stem Wattle
Rosaceae	*Acaena ovina*	-
Polygonaceae	*Acetosella vulgaris**	Sheep Sorrel
Lamiaceae	*Ajuga australis*	Austral Bugle
Primulaceae	*Anagallis arvensis**	Scarlet Pimpernel
Poaceae	*Austrodanthonia tenuior*	Wallaby Grass
Rutaceae	*Boronia microphylla*	Small-leaved Boronia
Epacridaceae	*Brachyloma daphnoides*	Daphne Heath
Asteraceae	*Brachyscome sp.*	
Poaceae	*Briza maxima**	Quaking Grass
Poaceae	*Briza minor**	Shivery Grass
Pittosporaceae	*Bursaria spinosa* subsp. *spinosa*	Blackthorn
Anthericaceae	*Caesia parviflora*	Pale Grass Lily
Asteraceae	*Calotis cuneifolia*	Purple Burr Daisy
Asteraceae	*Cassinia aculeata*	Dolly Bush
Asteraceae	*Cassinia arcuata*	Sifton Bush
Asteraceae	*Cassinia longifolia*	
Asteraceae	*Cassinia uncata*	Sticky Cassinia
Gentianaceae	*Centaurium erythraea**	Common Centaury,Pink Stars
Gentianaceae	*Centaurium tenuiflorum*	
Sinopteridaceae	*Cheilanthes sp.*	Fern
Sinopteridaceae	*Cheilanthes sieberi* subsp. *sieberi*	Poison Rock Fern
Asteraceae	*Cirsium vulgare**	Spear Thistle
Asteraceae	*Coronidium scorpioides*	Button Everlasting
Asteraceae	*Craspedia variabilis*	Emu Flower
Asteraceae	*Cymbonotus lawsonianus*	Bears-ear
Cyperaceae	*Cyperus polystachyos*	-
Scrophulariaceae	*Derwentia perfoliata*	Digger's Speedwell
Fabaceae/faboideae	*Desmodium varians*	Slender Tick-trefoil
Phormiaceae	*Dianella caerulea* var. *producta*	Blue Flax Lily
Phormiaceae	*Dianella longifolia*	Blue Flax Lily
Phormiaceae	*Dianella revoluta* var. *revoluta*	Spreading Flax Lily
Convolvulaceae	*Dichondra repens*	Kidney Weed
Anthericaceae	*Dichopogon fimbriatus*	Nodding Chocolate Lily
Orchidaceae	*Dipodium punctatum*	Hyacinth Orchid
Orchidaceae	*Dipodium variegatum*	Blotched Hyacinth Orchid
Orchidaceae	*Diuris sulphurea*	Tiger Orchid
Droseraceae	*Drosera peltata*	Sundew
Poaceae	*Echinopogon caespitosus* var. *caespitosus*	Tufted Hedgehog Grass

Family	Scientific Name	Common Name
Poaceae	*Echinopogon ovatus*	Forest Hedgehog Grass
Boraginaceae	*Echium plantagineum**	Paterson's Curse
Poaceae	*Eragrostis brownii*	Brown's Lovegrass
Myrtaceae	***Eucalyptus aggregata***	**Black Gum**
Myrtaceae	*Eucalyptus dives*	Broad-leaved Peppermint
Myrtaceae	*Eucalyptus macrorhyncha*	Red Stringybark
Myrtaceae	*Eucalyptus mannifera* subsp. *mannifera*	Red-spotted Gum
Myrtaceae	*Eucalyptus pauciflora*	Snow Gum
Myrtaceae	*Eucalyptus rubida subsp. rubida*	Candlebark
Myrtaceae	*Eucalyptus sclerophylla*	Scribbly Gum
Myrtaceae	*Eucalyptus sieberi*	Silvertop Ash
Myrtaceae	*Eucalyptus viminalis*	Ribbon Gum
Asteraceae	*Euchiton involucratus*	Star Cudweed
Geraniaceae	*Geranium homeanum*	Northern Cranesbill
Fabaceae/faboideae	*Glycine clandestina*	Twining Glycine
Haloragaceae	*Gonocarpus tetragynus*	Poverty Raspwort
Haloragaceae	*Gonocarpus teucroides*	Raspwort
Goodeniaceae	*Goodenia bellidifolia*	Daisy-leaved Goodenia
Goodeniaceae	*Goodenia hederacea* subsp. *hederacea*	Ivy-leaved Goodenia
Fabaceae/faboideae	*Hardenbergia violacea*	False Sarsparilla
Boraginaceae	*Heliotropium amplexicaule*	Blue Heliotrope
Dilleniaceae	*Hibbertia aspera*	Rough Guinea Flower
Dilleniaceae	*Hibbertia obtusifolia*	Grey Guinea Flower
Fabaceae/faboideae	*Hovea linearis*	-
Apiaceae	*Hydrocotyle peduncularis*	Pennywort
Clusiaceae	*Hypericum gramineum*	
Clusiaceae	*Hypericum perforatum**	St Johns Wort
Asteraceae	*Hypochaeris radicata**	Flatweed
Hypoxidaceae	*Hypoxis hygrometrica*	Golden Star
Poaceae	*Imperata cylindrica*	Blady Grass
Myrtaceae	*Leptospermum arachnoides*	-
Myrtaceae	*Leptospermum continentale*	Tea-tree
Myrtaceae	*Leptospermum polygalifolium* subsp. *polygalifolium*	Tantoon
Epacridaceae	*Leucopogon virgatus*	-
Epacridaceae	*Lissanthe strigosa*	Peach Heath
Lomandraceae	*Lomandra confertifolia*	Mat-rush
Lomandraceae	*Lomandra filiformis* subsp. *filiformis*	Wattle Mat-rush
Lomandraceae	*Lomandra glauca*	Pale Mat-rush
Lomandraceae	*Lomandra longifolia*	Spiky-headed Mat-rush
Solanaceae	*Lycium ferocissimum**	African Boxthorn
Poaceae	*Melinus repens**	Red Natal Grass

Family	Scientific Name	Common Name
Poaceae	*Microlaena stipoides* var. *stipoides*	Weeping Rice Grass
Orchidaceae	*Microtis sp.*	
Fabaceae/faboideae	*Mirbelia platylobioides*	-
Loganiaceae	*Mitrasacme polymorpha*	Mitrewort
Oxalidaceae	*Oxalis perrenans*	Yellow-flowered Wood Sorrel
Asteraceae	*Ozothamnus diosmifolius*	Ball Everlasting
Poaceae	*Panicum sp.*	-
Proteaceae	*Persoonia chamaepitys*	Mountain Geebung
Plantaginaceae	*Plantago debilis*	Slender Plantain
Apiaceae	*Platysace ericoides*	Heathy Platysace
Poaceae	*Poa labillardieri* var. *labillardieri*	Tussock Grass
Poaceae	*Poa seiberiana*	Tussock Grass
Euphorbiaceae	*Poranthera microphylla*	-
Dennstaedtiaceae	*Pteridium esculentum*	Bracken
Fabaceae/faboideae	*Pultenaea microphylla*	-
Pittosporaceae	*Rhytidosporum procumbens*	
Rosaceae	*Rubus fruiticosis*	Blackberry
Asteraceae	*Senecio madagascariensis**	Fireweed
Caryophyllaceae	*Silene gallica**	French Catchfly
Asteraceae	*Sonchus asper**	Prickly Sow-thistle
Anthericaceae	*Sowerbaea juncea*	Vanilla Plant
Stylidiaceae	*Stylidium graminifolium*	Grass Trigger Plant
Stylidiaceae	*Stylidium sp.*	
Poaceae	*Themeda australis*	Kangaroo Grass
Anthericaceae	*Thysanotus juncifolius*	Branching Fringe Lilly
Anthericaceae	*Thysanotus tuberosus*	Fringed Lily
Scrophulariaceae	*Verbascum virgatum**	Twiggy Mullein
Verbenaceae	*Verbena bonariensis**	Purpletop
Scrophulariaceae	*Veronica plebia*	Creeping Speedwell
Violaceae	*Viola hederacea*	Ivy-leaved Violet
Campanulaceae	*Wahlenbergia gracilis*	Australian Bluebell
Campanulaceae	*Wahlenbergia stricta* subsp. *stricta*	Austral Bluebell
Asteraceae	*Xerochrysum bracteatum*	Golden Everlasting
Myrtaceae	*Eucalyptus stellulata*	Black Sally
Asteraceae	*Chrysocephalum apiculatum*	Yellow Buttons
Thymelaeceae	*Pimelea sp.*	Pimelea

Appendix 3

TSC Act Assessment of Significance (7-Part Test)

The following impact assessment has been written with the expectation that the recommendations detailed in **Section 9** are to be implemented. For those species and ecological communities in **Table 9** that are considered as having potential to be impacted by the proposed upgrade, a 7-part test of significance has been applied to determine in detail the potential of the impact. Those species and ecological communities are as follows:

Threatened Flora

▪ *Eucalyptus aggregata*	Black Gum	V
▪ *Eucalyptus cannonii*	Capertee Stringybark	V
▪ *Thesium australe*	Austral Toadflax	V

Threatened Fauna

▪ *Hieraaetus morphnoides*	Little Eagle	V

Woodland/Forest Birds

▪ *Anthochaera phrygia*	Regent Honeyeater	CE
▪ *Calocephalum fimbriatum*	Gang-gang Cockatoo	V
▪ *Chthonicola sagittata*	Speckled Warbler	V
▪ *Climacteris picumnus victoriae*	Brown Treecreeper	V
▪ *Daphoenositta chrysoptera*	Varied Sittella	V
▪ *Melanodryas cucullata*	Hooded Robin	V
▪ *Petroica boodang*	Scarlet Robin	V
▪ *Petroica phoenicea*	Flame Robin	V

Large Forest Owls

▪ *Ninox connivens*	Barking Owl	V
▪ *Ninox strenua*	Powerful Owl	V
▪ *Tyto novaehollandiae*	Masked Owl	V

Hollow Dependent Bats

▪ *Mormopterus norfolkensis*	Eastern Freetail-bat	V
▪ *Falsistrellus tasmaniensis*	Eastern False Pipistrelle	V
▪ *Scoteanax rueppellii*	Greater Broad-nosed Bat	V
▪ *Nyctophilus timoriensis*	Greater Long-eared Bat	V
▪ *Saccolaimus flaviventris*	Yellow Bellied Sheathtail Bat	V

Cave Dwelling Bats

▪ *Miniopterus schreibersii subsp.*		
▪ *oceanensis*	Eastern Bentwing Bat	V
▪ *Chalinolobus dwyeri*	Large-eared Pied Bat	V
▪ *Dasyurus maculatus maculatus*	Spotted-tailed Quoll	V
▪ *Petaurus norfolcensis*	Squirrel Glider	V

Endangered Ecological Communities

- Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon
- Gum Grassy Woodland E

(a) **In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.**

Threatened Flora

- *Eucalyptus aggregata* Black Gum V

E. aggregata was recorded in the south of the site, within Lambert's Gully, outside of the proposed development footprint. The site's population is part of a larger population that extends south through Ben Bullen State Forest. The recorded population is outside of the development footprint and is not expected to be directly or indirectly impacted by the proposal. It is therefore considered that the proposal is unlikely to have an adverse effect on the life cycle of the *E. aggregata* such that a viable local population of the species is likely to be placed at risk of extinction.

- *Eucalyptus cannonii* Capertee Stringybark V

E. cannonii is likely to be present within the rehabilitation areas across the Coal Services site and potentially occurs in low numbers within the Cox's Permian Red Stringybark – Brittle Gum Woodland (see **Section4.4**). A potentially large local population of *E. cannonii* is known to occur throughout the neighbouring Ben Bullen State Forest to the north of the site (RPS 2013). In addition, within the site, approximately 80% of the Cox's Permian Red Stringybark – Brittle Gum Woodland and approximately 50% of the planted vegetation will be retained within the site. It is therefore considered that the proposal is unlikely to have an adverse effect on the life cycle of the *E. cannonii* such that a viable local population of the species is likely to be placed at risk of extinction.

- *Thesium australe* Austral Toadflax V

T. australe has not been recorded within the site, however a population is known to occur within the Pine Dale Coal Mine Stage 2 Extension Area, which is located to the immediate north of the site. The most appropriate habitat for this species within the site exists within the patches of *Themeda australis* found amongst the Pine Plantation in the north of the site. Option 2 haul road may impact upon a small area (approximately 0.21ha) of potential habitat for *T. australe*, albeit marginal. This potential habitat quality and potential for presence of *T. australe* is lessened by the past land use as pine plantation and the encroachment of *Rubus fruticosus* (Blackberry) within this area. Larger areas of potential and known habitat are available further to the north of the site. It is therefore considered that the proposal is unlikely to have an adverse effect on the life cycle of the *T. australe* such that a viable local population of the species is likely to be placed at risk of extinction.

Threatened Fauna

- *Hieraaetus morphnoides* Little Eagle V

This species was recorded flying over the site during field surveys. The proposed Reject Emplacement Area and haul road construction involves the removal of a maximum of 10.67 ha of woodland habitat that could potentially be used for nesting and foraging by this species. No population of this species, which would occupy a large home range, is considered to be greatly reliant on the habitat areas to be removed. Therefore it is unlikely that the proposal will affect the life cycle of the Little Eagle such that a viable local population of the species is likely to be placed at risk of extinction.

Woodland/Forest Birds

- *Anthochaera phrygia* Regent Honeyeater CE
- *Calocephalum fimbriatum* Gang-gang Cockatoo V
- *Chthonicola sagittata* Speckled Warbler V
- *Climacteris picumnus victoriae* Brown Treecreeper V
- *Daphoenositta chrysoptera* Varied Sittella V
- *Melanodryas cucullata* Hooded Robin V
- *Petroica boodang* Scarlet Robin V
- *Petroica phoenicea* Flame Robin V

The Gang-gang Cockatoo and Scarlet Robin were recorded on site and suitable habitat exists for the remaining species listed above. The proposed Reject Emplacement Area and haul road construction involves the removal of a maximum of 10.67 ha of woodland habitat that could potentially be used for nesting and foraging by woodland/forest birds. This would include the potential removal of both native woodlands and the Pine plantation. Additional areas of rehabilitation/planted vegetation could also provide supplementary habitat for these species.

These woodland/forest birds are highly mobile and may utilise the habitats on site as part of a larger home range. The surrounding state forests provide large areas of suitable consolidated habitat for the abovementioned species. None of the birds recorded were located within the areas proposed to be removed, which occur within an already modified and fragmented landscape. No populations of these species are considered to be greatly reliant on the habitat areas to be removed. Therefore it is unlikely that the proposal will affect the life cycle of the above woodland/forest bird species such that a viable local population of these species is likely to be placed at risk of extinction.

Large Forest Owls

- *Ninox connivens* Barking Owl V
- *Ninox strenua* Powerful Owl V
- *Tyto novaehollandiae* Masked Owl V

These owl species were not recorded within the site, however potential habitat exists within the forests and woodlands within the site. During surveys, no large hollows suitable for roosting or nesting by these species were located. The site is therefore considered to represent hunting habitat for these species only. The removal of vegetation within the site is therefore considered to constitute the loss of a small amount of hunting habitat for these species and is unlikely to affect the life cycle of these owl species, such that a viable local population of these species is likely to be placed at risk of extinction.

Hollow Dependent Bats

▪ *Mormopterus norfolkensis*	Eastern Freetail-bat	V
▪ *Falsistrellus tasmaniensis*	Eastern False Pipistrelle	V
▪ *Scoteanax rueppellii*	Greater Broad-nosed Bat	V
▪ *Nyctophilus timoriensis*	Greater Long-eared Bat	V
▪ *Saccolaimus flaviventris*	Yellow Bellied Sheathtail Bat	V

The Eastern False Pipistrelle and the Yellow Bellied Sheathtail Bat were recorded on site and suitable habitat exists for the remaining Bat species listed above. The proposed Reject Emplacement Area and haul road construction involves the removal of a maximum of 10.67 ha of woodland which provides hollows suitable for these species, as well as foraging habitat. The Pine plantation and Planted / Regenerating Vegetation may provide additional foraging habitat.

The surrounding state forests provide large areas of consolidated habitat for the abovementioned bat species. No populations of these species are considered to be greatly reliant on the habitats to be removed. Therefore is unlikely that the proposal will affect the life cycle of the above bat species such that a viable local population of these species is likely to be placed at risk of extinction.

Cave Dwelling Bats

▪ *Miniopterus schreibersii subsp.*		
▪ *oceanensis*	Eastern Bentwing Bat	V
▪ *Chalinolobus dwyeri*	Large-eared Pied Bat	V

Both the Eastern Bentwing Bat and Large-eared Pied Bat were recorded on site. No caves were recorded on site and therefore the site is considered to provide feeding habitat only.

The surrounding state forests provide large areas of commensurate consolidated habitat for the abovementioned bat species. No populations of these species are considered to be greatly reliant on the habitats to be removed. Therefore is unlikely that the proposal will affect the life cycle of the above bat species such that a viable local population of these species is likely to be placed at risk of extinction.

▪ *Dasyurus maculatus maculatus*	Spotted-tailed Quoll	V

This species was not recorded on site, however the habitats therein may constitute the potential home range of individuals of this species, which would also utilise the neighbouring Ben Bullen State forest. The areas of forest which are proposed to be removed are mostly characterised with an open understorey, with few potential den sites in the form of fallen hollow logs. The removal of vegetation within the site is therefore considered to constitute the loss of a small amount of hunting habitat for this species and is unlikely to affect the life cycle of the Spotted-tailed Quoll, such that a viable local population of these species is likely to be placed at risk of extinction.

- *Petaurus norfolcensis* Squirrel Glider V

This species was not recorded on site, however potential habitat exists for this species in the form of the Coxs Permian Red Stringybark - Brittle Gum Woodland. Therefore, the proposal is expected to result in the removal of a maximum of 10.62 ha of suitable habitat. The majority of this impacted vegetation occurs as highly fragmented parcels of vegetation within the south of the site.

The surrounding state forests provide large areas of consolidated habitat, which would also be suitable for Squirrel Gliders. Whilst the removal of the vegetation on site is considered to constitute a loss of habitat for this species, given the large amounts of neighbouring habitat, the proposal is not considered to affect the life cycle of the Squirrel Glider, such that a viable local population of these species is likely to be placed at risk of extinction.

(b) **In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,**

No endangered populations are considered to have a potential of occurring within the site.

(c) **In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:**

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction

- Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland

Approximately 10.21 ha of Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland occurs within the site. The proposal has been deliberately redesigned to avoid impact to the highest quality areas of this EEC. A road side remnant of this EEC has the potential to be impacted upon due to the positioning of one of the proposed routes of the services haul road (Option 2). The area to potentially be lost is in the form of a small (0.05ha) young stand of mostly *E. pauciflora*. This community exists as modified remnant roadside vegetation, which is only tentatively connected to other areas of commensurate vegetation.The conservation significance of this regrowth roadside remnant is considered to be low, with the higher quality examples within the site being avoided. Therefore, the proposal is unlikely to have an adverse effect on the extent or adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

(d) **In relation to the habitat of a threatened species, population or ecological community:**

(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed,

- *Eucalyptus aggregata* Black Gum V

No areas of suitable habitat for this species will be removed.

- *Eucalyptus cannonii* Capertee Stringybark V

E. cannonii may exist as juvenile trees within the 30.78 ha with Option 1 haul road or 30.67 ha with Option 2 haul road of regenerating vegetation recorded within the proposed disturbance footprints. *E. cannonii* may also occur within the Cox's Permian Red Stringybark – Brittle Gum Woodland community, with approximately 10.47 ha with Option 1 haul road or 10.62 ha with Option 2 haul road potentially being removed.

- *Thesium australe* Austral Toadflax V

Approximately 0.21 ha of potential marginal habitat will be removed if Option 2 haul road is required to be constructed.

Threatened Fauna

- *Hieraaetus morphnoides* Little Eagle V

The proposal is expected to result in the removal of a maximum of 10.67 ha of native woodlands and Pine plantations, which could potentially be used for nesting and foraging by this species. Additional areas of rehabilitation/planted vegetation could also provide supplementary hunting habitat for this species.

Woodland/Forest Birds

- *Anthochaera phrygia* Regent Honeyeater CE
- *Calocephalum fimbriatum* Gang-gang Cockatoo V
- *Chthonicola sagittata* Speckled Warbler V
- *Climacteris picumnus victoriae* Brown Treecreeper V
- *Daphoenositta chrysoptera* Varied Sittella V
- *Melanodryas cucullata* Hooded Robin V
- *Petroica boodang* Scarlet Robin V
- *Petroica phoenicea* Flame Robin V

The proposal is expected to result in the removal of a maximum of 10.67 ha of woodland habitat that could potentially be used for nesting and foraging by woodland/forest birds. Additional areas of rehabilitation/planted vegetation could also provide supplementary habitat for these species.

Large Forest Owls

- *Ninox connivens* Barking Owl V
- *Ninox strenua* Powerful Owl V
- *Tyto novaehollandiae* Masked Owl V

The proposal is expected to result in the removal of a maximum of 10.67 ha of woodland habitat that could potentially be used for nesting and foraging by woodland/forest birds. Additional areas of rehabilitation/planted vegetation could also provide supplementary habitat for these species.

Hollow Dependent Bats

- *Mormopterus norfolkensis* Eastern Freetail-bat V
- *Falsistrellus tasmaniensis* Eastern False Pipistrelle V
- *Scoteanax rueppellii* Greater Broad-nosed Bat V
- *Nyctophilus timoriensis* Greater Long-eared Bat V
- *Saccolaimus flaviventris* Yellow Bellied Sheathtail Bat V

The proposed Reject Emplacement Area and haul road construction involves the removal of a maximum of 10.67 ha of woodland which provides hollows suitable for these species, as well as foraging habitat. The Pine plantation and Planted / Regenerating Vegetation may provide additional foraging habitat, with the maximum loss of foraging habitat being 41.34 ha, if Option 2 haul road is required.

Cave Dwelling Bats

- *Miniopterus schreibersii subsp.*
- *oceanensis* Eastern Bentwing Bat V
- *Chalinolobus dwyeri* Large-eared Pied Bat V

The maximum loss of potential foraging habitat for these species to be lost would be 41.34 ha, if Option 2 haul road is required.

- *Dasyurus maculatus maculatus* Spotted-tailed Quoll V

The proposal is expected to result in the removal of a maximum of 10.62 ha of Cox's Permian Red Stringybark – Brittle Gum Woodland that could potentially be used for hunting by this species. It is considered unlikely that this species would utilise remnant roadside vegetation for hunting.

- *Petaurus norfolcensis* Squirrel Glider V

The proposal is expected to result in the removal of a maximum of 10.62 ha of Cox's Permian Red Stringybark – Brittle Gum Woodland that could potentially be used for nesting and foraging by this species.

- Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland

Approximately 0.05ha of this ecological community will be removed if Option 2 becomes the required option.

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

The proposed infrastructure occurs on pre-existing cleared land or along the edges of existing cleared land. Therefore no areas of habitat will become more fragmented or isolated than what already exists.

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality

Given the larger areas of higher quality habitat immediately adjacent to the site, the importance of the habitat that may be removed is considered to be low.

(e) **Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly)**

No areas of the site are recognised as critical habitat.

(f) **Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,**

Recovery Plans

Of the threatened species under consideration for this site, none of the species had a recovery plans or threat abatement plan (except for the species assessed below) to assess whether the action proposed is consistent with the objectives or actions. Nevertheless, the proposed action is unlikely to contravene any objectives or actions necessary to maintain the local population of these species.

Recovery Plan for the Large Forest Owls

- *Ninox strenua* Powerful Owl V
- *Tyto novaehollandiae* Masked Owl V

As potential habitat will be removed, albeit a small area, the proposal would be inconsistent with objective 5 (minimise loss and fragmentation of owl habitat areas) of the large forest owl recovery plan (DEC 2006).

- Recovery Plan for the Barking Owl *Ninox connivens*

As potential habitat will be removed, albeit a small area, the proposal would be inconsistent with Action 3.2 (Assist with the protection of Barking Owl habitat from disturbance due to developments and activities) (NPWS, 2003).

Threat Abatement Plans

None of the Key Threatening Processes (KTP's) that relate to prepared Threat Abatement Plans are considered relevant to this proposal.

(g) **Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.**

The following KTP's are considered to be potentially associated with the Proposal:

- Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands;
- Clearing of Native Vegetation;
- Invasion of native plant communities by exotic perennial grasses;
- Anthropogenic climate change;
- Competition and grazing by the feral European Rabbit; and
- Loss of hollow-bearing trees

These KTP's are discussed in **Section 7**.

Appendix 4

EPBC Act Assessment of Significance

A Protected Matters Search was conducted to determine if any nationally listed threatened species and ecological communities under the EPBC Act 1999 were recorded within a 10km radius of the site. A number of threatened species and one community were recorded within a 10 km radius of the site. An assessment has been undertaken in accordance with the EPBC Act and *EPBC Act Policy Statement 1.1 - Significant Impact Guidelines Matters of National Environmental Significance* (DEWHA, 2009). Those terrestrial fauna and flora under consideration and for which potential habitat was identified within the site in **Section 6** are listed as follows:

Threatened Flora

▪ *Eucalyptus cannonii*	Capertee Stringybark	V
▪ *Thesium australe*	Austral Toadflax	V

Threatened Fauna

▪ *Anthochaera phrygia*	Regent Honeyeater	E
▪ *Nyctophilus timoriensis*	Greater Long-eared Bat	V
▪ *Chalinolobus dwyeri*	Large-eared Pied Bat	V
▪ *Dasyurus maculatus maculatus*	Spotted-tailed Quoll	E

The following EPBC Act Assessments of Significance have been undertaken in accordance with the EPBC Act and *EPBC Act Policy Statement 1.1 - Significant Impact Guidelines Matters of National Environmental Significance* (DEWHA, 2009):

Endangered Species

▪ *Anthochaera phrygia*	Regent Honeyeater	E
▪ *Dasyurus maculatus maculatus*	Spotted-tailed Quoll	E

An action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will:

- lead to a long-term decrease in the size of a population

Due to the small amount of proposed habitat removal, the proposed action is unlikely to lead to a long-term decrease in the size of a population of these species, if present.

- reduce the area of occupancy of the species

These species were not recorded on site. Whilst a small area of potential habitat may reduce the amount of available habitat, these species are likely to place greatest reliance on the neighbouring Ben Bullen State Forest. Therefore the area of occupancy is unlikely to be greatly reduced.

- fragment an existing population into two or more populations

The proposed action is not expected to fragment an existing population of these species into two or more populations.

- adversely affect habitat critical to the survival of a species

The proposed action is not expected to affect habitat critical to the survival of these species.

- disrupt the breeding cycle of a population

The proposed action is not expected to disrupt the breeding cycle of a population of these species.

- modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

Due to the small amount of proposed habitat removal, its removal is expected to be of the extent that these species are likely to decline.

- result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat

The proposed action is not expected to result in invasive species that are harmful to these species becoming established.

- introduce disease that may cause the species to decline, or

No diseases are known to cause the decline of these species.

- interfere with the recovery of the species.

The proposed action is not expected to interfere with the recovery of these species.

Vulnerable Species

- *Eucalyptus cannonii*	Capertee Stringybark	V
- *Thesium australe*	Austral Toadflax	V
- *Nyctophilus timoriensis*	Greater Long-eared Bat	V
- *Chalinolobus dwyeri*	Large-eared Pied Bat	V

For the purpose of the below assessment, an 'important population' is defined as a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are:

- key source populations either for breeding or dispersal
- populations that are necessary for maintaining genetic diversity, and/or
- populations that are near the limit of the species range (DEWHA, 2009).

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

- lead to a long-term decrease in the size of an important population of a species
- reduce the area of occupancy of an important population
- fragment an existing important population into two or more populations
- disrupt the breeding cycle of an important population

None of the nationally listed threatened species considered to have potential to occur within the site fit into the above important population criteria. Whilst individuals of *E. cannonii* are likely to be removed as a result of the proposed action, a large proportion of this population is located within the neighbouring Ben Bullen State Forest. The potentially occurring population within the site, which is mainly planted individuals, is therefore not considered to be necessary for a species' long-term survival or recovery of this species.

- adversely affect habitat critical to the survival of a species

None of the habitats to be affected are considered critical for the survival of these species.

- modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

The removal of a maximum of approximately 41.29 ha of mostly planted vegetation may cause a decline in the local population of *E. cannonii* if present. However, thereafter the proposal is not considered likely to cause further declines in this species population.

- result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat

The proposed action is not expected to result in invasive species that are harmful to these species becoming established.

- introduce disease that may cause the species to decline, or

No diseases are known to cause the decline of these species.

- interfere substantially with the recovery of the species.

The proposed action is not expected to interfere with the recovery of these species.

Conclusion

Pursuant to the EPBC Act, an assessment of potential impacts arising from the proposal on MNES has been undertaken. This assessment has been undertaken in accordance with the EPBC Act and *EPBC Act Policy Statement 1.1 - Significant Impact Guidelines Matters of National Environmental Significance* (DEWHA, 2009). The assessment has concluded that no significant impact is likely to relevant MNES.

Appendix 5

Qualifications

Curriculum Vitae

MATTHEW DOHERTY

Technical Director (Ecology)

Manager - Ecology & GIS

Newcastle, NSW

Bachelor of Landscape Management and Conservation (Land & Water Conservation Major), University of Western Sydney, 2002

Bushland Regeneration Certificate II, Western Sydney Institute of TAFE, 1999

Spikeless Tree Climbing Techniques, Total Height Safety, 2004

AREAS OF EXPERTISE:

Matthew has over ten years experience in the environmental industry with key skills in project management, survey design, GIS and client relations. In his position as Technical Director (Ecology), Matt manages environment department including the day to day running of projects, verification of reports and other outputs and ensures clients are well informed of project progress and key findings. Matt's background in local government, state government and private consultancy gives him a high level of appreciation of the environmental and consultancy sector, thus allowing him to take a pragmatic approach to providing successful conservation and development outcomes whilst meeting the aims and objectives of clients and determining authorities.

SELECTED PROJECT EXPERIENCE:

Ecology and GIS

- **Various large-scale land development, mining, energy and infrastructure projects –** Matt has project managed and/or participated in numerous large-scale land development, mining, energy and infrastructure projects including Queensland Hunter Gas Pipeline (850km); Hunter Gas Pipeline; Rio Tinto Lower Hunter Lands Project; GIS biodiversity, large scale vegetation, habitat and predicative modelling mapping works; wind farms and coordination of environmental monitoring programs for mines.

PREVIOUS EXPERIENCE:

Ecologist – Andrews Neil Pty Ltd **2004 - 2005**

Duties included: preparation of Fee Proposals for Ecological Services; General and Targeted Flora and Fauna Surveys including Flora and Fauna Identification; Desktop Studies and Literature Searches; Interpretation and Application of Legislation; report preparation including Threatened Species Assessments (8 part test), Vegetation Management Plans (Riparian Restoration/ Rehabilitation, Bush Regeneration), Species Impact Statements, Weed Management Strategies, Habitat Management Strategies and Tree Assessments; GIS/ Spatial Analysis and Database Management; Liaison with Client, Stakeholder Groups, State and Local Governing Bodies; Site Supervision of Ecological Conditions; Tree Climbing for installation, maintenance and monitoring of nest boxes.

Project Officer / Horticultural Services – Gosford City Council **06/2003 – 05/2004**

reviewed noxious weed management; performed vegetation surveys on GCC landfills to identify the presence of noxious weeds; quantify the extent of infestation of each noxious weeds species and map the affected areas; developed a management plan for the control of NW species identified in the survey in accordance with relevant legislation; maintained Japanese Gardens along with City Wide Gardens and Streetscapes.

Environmental Officer - Dept of Land & Water Conservation, Newcastle **01/1999 – 12/1999**
Liaised with relevant agency and stakeholder groups; researched and prepared an extensive literature review of issues pertaining to riparian vegetation; assessed current best practice for revegetation and rehabilitation of degraded sites; prepared a Riparian Revegetation Management Strategy

Volunteer – Maitland City Council **07/1999 – 12/1999**
Assisted with Rivercare implementation throughout LGA. Utilised primary, secondary and field research to prepare a River Plan under 'Rivercare' guidelines.

Volunteer – Brisbane Waters & Gosford Lagoons Catchment Management Committee **03/1998 – 05/1998**
Prepared Riparian Zone Rehabilitation Plan for Degraded Creek Management, Research and prepared a Riparian Zone Rehabilitation Project. Member on several Gosford City Council steering committees and working groups.

MEMBERSHIPS & ACHIEVEMENTS:

- NSW Animal Ethics Research Authority
- NPWS Scientific Investigation Licence
- Senior First Aid
- Fire Protection Association Australia (FPAA)
- OH&S Induction Training (Green Card)

RPS

Curriculum Vitae

PAUL HILLIER

Senior Ecologist / Project Manager

Newcastle, NSW

Bachelor of Environmental Science (Environmental Management)

AREAS OF EXPERTISE:

Paul has broad range of Ecological Assessment reporting and project management experience from 9 years of professional ecological work both in Australia and abroad. Project experience has primarily included a range of flora and fauna assessment disciplines as required by a wide range of corporate and domestic client requirements. Paul has been employed both within the private and public sector, providing a strong knowledge and understanding of the role of both developers and government in legislation and planning.

Paul has the majority of his experience within the consultancy industry, primarily focussing on the preparation of Flora and Fauna Assessments, Environmental Assessments, Environmental Impact Statements, Review of Environmental Factors and Statement of Environmental Effects. Paul has experience with targeted threatened flora and fauna surveys, including a strong knowledge of Geographic Information Systems mapping and analyses.

SELECTED PROJECT EXPERIENCE:

Ecology

- Ecological Constraints Master Plan – Huntlee, Singleton and Cessnock, NSW (2007-2010)
- Ecosystem Function Analysis – Wambo Coal, Singleton NSW (2010).
- Ecological Assessment Report – White Rock Wind Farm, Glen Innes, NSW (2011)

PREVIOUS EXPERIENCE:

Ecological Records Officer – West Yorkshire Ecology 2007-2009

Duties included collection and collation of ecological records from across West Yorkshire, United Kingdom; Preparation of fee proposals for ecological services; GIS/ spatial analysis and database management; Database searches and reporting; Liaison with client, stakeholder groups, state and local governing bodies; Review of local planning applications and consequent consultations to local councils.

Ecologist – Harper Somers O'Sullivan 2004-2006

Duties included flora and fauna surveying and survey design; overseeing and contribution to the preparation of complex ecological and environmental reports for both small and large projects; liaison with both the private sector and federal, state and local government department.

MEMBERSHIPS & ACHIEVEMENTS:

- NSW Driver's Licence (Class C)
- OH&S Induction Training (White Card)
- Senior First Aid
- For Australian Wildlife Needing Aid (FAWNA), NSW Australia

Curriculum Vitae

LAUREN VANDERWYK

Field Ecologist

Newcastle, NSW

Bachelor of Science, University of Newcastle

AREAS OF EXPERTISE:

Lauren has a broad range of ecological field experience and experience in Bushfire and Ecological Assessment reporting. Her experience within the consulting industry has primarily included a wide range of flora and fauna assessment disciplines as required by a wide range of public and private clients. Lauren's knowledge of the Central Coast and Newcastle regions has expanded extensively since the commencement of her career, particularly in the area of threatened flora and fauna species.

SELECTED PROJECT EXPERIENCE:

Environment

- Flora and fauna identification and habitat assessment
- Targeted threatened flora and fauna surveys
- Delineation and mapping of vegetation communities
- Endangered Ecological Community (EEC) assessment
- Conducting Field Surveys for Flora, Fauna and Habitat Identification
- Report Preparation including Fauna & Flora Assessments
- Ecological Monitoring and Reporting
- Bushfire Threat Assessment & Management reporting
- Understanding of environmental legislation.

Ecology

- Santos- On site supervisor for coal seam gas exploration in the Gunnedah region
- Centennial Coal Charbon– Field surveys identifying management issues for the development of a Compensatory Habitat Management Plan at Charbon Colliery
- Morisset – Flora and fauna surveys to produce an Ecological Assessment and Bushfire Threat Assessment

PREVIOUS EXPERIENCE:

Environmental Scientist - Ecobiological (2011)

Primary roles included bush regeneration and the identification of a wide range of native and non-native plant species for rehabilitation of various sites. Some ecological surveys and Ecological Assessment reporting was carried out during her time with Ecobiological.

Trainee Ecologist - Pygmy Possum Ecological Consulting (2008-2010)

Ecological field surveys were the main role at Pygmy Possum. Fauna surveys carried out across the Central Coast have provided for an increased knowledge in common and threatened fauna species as well as the vegetation communities in which they inhabit. Exposure to ecological reporting also occurred.

VOLUNTEER EXPERIENCE:

- Biodiversity research for independent researchers and Australian Geographic in East Kimberley (2011);
- Amphibian (*Litoria subglandulosa* and *Mixophyes balbus*) research at the New England Tablelands with Simon Clulow, Carl Gerhardt and Marion Anstis (2010);
- Bandicoot Research in Manly with the Australian Wildlife Conservancy (2010);
- Microbat dietary surveys and tracking at Empire Bay with Leroy Gonsalves (2010);
- Green and Golden Bell frog research at the Sydney Olympic Park (2010);
- Bush regeneration at Wamberal Lagoon Nature Reserve with National Parks and Wildlife Services primarily restoring Littoral Rainforest (EEC) (2007-2010);
- Fauna research including pit trapping, Elliot trapping, triangulation (for amphibians) and spotlighting for the Watagans fauna database (2007); and
- Bush-stone Curlew surveys at Empire Bay on the Central Coast undertaking call play back methods (2010).

MEMBERSHIPS & ACHIEVEMENTS:

- NSW Driver's Licence (Class C)
- OH&S Induction Training (White Card)
- Santos approved 4WD course
- ChemCert II certification
- Landscape Function Analysis Training
- Member of the Ecological Society of Australia (ESA)
- Member of the Hunter Bird Observatory Club (HBOC)

Curriculum Vitae

JOEL STIBBARD

Field Ecologist

Newcastle, New South Wales

Masters of Environmental Management, University of Queensland, 2009 - Present

Bachelor of Science, University of Queensland, 2001 - 2004

AREAS OF EXPERTISE:

I have had over five years of ecological experience around the world in both aquatic and terrestrial environments. I have spent the last 12 months working as an ecologist in Queensland, focussing on botany, vegetation mapping and environmental legislation.

SELECTED PROJECT EXPERIENCE:

Resource Sector

- **Northern Energy Corporation: Elimatta Project** – This project is located 30km west of Wandoan in Queensland and is the site of a large resource of thermal coal. I was involved in the ecological surveys, GIS work and flora and fauna assessment reporting of this project as part of the Environmental Impact Assessment process.
- **Hancock Coal Pty Ltd: Alpha Coal Project** – The site of a well known thermal coal deposit in the Galilee Basin of Queensland, I was involved in terrestrial and aquatic flora and fauna surveys, habitat assessments and reporting.
- **Hancock Coal Pty Ltd: Kevins Corner Project** – Situated to the north of the Alpha Coal Project, I was involved in flora and fauna surveys as well as ecological assessment reporting.
- **Perilya – Mount Oxide** – A copper mine is to be developed on this site; 140km northwest of Mount Isa in Queensland. I was part of a four-man ecology team employed to investigate local flora and fauna as part of the Environmental Impact Assessment process

Ecological Sector

- **Kalahari Meerkat Project** – This project was collaboratively run by the University of Cambridge in the UK and the University of Zurich in Switzerland. I was an ecological researcher on this project in the Northern Cape of South Africa for 1.5 years, assessing the behavioural and reproductive ecology of the Meerkat *Suricatta suricatta*.
- **Great Barrier Reef Monitoring Program** – I was a Project Officer for Reef Check Australia in Townsville throughout 2009. I was primarily responsible for organising and implementing monitoring surveys, data collection and reporting to the Great Barrier Reef Marine Park Authority on the health of reefs across the entire GBR.
- **Meso-American Barrier Reef Monitoring Program** – I was a volunteer surveyor for Global Vision International in the Yucatan Peninsula of Mexico during 2008, primarily involved in dive surveys, data collection and ecotourism as a part of a long-term monitoring program.

PREVIOUS EXPERIENCE:

Ecologist – Australasian Resource Consultants **1 year**

I was employed at AARC as an ecologist at the beginning of 2011. My role primarily involved ecological field surveys, EIA reporting and GIS mapping within a consultancy role that required initiative, efficiency and innovation. A valued member of the team, I left AARC to pursue a similar role with RPS in my hometown of Newcastle.

Lab Technician – Fisheries Resource Consultants **0.5 years**

My role in the laboratory for FRC in 2010 involved the sorting and identification of macro-invertebrates as an indication of aquatic waterway health. This was a casual position that ended upon gaining employment full-time at AARC.

Ecologist – Environmental, Ground & Water Consultants **0.5 years**

I was employed at EGC whilst completing my Masters at the University of Queensland in 2010. This was a project-based role on Curtis Island off of Gladstone in Central Queensland. My role involved ecological surveys, identification of fauna habitat and assessment reporting prior to the development of the QCG LNG plant on Curtis Island.

MEMBERSHIPS & ACHIEVEMENTS:

Deans' Commendation for High Achievement – University of Queensland (2009 -2010)