



Battery Energy Storage System, Wallerawang Biodiversity Development Assessment Report

FINAL REPORT

Prepared for AECOM

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Glossary

Assessment Area	All land within 500m of a linear development and 1500m of a broader development site
BAM	NSW Biodiversity Assessment Method
BAM-C	BAM Calculator
BC Act	NSW <i>Biodiversity Conservation Act 2016</i>
BDAR	Biodiversity Development Assessment Report
BESS	Battery Energy Storage System
Biosecurity Act	NSW <i>Biosecurity Act 2015</i>
BOS	Biodiversity Offsets Scheme
CEMP	Construction Environmental Management Plan
DA	Development Application
DCDB	Digital cadastral database
DCCEEW	Commonwealth Department of Climate Change, Energy, the Environment and Water
Development footprint	The area of land that is directly impacted by the proposal
Development site	The broader area in which the subject land is located.
DoIW	Directory of Important Wetlands
DPE	NSW Department Planning and Environment
DPI	NSW Department of Primary Industries
DTDB	Digital topographic databases
Ecosystem credit species	A measurement of the value of EECs, CEECs and threatened species habitat for species that can be reliably predicted to occur with a PCT. Ecosystem credits measure the loss in biodiversity values at a development
EES	NSW Environment, Energy and Science Group
EP&A Act	NSW <i>Environmental Planning and Assessment Act 1979</i>
EPBC Act	Commonwealth <i>Environment Protection and Biodiversity Conservation Act 1999</i>
GDE	Groundwater Dependent Ecosystem
GIS	Geographic Information System
IBRA	Interim Biogeographic Regionalisation of Australia
LEP	Local Environmental Plan
LGA	Local Government Area

Locality	Area located within 10 kilometres radius from the subject land
LPI	NSW Land and Property Information
Matters of NES	Matters of National Environmental Significance protected by a provision of Part 3 of the EPBC Act
EES	NSW Environment, Energy and Science Group
PCT	Plant Community Type
SAII	Serious and Irreversible Impact
SALIS	NSW Soil and Land Information System
SEARs	Secretary's Environmental Assessment Requirements
SEPP	NSW State Environmental Planning Policy
SIS	Species Impact Statement
Species credits species	A class of biodiversity credits created or required for the impact on threatened species that cannot be reliably predicted to use an area of land based on habitat surrogates
SSD / SSI	State Significant Development / State Significant Infrastructure
Subject land	The areas within or the combined areas of the development site, and any indirect and prescribed impacts.
TEC	Threatened Ecological Community
TBDC	Threatened Biodiversity Data Collection
WM Act	NSW <i>Water Management Act 2000</i>

Certification and Declarations

I certify that this report has been prepared on the basis of the requirements of, and information provided under, the Biodiversity Assessment Method (DPIE 2020) and s6.15 of the *Biodiversity Conservation Act 2016*.

In preparing this assessment I have acted in accordance with the Accredited BAM Assessor Code of Conduct.

I declare that I have considered the circumstances and there is no actual, perceived or potential conflict of interest.

Name: Paul Price

Signature:

A handwritten signature in black ink, appearing to read 'Paul Price', with a stylized flourish at the end.

Date: 16/09/2022

BAM Assessor Accreditation Number: BAAS 18089

Summary

Neoen Australia Pty Ltd (Neoen) is seeking development consent to construct, operate and maintain a large-scale Battery Energy Storage System (BESS) at 173 Brays Lane, Wallerawang, NSW (the Site), as well as a new transmission line that would connect the BESS to the existing Transgrid 330 kilovolt (kV) substation at Wallerawang (the Project).

The project is considered State Significant Development (SSD) and will be assessed under Part 4 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act). Vegetation will be removed as part of the Project. As the Project is considered an SSD, the Biodiversity Offset Scheme (BOS) applies in accordance with Section 7.9 of the *Biodiversity Conservation Act 2016* (BC Act), and an assessment is required in accordance with the NSW Biodiversity Assessment Method (BAM) (DPIE 2020a), and the BC Act. This Biodiversity Development Assessment Report (BDAR) has been prepared by Accredited Assessor Paul Price (BAAS18089) and describes the outcome of the development assessment case (00024080/BAAS18089/21/00024081) conducted consistent with the BAM.

Field investigation, undertaken in accordance with the BAM, recorded 20.71 hectares of native vegetation within the subject land (inclusive of the Site, the transmission line corridor and other lands that could be impacted by the Project), representing no threatened ecological communities (TEC).

Consideration has been given to avoiding and minimising impacts to biodiversity where possible during the assessment and project design. As such mitigation and management measures will be put in place to adequately address impacts associated with the Project, both direct, indirect and prescribed.

Habitat for five threatened species were recorded within the subject land where the vegetation integrity (VI) score of the impacted vegetation was calculated as 0.2 to 83.6. As such, in accordance with Section 10 of the BAM, offsets are required to be secured for the Project, including:

- 0.27 ha of PCT 677
- 0.78 ha of PCT 732
- 0.27 ha of Black Gum habitat
- 0.83 ha of Koala habitat
- 0.78 ha of Squirrel Glider habitat
- 0.78 ha of Eastern Pygmy-possum habitat.
- 0.43 ha of Purple Copper Butterfly habitat.

The Project is not considered likely to result in a significant impact to species or communities listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), and as such a referral to the Minister for the Environment is not required.

Stage 1 – Biodiversity assessment

1 Introduction

Neoen Australia Pty Ltd (Neoen) is seeking development consent to construct, operate and maintain a large-scale Battery Energy Storage System (BESS) of approximately 500 megawatts (MW) and approximately 1000 megawatt-hour (MWh) at 173 Brays Lane, Wallerawang, NSW (the Site), as well as a new transmission line that would connect the BESS to the existing Transgrid 330 kilovolt (kV) substation at Wallerawang (the Project).

Biosis Pty Ltd was commissioned by AECOM to undertake a biodiversity assessment of the Project. The proposed BESS is to be constructed within the suburb of Wallerawang, in the Lithgow Local Government Area (LGA).

The Project is considered State Significant Development (SSD) under the *Environmental Planning and Assessment Act 1979* (EP&A Act) as it satisfies the requirements of Clause 8 of the State Environmental Planning Policy (State and Regional Development) 2011 (SRD SEPP). An Environmental Impact Statement (EIS) has been prepared for the Project in accordance with Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

The purpose of this assessment is to apply the NSW Biodiversity Assessment Method 2020 (BAM) (DPIE 2020a) to the Project in accordance with the NSW *Biodiversity Conservation Act 2016*, and provide AECOM with a Biodiversity Development Assessment Report (BDAR) to support the EIS for the Project.

1.1 Project description

As described above, the Project would comprise the construction and operation of a large-scale BESS, as well as a new underground transmission line that would connect the BESS to the existing Transgrid 330 kV substation at Wallerawang.

The proposed location of the BESS is on the southern part of Lot 4 Deposited Plan (DP) 751651. The Site is located approximately 1.25 km north west of the Transgrid Wallerawang 330 kV substation. This substation is located at Main Street, Wallerawang 2845 (Lot 91 of DP 1043967).

The proposed transmission line would be constructed using a combination of an underboring method known as horizontal directional drilling (HDD) in conjunction with open trenching in less constrained areas. HDD would be used where required to avoid areas of sensitivity, including Aboriginal heritage, large remnant stands of intact vegetation which contains , large hollow-bearing trees and populations of Black Gum *Eucalyptus aggregata* (Vulnerable, EPBC and BC Act), Pipers Flat Creek, and rail crossings. The utilisation of this methodology will require the creation of both an entry and exit pit to facilitate the HDD. Both the entry and exit pits will be located on areas devoid of threatened species and native vegetation as such no impacts will be recorded. The remainder would be constructed using an open trenching methodology. The vast majority of the new transmission line would be installed underground except for where it connects to Transgrid Wallerawang 330kV substation within the substation site.

The new transmission line would traverse:

- Lot 8 and Lot 9 DP 252472
- Lot 2 DP 108089
- Lot 1 DP 108089
- Lot 10 DP 1168824
- Lot 1115 DP 1204803
- Lot 91 DP 1043967.

Key components of the Project are shown on Figure 13 and would include:

- Site establishment, including installation of fencing, environmental controls, grading, modification of dams, and other civil work including earthworks.
- Establishment of a new driveway and access road (up to 10 m wide), located at the south-western boundary of the Site, providing access to the Site from Brays Lane.
- The upgrading of an access track located off Brays lanes to provide a HDD staging drilling point.
- Establishment of an internal access road and construction of a permanent car parking area with spaces for up to eight light vehicles.
- Construction of permanent operations and management (O&M) buildings, including staff amenities.
- Construction of new switch rooms and control room.
- Construction of new 330/33 kV substation on the Site (including outdoor switchgear (up to 330 kV) and transformers).
- A 10 m buffer (or Asset Protection Zone (APZ)) would be established around all battery storage infrastructure. This buffer area would comprise non-combustible ground cover with no vegetation present.
- Construction of stormwater controls (including swales and bioretention basins).
- Installation of two 45 kL metal water tanks.
- Provision of fire alert equipment.
- Construction of lighting and installation of security devices around the perimeter of the BESS compound, including cyclone mesh security fencing about 2.7 m high.
- Construction of 10 m high noise walls around all battery enclosures and high voltage transformers.
- Establishment of landscaping and screening vegetation.
- Upgrades to the Wallerawang 330 kV substation switchyard.
- Connection to the existing potable water supply and the 11kV transmission line in Brays Lane.
- Following completion of the construction activities, Neoen are proposing to subdivide Lot 4 DP 751651 to separate the existing rural residential use of the Lot from the proposed BESS.

The Project seeks to provide a critical element of the expanding renewable energy industry and support the future capacity and resilience of the NSW energy network through providing a large-scale energy storage system. The energy storage capacity provided by the Project would allow for increased installation of renewable energy sources while maintaining network stability and security.

The Project has been assessed as triggering the NSW Biodiversity Offset Scheme (BOS) through the following:

- The Project is considered to be SSD under the EP&A Act.

The NSW BC Act requires that the BAM be applied to all proposals that trigger the BOS, and that a BDAR is required to be submitted to the approval authority.

1.2 Purpose of this assessment

This BDAR will:

- Address the BAM (DPIE 2020a) and the BOS.
- Identify how the proponent has avoided and minimised impacts to biodiversity.
- Identify any potential impact that could be characterised as serious and irreversible.
- Describe the offset obligations required to compensate for any unavoidable biodiversity impacts resulting from the proposed development.
- Consider and assess the proposal in accordance with other relevant legislation such as the Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act).

All biodiversity assessments have been undertaken in accordance with the BAM, and this BDAR has been prepared and reviewed by Accredited Assessor Paul Price (BAAS18089). This BDAR describes the outcome of the development assessment case (00024080/BAAS18089/21/00024081) conducted consistent with the BAM.

1.3 The subject land, development footprint and assessment area

The terms subject land, development footprint and assessment area are used throughout this BDAR and are defined as follows:

- The subject land is defined as the total area of proposed disturbance, encompassing the proposed development footprint and all areas that could be disturbed, including direct, indirect and prescribed impacts (Figure 1). The subject land is approximately 37.63 ha in area, and comprises the proposed development footprint, including the portion of Lot 4 /- DP 751651 that would be used to construct the BESS (the Site), and a 50 m buffer on the proposed transmission line that includes adjacent mapped native vegetation. The subject land is situated within the Lithgow LGA and the Central Tablelands (LLS) region. It is approximately 12 km north-west of the Lithgow central business district and is zoned as RU1 – Primary Production and IN1 – General Industrial and SP2 – Infrastructure (Rail Infrastructure Facilities) under the *Lithgow Local Environmental Plan 2014* (LEP). The subject land is bounded by farmland to the north and east, Ben Bullen State Forest to the west, and industrial zoned land to the south.
- The development footprint is the area of land that would be required to construct the Project (including the BESS, the new transmission line, and part of the Transgrid Wallerawang 330 kV substation. This area would be directly impacted by the Project. It comprises the clearing footprint, plant laydown, access roads and other associated construction works. The development footprint is approximately 9.95 ha in area. This development footprint corresponds to that area defined as the ‘Project Area’ in the EIS.
- The assessment area has been determined as per the BAM and includes the subject land and the area of land within the 1,500 m buffer zone surrounding the subject land.

1.4 Sources of information

Sources of information used in the assessment included relevant databases, spatial data, literature and previous site reports.

In order to provide a context for the assessment area, records of flora and fauna from within 5 kilometres (the locality) were collated from the following databases and datasets were reviewed:

- Commonwealth Department of Agriculture, Water and Environment (DAWE) Protected Matters Search Tool for matters protected by the EPBC Act.
- NSW Environment, Energy and Science (EES) BioNet Atlas of NSW Wildlife for species, populations and ecological communities listed under the BC Act.

-
- PlantNET (The Royal Botanic Gardens and Domain Trust).
 - BirdLife Australia, the New Atlas of Australian Birds 1998-2020.

Other sources of biodiversity information relevant to the assessment area were sourced from:

- The NSW Plant Community Types (PCTs), as held within the BioNet Vegetation Classification database (DPIE 2021a).
- Relevant vegetation mapping, such as the *State Vegetation Type Map: Central Tablelands Region Version 1.0. VIS_ID 4778*.
- NSW BAM Calculator.
- Biodiversity Values map.
- Native vegetation regulatory map.
- BAM Important Areas maps.

Mapping was conducted using hand-held (uncorrected) GPS units (GDA94), mobile tablet computers running Collector for ArcGIS™ and aerial photo interpretation. The accuracy of this mapping is therefore subject to the accuracy of the GPS units (generally ± 5 metres) and dependent on the limitations of aerial photo rectification and registration.

Basemap data was obtained from NSW Land and property information (LPI) 1:25,000 digital topographic databases, with cadastral data, obtained from LPI digital cadastral database.

The following spatial datasets were utilised during the development of this report:

- Catchment Boundaries of New South Wales dataset.
- Mitchell Landscapes Version 3.1.
- Interim Biogeographic Regionalisation of Australia (IBRA) Version 7.
- Directory of Important Wetlands (DoIW).
- NSW Soil and Land Information System (SALIS).

Mapping has been produced using a Geographic Information System (GIS). The following maps and data have been provided:

- Digital mapping with aerial photography showing 1:1000 or finer.
- Site map as described in subsection 3.1.1 of the BAM.
- Location Map as described in subsection 3.1.2 of the BAM.
- Landscape map with features including 1,500 m buffer, as described in section 3.1.3 of the BAM.

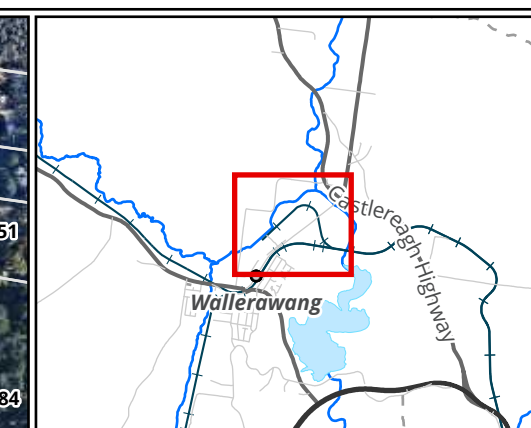
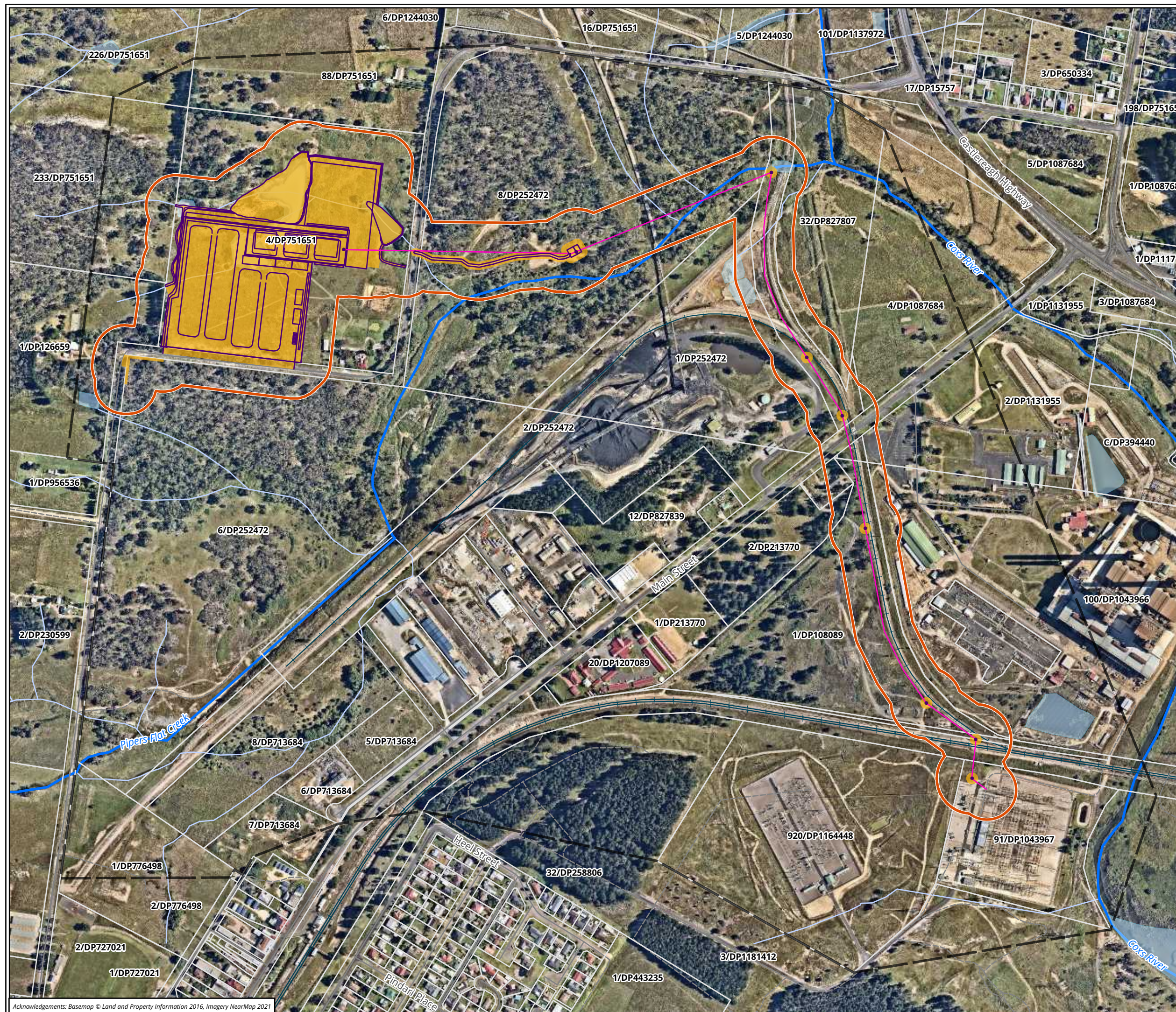
1.5 Legislative requirements

The Project has considered, or has been assessed against, relevant biodiversity legislation and government policy. This is provided in Table 1.

Table 1 Legislation relevant to the project

Legislation / Policy	Description	Relevance to the current assessment
Commonwealth Acts		
<i>Environment Protection and Biodiversity Conservation Act 1999</i>	Australian Government's key piece of environmental legislation. The EPBC Act applies to developments and associated activities that have the potential to significantly impact on MNES protected under the Act. Under the EPBC Act, the minister may agree to undertake a strategic assessment on the impacts of actions under a policy, plan or program.	Matters of National Environmental Significance (MNES) relevant to the Project include nationally threatened species and ecological communities and migratory species. Threatened species and ecological communities protected by the EPBC Act and present within the subject land are outlined in Sections 3, 4 and 10.
NSW Acts		
<i>Environmental Planning and Assessment Act 1979</i>	Provides the overarching structure for planning in NSW and is supported by other statutory environmental planning instruments (EPIs).	Determines the approval pathway for the Project and prescribes the consideration of relevant EPIs.
<i>Biodiversity Conservation Act 2016</i>	Key piece of legislation providing for the protection and conservation of biodiversity in NSW through the listing of threatened species and communities and key threatening processes.	Mandates the application of the NSW BOS and BAM.
<i>Biosecurity Act 2015</i>	Outlines biosecurity risks and impacts, and prescribes requirements for the management of risk to reduce the severity of impacts.	Biosecurity risks relevant to the current assessment include weeds, pest animals and pathogens that are known to occur, or potentially occur, within the subject land. Further details of biosecurity risks present assessment area are provided in Section 5.
<i>Fisheries Management Act 1994 (FM Act)</i>	Provides for the protection and conservation of aquatic species and their habitat throughout NSW.	The BAM focusses on impacts to terrestrial ecology and thus excludes items listed under the FM Act.

Legislation / Policy	Description	Relevance to the current assessment
NSW EPIs		
SEPP (Koala Habitat Protection) 2021.	This SEPP commenced on 17 March 2021 to replace and repeal the 2020 Koala SEPP. This SEPP aims to encourage the conservation and management of areas of natural vegetation that provide habitat for Koalas to support a permanent free-living population over their present range and reverse the current trend of Koala population decline.	The Lithgow LGA is listed under Schedule 1 as an area to which this SEPP applies. State Environmental Planning Policy (Biodiversity and Conservation) 2022 which address' Koala Habitat applies to identified LGAs in areas not zoned as RU1 Primary Production, RU2 Rural Landscape or RU3 Forestry, and within these rural land zonings. However, this SEPP only applies to development applications where Council is the consent authority, which is not the case for the project that has been designated as SSD under Section 4 of the EP&A Act.
Lithgow Local Environmental Plan 2014 (LEP).	This Plan aims to make local environmental planning provisions for land in Lithgow in accordance with the relevant standard environmental planning instrument under Section 3.20 of the Act.	The subject land is located within the Lithgow LGA. As such, the LEP applies.

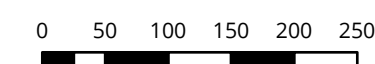


Legend

-  Subject land
-  Development site
-  Development footprint
-  Construction footprint
-  HDD and trenching



Figure 1 Subject land



Metres
Scale: 1:6,000 @ A3
Coordinate System:
GDA 1994 MGA Zone 56



Matter: 34343, Date: 15 September 2022,
GIS: AM, Checked by: PP, Last edited by: lharley
Location: P:\34300s\34343\Mapping\34343_BDAR2020_F1.aprx
Layout: 34343 F1 SubjectLand

2 Landscape Context

This chapter describes the landscape and site context of the assessment area. In accordance with the BAM, a number of features are assessed within the subject land and within a 1,500 metre buffer around the subject land (Figure 2). These landscape features are used to identify biodiversity values that are important for the subject land and inform the habitat suitability of the subject land for threatened species. Other features, such as rivers, streams, estuaries and wetlands, habitat connectivity, karst areas or areas of outstanding biodiversity value are considered, where appropriate.

2.1 Landscape features

2.1.1 IBRA bioregions and IBRA subregions

The subject land occurs within the Sydney Basin IBRA bioregion and the Capertee Uplands IBRA subregion. The Sydney Basin Bioregion lies on the central east coast of NSW and covers an area of approximately 3,624,008 hectares. It occupies approximately 4.53 % of NSW and is one of two bioregions contained wholly within the state. The bioregion extends from just north of Batemans Bay to Nelson Bay on the central coast, and almost as far west as Mudgee. The bioregion is bordered to the north by the Brigalow Belt South and North Coast bioregions, to the south by the South East Corner Bioregion and to the west by the South Eastern Highlands and South Western Slopes bioregions. The Sydney Basin Bioregion is one of the most species diverse in Australia. This is a result of the variety of rock types, topography and climates in the bioregion (DPIE 2016a).

2.1.2 Rivers, streams, estuaries and wetlands

The subject land is located within the Central Tablelands LLS region and the Hawkesbury Catchment Management Area (CMA). The closest major waterbody is Lake Wallace located approximately 200 metres south-east of the development footprint. The closest major river is Coxs River which flows parallel to the proposed transmission line and flows into Lake Wallace, joining Pipers Flat Creek immediately to the east of the subject site.

Several watercourses dissect the subject land, including; Pipers Flat Creek, which is a 5th order (Strahler method) watercourse which flows west to east through the subject land and has been designated a 'Poor' freshwater fish community status grade (DPI 2021). Other mapped waterways include one unnamed 3rd order watercourse, one unnamed 2nd order watercourse and multiple unnamed 1st order watercourses.

Of most relevant to the Project are two unnamed 1st order drainage lines, both of which are ephemeral, flowing east to west across a predominantly cleared portion of the subject site and join within it to form a 2nd order drainage line, which is also ephemeral. These drainage lines have been modified through historical land use activities; namely, the construction of onsite farm dams and/or road/vehicle track construction. These drainage lines are ephemeral and while some minor degree of remaining channel form is discernible in limited sections, due to the level and extent of modification (vegetation clearing, dam construction, and historical land use) they no longer function as ephemeral waterways but simply as drainage lines as the lowest points in the landscape and do not sustain aquatic habitats and are typically lacking native riparian vegetation structures particularly in their downstream extents and surrounding the dams.

Pipers Flat Creek and the unnamed 3rd order tributary are mapped as Key Fish Habitats as part of broad scale mapping of the Hawkesbury Nepean Catchment published by the NSW Department of Primary Industries (DPI) within the subject land (DPI 2021).

No local wetlands were identified within the subject land or development footprint. Two reservoirs are situated within 300 metres of the subject land, both of which contain some native vegetation. The native vegetation observed in these freshwater systems is made up of a range of water dependent or tolerant grasses, sedges, herbs and rushes, with a moderate cover of weeds also present. These reservoirs are not included in the DoI of Australia (DAWE 2004) and are not classified as Ramsar Wetlands.

Ramsar wetlands are representative, rare or unique wetlands, or are important for conserving biological diversity. They are included on the List of Wetlands of International Importance developed under the Ramsar convention. No Ramsar Wetlands or "Important Wetlands" are located within the local area. The closest "Important Wetland" is situated over 60 kilometres south-east of the subject land and the closest Ramsar Wetland is located approximately 120 kilometres south-east of the subject land.

2.1.3 Habitat connectivity

The subject land does not form part of any recognised biodiversity corridors, flyways or significant habitat connectivity features.

The primary connectivity features of the subject land consist of a small patch of native vegetation in the north-west and a large patch of native vegetation located within the subject land (in the location of the proposed transmission line, between Brays Lane and the existing rail corridor) and Pipers Flat Creek, a 5th order watercourse that flows through the subject land. These connectivity features provide breeding, foraging and dispersal resources for terrestrial and arboreal mammals, flying mammals, and avifauna. Habitat fragmentation occurs across the subject land, however connectivity is preserved through bushland extending west towards Ben Bullen State Forest and riparian vegetation associated with Pipers Flat Creek. Across the broader landscape, the subject land exists on the fringes of a larger patch of native vegetation extending north-west of the subject land.

Aquatic habitat corridors for fish species across the subject land include Pipers Flat Creek and associated tributaries. Given the extent of modification to habitats along the first and second order waterways identified as being interrupted by the series of inline dams, most particular the barrier to fish passage presented by the dams, limit available connectivity along these specific drainage lines. The Vegetated Riparian Corridors (VRZ) identified within the subject land may also provide movement and dispersal areas for semi-terrestrial species, such as amphibians.

2.1.4 Geological features

There were no recorded karst, caves, crevices, cliffs or other areas of geological significance within the subject land.

Ben Bullen State Forest, which is located within the 1,500 metre buffer area surrounding the subject land, may contain areas of geological significance given the mountainous terrain and catchment areas present.

2.1.5 Areas of outstanding biodiversity value

Under the BC Act, the Minister for the Environment has the power to declare Areas of Outstanding Biodiversity Value (AOBVs). To date no AOBVs have been declared within the development footprint or subject land.

2.1.6 NSW (Mitchell) Landscape

The subject land occurs within the Capertee Plateau Mitchell Landscape (Mitchell 2002). This landscape is characterised by wide valleys, low rolling hills below sandstone cliffs on Permian conglomerates, sandstones, and shales with coal at the base of the Sydney Basin and exposure of underlying Devonian shale, siltstone or quartzite. The general elevation is between 800 and 1000 metres and the local relief is approximately 100 to 120 metres.

Common vegetation communities found in this landscape are woodlands typically consisting of Rough-barked Apple *Angophora floribunda*, Red Stringybark *Eucalyptus macrorhyncha*, Red Box *Eucalyptus polyanthemos*, Yellow Box *Eucalyptus melliodora*, Blakely's Red Gum *Eucalyptus blakelyi* in open valleys, Scribbly Gum *Eucalyptus sclerophylla*, Red Stringybark Red Box and Broad-leaved Ironbark *Eucalyptus fibrosa* on talus slopes, and Silvertop Ash *Eucalyptus sieberi* and Sydney Peppermint *Eucalyptus piperita* on sandstone peaks.

2.1.7 Hydrology

The subject land is mapped on the Groundwater Dependent Ecosystems (GDE) Atlas as containing High and Moderate Potential Terrestrial GDEs (BOM 2021). Two plant communities, *Black Gum grassy woodland of damp flats and drainage lines of the eastern Southern Tablelands, South Eastern Highlands Bioregion* and *Broad-leaved Peppermint - Ribbon Gum grassy open forest in the north east of the South Eastern Highlands Bioregion*, that are known to be GDEs are mapped within the subject land (further discussed in section 3 of this report).

One watercourse, Pipers Flat Creek, within the subject land is designated on the Biodiversity Values Map (DPIE 2021b) as "Protected Riparian Land".

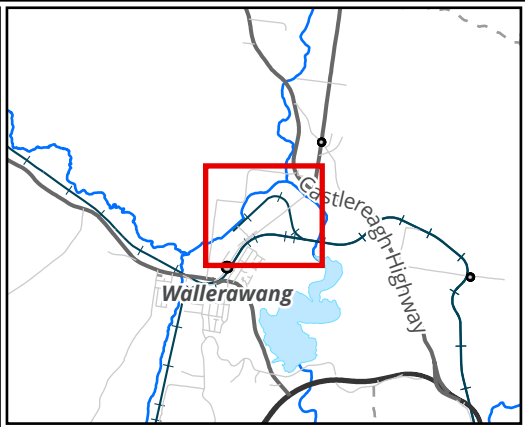
2.1.8 Additional landscape features

The subject land and 1,500 metre assessment area do not contain any soil hazard features or other additional features that are required to be assessed according to any Secretary's Environmental Assessment Requirements.

2.2 Native vegetation cover

In accordance with section 3.2 of the BAM, native vegetation cover must be estimated for a 1,500 metre buffer around the subject land to determine the landscape context of the subject land. The extent of native vegetation on the subject land and immediate surrounds was mapped using State Vegetation Type Map: Central Tablelands Region Version 1.0. VIS_ID 4778 (DPIE 2018), with edits made to the layer to improve line-work and where obvious changes to vegetation extent had occurred.

The total mapped area of the 1,500 metre buffer area around the subject land is 1,503 hectares, with the area of native vegetation mapped within the buffer being 427 hectares. This is a native vegetation cover of approximately 29% (>10 –30 % class as defined in Section 3.2.3 of the BAM) and this value was entered into the BAM Calculator.



Legend

- Subject land
- Development site
- Development footprint
- IBRA Region/Sub-region

HydroLine stream order

- 1
- 2
- 3
- 4
- 5
- 6
- 7

HydroLine stream order buffers

- 1
- 2
- 3
- 5
- 6

Mitchell landscapes

- Cpt,Capertee Plateau

Figure 2 Site map

0 50 100 150 200 250

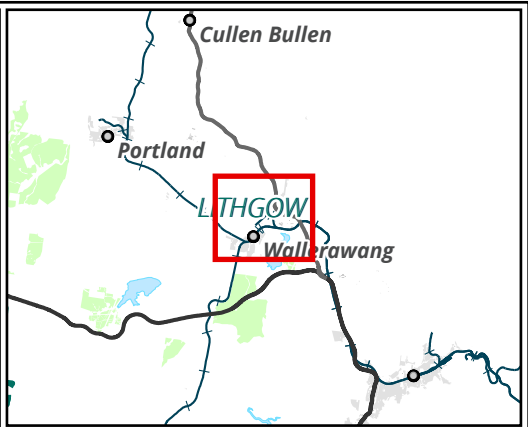
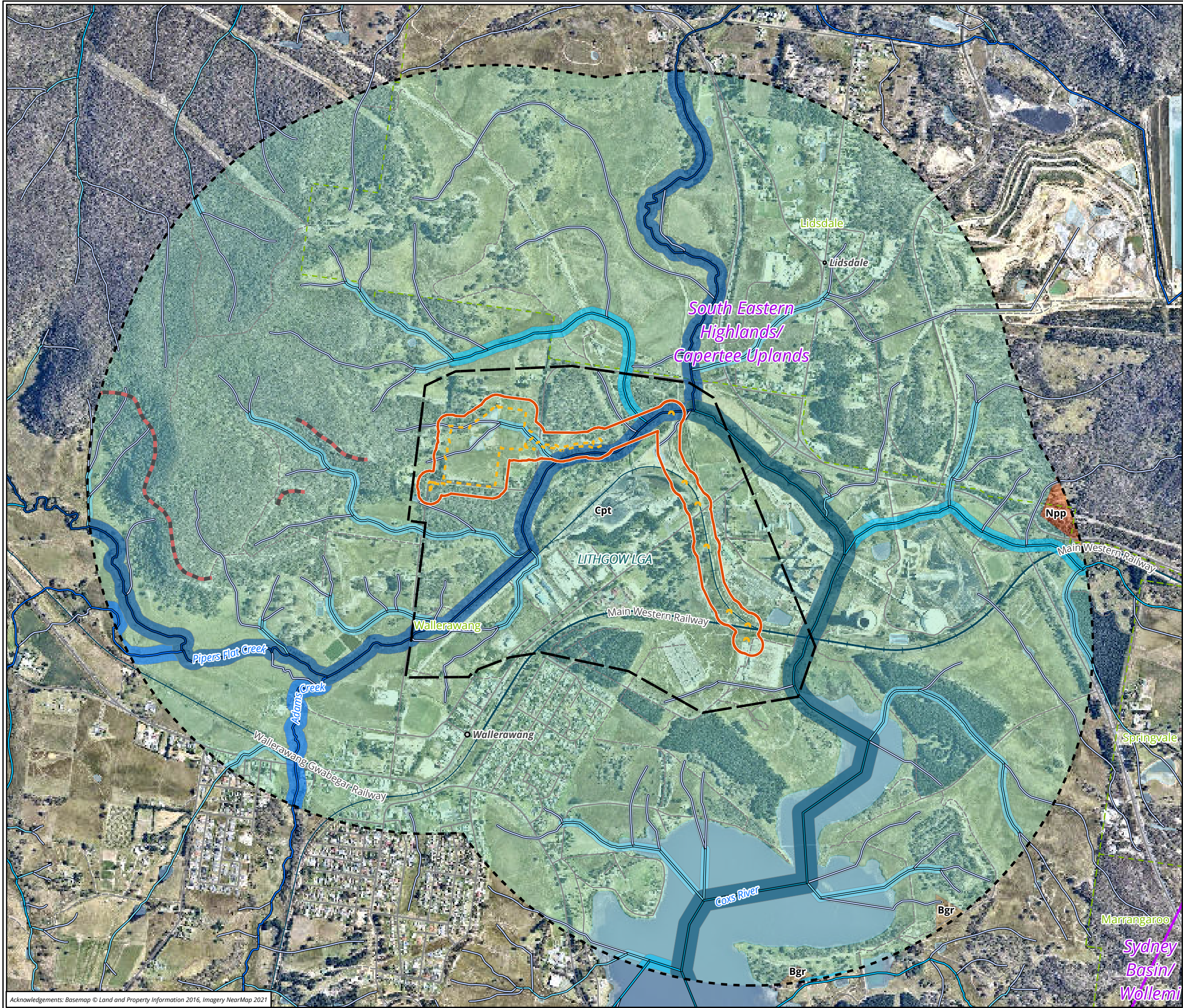
Metres

Scale: 1:6,000 @ A3

Coordinate System:
GDA 1994 MGA Zone 56

biosis

Matter: 34343, Date: 15 September 2022
GIS: AM, Checked by: PP, Last edited by: amackegard
Location: P:\34300s\34343\Mapping\34343_BDAR2020.aprx
Layout: 34343_F2_Sitemap



Legend

- Subject land
- Development site
- Development footprint
- Assessment area
- IBRA Region/Sub-region
- Cliff top

HydroLine stream order

- 1
- 2
- 3
- 4
- 5
- 6

Strahler stream order buffers

- 1
- 2
- 3
- 4
- 5
- 6

Mitchell landscapes

- Bgr, Bathurst Granites
- Cpt, Capertee Plateau
- Npp, Newnes Plateau

Figure 3 Location map

0 120 240 360 480 600

Metres

Scale: 1:16,000 @ A3

Coordinate System:

GDA 1994 MGA Zone 56



Matter: 34343, Date: 15 September 2022
GIS: AM, Checked by: PP, Last edited by: amackegard
Location: P:\34300s\34343\Mapping\34343_BDAR2020.aprx
Layout: 34343_F3_Location

3 Native vegetation

The proposed development is located within a mosaic of agricultural and environmental lands. The environmental lands are situated along watercourses, reserves or roads and contain native woodland vegetation and terrestrial and aquatic fauna habitat features. However, the predominantly linear nature of these reserves means that they are subject to edge effects and are symptomatic of past disturbances that have occurred more broadly in the landscape associated with land clearing, irrigation development, cropping, livestock grazing and weed invasion.

The subject land supports 20.71 hectares of native vegetation with varying levels of disturbance. As such, the Project's development footprint can be defined as three distinctly different board vegetation types, medium, low and disturbed. The medium quality native vegetation, which was also deemed the highest quality, was limited to isolated patches located with the North West corner of the Lot where the BESS facility is proposed and a small section of the proposed transmission easement (Figure 5). This vegetation type contained large trees, an understorey with most of the structural components still intact and a number of species that characterise the PCT. The lowest quality and disturbed patches either support remnant canopy tree cover but generally have few large trees and have a modified understorey invaded by introduced pasture grasses and weeds or consists of exotic grasslands where the native canopy has been removed, such as the recorded railway corridor located in the eastern portion of the transmission line easement.

3.1 Native vegetation extent

The extent of native vegetation, TECs and vegetation integrity within the subject land was determined using the results of site investigations and Section 4 of the BAM (DPIE 2020a).

Figure 4 shows the native vegetation extent recorded within the subject land, development footprint and 1,500 metre assessment area, as assessed during field investigations undertaken in March and June 2021 as well as 15 July 2022. The figure includes all areas of native vegetation (native ground cover and areas with canopy).

3.1.1 Changes to mapped native vegetation extent

There were some differences between the actual native vegetation extent and that visible on aerial imagery. Portions of the development footprint had previously been mapped as cleared land by DPIE (DPIE 2018) that in actuality included patches of native vegetation. This was particularly relevant for vegetation identified within the North-Western portion of the proposed location of the BESS facility.

3.1.2 Areas that are not native vegetation

Parts of the subject land mapped as Urban Native / Exotics with no native over storey or mid storey cover met the definition of non-native vegetation. Areas not shown as native vegetation cover within the subject land, and which do not provide habitat for threatened species, are not included for further assessment in accordance with Section 5.1.1.5 of the BAM (DPIE 2020a). Non-native vegetation which does provide habitat for threatened species is required to be assessed.

3.2 Plant community types and ecological communities

3.2.1 Review of existing information

Existing information regarding native vegetation was reviewed to inform field investigations including:

- Existing vegetation mapping, including State Vegetation Type Map: Central Tablelands Region Version 1.0. VIS_ID 4778 (DPIE 2018).
- Database searches.

Based on the results of the background review and the requirements of the BAM with respect to this BDAR, appropriate surveys were designed for the subject land and development footprint.

3.2.2 Field investigation

A systematic biodiversity assessment was conducted 17-18 March 2021, 16 June 2021, 12 November 2021 and 15 July 2022 by Paul Price (Senior Restoration Ecologist, Accredited Assessor #BAAS18089), under the terms of Biosis' Scientific Licence issued by the Environment Energy and Science (EES) under the *National Parks and Wildlife Act 1974* (SL100758, expiry date 31 March 2022). Fauna survey was conducted 17-18 March 2021 by Anthony Cable (Senior Ecologist and Technical Lead) and 10, 15 and 16 November 2021 by Sarah Allison (Project Zoologist) and Zoe Goold (Project Zoologist) under approval 11/355 from the NSW Animal Care and Ethics Committee (expiry date 31 January 2022).

The BAM assessment was carried out by Paul Price and overseen by Accredited Assessor Rebecca Dwyer (#BAAS17067).

The development site was surveyed in accordance with the BAM (DPIE 2020a), which involved:

- The identification and mapping of Plant Community Types (PCTs) according to the structural definitions held in the BioNet Vegetation Classification database, with reference to information provided in State Vegetation Type Map: Central Tablelands Region Version 1.0. VIS_ID 4778 (DPIE 2018).
- Undertaking floristic plots within each vegetation zone in accordance with Section 4 of the BAM (DPIE 2020a), considering varying condition states and avoidance of ecotones, areas of disturbance, and edges.
- The identification of native and exotic plant species, according to the Flora of NSW (Harden 1992, 1993, 2000, 2002) with reference to recent taxonomic changes.
- Targeted searches for plant species of conservation significance according to the *Surveying threatened plants and their habitats* (DPIE 2016b).
- Incidental observations using the “random meander” method (Cropper 1993).
- Identification of previous and current factors threatening the ecological function and survival of native vegetation within and adjacent to the development site.
- An assessment of the natural resilience of the vegetation of the Site.
- Identifying and mapping fauna habitats (e.g., hollow-bearing trees, rock outcropping etc.), assessing their condition and value to threatened fauna species, and considering threatened species' habitat constraints.
- Observations of animal activity and searches for indirect evidence of fauna (such as scats, nests, burrows, hollows, tracks, scratches and diggings).

- Targeted surveys for threatened fauna species.

The conservation significance of plant species and plant communities was determined according to:

- BC Act for significance within NSW.
- EPBC Act for significance within Australia.

Detailed field mapping and collection of GPS point locations were conducted using hand-held (uncorrected) tablet units (Samsung Galaxy Tab X) running the ArcGIS Collector and Field Maps applications, using the inbuilt GPS, and aerial photo interpretation. Spatial locations are therefore considered to have an accuracy of generally ± 5 metres.

Areas of native vegetation for which a PCT could validly be assigned were identified and delineated in the field, and their condition determined and assigned. Identification of PCTs within the subject land was confirmed with reference to the community profile descriptors (and diagnostic species tests) held within the State Vegetation Type Map: Central Tablelands Region Version 1.0. VIS_ID 4778 (DPIE 2018) and NSW BioNet Vegetation Classification database (DPIE 2021a). Locations of floristic plots surveyed are shown on Figure 6.

Further details of targeted survey for threatened flora and fauna species are provided in Section 4.2 below.

3.2.3 Plant community types

The following PCTs were assessed as present within the subject land:

- PCT 677 - *Black Gum grassy woodland of damp flats and drainage lines of the eastern Southern Tablelands, South Eastern Highlands Bioregion* (Table 2).
- PCT 732 - *Broad-leaved Peppermint - Ribbon Gum grassy open forest in the north east of the South Eastern Highlands Bioregion* (Table 3).

Table 2 to Table 3 provide detailed descriptions of the two PCTs recorded within the subject land. PCTs recorded within the subject land are shown on Figure 5 and Figure 6.

Table 2 PCT 677 - Black Gum grassy woodland of damp flats and drainage lines of the eastern Southern Tablelands, South Eastern Highlands Bioregion

677 - Black Gum grassy woodland of damp flats and drainage lines of the eastern Southern Tablelands, South Eastern Highlands Bioregion	
Common name	<i>Black Gum grassy woodland of damp flats and drainage lines of the eastern Southern Tablelands, South Eastern Highlands Bioregion</i>
Vegetation formation	Grassy Woodlands
Vegetation class	Subalpine Woodlands
Extent within subject land	5.50 ha
Condition	This community at the subject land was recorded in two conditional states of moderate and low.
Description	Low condition PCT 677 (approx. 3.54 ha within the subject land) was primarily recorded at the bushland/urban native exotic interface (Figure 5). As a result, the recorded low conditional state lacked both structural and floristic diversity primarily within the mid and ground layer strata. The upper stratum consisted of a dominant canopy of Black Gum <i>Eucalyptus aggregata</i> supported by a reduced native mid storey stratum of scattered Silver Wattle <i>Acacia dealbata</i> . Other recorded flora species within an observed

677 - Black Gum grassy woodland of damp flats and drainage lines of the eastern Southern Tablelands, South Eastern Highlands Bioregion

	lower mid storey stratum were primarily exotic, with species such as Hawthorn <i>Crataegus monogyna</i>, Sweet Briar <i>Rosa rubiginosa</i> and Blackberry <i>Rubus anglocandicans</i> being most common. The reduced native ground layer stratum was confirmed to contain a number of native grasses and forb's with species such as Tussock Grass <i>Poa labillardierei</i> var. <i>labillardierei</i>, Bidgee-widgee <i>Acaena novae-zelandiae</i>, Common Woodruff <i>Asperula conferta</i> and Weeping Grass <i>Microlaena stipoides</i> var. <i>stipoides</i>. As a result of the disturbed nature of the conditional state, exotic species dominated the stratum with species such as Phalaris <i>Phalaris aquatica</i>, Cocksfoot Grass <i>Dactylis glomerata</i> and Paspalum <i>Paspalum dilatatum</i> being recorded. Moderate condition PCT 677 (approx. 0.97ha within the subject land) was recorded at the eastern portion of the proposed transmission alignment (Figure 5). The upper stratum consisted of a dominant canopy of Black Gum with occasional representations of Black Sally <i>Eucalyptus stellulata</i>. A native mid storey stratum was not present within the conditional state. The mid storey stratum consisted of primarily of Hawthorn, Small-leaved Privet <i>Ligustrum sinense</i> and Blackberry. The ground layer stratum was well represented by mixed dominance of both native and exotic flora. Native species recorded with the stratum included Common Everlasting <i>Chrysocephalum apiculatum</i>, Longhair Plumegrass <i>Dichelachne crinita</i>, Wattle Matt-rush <i>Lomandra filiformis</i> subsp. <i>coriacea</i>, Tussock Grass, Wild Sorghum <i>Sorghum leiocladum</i>, Kangaroo Grass <i>Themeda triandra</i> and Weeping Grass. Exotic flora species recorded within the stratum were primarily limited to soft wood perennials and grasses with recorded species such as Branched Centaury <i>Centaureum tenuiflorum</i>, Flaxleaf Fleabane <i>Cirsium vulgare</i>, Serrated Tussock <i>Nassella trichotoma</i> and Phalaris.
Survey effort	PCT 677 Low : One BAM plot/transect PCT 677 Moderate : One plot/transect (Figure 6)
Justification of PCT	The subject land is within the South Eastern Highlands IBRA bioregion. The community occurs as an open woodland with a densely grassy groundlayer and a sparse to absent shrub layer. The landscape position predominantly occurs on drainage lines and associated flats. Dominance of Black Gum, White Sally and/or Black Sally trees. The BioNet PCT Identification tool identified PCT 677 from the species recorded at the subject land.
Justification of condition	Low conditioned PCT 677 tree species richness (2) and percentage tree cover (10.1 %) was recorded to be distinctly below the PCT benchmark of 4 and 26% respectively. Furthermore, floristic surveys failed to document a shrub species richness or percentage cover, thus failing to meet that of the PCT benchmark requirements of 8 species and 9% cover. Similar results were also recorded within the other characteristic growth forms, by where the Grass and Grass-like growth form (7 species, 18.1% cover) failed to meet that of the PCT benchmarks of 8 species and 46% cover and the forb growth form (7 species, 0.7% cover) failed to meet the PCT benchmarks of 18 species and 11% cover. The growth forms of 'Fern' and "Other" were not recorded within the floristic plot. Four high threat weeds (HTW) (Hawthorn, St. Johns Wort <i>Hypericum perforatum</i>, Paspalum and Sweet Briar) were also recorded within the conditional state equating to a cover of 9.3%.

677 - Black Gum grassy woodland of damp flats and drainage lines of the eastern Southern Tablelands, South Eastern Highlands Bioregion

As a result of the reduced species diversity, low native cover abundance and abundance of high threat weed species, the conditional state of 'low' is justified.

The moderate condition PCT 677 tree species richness (2) and percentage tree cover (5.1 %) was recorded to be distinctly below the PCT benchmark of 4 and 26% respectively. Again, floristic surveys failed to document a shrub species richness or percentage cover, thus failing to meet that of the PCT benchmark requirements of 8 species and 9% cover. The bulk of the floristic diversity of the conditional state was recorded within the Grass and Grass-like growth form by where 14 species with a cover of 29.1% were recorded. Whilst exceeding that of the species richness benchmark of 8, the conditional state failed to meet the required benchmark percentage cover of 46%. Whereas forb growth forms (10 species, 0.9% cover) failed to meet the PCT benchmarks of 18 species and 11% cover. In similarity to that of the low conditional state, the growth forms of 'Fern' and "other" were not recorded within the floristic plot. Four HTW (Hawthorn, St. Johns Wort, Paspalum and Sweet Briar) were also recorded within the conditional state equating to a percentage cover of 1.2 %.

As a result of the recorded species diversity/ cover abundance within the canopy and ground layer stratum and the reduced cover of HTW, the conditional state of 'moderate' is justified.

TEC Status

Not listed under State or Commonwealth legislation.

Estimate of percent cleared value of PCT (BioNet)

95% (DPIE 2021a).

PCT 677 -Low condition



677 - Black Gum grassy woodland of damp flats and drainage lines of the eastern Southern Tablelands, South Eastern Highlands Bioregion

PCT 677 –Moderate condition



Table 3 PCT 732 - Broad-leaved Peppermint - Ribbon Gum grassy open forest in the north east of the South Eastern Highlands Bioregion

PCT 732 - Broad-leaved Peppermint - Ribbon Gum grassy open forest in the north east of the South Eastern Highlands Bioregion

Common name	<i>Broad-leaved Peppermint - Ribbon Gum grassy open forest in the north east of the South Eastern Highlands Bioregion</i>
Vegetation formation	Grassy Woodlands
Vegetation class	Southern Tableland Grassy Woodland
Extent within subject land	16.21ha
Condition	This community at the subject land was recorded in three conditional states of non-offsetable grasslands (NOG), scattered trees and moderate.
Description	The PCT 732 NOG (approx. 10.39 ha) was primarily recorded within proposed battery storage area, located in the western portions of the development footprint (Figure 5). As a result of the historical clearing and pasture improvement, the recorded NOG conditional state lacked both native structural and floristic diversity within all strata. A distinguishable canopy layer was not recorded within the vegetation conditional state. Additionally, a native shrub layer was limited to occasional specimens of Sifton Bush <i>Cassinia sifton</i> only. The ground layer stratum was recorded to contain a reduced representation of native grass and forbs species dominated by a composite of exotic pasture species. Native flora species included in the stratum included Common Couch <i>Cynodon dactylon</i> , <i>Deyeuxia quadriseta</i> , Paddock Lovegrass <i>Eragrostis leptostachya</i> , Hairy Panic <i>Panicum effusum</i> and Variable Raspwort <i>Haloragis heterophylla</i> . Exotic flora recorded within the stratum included Browntop Bent, Sweet Vernal Grass <i>Anthoxanthum odoratum</i> , <i>Panicum gilvum</i> , Lamb's Tongues <i>Plantago lanceolata</i> , Catsear <i>Hypochaeris</i>

PCT 732 - Broad-leaved Peppermint - Ribbon Gum grassy open forest in the north east of the South Eastern Highlands Bioregion

	<i>radicata</i> and Rat's Tail Fescue <i>Vulpia myuros</i>. The PCT 732 scattered trees (approx. 0.05 ha) was primarily recorded in the north east corner of subject area (Figure 5). As a result of the historical clearing and pasture improvement, the recorded scattered trees conditional state lacked both native structural and floristic diversity within all strata. As such, distinguishable native mid and ground layer stratum were not recorded within the vegetation conditional state. The ground layer stratum was recorded to contain a reduced representation of native grass and forbs species dominated mixture of exotic pasture species. Native flora species included in the stratum included Common Couch and Variable Raspwort. Exotic flora recorded within the stratum included <i>Paspalum dilatatum</i>, Sweet Vernal Grass, Lamb's Tongues and Rat's Tail Fescue. Moderate condition PCT 732 (approx. 7.98 ha) was recorded within two locations within the development footprint area (Figure 5). The upper stratum consisted of a mixed canopy of Broad-leaved Peppermint <i>Eucalyptus dives</i>, Brittle Gum <i>Eucalyptus mannifera</i> subsp. <i>mannifera</i> and White Sally <i>Eucalyptus pauciflora</i>. As a result of the historical clearing and under scrubbing, the native mid storey stratum was characterised by a low open shrub layer represented by grouped stands of Native Blackthorn <i>Bursaria spinosa</i> subsp. <i>lasiophylla</i>, Dolly Bush <i>Cassinia aculeata</i>, Prickly Teatree <i>Leptospermum continentale</i> and Sifton Bush. The ground layer stratum was observed to contain a number of low shrubs, grasses and forb species. Native flora recorded within the vegetation type included <i>Bossiaea buxifolia</i>, Button Everlasting <i>Coronidium scorpioides</i>, Wattle Matt-rush, Weeping Grass, Ringed Wallaby Grass <i>Rytidosperma caespitosum</i> and Sticky Everlasting <i>Xerochrysum viscosum</i>. Exotic flora species recorded within the conditional state included the HTW's of Browntop Bent <i>Agrostis capillaris</i>, St. Johns Wort, Sweet Briar and Blackberry.
Survey effort	PCT 732 NOG : three BAM plot/transect PCT 732 scattered trees : One plot/transect PCT 732 Moderate : One plot/transect (Figure 6)
Justification of PCT	The subject land is within the South Eastern Highlands IBRA bioregion. The community occurs as an open forest with a sparse shrub layer and grassy groundcover. The landscape position predominantly occurs on undulating granite tablelands of the upper Cocks and Abercrombie River valleys. Dominance of Broad-leaved Peppermint trees. The subject land occurs between 600 m and 1100 m elevation. The BioNet PCT Identification tool identified PCT 732 from the species recorded at the subject land.
Justification of condition	PCT 732 NOG did not record a canopy or sub canopy with the conditional state across the three replicate plots, thus failing the required tree species richness and percentage tree cover PCT benchmark of 4 and 25% respectively. The recorded shrub species richness (1) and percentage cover (0.4%) across the three replicates also failed to meet that of the PCT benchmark requirements of 7 species and 5% cover. Similar results were also recorded within the other characteristic growth forms, by where the Grass and

PCT 732 - Broad-leaved Peppermint - Ribbon Gum grassy open forest in the north east of the South Eastern Highlands Bioregion

Grasslike growth form across the three replicates (3 species, 23.6% cover) failed to that the PCT benchmarks of 9 species and 37% cover.

The forb growth form across the three replicates provided a mean species richness of 1 and a percentage cover of 0.1%. As such, the conditional state failed to that the forb growth form PCT benchmarks of 16 species and 9% cover. The growth forms of 'Fern' and "other" were not recorded within the three floristic plots. Four HTW's (Sheep Sorrel *Acetosella vulgaris*, Browntop Bent, St. Johns Wort and Paspalum) were also recorded within the conditional state equating to a mean cover of 15.3% across the three replicates. As a result of the reduced species diversity, low native cover abundance and abundance of high threat weed species and a calculated vegetation integrity (VI) score of 0.2 (Table 6) the conditional state of 'NOG' is justified.

PCT 732 scattered trees conditional state tree species richness (1) and percentage tree cover (5%) were recorded to be below that of the PCT benchmark of 4 and 25% respectively. A native mid story stratum was not observed within the vegetation conditional state. The 'grass and grass like' growth form recorded a species richness (2) and percentage tree cover (1.1 %), thus failing to meet that of the PCT benchmarks of 9 species and a percentage cover 37%. Similar results were recoded within the 'forb' growth form, where the species richness of 2 and percentage cover of 0.2% failed to meet the PCT growth form benchmarks of 16 species and 9% cover. Again, due to the disturbed nature of the conditional type, the growth forms of 'fern' and 'other' were not recorded thus failing that of their associated PCT benchmarks. Four HTW's (Sheep Sorrel, St. Johns Wort, Blackberry *Rubus anglocandicans* and Paspalum) were also recorded within the conditional state with a percentage cover of 35.3%. As a result of the recorded species diversity/ cover abundance within all recorded strata the conditional state of 'scattered trees' is justified.

The moderate condition PCT 732 tree species richness (3) and percentage tree cover (20.5 %) was recorded to be below that of the PCT benchmark of 4 and 25% respectively. Similar results were also documented in association with the shrub growth form for the conditional state, by where a recorded species richness of 5 and percentage cover of 5.5% failed to meet the PCT benchmark condition of 7 species, yet exceeded that of the PCT benchmark percentage cover requirements by 0.5%.

The bulk of the floristic diversity of the conditional state was recorded within the Grass and Grasslike growth form by where 10 species with a cover of 74.1% were recorded. These results exceeded that of the species richness benchmark of 9 and percentage cover of 37%. The forb growth form species richness of 12 and percentage cover of 1.6% was recorded to be below that of the PCT benchmark of 16 and 9% respectively. The growth forms of 'Fern' and "other" were not recorded within the floristic plot. Six HTW (Sheep Sorrel, Browntop Bent, St. Johns Wort Paspalum, Sweet Briar and Blackberry) were also recorded within the conditional state equating to a cover of 4.7%.

As a result of the recorded species diversity/ cover abundance within all recorded strata and the reduced cover of HTW, the conditional state of 'moderate' is justified.

TEC Status

Not listed under State or Commonwealth legislation

PCT 732 - Broad-leaved Peppermint - Ribbon Gum grassy open forest in the north east of the South Eastern Highlands Bioregion

Estimate of percent cleared value of PCT (BioNet) 65 % (DPIE 2021a).

PCT 732 NOG condition



PCT 732 - Scattered trees condition



PCT 732 - Broad-leaved Peppermint - Ribbon Gum grassy open forest in the north east of the South Eastern Highlands Bioregion

PCT 732 –Moderate condition



3.2.4 Threatened ecological communities

Vegetation identified within the subject land was not found to form part of any TEC under the BC Act or EPBC Act.

3.3 Vegetation integrity assessment

3.3.1 Vegetation zones and patch size class

PCTs within the subject land were assessed and stratified, based on broad condition state, into vegetation zones in accordance with Section 4.3 of the BAM. This resulted in four vegetation zones identified within the development footprint. Table 4 describes each of the zones, and provides details on the numbers of BAM floristic plots undertaken in each zone.

Patch size classes for each vegetation zone present within the subject land were assessed as per Section 4.3.2 of the BAM (DPIE 2020a) using a select process in ArcGIS. All native vegetation with a gap of less than 100 metres from the next area of native vegetation (or ≤ 30 metres for non-woody ecosystems), is considered a single patch, with a patch able to extend onto adjoining land.

The minimum patch size that was entered into the BAM-C was 101 hectares. Patch size classes for each vegetation zone are also outlined in Table 4 below.

Table 4 Vegetation zones within the subject land

Vegetation zone	Plant Community Type	Condition	BAM plots completed	Impact assessment area	Max. patch size development footprint
677_Low	677 - Black Gum grassy woodland of damp flats and drainage lines of the eastern Southern Tablelands, South Eastern Highlands Bioregion	Low	1	0.04 ha	>100 ha
677_Moderate	677 - Black Gum grassy woodland of damp flats and drainage lines of the eastern Southern Tablelands, South Eastern Highlands Bioregion	Moderate	1	0.23 ha	>100 ha
732_Moderate	732 - Broad-leaved Peppermint - Ribbon Gum grassy open forest in the north east of the South Eastern Highlands Bioregion	Moderate	1	0.78 ha	>100 ha
732_Scattered Trees	732 - Broad-leaved Peppermint - Ribbon Gum grassy open forest in the north east of the South Eastern Highlands Bioregion	Scattered trees	1	0.05 ha	>100 ha
732_NOG	732 - Broad-leaved Peppermint - Ribbon Gum grassy open forest in the north east of the South Eastern Highlands Bioregion	NOG	3	7.27ha	>100 ha

3.3.2 Vegetation integrity

Vegetation integrity, or condition, was assessed using data obtained from undertaking BAM plots within the vegetation zones, as per Section 4.3.4 of the BAM (DPIE 2020a). Plot data was collected via:

- A 20 m x 50 m quadrat and 50 m transect for assessment of site attributes and function.
- A 20 m x 20 m quadrat, nested within the larger quadrat for full floristic survey to determine composition and structure of the PCT.

The minimum number of BAM plots per vegetation zone was determined using Table 3 of the BAM (DPIE 2020a). A total of seven BAM plots have been completed within the vegetation zones present within the development footprint, details are provided in Table 5 and shown on Figure 6.

Table 5 BAM plots completed within the subject land

BAM plot reference	Vegetation zone	BAM plot reference	Vegetation zone
34343_Plot 1	677_Moderate	34343_Plot 5	732_NOG
34343_Plot 2	677_Low	34343_Plot 6	732_NOG

BAM plot reference	Vegetation zone	BAM plot reference	Vegetation zone
34343_Plot 3	732_Moderate	34343_Plot 7	732_Scattered trees
34343_Plot 4	732_NOG		

Assessment of vegetation integrity was undertaken using standard benchmark data as outlined in the BAM and held in the BioNet Vegetation Classification database. A list of flora species was compiled for each BAM plot completed and is included in Appendix 3. Records of all flora species will be submitted to EES for incorporation into the Atlas of NSW Wildlife.

3.3.3 Vegetation integrity score

Plot data was entered into the BAM calculator to determine vegetation integrity score. Plot data are presented in Appendix 3, with vegetation integrity scores for each vegetation zones provided in Table 6.

Table 6 Vegetation zone integrity scores

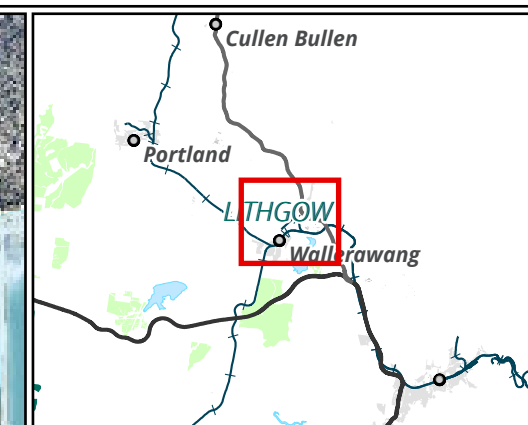
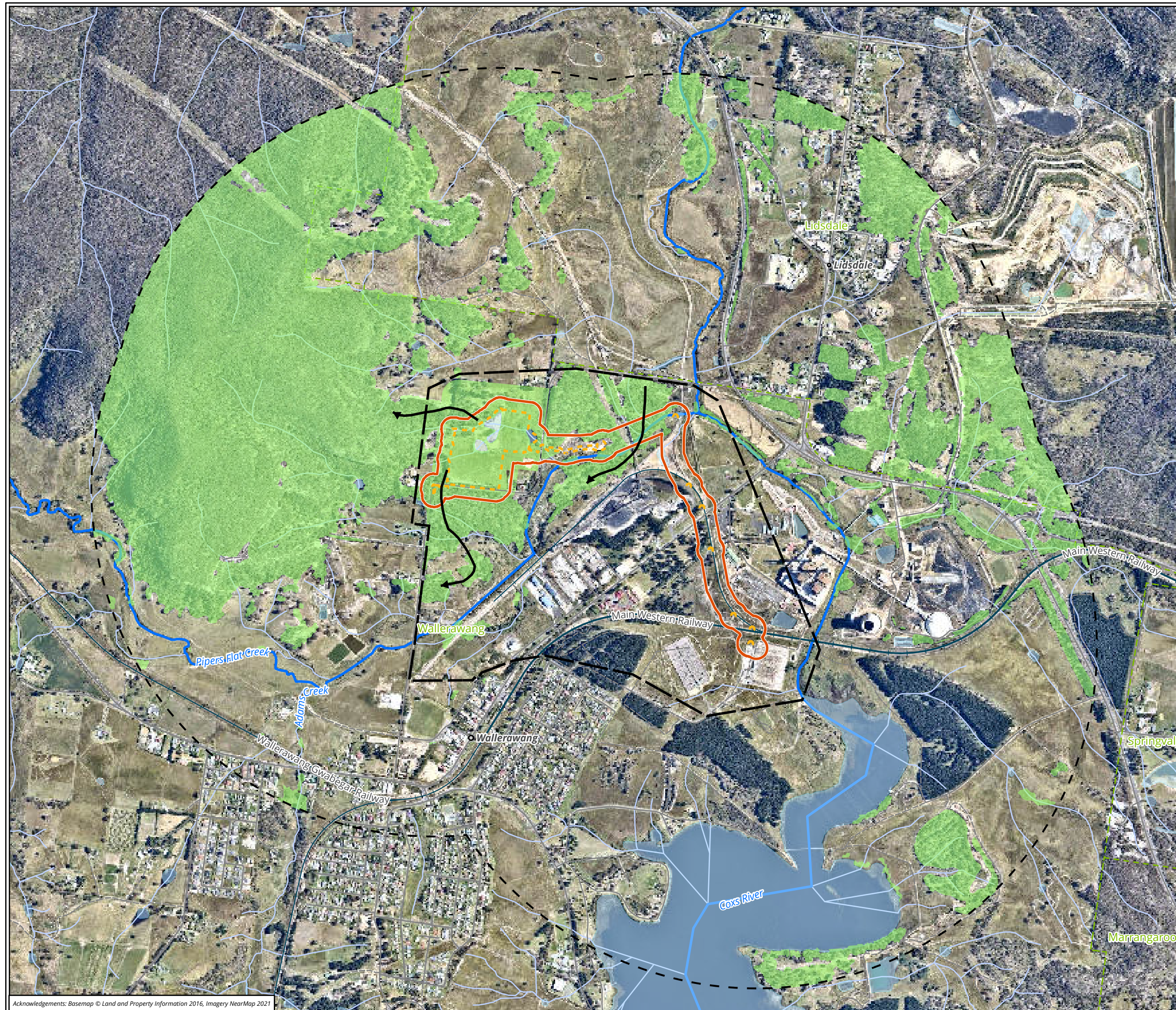
Vegetation zone	Composition score	Structure score	Function score	Vegetation integrity score*	IBRA subregion
677_Low	40.5	30.2	84.6	46.9	Capertee Uplands
677_Moderate	54.2	42.0	61.6	51.9	Capertee Uplands
732_Moderate	87.6	87.0	76.5	83.6	Capertee Uplands
732_NOG	10.2	36.5	0	0.2	Capertee Uplands
732_Scattered trees	4.5	2.7	4.7	3.9	Capertee Uplands

*Benchmark (pristine) condition vegetation would receive a VI score of 100.

As outlined in Section 9.2.1 of the BAM, an offset is required for impacts on native vegetation where the vegetation integrity score is:

- ≥ 15 where the PCT is representative of an endangered or critically endangered ecological community.
- ≥ 17 where the PCT is associated with threatened species habitat (as represented by ecosystem credits), or is representative of a vulnerable ecological community.
- ≥ 20 where the PCT is not representative of a TEC or associated with threatened species habitat.

As such, ecosystem credit offsets are not required for the vegetation zones 732_NOG and 732_Scattered trees due to the VI score of 0.2 and 3.9, respectively.



Legend

- Subject land
- Development site
- Development footprint
- Assessment area
- Habitat connectivity
- Native vegetation

Figure 4 Native vegetation extent

0 100 200 300 400 500

Metres

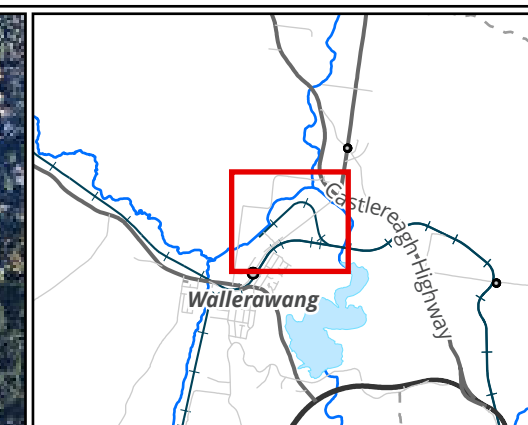
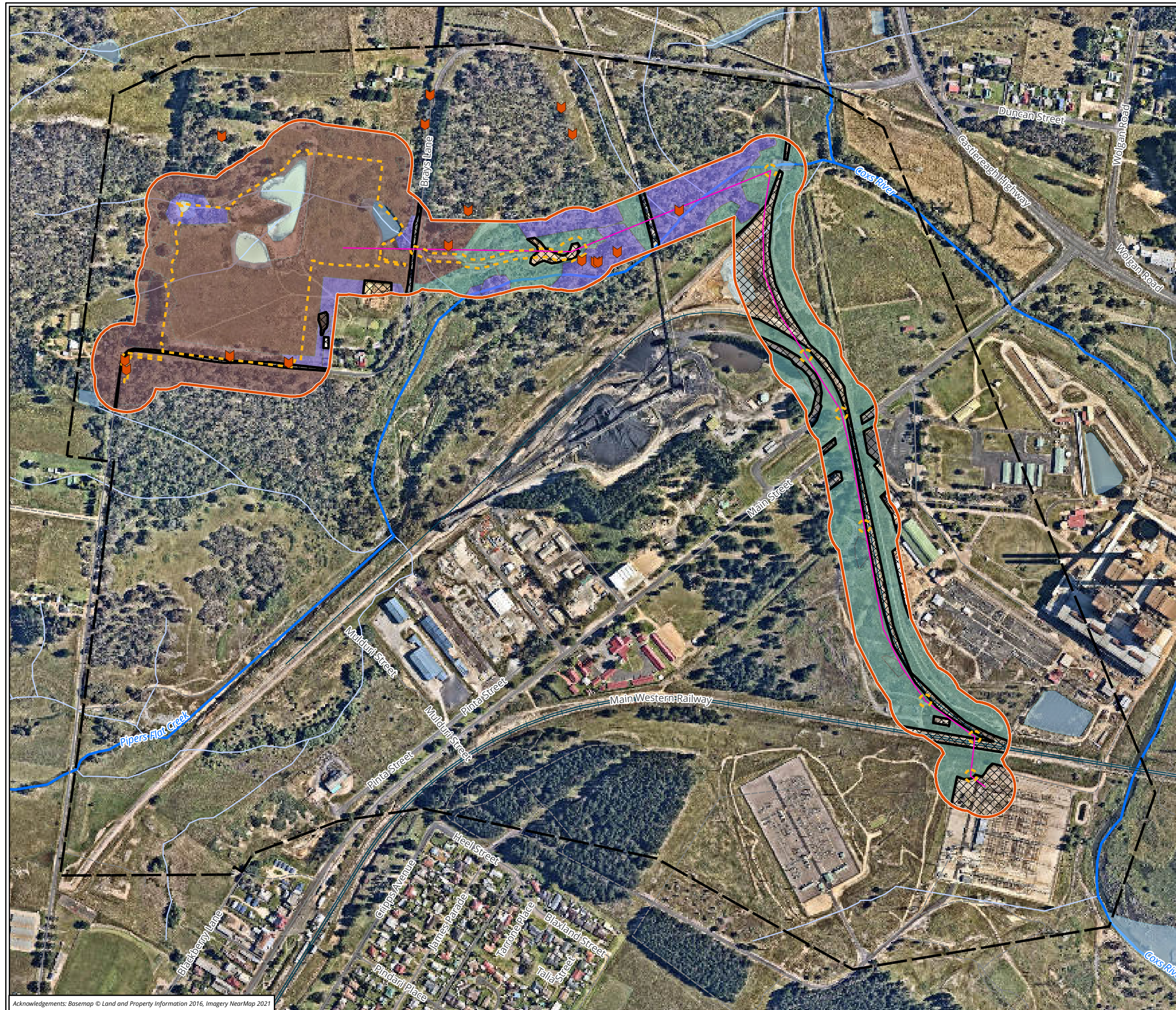
Scale: 1:16,000 @ A3

Coordinate System:

GDA 1994 MGA Zone 56



Matter: 34343, Date: 15 September 2022GIS: AM, Checked by: PP, Last edited by: amackegardLocation: P:\34300s\34343\Mapping\34343_BDAR2020.aprx Layout: 34343_F4_NativeVeg



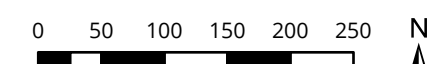
Legend

- Subject land
- Development footprint
- HDD and trenching
- 🌳 Hollow-bearing tree
- Cleared

Plant Community Type

- Urban Native/Exotic
- 677 - Black Gum grassy woodland of damp flats and drainage lines of the eastern Southern Tablelands, South Eastern Highlands Bioregion
- 732 - Broad-leaved Peppermint - Ribbon Gum grassy open forest in the north east of the South Eastern Highlands Bioregion

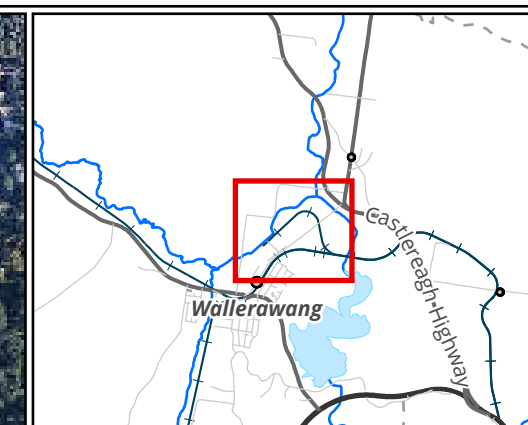
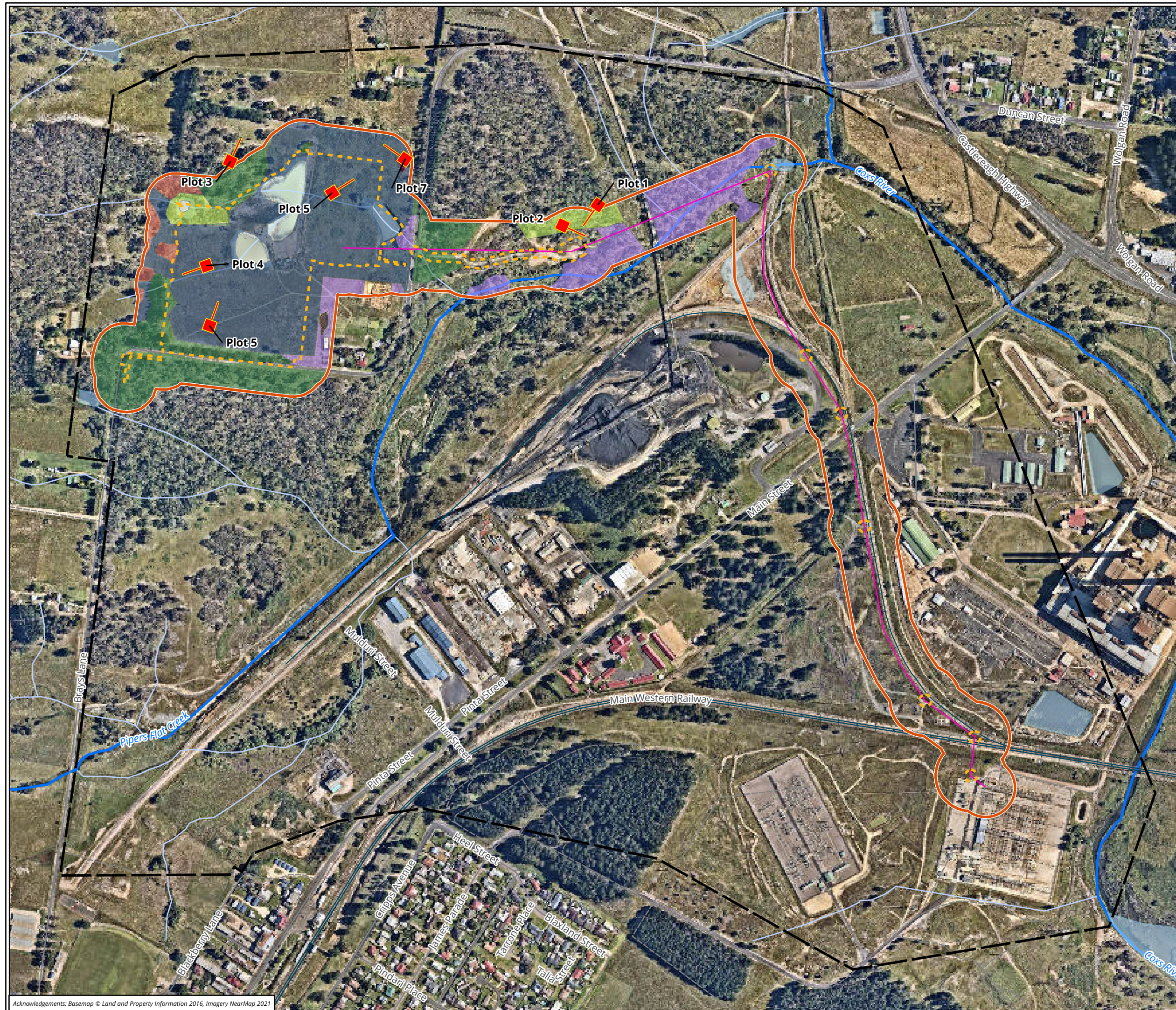
Figure 5 Vegetation within the subject land



Metres
Scale: 1:6,000 @ A3
Coordinate System:
GDA 1994 MGA Zone 56



Matter: 34343, Date: 15 September 2022
GIS: AM, Checked by: PP, Last edited by: amackegard
Location: P:\34300s\34343\Mapping\34343_BDAR2020.aprx
Layout: 34343_FS_BiosisVeg



- Legend**
- Subject land
 - Development site
 - Development footprint
 - HDD and trenching
 - BAM plot
- Vegetation Zones**
- 677-Low
 - 677-Moderate
 - 732-Low
 - 732-Moderate
 - 732-NOG
 - 732-Scattered Trees

Figure 6 Vegetation zones and plot locations

0 50 100 150 200 250
Metres
Scale: 1:6,000 @ A3
Coordinate System:
GDA 1994 MGA Zone 56



Matter: 34343, Date: 15 September 2022
GIS: AM, Checked by: PP, Last edited by: amackegard
Location: P:\34300s\34343\Mapping\34343_BDAR2020.aprx
Layout: 34343_F6_VegZones



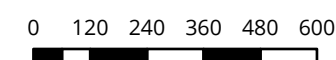
Legend

- Subject land
- Development site
- Development footprint
- Assessment area

Patch size

≥100ha (677 Low, 677 Moderate,
732 Low, 732 Moderate, 732 NOG,
732 Scattered trees)

Figure 7 Patch size



Metres
Scale: 1:16,000 @ A3
Coordinate System:
GDA 1994 MGA Zone 56



Matter: 34343, Date: 15 September 2022
GIS: AM, Checked by: PP, Last edited by: amackegard
Location: P:\34300s\34343\Mapping\34343_BDAR2020.aprx
Layout: 34343_F7_PatchSize

4 Threatened species

4.1 Predicted species (ecosystem credit species)

A list of predicted species (ecosystem credit species) expected to occur within the subject land was generated as per Section 5 of the BAM. Impacts to these species require assessment, however targeted survey is not required as these species are assumed to occur, based on the occurrence of the PCTs, habitat constraints, native vegetation cover in the landscape and calculated patch sizes. These species are identified as ecosystem credit species in the Threatened Biodiversity Data Collection (TBDC). Table 7 lists the ecosystem credit species that could not be discounted from using the subject land on occasion, based on geographical restrictions or a lack of suitable habitat.

These species were considered when prescribing management and mitigation measures for the Project.

Table 7 Ecosystem credit species (predicted species) with potential to occur

Species name	Common name
<i>Anthochaera phrygia</i>	Regent Honeyeater (foraging)
<i>Artamus cyanopterus</i>	Dusky Woodswallow
<i>Callocephalon fimbriatum</i>	Gang-gang Cockatoo (foraging)
<i>Chthonicola sagittata</i>	Speckled Warbler
<i>Climacteris picumnus victoriae</i>	Brown Treecreeper (eastern subspecies)
<i>Daphoenositta chrysoptera</i>	Varied Sittella
<i>Dasyurus maculatus</i>	Spotted-tailed Quoll
<i>Falsistrellus tasmaniensis</i>	Eastern False Pipistrelle
<i>Glossopsitta pusilla</i>	Little Lorikeet
<i>Grantiella picta</i>	Painted Honeyeater
<i>Hieraaetus morphnoides</i>	Little Eagle (foraging)
<i>Hirundapus caudacutus</i>	White-throated Needletail
<i>Hoplocephalus bungaroides</i>	Broad-headed Snake (foraging)
<i>Lathamus discolor</i>	Swift Parrot (foraging)
<i>Miniopterus orianae oceanensis</i>	Large Bent-winged Bat
<i>Neophema pulchella</i>	Turquoise Parrot
<i>Ninox connivens</i>	Barking Owl (foraging)
<i>Ninox strenua</i>	Powerful Owl (foraging)
<i>Petaurus australis</i>	Yellow-bellied Glider
<i>Petroica boodang</i>	Scarlet Robin
<i>Petroica phoenicea</i>	Flame Robin

Species name	Common name
<i>Phascolarctos cinereus</i>	Koala (foraging)
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox (foraging)
<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail-bat
<i>Scoteanax rueppellii</i>	Greater Broad-nosed Bat
<i>Stagonopleura guttata</i>	Diamond Firetail
<i>Tyto novaehollandiae</i>	Masked Owl (Foraging)
<i>Varanus rosenbergi</i>	Rosenberg's Goanna

The following ecosystem credit species were discounted from occurring within the subject land due to the absence of required habitat constraints:

- Glossy Black-Cockatoo *Calyptrorhynchus lathami* – the subject land lacked the necessary required feed trees such as Black She-oak *Allocasuarina littoralis*, *A. diminuta* and *A. gymnanthera*. In addition, the lack large suitable nesting locations (Large Hollow-bearing trees) were not identified within the subject land.

4.2 Species credit species

Species credit species are threatened species for which vegetation surrogates and/or landscape features cannot reliably predict the likelihood of their occurrence, or components of their habitat. These candidate species are identified as species credit species in the TBDC. A targeted survey or an expert report is required to confirm the presence of these species on the subject land, or alternatively the species can be assumed to be present (DPIE 2020a).

Appendix 2 provides the full list of species credit species predicted to occur within the subject land based on the IBRA subregion within which the Project occurs, the native vegetation cover present within the 1,500 metre assessment area, the PCTs present within subject land, and patch sizes listed in Table 4. The potential for a species to occur within the subject land was assessed in accordance with Section 5.2 of the BAM and species with geographical restrictions, or habitat constraints not present, were not required to be assessed.

17 predicted species credit species have been excluded from occurring within the subject land based on a lack of suitable habitat, degradation of existing habitat and lack of required microhabitat features. Species credit species considered to potentially occur within the subject land, and thus considered 'candidate species credit species' have been either assumed present or the subject of the target of threatened species surveys. A detailed assessment of potential for occurrence, and potential for impact, for all species credit species predicted to occur within the subject land is provided in Appendix 2. Two species credit species (*Swainsona sericea* and *Prasophyllum petilum*) not predicted by the BAM Calculator (BAM-C) or BioNet to occur within the subject land were added to the assessment as candidate species credit species.

All candidate species credit species considered as part of this assessment, and their associated method of assessment, are listed in Table 8 (flora species) and Table 9 (fauna species).

Table 8 Candidate species credit flora species

Species name	Common name	Survey period	Method of assessment
<i>Eucalyptus aggregata</i>	Black Gum	All year	Targeted survey
<i>Eucalyptus pulverulenta</i>	Silver-leafed Gum	All year	Targeted survey
<i>Leucochrysum albicans</i> var. <i>tricolor</i>	Hoary Sunray	September – April	Targeted survey
<i>Prasophyllum petilum</i>	Tarengo Leek Orchid	September – December	Targeted survey
<i>Swainsona sericea</i>	Silky Swainson-pea	September – November	Targeted survey
<i>Thesium australe</i>	Austral Toadflax	November – February	Targeted survey
<i>Veronica blakelyi</i>	-	December – February	Targeted survey

Table 9 Candidate species credit fauna species

Species name	Common name	Survey period	Method of assessment
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	November - January	Assumed present
<i>Miniopterus orianae oceanensis</i>	Large Bent-winged Bat	December – February	Targeted survey
<i>Paralucia spinifera</i>	Purple Copper Butterfly	September, October, December	Assumed present
<i>Cercartetus nanus</i>	Eastern Pygmy Possum	All year	Assumed present.
<i>Petaurus norfolcensis</i>	Squirrel Glider	All year	Targeted survey
<i>Petauroides volans</i>	Greater Glider	All year	Targeted survey
<i>Phascolarctos cinereus</i>	Koala	All year	Targeted survey

4.2.1 Threatened species survey details

Targeted threatened species surveys within the subject land were undertaken in March 2021, October 2021 and November 2021. Surveys undertaken and weather observations for each survey date are shown in Table 10. Weather observations were recorded using a handheld Kestrel device for some 2021 data. Weather observations were sourced from Lithgow (Cooerwull) weather station (station number 063226).

Table 10 Weather observations during targeted flora and fauna surveys

Survey undertaken	Survey date	Temperature (°C)		Rain (mm)	Wind (km/h)
		Min	Max		
- Flora habitat assessment. - Fauna habitat assessment – hollow-bearing trees and large stick-nest searches. - Habitat mapping – Purple Copper Butterfly.	17-18 March 2021	12.4	17.9	6.6	7

Survey undertaken	Survey date	Temperature (°C)		Rain (mm)	Wind (km/h)
		Min	Max		
Targeted flora survey – Black Gum and Silver-leafed Gum	16 June 2021	-2.0	15.5	0.1	7
Targeted fauna survey – microbats (ultrasonic recording).	10 – 16 November 2021	4.2	20.7	66.4	5 – 19
Targeted flora survey – Hoary Sunray, Tarengo Leek Orchid, Silky Swainson-pea, Austral Toadflax and <i>Veronica blakelyi</i>.	12 November 2021	4.9	12.2	4.4	19 (3 pm)
Targeted fauna survey – Koala, Squirrel and Greater Glider (spotlighting and call playback).	15 – 16 November 2021	4.4	15.6	0	9 (3 pm)
Additional targeted surveys (Black Gum and Silver-leafed Gum) and ecological constraints mapping	14 and 15 July 2022	-1.0	9.4	0	11 (9 am)

4.2.2 Targeted threatened flora surveys and results

An initial site assessment was undertaken on 17 and 18 March 2021 to map broad scale vegetation types. Additional site visits were undertaken on 16 June 2021, to undertake targeted flora survey for Black Gum and Silver-leafed Gum and finalise a detailed flora assessment of the subject land, and 12 November 2021 for further potential flora credit species within the study area.

Furthermore, additional targeted surveys were undertaken 14 and 15 July 2022 as a part of the investigation exercise with scope to attain the boarder study areas ecological constraints as a result of the potential (now confirmed) staged bore hole drilling locations.

Native vegetation within subject land has been subject to a varying land use history of; grazing, agricultural, clearing, dumping and recreational impacts contributing to degradation of understorey vegetation, and thus threatened species habitats. Habitats for threatened flora species within the north-western portion of the development site are considered low to moderate due to the degree of management, grazing and history of pasture improvement. Open areas are typically dominated by exotic pasture grasses and herbaceous exotics well suited to the low lying and typically damp habitat. Habitats supported by vegetation identified within the proposed eastern transmission line were considered to be of moderately higher quality as a result of the lower levels of disturbance present in the understorey and the presence of mature canopy trees. However, overall, the vegetation occurs as edge effected patches across the subject land.

Targeted threatened flora survey, undertaken on the dates listed in Table 10 above, were done so in accordance with the required BAM survey guideline, *NSW Surveying threatened plants and their habitats* (DPIE 2020c). Targeted threatened flora survey was undertaken throughout the development footprint, utilising a minimum 10 metre separated transects, with the exception of private land areas, where access could not be arranged. Portions of the development footprint were not subject to targeted survey for threatened flora, as suitable habitat was not present.

Targeted threatened flora surveys undertaken for the Project are detailed in Table 8, and a detailed assessment of candidate flora species credit species is provided in Appendix 2.

Survey method and effort

The targeted survey for Black Gum and Black Gum and Silver-leafed Gum was undertaken on 16 June 2021 and 14 and 15 July 2022 (within the final development footprint, refer to Figure 1). Targeted survey for the remaining flora species, Hoary Sunray, Tarengo Leek Orchid, Silky Swainson-pea, Austral Toadflax and *Veronica blakelyi* were surveyed on 12 November 2021 to coincide with the relevant flowering periods as described in the TBDC. As a result of the constraints mapping undertaken (July 2022) and the disturbed nature of the proposed new drilling locations and access trail, the need for additional targeted surveys for other potential threatened species was not required to be undertaken. This action was support by the Biodiversity, Conservation and Science Directorate (BCS) of the Department of Planning and Environment (DPE)

Targeted surveys were undertaken for *Veronica blakelyi* 12 November 2021. Whilst the BAM C allocates the survey period for the species as December – February, the TBDC indicates the potential for a late Spring flowering event. As such the allocated time frame for the survey was deemed suitable, due to the TBDC.

Austral Toadflax surveys were undertaken within the recorded PCT 677 (moderate condition) and PCT 732 (moderate condition) as result of the presence of know associated species, Kangaroo grass *Themeda triandra*, a preferred symbiote host of the target species. With this in mind, targeted surveys for Austral Toadflax were not undertaken within PCT 732 (NOG) due to the lack of recorded Kangaroo Grass with the vegetation zone. This decision was supported by floristic data, by where the Grass and Grasslike growth forms across the three replicate plots scored an average of three species and a 23.6% cover, with no Kangaroo Grass being recorded. In addition, as a result of the reduced species diversity within PCT 732 (NOG), the low native cover abundance and the abundance of high threat weed species as well as a calculated vegetation integrity (VI) score of 0.2 (Table 6) the conditional state of 'NOG' is further justified.

An ecologist walked through all suitable habitat for each target species at 10 metre spaced transects for Black Gum/ Silver-leafed Gum and 5 metre spaced transects for all remaining species. The transect spacing is consistent with the spacing described within the NSW *Surveying threatened plants and their habitats* (DPIE 2020b). When encountered all individual plants were recorded using a using hand-held (uncorrected) GPS Tablet. Figure 8 shows the targeted flora survey effort.

Targeted flora surveys were undertaken by the qualified and experienced Biosis ecologists outlined in Table 11.

Table 11 Targeted flora survey personnel and relevant experience

Staff member	Role	Relevant experience
Paul Price	Senior Restoration Ecologist BAM Accredited Assessor	Over 10 years' experience undertaking targeted flora surveys in NSW.

Results

Targeted surveys resulted in the detection of a population of Black Gum, containing 286 individuals within the subject land. The remaining vegetation in the moderate and low condition PCT 677 across the subject land contained an approximate count of 1000 plus individual specimens of Black Gum.

Table 12 provides a summary of the results of the targeted flora surveys completed.

Table 12 Summary of targeted flora survey method and results

Species name	Common name	Survey method	Survey results	Species Polygon (ha) or count
<i>Eucalyptus aggregata</i>	Black Gum	10m separated transect searches of areas of potential	Recorded during targeted survey. 258	286 individuals recorded.

Species name	Common name	Survey method	Survey results	Species Polygon (ha) or count
		habitat in June 2021 and 14-15 July 2022 (for the new alignment)	individuals recorded with an additional 28 recorded within and adjacent to the new alignment.	
<i>Eucalyptus pulverulenta</i>	Silver-leafed Gum	10m separated transect searches of areas of potential habitat in June 2021 and 14-15 July 2022	Not recorded during targeted survey	n/a
<i>Prasophyllum petilum</i>	Tarengo Leek Orchid	5m separated transect searches of areas of potential habitat in November 2021	Not recorded during targeted survey	n/a
<i>Leucochrysum albicans</i> var. <i>tricolor</i>	Hoary Sunray	5m separated transect searches of areas of potential habitat in November 2021	Not recorded during targeted survey	n/a
<i>Swainsona sericea</i>	Silky Swainson-pea	5m separated transect searches of areas of potential habitat in November 2021	Not recorded during targeted survey	n/a
<i>Thesium australe</i>	Austral Toadflax	5m separated transect searches of areas of potential habitat in November 2021	Not recorded during targeted survey	n/a
<i>Veronica blakelyi</i>	-	5m separated transect searches of areas of potential habitat in November 2021	Not recorded during targeted survey	n/a

4.2.3 Targeted threatened fauna species

Fauna habitat within the subject land and development footprint were generally found to be in good condition, with localised areas of good quality habitat identified. A number of key habitat features were recorded across the landscape such as: patches of well-structured vegetation not subject to edge effects, and habitat connectivity corridors.

Threatened fauna species survey included habitat assessment to determine suitable microhabitats across the subject land and development footprint and, where necessary, targeted species survey to determine presence/absence of species and/or their habitats were completed.

Fauna habitat assessment was undertaken to determine whether the vegetation to be impacted by the Project contained microhabitats suitable to support the candidate fauna species credit species, as outlined in Appendix 2.

Fauna habitat assessments

Fauna habitat assessment was undertaken to determine the presence of microhabitats and other critical habitat components (habitat constraints) suitable for all fauna species outlined in Table 9 and Appendix 2. Habitat assessments focussed on the presence of the following features within the subject land:

- Habitat trees including large and/or hollow-bearing trees, stick nests, availability of flowering shrubs and canopy/understorey feed tree species.
- Soil type and presence of cliffs, overhangs and other rocky areas.
- Condition and type of native vegetation and the presence of exotic species.
- Presence and condition of pools and waterways.
- Quantity of ground litter and woody debris.
- Searches for indirect evidence of fauna (i.e. feathers, tracks and scats).
- General degradation of the site as a result of past and current disturbances such as vegetation clearing and industrial land management practices.
- Topography and landscape morphology.
- Presence of Flying-fox camps.

Several habitat features with potential to support threatened species credit species were identified during these habitat assessments. These features have been summarised in Table 13.

Table 13 Habitat features with potential to support threatened species credit species

Habitat feature	Presence within the development footprint
Hollow-bearing trees	Habitat trees supporting hollows of a variety of size classes from small (<50 mm diameter) through to large (150 - 400 mm diameter) were present across the subject land. These trees have the potential to provide breeding resources for a range of native fauna species including threatened microbats, Eastern Pygmy-possum <i>Cercartetus nanus</i> and Squirrel Glider <i>Petaurus norfolcensis</i> . Large hollows adjacent to the subject land were of poor quality for fauna due to the vertical aspect of entrances, these hollows will not be removed by the proposed works.
Feed tree species	Tree species within PCT 732 in the north-west of the subject land provide potential foraging habitat for Koala and Greater Glider. Across the subject land flowering tree species may also provide foraging resources for Squirrel Glider, Eastern Pygmy Possum and Grey-headed Flying Fox as well as a range of more common bird and mammal species. Vegetation within PCT 677 was limited in providing microhabitats suitable for most threatened species such as suitable flowering shrubs for arboreal mammal species and native ground cover species for foraging and shelter by terrestrial species.
Caves, overhangs and disused mines	Sandstone formations in the Blue Mountains to the north and east of the subject land provide caves and rocky overhangs. These environments provide potential breeding habitat for threatened microbats including Large-eared Pied Bat and Large Bent-winged Bat as well as Sooty Owl, and potentially Masked Owl. Disused mines can also provide suitable roosting habitat for threatened microbats, one disused coal mine 'Western Main' is located to the west of the subject land, adjacent to Ben Bullen State Forest and is approximately 2 kilometres from the subject land.
Rocky outcrops and sandstone crevices	The surface geology of the Blue Mountains, in the Great Dividing Range to the east of the subject land supports rocky outcrops, sandstone crevices, and caves. These

Habitat feature	Presence within the development footprint
	features provide potential habitat for native frogs and reptiles including the threatened Giant Burrowing Frog, Red-crowned Toadlet and Broad-headed Snake. The subject land occurs at the base of the mountains primarily on alluvial soils associated with Piper's Flat Creek and did not contain any rock outcropping or surface geology suitable for these species.
Major and minor watercourses and waterbodies (i.e. dams)	Piper's Flat Creek runs in the east of the subject land is a Strahler Order 5 waterway. This waterway runs through agricultural areas, cleared areas and remnant vegetation within the subject land. A high level of exotic species were observed on the banks of the waterway which is characterised by soils of recent alluvium with unconsolidated sands and gravels. Farm Dams occur on the Curran Bullen soil landscape which is characterised by hard setting topsoils. Waterways and dams lacked outcropping rock and complexity of micro-habitats and do not provide suitable habitat for threatened amphibian species. The aquatic habitat of Piper's Flat Creek is heavily degraded and does not contain suitable microhabitats for threatened fish species. A small ephemeral drainage line dissects the north-western section of the Project area. This waterway runs through agricultural areas and small sections of degraded remnant vegetation. Small stands of Black Gum has been recorded at either end of the drainage line only.
Woody debris and leaf litter	Woody debris and leaf litter occurred in low abundance in the remnant vegetation patches across development footprints and impact assessment area. The subject land does not support complex habitat for species reliant on these features due to a lack of woody debris and history of disturbance through land clearing and ongoing livestock grazing.

Field capture of detailed fauna habitat information allowed for confirmation of presence/absence of habitat features and microhabitats for a range of candidate threatened species across surveyed portions of the subject land and development footprint. Fauna habitat assessments were captured using ArcGIS polygons attributed with specific habitat criteria that allowed for planning of further targeted survey for select species, or the exclusion of the potential for occurrence of various candidate species from the subject land.

These field captured polygons have also been used to refine species polygons developed for those species either recorded by targeted survey or assumed present. Further detail is provided in Section 4.4.

Mammals

Targeted mammal surveys were undertaken for the Koala (breeding habitat only), Greater Glider, Squirrel Glider and Eastern Pygmy Possum, due to its consideration as candidate species credit species and the potential availability of habitat within the subject land. The survey guidelines and requirements for the targeted surveys is detailed in Table 14.

Table 14 Survey guidelines and requirements for mammal surveys

Survey guidelines	Survey requirements
<i>EPBC Act referral guidelines for the vulnerable Koala (DoE 2014)</i> <i>Biodiversity Assessment Method (BAM) (DPIE 2020)</i>	Koala • Call playback. • Spotlight survey.
<i>Threatened Biodiversity Survey and Assessment Guidelines for Developments and Activities (Working Draft) (DEC 2004)</i>	Squirrel Glider, Greater Glider • Spotlight survey.
<i>Threatened Biodiversity Survey and Assessment Guidelines for Developments and Activities (Working Draft) (DEC 2004)</i>	Eastern Pygmy Possum • Species assumed present and habitat polygon generated.

Survey method and effort

All woodlands and trees within the development footprint were identified and recorded during the general fauna habitat assessment described above and this ensured a focused effort for targeted surveys.

Targeted survey for Koala was undertaken over two survey nights, 15 – 16 November 2021. Two ecologists undertook spotlighting on foot through all woodland habitats to detect eye shine. Call playback was undertaken at two locations in the subject land (Figure 8) and involved a 10 minute listening period followed by two minutes of call playback, played twice (total of four minutes call playback) and ending with a ten minute listening period.

Threatened mammal surveys were undertaken by the Biosis ecologists outlined in Table 15.

Table 15 Targeted mammal survey personnel and relevant experience

Staff member	Role	Relevant experience
Sarah Allison	Project Zoologist	Over 5 years' experience undertaking targeted arboreal and terrestrial mammal surveys across NSW.
Zoe Goold	Project Zoologist	One year experience assisting arboreal mammal survey.

Results

Targeted fauna survey was conducted over two nights; weather conditions are provided in Table 10. Conditions on the 15 November started poor with wind approximately 19 kilometres an hour (moderate wind) observed, survey was commenced once windy conditions began to ease (approximately 8:15 pm) and a light wind was observed for the remainder of the night. Survey was conducted when the moon was approximately three quarters full with cloud cover of approximately 70 % on the 15 November and clear conditions on the 16 November.

One Squirrel Glider was detected during targeted survey within PCT 732 vegetation (Figure 8). A Sugar Glider was also observed further south within vegetation comprising low condition PCT 677, it is noted identification

of the two species can be difficult to discern and identification was made by an experienced observer after visually inspecting the individuals multiple times over a prolonged period (> 10 minutes).

The vegetation in the north-west corner of the subject land could not be surveyed both nights due to access issues and as such, presence has been assumed for Koala and Greater Glider and species polygons have been created.

Spotlighting alone is not considered effective for detection of Eastern Pygmy-possum, the species is not associated with the PCTs within the subject land (DPIE 2020c). However suitable potential foraging habitat occurs within the PCT 732 vegetation of the subject land, and the subject land is connected to large areas of habitat within National Parks in the wider area. Therefore, this species has been assumed present within PCT 732 in the subject land.

Table 16 provides a summary of the results of the mammal surveys completed.

Table 16 Summary of mammal survey method and results

Species name	Common name	Survey method	Survey results	Species Polygon (ha) or count
<i>Phascolarctos cinereus</i>	Koala	2 nights call-playback and spotlighting 15 – 16 November 21	Not detected	3.69 ha of PCT 732
<i>Petaurus norfolcensis</i>	Squirrel Glider	2 nights spotlighting 15 – 16 November 21	Species detected	3.69 ha of PCT 732
<i>Cercartetus nanus</i>	Eastern Pygmy Possum	Baited remote camera survey/Assumed present	Assumed present	3.69 ha of PCT 732
<i>Petauroides volans</i>	Greater Glider	2 nights spotlighting 15 – 16 November 21	Assumed present	3.69 ha of PCT 732

Microchiropteran bats

Two microchiropteran bat species, Large-eared Pied Bat and Large Bent-winged Bat were identified as candidate species credit species for the subject land.

Survey method and effort

Ultrasonic call analysis was undertaken using Anabat Insight software and relevant published reference call guides (Pennay, Law, & Reinhold 2004). Analysis was run through custom filters/a decision tree to remove noise (frequencies below 7kHz) and files/passes with less than three pulses. The custom decision tree/filter was then run using characteristic frequency and duration to identify calls to genus, or species level where possible.

Any calls identified by the system as significant or uncommon species were checked manually against the NSW reference calls, by visual comparison of sonograms with published reference calls by an experienced bat expert, to ensure accurate results. In addition, calls were chosen for manual vetting from each species/genus grouping for quality assurance of data.

Targeted survey for the threatened microbat species included the use of three ultrasonic detectors over six nights (10 – 16 November 2021). The total survey effort of 18 nights meets the survey requirements specified in 'Species credit' threatened bats and their habitats (OEH 2018). The detectors were set to record 30 minutes

before sunset and stop 30 minutes after dawn. Units were placed in a position that maximised the likelihood of recording bats in accordance with the guidelines (along waterways and in flyways).

Microbat surveys were undertaken by the Biosis ecologists and experienced bat expert as outlined in Table 17.

Table 17 Targeted microbat survey personnel and relevant experience

Staff member	Role	Relevant experience
Sarah Allison	Project Zoologist	Over 5 years' experience surveying and identifying microchiropteran bats. Two years' experience identification of bat calls.
Zoe Goold	Project Zoologist	One year experience surveying microchiropteran bats.

Sandstone outcrops containing potential caves, overhangs and crevices occur within 2 kilometres of the subject land. Call sequences containing characteristics consistent with those of the Large Bent-winged Bat were recorded during targeted survey and as such this species has been recorded as present within the subject land. Calls sequences displaying characteristic features consistent with those known for Eastern Cave Bat *Vespadelus trougtoni* were recorded by detectors during survey. As the calls of this species occur within a similar frequency range and contain characteristics consistent with other *Vespadelus* species which may also occur in the region, this species could not be identified with confidence based on call analysis alone. No suitable breeding habitat was identified for the Large Bent-winged Bat or Eastern Cave Bat within the development footprint or within 100 metres of the subject land. As such, in accordance with the guideline for species credit threatened bats (OEH 2018) no habitat important to breeding occurs within the subject land, species polygons have not been developed and further survey or assessment is not required for these species.

Potential calls with characteristics attributed to Little Pied Bat *Chalinolobus picatus* listed vulnerable under the BC Act, were recorded with low to moderate confidence. The low confidence assigned was due to the short sequence and interference of other bat calls in the recording. In addition, the species distribution is generally further west of the subject land. For confidence in this identification further assessment and analysis would be recommended, however, as there is no breeding habitat present within 100 metres the subject land for this species, it is not considered to be impacted and no further assessment is required for the Project.

Calls with characteristics attributed to a total of ten microchiropteran bat species and one species complex (*Vespadelus species*) were detected within and near the subject land. Species recorded include one species credit species listed vulnerable under the BC Act, Large Bent-winged Bat, and one ecosystem credit species listed vulnerable under the BC Act, *Saccolaimus flaviventris*. An additional potential four species were recorded, however, due to similarities in call characteristics including similar shapes and overlapping frequency these species have been grouped as *Vespadelus* species complex. The species included are Little Forest Bat *Vespadelus vulturnus*, Southern Forest Bat *Vespadelus regulus*, Large Forest Bat *Vespadelus darlingtoni* and Eastern Cave Bat *Vespadelus trougtoni*. Eastern Cave Bat is listed Vulnerable under the BC Act.

The Large Bent-winged Bat and Eastern Cave Bat are species credit species for breeding habitat only, suitable potential habitat for this species occurs in the locality (within 2 kilometres of the subject land) in the form of caves and overhangs associated with rocky escarpments and disused mines. No suitable breeding habitat occurs within 100 metres of the subject land and therefore, in accordance with species credit bat guidelines (OEH 2018), a species polygon has not been developed for this species. The habitat for the remainder of the

threatened microbat species are treated as ecosystem credits under the BAM and impacts to these species are assessed in conjunction with the impacts to PCTs. No further assessment of these species is required.

Table 18 provides a summary of the results of the microbat surveys completed.

Table 18 Summary of microbat survey method and results

Species name	Common name	Survey method	Survey results	Species Polygon (ha) or count
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	• Ultrasonic recording • 10 – 15 November 2021	Not detected during survey	Not required, no suitable breeding habitat occurs within 100 m of the subject land.
<i>Miniopterus orianae oceanensis</i>	Large Bent-winged Bat	• Ultrasonic recording • 10 – 15 November 2021	Species recorded	Not required, no suitable breeding habitat occurs within 100 m of the subject land.

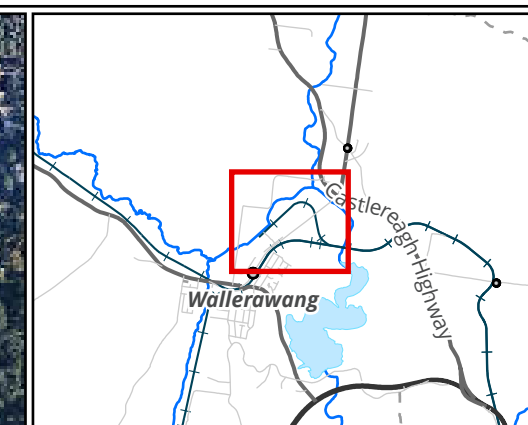
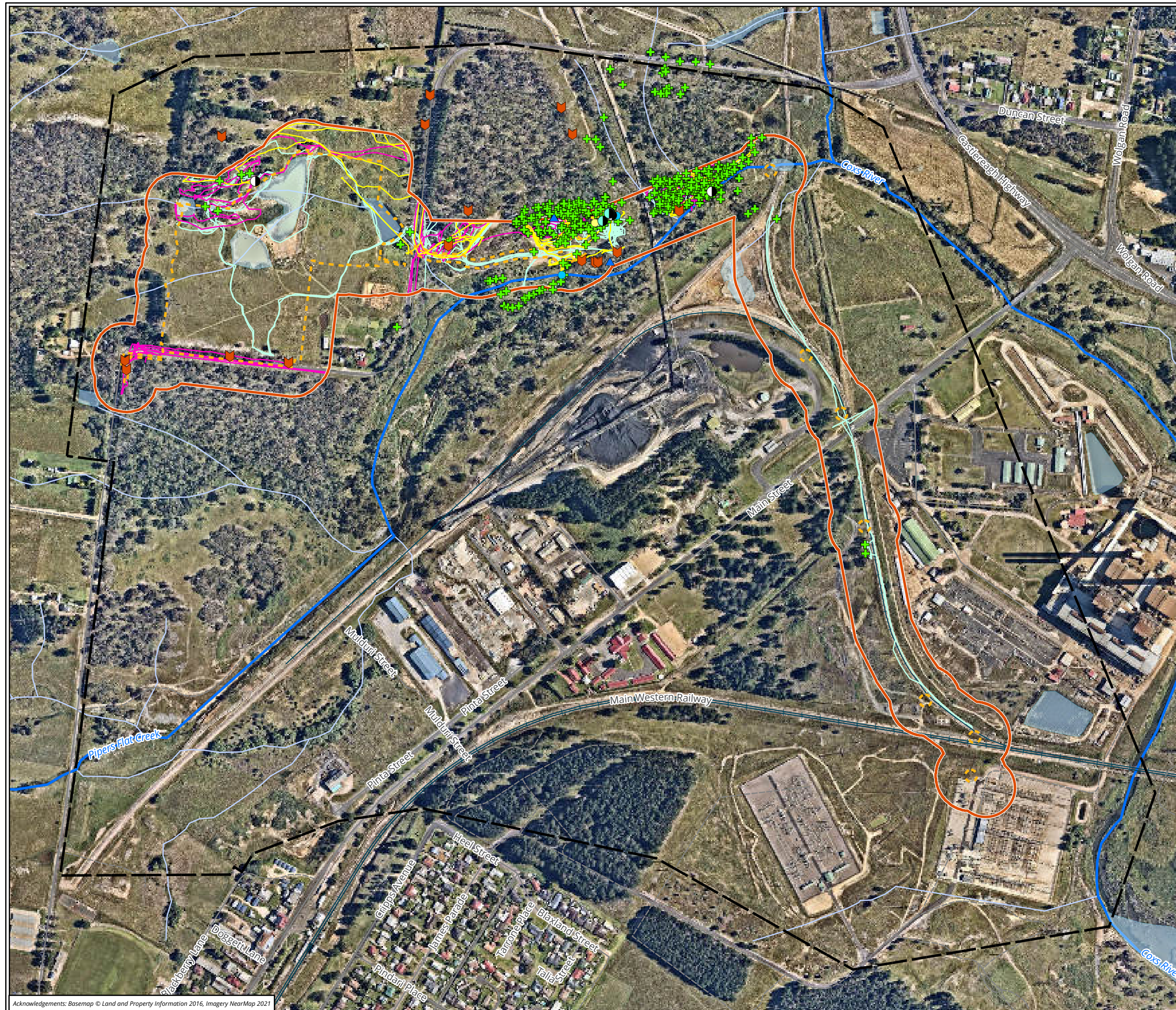
Invertebrates

One invertebrate, Purple Copper Butterfly *Paralucia spinifera*, was identified as a candidate species for the subject land. Targeted survey could not be conducted for the species within the allowable surveyable period, and thus targeted survey was not performed. However, habitat mapping was carried out in March 2021 for the species, including mapping all areas containing Blackthorn *Bursaria spinosa* subsp. *lasiophylla* identified within the development footprint. The extents of the Blackthorn were then buffered by 40 metres. The species was assumed to be present within all suitable habitat identified and mapped. As such, a species polygon has been prepared for the Purple Copper Butterfly and discussed further in Section 4.4.

4.3 Incidental flora and fauna surveys

Fauna surveys undertaken on an ongoing basis throughout the field campaign included incidental diurnal bird surveys, active searches of woody debris and leaf litter, incidental aural observations of frog species and incidental observations of various mammal species. The following threatened species were recorded during incidental fauna surveys:

- Dusky Woodswallow *Artamus cyanopterus*
- Little Eagle *Hieraaetus morphnoides*



Legend

- Subject land
- Development site
- Development footprint
- Anabat
- Call playback
- Hollow-bearing tree

Threatened flora records

- Black Gum - *Eucalyptus aggregata* (BioNet record)
- Black Gum - *Eucalyptus aggregata* (Biosis record)

Threatened fauna records (Biosis)

- Dusky Woodswallow, *Artamus cyanopterus cyanopterus*
- Little Eagle, *Hieraaetus morphnoides*

Targeted surveys

- Initial habitat and vegetation survey
- Night targeted fauna survey
- Targeted flora survey

Figure 8 Targeted species mapping

0 50 100 150 200 250

Metres

Scale: 1:6,000 @ A3

Coordinate System:

GDA 1994 MGA Zone 56



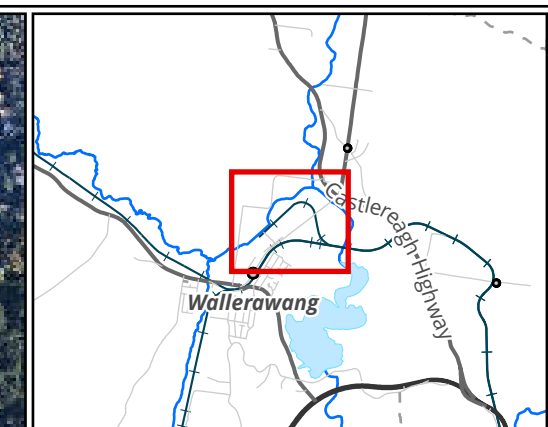
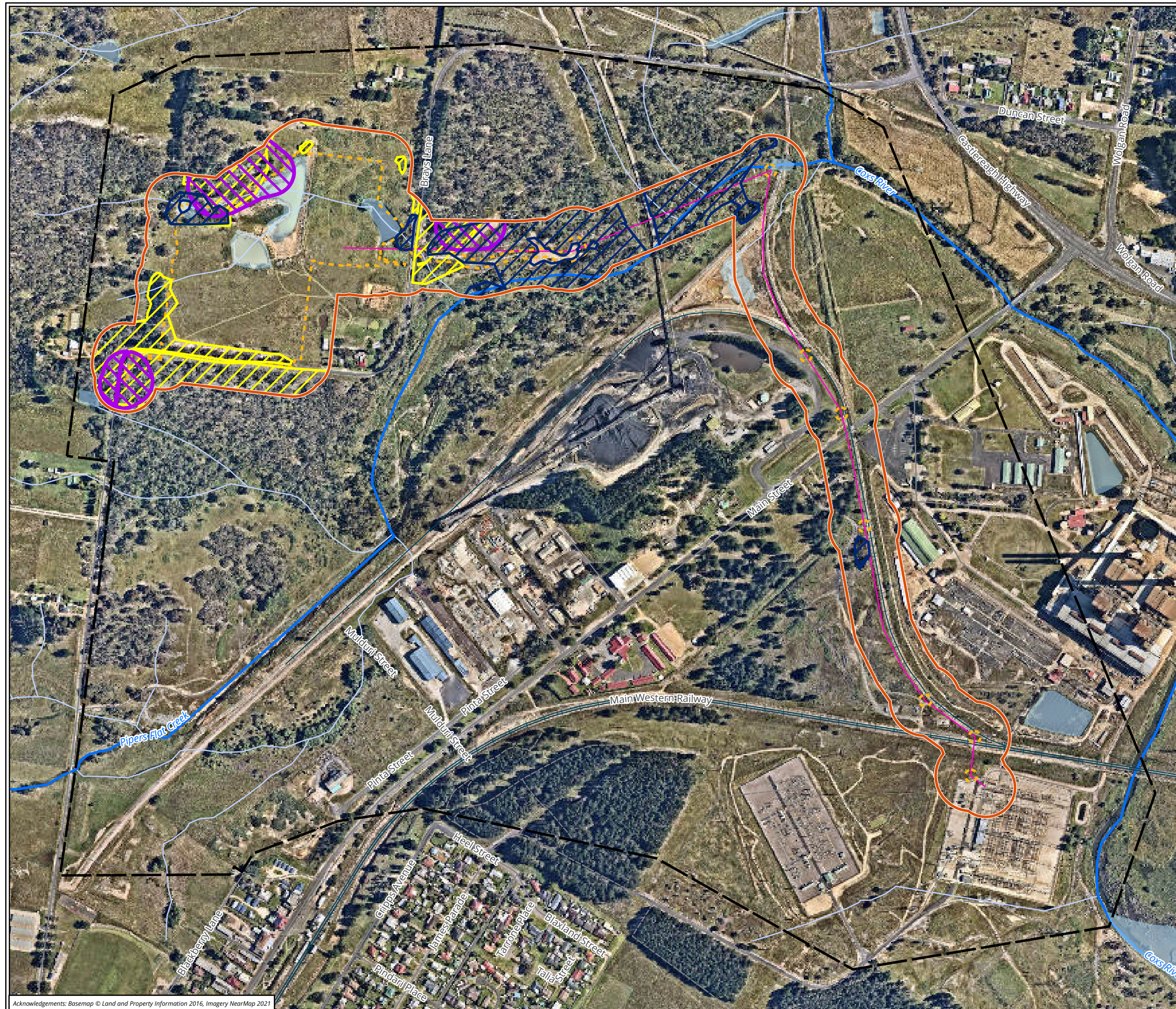
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Location: P:\34300s\34343\Mapping\34343_BDAR2020.aprx
Layout: 34343_F8_TargetedSurveys

4.4 Threatened species summary and polygons

Table 19 provides details of threatened species and their habitat impacted by the Project and outlines the attributes that comprise the threatened species polygons. The presence of threatened species and their habitat impacted by the Project is illustrated on Figure 9.

Table 19 Threatened species polygons within the development footprint and impact assessment area

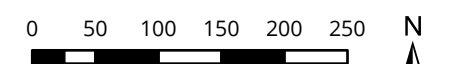
Threatened species	Impact (ha / No. indiv.)	Unit of measure	Biodiversity risk weighting	Polygon attributes
Flora				
<i>Eucalyptus aggregata</i>	2	Count	2	2 Individuals
Fauna				
Eastern Pygmy-possum <i>Cercartetus nanus</i>	0.78	Area	2	0.78
Koala <i>Phascolarctos cinereus</i>	0.83	Area	2	0.83
Squirrel Glider <i>Petaurus norfolcensis</i>	0.73	Area	2	0.78
Invertebrates				
Purple Copper Butterfly <i>Paralucia spinifera</i>	0.43	Area	2	0.43



Legend

- Subject land
- Development site
- Development footprint
- HDD and trenching
- Threatened species polygons**
- Purple Copper Butterfly habitat (including 40 m buffer)
- Squirrel Glider, Greater Glider, Eastern Pygmy-possum, and Koala habitat
- Black Gum habitat

Figure 9 Threatened species polygons



Scale: 1:6,000 @ A3
Coordinate System:
GDA 1994 MGA Zone 56



Matter: 34343, Date: 15 September 2022
GIS: AM, Checked by: PP, Last edited by: amackegard
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Layout: 34343_F9_ThrSpPolygon

Stage 2 – Impact assessment (biodiversity values)

5 Avoid and minimise impacts

This section demonstrates the efforts to avoid and minimise impacts on biodiversity values (including prescribed impacts) associated with the proposal location in accordance with BAM, including an analysis of alternatives:

- Modes or technologies that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed mode or technology.
- Routes that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed route.
- Alternative locations that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed location.
- Alternative sites within a property on which the proposal is located that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed site.
- Describe efforts to avoid and minimise impacts (including prescribed impacts) to biodiversity values through proposal design.
- Identification of any other site constraints that the proponent has considered in determining the location and design of the proposal.

5.1 Actions to avoid/minimise project impacts

The principal means to reduce impacts on biodiversity values within the development footprint and subject land is to avoid and/or minimise the removal of native vegetation and fauna habitat. Additional recommendations include measures to mitigate residual impacts after all measures to avoid and minimise impacts have been considered.

Site selection and planning

The development footprint has been selected, in part, to minimise impacts to native vegetation and flora and fauna habitats present within the broader subject land. Key design elements were altered in the early design phase to reduce direct impacts to native vegetation and focus impacts within the part of the subject land containing non-native vegetation and more heavily disturbed native vegetation.

The BESS footprint is located such that direct impacts to better condition native vegetation (e.g. in the north-west corner of the site) are avoided and the east /west fauna and riparian corridors are maintained.

The proposed eastern transmission line was selected in the final design as direct impacts to vegetation were originally considered to be less than within the proposed southern transmission line. In addition, the final design proposes to install the transmission line connection underground using trenching in less sensitive areas (predominantly the rail corridor) and underboring at environmentally sensitive locations (including watercourses GDEs and threatened species habitat). Thus, underboring native vegetation across the eastern transmission line will be an indirect impact, and all direct impacts to native vegetation will be avoided along the proposed transmission line corridor.

Figure 10 shows the proposed development footprint, while Figure 11 shows the alternative footprint including the southern transmission line that was initially considered.

Construction

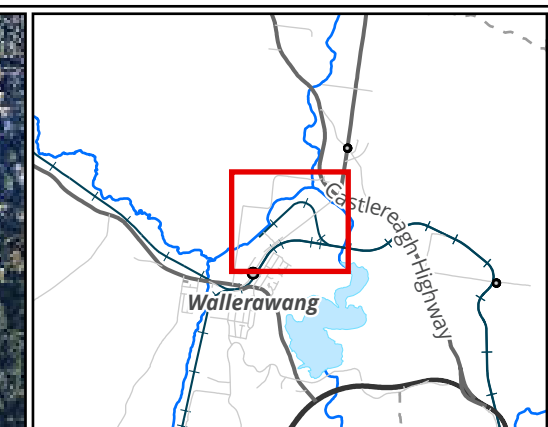
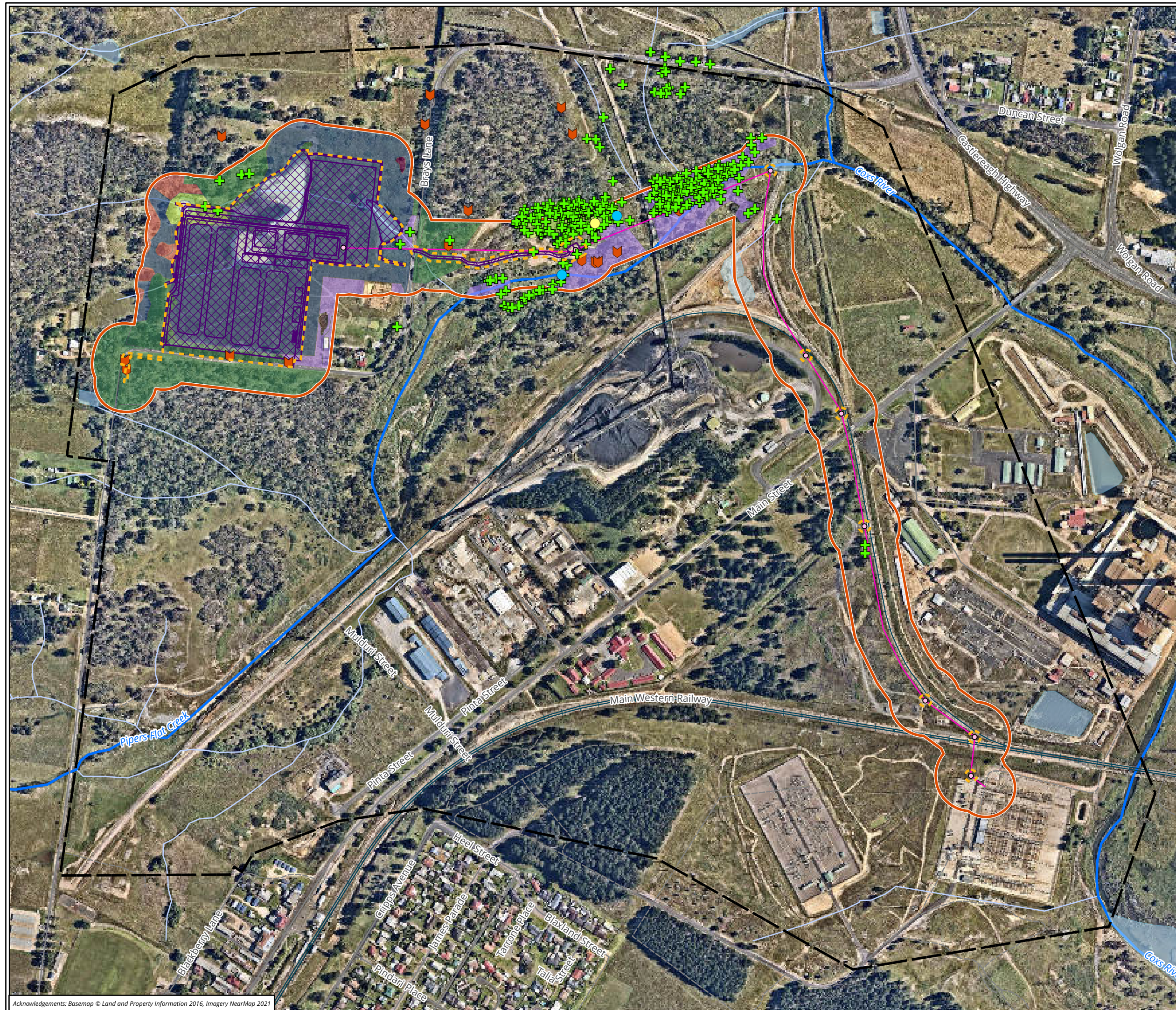
Direct and indirect impacts to biodiversity values retained within the subject land (e.g. winter flowering mature eucalypts and other canopy trees) and adjoining the subject land may occur if adequate mitigation and management measures are not in place during construction of the Project.

The following mitigation and management measures are to be implemented in order to mitigate and manage potential direct and indirect impacts during construction:

- Prior to construction, a Construction Environmental Management Plan (CEMP) is to be developed which includes standard measures, including:
 - Installation of appropriate exclusion fencing to the boundary of the retained vegetation and retained native trees in construction areas where there is some potential for accidental encroachment. This will include appropriate signage such as 'No Go Zone' or 'Environmental Protection Area'. Identification of any 'No Go Zones' in site inductions for all construction personnel.
 - All site perimeter fencing is to be of a design that excludes terrestrial fauna, so as to minimise the risk of Koala ingress to the construction site.
 - All material stockpiles, vehicle parking and machinery storage should be located within the areas proposed for clearing, and not in areas of native vegetation that are to be retained.
 - Sedimentation and erosion control measures including silt fencing, sediment traps, etc. to prevent sediment-laden stormwater exiting the construction areas and to prevent scouring and erosion of land beyond the development footprint. All erosion and sediment control measures are to be constructed and installed in accordance with relevant guidelines, are to be regularly maintained for the duration of the construction period and are to be carefully removed at completion of works.
 - Sediment and erosion control measures should follow recommendations of *The Blue Book – Managing Urban Stormwater: Soils and Construction* (Landcom 2004)
 - Dust suppression measures to ensure dust deposition beyond the construction area is minimised.
 - Weed and pathogen management including weed hygiene protocols for personnel, machinery and construction materials entering and exiting construction areas to minimise risk of weed and pathogen introduction and spread.
 - Waste management is to ensure food scraps and other organic waste that may attract introduced predators (e.g. fox, cats) or other pests (e.g. rats) is not stored for prolonged periods within the construction site.
- As far as practicable, all construction activities are to be undertaken during daylight hours to minimise noise impacts on fauna utilising adjacent habitats.
- Selection and retention of suitable logs (>10 cm diameter only) and hollows for placement within retained native vegetation adjoining the subject land.
- Where appropriate native vegetation cleared from the subject land should be mulched for re-use on the site to stabilise bare ground.
- Security lighting within the construction site is to be minimised and where required, is to be oriented such that light spill beyond the subject land and in to patches of retained vegetation is minimised.

Operation

- Stormwater generated and discharged from the site is not to be substantially different in volume relative to the pre-development regime to protect downstream communities from erosion impacts.
- All perimeter fencing and is to be of a 'fauna-friendly' design i.e. barbed wire free, which minimises potential impacts to flying and gliding arboreal mammals (e.g. sugar gliders) which may utilise retained trees within the subject land.



Legend

- Subject land
- Development site
- Development footprint
- Hollow-bearing tree
- Construction footprint
- HDD and trenching
- Pit

Fauna sightings (Biosis record)

- Dusky Woodswallow, *Artamus cyanopterus cyanopterus*
- Little Eagle, *Hieraaetus morphnoides*
- Squirrel Glider, *Petaurus norfolcensis*

Flora sightings (Biosis record)

- Black Gum - *Eucalyptus aggregata* (Biosis record)

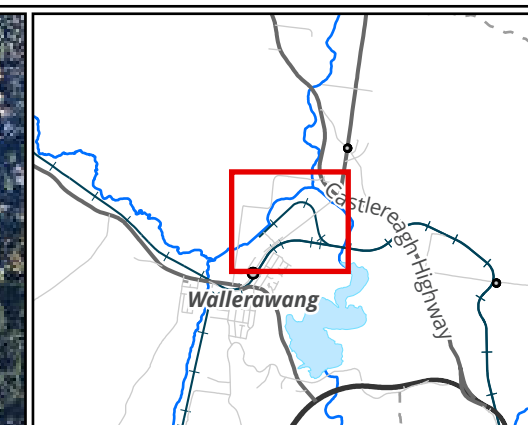
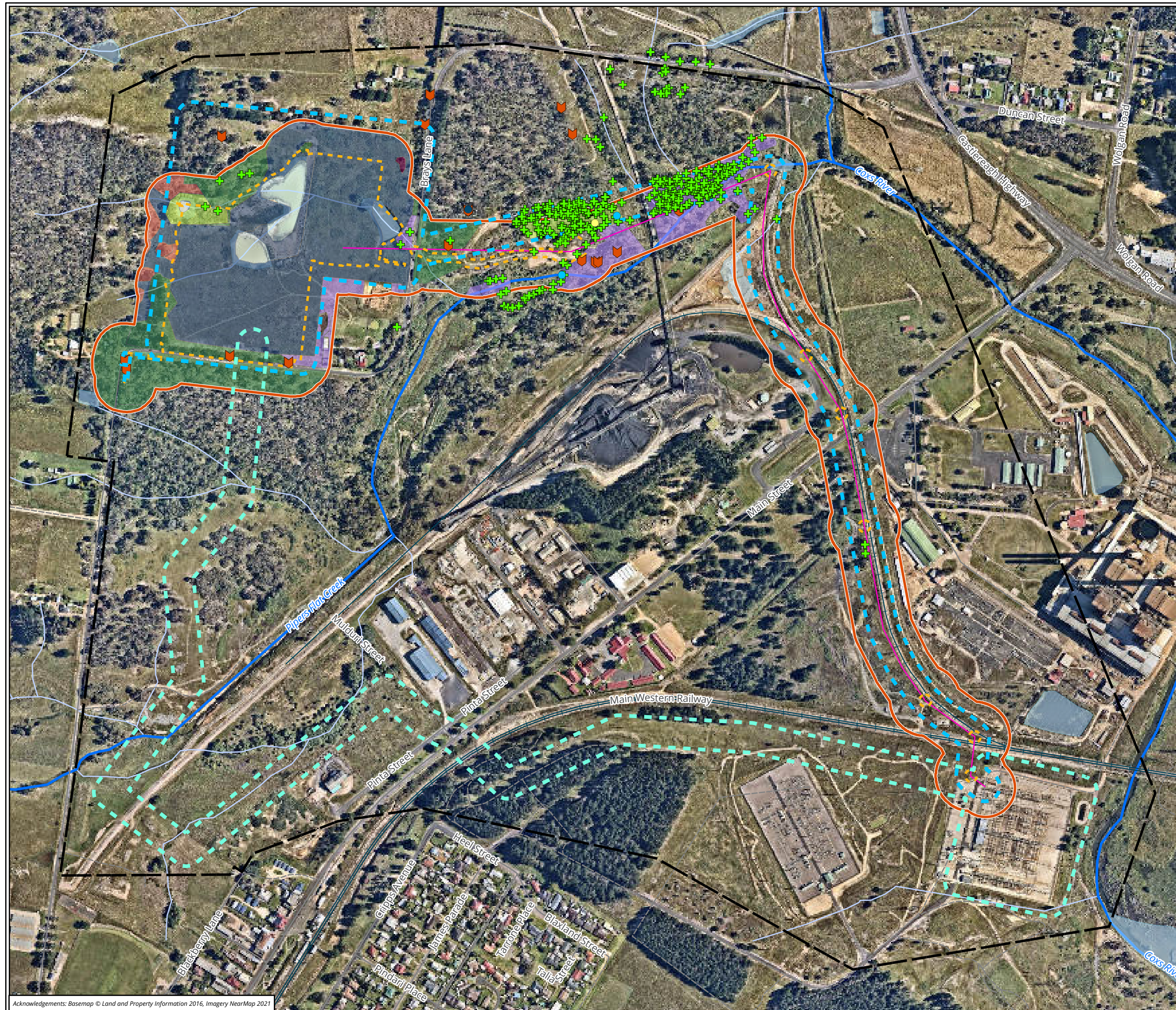
Vegetation Zones

- 677-Low
- 677-Moderate
- 732-Low
- 732-Moderate
- 732-NOG
- 732-Scattered Trees

Figure 10 Final development footprint

0 50 100 150 200 250
Metres
Scale: 1:6,000 @ A3
Coordinate System:
GDA 1994 MGA Zone 56

Matter: 34343, Date: 15 September 2022,
GIS: AM, Checked by: PP, Last edited by: amackegard
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Layout: 34343_F10_DevFootprint



Legend

- Subject land
- Development site
- Development footprint
- HDD and trenching
- Hollow-bearing tree

Alternative development footprints

- Alternative 1
- Alternative 2

Fauna sightings (Biosis record)

- Dusky Woodswallow, *Artamus cyanopterus cyanopterus*
- Little Eagle, *Hieraaetus morphnoides*
- Squirrel Glider, *Petaurus norfolcensis*

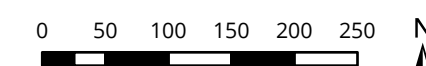
Flora sightings (Biosis record)

- Black Gum - *Eucalyptus aggregata*

Vegetation Zones

- 677-Low
- 677-Moderate
- 732-Low
- 732-Moderate
- 732-NOG
- 732-Scattered Trees

Figure 11 Alternate options and avoidance



Scale: 1:6,000 @ A3
Coordinate System:
GDA 1994 MGA Zone 56



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GIS: AM, Checked by: PP, Last edited by: amackegard
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Layout: 34343_F11_AlternateOptions

6 Impacts that are unable to be avoided

Assessment of direct and indirect impacts unable to be avoided has been undertaken in accordance with the BAM (DPIE 2020b). The following direct and indirect impacts are unable to be avoided in progressing the Project.

6.1 Direct impacts

Direct impacts include vegetation clearing calculated from the development footprint. Direct impacts arising from the Project include:

- 0.27 ha of PCT 677.
- 0.78 ha of PCT 732.
- 0.27 ha of Black Gum habitat and 2 individuals.
- 0.83 ha of Koala habitat.
- 0.78 ha of Squirrel Glider habitat
- 0.78 ha of Eastern Pygmy-possum habitat.
- 0.43 ha of Purple Copper Butterfly habitat.

These impacts will be permanent and will occur from the outset of the development. Mitigation measures outlined in Section 5.1 above will help to minimise the potential impacts to biodiversity values that remain present within the subject land.

Assessment of the above impacts is provided in Table 20.

Table 20 Summary of direct impacts to vegetation

Potential direct impact	Location / description of impact	Significance of impact
Removal of native vegetation and flora and fauna habitats	Removal of 1.05 ha of native vegetation from two PCTs throughout the development footprint, supporting habitat for a range of threatened and non-threatened flora and fauna species.	The majority of the vegetation and habitats impacted by the Project has undergone historical modification through clearing and other detrimental landuse practices, and all native vegetation identified within the development footprint is in low or moderate condition. Whilst the removal native vegetation and threatened species' habitats by the Project could be considered an impact, when considered in the context of the size of the Project Area, and the general landscape through which the development traverses, the impact of native vegetation removal are not considered to be significant. Substantial efforts have been made through the Project to reduce and minimise impact to native vegetation habitats, and this process has resulted in the residual impacts being largely comprised of degraded, fragmented, and edge effected ecological values.

Potential direct impact	Location / description of impact	Significance of impact
Removal of known mapped habitat for threatened flora species and individual plants	The Project will result in the removal of the following threatened flora individuals / habitat: Black Gum – two individuals, 0.31 ha of known habitat.	As with impacts to native vegetation, impacts to threatened flora species and habitats are not considered significant when assessed in the context of the scale of the Project. Direct impacts to a total of two individual plants, and 0.31 ha of known mapped habitat, are considered to be an acceptable outcome for a Project with impacts spanning such a large area. Again, it should be noted that significant efforts have been undertaken to minimise and avoid impacts to threatened flora over the course of the Project and underboring along the transmission line will avoid the majority of Black Gum habitat identified within the subject land.
Removal of known habitat for threatened fauna species	The Project will result in the removal of the following threatened flora individuals / habitat: 0.78 ha of Squirrel Glider, Greater Glider and Eastern Pygmy Possum habitat. 0.83 of Koala habitat. 0.43 ha of Purple Copper Butterfly habitat.	As with impacts to native vegetation, overall direct impacts to threatened fauna habitats are not considered significant when assessed in the context of the scale of the Project. Targeted surveys and habitat assessments have concluded that the majority of the development footprint supports only marginal quality habitat for threatened fauna species, having undergone degradation through historical landuse. Removal of higher quality habitat in the north-west corner has been avoided. In addition, the underboring of the eastern transmission line will avoid all direct impacts to native vegetation in this area. Impacts to potential microbat habitat at the site have been assumed based on the presence of potential habitat within the subject land and the lack of targeted survey using ultrasonic call data. Whilst a mapped 0.43 ha of Purple Copper Butterfly habitat will be impacted as a part of the Project, all recorded locations of Blackthorn are outside of the development footprint and the impacts are not considered significant.

6.1.1 Loss of hollow-bearing trees

Three hollow-bearing trees were identified within the proposed development footprint i.e. within the transmission line easement and along Brays Lane (proposed vegetation trimming for oversized vehicle access). These trees have the potential to provide roosting habitat for Large-eared Pied Bat and Large Bent-winged Bat. Given the Project involves the installation of an underground transmission line in this portion of the development footprint, the hollow-bearing trees will not be removed. However, the indirect impacts from underboring native vegetation may occur here.

The two hollow-bearing trees located on Brays Lane potentially will be removed during the site construction phase of the Project through branch and vegetation trimming to make allowances for heavy-rigid plant and machinery accessing the site. The recorded hollows were considered low quality and provided limited roosting opportunities to microbat species.

6.2 Indirect impacts

Potential indirect impacts arising from the Project are outlined and addressed in Table 21. Indirect impacts have been assessed based on a number of factors, including:

- The presence of native vegetation and habitats directly adjacent to the development footprint, i.e. within the subject land, and the potential for those retained patches of vegetation and habitat to be negatively affected by the Project.
- The presence of biodiversity values on and adjacent to watercourses and the potential for impacts relating to changes to local hydrology.
- Landscape scale impacts to species habitat connectivity.
- The potential for the incidental impacts to the secondary root systems of Black Gum.

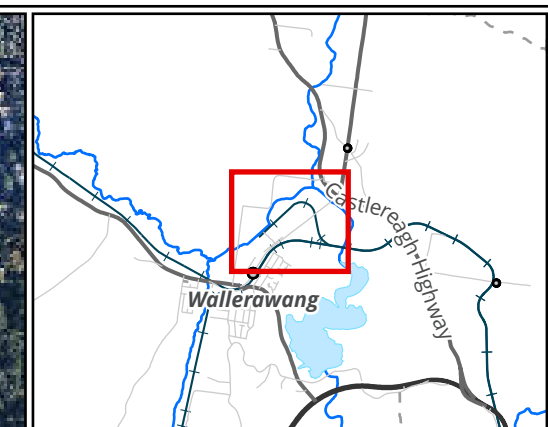
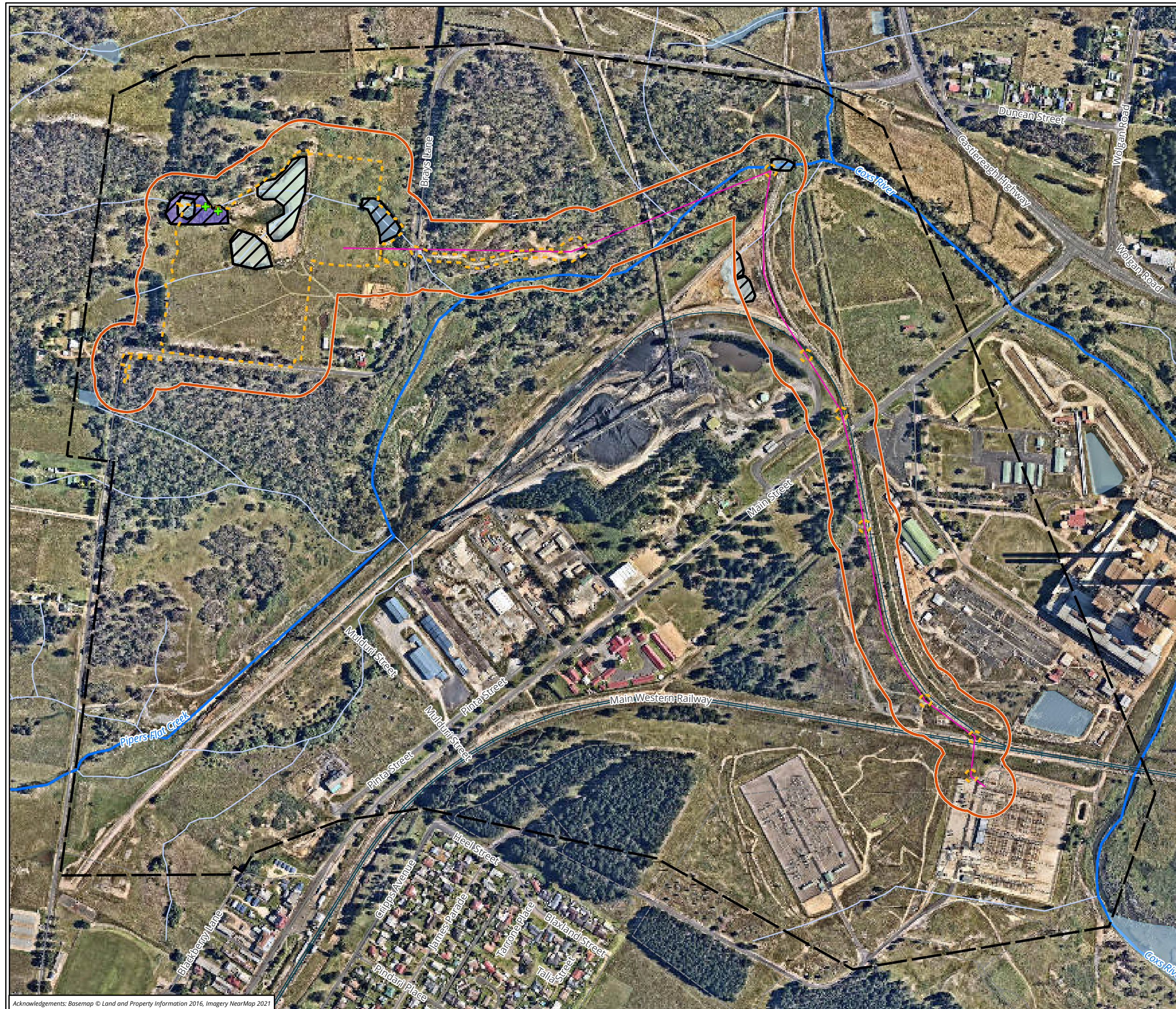
Table 21 Avoidance and minimisation of impact

Indirect impact	Assessment / likelihood of occurrence
Inadvertent impacts on adjacent habitat or vegetation	Impacts to the vegetation associated with the transmission line are being prevented through the utilisation of an underboring method known as horizontal directional drilling (HDD). HDD would be used where required to avoid areas of sensitivity, including Aboriginal heritage, biodiversity, Pipers Flat Creek, and rail crossings. The remainder would be constructed using an open trenching methodology which will occur in areas of low conservation value. The vast majority of the new transmission line would be installed underground except where the line enters and connects to the Transgrid Wallerawang 330kV substation. Additional inadvertent impacts may potentially occur to adjacent vegetation during construction and operational phase can be prevented or minimised through appropriate exclusion fencing, implementation of a CEMP detailing environmental protection measures, strict water quality practices and stormwater controls, and by ensuring lighting is directed towards the developed area, rather than towards the surrounding remnant vegetation.
Reduced viability of adjacent habitat due to edge effects	Adjacent habitats are currently subject to a high degree of edge effects due to prior clearing and surrounding existing residential and agricultural land use. Since a small and localised patch of vegetation (0.93 ha) is to be directly impacted by the Project, an increase to edge effects is not expected to occur to the remnant vegetation surrounding the subject land, as a result of the proposed development. In addition, a large proportion of native vegetation within the subject land will be underbored, thus edge effects are not expected to be exacerbated as a result.
Reduced viability of adjacent habitat due to noise, dust or light spill	It is predicted that the adjacent habitat will be impacted in a small way by noise, dust and light spill, during construction and operation of the future development of the subject land. However, this will be managed via measures outlined in a CEMP. The development is expected to be periodically serviced by medium and light vehicular traffic. Currently, the majority of the site is zoned as RU1 - Rural. The Project may therefore result in a minor change to the functioning of the development site and the amount or type of vehicular traffic, noise

Indirect impact	Assessment / likelihood of occurrence
	and light pollution. Indirect impacts from lighting may affect foraging of threatened microbats, but impacts are not considered significant as it is highly unlikely that species abundance will be diminished.
Transport of weeds and pathogens from the site to adjacent vegetation	Weeds occurring within the subject land are common with those occurring within adjacent vegetation to be retained. Increased transport of pathogens and weeds is unlikely to occur but will be managed by biosecurity measures outlined in the CEMP.
Increased risk of starvation, exposure and loss of shade or shelter	The habitat present in the subject land considered marginal for most fauna species given the disturbed condition, however is potential habitat for Purple Copper Butterfly, Koala, Squirrel Glider, Greater Glider, Eastern Pygmy-possum and several threatened microbat species. The proposed future development will not result in an increased risk of starvation, exposure and loss of shade or shelter to native species due to the small total area of vegetation being removed, and it very small proportion of commensurate habitats available in the immediate vicinity.
Loss of breeding habitats	No specialist breeding habitat will be impacted by the proposed future development. Retained vegetation in adjacent lots and along riparian corridors within the local area provides higher quality habitat and will not be reduced by the proposed works.
Trampling/damage of threatened flora species	A population of the threatened flora species, Black Gum, was identified within both the site proposed for the BESS and along the transmission line corridor. Under the current proposal, it is anticipated that only two will be impacted as a part of the Project whilst the transmission line will be installed underground using underboring at environmentally sensitive locations. The Project will avoid direct impacts to the main Black Gum population and will minimise foot traffic where the threatened flora species is present. Thus, trampling of threatened flora species is unlikely. The HDD drilling alignment will be drilled to a variable depth that is cognisant of the Black Gum root systems. Prior to drilling activities, Black Gum within the HDD drilling corridor will be identified and assessed for root maturity. Following this preliminary assessment, the drilling depth will be augmented to minimise the potential impact to the relevant Black Gums, this may constitute a depth of down to 2 – 3 metres below natural ground level. Thus, impacting of the threatened flora species is unlikely
Inhibition of nitrogen fixation and increased soil salinity	The NSW DPIE Hydrogeological Landscape and Salinity Hazard Maps did not identify any areas of inland soil salinity risk. Any future excavations or soil disturbance resulting from the Project would be largely restricted to areas having undergone significant previous disturbance through cattle grazing and vehicular traffic. As such it is not considered likely that the future development of the subject land would result in substantial changes to the level of nitrogen fixation or soil salinity in the locality.
Fertiliser drift	The site has a long history of grazing over its total extent. Exotic species dominance within cleared areas indicates a pattern of pasture

Indirect impact	Assessment / likelihood of occurrence
	improvement. The proposal will cease these activities and not contribute to fertiliser drift into surrounding areas with future practices. No fertiliser is proposed to be used.
Rubbish dumping	Standard environmental controls for the development would ensure potential impacts are minimised. Works would follow an approved Waste Management Plan.
Wood collection	Future development proposed within the subject land is unlikely to increase access to any retained vegetation, beyond current access capacity. Based on the future industrial use of the subject land, future landholders are not expected to be likely to undertake wood collection within the retained vegetation to a level that it will have a detrimental effect. Unauthorised access and collection of wood is expected to be minimal.
Removal and disturbance of rocks, including bush rock	The subject land does not support bush rock.
Increase in predators	The subject land is already largely cleared and heavily fragmented. The vegetation clearance proposed from within the development footprint is unlikely to increase predatory species populations.
Increase in pest animal populations	The proposal occurs in a rural and semi-industrial area with impacts including introduced domestic pets such as cats <i>Felis catus</i> currently occurring within the locality. Pest animals such as Rats <i>Rattus rattus</i> and European Rabbit <i>Oryctolagus cuniculus</i> are also widely spread within the region and are likely to occur across the locality. The proposal will not result in an increase in available habitat for these species and is unlikely to lead to an increase in pest animal populations. Suitable waste disposal implemented during and post construction will further reduce the resources available for pest species.
Changed fire regimes	The subject land is largely cleared of vegetation. Appropriate APZs and fire mitigation systems will be implemented for the future development and the proposal will not result in an increased risk of fire.
Disturbance to specialist breeding and foraging habitat, e.g. Beach nesting for shorebirds	No specialist breeding and foraging habitat will be indirectly impacted by the proposed work. Direct impacts to breeding and foraging habitat for Koala and Squirrel Glider will be offset. The proposal is unlikely to constitute significant disturbance, to adjacent habitats as underboring will avoid the majority of vegetation clearing and once the works are completed minimal disturbance will be generated to adjacent areas (occasional maintenance if required).
Fragmentation of movement corridors	Movement corridors are currently restricted in width and availability through the locality. The occurrences of habitat connectivity occurs predominantly in east – west bands along drainage lines or roads. The development footprint crosses a number of features that provide opportunities for movement of biodiversity values across the landscape. However, most of these features will not be directly impacted by the Project (with underboring across the proposed eastern transmission line). The

Indirect impact	Assessment / likelihood of occurrence
	Project will result in the removal of 1.05 ha of native vegetation that fringes the subject land to the north and west. Remnant vegetation along Pipers Flat Creek and within the proposed eastern transmission line will remain intact and not be fragmented.



Legend

- Subject land
- Development site
- Development footprint
- HDD and trenching
- Prescribed impacts
- Black Gum - *Eucalyptus aggregata* (Biosis record)

Plant Community Type

677 - Black Gum grassy woodland of damp flats and drainage lines of the eastern Southern Tablelands, South Eastern Highlands Bioregion

Figure 12 Prescribed impacts

0 50 100 150 200 250
Metres

Scale: 1:6,000 @ A3
Coordinate System:
GDA 1994 MGA Zone 56

biosis

Matter: 34343, Date: 15 September 2022
Drawn by: AM, Checked by: PP, Last edited by: amackegard
Location: P:\34300s\34343\Mapping\34343_BDAR2020.aprx
Layout: 34343_F12_PrescribedImpacts

6.3 Prescribed impacts

Assessment of prescribed biodiversity impacts are outlined and addressed in Table 22 below and shown in Figure 12.

Table 22 Assessment of prescribed impacts

Prescribed impact	Assessment / likelihood of occurrence
Karst, caves, crevices, cliffs, rocks and other geological features of significance	No areas of geological significance occur within the subject land. The development will not impact on threatened species or ecological communities associated with karst, caves, crevices or cliffs.
Occurrences of human-made structures and non-native vegetation	Several human-made structures will be impacted by the development, however no threatened species or communities associated with human-made structures will be impacted by the development. Non-native vegetation has been mapped across the development footprint, however never in sufficient quantities, or suitable locations to provide valuable habitat to threatened species.
Corridors or other areas of connectivity linking habitat for threatened entities	As the subject land is already largely cleared, the removal of 1.05 ha of native vegetation is expected to have a limited impact on the connectivity of threatened species habitat, such as the Black Gum, Purple Copper Butterfly, Large Bent-winged Bat, Eastern Cave Bat, Dusky Woodswallow, Little Eagle, Koala, Eastern Pygmy-possum, Greater Glider and Squirrel Glider. Further, a large portion of the development footprint will be subject to underboring and thus the vegetation identified within this area will not be directly removed. The occurrences of habitat connectivity occurs predominantly in east – west bands along drainage lines or roads, and remnant vegetation along Pipers Flat Creek. Vegetation within the proposed eastern transmission line will remain intact and will not be fragmented. All flora and fauna species and ecological communities recorded as present within the subject land rely on habitat connectivity to some degree for persistence. Habitat connectivity is more important for species with reproductive strategies that require movement of individuals or reproductive material through the landscape.
Water bodies or any hydrological processes that sustain threatened entities	The proposed works are not expected to further impact hydrological process within the subject land. Several small dams and ephemeral drainage lines occur within the subject land. The dams appear to be of low foraging quality for fauna as they are highly modified due to the construction, and are heavily degraded due to previous agricultural use of the landscape. Removal of the dams within the development footprint are not considered likely to have a significant or substantial impact on threatened species. The dams within the development footprint will be decommissioned and backfilled as part of the Project and Biosis recommend that a dam dewatering is implemented, whereby all rescued fauna are relocated to adjacent dams and/or waterways. Pipers Flat Creek flows through the development footprint, however, underboring is proposed to be used to install the transmission line under

Prescribed impact	Assessment / likelihood of occurrence
	sensitive areas such as Pipers Flat Creek.
Protected animals that may use the proposed wind farm development site as a flyway or migration route	There are no wind turbines involved in this project.
Where the proposed development may result in vehicle strike on threatened fauna or on animals that are part of a threatened ecological community	The Project may result in increased vehicle traffic during the construction and, to a lesser extent, during the operational phase of the Project. This increased vehicle traffic has the potential to impact upon native fauna species that are active during the day, and generally with a higher potential for impact in areas where refuge/forage habitat exists immediately adjacent to areas where vehicle movements will occur. However, the majority of the development occurs in locations that are generally already cleared of native vegetation.

6.4 Impacts considered uncertain

There are no impacts considered uncertain for the current assessment.

6.5 Impacts to Groundwater Dependent Ecosystems (GDE)

Assessment of the potential for the subject land to support GDEs was undertaken using the Australian Government's Bureau of Meteorology Groundwater Dependant Ecosystems Atlas (BOM 2019). The subject land is mapped on the GDE Atlas as containing both Aquatic and Terrestrial GDEs (BOM 2021).

GDEs are defined as ecosystems that require access to groundwater to meet all or some of their water requirements in order to maintain their ecological components and processes. The dependence of GDEs on groundwater varies from seasonal or episodic, to continual. They can range in size from a few square metres to many square kilometres (DPIE 2021).

Impacts to GDEs will occur as a result of the Project through direct removal of vegetation comprising the surface expression of the GDE, and through indirect impact associated with impacts on groundwater through vectors such as drawdown and aquifer interference.

The potential for groundwater dependence has been mapped by the Australian Bureau of Meteorology (BOM) and included in the GDE Atlas. This data has been used to assess the potential for GDEs to be present within and surrounding the impact area, and to determine the PCTs to which these GDEs equate, which are likely to be subject to potential impacts. Two plant communities that are known to be GDEs are mapped as occurring within the development footprint. These include:

- PCT 677 - *Black Gum grassy woodland of damp flats and drainage lines of the eastern Southern Tablelands, South Eastern Highlands Bioregion*. This vegetation community occurs in a small pocket at the north-west of the development footprint and within the vegetated area east of Brays Lane.
- PCT 732 - *Broad-leaved Peppermint - Ribbon Gum grassy open forest in the north east of the South Eastern Highlands Bioregion*. This vegetation community occurs in small pockets at the north-west.

The groundwater is considered to be approximately 10 metres below ground level (bgl) where drawdown and aquifer interference are unlikely to be issues. As such it is not expected that the Project will not result in significant groundwater dewatering.

6.6 Aquatic habitat impacts relating Fisheries Management Act matters

There are no aquatic habitat impacts relating to the *Fisheries Management Act 1994*.

6.7 Impacts to Matters of National Environmental Significance (MNES)

An assessment of the impacts of the Project on Matters of National Environmental Significance (MNES), against heads of consideration outlined in Commonwealth of Australia (2013) was prepared to determine whether referral of the Project to the Commonwealth Minister for the Environment is required. MNES relevant to the Project are summarised in Table 23.

Table 23 Assessment of the proposed development against the EPBC Act

Matter of NES	Project specifics	Potential for significant impact
Threatened species	The following threatened species listed under the EPBC Act are predicted/known to occur within the subject land: • Black Gum (known) • Koala (predicted) • Purple Copper Butterfly (predicted) • Greater Glider (predicted)	Two Black Gum specimens will be removed for the Project, based on the significant population of Black Gum within the broader subject area, it has been deemed that there is no potential for significant impact. As a result of the Project's design to avoid higher quality vegetation within the subject land it has been deemed that there is no potential for significant impact to Koala, Greater Glider Purple or Copper Butterfly populations.
Threatened ecological communities	There are no TECs recorded within the subject land.	No potential for impact.
Migratory species	Migratory species are unlikely to occur within the subject land given in location in the landscape.	No direct impact is expected to any migratory listed species.
National Heritage Places	There are no National Heritage Places within the subject land.	No potential for impact.
Wetlands of international importance (Ramsar sites)	The closest Important Wetland to the subject land is Towra Point Nature Reserve, which is situated approximately 120 km south-east of the subject land.	No potential for impact.

7 Mitigation and management of impacts

Identification of measures to mitigate or manage impacts has been undertaken in accordance with the BAM (DPIE 2020a), including considerations such as:

- Techniques, timing, frequency and responsibility.
- Identification of measures for which there is risk of failure.
- Evaluation of the risk and consequence of any residual impacts.
- Documentation of any adaptive management strategy proposed.

Identification of measures for mitigating impacts related to:

- Displacement of resident fauna.
- Indirect impacts on native vegetation and habitat.
- Mitigating prescribed biodiversity impacts.
- Details of the adaptive management strategy proposed to monitor and respond to impacts on biodiversity values that are uncertain.

Table 24 Measures to mitigate and manage impacts

Measures to mitigate and manage impacts	Action	Outcome	Timing	Responsibility
Displacement of resident fauna	All vegetation is to be inspected immediately prior to removal, by a qualified ecologist, to confirm absence of resident fauna.	No direct impact to resident fauna during vegetation removal.	Immediately prior to vegetation removal.	Qualified ecologist and construction contractor.
Indirect impacts on native vegetation and habitat	Install appropriate stormwater and erosion controls on site (in accordance with a CEMP) to avoid impacts to nearby waterways via stormwater collection systems	No further degradation to retained vegetation and habitats.	Ongoing/throughout earthworks.	Construction contractor.
	The HDD drilling alignment will be drilled to a variable depth that is cognisant of the Black Gum root systems. Prior to drilling activities, the Black Gum within the HDD drilling corridor will be identified and assessed for root maturity. Following this preliminary assessment, the drilling depth will be augmented to minimise the potential impact to the relevant Black Gums, this may constitute a depth of down to 2 – 3 metres below natural ground level	No direct impact to the primary/structurally supportive roots systems of Black Gum.	During HDD drilling operation	HDD drilling contractor

Measures to mitigate and manage impacts	Action	Outcome	Timing	Responsibility
	Impacts resulting from light spill can be mitigated by adapting from Part 4 (good lighting design principles) of the Dark Sky Planning Guideline (DPE 2016), including: - Installing light fitting shields with an opaque cover, mounted horizontally across the top of the lighting module. These shielding attachments allow only the downward projection of light. - Direct lights downwards and avoid shining directly onto the public amenities, which have the potential to reflect light skywards. - Utilise low beam angles that are close to vertical where possible to minimise light glare.	No indirect impact to fauna in retained vegetation and habitats.	Ongoing	Construction contractor.
Mitigating prescribed biodiversity impacts	With scope for the required removal of the residing dam, dam dewatering is to be undertaken to ensure that any fauna within the dams is salvaged and relocated (an ecologist would only be required on site when dam water levels are below 1/5 capacity).	No direct impact to resident fauna during dam dewatering.	Immediately prior to dam dewatering.	Qualified ecologist and construction contractor.
Adaptive management strategies proposed to monitor and respond to impacts on biodiversity values that are uncertain	Implementation of an appropriate CEMP during works.	Mitigate risk of impact to environmental controls during project construction.	Ongoing/throughout earthworks.	Construction contractor.

7.1 Adaptive management strategy

Construction and operational management plans will contain an adaptive management component. Adaptive management strategies will be receptive to any new and relevant data that may arise through ongoing assessment and monitoring and are key to the successful implementation of crucial objectives yet also allow flexibility to changing dynamics and ongoing feedback and results. This includes measures to monitor predicted and uncertain impacts which will trigger adaptive management actions and allow for effective and quick responses.

8 Impact summary

8.1 TECs and threatened species

This section outlines the impact summary for the Project which has identified and assessed impacts on TECs and threatened species that are at risk of a Serious and Irreversible Impact (SAIL) including:

- Addressing all criteria for each TEC listed as at risk of an SAIL present on the subject land.
- Addressing all criteria for each threatened species at risk of an SAIL present on the subject land.
- Documenting assumptions made and/or limitations to information.
- Documenting all sources of data, information, references used or consulted.
- Clearly justifying why any criteria could not be addressed.
- Identification of impacts requiring offset.
- Identification of impacts not requiring offset.
- Identification of areas not requiring offset.

Figure 13 shows the location of impacts requiring offset, impacts not requiring offset and areas not requiring assessment.

8.2 Serious and irreversible impacts

In accordance with Clause 6.7 of the BC Regulation an impact is to be regarded as serious and irreversible if it is likely to contribute significantly to the risk of a threatened species or ecological community becoming extinct because:

- a) Principle 1: It will cause a further decline of the species or ecological community that is currently observed, estimated, inferred or reasonably suspected to be in a rapid rate of decline.*
- b) Principle 2: It will further reduce the population size of the species or ecological community that is currently observed, estimated, inferred or reasonably suspected to have a very small population size.*
- c) Principle 3: It is an impact on the habitat of the species or ecological community that is currently observed, estimated, inferred or reasonably suspected to have a very limited geographic distribution.*
- d) Principle 4: The impacted species or ecological community is unlikely to respond to measures to improve its habitat and vegetation integrity and therefore its members are not replaceable.*

No vegetation communities or threatened species are considered to meet the above principles.

8.3 Identification of impacts requiring offset

8.3.1 Impacts to native vegetation (ecosystem credits)

As outlined in Section 9.2.1 of the BAM, the assessor must determine an offset for all impacts of proposals on PCTs that are associated with a vegetation zone that has a vegetation integrity score of:

- a) ≥ 15 , where the PCT is representative of an EEC or a CEEC.
- b) ≥ 17 , where the PCT is associated with threatened species habitat (as represented by ecosystem credits) or represents a vulnerable ecological community.
- c) ≥ 20 , where the PCT does not represent a TEC and is not associated with threatened species habitat.

On this basis, offsets are required for four vegetation zones as it has a vegetation integrity score greater than 20.

The offset requirement for the Project was calculated using the BAM Calculator. Table 25 provides a summary of the ecosystem credit offsets required for impacts from proposed development at the subject land.

Table 25 Offsets required (ecosystem credits)

Vegetation zone	Area (ha)	Impact	VI score	Offset required	TEC	HBTs	Credit requirement
677_Low		0.04	46.9	Yes	No	1	1
677_Moderate		0.23	51.9	Yes	No	1	7
732_Moderate		0.78	83.6	Yes	No	1	29

8.3.2 Impacts to threatened species and their habitat

As outlined in Section 9.2.2 of the BAM, an offset is also required for the impacts of the proposal on the habitat of threatened species assessed for ecosystem credits and associated with a PCT in a vegetation zone with a vegetation integrity score of ≥ 17 .

The offset requirement for the Project was calculated using the BAM Calculator. Table 26 provides a summary of the species credit offsets required for impacts from Project at the subject land.

Table 26 Offsets required (species credits)

Vegetation zone	Species	Habitat condition (vegetation integrity score) loss	Area (ha) / individuals	Biodiversity risk weighting	Credit requirement
677 Moderate	Black Gum	- 51.9	2 individuals	2	4
732 Moderate	Squirrel Glider	- 83.6	0.78 ha	2	33
732 Moderate	Koala	- 83.6	0.83 ha	2	34
732 Moderate	Purple Copper Butterfly	- 83.6	0.43 ah	2	18
732	Eastern Pygmy-possum	- 83.6	0.78 ha	2	33

Vegetation zone	Species	Habitat condition (vegetation integrity score) loss	Area (ha) / individuals	Biodiversity risk weighting	Credit requirement
Moderate					

Species polygons for the above 60 species credit species impacted by the Project are illustrated in Figure 13 below. Habitat for Koala, Squirrel Glider, Eastern Pygmy Possum and Purple Copper Butterfly has been avoided through project design, polygons for these species are shown on Figure 13, illustrating avoidance.

8.4 Identification of impacts not requiring offset

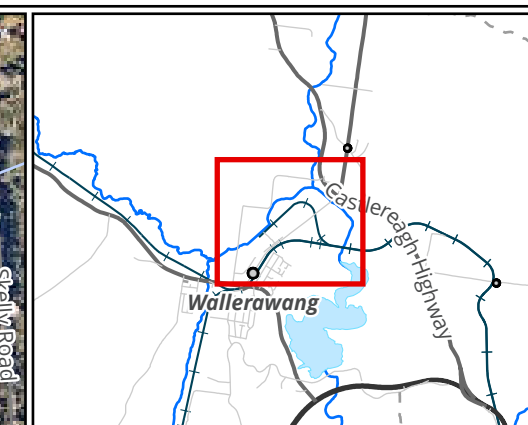
Following assessment, the following impacts do not require offsetting in accordance with BAM:

- Removal of 7.27 ha of NOG not requiring offsets.
- Removal of 0.05 ha of PCT 732 Scattered trees.

8.5 Identification of areas not requiring assessment

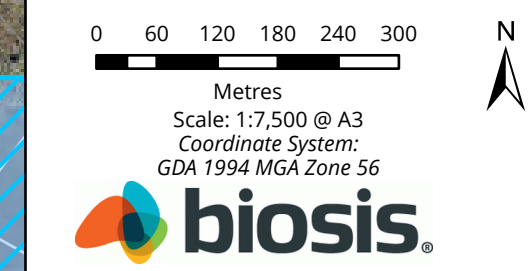
Following assessment, the following areas do not require assessment in accordance with BAM:

- Removal of 4.55 ha of cleared land/urban native exotic

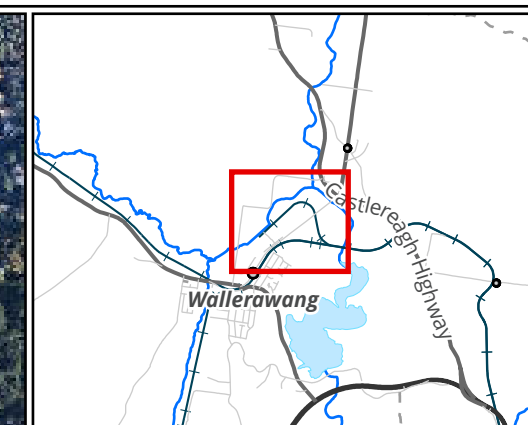
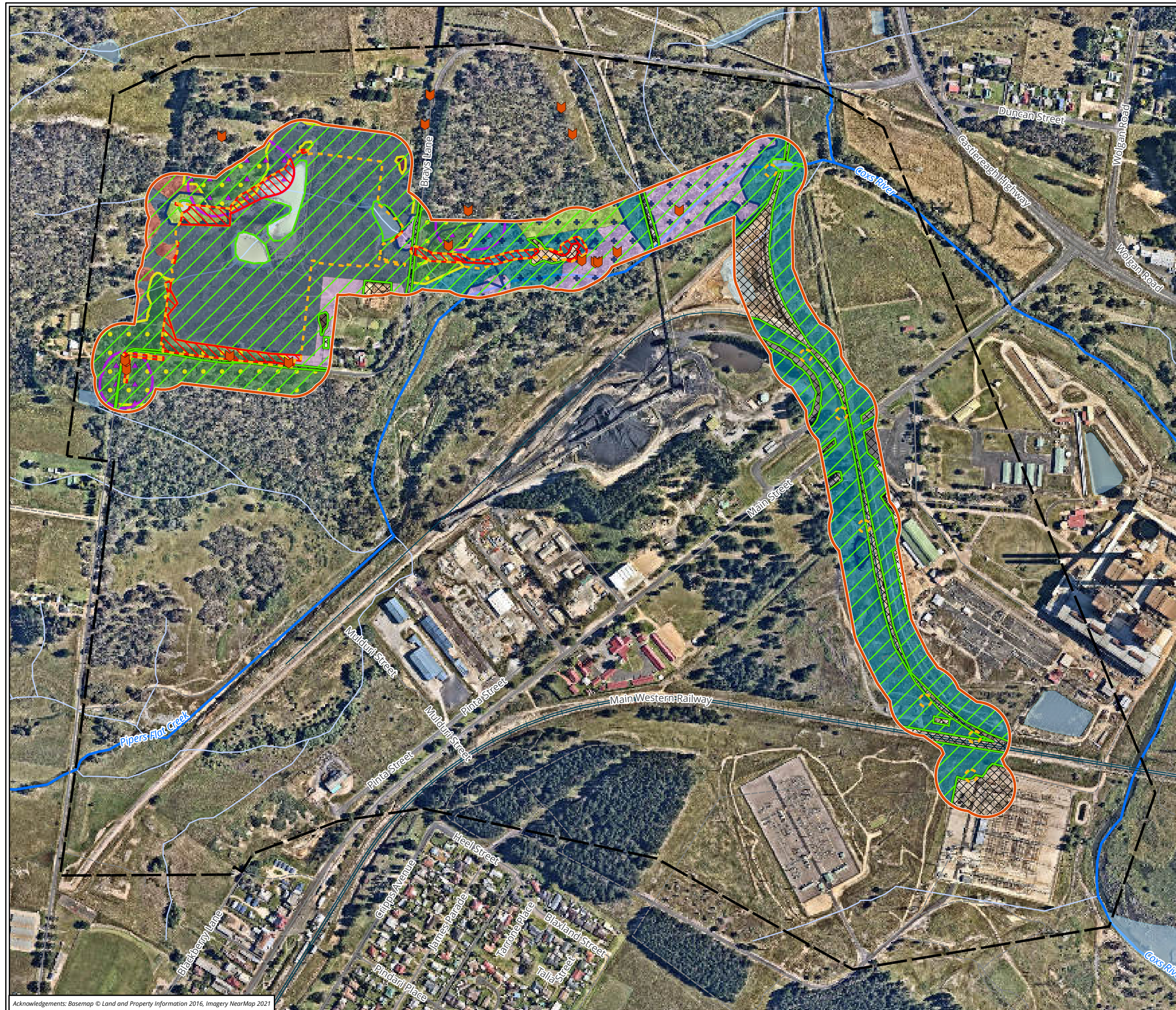


- Legend**
- Subject land
 - Development site
 - Development footprint
 - Indirect impact
 - Black Gum habitat
 - Purple Copper Butterfly habitat (including a 40 m buffer)
 - Squirrel Glider, Greater Glider, Eastern Pygmy-possum, and Koala habitat
 - Indirect impact - Waterways
- Vegetation Zones**
- 677-Low
 - 677-Moderate
 - 732-Low
 - 732-Moderate
 - 732-NOG
 - 732-Scattered Trees
 - Urban Native/Exotic

Figure 13 Estimated zones of indirect impact for the proposal



Matter: 34343, Date: 15 September 2022,
GIS: AM, Checked by: PP, Last edited by: amackegard
Location: P:\34300s\34343\Mapping\34343_BDAR2020_part2.aprx
Layout: 34343_F13_IndirectImpact



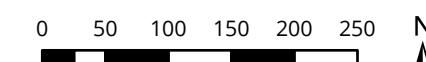
Legend

- Subject land
- Development site
- Development footprint
- Impacts requiring offset
- Impacts not requiring offset
- Area not requiring assessment
- Hollow-bearing tree
- Black Gum habitat
- Purple Copper Butterfly habitat (including a 40 m buffer)
- Squirrel Glider, Greater Glider, Eastern Pygmy-possum, and Koala habitat

Vegetation Zones

- 677-Low
- 677-Moderate
- 732-Low
- 732-Moderate
- 732-NOG
- 732-Scattered Trees
- Urban Native/Exotic

Figure 14 Impacts requiring offset



Metres
Scale: 1:6,000 @ A3
Coordinate System:
GDA 1994 MGA Zone 56



Matter: 34343, Date: 15 September 2022
GIS: AM, Checked by: PP, Last edited by: amackegard
Location: P:\34300s\34343\Mapping\34343_BDAR2020_F14Offsets.aprx
Layout: 34343_F14_Offset

9 Biodiversity credit report

Offsetting through the transfer and retirement of biodiversity credits, or paying into the BCT Offset Fund, is required for the current assessment for impacts to three vegetation zones at the subject land. A biodiversity credit report is provided on the following pages.

BAM Biodiversity Credit Report (Like for like)

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00024080/BAAS18089/21/00024081	Confidential Lithgow SSD Southern Easement	14/10/2022
Assessor Name	Assessor Number	BAM Data version *
Paul Price	BAAS18089	55
Proponent Names	Report Created	BAM Case Status
	15/11/2022	Finalised
Assessment Revision	Assessment Type	Date Finalised
1	Major Projects	17/10/2022

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Potential Serious and Irreversible Impacts

Name of threatened ecological community	Listing status	Name of Plant Community Type/ID
Nil		
Species		
Nil		

Additional Information for Approval

PCT Outside Ibra Added

BAM Biodiversity Credit Report (Like for like)

None added

PCTs With Customized Benchmarks

PCT

No Changes

Predicted Threatened Species Not On Site

Name

Calyptrorhynchus lathami / Glossy Black-Cockatoo

Ecosystem Credit Summary (Number and class of biodiversity credits to be retired)

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	HBT Cr	No HBT Cr	Total credits to be retired
677-Black Gum grassy woodland of damp flats and drainage lines of the eastern Southern Tablelands, South Eastern Highlands Bioregion	Not a TEC	0.3	8	0	8
732-Broad-leaved Peppermint - Ribbon Gum grassy open forest in the north east of the South Eastern Highlands Bioregion	Not a TEC	8.1	29	0	29

BAM Biodiversity Credit Report (Like for like)

677-Black Gum grassy woodland of damp flats and drainage lines of the eastern Southern Tablelands, South Eastern Highlands Bioregion	Like-for-like credit retirement options					
	Class	Trading group	Zone	HBT	Credits	IBRA region
	Subalpine Woodlands This includes PCT's: 677, 1191	Subalpine Woodlands > =90%	677_Low	Yes		1 Capertee Uplands, Capertee Valley, Hill End, Inland Slopes and Wollemi. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Subalpine Woodlands This includes PCT's: 677, 1191	Subalpine Woodlands > =90%	677_moderate	Yes		7 Capertee Uplands, Capertee Valley, Hill End, Inland Slopes and Wollemi. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
732-Broad-leaved Peppermint - Ribbon Gum grassy open forest in the north east of the South Eastern Highlands Bioregion	Like-for-like credit retirement options					
	Class	Trading group	Zone	HBT	Credits	IBRA region

BAM Biodiversity Credit Report (Like for like)

	Southern Tableland Grassy Woodlands This includes PCT's: 303, 312, 350, 654, 680, 703, 705, 731, 732, 1103, 1330, 1334, 1501	Southern Tableland Grassy Woodlands >=50% and <70%	732_Moderate	Yes	29	Capertee Uplands, Capertee Valley, Hill End, Inland Slopes and Wollemi. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Southern Tableland Grassy Woodlands This includes PCT's: 303, 312, 350, 654, 680, 703, 705, 731, 732, 1103, 1330, 1334, 1501	Southern Tableland Grassy Woodlands >=50% and <70%	732_NOG	No	0	Capertee Uplands, Capertee Valley, Hill End, Inland Slopes and Wollemi. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Southern Tableland Grassy Woodlands This includes PCT's: 303, 312, 350, 654, 680, 703, 705, 731, 732, 1103, 1330, 1334, 1501	Southern Tableland Grassy Woodlands >=50% and <70%	732_scattered0 1	No	0	Capertee Uplands, Capertee Valley, Hill End, Inland Slopes and Wollemi. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Species Credit Summary

Species	Vegetation Zone/s	Area / Count	Credits
Cercartetus nanus / Eastern Pygmy-possum	732_Moderate	0.8	33.00

BAM Biodiversity Credit Report (Like for like)

Eucalyptus aggregata / Black Gum	677_moderate	2.0	4.00
Paralucia spinifera / Purple Copper Butterfly, Bathurst Copper Butterfly	732_Moderate	0.4	18.00
Petaurus norfolcensis / Squirrel Glider	732_Moderate	0.8	33.00
Phascolarctos cinereus / Koala	732_Moderate, 732_scattered01	0.8	34.00

Credit Retirement Options

Like-for-like credit retirement options

Cercartetus nanus / Eastern Pygmy-possum	Spp	IBRA subregion
	Cercartetus nanus / Eastern Pygmy-possum	Any in NSW
Eucalyptus aggregata / Black Gum	Spp	IBRA subregion
	Eucalyptus aggregata / Black Gum	Any in NSW
Paralucia spinifera / Purple Copper Butterfly, Bathurst Copper Butterfly	Spp	IBRA subregion
	Paralucia spinifera / Purple Copper Butterfly, Bathurst Copper Butterfly	Any in NSW
Petaurus norfolcensis / Squirrel Glider	Spp	IBRA subregion
	Petaurus norfolcensis / Squirrel Glider	Any in NSW



BAM Biodiversity Credit Report (Like for like)

Phascolarctos cinereus / Koala	Spp	IBRA subregion
	Phascolarctos cinereus / Koala	Any in NSW

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00024080/BAAS18089/21/00024081	Confidential Lithgow SSD Southern Easement	14/10/2022
Assessor Name	Report Created	BAM Data version *
Paul Price	15/11/2022	55
Assessor Number	BAM Case Status	Date Finalised
BAAS18089	Finalised	17/10/2022
Assessment Revision	Assessment Type	
1	Major Projects	

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Ecosystem credits for plant communities types (PCT), ecological communities & threatened species habitat

Zone	Vegetation zone name	TEC name	Current Vegetation integrity score	Change in Vegetation integrity (loss / gain)	Area (ha)	Sensitivity to loss (Justification)	Species sensitivity to gain class	BC Act Listing status	EPBC Act listing status	Biodiversity risk weighting	Potential SAI	Ecosystem credits
Black Gum grassy woodland of damp flats and drainage lines of the eastern Southern Tablelands, South Eastern Highlands Bioregion												
1	677_Low	Not a TEC	46.9	46.9	0.04	PCT Cleared - 95%	High Sensitivity to Gain			2.50		1

BAM Credit Summary Report

2	677_mode rate	Not a TEC	51.9	51.9	0.23	PCT Cleared - 95%	High Sensitivity to Gain			2.50		7
											Subtotal	8
Broad-leaved Peppermint - Ribbon Gum grassy open forest in the north east of the South Eastern Highlands Bioregion												
3	732_Mode rate	Not a TEC	83.6	83.6	0.78	PCT Cleared - 65%	High Sensitivity to Gain			1.75		29
4	732_NOG	Not a TEC	0.2	0.2	7.3	PCT Cleared - 65%	High Sensitivity to Gain			1.75		0
5	732_scattered01	Not a TEC	3.9	3.9	0.05	PCT Cleared - 65%	High Sensitivity to Gain			1.75		0
											Subtotal	29
											Total	37

Species credits for threatened species

Vegetation zone name	Habitat condition (Vegetation Integrity)	Change in habitat condition	Area (ha)/Count (no. individuals)	Sensitivity to loss (Justification)	Sensitivity to gain (Justification)	BC Act Listing status	EPBC Act listing status	Potential SAI	Species credits
<i>Cercartetus nanus</i> / Eastern Pygmy-possum (Fauna)									
732_Moderate	83.6	83.6	0.78			Vulnerable	Not Listed	False	33
								Subtotal	33

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<i>Eucalyptus aggregata / Black Gum (Flora)</i>									
677_moderate	N/A	N/A	2			Vulnerable	Vulnerable	False	4
								Subtotal	4
<i>Paralucia spinifera / Purple Copper Butterfly, Bathurst Copper Butterfly (Fauna)</i>									
732_Moderate	83.6	83.6	0.43			Endangered	Vulnerable	False	18
								Subtotal	18
<i>Petaurus norfolcensis / Squirrel Glider (Fauna)</i>									
732_Moderate	83.6	83.6	0.78			Vulnerable	Not Listed	False	33
								Subtotal	33
<i>Phascolarctos cinereus / Koala (Fauna)</i>									
732_Moderate	83.6	83.6	0.78			Endangered	Endangered	False	33
732_scattered01	3.9	3.9	0.05			Endangered	Endangered	False	1
								Subtotal	34

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Appendices

Appendix 1 Survey methods

Appendix 1.1 Nomenclature

The flora taxonomy (classification) used in this report follows the most recent Flora of NSW (Harden 1992, Harden 1993, Harden 2000, Harden 2002). All doubtful species names were verified with the on-line Australian Plant Name Index (Australian National Botanic Gardens 2007). Flora species, including threatened species and introduced flora species, are referred to by both their common and then scientific names when first mentioned. Subsequent references to flora species cite the common names only, unless there is no common name, for which scientific name will be used. Common names, where available, have been included in threatened species tables and the complete flora list in Appendix 3.

Names of vertebrates follow the Census of Australian Vertebrates (CAVs) maintained by the DEE (DSEWPac 2009). In the body of this report vertebrates are referred to by both their common and scientific names when first mentioned. Subsequent references to these species cite the common name only.

Appendix 1.2 Permits and licences

The flora and fauna assessment was conducted under the terms of Biosis' Scientific Licence issued by EES (SL100758, expiry date 30 June 2023). The BAM Assessment and quality review of the BDAR was carried out by Accredited Assessor Paul Price (BAAS18089) and overseen by Accredited Assessor Rebecca Dwyer (BAAS17067).

Appendix 1.3 Limitations

Field surveys were undertaken in accordance with the BAM. Ecological surveys provide a sampling of flora and fauna at a given time and season. Factors influencing detectability of species during survey include species dormancy, seasonal conditions, ephemeral status of waterbodies, and migration and breeding behaviours of some fauna. In many cases, these factors do not present a significant limitation to assessing the overall biodiversity values of a site.

The field surveys were conducted in autumn, winter and spring. The range of survey seasons is considered substantial and suitable to determine the presence of a wide range of threatened flora species. All targeted flora and fauna surveys were completed within the allowable survey periods according to the TBDC.

Surveys undertaken, combined with habitat assessments and desktop analysis are considered sufficient to reach the conclusions herein in regard to this and all other species' likelihood of occurrence within the subject land.

Database searches, and associated conclusions on the likelihood of species to occur within the assessment area, are reliant upon external data sources and information managed by third parties.

Appendix 2 BAM Candidate species assessment

Table A. 1 Threatened flora species assessment

Species	Status		BAM predicted SCS	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/undertaken	Potential for impact	Candidate species rationale
	EPBC	BC							
<i>Eucalyptus aggregata</i> Black Gum	V	V	Yes	Small to medium sized woodland tree that grows in the wetter, cooler areas of the Southern Highlands on the lowest parts of the landscape in poorly drained flats and hollows adjacent to creeks and small rivers. Associated with a variety of communities including Eastern Riverine Forests, Montane Bogs and Fens, Temperate Montane Grasslands, Subalpine Woodlands and Southern Tableland Wet Sclerophyll Forest. Grows in alluvial soils.	High	Yes	Yes - targeted survey undertaken June 2021, 14 – 15 July 2022	Yes	A population of this species was identified within the subject land. A total of 286 individuals were recorded.
<i>Eucalyptus pulverulenta</i> Silver-leafed Gum	V	V	Yes	Mallee or small tree that grows as an understorey plant in a variety of communities including Upper Riverina Dry Sclerophyll Forests, Southern Tableland Dry Sclerophyll Forests, Southern Tableland	Negligible	No	Yes - targeted survey undertaken June 2021, 14 – 15 July 2022	No	This species has been previously recorded on 2 occasions within 10 km of the subject land, with closest record being 2 km from the subject land. Potential habitat for this species in the development footprint is not

Species	Status		BAM predicted SCS	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/undertaken	Potential for impact	Candidate species rationale
	EPBC	BC							
				Grassy Woodlands and Tableland Clay Grassy Woodlands. Grows in shallow, infertile soils.					present, as the species predominantly grows in rocky areas. Whilst suitable habitat was not present within the subject land, targeted surveys undertaken in conjunction with other TS, did not record individuals of Silver-leafed Gum.
<i>Leucochrysum albicans</i> var. <i>tricolor</i> Hoary Sunray	E	-	Yes	Small perennial herb that grows in disturbed areas and inter-tussock spaces in grasslands, woodlands and forests. Grows in a variety of soils including clays, clay loams, stony and gravelly.	Moderate	No	Yes – targeted survey undertaken November 2021.	No	Hoary Sunray has been not been previously recorded within 10 km of the subject land. Whilst limited potential habitat for this species in the subject land is present, it was not was identified during targeted flora surveys within
<i>Prasophyllum petilum</i> Tarengo Leek Orchid	E	E	No	Terrestrial orchid found growing in open sites and patchy forest in Natural Temperate Grassland, Box-Gum Woodlands, Temperate Montane Grasslands, Southern Tableland Grassy Woodlands, Subalpine Woodlands, Tableland Clay Grassy Woodlands, Western Slopes Grassy Woodlands. This species is cryptic and most visible when flowering between October and	Moderate	No	Yes – targeted survey undertaken November 2021.	No	The Tarengo Leek Orchid has been not been previously recorded within 10 km of the subject land. Whilst limited potential habitat for this species in the subject land is present, it was not was identified during targeted flora surveys.

Species	Status		BAM predicted SCS	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/undertaken	Potential for impact	Candidate species rationale
	EPBC	BC							
				December. Grows in fertile soils.					
<i>Swainsona sericea</i> Silky Swainson-pea	V	-	No	Prostrate or erect perennial, growing to 10 cm tall. Has been recorded from the Northern Tablelands to the Southern Tablelands and further inland on the slopes and plains. There is one isolated record from the far north-west of NSW. Its stronghold is on the Monaro. Also found in South Australia, Victoria and Queensland. Found in Natural Temperate Grassland and Snow Gum Woodland on the Monaro. Also found in Box-Gum Woodland in the Southern Tablelands and South West Slopes.	Moderate	No	Yes – targeted survey undertaken November 2021.	No	The Silky Swainson-pea has been not been previously recorded within 10 km of the subject land. Whilst limited potential habitat for this species in the subject land is present, the Silky Swainson-pea was not was identified during targeted flora surveys.
<i>Thesium australe</i> Austral Toadflax	V	V	Yes	Small, straggling herb and root parasite found growing on damp sites in grassland, grassy woodlands and coastal headlands often in association with Kangaroo Grass <i>Themeda triandra</i> in a variety of communities including New England Dry Sclerophyll Forests,	Low	No	Yes – targeted survey undertaken November 2021.	No	This species has been previously recorded on 4 occasions within 10 km of the subject land, with closest record being 4.2 km from the subject land. Whilst marginal potential habitat for this species is located with the transmission line corridor within PCT 677 in a moderate condition,

Species	Status		BAM predicted SCS	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/undertaken	Potential for impact	Candidate species rationale
	EPBC	BC							
				Western Slopes Grasslands, Northern Tableland Wet Sclerophyll Forests, Brigalow Clay Plain Woodlands, Subalpine Woodlands and Maritime Grasslands.					the species not recorded during targeted flora surveys. Targeted surveys were not undertaken within PCT 732 NOG as a result of the low condition and absence of suitable host species i.e. Kangaroo Grass
<i>Veronica blakelyi</i>	-	V	Yes	Occurs in eucalypt forest, often in moist and sheltered areas. Associated canopy species include <i>Eucalyptus dives</i> , <i>E. dalrympleana</i> , <i>E. rossii</i> and <i>E. pauciflora</i> . The species appears to re-sprout after fire, although an optimal fire regime (frequency, intensity, etc) is unknown.	Low	No	Yes – targeted survey undertaken November 2021.	No	This species has been previously recorded on 7 occasions within 10 km of the subject land, with closest record being approximately 3.2 km from the subject land. Whilst potential habitat for this species in the development footprint is present, no specimens were identified during targeted flora surveys.

Table A. 2 Threatened fauna species assessment

Species	Status		BAM predic ted SCS	Habitat description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Candidate species rationale
	EPB C	BC							
<i>Anthochaera Phrygia</i> Regent Honeyeater	CE	CE	Yes	The Regent Honeyeater mainly inhabits temperate woodlands and open forests of the inland slopes of south-east Australia. Birds are also found in drier coastal woodlands and forests in some years. Once recorded between Adelaide and the central coast of Queensland, its range has contracted dramatically in the last 30 years to between north-eastern Victoria and south-eastern Queensland. There are only three known key breeding regions remaining: north-east Victoria (Chiltern-Albury), and in NSW at Capertee Valley and the Bundarra-Barraba region. In NSW the distribution is very patchy and mainly confined to the two main breeding areas and surrounding fragmented woodlands. In some years flocks converge on flowering coastal woodlands and forests. The	Moderate	No	No	Low	May forage on occasion as part of large broad-scale movements, however, the subject land is not within mapped important areas.

Species	Status		BAM predic ted SCS	Habitat description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Candidate species rationale
	EPB C	BC							
				species breeds between July and January in Box-Ironbark and other temperate woodlands and riparian gallery forest dominated by River Sheoak. Regent Honeyeaters usually nest in horizontal branches or forks in tall mature eucalypts and Sheoaks. Also nests in mistletoe haustoria (DPIE 2020c). This species is relevant to the Cumberland and Wollemi IBRA subregions.					
<i>Aprasia parapulchella</i> Pink-tailed Legless Lizard	V	V	No	Fossorial species, which lives beneath surface rocks and occupies ant burrows. It feeds on ants, particularly their eggs and larvae. Thought to lay eggs within the ant nests under rocks that it uses as a source of food and shelter. Key habitat features are a cover of native grasses, particularly Kangaroo Grass (<i>Themeda australis</i>), sparse or no tree cover, little or no leaf litter, and scattered	Low	No	No	Low	The subject land provides limited surface rock with no areas of outcropping. The subject land does not contain microhabitats required by this species and as such the species is unlikely to utilise the subject land.

Species	Status		BAM predic ted SCS	Habitat description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Candidate species rationale
	EPB C	BC							
				small rock with shallow embedment in the soil surface.					
<i>Botaurus poiciloptilus</i> Australasian Bittern	E	E	No	The Australasian Bittern is distributed across south-eastern Australia. Often found in terrestrial and estuarine wetlands, generally where there is permanent water with tall, dense vegetation including <i>Typha</i> sp. and <i>Eleocharis</i> sp. Typically this bird forages at night on frogs, fish and invertebrates, and remains inconspicuous during the day. The breeding season extends from October to January with nests being built amongst dense vegetation on a flattened platform of reeds.	Low	No	No	Low	The waterways and dams within the subject land are impacted by exotic grasses and livestock grazing. Potentially suitable waterways do not contain dense fringing or emergent aquatic vegetation, no records exist of this species within 10 km. The subject land does not contain microhabitats required by this species and as such the species is unlikely to utilise the subject land.
<i>Calidris ferruginea</i> Curlew Sandpiper	CE	E	No	Inhabits sheltered intertidal mudflats. Also, non-tidal swamps, lagoons and lakes near the coast. Infrequently recorded inland.	Low	No	No	N/A	There is no suitable habitat within the subject land for wading/ shorebird species.

Species	Status		BAM predic ted SCS	Habitat description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Candidate species rationale
	EPB C	BC							
<i>Callocephalon fimbriatum</i> Gang-gang Cockatoo		V	Yes	In summer, occupies tall montane forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. Also occur in subalpine Snow Gum woodland and occasionally in temperate or regenerating forest. In winter, occurs at lower altitudes in drier, more open eucalypt forests and woodlands, particularly in box-ironbark assemblages, or in dry forest in coastal areas. It requires tree hollows in which to breed.	Low	No	No	Low	No suitable hollows occur within the subject land. Areas adjacent to the subject land contained large hollows, however, these were considered of low quality for nesting due to the vertical position of the entrance which provides limited shelter from the weather. The subject land does not contain suitable microhabitats required for breeding by this species and therefore is unlikely to occur except on occasion as part of foraging or dispersal movements.
<i>Calyptrorhynchus lathami</i> Glossy Black-Cockatoo		V	Yes	Inhabits forest with low nutrients, characteristically with key <i>Allocasuarina</i> species. Tends to prefer drier forest types. Often confined to remnant patches in hills and gullies. Breed in hollows stumps or limbs, either living or dead.	Low	No	No	Low	No suitable hollows occur within the subject land. Areas adjacent to the subject land contained large hollows, however, these were considered of low quality for nesting due to the vertical position of the entrance which provides limited shelter from

Species	Status		BAM predic ted SCS	Habitat description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Candidate species rationale
	EPB C	BC							
									the weather. The subject land does not contain suitable microhabitats required for breeding by this species and therefore is unlikely to occur except on occasion as part of foraging or dispersal movements.
<i>Cercartetus nanus</i> Eastern Pygmy-possum		V	Yes	Patchily distributed from the coast to the Great Dividing Range, and as far as Pillaga, Dubbo, Parkes and Wagga Wagga on the western slopes. Inhabits rainforest through to sclerophyll forest and tree heath. Banksias and myrtaceous shrubs and trees are a favoured food source. Soft fruits are eaten when flowers are unavailable, and it also feeds on insects. Will often nest in tree hollows but can also construct its own nest. Because of its small size it is able to utilise a range of hollow sizes including very small hollows.	Moderate	Yes	Presence assumed	Moderate	The north-west section of the subject land (PCT 732) contains potential low-quality habitat for this species. Habitat is considered low quality due to the presence of hollows, limited understorey shrubby species and history of grazing of the land. The remainder of the subject land is degraded through exotic weed invasion and does not provide suitable microhabitat features (shrubby understorey with foraging/nesting resources) to support the species. The study area provides marginal habitat due to a low

Species	Status		BAM predicted SCS	Habitat description	Potential occurrence in subject land	BAM Candidate species	Survey required/undertaken	Potential for impact	Candidate species rationale
	EPB C	BC							
				Individuals will use a number of different hollows and an individual has been recorded using up to 9 nest sites within a 0.5 ha area over a 5 month period.					density of hollows and relatively degraded understorey lacking an abundance of foraging resources for this species. Records of this species in the locality occur in Newnes State Forest to the east.
<i>Chalinolobus dwyeri</i> Large-eared Pied Bat	V	V	Yes	Primarily found in dry sclerophyll forests and woodlands, but also found in rainforest fringes and subalpine woodlands. Forages on small, flying insects below the forest canopy. Roosts in colonies of between 3 and 80 in caves, Fairy Martin nests and mines, and beneath rock overhangs, but usually less than 10 individuals. Likely that it hibernates during the cooler months. The only known existing maternity roost is in a sandstone cave near Coonabarabran.	High	Yes	Targeted survey.	Low	Rocky outcrop and escarpments associated with the Great Dividing Range east of the subject land, occur within 2 kilometres of the development footprint and provide suitable roosting habitat for this species. Given the proximity of the subject land to suitable habitat features it is likely this species occurs on occasion as part of dispersal and foraging movements. This species was recorded during targeted survey. However, the subject land is not within 100 metres of suitable roosting habitat and therefore the proposed works will not impact

Species	Status		BAM predic ted SCS	Habitat description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Candidate species rationale
	EPB C	BC							
									on breeding habitat for this species (OEH 2018).
<i>Dasyurus maculatus</i> Spotted-tailed Quoll	E		No	Quolls use hollow-bearing trees, fallen logs, other animal burrows, small caves and rock outcrops as den sites. Use communal 'latrine sites', often on flat rocks among boulder fields, rocky cliff-faces or along rocky stream beds or banks. Such sites may be visited by multiple individuals and can be recognised by the accumulation of the sometimes characteristic 'twisty-shaped' faeces deposited by animals.	Moderate	No	No	Low	Microhabitat such as woody debris is limited in the subject land and dense shrubs/ understorey are lacking across the impact area. Following detailed traverses, no potential den sites were identified during the field assessment. No cliff faces or rocky stream banks are present within the subject land, such features are used in breeding seasons to identify females within the area. The large areas of intact land to the south of the impact site and west of the subject land that is not being impacted, will remain as habitat for this species if present in the locality. The species is likely to forage across the subject land and may occur on occasion but is unlikely to be impacted by the

Species	Status		BAM predic ted SCS	Habitat description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Candidate species rationale
	EPB C	BC							
									proposed works.
<i>Grantiella picta</i> Painted Honeyeater	V	V	No	Found mainly in dry open woodlands and forests, where it is strongly associated with mistletoe. Often found on plains with scattered eucalypts and remnant trees on farmlands.	Low	No	No	Low	No mistletoe were recorded within the impact area and this species is unlikely to occur within the subject land except on occasion as part of dispersal movements.
<i>Haliaeetus leucogaster</i> White-bellied Sea-Eagle		V	Yes	A migratory species that is generally sedentary in Australia, although immature individuals and some adults are dispersive. Found in terrestrial and coastal wetlands; favouring deep freshwater swamps, lakes and reservoirs; shallow coastal lagoons and saltmarshes. It hunts over open terrestrial habitats. Feeds on birds, reptiles, fish, mammals, crustaceans and carrion. Roosts and makes nest in trees.	Low	No	No	Low	No large stick nests were recorded during field investigation within or immediately adjacent to the impact area.
<i>Heleioporus australiacus</i>	V	V	Yes	Prefers hanging swamps on sandstone shelves adjacent to	Low	No	No	Low	This species is associated with hanging swamps on sandstone

Species	Status		BAM predic ted SCS	Habitat description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Candidate species rationale
	EPB C	BC							
Giant Burrowing Frog				perennial non-flooding creeks. Can also occur within shale outcrops within sandstone formations. Known from wet and dry forests and montane woodland in the southern part range. Individuals can be found around sandy creek banks or foraging along ridge-tops during or directly after heavy rain. Males often call from burrows located in sandy banks next to water. Spends the majority of its time in non-breeding habitat 20-250m from breeding sites.					shelves adjacent to perennial non-flooding streams. The subject land does not support essential micro-habitat features required by this species. Waterways within the subject land are degraded by land clearing and livestock presence and are not suitable for this species.
<i>Hieraaetus morphnoides</i> Little Eagle		V	Yes	The Little Eagle is most abundant in lightly timbered areas with open areas nearby providing an abundance of prey species. It has often been recorded foraging in grasslands, crops, treeless dune fields, and recently logged areas. The Little Eagle nests in tall living trees within farmland, woodland and forests.	Low	No	No	Low	No large stick nests were present during field investigation in the breeding season. This species may forage on occasion as part of a large home range but is unlikely to be impacted by the proposed works.

Species	Status		BAM predic ted SCS	Habitat description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Candidate species rationale
	EPB C	BC							
<i>Hirundapus caudacutus</i> White-throated Needletail	V		No	An aerial species found in feeding concentrations over cities, hilltops and timbered ranges. Migratory species that is usually seen in eastern Australia from October to April, with breeding occurring in Asia from June to August. Low pressure troughs and approaching cold fronts tend to lift insects away from the surface to be preyed upon by the White-throated Needletail. Typically, more common in coastal areas, less so inland.	Low	No	No	Low	Species migrates to Australia and is often seen from October to April. The White-throated Needletail forages aerially on insects and is more common in coastal areas, however this species may occur on occasion in the subject land. The proposed development will not significantly affect the foraging resources (insects) required by the White-throated Needletail for aerial foraging. The proposed works are not likely to impact on the species as no breeding habitat is present or will be impacted and aerial foraging will not be impacted. The vegetation directly outside the impact area and to the east provides larger patches of intact bushland that will sustain the insect resources, habitat and connectivity required by the White-throated Needletail.

Species	Status		BAM predic ted SCS	Habitat description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Candidate species rationale
	EPB C	BC							
<i>Hoplocephalus bungaroides</i> Broad-headed Snake	V	E	Yes	Mainly occurs in association with communities occurring on Triassic sandstone within the Sydney Basin. Typically found among exposed sandstone outcrops with vegetation types ranging from woodland to heath. Within these habitats they generally use rock crevices and exfoliating rock during the cooler months and tree hollows during summer.	Low	No	No	Low	The subject land does not support essential micro-habitat features as there is no rocky outcrops, surface rock or suitable escarpments.
<i>Lathamus discolor</i> Swift Parrot	CE	E	Yes	The Swift Parrot occurs in woodlands and forests of NSW from May to August, where it feeds on eucalypt nectar, pollen and associated insects. The Swift Parrot is dependent on flowering resources across a wide range of habitats in its wintering grounds in NSW. Favoured feed trees include winter flowering species such as Swamp Mahogany <i>Eucalyptus robusta</i> , Spotted Gum <i>Corymbia maculata</i> , Red Bloodwood C.	Low	No	No	Low	Highly mobile species foraging across large areas of New South Wales and breeding in Tasmania. The subject land is not within any mapped important areas for this species and as such the proposed works are not likely to have an impact to the species.

Species	Status		BAM predic ted SCS	Habitat description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Candidate species rationale
	EPB C	BC							
				<i>gummifera</i> , Mugga Ironbark <i>E. sideroxylon</i> , and White Box <i>E. albens</i> . Commonly used lerp infested trees included Grey Box <i>E. microcarpa</i> , Grey Box <i>E. moluccana</i> and Blackbutt <i>E. pilularis</i> . This species is migratory, breeding in Tasmania and also nomadic, moving about in response to changing food availability.					
<i>Litoria booroolongensis</i> Booroolong Frog	E	E	Yes	The species is found in upland rivers, montane creeks and lowland rivers and creeks, particularly in permanent rocky western-flowing streams and rivers on the slopes and tablelands of NSW, with some fringing vegetation cover such as ferns, sedges or grasses. The Booroolong Frog is often found in daylight on rocks by the water's edge or sheltering under rocks or amongst vegetation. Breeding occurs in spring and early summer when eggs are	Low	No	No	Low	The subject land contains one waterway and multiple farm dams. The subject land occurs at the base of the foothills of the western side of the Blue Mountains. The waterway in the subject land is impacted by historic clearing of the surrounding area for livestock grazing and does not contain significant rocky features (outcropping, boulders etc). The subject land does not contain microhabitats required by this species and as such the species

Species	Status		BAM predic ted SCS	Habitat description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Candidate species rationale
	EPB C	BC							
				laid in submerged rock crevices. Tadpoles develop in slow-flowing connected or isolated pools and metamorphose in late summer to early autumn.					is unlikely to utilise the subject land.
<i>Litoria littlejohni</i> Littlejohn's Tree Frog	V	V	Yes	Occurs in wet and dry sclerophyll forests and heath communities associated with sandstone outcrops between 280 and 1000 m. Littlejohn's Tree Frog prefers permanent and semi-permanent rock flowing streams, but individuals have also been collected from semi-permanent dams with some emergent vegetation. Forages both in the tree canopy and on the ground, and has been observed sheltering under rocks on high exposed ridges during summer. The species breeds in autumn but will also breed after heavy rainfall in spring and summer. The species has been recorded calling in all seasons with variously reported					The subject land contains one waterway and multiple farm dams. The waterway in the subject land is impacted by historic clearing of the surrounding area for livestock grazing and does not contain significant rocky features (outcropping, boulders etc). The subject land does not contain microhabitats required by this species and as such the species is unlikely to utilise the subject land.

Species	Status		BAM predic ted SCS	Habitat description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Candidate species rationale
	EPB C	BC							
				peak calling periods. Eggs are laid in loose gelatinous masses attached to submerged twigs; eggs and tadpoles are most often recorded in slow-flowing pools that receive extended exposure to sunlight.					
<i>Lophoictinia isura</i> Square-tailed Kite		V	Yes	Typically inhabits coastal forested and wooded lands of tropical and temperate Australia. In NSW it is often associated with ridge and gully forests dominated by <i>Eucalyptus longifolia</i> , <i>Corymbia maculata</i> , <i>E. elata</i> , or <i>E. smithii</i> . Individuals appear to occupy large hunting ranges of more than 100 km ² . They require large living trees for breeding, particularly near water with surrounding woodland/forest close by for foraging habitat. Nest sites are generally located along or near watercourses, in a tree fork or on large horizontal limbs.	Moderate	Yes	Yes	Low	No large stick nests were observed during field survey, conducted during the breeding period.

Species	Status		BAM predic ted SCS	Habitat description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Candidate species rationale
	EPB C	BC							
<i>Macquaria australasica</i> Macquarie Perch	E		No	Macquarie perch are found in both river and lake habitats, especially the upper reaches of rivers and their tributaries.	Low	No	No	Low	No recent records within the locality, microhabitats required are absent and habitat is degraded to the point the species is unlikely to use the subject land.
<i>Miniopterus orianae oceanensis</i> Large Bent-winged Bat		V	Yes	Forms large maternity roosts (up to 100,000 individuals) in caves and mines in spring and summer. Individuals may fly several hundred kilometres to their wintering sites, where they roost in caves, culverts, buildings, and bridges. They occur in a broad range of habitats including rainforest, wet and dry sclerophyll forest, paperbark forest and open grasslands. Has a fast, direct flight and forages for flying insects (particularly moths) above the tree canopy and along waterways.	Moderate	Yes	Targeted survey	Low	Rocky outcrop and escarpments associated with the Great Dividing Range east of the subject land, occur within 2 kilometres of the development footprint and provide suitable roosting habitat for this species. Given the proximity of the subject land to suitable habitat features it is likely this species occurs on occasion as part of dispersal and foraging movements. This species was recorded during targeted survey. However, the subject land is not within 100 metres of suitable roosting habitat and therefore the proposed works will not impact on breeding habitat for this species (OEH

Species	Status		BAM predic ted SCS	Habitat description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Candidate species rationale
	EPB C	BC							
									2018).
<i>Ninox connivens</i> Barking Owl		V	Yes	Generally found in open forests, woodlands, swamp woodlands, farmlands and dense scrub. Can also be found in the foothills and timber along watercourses in otherwise open country. Territories are typically 2000 ha in NSW habitats. Hunts small arboreal mammals or birds and terrestrial mammals when tree hollows are absent.	Low	No	No	Low	Following detailed traverses and careful assessment of existing trees to determine the presence of hollow-bearing trees, no large hollows suitable for breeding for this species were recorded within the subject land. It was noted that areas adjacent to the development footprint contain large hollows, however these are not considered suitable for use by Barking Owl as entrances are vertical, in broken limbs and trunks. Large hollows recorded adjacent to the subject land will not be impacted and are not considered suitable for use due to the vertical position of entrances. The subject land does not contain microhabitats required by this species for foraging such

Species	Status		BAM predic ted SCS	Habitat description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Candidate species rationale
	EPB C	BC							
									as small arboreal mammals or birds and as such the species is unlikely to utilise the subject land.
<i>Ninox strenua</i> Powerful Owl		V	Yes	The Powerful Owl occupies wet and dry eucalypt forests and rainforests. It may inhabit both un-logged and lightly logged forests as well as undisturbed forests where it usually roosts on the limbs of dense trees in gully areas. Large mature trees with hollows at least 0.5 m deep are required for nesting. Tree hollows are particularly important for the Powerful Owl because a large proportion of the diet is made up of hollow-dependent arboreal marsupials. Nest trees for this species are usually emergent with a diameter at breast height of at least 100 cm. It has a large home range of between 450 and 1450 ha.	Low	No	No	Low	Areas adjacent to the development footprint contain large hollows, however these are not considered suitable for use by Powerful Owl as entrances are vertical, in broken limbs and trunks. The subject land does not contain microhabitats required by this species and as such the species is unlikely to utilise the subject land.

Species	Status		BAM predic ted SCS	Habitat description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Candidate species rationale
	EPB C	BC							
<i>Numenius madagascariensis</i> Eastern Curlew	CE		No	Occurs in sheltered coasts, especially estuaries, embayments, harbours, inlets and coastal lagoons with large intertidal mudflats or sandflats often with beds of seagrass.	Low	No	No	N/A	The subject land does not contain habitat suitable for this species.
<i>Paralucia spinifera</i> Purple Copper Butterfly, Bathurst Copper Butterfly	V	E	Yes	Commonly found in open woodland or open forest with a sparse understorey dominated by Blackthorn (<i>Bursaria spinosa</i> subsp. <i>lasiophylla</i>). Found in locations above 850 m altitude and is associated with exposure to full day sun, often with a west to north aspect. Also associated with extremes of cold.	Moderate	Yes	Species assumed present based on presence of suitable habitat, with an additional 40 meter buffer around the suitable habitat.	Low	Impacts to areas containing suitable habitat have been avoided.
<i>Petauroides volans</i> Greater Glider	V		No	The distribution of the Greater Glider includes the ranges and coastal plain of eastern Australia, where it inhabits a variety of eucalypt forests and woodlands. Presence and density of Greater Gliders is related to soil fertility, eucalypt tree species, disturbance history	Moderate	Yes	Assumed present.	Moderate	Suitable foraging habitat exists in the north-west of the subject land. The subject land does not contain a high density of large hollows and connected vegetation to the west provides larger more intact habitat. The species has been assumed present in the north-west of the

Species	Status		BAM predic ted SCS	Habitat description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Candidate species rationale
	EPB C	BC							
				and density of suitable tree hollows. Feeds exclusively on eucalypt leaves, buds, flowers and mistletoe.					subject land in PCT 732, impacts to this habitat have been avoided.
<i>Petaurus norfolcensis</i> Squirrel Glider		V	Yes	The species is widely though sparsely distributed in eastern Australia, from northern Queensland to western Victoria that habits mature or old growth Box, Box-Ironbark woodlands and River Red Gum forest west of the Great Dividing Range	High	Yes	Yes	Low	Suitable foraging habitat exists in the north-west of the subject land. The subject land does not contain a high density of large hollows and connected vegetation to the west provides larger more intact habitat. The species has been assumed present in the north-west of the subject land in PCT 732, impacts to this habitat have been avoided.
<i>Petrogale penicillata</i> Brush-tailed Rock-wallaby	V	E	Yes	Habitats range from rainforest to open woodland. It is found in areas with numerous ledges, caves and crevices particularly with northern aspects. The species forages on grasses and forbs.	Low	No	No	Low	The subject land does not contain rocky outcrops, escarpments or steep slopes. No suitable habitat occurs within the subject land for this species.
<i>Phascogale tapoatafa</i>		V	Yes	The Brush-tailed Phascogale	Low	Yes	No	Low	No records exist within 20 km

Species	Status		BAM predic ted SCS	Habitat description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Candidate species rationale
	EPB C	BC							
Brush-tailed Phascogale				had a scattered distribution centred around the Great Dividing Range. It prefers open forests with a sparse ground cover, but also inhabits mallee and rainforests. It feeds on insects and nectar, particularly in rough-barked trees. Nests and shelters in tree hollows, tree stumps and occasionally birds nests, and can use more than 40 nests in a year.					of the subject land and this species is mainly found east of the Great Dividing Range. Suitable hollows occur within the subject land, however, the subject land does not contain a high density of hollows for use by this species which typically use a large number of nest sites. Spotlight survey did not detect this species, therefore this species is considered unlikely to occur in the subject land.
<i>Phascolarctos cinereus</i> Koala	V	V	yes	Koalas feed almost exclusively on eucalypt foliage, and their preferences vary regionally. Primary feed trees include <i>Eucalyptus robusta</i> , <i>E. tereticornis</i> , <i>E. punctata</i> , <i>E. haemostoma</i> and <i>E. signata</i> . They are solitary with varying home ranges.	Moderate	No	Yes	Low	Potential habitat for this species occurs in the north-west of the subject land. No impacts will occur to the vegetation as a part of the Project. Spotlight and call back survey did not detect this species, therefore this species is considered unlikely to occur in the subject land.
<i>Pseudomys novaehollandiae</i>	V		No	Across the species' range the New Holland Mouse is known to	Low	No	No	Low	Habitat within the subject land is not suitable for this species as

Species	Status		BAM predic ted SCS	Habitat description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Candidate species rationale
	EPB C	BC							
New Holland Mouse				inhabit open heathlands, open woodlands with a heathland understorey, and vegetated sand dunes. The home range of the New Holland Mouse can range from 0.44 ha to 1.4 ha. The New Holland Mouse is a social animal, living predominantly in burrows shared with other individuals. The species is nocturnal and omnivorous, feeding on seeds, insects, leaves, flowers and fungi. It is likely that the species spends considerable time foraging above-ground for food. Breeding typically occurs between August and January, but can extend into autumn.					soil is alluvial clays and historical clearing has removed much of the mid-storey and native ground cover. Livestock grazing further impacts the suitability of land for this species due to compaction by hooved animals. No known populations occur within 10 km of the subject land.
<i>Pteropus poliocephalus</i> Grey-headed Flying-fox	V	V	Yes	Occurs along the NSW coast, extending further inland in the north. This species is a canopy-feeding frugivore and nectarivore of rainforests, open forests, woodlands, melaleuca swamps and banksia	Moderate	No	No	Low	No camps or individuals were recorded in the subject land or immediately adjacent during field investigations. May forage across the subject land on occasion on flowering eucalyptus species but it is not

Species	Status		BAM predic ted SCS	Habitat description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Candidate species rationale
	EPB C	BC							
				woodlands. Roosts in large colonies, commonly in dense riparian vegetation.					considered essential foraging habitat for this species. As such, a Significant Impact Criteria (SIC) assessment has not been completed for this species.
<i>Rostratula australis</i> Australian Painted Snipe	E	E	No	Usually found in shallow inland wetlands including farm dams, lakes, rice crops, swamps and waterlogged grassland. They prefer freshwater wetlands, but have been recorded in brackish waters. Forages on mud-flats and in shallow water. Feeds on worms, molluscs, insects and some plant-matter.	Low	No	No	No	The subject land does not provide suitable areas for foraging or breeding by this species.
<i>Tyto novaehollandiae</i> Masked Owl	-	V	Yes	The Masked Owl is found in range of wooded habitats that provide tall or dense mature trees with hollows suitable for nesting and roosting. It is mostly seen in open forests and woodlands adjacent to cleared lands. Prey includes hollow-dependent arboreal marsupials and terrestrial mammals.	Low	No	No	Low	No hollows suitable for breeding for this species were recorded within the subject land or immediately adjacent to the subject land. Large hollows recorded adjacent to the subject land will not be impacted and are not considered suitable for use due to the vertical position of

Species	Status		BAM predic ted SCS	Habitat description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Candidate species rationale
	EPB C	BC							
									entrances. Underboring in areas adjacent to where large hollows occur will provide temporary disturbance to these areas and is not expected to interrupt potential nest sites unless conducted during the breeding season.
<i>Varanus rosenbergi</i> Rosenberg's Goanna	-	V	Yes	Rosenberg's Goanna occurs on the Sydney Sandstone in Wollemi National Park, in Goulburn and ACT regions and near Cooma. It is found in heath, open forest and woodland areas, with individuals requiring large areas of habitat of hollow logs, rock crevices and burrows. Termite mounds are a critical habitat component for this species were they can lay up to 14 eggs in a mound, with the hatchlings digging themselves out.	Low	No	No	Low	Following detailed traverses, the impact area was not found to contain significant habitat features in the form of rock crevices, escarpments or steep slopes or hollow logs. In addition, no termite mounds were identified within the impact area. Therefore there is not likely to be any impact to a crucial component of the Rosenberg's Goanna habitat.

Appendix 3 Flora

Appendix 3.1 BAM plot field data

Table A. 3 Flora species recorded in the subject land from BAM plots

Scientific name	Common name	Plot 1		Plot 2		Plot 3		Plot 4		Plot 5		Plot 6		Plot 7	
		Cover	Abundance	Cover	Abundance	Cover	Abundance	Cover	Abundance	Cover	Abundance	Cover	Abundance	Cover	Abundance
<i>Acacia dealbata</i>	Silver Wattle			0.1	5										
<i>Acaena novae-zelandiae</i>	Bidgee-widgee	0.2	100	0.1	50										
<i>Acetosella vulgaris</i>	Sheep Sorrel					0.1	10	0.1	100					0.2	1000
<i>Agrostis capillaris</i>	Browntop Bent					2	1000	15	3000	10	1000	10	1000		
<i>Anthosachne scabra</i>	Wheatgrass, Common Wheatgrass	0.3	100												
<i>Anthoxanthum odoratum</i>	Sweet Vernal Grass									0.5	100			40	5000
<i>Aristida ramosa</i>	Purple Wiregrass									0.1	10				
<i>Asperula conferta</i>	Common Woodruff			0.1	30										
<i>Bromus catharticus</i>	Praire Grass													1	60
<i>Bossiaea buxifolia</i>						0.1	20								
<i>Bursaria spinosa</i> subsp. <i>lasiophylla</i>	Native Blackthorn					5	20								

Scientific name	Common name	Plot 1		Plot 2		Plot 3		Plot 4		Plot 5		Plot 6		Plot 7	
		Cover	Abundance	Cover	Abundance	Cover	Abundance	Cover	Abundance	Cover	Abundance	Cover	Abundance	Cover	Abundance
<i>Carex appressa</i>	Tall Sedge	0.1	2	0.2	5										
<i>Carex inversa</i>	Knob Sedge	0.1	100	0.2	1000	0.2	1000							0.1	30
<i>Cassinia aculeata</i>	Dolly Bush					0.1	1								
<i>Cassinia sifton</i>						0.1	1			0.3	5	0.1	1		
<i>Centaureum tenuiflorum</i>	Branched Centaury, Slender centaury	0.1	10	0.1	1	0.1	10	0.1	10					0.1	20
<i>Cheilanthes sieberi</i> subsp. <i>sieberi</i>	Rock Fern					0.1	30								
<i>Chrysocephalum apiculatum</i>	Common Everlasting	0.1	10												
<i>Chrysocephalum semipapposum</i>	Clustered Everlasting	0.1	10												
<i>Cirsium vulgare</i>	Spear Thistle	0.1	2	0.1	10	0.1	1							0.2	30
<i>Conyza bonariensis</i>	Flaxleaf Fleabane	0.1	100	0.1	20	0.1	10			0.1	2			0.1	20
<i>Coronidium rutidolepis</i>								0.1	10						
<i>Coronidium scorpioides</i>	Button Everlasting					0.1	5								
<i>Crataegus monogyna</i>	Hawthorn	0.2	10	3	10										
<i>Cynodon dactylon</i>	Common Couch	0.5	1000					5	1000	0.2	100	5	500	1	1000
<i>Dactylis glomerata</i>	Cocksfoot			0.5	200	2	1000							0.3	200

Scientific name	Common name	Plot 1		Plot 2		Plot 3		Plot 4		Plot 5		Plot 6		Plot 7	
		Cover	Abundance	Cover	Abundance	Cover	Abundance	Cover	Abundance	Cover	Abundance	Cover	Abundance	Cover	Abundance
<i>Deyeuxia quadriseta</i>								20	1000			10	1000		
<i>Dichelachne crinita</i>	Longhair Plumegrass	0.1	1												
<i>Dichelachne micrantha</i>	Shorthair Plumegrass					0.1	10								
<i>Dichondra repens</i>	Kidney Weed	0.1	1000												
<i>Echium plantagineum</i>	Patterson's Curse	0.1	2	0.1	2									01	1
<i>Eragrostis leptostachya</i>	Paddock Lovegrass											0.1	1		
<i>Eragrostis trachycarpa</i>	A Lovegrass					0.1	1								
<i>Eucalyptus aggregata</i>	Black Gum	5	7	10	10										
<i>Eucalyptus dives</i>	Broad-leaved Peppermint					15	30								
<i>Eucalyptus mannifera</i>	Brittle Gum					0.5	2								
<i>Eucalyptus pauciflora</i>	White Sally					5	1							5	5
<i>Eucalyptus stellulata</i>	Black Sally	0.1	2												
<i>Euchiton involucratus</i>	Star Cudweed	0.1	20	0.1	1	0.1	30			0.1	5				
<i>Gamochaeta purpurea</i>	Purple Cudweed	0.1	2												
<i>Geranium solanderi</i> var. <i>solanderi</i>		0.1	100	0.1	5										

Scientific name	Common name	Plot 1		Plot 2		Plot 3		Plot 4		Plot 5		Plot 6		Plot 7	
		Cover	Abundance	Cover	Abundance	Cover	Abundance	Cover	Abundance	Cover	Abundance	Cover	Abundance	Cover	Abundance
<i>Gonocarpus tetragynus</i>	Poverty Raspwort					0.5	1000								
<i>Goodenia bellidifolia</i> subsp. <i>bellidifolia</i>						0.1	1								
<i>Haloragis heterophylla</i>	Variable Raspwort			0.1	10			0.1	10			0.1	200	0.1	5
<i>Hemarthria uncinata</i>	Matgrass											0.2	10		
<i>Holcus lanatus</i>	Yorkshire Fog											0.1	1	0.3	20
<i>Hydrocotyle laxiflora</i>	Stinking Pennywort					0.1	10								
<i>Hypericum gramineum</i>	Small St John's Wort					0.1	50								
<i>Hypericum perforatum</i>	St. Johns Wort	0.4	1000	1	1000	0.5	1000			0.1	1	0.1	1	0.1	20
<i>Hypochaeris radicata</i>	Catsear	0.2	1000	0.5	1000	0.2	100	10	5000	10	5000	10	2000	0.2	30
<i>Juncus cognatus</i>								0.1	10						
<i>Juncus</i> spp.	A Rush							0.1	5						
<i>Juncus usitatus</i>												0.1	5		
<i>Lactuca serriola</i>	Prickly Lettuce			0.1	1										
<i>Leptospermum continentale</i>	Prickly Teatree					0.2	1								
<i>Ligustrum sinense</i>	Small-leaved Privet	0.1	1												
<i>Lolium perenne</i>	Perennial Ryegrass													0.2	40

Scientific name	Common name	Plot 1		Plot 2		Plot 3		Plot 4		Plot 5		Plot 6		Plot 7	
		Cover	Abundance	Cover	Abundance	Cover	Abundance	Cover	Abundance	Cover	Abundance	Cover	Abundance	Cover	Abundance
<i>Lomandra filiformis</i> subsp. <i>coriacea</i>	Wattle Matt-rush	0.1	10			10	1000								
<i>Lomandra longifolia</i>	Spiny-headed Mat	0.2	2												
<i>Lomandra multiflora</i> subsp. <i>multiflora</i>	Many					0.1	20								
<i>Lysimachia arvensis</i>	Scarlet Pimpernel	0.1	1			0.1	2							0.1	5
<i>Microlaena stipoides</i>	Weeping Grass	5	1000	10	2000	60	3000								
<i>Modiola caroliniana</i>	Red-flowered Mat			0.1	10										
<i>Nassella trichotoma</i>	Serrated Tussock	0.3	10	0.1	50										
<i>Oxalis corniculata</i>	Creeping Oxalis	0.1	10	0.1	20										
<i>Oxalis perennans</i>		0.1	10			0.1	10								
<i>Panicum effusum</i>	Hairy Panic									30	5000				
<i>Panicum gilvum</i>								30	5000	0.1	5				
<i>Panicum simile</i>	Two-colour Panic	0.4	100												
<i>Paspalum dilatatum</i>	Paspalum	0.5	100	5	1000	0.1	10	10	1000			0.5	50	20	2000
<i>Phalaris aquatica</i>	Phalaris	1	500	60	5000							0.2	20	0.5	30
<i>Plantago lanceolata</i>	Lamb's Tongues	0.2	100	0.5	500	0.1	10	2	1000	1	500	0.5	1000	45	5000
<i>Poa labillardierei</i> var. <i>labillardierei</i>	Tussock	5	200	0.5	500										

Scientific name	Common name	Plot 1		Plot 2		Plot 3		Plot 4		Plot 5		Plot 6		Plot 7	
		Cover	Abundance	Cover	Abundance	Cover	Abundance	Cover	Abundance	Cover	Abundance	Cover	Abundance	Cover	Abundance
<i>Poa sieberiana</i>	Snowgrass					0.3	500								
<i>Poranthera microphylla</i>	Small Poranthera					0.1	10								
<i>Pterostylis coccinea</i>						0.1	5								
<i>Rosa rubiginosa</i>	Sweet Briar			0.3	10	0.1	2								
<i>Rubus fruticosus</i> sp. agg.	Blackberry complex	0.1	10	10	50	4	10	0.1	1			15	5	15	100
<i>Rytidosperma caespitosum</i>	Ringed Wallaby Grass					3	200								
<i>Rytidosperma erianthum</i>	Wallaby Grass	2	1000	5	1000										
<i>Schoenus apogon</i>	Fluke Bogrush											0.1	10		
<i>Senecio madagascariensis</i>	Fireweed			0.1	1										
<i>Senecio prenanthoides</i>		0.1	10	0.1	10										
<i>Setaria pumila</i>	Pale Pigeon Grass							5	1000					0.2	100
<i>Solanum americanum</i>	Glossy Nightshade			0.1	5										
<i>Solanum nigrum</i>	Black-berry Nightshade	0.1	10	0.1	2										
<i>Sonchus oleraceus</i>	Common Sowthistle			0.1	1										
<i>Sorghum leiocladum</i>	Wild Sorghum	0.2	5	2	20										
<i>Sporobolus elongatus</i>	Slender Rat's Tail Grass	0.1	5												

Scientific name	Common name	Plot 1		Plot 2		Plot 3		Plot 4		Plot 5		Plot 6		Plot 7	
		Cover	Abundance	Cover	Abundance	Cover	Abundance	Cover	Abundance	Cover	Abundance	Cover	Abundance	Cover	Abundance
<i>Themeda triandra</i>		15	1000	0.2	50	0.2	1000								
<i>Trifolium repens</i>	White Clover											0.1	10	0.1	20
<i>Veronica plebeia</i>	Trailing Speedwell	0.1	2			0.1	10								
<i>Vulpia myuros</i>	Rat's Tail Fescue					0.1	2	0.5	100	0.2	500			10	500
<i>Wahlenbergia communis</i>	Tufted Bluebell	0.1	2			0.1	10							0.2	100
<i>Xerochrysum viscosum</i>	Sticky Everlasting					0.1	10								

Appendix 4 Fauna

Table A. 4 Fauna species recorded at the subject land

Common name	Scientific name
Mammals	
Common Ringtail Possum	<i>Pseudocheirus peregrinus</i>
Common Brushtail Possum	<i>Trichosurus vulpecula</i>
Eastern Grey Kangaroo	<i>Macropus giganteus</i>
Rabbit	<i>Oryctolagus cuniculus</i>
Squirrel Glider	<i>Petaurus norfolcensis</i>
Sugar Glider	<i>Petaurus breviceps</i>
Gould's Wattled Bat	<i>Chalinolobus gouldii</i>
Little Pied Bat	<i>Chalinolobus picatus</i>
Chocolate Wattled Bat	<i>Chalinolobus morio</i>
Vespadelus species (Little Forest Bat/ Southern Forest Bat/ Large Forest Bat/ Eastern Cave Bat).	<i>Vespadelus vulturnus/ regulus/ darlingtoni/ trougtoni*</i>
Little Broad-nosed Bat	<i>Scotorepens greyi</i>
Western Broad-nosed Bat	<i>Scotorepens balstoni</i>
South-eastern Free-tailed Bat	<i>Ozimops planiceps</i>
Yellow-bellied Sheath-tail-bat	<i>Saccolaimus flaviventris</i>
White-striped Free-tailed Bat	<i>Austronomus australis</i>
Eastern Horseshoe Bat	<i>Rhinolophus megaphyllus</i>
Large Bent-winged Bat*	<i>Miniopterus orianae oceanensis</i>
Birds	
Australian Magpie	<i>Cracticus tibicen</i>
Australian Raven	<i>Corvus coronoides</i>
Black-eared Cuckoo	<i>Chalcites osculans</i>
Black-faced Cuckoo-shrike	<i>Coracina novaehollandiae</i>
Brown Quail	<i>Coturnix ypsilophora</i>
Brown Thornbill	<i>Acanthiza pusilla</i>
Crested Pigeon	<i>Ocyphaps lophotes</i>
Crimson Rosella	<i>Platycercus elegans</i>
Dollarbird	<i>Eurystomus orientalis</i>

Common name	Scientific name
Double-barred Finch	<i>Taeniopygia bichenovii</i>
Dusky Woodswallow*	<i>Artamus cyanopterus cyanopterus</i>
Eastern Whipbird	<i>Psophodes olivaceus</i>
Eastern Yellow Robin	<i>Eopsaltria australis</i>
Fairy Martin	<i>Petrochelidon ariel</i>
Fan-tailed Cuckoo	<i>Cacomantis flabelliformis</i>
Grey Fantail	<i>Rhipidura albiscapa</i>
Grey Shrike-thrush	<i>Colluricincla harmonica</i>
Little Eagle*	<i>Hieraaetus morphnoides</i>
Little Pied Cormorant	<i>Microcarbo melanoleucos</i>
Magpie-lark	<i>Grallina cyanoleuca</i>
Noisy Miner	<i>Manorina melanocephala</i>
Pacific Black Duck	<i>Anas superciliosa</i>
Pale-flecked Garden Sunskink	<i>Lampropholis guichenoti</i>
Pied Butcherbird	<i>Cracticus nigrogularis</i>
Pied Currawong	<i>Strepera graculina</i>
Red Wattlebird	<i>Anthochaera carunculata</i>
Red-browed Finch	<i>Neochmia temporalis</i>
Red-rumped Parrot	<i>Psephotus haematonotus</i>
Restless Flycatcher	<i>Myiagra inquieta</i>
Sacred Kingfisher	<i>Todiramphus sanctus</i>
Silvereve	<i>Zosterops lateralis</i>
Superb Fairy-wren	<i>Malurus cyaneus</i>
Welcome Swallow	<i>Hirundo neoxena</i>
Whistling Kite	<i>Haliastur sphenurus</i>
White-browed Scrubwren	<i>Sericornis frontalis</i>
White-necked Heron	<i>Ardea pacifica</i>
White-plumed Honeyeater	<i>Ptilotula penicillatus</i>
White-throated Treecreeper	<i>Cormobates leucophaea</i>
Willie Wagtail	<i>Rhipidura leucophrys</i>
Yellow-faced Honeyeater	<i>Caligavis chrysops</i>
Frogs	
Bleating Tree Frog	<i>Litoria dentata</i>

Common name	Scientific name
Brown-striped Frog	<i>Limnodynastes peronii</i>
Common Eastern Froglet	<i>Crinia signifera</i>
Sign-bearing Froglet	<i>Crinia insignifera</i>
Spotted Grass Frog	<i>Limnodynastes tasmaniensis</i>
Brown Tree Frog	<i>Litoria ewingii</i>
Eastern Banjo Frog	<i>Limnodynastes dumerilii</i>

*denotes Threatened species recorded on site