BIODIVERSITY DEVELOPMENT ASSESSMENT REPORT

Under the *Biodiversity Conservation Act 2016*

HGBE Properties Pty Limited
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Bolwarra

PREPARED BY:

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SEPTEMBER 2024

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Cover Photo: View of part of development site.

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TERMS AND ABBREVIATIONS

Abbreviation	Meaning
APZ	Asset Protection Zone
AS3959-2018	Australian Standard – Construction of Buildings in Bush Fire Prone Areas
BCA	Building Code of Australia
BC Act	*Biodiversity Conservation Act 2016*
BAR	Biodiversity/Ecological Assessment Report incld 5 Part Test. Prepared when under the clearing threshold, not on BV Map (or incorrectly mapped), no significant impact on any threatened species or Endangered Ecological Community or over a declared Outstanding Biodiversity Area, or a Part 5 activity where authority chooses not to opt in to BOS scheme.
BCAR	Biodiversity Certification Assessment Report
BDAR	Biodiversity Development Assessment Report
BE	Building envelope, including Asset Protection Zone, dwelling, effluent zone
BSSAR	Biodiversity Stewardship Site Assessment Report
BTA	Bushfire Threat Assessment
CEEC	Critically Endangered Ecological Community
Defendable Space	An area within the asset protection zone that provides an environment in which a person can undertake property protection after the passage of a bush fire with some level of safety.
Development site	The area of native vegetation impact from the proposed development footprint.
DPE	NSW Department of Planning and Environment
Ecological community	An assemblage of species occupying a particular area.
Ecosystem credit species	A measurement of the value of vegetation communities, 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.
EEC	Endangered Ecological Community
EP&A Act	*NSW Environmental Planning and Assessment Act 1979*
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
FDI	Fire Danger Index
Ha	Hectare
HBT	Hollow bearing habitat tree
Habitat	(a) an area periodically or occasionally occupied by a species or ecological community, and (b) the biotic and abiotic components of an area.
IPA	Inner Protection Area
Key threatening process	A threatening process listed in Schedule 4 of the *Biodiversity Conservation Act 2016*.
LEP	Local Environment Plan
LGA	Local Government Area
LLS Act	*Local Land Services Amendment Act 2016*
Native Vegetation	Native vegetation means any of the following types of plants native to New South Wales: (a) trees (including any sapling or shrub or any scrub), (b) understorey plants, c) groundcover (being any type of herbaceous vegetation), (d) plants occurring in a wetland.

Native Vegetation clearing	Clearing native vegetation means any one or more of the following: (a) cutting down, felling, uprooting, thinning or otherwise removing native vegetation, (b) killing, destroying, poisoning, ringbarking or burning native vegetation.
Native vegetation regulatory map	A native vegetation regulatory map prepared and published under Division 2 of the LLS Act 2016.
NRAR	Natural Resources Access Regulator (NSW Water)
OPA	Outer Protection Area
PBP 2006	Planning for Bushfire Protection 2006
PCT	Plant Community Type
Preferred Koala Feed Trees	Tree species used preferentially as forage for Koalas. In the context of SEPP (Koala Habitat Protection) around 65 tree species are listed regionally including Swamp Mahogany (*Eucalyptus robusta)*, *Eucalyptus punctata* (Grey Gum), Parramatta Red Gum (*Eucalyptus parramattensis),* Scribbly Gum *(E.haemastoma),* Tallowood *(E. microcorys),* Forest Red Gum (*Eucalyptus tereticornis),* Narrow leafed Ironbark (*Eucalyptus crebra)* and Spotted Gum *(Corymbia maculata).*
Protected Animal	Any of the following that are native to Australia or that periodically or occasionally migrate to Australia (including their eggs and young): Amphibians—frogs or other members of the class amphibia. Birds—birds of any species. Mammals—mammals of any species (including aquatic or amphibious mammals but not including dingoes). Reptiles—snakes, lizards, crocodiles, tortoises, turtles or other members of the class reptilia.
Protected plant	(a) a plant that is of a threatened species, or (b) a plant that is part of a threatened ecological community, or I a protected plant (as listed in Schedule 6 of the BCA 2016).
RoTAP	Rare or Threatened Australian Plant
RF Act	*Rural Fires Act 1997*
RF Regulation	Rural Fires Regulation
SEARs	Secretary's Environmental Assessment Requirements
BDAR	Biodiversity Development Assessment Report
Species/candidate credit species	Threatened species or components of species habitat that are identified in the Threatened Species Data Collection as requiring assessment for credit species. These species cannot be reliably predicted to use an area of land based on habitat surrogates.
Study area	The locality including the subject land/development site and surrounding areas.
Subject site/land	The entire extent of the land holdings associated with the development. Includes vegetation and land that is not being developed, but may have indirect impacts upon it.
TBDC	Threatened Biodiversity Data Collection
TEC	Threatened Ecological Community
Threatening process	A process that threatens, or that may threaten, the survival or evolutionary development of species or ecological communities
VIS	NSW Vegetation Information System
VMP	Vegetation Management Plan

CERTIFICATION AND DECLARATIONS

Certification under clause 6.15 Biodiversity Conservation Act 2016

I certify that this report has been prepared based on the requirements of, and information provided under, the Biodiversity Assessment Method and clause 6.15 of the *Biodiversity Conservation Act 2016* (BC Act).

Signature: _____

Date: 11th September, 2024

BAM Assessor Accreditation no: BAAS 17076

This BDAR has been prepared to meet the requirements of BAM 2020. Appendix 1 provides details of the person/s responsible for preparing the BDAR plus any surveys and/or investigations on which the BDAR relies (excluding approved biodiversity experts).

CONFLICT OF INTEREST

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

This declaration has been made in the interests of full disclosure to the decision-maker. Full disclosure has also been provided to the client.

Signature: _____

Date: 11th September, 2024

BAM Assessor Accreditation no: BAAS 17076

BOAMS Customer Number: **C-026817** (corporation landholder case party for HGBE Properties Pty Limited)

Document History

Document Id.	Prep. Date	Version	Submitted to:
Biodiversity Development Assessment Report (BDAR)	3.7.24	1	HGBE Properties Pty Ltd
Biodiversity Development Assessment Report (BDAR)	4.7.24	2	HGBE Properties Pty Ltd
Biodiversity Development Assessment Report (BDAR)	16.7.24	3	HGBE Properties Pty Ltd
Biodiversity Development Assessment Report (BDAR)	29.7.24	4	HGBE Properties Pty Ltd
Biodiversity Development Assessment Report (BDAR)	11.9.24	5	HGBE Properties Pty Ltd

1.0 INTRODUCTION

1.1.1: Development overview

PEAK LAND MANAGEMENT has been engaged by HGBD Properties Pty Ltd to prepare a Biodiversity Development Assessment Report (BDAR) for a proposed Community Title subdivision over land located at Lot C DP 163627/ 256 Paterson Rd, Bolwarra (referred to hereafter as "subject/ development site").

The subject site is currently zoned R5: Large Lot Residential under the provisions of Maitland Local Environmental Plan, 2011. It has a 0.5Ha minimum lot size. The development is Part 4 under the EP&A Act and BOS.

Figures 1-4 show the subject site map and 1500m buffer zone location map.

The development comprises:

- 1 into 13 lots being large lot (R5), and one community title lot (14 in total) residential community title subdivision.
- Associated building envelopes & Asset Protection Zones over each proposed residential Lot.
- Access roads.
- Existing dwelling to be demolished.
- Site is proposed to be sewered, and with reticulated water.
- Detention basin.
- Conservation Area.

This BDAR will:

- Address the BAM and the Biodiversity Offsets Scheme.
- Identify how the proponent proposes to avoid and minimise impacts to biodiversity.
- Identify any potential impact that could be characterised as prescribed or serious and irreversible in accordance with the BAM.
- Describe the offset obligations required to compensate for any unavoidable biodiversity impacts resulting from the proposed development (assumes all vegetation cleared over the subject development site).
- Describe and assess the significance of potential impacts to Matters of National Environmental Significance (MNES) in accordance with relevant provisions of the EPBC Act.

1.1.2 Other documentation

A Bush Fire Report has been completed by PEAK LAND MANAGEMENT, July, 2024 for the proposed subdivision. This has been adopted for this report. It assumes vegetation over the subject site where shown to be retained is assessed as a Bush Fire hazard, and all other vegetation is approved to be cleared, or to an Asset Protection Zone standard, subject to Council DA consent conditions.

1.2 Biodiversity Offsets Scheme entry

A BDAR report is required as the proposed development area is over the 0.5Ha clearing threshold. The total proposed development impact footprint over native vegetation is 3.7Ha.

The purpose of this assessment is to apply the NSW Biodiversity Assessment Method (BAM 2020) to the proposed development site in accordance with the *Biodiversity Conservation Act 2016* (BC Act), and provide the proponent with a Biodiversity Development Assessment Report (BDAR). The BDAR is to be submitted to Maitland City Council as the approval/consent authorities, as part of a Part 4 Development Application.

The BDAR will be undertaken according to the BAM. The BDAR also considers potential impacts to Matters of Environmental Significance in accordance with the *Environmental Protection and Biodiversity Conservation Act* 1999 (EPBC Act).

The report follows the Biodiversity Assessment Method 2020 (BAM), and is prepared in reference to the Biodiversity Assessment Method Operational Manual-Stage 1 & 2, and documents both Stage 1 & Stage 2 including Serious and Irreversible impacts assessment of the BAM, required for a BDAR project under the *Biodiversity Conservation Act 2016* (BC Act), and *Biodiversity Regulations 2017*.

It is noted that 5 Part Tests are not required under the BAM.

1.3 Excluded impacts

Clause 6.8(3) of the BC Act specifies that the BAM is to exclude the assessment of the impacts of any clearing of native vegetation and loss of habitat on Category 1-exempt land (as defined in Part 5A of the LLS Act), other than prescribed impacts (as defined in clause 6.1 of the Biodiversity Conservation Regulation 2017 (BC Regulation)). Prescribed impacts must therefore be assessed for category 1-exempt land.

Category 2 land is defined as Rural zoned land having trees & native vegetation >15 % cover that predate 1990 (historic 1993 aerial imagery – Fig 12 (closest year available aerial photo), and these areas only are assessed within the Biodiversity Offsets Scheme (BOS).

In this case the site is excluded from the LLS Act, as R5 zoned residential land. The Native Vegetation Regulatory map demonstrates this (Fig 11).

All areas of native vegetation over the development site are assessed within this report as per Maitland City Council Flora & Fauna Survey Guidelines.

1.4 Matters of national environmental significance

The proposed development is not deemed a controlled action and does not need referral under the EPBC Act. Refer to Appendix 9 Matters of national environmental significance (MNES) for a summary of EPBC Act listed threatened species, and communities, and Chapter 8.1.

There are EPBC listed threatened species present or habitat presence, and no EPBC listed Endangered Ecological Community. These species are assessed within the BAM, but if an EPBC species listed only (and not a NSW listed species) then Biodiversity Offset Credits are not applicable.

1.5 Sources of information

Sources of information used in the assessment include relevant databases, spatial data, literature and previous site reports (see literature review). In order to provide a context for the subject land, records of flora and fauna from within 5 kilometres (the 'locality') were collated from the following databases and were reviewed:

- Commonwealth Department of the Environment and Energy (DEE) Protected Matters Search Tool for matters protected by the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act).
- NSW Department of Infrastructure and Environment (DPE) BioNet Atlas of NSW Wildlife, for species, populations and ecological communities listed under the Biodiversity Conservation Act 2017 (BC Act).
- Plantnet (The Royal Botanic Gardens and Domain Trust).
- BirdLife Australia, the New Atlas of Australian Birds 1998-2015.
- NSW Department of Primary Industry (DPI) Spatial Data Portal.
- SIX maps & nearmap.
- Other sources of biodiversity information relevant to the study area were sourced from:
    - The NSW Plant Community Type Map, 2023
    - BioNet Vegetation Classification database.
    - Lower Hunter Central Coast REMS Vegetation Mapping, 2003.

Mapping was conducted using hand-held Garmin handheld GPS 65Map unit, generally accurate to within 6m depending on canopy cover to record plots, transects, hollow bearing trees, and threatened species sightings.

Base map data was obtained from nearmap, using the latest most recent photography (24th April, 2024).

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

- Mitchell Landscapes Version 3.0;
- Interim Biogeographic Regionalisation of Australia (IBRA) Version 7;
- Directory of Important Wetlands (DIWA);
- NSW Soil and Land Information System (SALIS);
- NSW Soils- eSPADE, Acid Sulphate Soils;
- Australian Groundwater Dependent Ecosystems (BOM);
- Biodiversity Values Map v16.10;
- NSW DPE Regent Honeyeater, Swift Parrot & Shorebirds Important Areas Mapping.

Mapping has been produced using a Geographic Information System (QGIS), utilising latest ortho rectified high resolution imagery from nearmap.

Figure 1: Site Map

Legend

Subject site

contour - 10m CI

Creek

North

0 50 100 150 200 m

Imagery from nearmap, 24th April, 2024
Projection: GDA 94/MGA Zone 56

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Note:Cadastre & GPS may be subject to innaccuracy

Figure 2a: Subdivision Plan (from GCA, dated 20.8.24)

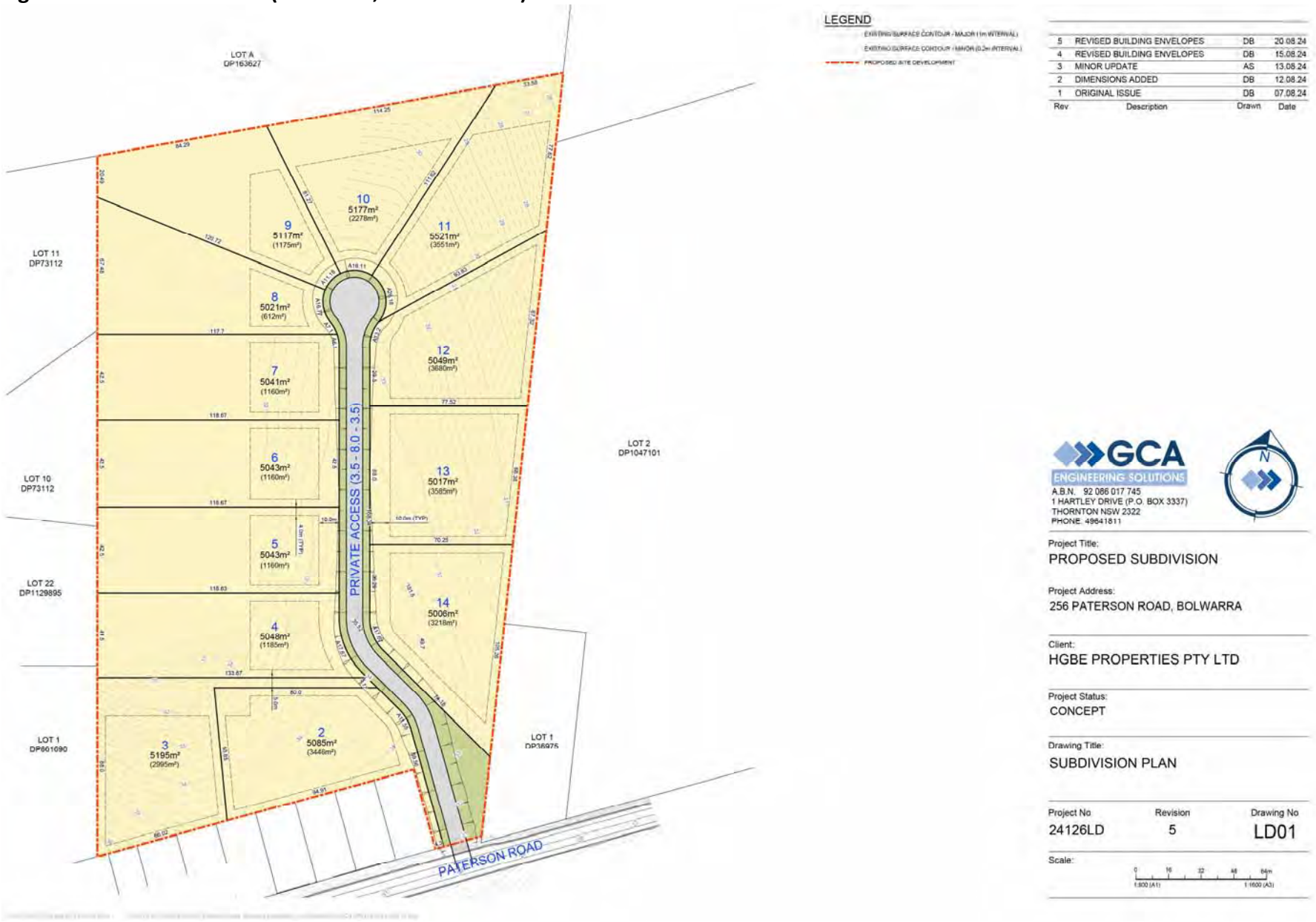
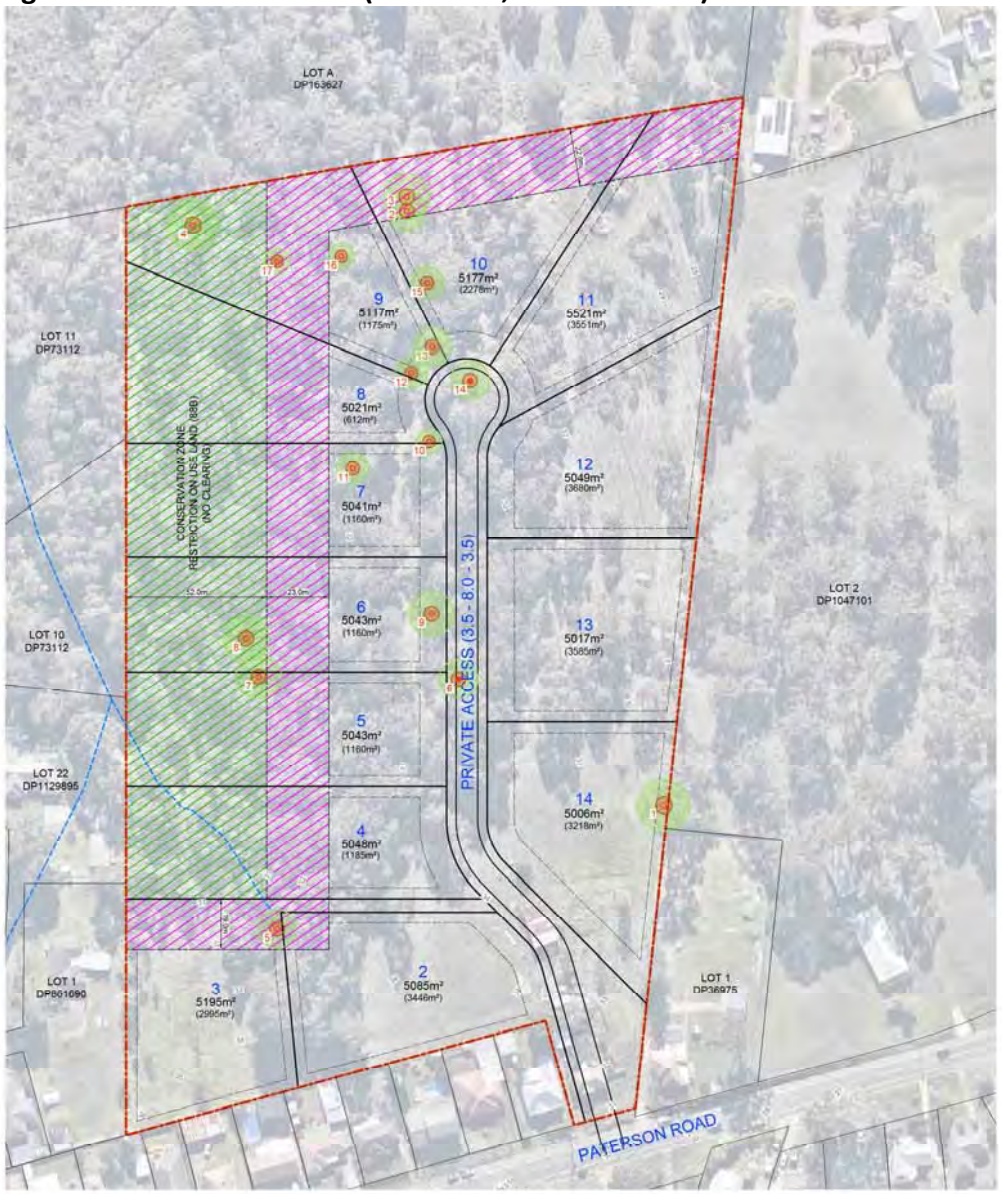


Figure 2b: Subdivision Plan (from GCA, dated 20.8.24)



LEGEND

- APZ (19m, 22m & 23m)
- CONSERVATION ZONE - RESTRICTION ON USE LAND (88B) (NO CLEARING)
- HOLLOW BEARING TREE (TO REMAIN)
- HOLLOW BEARING TREE (TO BE REMOVED)
- HOLLOW BEARING TREE STRUCTURAL ROOT ZONE
- HOLLOW BEARING TREE TREE PROTECTION ZONE
- EXISTING SURFACE CONTOUR - MAJOR (1m INTERVAL)
- EXISTING SURFACE CONTOUR - MINOR (0.2m INTERVAL)
- PROPOSED SITE DEVELOPMENT
- MAPPED WATERCOURSE UNDER THE WATER MANAGEMENT (GENERAL) REGULATION 2018 (HYDROLINE SPATIAL DATA)

Rev	Description	Drawn	Date
6	ANNOTATED CONSERVATION ZONE	AS	09.09.24
5	REVISED BUILDING ENVELOPES	DB	20.08.24
4	REVISED BUILDING ENVELOPES	DB	15.08.24
3	MINOR UPDATE	AS	13.08.24
2	DIMENSIONS ADDED	DB	12.08.24
1	ORIGINAL ISSUE	DB	07.08.24

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Project Title:
PROPOSED SUBDIVISION

Project Address:
256 PATERSON ROAD, BOLWARRA

Client:
HGBE PROPERTIES PTY LTD

Project Status:
CONCEPT

Drawing Title:
ENVIRONMENTAL OVERLAY PLAN

Project No	Revision	Drawing No
24126LD	6	LD02

Scale:
0 16 32 48 64m
1:800 (A1) 1:1600 (A3)

Figure 2c: Stormwater detention basin (from GCA, dated 5.9.24)

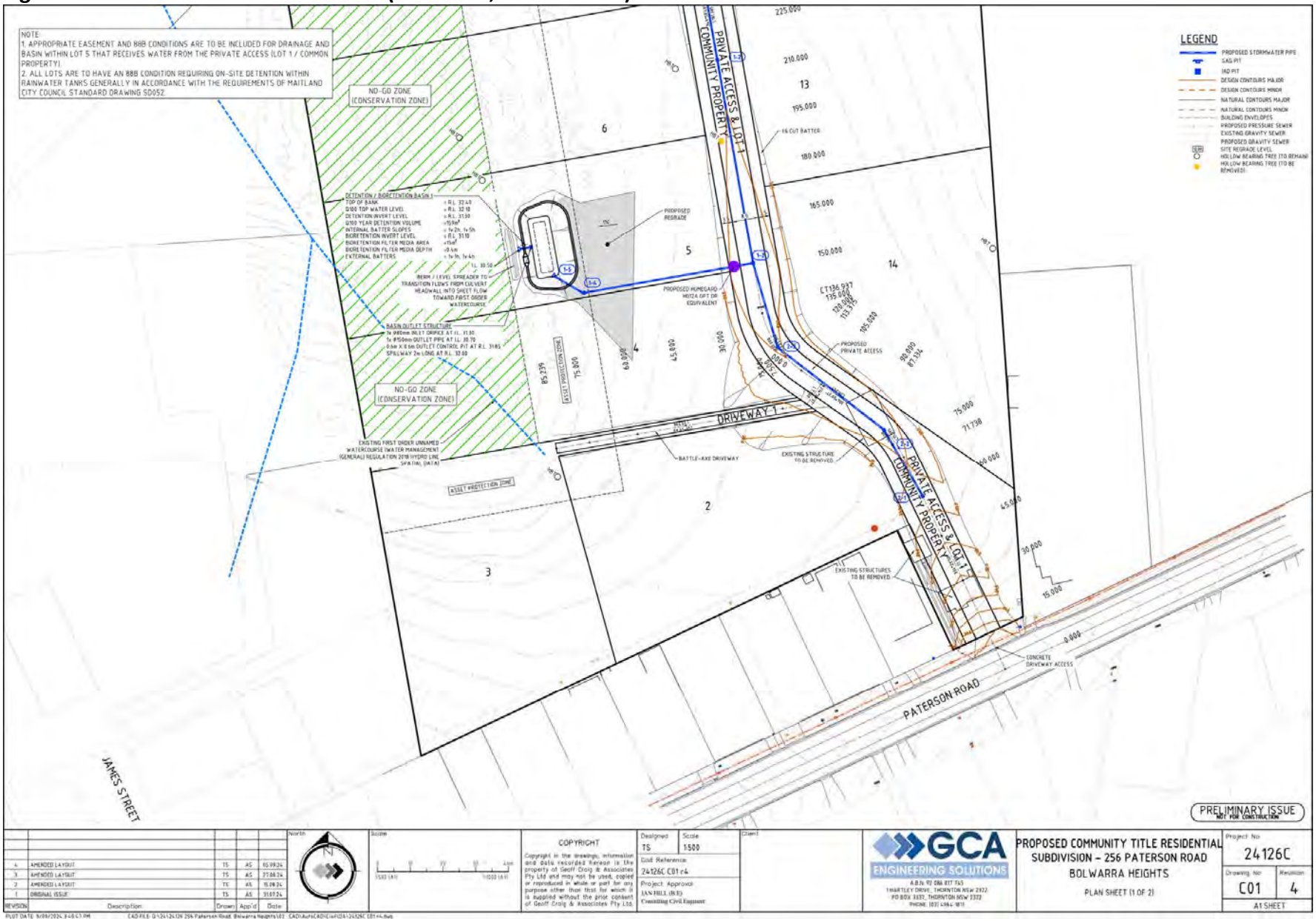


Figure 3: Topographic Map (from SIX Maps, Department of Lands)

Figure 4a: Location Map and 1500m buffer native vegetation cover

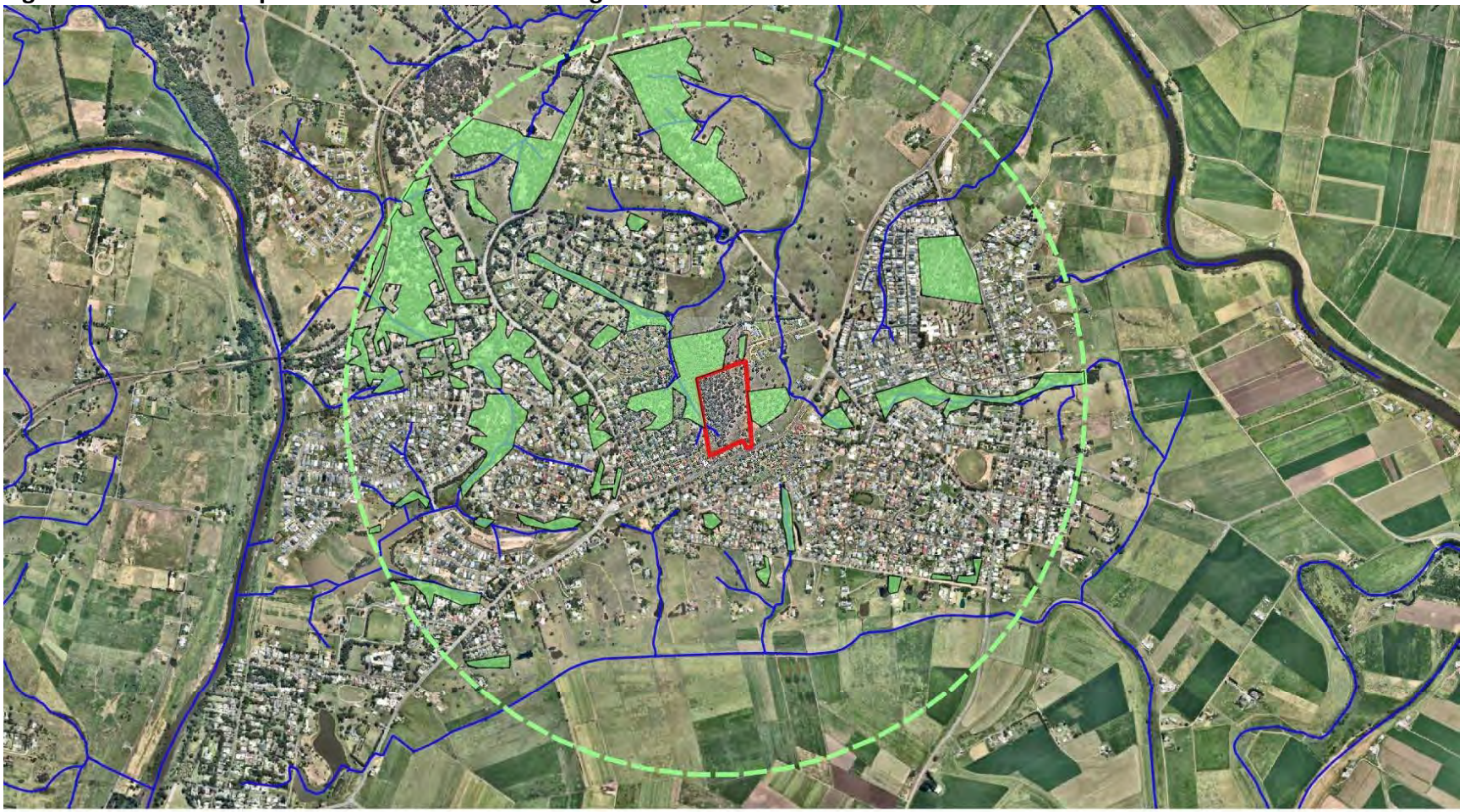


Figure 4b: Patch size

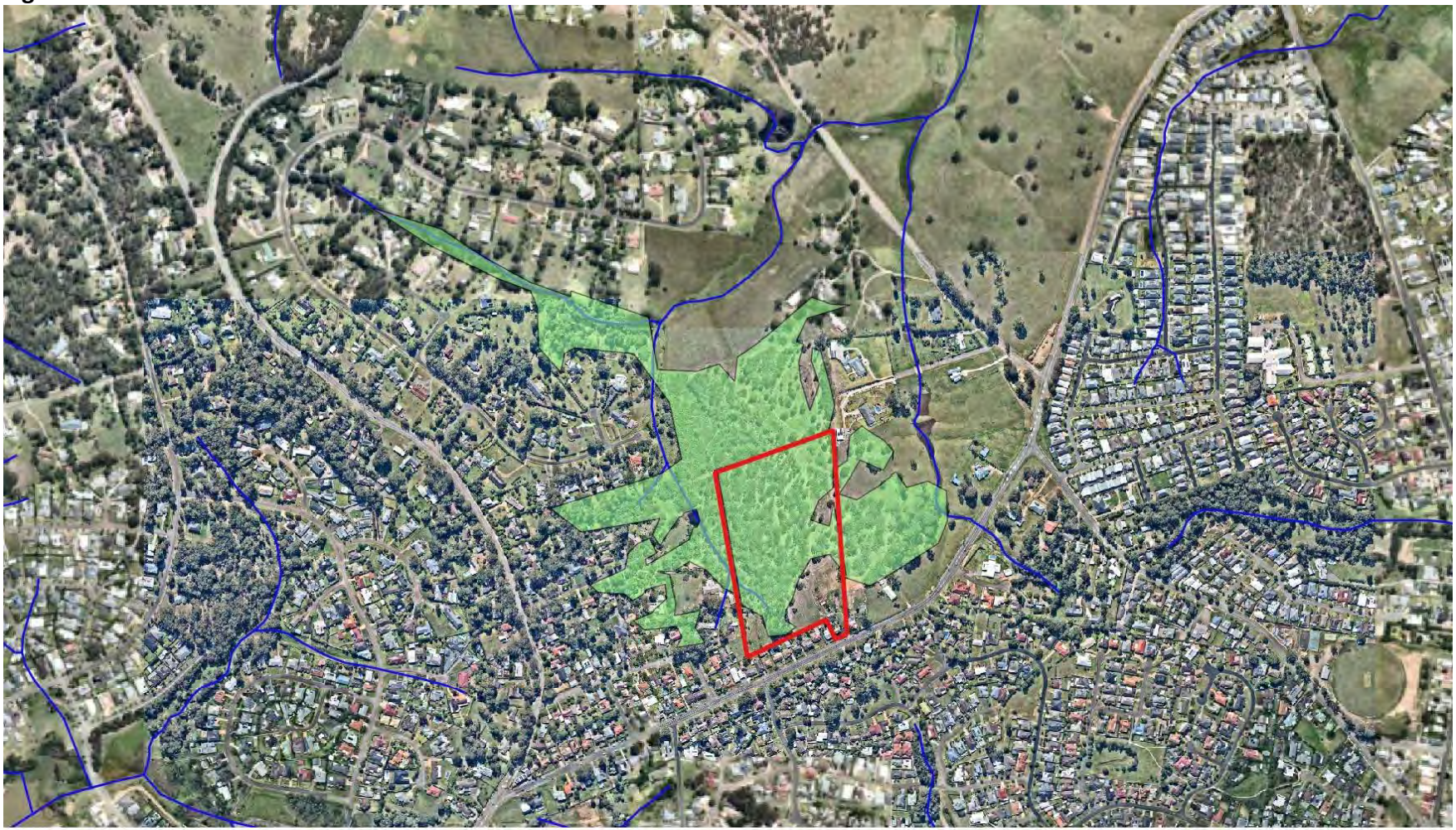


Figure 5: Wildlife/habitat connectivity

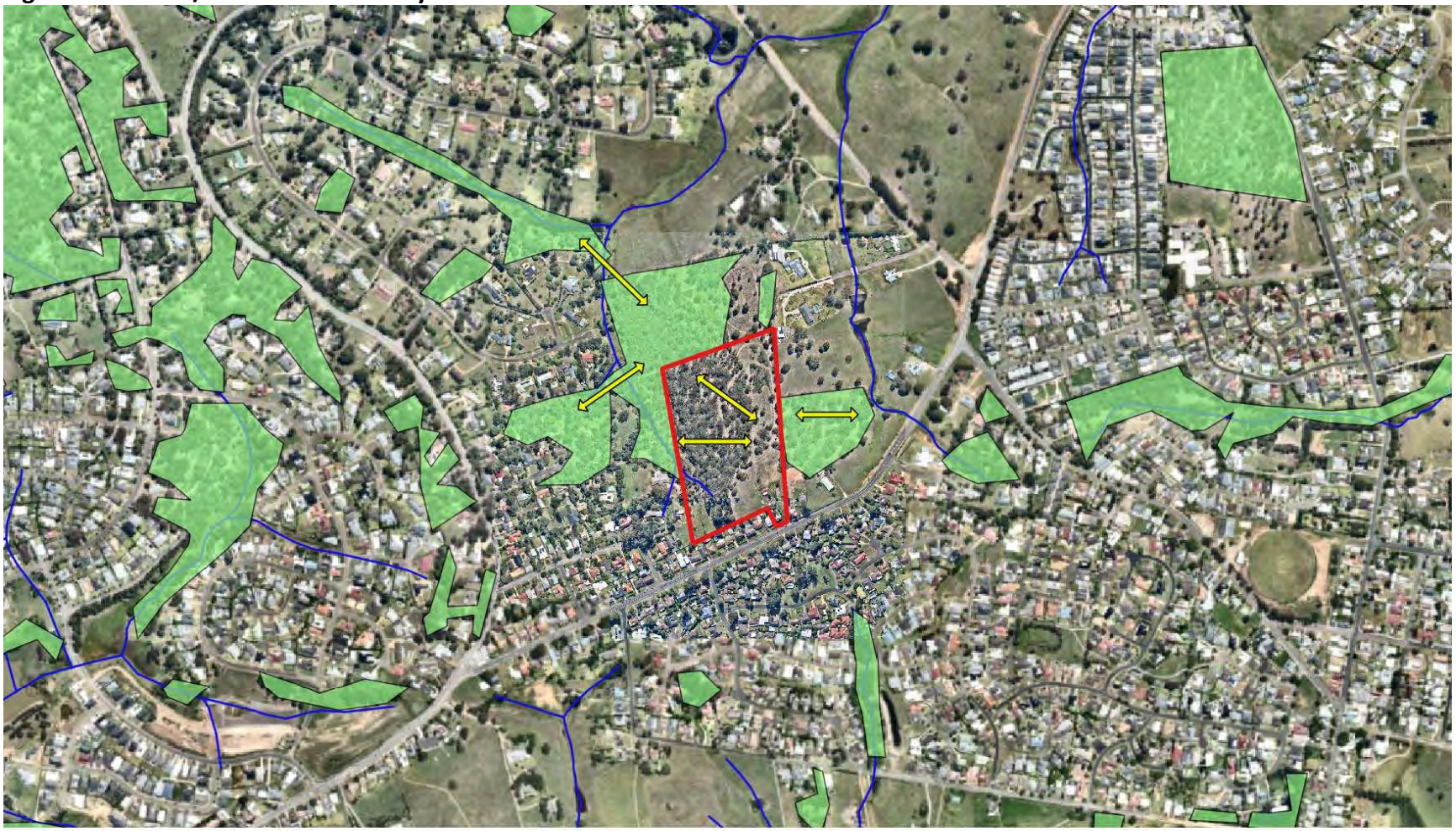


Figure 6: Soils (from eSPADE Eastern Soil Landscapes-from Matthei, 1995)

2.0 METHODS

2.1 Site context methods

2.1.1 Landscape features

Site field reconnaissance including driving to and around subject site observing surrounding landscape features within 1500m of the site, past experience/local knowledge in this area, and validation of features shown on topographic maps, and aerial photography vegetation extent (where feasible) were used to confirm the extent and condition of landscape features.

2.1.2 Native vegetation cover

Site field reconnaissance including driving to and around subject site and observing surrounding native vegetation cover features within 1500m, past experience/local knowledge in this area, and validation of features shown on aerial photography vegetation extent (where feasible) were used to confirm the extent and condition the extent and condition of native vegetation cover on the subject land and assessment area.

2.2 Native vegetation, threatened ecological communities and vegetation integrity methods

2.2.1 Existing information

The review of existing information undertaken to identify PCTs (Section 4.2) and TECs (Section 4.3) including native vegetation information in BioNet, other reports/surveys and existing maps of the subject land and assessment area included analysis of State Vegetation Type Map, 2023.

Database searches (See Section 1.3) and literature reviews were reviewed to inform the site investigations. 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 development site. Latest aerial imagery (nearmap) was also examined. A field survey informed locations of BAM Plots.

2.2.2 Mapping native vegetation extent

Vegetation within the study area and within the 1500 metre buffer area was assessed using aerial photographic interpretation (latest Nearmap imagery dated April, 2024), field survey results and existing vegetation mapping. Figure 4a shows the mapped native vegetation extent.

2.2.3 Plot-based vegetation survey

The survey BAM Plot design was based upon the requisite number of vegetation integrity survey plots within each broad condition state of each mapped PCT in accordance with the BAM. The location of the surveyed plot is shown in Figure 3.

It also took into account the constraints of the subject site, with plots based over native vegetation.

Areas of native vegetation for which a PCT could validly be assigned were identified and delineated in the field, and their condition determined. Identification of PCTs within the subject land was confirmed with reference to the community profile descriptors, and diagnostic species tests held within the NSW BioNet Vegetation Classification database, OEH 2017b, and in reference to NSW State Vegetation type Map, 2023.

In this case all vegetation comprised two vegetation communities, same condition, and three plots were required under the BAM. Four plots were undertaken.

2.2.4 Vegetation integrity survey

The methods used to undertake the vegetation integrity survey consisted of four BAM plots in accordance with BAM Subsection 4.3.4. All requisite information was collected (see BAM plot sheets Appendix 2).

2.3 Threatened flora survey methods

2.3.1 Review of existing information

The review of existing information undertaken to identify habitat constraints and microhabitats for threatened species comprised of Bionet searches, BAM Calculator generated threatened species, and interrogation of the Threatened Biodiversity Database (TBDC) within Bionet for each species where required.

2.3.2 Habitat constraints assessment

A field survey assessed flora habitat constraints and microhabitats for threatened flora species within the subject land.

A habitat-based fauna assessment was undertaken, seeking to identify the following flora habitat features within the site boundary. The following features were assessed:

- Soils/geology;
- Topography/aspect;
- Streams, wetlands;
- Dominant overstorey & other flora species;
- Level of disturbance, main weeds, and cover of weeds/native vegetation;
- Orchid indicator species such as *Burchardia umbellata.*
- Land management practices.

2.3.3 Field surveys

The field survey collected plant species, ecological community, and habitat information. Vegetation was assessed by use of BAM plots and further meander transects targeting orchids/other species in accordance with the BAM where habitat existed (more detailed transects not required in this case as no threatened orchid species records/habitat), and NSW

DPIE, 2020 threatened flora species guidelines, and Maitland City Council Flora & Fauna Survey Guidelines. The survey also targeted threatened species identified in the BAM Calculator as credit species, and to verify vegetation zones. A flora survey occurred as shown in Table 1.

All transects, and any hollow bearing trees or threatened species were recorded by a Garmin handheld GPS Map65 unit, generally accurate to within 6m depending on canopy cover (reading +/-6m accuracy under canopy at time of survey). All area measurements have been made using a Geographic Information System (GIS), from georeferenced Nearmap images, and the site ground truthed.

Special attention was paid to any potential threatened species. This has enabled identification and assessment of most species on the site. The survey is limited by:

- Non flowering of cryptic orchid/grass/sedge species at time of survey as described above making identification impossible/problematic.

To help overcome these limitations surveys are carried out where feasible during known flowering seasons (as stated within the BAM Calculator), and if this cannot occur and habitat requirements are suitable for a species to be present, then additional targeted surveys will be recommended if impact is expected, or presence assumed. These are outlined in Table 1.

Any plants that were not readily identifiable in the field were sampled and analysed in the office. Potential threatened species are sent to NSW Herbarium for identification /ratification, and NSW DPE informed of locations for recording on the NSW Bionet database as per NPWS scientific licence requirements. This was not required in this instance.

All field work for this current flora survey was undertaken by Ted Smith, Ecologist/Botanist, PEAK LAND MANAGEMENT, as shown in Table 1. The author is familiar with flora in this locality, having conducted surveys over this locality and surrounds over many years (see author experience Appendix 1).

Table 1: Flora & fauna survey effort

Type of survey	Survey dates	Weather conditions	Survey outline	Survey Effort
BAM Plot and, flora transects	16th April, 2024. 12pm-5pm.	25^{0}C, light NE wind, fine, moderate humidity.	Systematic flora survey and targeted threatened species surveys over site including transects/ meander transect & BAM Plots over site.	5hrs
Incidental Fauna Survey	16th April, 2024. 12pm-5pm.	25^{0}C, light NE wind, fine, moderate humidity.	Opportunistic searches for fauna, for amphibians, birds, mammals, and reptiles. Searches included auditory and visual surveys, using binoculars and searches for scat, tracks, hollows and nests/feathers/owl regurgitation pellets, quiet periods to listen.	5hrs

Type of survey	Survey dates	Weather conditions	Survey outline	Survey Effort
General Flora & fauna PTY Ltd – Full fauna survey	April - May 2024	See Appendix 8	Fauna survey (full fauna survey) was also undertaken by Greg Little, General Flora & Fauna (see Appendix 8). Timing and survey methodology shown in his report.	

2.4 Limitations flora survey

The survey is limited by:

- Non flowering of cryptic orchid/grass/other species at time of survey as described above making identification impossible/problematic.

To help overcome these limitations surveys are carried out where feasible during known flowering seasons, and if this cannot occur and habitat requirements are suitable for a species to be present then an additional targeted survey will be recommended if impact is expected. Any plants that were not readily identifiable in the field were sampled and analysed in the office. Potential threatened species are sent to NSW Herbarium for identification /ratification, and NSW DPE informed of locations for recording on the NSW Bionet database as per NSW DPE scientific licence requirements. This was not required in this instance.

2.5 Threatened fauna survey methods

2.5.1 Review of existing information

The review of existing information undertaken to identify habitat constraints and microhabitats for threatened species comprised of Bionet searches, BAM Calculator generated threatened species, and interrogation of the Threatened Biodiversity Database within Bionet for each species where required.

2.5.2 Habitat constraints assessment

A habitat-based fauna assessment was undertaken, seeking to identify the following fauna habitat features within the site boundary.

Habitat assessment focused on the following features within the subject land:

- Habitat trees including large hollow-bearing trees, availability of flowering shrubs and feed tree species;
- Condition & structure of native vegetation and the presence of exotic species;
- Condition of waterways and associated habitat for aquatic threatened species;
- Quantity of ground litter and logs;
- General degradation of the site as a result of past land management practices;
- Habitat description and distribution in the vicinity;
- Habitat fragmentation & corridors;
- Habitat for significant species including surveying any rock outcrops or caves;

- Incidental observations.

2.5.3 Field surveys

General Flora & Fauna Survey 2024 (Appendix 8) undertook a full Fauna survey and fauna habitat assessment (see Table 1). All fauna survey methodology is shown within Appendix 8 Fauna Report.

In addition to on site fauna survey, habitat assessment, and research using Bionet records, and other records where available have been used to determine possible occurrence of threatened species. If suitable habitat is present, and Wildlife Atlas- Bionet records occur in the local area, an assumption has been made that potential threatened fauna species listed in Appendix 3 Bionet search may occur.

2.6 Limitations fauna survey

General Flora & Fauna list their limitations in Appendix 8.

Several factors limit the ability of surveys such as this ecological investigation to fully determine the occurrence of all species of fauna which may utilise the subject site. Surveys undertaken over a short time period are unlikely to document the full inventory of fauna species which may occur in the study area. In the case of highly mobile fauna such as birds and bats, many species may utilise the site only temporarily as a component of their larger foraging range, or may occur in the study area or locality during particular periods of the year, such as their seasonal migratory path.

In addition to on site fauna survey, habitat assessment, and research using Bionet records, and other records where available have been used to determine possible occurrence of threatened species. If suitable habitat is present, and Wildlife Atlas- Bionet records occur in the local area, an assumption has been made that potential threatened fauna species listed in Appendix 3 Bionet search may occur.

Trapping, hair sampling, pit fall traps, and other fauna survey techniques were used, and are required under the BAM, 2020.

Some on site limitations were encountered. These included:

- Note GPS inaccuracy, can vary by up to 6m, especially under heavy tree cover which was present in parts.

PEAK LAND MANAGEMENT & General Flora & Fauna have all appropriate licences to undertake required survey (Appendix 1 & 7).

3.0 SITE CONTEXT

3.1 Assessment area

Vegetation within the study area, and within the 1500 metre buffer area, was assessed using aerial photographic interpretation (latest nearmap imagery dated 2024), field survey results and existing vegetation mapping.

3.2 Landscape Features

3.2.1 IBRA bioregions and IBRA subregions

Interim Biogeographic Regionalisation for Australia (IBRA) bioregions and IBRA subregions within the subject land and assessment area:

IBRA Region: - Sydney Basin.
IBRA Sub Region: - Hunter.
CMA: - Hunter.
Sub CMA- Hunter/Central Rivers.

Note the development site is wholly within Hunter IBRA Sub Region.

3.2.2 Rivers & Streams

The subject land is located within the Hunter Local Land Services Region and Hunter River catchment.

A small 1st order small creek line without a defined bed or bank, and no floodplain, occurs over part of the development site. It is affected by the proposal, with a lot access road proposed over it. Natural aquatic fringing creek vegetation is not present, no permanent water present, ephemeral flow only, unaffected by the proposal.

The stream however is ephemeral, and provides limited/no threatened amphibian habitat. It has been entered as a landscape feature within the BAM Calculator.

3.2.3 Important and Local Wetlands

There are no listed DIWA nationally important Wetlands, or NSW listed SEPP (Resilience and Hazards) 2021 Wetlands within the 1500m buffer.

3.2.4 Habitat connectivity

Habitats within the study area are primarily those associated with dry sclerophyll forest. The subject site is part vegetated, with old growth remnant vegetation present, and other areas being part slashed but retaining native understorey and remnant overhead tree cover, and cleared areas.

Surrounding areas are a mix of cleared residential land, and farmland with scattered old growth trees and grazed/cleared understorey, and remnant & regrowth vegetation to the north and part west of the site. Although only remnants are left in this cleared landscape, there is sufficient connectivity to allow Gliders and Birds some additional habitat patch size. Total patch size is around 22Ha (Fig 4b).

This provides some connectivity & habitat for species such as gliders, birds and possibly Koala. It is noted however total patch size is very limited, and may cause local extinction of Koala (if present at all, not recorded in fauna survey) & Gliders in this area due to lack of sufficient habitat patch size/limited foraging & shelter resources, limited genetic diversity.

Research from Lake Macquarie City Council Squirrel Glider Guidelines 2015 stated that:

The minimum habitat patch size that will be occupied by squirrel gliders is strongly influenced by habitat quality. Squirrel gliders occupy very small patches if habitat quality is high, and much larger habitat patch sizes in lower quality habitat.

However, the probability of a patch being occupied by squirrel gliders decreases with remnant size. Modelling predicts that density and occurrence begins to decline when patch size falls below 100 ha depending on time since isolation, remnant shape, and distance to nearby habitat. In Wyong, the largest known remnant of suitable habitat without squirrel gliders is 30 ha. Habitat patches of less than 4 ha are considered unsuitable for permanent occupancy. Small habitat patches of 4 ha to 30ha, are considered at high risk of local extinction. Minor habitat patches of 30 ha to 100 ha, are considered at moderate to low risk in the short-term, and high risk in the long-term; and major habitat patches, 100 ha to 1,000 ha are considered at no risk in the short-term, (50 yrs to 100 yrs), and low to moderate risk in the long term (Smith 2002).

Smaller fauna such as reptiles, amphibians and smaller mammals would be open to predation. There is connectivity through and around the subject site & development site to the north and west, however this terminates further south and west with cleared residential land present. To the east is limited to tree cover only which is farmland & mainly cleared and grazed.

Figure 5 shows the mapped wildlife connectivity.

3.2.4 Karst, caves, crevices, cliffs, rocks or other geological features of significance

There were no recorded karst, caves, crevices & cliffs or other areas of geological significance within the subject land or within the 1,500 metre buffer area surrounding the study areas (Fig 1).

3.2.5 Areas of outstanding biodiversity values identified under the BC Act

None identified as per register of outstanding biodiversity values identified under the BC Act.

3.2.6 Mitchell Landscape

- Newcastle Coastal Ramp.

3.2.7 Additional landscape features identified in SEARs

Not applicable.

3.2.8 Soils and soil hazard features (clearing projects only)

Soils occur on the property as a result of parent material, geology, slope, landscape position, land use, aspect, time, and to a lesser degree vegetation and climate. The soil landscapes have been mapped for this area by NSW Government (Central Eastern NSW Soil Landscapes) and are shown in Figure 6. Soil landscapes are mapped using a combination of slope, soil type, and terrain to give a broad picture of major soil groups occurring over the landscape. The soil landscape mapped over the site is:

The soil-landscape over the subject site is mapped by Central Eastern NSW Soil Landscapes / Matthei 1995 as:

- Bolwarra Heights.

Landscape—rolling low hills on Permian sediments in the centre-west of the sheet in the East Maitland Hills region. Slopes are 5–20%, elevation to 100 m, local relief to 80 m. Cleared tall open-forest.

Landscape Variant—bha—shallow (<55 cm) soils.

Soils—moderately deep (<150 cm), well-drained Yellow Podzolic Soils (Dy2.21, Dy2.31), Red Podzolic Soils (Dr2.31, Dr3.21) and Brown Podzolic Soils (Db1.21, Db1.11) with some moderately deep (<100 cm), well-drained Lithosols (Um1.41, Um1.42) on crests, moderately deep (<140 cm), imperfectly drained yellow Soloths (Dy2.41, Dy3.41) on lower slopes.

Qualities and Limitations—moderate foundation hazard, water erosion hazard, high run-on (localised), seasonal waterlogging (localised), localised steep slopes with mass movement hazard.

Rolling low hills on Permian sediments, predominantly in the East Maitland Hills region, in the centre-west of the area. Examples include Bolwarra Heights, Rutherford, Heddon Greta and Gillieston Heights.

No parts of the development site are mapped as Acid Sulphate Soil occurrence. No caves, cliffs, karst, etc. occur over the subject site or development site. No rock outcrops occurred over the development site.

3.3 Native vegetation cover

Figure 4a provides a map of the native vegetation extent recorded within 1500m of the site subject land. The figure includes all areas of native vegetation (native ground cover and areas with native tree canopy). Areas not shown as native vegetation cover within Figure 4a (clear) are not included for further assessment in accordance with the BAM, 2020.

Figure 4a & Table 2a shows native cover within the 1500m buffer area.

Table 1a Native vegetation cover in the 1500m assessment area

Assessment area (ha)	845Ha
Total area of native vegetation cover (ha)	98Ha
Percentage of native vegetation cover (%)	11.6%
Class (0-10, >10-30, >30-70 or >70%)	>10-30%

4.0 NATIVE VEGETATION, TEC'S AND VEGETATION INTEGRITY

4.1 Native vegetation extent

Native vegetation extent within the subject land is shown in Figure 7 and 8. Table 2b provides a list of Plant Community Types (PCT's) and zones identified over the subject land.

4.1.1 Changes to the mapped native vegetation extent

There is no difference between the actual native vegetation extent and that shown on the aerial imagery used in the figures. The assessment of the subject land & development site was undertaken, which validated all aerial imagery and vegetation mapping.

4.1.2 Areas that are not native vegetation

Most parts of the subject land contain native vegetation. These are shown in Figure 7 & 8.

These areas are shown as clear within Fig 7, with exotic cover present, or planted non endemic/non NSW natives/or planted native present, or are cleared/developed. Note this map is slightly inaccurate, and a more accurate vegetation map is shown in Figure 8 prepared after site inspection.

Note: - Vegetation mapping by PEAK LAND MANAGEMENT takes overstorey & understorey composition into account. If NSW native plant overstorey present, or removed, and native understorey is >15% native cover, then it has been assessed as native vegetation in accordance with the BAM, 2020, and *Reviewing Biodiversity Values Map and Threshold Tool area clearing threshold results; Guidance for proponents and local government, 2023*. Otherwise shown as non-native vegetation. Where native tree canopy is present, even if overhanging a road, it is mapped/considered native vegetation.

The *Reviewing Biodiversity Values Map and Threshold Tool area clearing threshold results; Guidance for proponents and local government*, 2023 outline that *the proportion of exotic to native vegetation cover within an impact area is to be assessed using a robust and repeatable method, such as the quadrat field assessment method detailed in Appendix A of the guidelines. In relation to disturbed areas with groundcover only, groundcover with less than 15% native cover and no native overstorey can be considered exotic for the purpose of the threshold. Refer to Step 4 and Appendix A of the guidelines for minimum requirements.*

Note 2: In this case planted native non NSW endemic vegetation within gardens occurs over the site. These plants have not been included as an impact in accordance with the BAM, 2020 where plants are considered non NSW plants (of which there are some Queensland only native plants present such as Silky Oak).

Note 3: *Appendix B* of the *Streamlined assessment module planted native vegetation*, 2022 states "*Widely cultivated native species list*

If a species on the "widely cultivated native species" list is found outside its accepted natural range, it is likely to have been planted and can be justified as a widely cultivated native species

for the purposes of Question 6 without additional evidence; for example, a silky oak (Grevillea robusta) occurring outside the NSW North Coast IBRA Bioregion.

If the species is found planted within its natural range, provide evidence that the species is planted using some or all of the following justifications in the BDAR/BCAR:

- *planted in lines/rows/other formal patterns*
- *hybrid cultivars of a native species known to be from a horticultural source*
- *landholder records of seed/seedling purchases, or pasture improvement activities*
- *historic photos/aerial photos showing land-use history*
- *local planting guides identifying the species as a local landscaping or street tree species.*

In this case Couch grass (*Cynodon dactylon*) is present. This species is likely introduced to this site, as a former grazing property (see historic aerial photo Fig 11 which shows those cleared parts of site mapped as no vegetation (Fig 8) are cleared and grazed in 2010, and also is now effectively a garden/lawn and slashed regularly over the cleared parts of the site. Although listed as a species comprising the mapped vegetation community (PCT 3433), it is of very low frequency (4%) as per Bionet Vegetation Classification, 2024, and is not considered natural in this case/introduced, and should therefore not be assessed as native cover in accordance with the BAM, 2020, and *Streamlined assessment module planted native vegetation*, 2022.

4.2 Plant community types

4.2.1 Overview

Vegetation within the subject land has been assessed as aligning with the BioNet Vegetation Classification PCTs identified within Table 2 and their extent is shown in Figure 8. Plant community types.

Table 2b: Plant community types (PCT) over subject development site and details (from Bionet Vegetation Classification, 2024)

PCT 3433 *Hunter Coast Foothills Spotted Gum-Ironbark Grassy Forest*	
Vegetation formation	Dry Sclerophyll Forest (shrub/grass sub formation)
Vegetation Class	Hunter Macleay DSF
Area within subject site	5.3 Ha
Area to be retained	Approx 1.6Ha
Area within development site & assessed within BDAR to be removed	3.7Ha
Condition	Generally moderate-good, however has been modified by slashing, and part tree removal/logging in some areas.
Vegetation Zones	One Zone :"Good condition" -3.7Ha
Description	Characterised over the development site by mainly remnant old growth forest dominated by *Corymbia maculata* (Spotted Gum), with a dry sclerophyll forest understorey of limited shrubs & vines, and more diverse forbs and grasses. Slashed in some parts but maintaining native understorey and some native tree cover. Weeds being mainly understorey grassy & herb weeds are scattered throughout, generally in low abundance.
Survey effort	Transect & 3x BAM Plots – Plots 1-3 (Fig 11).
PCT justification	Best fit – Fitted the same Mitchell landscape, and IBRA region & subregion, same canopy and similar understorey species, same landscape and soils description as the Bionet PCT description. Also is the same PCT as mapped and described by State Vegetation Type Map, 2023.
TEC status	EPBC- Not listed. NSW BC Act –*" Lower Hunter Spotted Gum—Ironbark Forest "* Endangered Ecological Community.
% Cleared (from Bionet Veg. Class.)	68.6% (from Bionet PCT Vegetation Classification).
Picture –Good-condition zone over BAM Plots/development site	

Plot 1

Plot 2

Plot 3

4.2.2 PCT description and justification

A flora species list of all plants recorded during survey and over the BAM plot is shown in Appendix 3. Raw BAM Plot field sheet data is shown in Appendix 2. More information presented in Section 4.6 of this BAR.

These PCT's (PCT 3433) *Hunter Coast Foothills Spotted Gum-Ironbark Grassy Forest* & PCT 4042 *Lower North Riverflat Eucalypt-Paperbark Forest* description and justification is based upon:

- Best fit – Fitted the same Mitchell landscape, and IBRA region & subregion, same canopy and similar understorey species, same landscape and soils description as the Bionet PCT description.
- Also is the same PCT as mapped and described by State Vegetation Type Map, 2023.
- Also is the same PCT as mapped and described by Lower Hunter Central Coast REMS Map, 2003.

4.3 Threatened Ecological Communities (TEC's)

PCT 3433 *Hunter Coast Foothills Spotted Gum-Ironbark Grassy Forest* within the subject land is consistent with threatened ecological communities (TECs) listed under the NSW BC Act, and Federal EPBC Act.

- NSW BC Act listed TEC- *NSW Lower Hunter Spotted Gum—Ironbark Forest TEC*
- EPBC Act- not listed.

PCT 4042 *Lower North Riverflat Eucalypt-Paperbark Forest* is not considered to relate to any Endangered Ecological Community in this case as not over a floodplain, and is not over the development site and therefore not further assessed.

Figure 8 illustrates the NSW & Federal EPBC TECs recorded within the subject site as detailed in Table 1.

4.4 Vegetation Zones

PCTs within the development site were stratified, based on broad condition state. This resulted in one vegetation zone over the development site, ascribed to PCT 3433 (Table 3a).

Note: cleared land with planted derived non NSW native vegetation (or on NSW DPE widely cultivated native plant species list) and/or land <15% native ground cover with no native tree cover is shown as clear/not mapped within Figure 3, and has not been assigned a vegetation zone.

Note 2: Planted native derived vegetation which is considered native to NSW is mapped as a vegetation community, which is not relevant in this case, in accordance with the BAM, 2020.

Table 3a: Vegetation Zones and Patch size over development site

PCT	Vegetation Zone	Ancillary description	Area (Ha)	Patch size class
PCT 3433 *Hunter Coast Foothills Spotted Gum-Ironbark Grassy Forest*	Moderate-Good	Mainly structured Forest –typical PCT condition, but with some underscrubbing and part slashed in some areas, missing some mid storey and some shrub layer in those areas, but retaining native groundcover >15% cover in all areas that are mapped in Fig 8. All considered the one zone, and all VI scores above 15.	3.7Ha	>10-20%
TOTAL			**3.7Ha**	

Management zones are applicable in this case, and shown in Figure and Table 3b.

4.4.1 Management Zones

Areas of native vegetation, be they grasslands or forested land which retain ecological values, have been ascribed **management zones** (Fig 10b) over the proposed Asset Protection Zone within the development site to minimise or avoid impacts. Management zones within the BAM calculator have been delineated as shown in Table 3b.

Management Zones: - Management zones have been mapped over the site within areas of native vegetation within the Asset Protection Zone that can be managed/retained to reduce impacts over flora & fauna values over the site. The Asset Protection Zone will retain all native grassland & groundstorey forbs/ferns/grass species, and scattered trees, including all hollow bearing habitat trees, and all trees within the Outer Asset Protection Zone, albeit in a trimmed and managed way.

Note: - the future vegetation integrity scores ascribed to each management zone within the BAM calculator were assessed and determined in accordance with the management zone objectives. For instance all Management Zones (both IPA & OPA) were prescribed full composition scores for trees, grasses, forbs and other as all these species will remain, but has been reduced to that VI score allowable by the BAM calculator. Structure VI scores, particularly trees and shrubs (0% cover), within both zones have been reduced to reflect allowable % cover under PBP, 2019, and OPA tree cover at 30%, and IPA tree cover at 15% cover as per PBP, 2019 (Appendix 4).

This information should be reflected within the consent conditions to ensure the proponent & future landowners understand and comply, such as a VMP with covenant requirement, and shown on the Community Title legal documents.

Table 3b: Vegetation and Management Zones over development site
(derived from PEAK LAND MANAGEMENT, Bush Fire Assessment Report, 2024)

Management Zone	PCT	Ancillary description	Management Zone area (Ha)
IPA	PCT 3433 *Hunter Coast Foothills Spotted Gum-Ironbark Grassy Forest*	Inner Protection Area* (15m to north of Lot 4, 18m to west, and 15m to north) Tree cover to be retained, but at 15% cover, canopy separation, all shrubs slashed taken as removed, and understorey slashed. Retain however native understorey cover/diversity, (grass, vine & forb) diversity, albeit in a slashed condition.	0.77Ha
OPA	PCT 3433 *Hunter Coast Foothills Spotted Gum-Ironbark Grassy Forest*	Outer Protection Area* (4m to north of Lot 4, 5m to west, and 5m to north) Tree cover to be retained, but at 30% cover, canopy separation, 20% shrub cover, grass <100mm in height/remainder of understorey slashed. Retain however native understorey (grasses, vines, and forb) diversity, albeit in a slashed condition.	0.27Ha
Development area	PCT 3433 *Hunter Coast Foothills Spotted Gum-Ironbark Grassy Forest*	To be cleared.	2.66Ha
TOTAL			**3.7Ha**

*Refer to Planning for Bush Fire Protection, 2019, Appendix 4 for detailed explanation of Asset Protection Zone requirements. Also refer to Figure 10b which shows IPA & OPA areas.

4.4.2 Patch size

Patch size was assessed as per the BAM (OEH 2020), and BAM Operations Manual, 2020 & measured using QGIS (Fig 4, Table 3).

Vegetation within the subject land meeting this criterion was mapped sequentially. Total area of each patch zone for each PCT was measured. All native vegetation meeting the definition outlined in the BAM Operations Manual, 2020 was mapped.

The patch size is 22Ha, which is ascribed to patch size class 20-<100Ha within the BAM Calculator.

4.5 Vegetation integrity assessment

Vegetation integrity was assessed using data obtained from BAM plots completed within each PCT & Zone in accordance with the methodology outlined in the BAM, 2020. Plot data was collected via:

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

The minimum number of BAM plots per vegetation zone was determined through application of Table 4 of the BAM 2020 to the total extent of each PCT mapped in the subject land (Table 3). In this case a total of three BAM plots over PCT 3433 were undertaken.

An assessment of vegetation integrity was undertaken using benchmark data collected as outlined in the BAM. Vegetation integrity plots were undertaken in each vegetation zone (one zone only in this case).

No additional local or benchmark data was used for this assessment. A list of flora species was compiled (collected both on BAM field data sheets, Appendix 2, and a list of species collated during other meander & parallel targeted transects, Appendix 3) . Records of all flora species will be submitted to NSW DPE for incorporation into the Atlas of NSW Wildlife.

4.5.1 Vegetation integrity plots and score

Plot data were entered into the BAM calculator to determine vegetation integrity score. Plot data is presented in Appendix 2 and 3. Vegetation integrity scores for the vegetation zone in the subject land is provided in Table 4a.

Table 4a: Vegetation integrity scores

PCT	Plot number	Applicable Vegetation Zones	Composition condition score	Structure condition score	Function condition score	Vegetation integrity score
PCT 3443	Plots 1, 2,3	Good	54.6	93.1	62.7	68.3
Management Zone IPA	-	Good	28.3	47.8	12.5	25.7
Management Zone OPA	-	Good	32	64	44	44.8
Development site			0	0	0	0

Note: All BAM plots were assessed during normal land management practices, and normal climatic conditions.

As outlined in the BAM, 2020 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 shown in Table 4a, the integrity score for the vegetation zone is above 15 (as a TEC), and is therefore required to be offset. Therefore, offsets will be required for all impacts to all other mapped native vegetation zones within the subject land/development site, except unmapped areas/conservation areas.

Some hollow-bearing trees to be directly impacted by the proposed development, and others to be retained (Fig 14). The subdivision was redesigned to retain as many HBT's as possible, with two only proposed for removal. A full list of those to be retained, and removed, is shown in Table 4b. More details in Appendix 8 Fauna Survey.

Table 4b: Hollow bearing trees to be retained/removed

Number	Species	Common name	Retained	Removed
1	*Corymbia maculata*	Spotted Gum	✓	
2	*Corymbia maculata*	Spotted Gum	✓	
3	*Corymbia maculata*	Spotted Gum	✓	
4	*Corymbia maculata*	Spotted Gum	✓v	
5		Dead	✓	
6	*Corymbia maculata*	Spotted Gum		x
7	*Corymbia maculata*	Spotted Gum	✓	
8	*Corymbia maculata*	Spotted Gum	✓	
9	*Corymbia maculata*	Spotted Gum	✓	
10	*Eucalyptus fibrosa*	Broad Leaved ironbark	✓	
11	*Corymbia maculata*	Spotted Gum	✓	
12		Dead	✓	
13		Dead	✓	
14	*Corymbia maculata*	Spotted Gum		x
15		Dead	✓	

16	*Corymbia maculata*	Spotted Gum	✓	
17	*Corymbia maculata*	Spotted Gum	✓	

Figure 7a: LHCCREMS, 2003 vegetation map over subject site

Figure 7b: Vegetation PCTs over subject site (from NSW State Vegetation Type Map, 2023)

Figure 8: Endangered Ecological Communities & PCT's over development site (as mapped by PEAK LAND MANAGEMENT)

Figure 9: Flora survey transect, hollow bearing habitat trees, and BAM Plots over development site

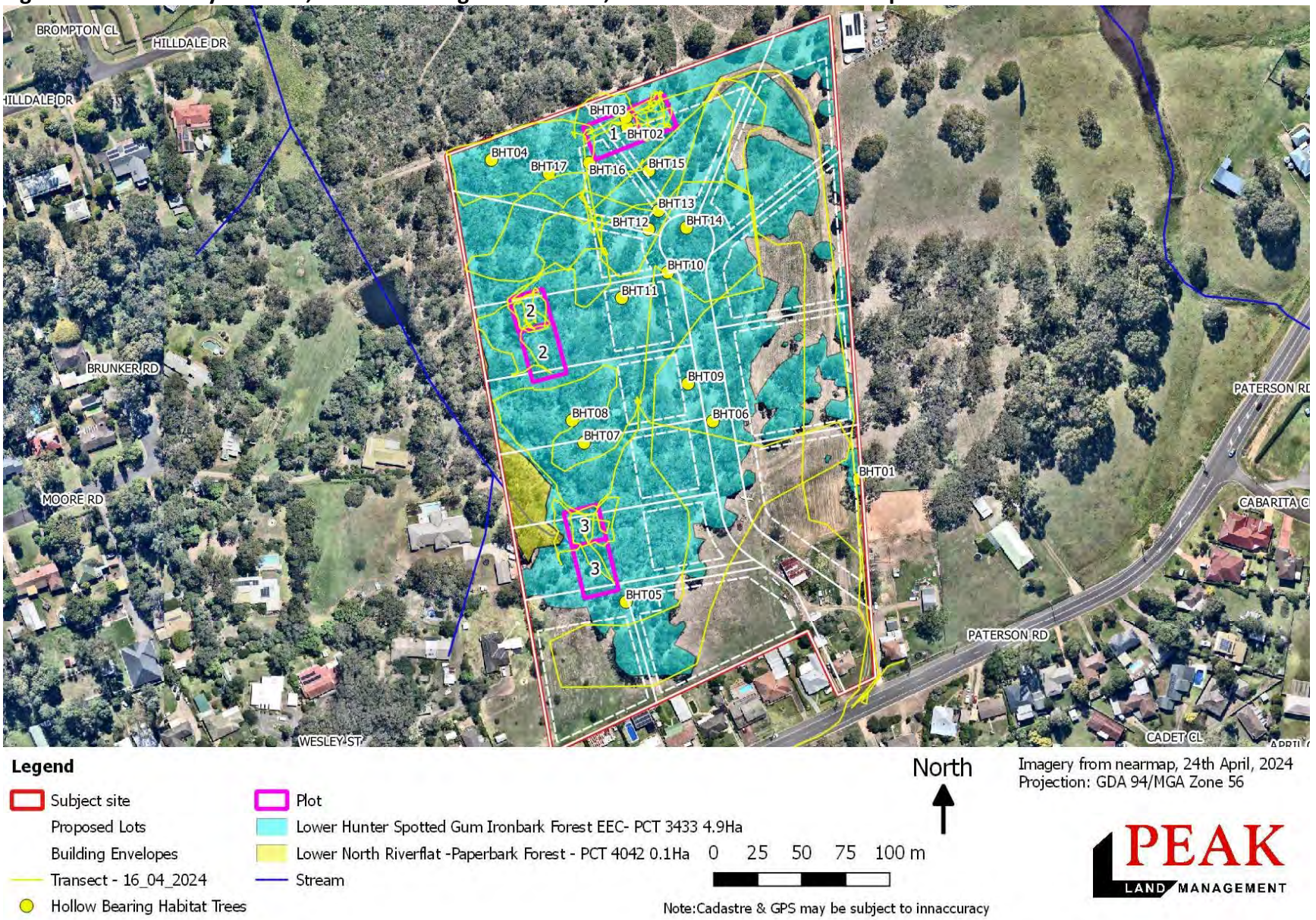


Figure 10a: Proposed Asset Protection Zone (from PLM Bush Fire Report dated Sept 2024)

Figure 10b: Proposed Asset Protection Zone IPA & OPA management zones (from PLM Bush Fire Report dated Sept 2024)

Figure 11: Native vegetation regulation mapping under LLS Act (from NVR map by NSW DPE).

Figure 12: Historic 1993 aerial photo (from NSW Government)

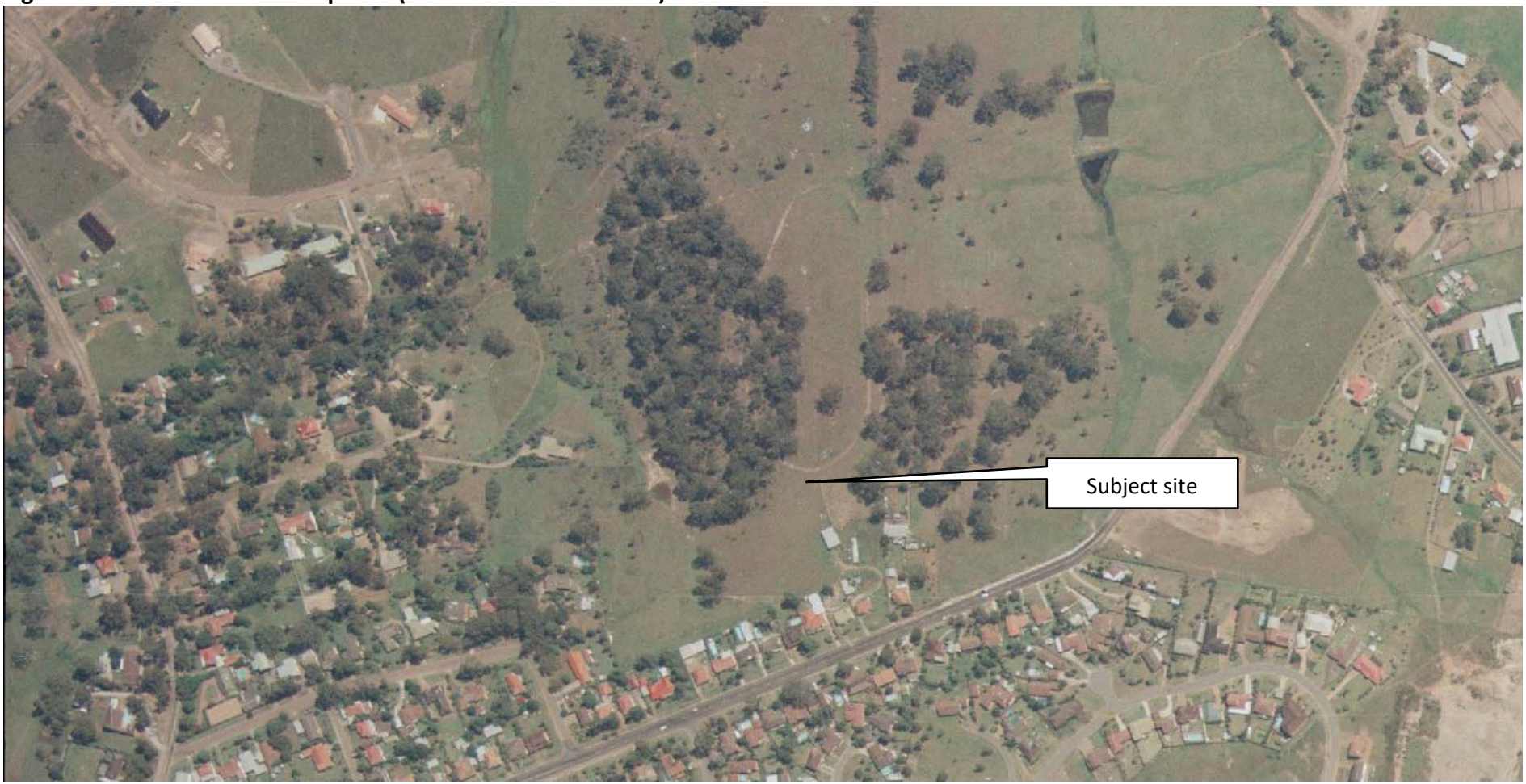


Figure 13: Important Areas Map- development site not mapped (from NSW DPE, 2024)

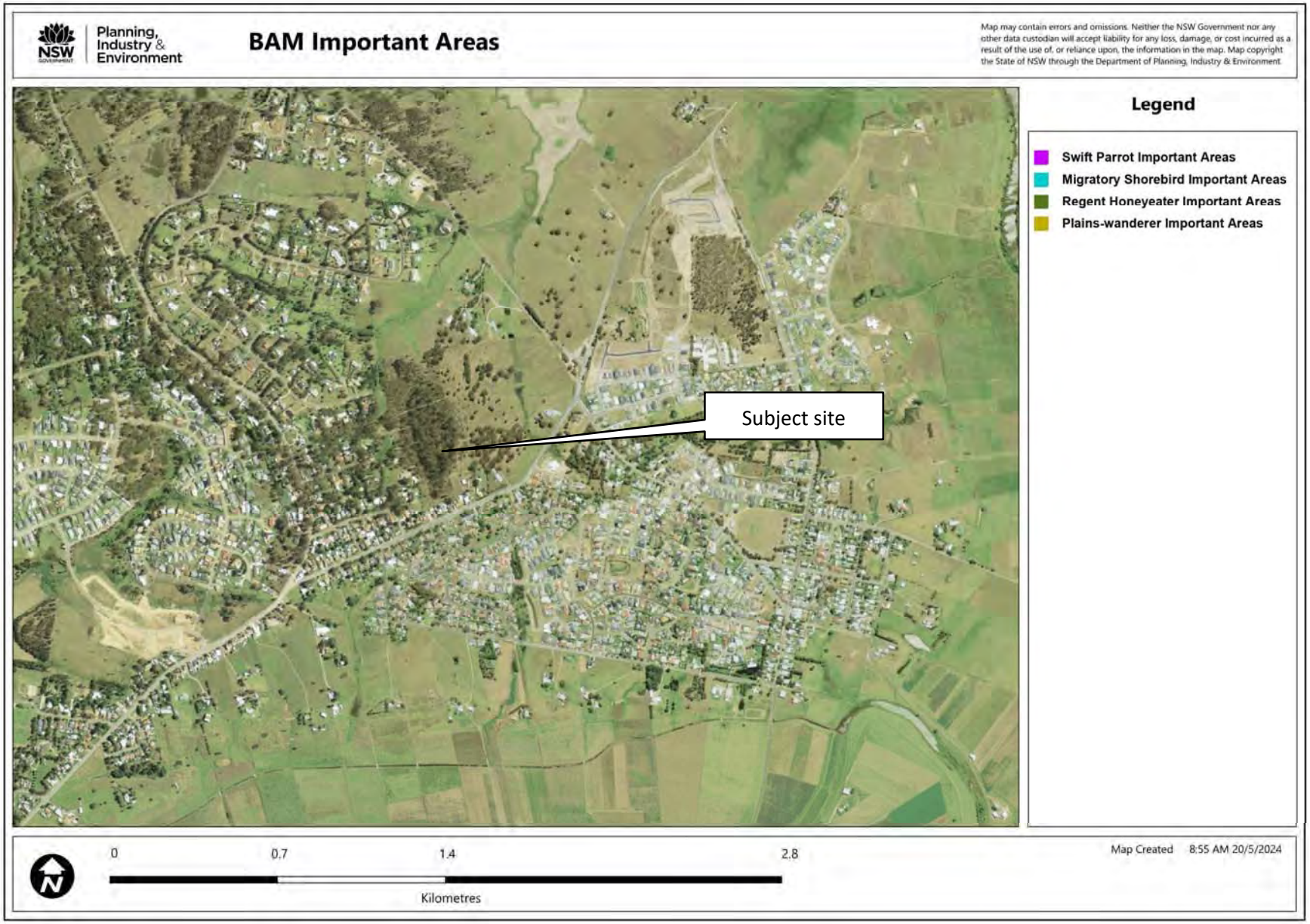


Figure 14a: Impact area showing HBT tree retention/loss & conservation area

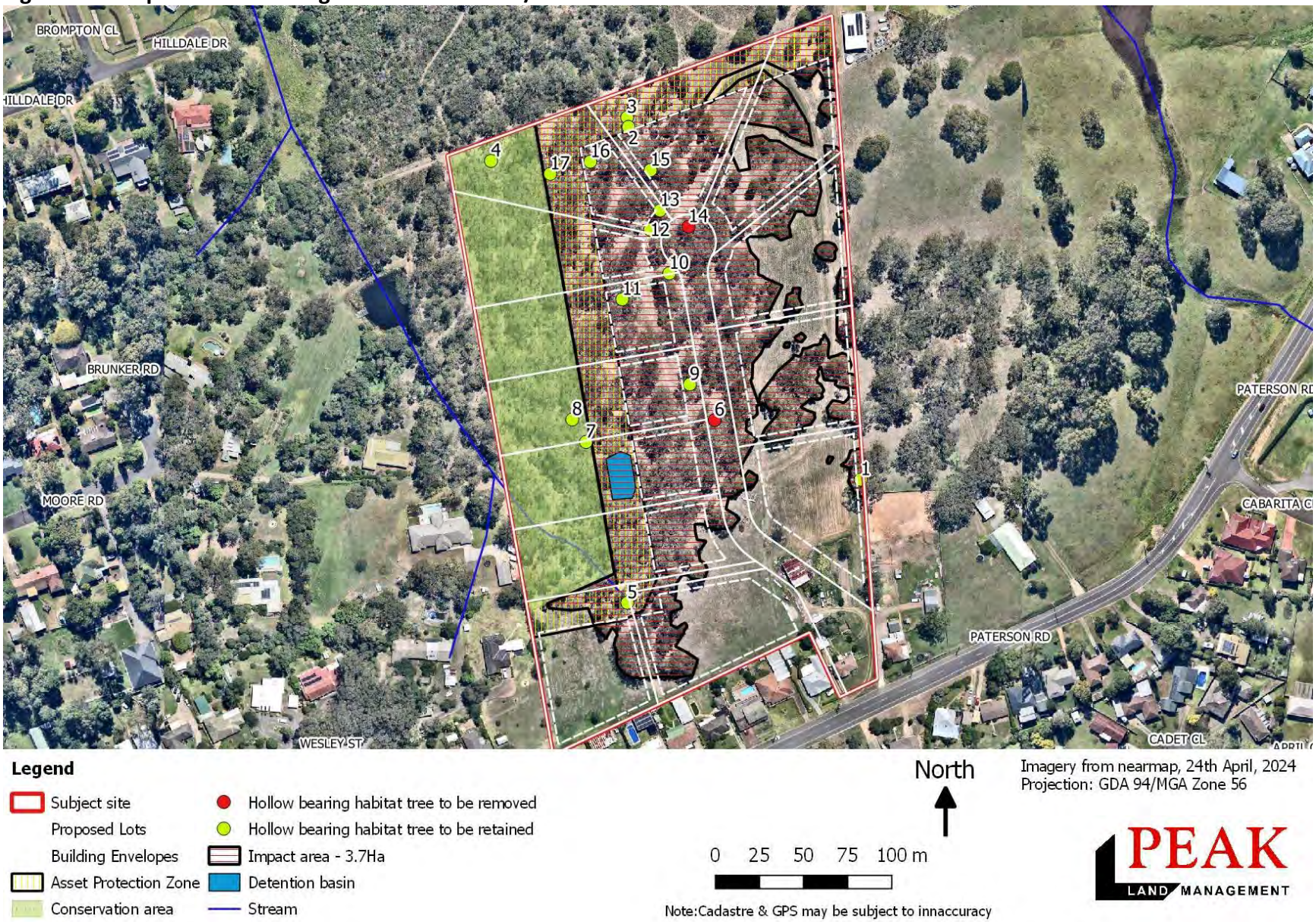


Figure 14b: Impact area over vegetation

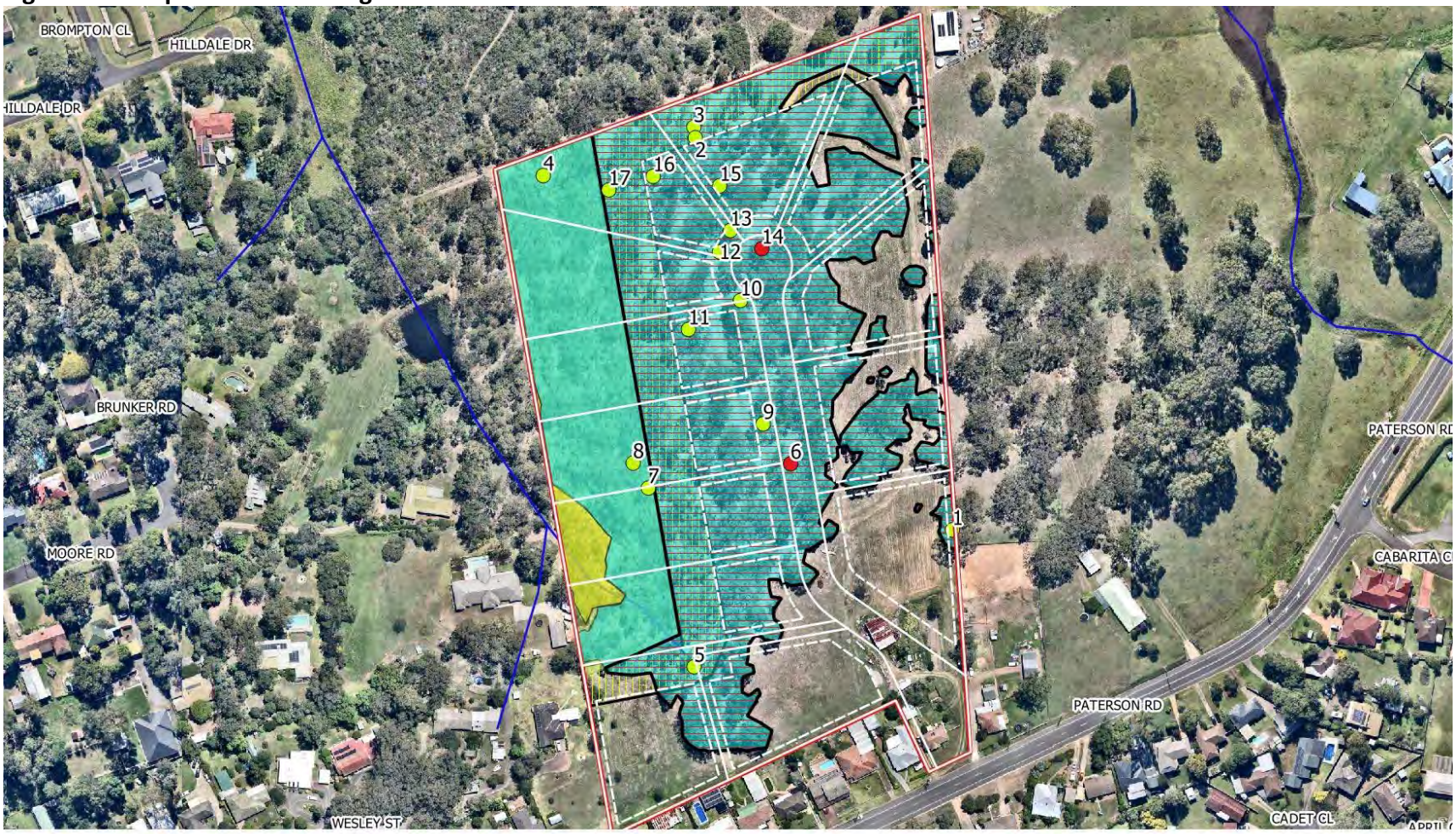
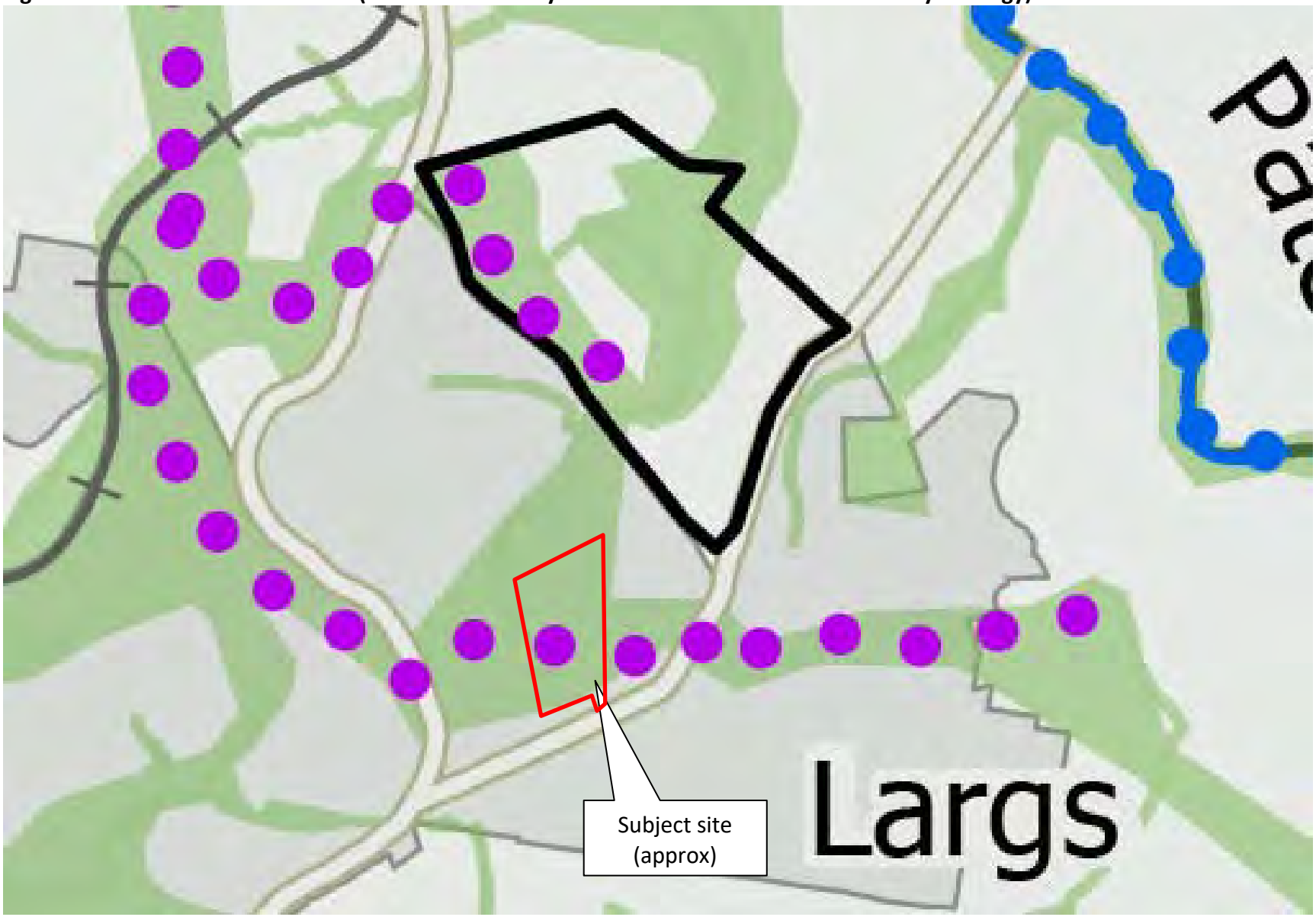


Figure 15: Biodiversity Values Map V16.10

Figure 16a: MCC Wildlife Corridors (from Maitland City Council Environmental Sustainability Strategy)

Figure 16b: MCC Wildlife Corridors (from Maitland City Council Environmental Sustainability Strategy)



5.0 HABITAT SUITABILITY FOR THREATENED SPECIES

5.1 Identification of threatened species for assessment

5.1.1 Ecosystem credit species assessment

Species reliably predicted to occur based on PCT's present within the subject land (i.e. ecosystem credit species) and information obtained from the Threatened Biodiversity Data Collection, were returned from the BAM Offsets Calculator. In addition as required by Maitland City Council Bionet listed species (Appendix 5) were examined for whether they are Ecosystems or Species Credit species as per NSW DPE Threatened Species Database listing, and assessed and added where relevant if habitat is present as per Section 6 of the BAM (Table 4). Impacts to these species may require offsetting as shown in Table 4.

Habitat & targeted survey has occurred as per Table 6 detailed below.

5.1.2 Species added or excluded from assessment

In this case no Ecosystem species were added. Bionet records were interrogated and due to lack of connectivity to site, small patch size, and lack of potential habitat presence for any other potential species no further species added.

In this case four Ecosystem species was removed due to habitat constraints including:

- *Black Bittern (Ixobrychus flavicollis)*- Not within land within 40 m of freshwater and estuarine wetlands, in areas of permanent water and dense vegetation.
- Broad-billed Sandpiper(Foraging) *(Limicola falcinellus)*- Not within land within 40 m of freshwater and estuarine wetlands, in areas of permanent water and dense vegetation.
- White-bellied Sea-Eagle(Foraging) *(Haliaeetus leucogaster)*– not within 1km of a rivers, lakes, large dams or creeks, wetlands and coastlines.
- Eastern Osprey (Foraging) *(Pandion cristatus)*- Not within land within 1km of freshwater and estuarine wetlands/rivers/lakes.
- *Ephippiorhynchus asiaticus* Black-necked Stork. No Swamps/Shallow, open freshwater or saline wetlands or shallow edges of deeper wetlands within 300m of these swamps. No Waterbodies Shallow lakes, lake margins and estuaries within 300m of these waterbodies

Figure 17: Ecosystem credit species (from BAM Calculator)

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BAM Predicted Species Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00047555/BAAS17076/24/00047557	256 Paterson Rd Bolwarra	14/03/2024
Assessor Name	**Report Created**	**BAM Data version ***
Ted Smith	02/07/2024	67
Assessor Number	**Assessment Type**	**BAM Case Status**
BAAS17076	Part 4 Developments (General)	Open
Assessment Revision	**BOS entry trigger**	**Date Finalised**
1	BOS Threshold: Area clearing threshold	To be finalised

* 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.

Threatened species reliably predicted to utilise the site. No surveys are required for these species. Ecosystem credits apply to these species.

Common Name	Scientific Name	Vegetation Types(s)
Black Falcon	Falco subniger	3433-Hunter Coast Foothills Spotted Gum-Ironbark Grassy Forest
Black-chinned Honeyeater (eastern subspecies)	Melithreptus gularis gularis	3433-Hunter Coast Foothills Spotted Gum-Ironbark Grassy Forest
Black-necked Stork	Ephippiorhynchus asiaticus	3433-Hunter Coast Foothills Spotted Gum-Ironbark Grassy Forest
Brown Treecreeper (eastern subspecies)	Climacteris picumnus victoriae	3433-Hunter Coast Foothills Spotted Gum-Ironbark Grassy Forest
Corben's Long-eared Bat	Nyctophilus corbeni	3433-Hunter Coast Foothills Spotted Gum-Ironbark Grassy Forest
Diamond Firetail	Stagonopleura guttata	3433-Hunter Coast Foothills Spotted Gum-Ironbark Grassy Forest
Dusky Woodswallow	Artamus cyanopterus cyanopterus	3433-Hunter Coast Foothills Spotted Gum-Ironbark Grassy Forest
Eastern Coastal Free-tailed Bat	Micronomus norfolkensis	3433-Hunter Coast Foothills Spotted Gum-Ironbark Grassy Forest
Eastern Osprey	Pandion cristatus	3433-Hunter Coast Foothills Spotted Gum-Ironbark Grassy Forest

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Flame Robin	Petroica phoenicea	3433-Hunter Coast Foothills Spotted Gum-Ironbark Grassy Forest
Gang-gang Cockatoo	Callocephalon fimbriatum	3433-Hunter Coast Foothills Spotted Gum-Ironbark Grassy Forest
Grey-crowned Babbler (eastern subspecies)	Pomatostomus temporalis temporalis	3433-Hunter Coast Foothills Spotted Gum-Ironbark Grassy Forest
Grey-headed Flying-fox	Pteropus poliocephalus	3433-Hunter Coast Foothills Spotted Gum-Ironbark Grassy Forest
Large Bent-winged Bat	Miniopterus orianae oceanensis	3433-Hunter Coast Foothills Spotted Gum-Ironbark Grassy Forest
Little Bent-winged Bat	Miniopterus australis	3433-Hunter Coast Foothills Spotted Gum-Ironbark Grassy Forest
Little Eagle	Hieraaetus morphnoides	3433-Hunter Coast Foothills Spotted Gum-Ironbark Grassy Forest
Little Lorikeet	Glossopsitta pusilla	3433-Hunter Coast Foothills Spotted Gum-Ironbark Grassy Forest
New Holland Mouse	Pseudomys novaehollandiae	3433-Hunter Coast Foothills Spotted Gum-Ironbark Grassy Forest
Regent Honeyeater	Anthochaera phrygia	3433-Hunter Coast Foothills Spotted Gum-Ironbark Grassy Forest
Scarlet Robin	Petroica boodang	3433-Hunter Coast Foothills Spotted Gum-Ironbark Grassy Forest
South-eastern Glossy Black-Cockatoo	Calyptorhynchus lathami lathami	3433-Hunter Coast Foothills Spotted Gum-Ironbark Grassy Forest
Speckled Warbler	Chthonicola sagittata	3433-Hunter Coast Foothills Spotted Gum-Ironbark Grassy Forest
Spotted Harrier	Circus assimilis	3433-Hunter Coast Foothills Spotted Gum-Ironbark Grassy Forest
Spotted-tailed Quoll	Dasyurus maculatus	3433-Hunter Coast Foothills Spotted Gum-Ironbark Grassy Forest
Square-tailed Kite	Lophoictinia isura	3433-Hunter Coast Foothills Spotted Gum-Ironbark Grassy Forest
Swift Parrot	Lathamus discolor	3433-Hunter Coast Foothills Spotted Gum-Ironbark Grassy Forest
Turquoise Parrot	Neophema pulchella	3433-Hunter Coast Foothills Spotted Gum-Ironbark Grassy Forest
Varied Sittella	Daphoenositta chrysoptera	3433-Hunter Coast Foothills Spotted Gum-Ironbark Grassy Forest

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BAM Predicted Species Report

White-throated Needletail	Hirundapus caudacutus	3433-Hunter Coast Foothills Spotted Gum-Ironbark Grassy Forest
Yellow-bellied Sheathtail-bat	Saccolaimus flaviventris	3433-Hunter Coast Foothills Spotted Gum-Ironbark Grassy Forest

Threatened species Manually Added

None added

Threatened species assessed as not within the vegetation zone(s) for the PCT(s)

Common Name	Scientific Name	Plant Community Type(s)
Black Bittern	Ixobrychus flavicollis	3433-Hunter Coast Foothills Spotted Gum-Ironbark Grassy Forest
Broad-billed Sandpiper	Limicola falcinellus	3433-Hunter Coast Foothills Spotted Gum-Ironbark Grassy Forest
White-bellied Sea-Eagle	Haliaeetus leucogaster	3433-Hunter Coast Foothills Spotted Gum-Ironbark Grassy Forest

Threatened species assessed as not within the vegetation zone(s) for the PCT(s)

Refer to BAR for detailed justification

Common Name	Scientific Name	Justification in the BAM-C
Black Bittern	Ixobrychus flavicollis	Habitat constraints
Broad-billed Sandpiper	Limicola falcinellus	Refer to BAR
White-bellied Sea-Eagle	Haliaeetus leucogaster	Refer to BAR

PEAK LAND MANAGEMENT

5.2 Candidate species credit species

A list of candidate species credit species potentially occurring within the subject land was generated in accordance with the BAM Offsets Calculator (Fig 18), including information obtained from the Threatened Biodiversity Data Collection.

Species records were analysed from Bionet search records in this area (Table 5), and from latest flora & fauna surveys conducted by PEAK LAND MANAGEMENT and General Flora & Fauna (Appendix 8) and habitat assessment. No species were added for assessment:

An assessment of whether suitable habitat occurs within the subject land, and therefore whether a species is to be considered a candidate species credit species is also provided, and rationale for their assumed presence or exclusion (Table 5). The identification of candidate species credit species was assessed in accordance with the BAM.

All candidate species considered likely to inhabit the subject land and shown as having suitable habitat & geographic location are assumed present.

5.2.1 Species excluded from candidate species assessment

Some candidate/species credit species are to be excluded from the assessment, with habitat constraints and / or geographic restrictions, or are considered vagrant.

These are shown in Table 5.

Table 5: Predicted fauna species credit species reason for exclusion

Common & scientific name	Listing status		Species retained for further assessment?	Reason for exclusion from further assessment
	BC Act	EPBC Act		
Anthochaera phrygia Regent Honeyeater (Breeding)	CE	CE	No.	Not a mapped Important Area (Fig 13) for this species.
Chalinolobus dwyeri Large-eared Pied Bat	V	V	No	No cliffs, or within 2kms of these features, and therefore excluded.
Corybas dowlingii Red Helmet Orchid	E		No	NSW DPE, 2024 state: *"Corybas dowlingii* is restricted to the central coast and Hunter regions of New South Wales where it is currently known from the Port Stephens, Bulahdelah, Lake Macquarie and Freemans Waterhole areas. It is known from the local government areas of Cessnock, Great Lakes, Lake Macquarie and Port Stephens. More recently the species has been recorded from the Wauchope and Port Macquarie areas. Sheltered areas such as gullies and southerly slopes in tall open forest on well-drained gravelly soil at elevations of 10-200 m; though the species has been recorded from sandy soils in swamp forest areas (e.g., Medowie, Anna Bay, Wauchope and Port Macquarie)". Therefore habitat is not present (no gravelly or sandy soils) and outside of known geographical range/LGA.
Delma impar Striped Legless Lizard	V	V	No	Outside known geographical range and no potential habitat. NSW DPE, 2024 state "Tussocky Grassland". Forest is present over site. Nearest Bionet records are at Lemington.

Dromaius novaehollandiae - endangered population Emu population in the New South Wales North Coast Bioregion and Port Stephens local government are			No	Not in Port Stephens LGA.
Haliaeetus leucogaster White-bellied Sea-Eagle(breeding)	V	-	No	No living or dead mature trees within suitable vegetation within 1km of rivers, lakes, large dams or creeks, wetlands and coastlines.
Lathamus discolor Swift Parrot (Breeding	E	CE	No	Not mapped on Important Habitat Map.
Limicola falcinellus Broad-billed Sandpiper (Breeding)	V		No	Not mapped on Important Habitat Map.
Litoria aurea *Green and Golden Bell Frog*	E	V	No	Not within 1km of semi permanent/ephemeral wet areas|Swamps|Waterbodies. The stream is predominantly dry over the conservation part of the site, and no connectivity exists to any swamp or waterbody.
Litoria brevipalmata Green-thighed Frog	V		No	Not within semi permanent/ephemeral wet areas|Swamps|Waterbodies.
*Miniopterus australis (*Little Bent-winged Bat (Breeding)	V	-	No	No cliffs, or within 2kms of these features, or Cave, tunnel, mine, culvert or other structure known or suspected to be used for breeding or any breeding records in Bionet, and therefore excluded.
Miniopterus orianae oceanensis Large Bent-winged Bat (Breeding)	V	-	No	No cliffs, or within 2kms of these features, or Cave, tunnel, mine, culvert or other structure known or suspected to be used for breeding or any breeding records in Bionet, and therefore excluded.

Myotis macropus Southern myotis	V	-	No	No waterbodies with permanent pools/stretches 3m or wider, including rivers, large creeks, billabongs, lagoons, estuaries, dams and other waterbodies, on or within 200m of the site
Pandion cristatus Eastern Osprey (Breeding)			No	No presence of stick-nests in living and dead trees (>15m) or artificial structures within 100m of a floodplain for nesting
Petrogale penicillata Brush-tailed Rock-wallaby	E	V	No	Subject site not within 1 km of rocky escarpments, gorges, steep slopes, boulder piles, rock outcrops or cliff lines.
Prostanthera cineolifera Singleton Mint Bush	V	V	No	As the name implies found at Singleton and nearest Bionet records around Bellbird, SW of Cessnock. No records east of Bellbird. Not considered suitable geographic location within development site.
Pteropus poliocephalus Grey-headed Flying-fox (Breeding)	V	V	No	No Breeding camp
Spyridium burragorang - endangered population Spyridium burragorang in the Cessnock local government area	E		No	Not in Cessnock local government area.
Uperoleia mahonyi Mahony's Toadlet	E	E	No	NSW DPE, 2024 state "*Current observations indicate Mahony's Toadlet inhabits ephemeral and semi-permanent swamps and swales on the coastal fringe of its range. Known records occur in heath or wallum habitats almost exclusively associated with leached (highly nutrient impoverished) white sand. Commonly associated with acid paperbark swamps, Mahony's Toadlet also is known to occur in wallum heath, swamp mahogany-paperbark swamp forest, heath shrubland and Sydney red gum woodlan*d". No habitat present for this amphibian.

Vespadelus troughtoni Eastern Cave Bat	V	-	No	Caves. Within two kilometres of rocky areas containing caves, overhangs, escarpments, outcrops, crevices or boulder piles, or within two kilometres of old mines, tunnels, old buildings or sheds. Subject site not within 2kms of these structures. No caves on site.

Figure 18: Candidate credit species with habitat suitability within development site

NSW GOVERNMENT

BAM Candidate Species Report

Proposal Details

Assessment Id 00047555/BAAS17076/24/00047557	Proposal Name 256 Paterson Rd Bolwarra	BAM data last updated * 14/03/2024
Assessor Name Ted Smith	Report Created 02/07/2024	BAM Data version * 67
Assessor Number BAAS17076	Assessment Type Part 4 Developments (General)	BAM Case Status Open
Assessment Revision 1	Date Finalised To be finalised	BOS entry trigger BOS Threshold: Area clearing threshold

* 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.

List of Species Requiring Survey

Name	Presence	Survey Months
Ninox connivens Barking Owl		☐ Jan ☐ Feb ☐ Mar ☑ Apr ☑ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Tetratheca juncea Black-eyed Susan	*Survey months are outside of the months specified in Bionet.	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☑ Survey month outside the specified months?
Phascogale tapoatafa Brush-tailed Phascogale		☐ Jan ☐ Feb ☐ Mar ☑ Apr ☑ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?

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Burhinus grallarius Bush Stone-curlew		☐ Jan ☐ Feb ☐ Mar ☑ Apr ☑ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Acacia bynoeana Bynoe's Wattle		☐ Jan ☐ Feb ☐ Mar ☑ Apr ☐ May ☑ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Angophora inopina Charmhaven Apple		☐ Jan ☐ Feb ☐ Mar ☑ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Planigale maculata Common Planigale		☐ Jan ☐ Feb ☐ Mar ☑ Apr ☑ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Cercartetus nanus Eastern Pygmy-possum	*Survey months are outside of the months specified in Bionet.	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☑ Survey month outside the specified months?
Eucalyptus parramattensis subsp. decadens Eucalyptus parramattensis subsp. decadens		☐ Jan ☐ Feb ☐ Mar ☑ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?

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Callocephalon fimbriatum Gang-gang Cockatoo	*Survey months are outside of the months specified in Bionet.	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☑ Survey month outside the specified months?
Rutidosis heterogama Heath Wrinklewort		☐ Jan ☐ Feb ☐ Mar ☑ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Phascolarctos cinereus Koala		☐ Jan ☐ Feb ☐ Mar ☑ Apr ☑ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Hieraaetus morphnoides Little Eagle	*Survey months are outside of the months specified in Bionet.	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☑ Survey month outside the specified months?
Syzygium paniculatum Magenta Lilly Pilly		☐ Jan ☐ Feb ☐ Mar ☑ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Tyto novaehollandiae Masked Owl		☐ Jan ☐ Feb ☐ Mar ☑ Apr ☑ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?

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Callistemon linearifolius Netted Bottle Brush	*Survey months are outside of the months specified in Bionet.	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☑ Survey month outside the specified months?
Eucalyptus pumila Pokolbin Mallee		☐ Jan ☐ Feb ☐ Mar ☑ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Ninox strenua Powerful Owl		☐ Jan ☐ Feb ☐ Mar ☑ Apr ☑ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Pterostylis chaetophora Pterostylis chaetophora	*Survey months are outside of the months specified in Bionet.	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☑ Survey month outside the specified months?
Pomaderris queenslandica Scant Pomaderris		☐ Jan ☐ Feb ☐ Mar ☑ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Eucalyptus glaucina Slaty Red Gum		☐ Jan ☐ Feb ☐ Mar ☑ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?

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Grevillea parviflora subsp. parviflora Small-flower Grevillea	*Survey months are outside of the months specified in Bionet.	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☑ Survey month outside the specified months?
Calyptorhynchus lathami lathami South-eastern Glossy Black-Cockatoo		☐ Jan ☐ Feb ☐ Mar ☑ Apr ☑ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Lophoictinia isura Square-tailed Kite	*Survey months are outside of the months specified in Bionet.	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☑ Survey month outside the specified months?
Petaurus norfolcensis Squirrel Glider		☐ Jan ☐ Feb ☐ Mar ☑ Apr ☑ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Crinia tinnula Wallum Froglet		☐ Jan ☐ Feb ☐ Mar ☑ Apr ☑ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?

Threatened species Manually Added

None added

Threatened species assessed as not on site

Refer to BAR for detailed justification

PEAK LAND MANAGEMENT

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Common name	Scientific name	Justification in the BAM-C
Broad-billed Sandpiper	Limicola falcinellus	Habitat constraints
Brush-tailed Rock-wallaby	Petrogale penicillata	Habitat constraints
Eastern Cave Bat	Vespadelus troughtoni	Habitat constraints
Eastern Osprey	Pandion cristatus	Habitat constraints
Emu population in the New South Wales North Coast Bioregion and Port Stephens local government area	Dromaius novaehollandiae - endangered population	Refer to BAR
Green and Golden Bell Frog	Litoria aurea	Habitat constraints
Green-thighed Frog	Litoria brevipalmata	Habitat constraints
Grey-headed Flying-fox	Pteropus poliocephalus	Habitat constraints
Large Bent-winged Bat	Miniopterus orianae oceanensis	Habitat constraints
Large-eared Pied Bat	Chalinolobus dwyeri	Habitat constraints
Little Bent-winged Bat	Miniopterus australis	Habitat constraints
Mahony's Toadlet	Uperoleia mahonyi	Species is vagrant
Red Helmet Orchid	Corybas dowlingii	Species is vagrant Geographic limitations
Regent Honeyeater	Anthochaera phrygia	Habitat constraints
Singleton Mint Bush	Prostanthera cineolifera	Species is vagrant
Southern Myotis	Myotis macropus	Habitat constraints
Spyridium burragorang in the Cessnock local government area	Spyridium burragorang - endangered population	Species is vagrant
Striped Legless Lizard	Delma impar	Species is vagrant
Swift Parrot	Lathamus discolor	Habitat constraints
White-bellied Sea-Eagle	Haliaeetus leucogaster	Habitat constraints

5.3 Threatened flora & fauna species surveys results

Flora and fauna surveys were undertaken as shown in Table 1, and as described in Section 2.3 & 2.4. Most potential threatened flora & fauna candidate listed species had targeted surveys occur over them, during the correct BAM Calculator nominated time/month (Fig 18). Some species were not surveyed in the correct month and will likely be surveyed in the correct month at a later stage. In the meantime they are treated as “Assumed Presence”.

Surveys are as shown within Table 1. The location of transects are shown in Figure 9. Hollow bearing trees were recorded.

A list of flora and fauna recorded over the site is shown in Appendices 3, 4 & 8.

Targeted fauna survey was undertaken for:

- Amphibians- during high humidity days in April/May;
- Birds;
- Koala – scat, visual.
- Other incidental.

In addition to surveys undertaken by PEAK LAND MANAGEMENT, General Flora & Fauna undertook a full fauna survey in April & May 2024. Results are shown in Appendix 8.

Fauna habitat was present over the site due to presence of remnant vegetation. Habitat presence for a number of fauna species as outlined in Table 5, and Fig 18.

The total site area is around 7.3Ha, with around 2/3 of it vegetated, and 3.7Ha of Dry Sclerophyll Forest directly impacted, but with recommendations to retain most hollow bearing habitat trees, retain wildlife connectivity where feasible (mainly along eastern and western parts of the site).

There are a number of potential threatened fauna species over the site, with habitat presence as described in Table 5 & 6, and assessed within the BAM Calculator/BDAR report. Some of these species were recorded during fauna survey, as described above, with targeted surveys occurring for them. Survey was generally conducted within the stated BAM calculator survey period, or if not has assumed presence unless habitat not present.

All discounted species are as shown in Table 5 after flora/fauna survey confirmed no presence.

As there are hollow bearing remnant old growth habitat trees present, all hollow dependant species have been included that rely on these hollows for nesting/denning etc if listed as a breeding requirement under the BAM calculator. Hollow dependent species include owls, and other hollow dependant bird and mammal threatened species such as Squirrel Glider. Note however Squirrel Glider does not have any breeding constraints (within TBDC), and is therefore included for assessment irrespective of HBT presence.

Common birds were present (Appendix 4). The subject land is likely to be influenced by introduced predators (e.g. European Fox, Rat, Mice, Cat & Dog) pressure.

Habitat within the development site may provide foraging resources for some threatened species in the form of large flowering eucalypts. *Corymbia maculata* is a winter-flowering species, and offers nectar resources for nectivorous birds, including threatened species. The development site however avoids impact over some of these trees and the site is not mapped as an important area for Regent Honeyeater, or Swift Parrot (Fig 13).

In summary the following results were found (Appendix 8):

- Eight (8) threatened species were recorded on the site:
  - *Petaurus norfolcensis* *Squirrel Glider*
  - *Pteropus poliocephalus* *Grey-headed Flying-fox*
  - *Chalinolobus dwyeri* *Large-eared Pied Bat*
  - *Micronomus norfolkensis* *Eastern Coastal Freetail Bat*
  - *Myotis Macropus* *Southern Myotis*
  - *Miniopterus australis* *Little Bent-wing Bat*
  - *Miniopterus orianae oceanensis* *Large Bent-wing Bat*
  - *Scoteanax rueppellii* *Greater Broad-nosed Bat*

- No threatened flora species were recorded on or near the subject land.
- Hollow-bearing trees were recorded within development site, and nearby.
- Flowering shrubs and feed tree species, including winter flowering species.
- No sandstone rocky outcrops or caves, or hollow bearing logs present.
- Connectivity present around subject site, including north-south, and part east – west however limited habitat to east and no habitat to the south. Effectively an urban remnant surrounded by residential/rural cleared land. It is noted part of the site is mapped on Councils connectivity map Fig 16). Part connectivity loss from the proposal, and reduction in patch size/reduction in foraging & shelter resources, which may lead to the local extinction of the Squirrel Glider population in this area.
- Presence of Koala feed trees such as Spotted Gum. Small patch size, however there are limited Koala records in this area (not over site) and not recorded in surveys. Possibly already locally extinct in this area.
- One man made drainage line and dam present, unaffected by proposal. No/marginal habitat for amphibian threatened species & none recorded.
- Allocasuarina Glossy Black Cockatoo feed trees present.
- No Koala scat, or any other scat recorded, no tracks, no burrows or feathers observed, no owl regurgitation pellets or other owl guano.
- Presence of some weed exotic species, mainly pasture grasses & Lantana.
- Some logs present, and old growth trees;
- Probably logged and grazed in the past;
- Some degradation over the site from slashing, past grazing, exotic plants, and part tree clearing. Remnant vegetation is still however in moderate to good condition, albeit modified.
- No Grey Crowned Babbler stick nests were recorded.

5.4 Expert reports

No expert reports required in this case.

5.5 More appropriate local data (where relevant)

Not applicable in this case.

5.6.1 Area or count, and location of suitable habitat for a fauna & flora species credit species (a species polygon)

Following site fauna and flora survey, habitat was considered present for the following species. In the absence of full fauna survey at correct BAM seasonal month, they are presumed present, and they are required to be offset, and polygons prepared. Species polygons (Fig 19 & 20) have been mapped. It is acknowledged individual polygon maps have not been produced in accordance with the BAM, however this will occur at a later stage when further surveys occur & species presence/absence known.

- *Petaurus norfolcensis* (Squirrel Glider).
- *Callistemon linearifolius* (Netted Bottle Brush)
- *Callocephalon fimbriatum* (Gang-gang Cockatoo)
- *Cercartetus nanus* (Eastern Pygmy-possum)
- *Grevillea parviflora subsp. Parviflora* (Small-flower Grevillea)
- *Hieraaetus morphnoides* (Little Eagle)
- *Lophoictinia isura* (Square-tailed Kite)
- *Pterostylis chaetophora* (An Orchid)
- *Tetratheca juncea* (Black-eyed Susan).

All vegetation with tree cover over the site has been taken as the polygon for Squirrel Glider (including trees within 30m glide path of other trees), Gang-gang Cockatoo, Little Eagle and Square-Tailed Kite.

All native vegetation including native ground cover over the site has been taken as the polygon for *Pterostylis chaetophora, Tetratheca juncea* (Black-eyed Susan), *Callistemon linearifolius* (Netted Bottle Brush) and *Grevillea parviflora subsp. Parviflora* (Small-flower Grevillea)

The impact area is in accordance with the area methodology stated within the TBDC. Note as assumed presence of these species (apart from Squirrel Glider) the area of potential habitat is used, rather than count (as unknown) for some flora species. The BAM calculator only accepts a Count of assumed flora species in some cases, so 3 has been used within the BAM - Calc in these cases as unknown number of species present. As noted, further surveys will occur at a later date and this BDAR will be amended/updated then with confirmed presence (area or count)/absence.

Figure 19: Squirrel Glider, Gang-gang Cockatoo, Little Eagle and Square-Tailed Kite Polygon

Figure 20: *Pterostylis chaetophora, Tetratheca juncea* (Black-eyed Susan), *Callistemon linearifolius* (Netted Bottle Brush) and *Grevillea parviflora subsp. Parviflora* (Small-flower Grevillea)

6.0 IDENTIFYING PRESCRIBED IMPACTS

6.1 Additional Habitat Features Relevant to Prescribed Biodiversity Impacts

Prescribed impacts are present, and these features are shown in Table 7. These impacts are generally not considered to affect any threatened species in this case.

Table 7: Prescribed impacts identified

Feature	Present	Description of feature characteristics and location	Threatened entities that use, are likely to use, or are part of the habitat feature.
Karst, caves, crevices, cliffs, rocks or other geological features of significance	☐Yes / ☒No	Not present.	N/A
Human-made structures	☒Yes / ☐No	Human structures to be removed including sheds and house.	Microbats. Anabat survey did not locate microbat presence within these structures.
Non-native vegetation	☒Yes / ☐No	Some weedy non native vegetation present.	Threatened plants, some fauna such as Phascogale. Surveys have occurred over weedy areas.
Habitat connectivity	☒Yes / ☐No	Limited connectivity present through site. Will be disconnected by the proposal. Some recommended tree retention along eastern boundary and northern boundary, in association with Conservation area will provide ongoing part connectivity through development site.	Koala, Squirrel Glider, other reptiles, mammals, birds etc. Connectivity disjunct.
Waterbodies, water quality and hydrological processes	☐Yes / ☒No	None impacted by proposal. All water & riparian zones unaffected.	N/A
Wind turbine strikes (wind farm development only)	☐Yes / ☒No		N/A
Vehicle strikes	☒Yes / ☐No	Low speed road proposed. Potential strike.	Koala, reptiles, other mammals.

STAGE 2: IMPACT ASSESSMENT (BIODIVERSITY VALUES AND PRESCRIBED IMPACTS)

7.0: AVOID AND MINIMISE IMPACTS

7.1 Avoid and minimise

In accordance with the BAM, proponents must demonstrate the measures employed to avoid, mitigate and offset impacts of a project on biodiversity values. This section of the report outlines the avoidance, management and mitigation measures that the proponent has incorporated into the project design or will employ during construction, operation or completion of the project to reduce impacts on biodiversity values.

7.1.1 Avoidance measures (pre-construction)

Recommendations are made to:

- Retain most large and hollow bearing habitat trees identified within this report (Fig 14b), and any large trees elsewhere where feasible, especially along eastern and northern boundary areas and over lots where not required to be cleared for dwellings etc.
- Retain & protect wildlife conservation area over western side of site;
- Retain native ground cover and selected trees conforming to an Asset Protection Zone standard over the proposed Asset Protection Zone ;
- Fence off Conservation Area over all lots and signpost. Ensure covenants are enacted to legally protect it, and ensure its retention, and to stop unlawful underscrubbing, clearing, poisoning, etc. Ensure prospective landowners understand this obligation.

Consideration of constraints such as threatened vegetation communities, threatened species habitat, creeks and other identified ecological constraints was undertaken.

7.1.2 Avoidance measures (construction and operation phases)

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 is to be developed which includes standard measures:
    - Installation of appropriate delineation to the boundary of the retained vegetation (Conservation Area) and any construction areas where there is some potential for accidental encroachment. This will include temporary (consider permanent) exclusion fencing, with appropriate signage such as ‘No Go Zone’ or ‘Environmental Protection Area’. Identification of any ‘No Go Zones’ in site inductions for all construction personnel.
    - Temporary no go fencing / barricades are to be used to establish tree protection zones around retained native habitat trees identified in this report (TPZs)

adjacent to the development site in accordance with the Standards Australia Committee (2009).

- All material stockpiles, vehicle parking and machinery storage should be located away from the nbn tower site and stored/located over the cleared area at the start of the access road (near the house/existing tower) where feasible, 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.
- 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.
- All native trees for retention marked/ribboned/identified pre clearing by a qualified Ecologist & Bush Fire consultant, including all hollow bearing/large trees.
- This needs to be done in conformance with Asset Protection Zone standards/windbreak exclusion under PBP, 2019.
- Ensure Tool Box induction of all contractors over these requirements.

7.1.3 Operation

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

- Landscaping of the site (if applicable) is recommended to use local native species where practicable to limit the potential spread of weeds in to adjoining retained native vegetation and maximise the foraging resources available for highly mobile species.
- Retained native habitat trees (Fig 14b) shall be clearly signposted as “Protected Trees” or the like to prevent inadvertent removal, disturbance, tree root disturbance, etc.
- Retain hollow bearing habitat trees identified within this report (Fig 14b), and any large trees elsewhere where feasible, especially along eastern and northern boundary areas and over lots where not required to be cleared for dwellings etc.
- Retain & protect wildlife conservation area over western side of site. A Vegetation management Plan (VMP) should be prepared to guide its ongoing management for conservation purposes.
- Fence off Conservation Area over all lots and signpost. Ensure covenants are enacted to legally protect it, ensure its retention, and to stop unlawful underscrubbing, clearing, poisoning, etc. Ensure prospective landowners understand this obligation.

- Retain native ground cover and selected trees conforming to an Asset Protection Zone standard over the proposed Asset Protection Zone ;
- If feasible restrict cat ownership.
- Ensure low speed road to minimise wildlife vehicle strike.

8.0 IMPACT ASSESSMENT

8.1 Direct impacts

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

The project would affect biodiversity, including threatened biodiversity through both direct and indirect impacts during construction and operation. The majority of impacts on biodiversity would occur during construction from clearing of native vegetation and removal of habitat.

The direct and indirect impacts associated with the project and measures to offset and manage biodiversity in the long term are outlined the following sections.

8.1.1 Residual direct impacts

Direct impacts arising from the project include:

- Clearing of 3.7Ha of PCT 3433 *Hunter Coast Foothills Spotted Gum-Ironbark Grassy Forest* within the subject land which is consistent with *Lower Hunter Spotted Gum Ironbark Forest* threatened ecological communities (TECs) listed under the NSW BC Act, but not listed under the Federal EPBC Act.
- Some vegetation to be retained within Management Zones as detailed within this BDAR.

The majority of vegetation likely to be affected by the project has not been subject to former clearing pre 1990 as evidenced by old aerial photography.

8.1.2 Change in vegetation integrity score

The change in vegetation integrity for residual direct impacts on native vegetation, TECs, threatened species and their habitat that were identified on the subject land.

Table 8: Vegetation integrity scores

PCT/Veg Zone	Applicable Vegetation Zones	Area (Ha)		Composition condition score	Structure condition score	Function condition score	Vegetation integrity score	Change in VI Score
PCT 3443 – all one zone	Good	3.7	Before development	54.6	93.1	62.7	68.3	N/A
	Management Zone IPA	0.77	After development	28.3	47.8	12.5	25.7	-42.6

	Management Zone OPA	0.27	After development	32	64	44	44.8	-23.5
	Development site	2.66	After development	0	0	0	0	-68.3

Management Zones

IPA- maintain full native groundstorey where already present but slashed regularly <100mm grass height, no shrubs, retain trees to 15% cover (including tree trimming, rather than removal where feasible), and retain larger trees where feasible, incld all hollow bearing trees. Manage to an IPA standard as stated under Appendix 4, PBP, 2019.

OPA- maintain full native groundstorey where already present, but slashed regularly <100mm grass height, no shrubs, retain trees to 30% cover (including tree trimming, rather than removal where feasible), retain larger trees incld all hollow bearing trees. Manage to an OPA standard as stated under Appendix 4, PBP, 2019.

Note: - the future vegetation integrity scores ascribed to each management zone within the BAM calculator were assessed and determined in accordance with the management zone objectives. For instance all Management Zones (both IPA & OPA) were prescribed full composition scores for trees, grasses, forbs and other as all these species will remain, but has been reduced to that VI score allowable by the BAM calculator. Structure VI scores, particularly trees and shrubs, within both zones have been reduced to reflect allowable % cover under PBP, 2019.

8.2 Indirect impacts

Potential indirect impacts arising from the project are outlined and addressed in Table 8 below. Consideration of indirect impacts was undertaken across an area encompassed by a 1500 metre buffer around the subject land. Impacts are over retained vegetation.

Table 9: Assessment of indirect impacts

Indirect Impact	Assessment / likelihood of occurrence	Duration	Project phase	Likelihood and consequences
Inadvertent impacts on adjacent habitat or vegetation including trampling	The proposed development may result in increased weeds and potential vegetation disturbance /inadvertent impacts on adjacent retained habitat or vegetation. The following measures will assist in mitigating these impacts: • Implementation of CEMP and VMP.	Long term	Construction, operation	Likely. Native groundcover being lost to weeds.

	• No go fencing during construction and delineation of all remnant vegetation areas & protected hollow bearing trees over the development site. Signage "Conservation Area-please keep out" or the like, "Protected Tree". • Tool Box all workers, about no go areas. Mitigation measures implemented during the construction and operations phases of the project will assist in ensuring no encroachment to adjacent vegetation and habitat by construction workers or permanent residents, etc during operation of the development.			
Reduced viability of adjacent habitat due to edge effects.	The proposed development will result in an increase in edge effects impacting upon the retained vegetation. The CEMP /VMP should include measures to minimise weed encroachment within APZs bordering adjacent habitat.	Long term	Construction, operation	Likely. Native groundcover being lost to weeds.
Reduced viability of adjacent habitat due to noise, dust or light spill.	Mitigation measures outlined above and standard construction environmental controls will ensure potential impacts are minimised.	Long term	Construction, operation	Likely. Reduced occupancy of retained vegetation by Fauna.
Transport of weeds and pathogens from the site to adjacent vegetation.	The potential introduction and spread of weeds and pathogens will be managed through implementation of weed hygiene controls as part of a CEMP/VMP during construction.	Long term	Construction, operation	Likely. Native groundcover being lost to weeds.
Loss of breeding habitats.	The proposed development will remove hollow-bearing trees. Therefore there is an impact over breeding habitat for hollow dependant fauna.	Long term	Construction, operation	Likely. Reduced /loss entirely of occupancy/breeding within retained vegetation by Fauna.
Rubbish dumping.	The CEMP/VMP will clearly set out waste management areas	Long term	Construction, operation	Likely. Pollution of retained vegetation and

	and procedures during construction of the development. During the operational phase, the CEMP will include measures to monitor and respond to rubbish dumping within the development site and interface with adjacent vegetation.			possible impacts over fauna.
Wood collection.	The CEMP/VMP will include measures to monitor and respond to illegal wood collection within the subject land and interface with adjacent vegetation (such as locked gates).	Long term	Construction, operation	Likely. Reduced occupancy of retained vegetation by fauna.
Increase in predatory & pest fauna species populations.	Waste management measures implemented as part of the CEMP/VMP will mitigate the potential increase in predator species populations.	Long term	Construction, operation	Likely. Reduced occupancy of retained vegetation by Fauna.
Change in fire regime of native vegetation and associated habitats	The construction and operation of the development site is unlikely to lead to a substantial change in the fire regime of adjacent vegetation and habitats.	Long term	Operation	Likely. Reduced eventual biodiversity decline for those plants requiring fire.
Disturbance to specialist breeding and foraging habitat.	There will be some indirect disturbance to retained hollow bearing trees (HBT) providing breeding & foraging habitat such as noise and light spill, as well as direct removal of around 3.7 hectares of forest habitat. Most HBT's to be retained.	Long term	Construction, operation	Likely. Reduced occupancy of retained vegetation/HBT's by fauna.
Fragmentation of movement corridors.	Fragmentation proposed. It is considered this may result in adverse impedance to fauna species mobility. It is noted connectivity is limited already to the east due to Paterson Road and clearing within residential areas further east.	Long term	Construction, operation	Likely. Reduced occupancy and use of this corridor by fauna. It is noted some connectivity can be retained if trees retained over future lots.

8.3 Prescribed impacts

Assessment of prescribed biodiversity impacts are outlined and addressed in Table 9 below. Prescribed impacts are present, and these features are shown on Figure 5. These impacts are generally not considered to affect any threatened species in this case.

Table 10: Prescribed impacts

Feature	Present	Description of feature characteristics and location/extent	Threatened entities that use, are likely to use, or are part of the habitat feature.	Duration	Consequences
Habitat connectivity	☒Yes / ☐No	Connectivity fragmentation proposed. It is considered this may result in adverse impedance to fauna species mobility. It is noted connectivity is limited already to the east due to Paterson Road and clearing within residential areas further east.	Koala, Squirrel Glider.	Permanent	Reduced connectivity. Potential increase in mortality to Koalas, and Gliders, from being forced to ground from dog/cat/fox attack, etc.

8.4 Mitigating residual impacts – management measures and implementation

Proposed mitigation and management measures are shown in Table 11.

Table 11 Summary of proposed mitigation and management measures for residual impacts (direct, indirect and prescribed)

Mitigation measure	Method/technique	Timing	Frequency	Responsibility	Likely efficacy (including risk of failure)	MNES (when relevant)
Retain all identified hollow bearing &/or larger habitat trees.	Ecologist mark up and ribbon/paint/signpost all trees to be retained. Toolbox/tell proponent/Project Manager and show on site	Prior to any clearing occurring	Once	Project Manager/Ecologist	Low	N/A
Retain selected other trees within development site to an Asset Protection Zone standard	Ecologist & Bush Fire consultant mark up trees for removal in accordance with Asset Protection Zone requirements/Rural Fire Service approval/Maitland City Council consent conditions/retain connectivity	Prior to any clearing occurring	Once	Project Manager/Ecologist	Low	N/A
Conservation Area. Retain wildlife connectivity & other vegetation off the development site	Mark boundary of building envelope area/edge of Asset Protection Zone & permanently fence off Conservation Area.	Prior to any clearing occurring.	Once	Project Manager/Ecologist	Low	N/A

8.5 Adaptive management strategy for uncertain impacts

The proposed development will have some direct impacts to biodiversity in the locality and may have some indirect impacts to adjacent habitats. The severity and consequence of direct and indirect impacts are sufficiently well understood that a detailed adaptive management strategy which includes measures to monitor impacts, is not considered necessary. The CEMP should include actions to monitor, assess and adaptively manage the effectiveness of planned mitigation measures.

9.0 SERIOUS AND IRREVERSIBLE IMPACTS

9.1 Assessment for serious and irreversible impacts on biodiversity values

Under the BC Act 2016, a determination of whether an impact is serious and irreversible (SAII) must be made in accordance with the principles prescribed in section 6.7 of the BC Regulation.

The "*Guidance to assist a decision maker to determine a serious and irreversible impact*, 2019, sets out those potential SAII species and ecological communities (known as "potential SAII entities".

The principles for determining serious and irreversible impacts in the Biodiversity Conservation Regulation, 2017 are:

- *will cause a further decline of a species or ecological community that is currently observed, estimated, inferred or reasonably suspected to be in a rapid rate of decline, or*
- *will further reduce the population of a species or ecological community that is currently observed, estimated, inferred, or reasonably suspected to have a very small population size, or*
- *are impacts on the habitat of a species or area of ecological community that is currently observed, estimated, inferred or reasonably suspected to have a very limited geographic distribution, or*
- *are impacts on a species or ecological community is unlikely to respond to measures to improve habitat and vegetation integrity and is therefore irreplaceable.*

9.1.1: Potential SAII entities

Threatened species and TEC's which have either been recorded within the subject land or are expected to inhabit the development site and which the proposed development may impact upon any candidate SAII entity as listed in Appendix 2 or ecological communities listed in Appendix 3 of the '*Guidance to assist a decision-maker to determine a serious and irreversible impact*' (OEH 2017e, and also now on NSW DPE website) have been addressed in Table 11.

Table 12: SAII impact evaluation

Potential SAII entities	Impact evaluation	Impact thresholds	Serious and irreversible impact?
Regent Honeyeater	Habitat present, and associated with this vegetation type (from NSW DPE threatened species profile database).	Not within a NSW DPE mapped important area (Fig 13). Area impacted is not likely to affect Regent Honeyeater over the region where they have known habitat over 1000's of hectares of Lower Hunter Spotted Gum Ironbark Forest and some other vegetation types. Werakata NP also has large areas preserved.	No.

Swift Parrot	Habitat present, and associated with this vegetation type (from NSW DPE threatened species profile database).	Not within a NSW DPE mapped important area (Fig 14). Area impacted is considered not likely to affect Swift Parrot over the region where they have known habitat over 1000's of hectares of Lower Hunter Spotted Gum Ironbark Forest and some other vegetation types. Werakata NP also has large areas preserved	No
Large eared Pied Bat (*Chalinolobus dwyeri*)	Roosts in caves (near their entrances), crevices in cliffs, old mine workings and in the disused, bottle-shaped mud nests of the Fairy Martin, frequenting low to mid-elevation dry open forest and woodland close to these features. Females have been recorded raising young in maternity roosts (c. 20-40 females) from November through to January in roof domes in sandstone caves and overhangs. They remain loyal to the same cave over many years. Found in well-timbered areas containing gullies.	Species roosting or breeding habitat is not present within the development site.	No
Eastern Cave Bat (*Vespadelus troughtoni)*	A cave-roosting species that is usually found in dry open forest and woodland, near cliffs or rocky overhangs; has been recorded roosting in disused mine workings, occasionally in colonies of up to 500 individuals.	Species roosting or breeding habitat is not present within the development site.	No
Miniopterus australis Little Bentwing-bat (Breeding)	Moist eucalypt forest, rainforest, vine thicket, wet and dry sclerophyll forest, Melaleuca swamps, dense coastal forests and banksia scrub. Generally found in well-timbered areas. Little Bentwing-bats roost in caves, tunnels, tree hollows, abandoned mines, stormwater drains, culverts, bridges and sometimes buildings during	Species roosting or breeding habitat is/was present within the development site (at least hollow bearing trees affected). Not considered an SAII.	No

	the day, and at night forage for small insects beneath the canopy of densely vegetated habitats.		

10.0 IMPACT SUMMARY

10.1 Determine an offset requirement for impacts

10.1.1 Impacts on native vegetation and TECs or ECs (ecosystem credits)

The BAM identifies the BAM Calculator as the appropriate tool for quantifying the offsets required in both Ecosystem Credit and Species Credit terms. A calculation of the nature and extent of offset credits required due to biodiversity impacts associated with the project has been undertaken using the BAM Calculator.

As outlined in Section 10.3.1 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.

10.2 Impacts over native vegetation and threatened flora species

The proposed development site will result in impacts to:

- 3.7 hectares of PCT 3433.

The vegetation integrity score for this PCT/vegetation zone (as all in the same condition and considered one vegetation zone) within the development site is greater than 15 (as an Endangered Ecological Community), therefore impacts on this PCT will require offsetting.

The vegetation integrity score for the future is taken as shown in the BAM Calculator/Table 8.

10.3 Areas not requiring assessment

Areas of land not containing native vegetation or threatened species habitat or already approved for clearing, or to be retained, and therefore not requiring offsetting, are all those areas outside of the development area. In this case that includes the proposed Conservation Area.

10.4 Biodiversity credits

This section provides a summary of biodiversity credits required for impacts on the biodiversity values within the development site, following consideration of measures to avoid, minimise and mitigate impacts.

Table 13 and Table 14 provide a summary of ecosystem credit and species credit requirements respectively resulting from the proposed development. The full credit profile is provided in Appendix 8.

Table 13: Impacts that require offsetting – ecosystem credits

PCT	TEC	Impact area (Ha)	Current VI score	Future VI score	Change in VI score	Required credits
3433 - Hunter Coast Foothills Spotted Gum-Ironbark Grassy Forest	Lower Hunter Spotted Gum Ironbark Forest in the Sydney Basin and NSW North Coast Bioregions	3.7Ha	68.3	IPA-25.7 OPA-44.8	-59.7	110

Table 14: Impacts that require an offset – species credits

Species Credit Species	BC Act status	EPBC Act status	Loss of habitat (Ha)/or number	Required credits
Petaurus norfolcensis / Squirrel Glider	V	-	3Ha	90
Callistemon linearifolius (Netted Bottle Brush)			Based off approximate count of 3	5
Callocephalon fimbriatum (Gang-gang Cockatoo)			3Ha	90
Cercartetus nanus (Eastern Pygmy-possum)			3Ha	90
Grevillea parviflora subsp. Parviflora (Small-flower Grevillea)			3.7Ha	110
Hieraaetus morphnoides (Little Eagle)			3	67
Lophoictinia isura (Square-tailed Kite)			3	67
Pterostylis chaetophora (An Orchid)			3.7Ha	110
Tetratheca juncea (Black-eyed Susan).			3.7Ha	110
TOTAL				**769**

11.0 BIODIVERSITY CREDIT REPORT

The total number and classes of biodiversity credits required to be retired for the project are summarised in the BAM Calculator, and a report shown in Appendix 8.

The proponent proposes to discharge the biodiversity offset obligations of the project through the retirement of the full number of like-for-like credits and/or payment in to the Biodiversity Conservation Trust, or through a private broker (if credits available) of an equivalent amount of credits as calculated using the BAM Offsets Payment Calculator.

Note- further surveys may occur at a later correct BAM specified survey date, with many Credit Species likely to then be re-assessed.

12.0 ASSESSMENT AGAINST BIODIVERSITY LEGISLATION AND POLICIES

12.1 Legislative and policy requirements

The project has been assessed against relevant biodiversity legislation and government policy, including:

- *Environment Protection and Biodiversity Conservation Act 1999*
- *Environmental Planning and Assessment Act 1979*
- *Biodiversity Conservation Act 2016*
- *Fisheries Management Act 1994* - -not applicable
- *Water Management Act 2000*
- *Biosecurity Act 2015*
- *State Environmental Planning Policy (Coastal Management) 2018* – N/A.
- *State Environmental Planning Policy (Biodiversity and Conservation) 2021*
- Maitland City Council *Flora & Fauna Survey Guidelines*.

12.2 *Environment Protection and Biodiversity Conservation Act 1999*

This Act is related to actions which may have a detrimental impact on matters of National Environmental Significance (NES). This includes:

- Nationally Threatened Species (including koala) and Ecological Communities;
- Listed Migratory Species;
- Declared world heritage sites;
- Ramsar Wetlands;
- Nuclear actions;
- Actions in a Commonwealth marine area.

For the purposes of this Act this report should be used by the determining authority to allow an Assessment of whether the site requires approval from Department of Environment. It is an offence to carry out an action that will or is likely to have a significant impact on one of the above NES matters without first obtaining an approval from the Commonwealth Environment Minister except where an exemption in the EPBC Act applies. A Bionet database search which includes listed locally recorded federal threatened species has been produced (Appendix 5), and BAM calculator generated species are shown in Figures 17 & 18.

The site is not a Declared World Heritage Site, Ramsar Wetland, has no Federal listed Endangered Ecological Communities present, and Nuclear Actions/Actions in a Commonwealth marine area are not relevant. There is habitat present for some listed EPBC threatened species, which are addressed within this BDAR.

There is no significant impact anticipated to any Federal species, primarily due to the absence /non recording of Koala in fauna survey over site, and other listed species over the site. The project in the consultant's opinion conforms to the *EP&BC Act 1999* and does not need referring to Federal Department of Environment.

An EPBC assessment of Significance is not therefore considered required.

12.3 *Water Management Act, 2000 – Riparian Management Water Management (General) Regulation 2018*

This Act is administered by the Office of Water and controls works along rivers and foreshore areas of streams or drainage lines, termed waterfront land where within 40m of a mapped (as shown on a topographic map) lake or creek.

The WM Act provides for the sustainable and integrated management of the state's water for the benefit of both present and future generations based on the concept of ecologically sustainable development. Under the WM Act an approval is required to undertake controlled activities on waterfront land, unless that activity is otherwise exempt under Section 91E.

Waterfront land is defined within the Act as the bed of any river, lake or estuary and any land within 40 meters of the river banks, lake shore or estuary mean high water mark.

A first order waterway/stream is mapped on the 1:25,000 topographic map for this site partly over the development site (access road to proposed Lot). A controlled activity permit is not required in this case however, as the stream has no defined bed or bank, is first order, and is not required to be referred to NSW DPE- Office of Water. It is at Councils discretion whether to refer or not.

12.4 Maitland Local Environmental Plan, 2011

The site is zoned R5: Large Lot Residential and the development site has minimised impacts to native vegetation and flora and fauna habitats by relocating road to avoid impact over most large hollow bearing habitat trees, has not proposed any undersized lots, and has a conservation area, and is therefore consistent with the environmental (biodiversity) related objectives of this zoning being sought within this application.

It addresses all requirements under the Biodiversity Act. It has also addressed the requirements under the Maitland City Council Flora & Fauna Survey Guidelines.

MCC Wildlife Corridors (from Maitland City Council Environmental Sustainability Strategy 2030, produced 2023)

The site is mapped on Councils ESS Strategy as a local wildlife corridor (Fig 16). The proposed development partly interrupts corridor connectivity, however overall, connectivity will be retained over neighbouring land to the east and north.

Retention of vegetation over the western part of the site is proposed being a Conservation Area and will provide part ongoing connectivity. Of the 17 hollow bearing habitat trees recorded on site, 5 are to be removed, and the remaining 12 will be retained to ensure most existing hollow bearing fauna dependant shelter habitat is retained.

It has been recommended to retain larger trees elsewhere over the development site, in particular over the eastern and northern areas to provide some ongoing tree top connectivity through the site where feasible.

It should be noted that connectivity is already impaired by Paterson Road, and surrounding cleared land, with a gap of around 160m present over Paterson Rd. Some retention of trees may be feasible over the site outside of the nominated Conservation Area, dependant on the proponent/future landowners.

12.5 State Environmental Planning Policy (Biodiversity and Conservation) 2021.

SEPP (Biodiversity and Conservation) 2021 incorporates the provisions of previous SEPP (Koala Habitat Protection) 2021. This SEPP is only applicable to Part 4 Development Applications and is therefore considered further here.

Chapter 4 Koala habitat protection 2021 states:

This Chapter 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.

Clause 4.4 Land to which Chapter applies states:
(1) This Chapter applies to each local government area listed in Schedule 2.

Clause 4.9 Development assessment process—no approved koala plan of management for land states:

(1) This section applies to land to which this Chapter applies if the land—
(a) has an area of at least 1 hectare (including adjoining land within the same ownership), and
(b) does not have an approved koala plan of management applying to the land.
(2) Before a council may grant consent to a development application for consent to carry out development on the land, the council must assess whether the development is likely to have any impact on koalas or koala habitat.
(3) If the council is satisfied that the development is likely to have low or no impact on koalas or koala habitat, the council may grant consent to the development application.
(4) If the council is satisfied that the development is likely to have a higher level of impact on koalas or koala habitat, the council must, in deciding whether to grant consent to the development application, take into account a koala assessment report for the development.
(5) However, despite subsections (3) and (4), the council may grant development consent if the applicant provides to the council—
(a) information, prepared by a suitably qualified and experienced person, the council is satisfied demonstrates that the land subject of the development application—
(i) does not include any trees belonging to the koala use tree species listed in Schedule 3 for the relevant koala management area, or
(ii) is not core koala habitat, or
(b) information the council is satisfied demonstrates that the land subject of the development application—

(i) does not include any trees with a diameter at breast height over bark of more than 10 centimetres, or
(ii) includes only horticultural or agricultural plantations.
(6) In this section—
koala assessment report, for development, means a report prepared by a suitably qualified and experienced person about the likely and potential impacts of the development on koalas or koala habitat and the proposed management of those impacts.

Maitland LGA is listed on Schedule 2. There is no approved koala plan of management for this site/land. The site is zoned R5, and over 1 hectare in area. It must therefore address this SEPP.

Site surveys by both PEAK LAND MANAGEMENT and General Flora & Fauna have detected no Koala scat, or any presence of Koala. Bionet records (Appendix 5) show two Koala Bionet records (since 1990) within 2.5kms of the site. General Flora and Fauna (Appendix 5) conducted a full targeted Koala fauna survey. In summary GFF state:

"*No Koalas were heard or observed on the site during Koala survey or searches for this current assessment. There were no Koalas recorded on the site by visual observation, listening, SAT or spotlighting".*

The proposed works have set aside a conservation area. It is likely that Koala no longer exist in this local area due to limited habitat/patch size too small to support an ongoing genetically viable population, lack of connectivity, and high risk of vehicle strike and predators.

It is considered that the development is likely to have low or no impact on koalas, but does impact potential Koala habitat.

A Koala assessment report has been undertaken for the development by a *suitably qualified and experienced person* (Greg Little- see Appendix 5).

The proposal is therefore considered to conform to this SEPP, and no further koala studies are considered required under this SEPP.

12.5 Biosecurity Act 2015

The Biosecurity Act was enacted to provide for the identification, classification and control of Priority Weeds with the purpose of determining if a biosecurity risk is likely to occur, i.e.:

- The introduction, presence, spread or increase of a pest into or within the state or any part of the state.
- A pest plant has the potential to; harm or reduce biodiversity or out-compete other organisms for resources, including food, water, nutrients, habitat and sunlight.

Priority Weeds recorded over the site are shown in Appendix 3 for Hunter Region. They should be controlled by the landowner in accordance with this Act.

13.0 CONCLUSION & RECOMMENDATIONS

This assessment has been completed in accordance with the BAM methodology.

The proposed development site will result in direct impacts to those species and eco-systems/vegetation communities as outlined in Table 15.

Table 15: Summary of impacts that require an offset

Ecosystem Credits	**Required credits**
3.7Ha of PCT 3433 - *Hunter Coast Foothills Spotted Gum-Ironbark Grassy Forest*/ equivalent to *Lower Hunter Spotted Gum Ironbark Forest* Endangered Ecological Community	110
TOTAL	**110**
Species Credit Species	
Petaurus norfolcensis / Squirrel Glider	90
Callistemon linearifolius (Netted Bottle Brush)	5
Callocephalon fimbriatum (Gang-gang Cockatoo)	90
Cercartetus nanus (Eastern Pygmy-possum)	90
Grevillea parviflora subsp. Parviflora (Small-flower Grevillea)	110
Hieraaetus morphnoides (Little Eagle)	67
Lophoictinia isura (Square-tailed Kite)	67
Pterostylis chaetophora (An Orchid)	110
Tetratheca juncea (Black-eyed Susan).	110
TOTAL	**769**

Additional residual impacts (direct, indirect and prescribed) will occur as outlined in Tables 9-11.

The vegetation integrity score for all vegetation zones within the development site is greater than 15, therefore impacts on this PCT will require offsetting.

No threatened flora, but threatened fauna species were recorded within the subject land during field investigation undertaken in accordance with the BAM.

There is suitable habitat for some threatened species to forage over, breed, and reside over the development site, and subject land, from time to time, as part of their foraging range, including Squirrel Glider & Microbats recorded over the site, which have been offset as either ecosystem credit species, or as a candidate species. Further Candidate species with assumed presence have also been added. These relevant species polygons are shown in Figures 19 & 20.

Measures to avoid and minimise impacts to biodiversity values over the development site were considered during the design and planning stage of the proposed development.

Measures to mitigate potential indirect impacts to biodiversity values are detailed in Section 8. The proposed development will not impact candidate species at risk of Serious and Irreversible Impact as outlined in the BAM.

Recommendations to avoid and minimise impact include:

- Where not affected by the proposal all native vegetation (particularly larger trees including native understorey) outside of the nominated development footprint be retained in natural condition subject to Asset Protection Zone conditions;
- Allow for wildlife connectivity through site by the strategic retention of larger trees with canopy connectivity where feasible.
- Implement a covenant over the Conservation Area, permanent fencing & signposting all ecological high value areas such as Conservation Area and retained large tree/habitat trees.
- Educate all prospective landowners over their legal obligations to retain/not disturb the Conservation Area and marked habitat trees.
- Prepare a VMP for the conservation area.
- Install at least 5 nest boxes over the retained Conservation Area, of varying aperture sizes, suitable for Squirrel Glider and Microbats.
- Works will be undertaken close to HBT's, and other large trees, and safeguards to prevent root damage are recommended such as tree protection zone temporary fencing (TPZ).
- A qualified fauna Ecologist be present and supervise hollow bearing tree removal. Trees to be knocked day before by sledge hammer or similar a number of times, then before felling. Tree incrementally lopped top down & hollows sectionally dismantled and carefully lowered to ground to prevent harm to wildlife. Ensure any resident wildlife released safely.
- Ecologist mark up/ribbon/paint/signpost all trees to be retained, and mark HBT on all habitat trees including those to be removed also marked with an "X" or similar. Ecologist & Bush Fire consultant mark up trees for removal in accordance with Asset Protection Zone requirements (ie OPA & IPA requirements).
- Toolbox proponent/Project Manager and show on site pre any clearing.

Accordingly the development site may be permitted to be developed without risk of serious environmental impact, subject to Council approval as the consent authority.

Impacts to native vegetation, and threatened species will require retirement of ecosystem & species credits in accordance with the Biodiversity Offsets Scheme (Appendix 8). It is understood that Council will advise when the BDAR contribution would be imposed, possibly as a condition of the consent to be paid prior to the issue of the Subdivision Works Certificate or Subdivision Certificate the same as the Section 7.11 (formerly Section 94) contribution, and any other consent conditions.

A new system has been introduced in regards to offset credit costs by NSW DPE which states

IMPORTANT UPDATE:
The Biodiversity Offsets Payment Calculator (BOPC) was replaced by the BCF Charge System on 17 October 2022. The new BCF Charge System will now be used to determine the amount a proponent may pay into the BCF to meet a biodiversity offset obligation.

The Biodiversity Conservation Trust (BCT) is responsible for administering the new charge system. More information about the new charge system, including how to request a quote from the BCT, is available on the BCT website.

Note: Under Clause 6.15 of the BC Act, the BDAR must be submitted within 14 days of the credit report being created. Additionally the BAM Calculator case may also need to be forwarded to Maitland City Council (dependant on Council).

Report prepared by:

Ted Smith BSc (Hons), Grad Dip (Bush Fire), BAM Accredited Assessor, Certified Practicing Ecologist
PEAK LAND MANAGEMENT

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Environment Protection and Biodiversity Conservation Act 1999
Biodiversity Conservation Act 2016
Biodiversity Conservation Act Regulations 2017
National Parks and Wildlife Act 1974
Environmental Planning and Assessment Act (1979)
Water Management Act, 2000
State Environmental Planning Policy - Coastal Management
State Environmental Planning Policy - Vegetation in Non-Rural Areas
State Environmental Planning Policy (Koala Habitat Protection) 2021

Other Websites

The following websites have been viewed throughout the development of this report:

http://plantnet.rbgsyd.nsw.gov.au/search/simple.htm
http://imagery.maps.nsw.gov.au/
Nearmap
http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10604
http://www.bom.gov.au/water/groundwater/gde/map.shtml
http://www.bionet.nsw.gov.au/
www.deh.gov.au
http://www.environment.gov.au/epbc/pmst/index.html- & Protected Matters Search
http:www.frogsaustralia.net.au/frogs/
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APPENDIX 1 AUTHOR DETAILS

PEAK LAND MANAGEMENT is an independent company specialising in providing quality consulting services in natural resource/land management including bush fire assessment. The company is a consultant member of the NSW Ecological Association, and accredited BAM Assessor and abides by both the NSW Ecological Association & NSW DPE professional code of conduct and ethics. PEAK LAND MANAGEMENT is licenced with NSW DPE for survey and collection of threatened flora (SL 100640).

Some examples of the type of work PEAK LAND MANAGEMENT PTY LTD undertakes includes Flora & Fauna Surveys/ Ecological/Biodiversity Assessments, Bushland/Vegetation Management Plans, Review of Environmental Factors, and Bush Fire Assessment Reports.

Mr Ted Smith is the Director of **PEAK LAND MANAGEMENT PTY LTD**. Ted has a Bachelor of Science Degree with Honours majoring in Physical Geography from the University of New South Wales, and a Graduate Diploma in Design for Bushfire Prone Areas from the University of Western Sydney. He is a qualified & experienced Ecologist being a Certified Practicing Ecological Consultant Ecologist (under the NSW Ecological Association -006); certified Bushfire Practitioner (FPA Aust-17671), and accredited Biodiversity Assessment Method (BAM) Assessor with NSW DPE (BAAS 17076).

Ted Smith was the author of this work, and conducted all flora and some fauna fieldwork.

A1.1 Nomenclature

The flora taxonomy (classification) used in this report follows the most recent Flora of NSW (Harden 1992, Harden 1993, 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 2.

A1.1 Permits and licences

The flora and fauna assessment was conducted under the terms of PEAK LAND MANAGEMENT Scientific Licence issued by the NSW DPE under the National Parks and Wildlife Act 1974 (PEAK LAND MANAGEMENT- SL 100640). The BAM Assessment was carried out by Accredited Assessor Ted Smith (BAAS 17076).

A1.2 Limitations

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 survey was conducted in Autumn weather, which is not a suitable time to determine the presence of some threatened flora & fauna species, (including some cryptic species such as orchids).

Surveys undertaken, combined with habitat assessments and desktop analysis are considered sufficient to reach the conclusions herein in regards to this and all other species' likelihood of occurrence within the study area. Further targeted surveys may be required dependant on proponent & consent authority.

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

APPENDIX 2: BAM FLORA PLOT FIELD SURVEY SHEETS

-This document has not been endorsed or approved by Office of Environment and Heritage or Muddy Boots Environmental Training-

BAM Site – Field Survey Form Site Sheet no: 1 of 2

		Survey Name	Zone ID	Recorders			
Date	16.3.24	1		TS			
Zone 56	Datum 94	Plot ID	1	Plot dimensions	20 x 20m	Photo #	✓
Easting 367803	Northing 6381547	IBRA region		Midline bearing from 0 m	230°		
Vegetation Class		PCT – 3477				Confidence: H M L	
Plant Community Type		Lower Hunter Spotted Gum Ironbark Forest		EEC: ✓		Confidence: H M L	

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot. (CLHSCIF)

BAM Attribute (400 m² plot)		Sum values
Count of Native Richness	Trees	1
	Shrubs	7
	Grasses etc.	7
	Forbs	1
	Ferns	–
	Other	–
Sum of Cover of native vascular plants by growth form group	Trees	25
	Shrubs	6.7
	Grasses etc.	96.1
	Forbs	0.1
	Ferns	–
	Other	–
High Threat Weed cover		7

BAM Attribute (1000 m² plot)		
DBH	# Tree Stems Count	# Stems with Hollows
80 + cm	1	1
50 – 79 cm	1	1
30 – 49 cm	1	
20 – 29 cm	IIII	
10 – 19 cm	IIII II	
5 – 9 cm	II	
< 5 cm		n/a
Length of logs (m) (≥10 cm diameter, >50 cm in length)	–	

Counts apply when the **number of tree stems** within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For a **multi-stemmed tree**, only the largest living stem is included in the count/estimate. **Tree stems must be living.**

For **hollows**, count only the presence of a stem containing hollows. For a **multi-stemmed tree**, only the largest stem is included in the count/estimate. **Stems may be dead and may be shrubs.**

BAM Attribute (1 x 1 m plots)	Litter cover (%)	Bare ground cover (%)	Cryptogam cover (%)	Rock cover (%)
Subplot score (% in each)	35 30 10 5	5 10 5 0 15	–	–
Average of the 5 subplots	19	6		

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography + site features that may help in determining PCT and Management Zone (optional)

Morphological Type		Landform Element		Landform Pattern		Microrelief	
Lithology		Soil Surface Texture		Soil Colour		Soil Depth	
Slope		Aspect		Site Drainage		Distance to nearest water and type	

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)			
Cultivation (inc. pasture)			slashed native o/s + u/s few shrubs
Soil erosion			
Firewood / CWD removal			
Grazing (identify native/stock)			
Fire damage			
Storm damage			
Weediness			
Other			

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

400 m² plot: Sheet 2 of _	Survey Name	Plot Identifier	Recorders
Date 16.3.24		1	TS

GF Code	Top 3 native species in each growth form group: Full species name mandatory All other native and exotic species: Full species name where practicable	N, E or HTE	Cover	Abund	stratum	voucher
T	Corymbia maculata	N	25	8		
S	Dentoniа sieberiana		0.1	1		
S	Oxytheca dimorphica		1	1		
S	Acacia falcata		0.5	1		
S	Bursaria spinosa		0.1	1		
S	Leptospermum polygalifolium		1	1		
S	Dodonaea viscosa		2	3		
S	Phyllanthus hirtellus		2	30		
G	Dianella revoluta		5	20		
G	Lomandra multiflora		0.1	2		
F	Sticherus flabellatus - Gonocalyx concolor		0.1	1		
G	Entolasia stricta		60			
G	Eragrostis brownii		20			
G	Microlaena stipoides		10			
G	Aristida vagans		3			
G	Aristida ramosa		3			
	Asparagus fern	HTE	1	5		
	Pennisetum macrourum	E	1	5		
	Carpet grass	HTE	5			
	Coolatai grass	HTE	1	1		

GF Code: see Growth Form definitions in Appendix 1 **N:** native, **E:** exotic, **HTE:** high threat exotic **GF – circle code** if 'top 3'.

Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover); ***Note:*** *0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m*

Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

BAM Site – Field Survey Form

Site Sheet no: 1 of 7

Survey Name	Zone ID	Recorders TS

Date	16.4.24			Plot dimensions	20x50m	Photo #	✓
Zone 56	Datum 94	Plot ID	2				
Easting 367741	Northing 6381444	IBRA region	In m	Midline bearing from 0 m	165	Magnetic °	
Vegetation Class	PCT 3477					Confidence: (H) M L	
Plant Community Type	LHSLIF			EEC: ✓		Confidence: (H) M L	

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m² plot)		Sum values
Count of Native Richness	Trees	1
	Shrubs	8
	Grasses etc.	8
	Forbs	4
	Ferns	1
	Other	4
Sum of Cover of native vascular plants by growth form group	Trees	30
	Shrubs	53.4
	Grasses etc.	74.1
	Forbs	3.4
	Ferns	0.1
	Other	5.3
High Threat Weed cover		0.1

BAM Attribute (1000 m² plot)		
DBH	# Tree Stems Count	# Stems with Hollows
80 + cm	1	1 1
50 – 79 cm	1111	
30 – 49 cm	1	
20 – 29 cm	1	
10 – 19 cm	1111	
5 – 9 cm	1111 11	
< 5 cm	1111 1	n/a
Length of logs (m) (≥10 cm diameter, >50 cm in length)	—	Tally space

Counts apply when the **number of tree stems** within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For a **multi-stemmed tree**, only the largest living stem is included in the count/estimate. **Tree stems must be living.**

For **hollows**, count only the presence of a stem containing hollows. For a **multi-stemmed tree**, only the largest stem is included in the count/estimate. **Stems may be dead and may be shrubs.**

BAM Attribute (1 x 1 m plots)	Litter cover (%)					Bare ground cover (%)					Cryptogam cover (%)					Rock cover (%)				
Subplot score (% in each)	10	15	0	3	4	0	0	0	1	2	a	b	c	d	e	a	b	c	d	e
Average of the 5 subplots	6					1					—					—				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography + site features that may help in determining PCT and Management Zone (optional)

Morphological Type		Landform Element		Landform Pattern		Microrelief	
Lithology		Soil Surface Texture		Soil Colour		Soil Depth	
Slope		Aspect		Site Drainage		Distance to nearest water and type	

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)			
Cultivation (inc. pasture)			
Soil erosion			Natural - virtually no weeds.
Firewood / CWD removal			
Grazing (identify native/stock)			
Fire damage			
Storm damage			
Weediness			
Other			

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

400 m² plot: Sheet 3 of 3	Survey Name	Plot Identifier	Recorders
Date 16.4.24	[illegible]	2	TS

GF Code	Top 3 native species in each growth form group: Full species name mandatory All other native and exotic species: Full species name where practicable	N, E or HTE	Cover	Abund	stratum	voucher
T	Syncarpia glomulifera	N	30	6		
S	Leptospermum polygalifolium		3	5		
S	Acacia falcata		3	2		
S	Melaleuca nodosa		35	25		
S	Pittosporum undulatum		10	14		
S	Acacia ulicifolia		2	2		
S	Ozothamnus diosmifolius		0.2	2		
S	Pultenaea spinosa		0.2	3		
S	Hakea sericea		0.1	1		
F	Chrysocephalum semipapposum		0.2	20		
F	Stackhousia viminea		0.1	1		
S	Phyllanthus hirtellus		0.1	5		
F	Goodenia rotundifolia (spp.)		0.1	10		
F	Lobelia purpurascens		3	10		
G	Dianella caerulea var producta		3	10		
G	Lomandra multiflora		0.1	2		
G	Lepidosperma laterale		3	10		
OG	Devils twine – Cassytha glabella		5	10		
G	Eragrostis leptostachya		1	10		
G	Eragrostis brownii		1	–		
G	Entolasia stricta		60			
G	Microlaena stipoides		5			
G	Digitaria parviflora		1			
OG	Wonga vine – Pandorea pandorana		0.1	1		
OG	Billardiera scandens – Apple berry		0.1	2		
EC	Cheilanthes sieberi		0.1	5		
	Lantana camara	NTH	0.1			

GF Code: see Growth Form definitions in Appendix 1 **N:** native, **E:** exotic, **HTE:** high threat exotic **GF – circle code** if 'top 3'.

Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover); ***Note:*** *0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m*

Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

-This document has not been endorsed or approved by Office of Environment and Heritage or Muddy Boots Environmental Training-

BAM Site – Field Survey Form | Site Sheet no: 1 of 2

		Survey Name	Zone ID	Recorders			
Date	16.4.24			IS			
Zone 56	Datum 94	Plot ID	3	Plot dimensions	20 x 20 m	Photo #	✓
Easting 367766	Northing 6381319	IBRA region	In m	Midline bearing from 0 m	165	Magnetic °	
Vegetation Class		PCT 3477				Confidence: H M L	
Plant Community Type		LHSLF		EEC: ✓		Confidence: H M L	

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m² plot)		Sum values
Count of Native Richness	Trees	2
	Shrubs	10
	Grasses etc.	7
	Forbs	1
	Ferns	1
	Other	4
Sum of Cover of native vascular plants by growth form group	Trees	75
	Shrubs	38.6
	Grasses etc.	41
	Forbs	1
	Ferns	0.1
	Other	7.2
High Threat Weed cover		4

BAM Attribute (1000 m² plot)		
DBH	# Tree Stems Count	# Stems with Hollows
80 + cm		
50 – 79 cm	1	
30 – 49 cm	1	
20 – 29 cm		
10 – 19 cm	111 + 10	
5 – 9 cm	15 + 10	
< 5 cm	10 + 20	n/a
Length of logs (m) (≥10 cm diameter, >50 cm in length)	—	Tally space

Counts apply when the **number of tree stems** within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For a **multi-stemmed tree**, only the largest living stem is included in the count/estimate. **Tree stems must be living.**

For **hollows**, count only the presence of a stem containing hollows. For a **multi-stemmed tree**, only the largest stem is included in the count/estimate. **Stems may be dead and may be shrubs.**

BAM Attribute (1 x 1 m plots)	Litter cover (%)	Bare ground cover (%)	Cryptogam cover (%)	Rock cover (%)
Subplot score (% in each)	a b c d e	a b c d e	a b c d e	a b c d e
Average of the 5 subplots	5	2	—	—

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography + site features that may help in determining PCT and Management Zone (optional)

Morphological Type		Landform Element		Landform Pattern		Microrelief	
Lithology		Soil Surface Texture		Soil Colour		Soil Depth	
Slope		Aspect		Site Drainage		Distance to nearest water and type	

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing (inc. logging)			
Cultivation (inc. pasture)			
Soil erosion			Natural
Firewood / CWD removal			
Grazing (identify native/stock)			
Fire damage			
Storm damage			
Weediness			
Other			

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

400 m² plot: Sheet 2 of 2	Survey Name	Plot Identifier	Recorders
Date		3	GS

GF Code	Top 3 native species in each growth form group: Full species name mandatory All other native and exotic species: Full species name where practicable	N, E or HTE	Cover	Abund	stratum	voucher
T	Corymbia maculata	N	40	37		
T	Eucalyptus fibrosa		5	7		
S	Pittosporum undulatum		3	7		
S	Ozothamnus diosmifolius		0.5	2		
S	Melaleuca nodosa		15	42		
S	Pultenaea spinosa		5	20		
S	Acacia falcata		2	10		
S	Acacia [illegible]		0.1	1		
F	Chrysocephalum semipapposum		0.5	10		
S	Dodonaea viscosa		1	2		
S	Acacia ulicifolia		1	2		
S	Baeckea diosmifolia		1	5		
S	M. linearifolia emporitifolia		10	40		
G	Lomandra multiflora		0.1	1		
F	Salvia purpurascens		0.5	20		
G	Dianella revoluta		0.1	1		
G	D. caerulea Cerealia var productive		0.2	5		
OG	Cassytha glabella		5	10		
OG	Passiflora herbertiana		2	1		
EG	Cheilanthes sieberi		0.1	10		
OG	Asplenium flabellifolium - Billardiera scandens		0.1	1		
OG	Glycine clandestina		0.1	5		
G	Themeda triandra		20			
G	Entolasia stricta		20			
G	Microlaena stipoides		0.5			
G	Digitaria parviflora		0.1			
	Asparagus - climbing	HTR	1			
	Lantana	HTR	1			
	Asparagus fern - ground	HTR	1			
	Ochna	HTR	1			

GF Code: see Growth Form definitions in Appendix 1 **N:** native, **E:** exotic, **HTE:** high threat exotic **GF – circle code** if 'top 3'.

Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover); ***Note:*** *0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m*

Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

APPENDIX 3: FLORA SURVEY RESULTS

Scientific Name	Common Name	Plot 1	Plot 2	Plot 3	Transect
Trees:					
Corymbia maculata	Spotted Gum	x	x	x	x
Eucalyptus acmenoides	White Mahogany				x
Eucalyptus fibrosa	Broad Leaved ironbark			x	x
Eucalyptus siderophloia	Grey Ironbark				x
Eucalyptus tereticornis	Forest Red Gum				x
^ *Grevillea robusta*	Silky Oak				x
Midstorey:					
Allocasuarina torulosa	Forest Oak				x
Casuarina glauca	Swamp Oak				x
Cupaniopsis anarcardioides	Tuckeroo				x
Elaeocarpus obovatus	Hard Quandong,				x
Glochidion ferdinandi	Cheese Tree				x
Pittosporum undulatum	Sweet Pittosporum		x	x	x
Shrubs and understorey:					
Acacia falcata	Sickle Wattle	x	x	x	x
Acacia ulicifolia	Prickly Moses		x	x	x
Baeckea diosmifolia	Fringed Baeckea			x	x
Brachyscome multifida	Cut-leaved daisy				x
Breynia oblongifolia	Coffee Bush				x
Bursaria spinosa	Blackthorn	x			x
Caesia parviflora	Pale Grass-lily				x
^ *Callistemon salignus*	Bottlebrush				x
Cyanthillium cinereum var. *cinereum*	Vernonia				x
Chrysocephalum semiapposum	Clustered Everlasting		x	x	x
Daviesia ulicifolia	Gorse Bitter Pea	x		x	x
Denhamia silvestris	Orange Bark	x			x
Dianella caerulea var producta	Flax lilly		x	x	x
Dianella revoluta	Flax lilly	x		x	x
Dichondra repens	Kidney weed				x
Einadia hastata	Berry Saltbush				x
Goodenia rotundifolia			x		x
Hakea salicifolia subsp. *salicifolia*	Willow-leaved Hakea			x	x
Hakea sericea	Needle bush		x		x
Hibbertia empetrifolia	A Guinea Flower			x	x
Leucopogon juniperinus	Prickly Beard-heath				x
Lobelia purpurascens	Pratia, White Root		x	x	x
Lomandra multiflora subsp multiflora	Mat Rush	x	x	x	x
Leptospermum polygalifolium	Lemon scented Tea Tree	x	x		x

Melaleuca nodosa	Ball paperbark		x	x	x
Notelaea longifolia	Mock Olive				x
Opercularia varia	Variable Stinkweed		x		x
Oxalis perennans					x
Ozothamnus diosmifolius	Pill flower	x	x	x	x
Phyllanthus hirtellus	Thyme Spurge	x	x		x
Pseuderanthemum variabile	Pastel Flower				x
Pultenaea spinosa	Spiny Bush-pea		x	x	x
Solanum prinophyllum	Forest nightshade				x
Vittadinia cuneata	Fuzzweed				x
Grasses					
Aristida ramosa	A Threeawn Speargrass	x			x
Aristida vagans		x			*x*
Cymbopogon refractus	Barb Wire Grass				x
^ Cynodon dactyldon	Couch				x
Dichelachne micrantha	Short Hair Plume grass				x
Digitaria parviflora	Small-flowered Finger Grass		x	x	x
Echinopogon caespitosus var caespitosus	Tufted Hedgehog grass				x
Entolasia marginata	Bordered Panic				x
Entolasia stricta	Wire grass	x	x	x	x
Eragrostis brownii	Love grass	x	x		x
Eragrostis leptostachya	Paddock Lovegrass		x		x
Microlaena stipoides	Weeping grass	x	x	x	x
Panicum effusum	Hairy Panic				x
Rytidosperma tenuius	Wallaby Grass				x
Themeda triandra	Kangaroo Grass			x	x
Ferns:					
Chielanthes sieberi	Poison rock fern		x	x	x
Sedges and water plants:					
Juncus ustitatus	Common reed				x
Lepidosperma laterale	Variable sword sedge		x		x
Persicaria hydropiper	Water Pepper				x
Vines and scramblers:					
Billardiera scandens var. scandens	Apple-berry Dumplings		x	x	x
Cassytha glabella forma glabella	Devils twine		x	x	x
Commelina cyanea	Scurvy weed	x			x
Glycine clandestina	Purple twining Pea			x	x
Glycine tabacina	Purple twining Pea				x
Hardenbergia violacea	Hardenbergia				x
Maekawaea rhytidophylla	A Tick Tre -Foil				x
Pandorea pandorana	Wonga vine		x		x
Parsonsia straminea	Monkey vine			x	x

Orchids/epiphytes:					
Weeds					
^ *Acacia podalyriifolia*	Queensland silver wattle				x
(P) Asparagus aethiopicus	Ground Asparagus	x		x	x
(P) Asparagus africanus	Climbing Asparagus			x	x
Axonopus affinis	Narrow leaf carpet grass	x			x
Cenchrus clandestinus	Kikuyu				x
Cyperus eragrostis					x
Facelis retusa	Annual trampweed				x
(P) Hyparrhenia hirta	Coolatai Grass	x			x
(P) Lantana camara	Lantana		x	x	x
Modiola caroliniana	Red Mallow				x
Ochna serrulata	Mickey Mouse Plant			x	x
Panicum maximum	Guinea Grass	x			x
Paspalum dilatum	Paspalum				x
(P) Senecio madagascariensis	Fireweed				x
Senna pendula	Cassia				x
Solanum mauritianum	Wild Tobacco Bush				x
Solanum seaforthianum	Brazilian/Climbing Nightshade				x
Verbena bonariensis	Purple top				x
Native species total:	**74**				
Weed species total:	**18**				
TOTAL PLANTS:	**92**				
# Threatened species	0				
(R) ROTAP - Rare plant	0				
Priority weed (P) NSW DPI Class for Maitland LGA	**3**				
^ Non NSW native/or non endemic native to this site/planted widely cultivated native species	3				

APPENDIX 4: INCIDENTAL FAUNA SURVEY RESULTS

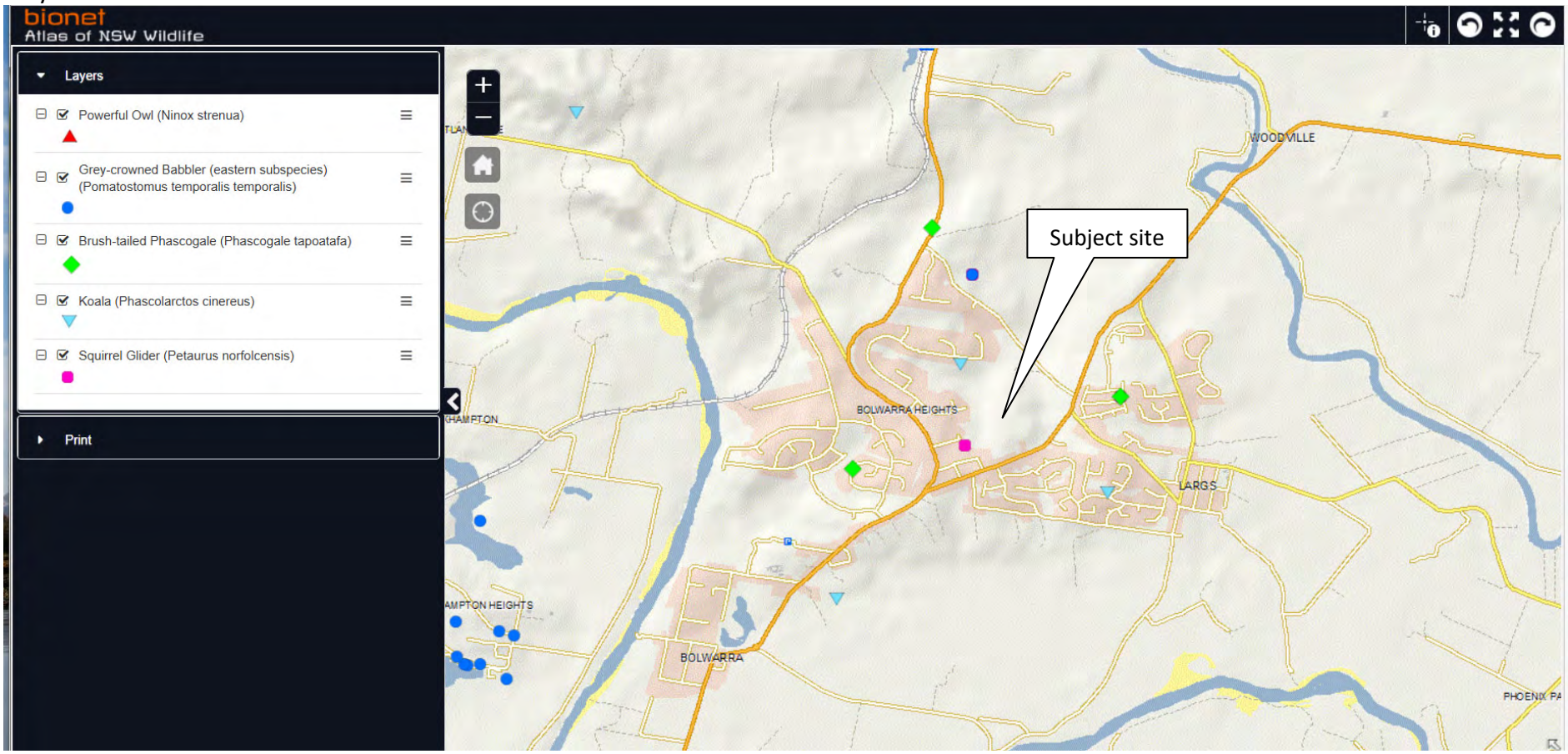
By PEAK LAND MANAGEMENT during flora survey.

COMMON NAME	
The following birds were observed, or heard either on or near the development site, including flying overhead (common bird names from Pizzey & Knight, 1997):	
Red Browed Firetail	Kookaburra
Rainbow Lorikeet	Eastern Rosella
Magpie	Grey Butcherbird
Australian Raven	Noisy Miner
Red Wattlebird	Pee Wee
Pallid Cuckoo	Willie Wagtail
Grey Fantail	Grey Shrike Thrush
Crested Pigeon	
Other fauna observed, or heard from calls/scats/footprints/scratch marks were:	
	Grey Kangaroo -observed & scat
+ Threatened spps listed under EPBC Act	
# Threatened spps listed under BC Act	
*Exotic species	

Note- A full fauna survey with detailed species list recorded by General Flora and Fauna shown in Appendix 8.

APPENDIX 5: THREATENED FLORA & FAUNA SPECIES SEARCH RESULT (Over a 100 square kilometre area – NSW & National EPBC Species – from Bionet).

Note: this does not mean these species are found on the site, or that all species are recorded. Maps are shown of some key indicative species only.



Data from the BioNet Atlas website, which holds records from a number of custodians. The data are only indicative and cannot be considered a comprehensive inventory, and may contain errors and omissions. Species listed under the Sensitive Species Data Policy may have their locations denatured (^ rounded to 0.1°C; ^^ rounded to 0.01°C. Copyright the State of NSW through the Department of Planning, Industry and Environment. Search criteria : Licensed Report of all Valid Records of Threatened (listed on BC Act 2016) or Commonwealth listed Entities in selected area [North: -32.65 West: 151.54 East: 151.64 South: -32.75] recorded since 16 Feb 1990 until 22 May 2024 returned a total of 6,066 records of 42 species.
Report generated on 22/05/2024 7:29 AM

Kingdom	Class	Family	Species Code	Scientific Name	Exotic	Common Name	NSW status	Comm. status	Records	Info
Animalia	Reptilia	Cheloniidae	2004	*Caretta caretta*		Loggerhead Turtle	E1,P	E	1	
Animalia	Aves	Casuariidae	0001	*Dromaius novaehollandiae*		Emu population in the New South Wales North Coast Bioregion and Port Stephens local government area	E2,P		1	
Animalia	Aves	Anseranatidae	0199	*Anseranas semipalmata*		Magpie Goose	V,P		1	
Animalia	Aves	Anatidae	0216	*Oxyura australis*		Blue-billed Duck	V,P		30	
Animalia	Aves	Anatidae	0214	*Stictonetta naevosa*		Freckled Duck	V,P		24	
Animalia	Aves	Columbidae	0025	*Ptilinopus magnificus*		Wompoo Fruit-Dove	V,P		2	
Animalia	Aves	Apodidae	0334	*Hirundapus caudacutus*		White-throated Needletail	V,P	V,C,J,K	9	
Animalia	Aves	Ciconiidae	0183	*Ephippiorhynchus asiaticus*		Black-necked Stork	E1,P		12	

Animalia	Aves	Ardeidae	0197	*Botaurus poiciloptilus*	Australasian Bittern	E1,P	E	2
Animalia	Aves	Accipitridae	0218	*Circus assimilis*	Spotted Harrier	V,P		6
Animalia	Aves	Accipitridae	0226	*Haliaeetus leucogaster*	White-bellied Sea-Eagle	V,P		182
Animalia	Aves	Accipitridae	0225	*Hieraaetus morphnoides*	Little Eagle	V,P		7
Animalia	Aves	Accipitridae	0230	*Lophoictinia isura*	Square-tailed Kite	V,P,3		6
Animalia	Aves	Accipitridae	8739	*Pandion cristatus*	Eastern Osprey	V,P,3		6
Animalia	Aves	Falconidae	0238	*Falco subniger*	Black Falcon	V,P		25
Animalia	Aves	Haematopodidae	0130	*Haematopus longirostris*	Pied Oystercatcher	E1,P		1
Animalia	Aves	Jacanidae	0171	*Irediparra gallinacea*	Comb-crested Jacana	V,P		2
Animalia	Aves	Scolopacidae	0164	*Calidris canutus*	Red Knot	P	E,C,J,K	1
Animalia	Aves	Scolopacidae	0161	*Calidris ferruginea*	Curlew Sandpiper	E1,P	CE,C,J,K	16
Animalia	Aves	Scolopacidae	0152	*Limosa limosa*	Black-tailed Godwit	V,P	E,C,J,K	2
Animalia	Aves	Cacatuidae	8862	*^^Calyptorhynchus lathami lathami*	South-eastern Glossy Black-Cockatoo	V,P,2	V	6

Animalia	Aves	Psittacidae	0260	*Glossopsitta pusilla*	Little Lorikeet	V,P		12
Animalia	Aves	Psittacidae	0309	*Lathamus discolor*	Swift Parrot	E1,P	CE	1
Animalia	Aves	Strigidae	0248	*Ninox strenua*	Powerful Owl	V,P,3		1
Animalia	Aves	Meliphagidae	0603	*^^Anthochaera phrygia*	Regent Honeyeater	E4A,P,2	CE	4
Animalia	Aves	Meliphagidae	0448	*Epthianura albifrons*	White-fronted Chat	V,P		2
Animalia	Aves	Meliphagidae	8303	*Melithreptus gularis gularis*	Black-chinned Honeyeater (eastern subspecies)	V,P		1
Animalia	Aves	Pomatostomidae	8388	*Pomatostomus temporalis temporalis*	Grey-crowned Babbler (eastern subspecies)	V,P		30
Animalia	Mammalia	Dasyuridae	1017	*Phascogale tapoatafa*	Brush-tailed Phascogale	V,P		8
Animalia	Mammalia	Phascolarctidae	1162	*Phascolarctos cinereus*	Koala	E1,P	E	8
Animalia	Mammalia	Petauridae	1137	*Petaurus norfolcensis*	Squirrel Glider	V,P		4
Animalia	Mammalia	Pteropodidae	1280	*Pteropus poliocephalus*	Grey-headed Flying-fox	V,P	V	5626
Animalia	Mammalia	Emballonuridae	1321	*Saccolaimus flaviventris*	Yellow-bellied Sheathtail-bat	V,P		1

Animalia	Mammalia	Molossidae	1329	*Micronomus norfolkensis*	Eastern Coastal Free-tailed Bat	V,P		6
Animalia	Mammalia	Vespertilionidae	1353	*Chalinolobus dwyeri*	Large-eared Pied Bat	V,P	E	1
Animalia	Mammalia	Vespertilionidae	1372	*Falsistrellus tasmaniensis*	Eastern False Pipistrelle	V,P		1
Animalia	Mammalia	Vespertilionidae	1357	*Myotis macropus*	Southern Myotis	V,P		5
Animalia	Mammalia	Vespertilionidae	1361	*Scoteanax rueppellii*	Greater Broad-nosed Bat	V,P		1
Animalia	Mammalia	Vespertilionidae	1025	*Vespadelus troughtoni*	Eastern Cave Bat	V,P		1
Animalia	Mammalia	Miniopteridae	1346	*Miniopterus australis*	Little Bent-winged Bat	V,P		4
Animalia	Mammalia	Miniopteridae	3330	*Miniopterus orianae oceanensis*	Large Bent-winged Bat	V,P		6
Plantae	Flora	Myrtaceae	4293	*Syzygium paniculatum*	Magenta Lilly Pilly	E1	V	1

APPENDIX 6: SELECTED PHOTOS OF SITE

Paterson Rd south of subject site.

Exisiting dwelling to be removed

Subject site looking north

Subject site looking north

Subject site looking north-west

Subject site looking west

Lower Hunter Spotted Gum Ironbark Forest EEC to east of subject site, part cleared and grazed, with old growth remnnat trees present some with hollows

Managed land to east of subject site –grazed by cattle & horses

Managed land to east of subject site –grazed by cattle

Lower Hunter Spotted Gum Ironbark Forest EEC over & to north of subject site (looking west over northern boundary)

Lower Hunter Spotted Gum Ironbark Forest EEC over subject site looking west

Looking north from proposed Lot 4

Part managed land to west of subject site

Creek line / PCT Lower North Riverflat -Paperbark Forest - PCT 4042

Small bund/dam over upper part of creek line

Slashed land over site not ascribed any PCT

Areas with remnnat native shrubs /native understorey >15% cover are ascribed to Lower Hunter Spotted Gum Ironbark Forest EEC

APPENDIX 7: BIODIVERSITY CREDIT REPORT (LIKE FOR LIKE)

Note:- finalised 11th Sept, 2024

NSW GOVERNMENT

BAM Biodiversity Credit Report (Like for like)

Proposal Details

Assessment Id 00047555/BAAS17076/24/00047557	Proposal Name 256 Paterson Rd Bolwarra	BAM data last updated * 14/03/2024
Assessor Name Ted Smith	Assessor Number BAAS17076	BAM Data version * 67
Proponent Names	Report Created 11/09/2024	BAM Case Status Finalised
Assessment Revision 2	Assessment Type Part 4 Developments (General)	Date Finalised 11/09/2024
BOS entry trigger BOS Threshold: Area clearing threshold	* 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

BAM Biodiversity Credit Report (Like for like)

PCT Outside Ibra Added

None added

PCTs With Customized Benchmarks

PCT
No Changes

Predicted Threatened Species Not On Site

Name
Limicola falcinellus / Broad-billed Sandpiper
Haliaeetus leucogaster / White-bellied Sea-Eagle
Ixobrychus flavicollis / Black Bittern

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
3433-Hunter Coast Foothills Spotted Gum-Ironbark Grassy Forest	Lower Hunter Spotted Gum Ironbark Forest in the Sydney Basin and NSW North Coast Bioregions	3.7	110	0	110

BAM Biodiversity Credit Report (Like for like)

3433-Hunter Coast Foothills Spotted Gum-Ironbark Grassy Forest

Like-for-like credit retirement options

Name of offset trading group	Trading group	Zone	HBT	Credits	IBRA region
Lower Hunter Spotted Gum Ironbark Forest in the Sydney Basin and NSW North Coast Bioregions This includes PCT's: 3433, 3442, 3443, 3444, 4158	-	3433_Good	Yes	110	Hunter, Ellerston, Karuah Manning, Kerrabee, Liverpool Range, Peel, Tomalla, Upper Hunter, Wyong and Yengo. 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
Callistemon linearifolius / Netted Bottle Brush	**3433_Good**	3.0	5.00
Callocephalon fimbriatum / Gang-gang Cockatoo	**3433_Good**	3.0	90.00
Cercartetus nanus / Eastern Pygmy-possum	**3433_Good**	3.0	90.00
Grevillea parviflora subsp. parviflora / Small-flower Grevillea	**3433_Good**	3.7	110.00
Hieraaetus morphnoides / Little Eagle	**3433_Good**	3.0	67.00
Lophoictinia isura / Square-tailed Kite	**3433_Good**	3.0	67.00

BAM Biodiversity Credit Report (Like for like)

Petaurus norfolcensis / Squirrel Glider	**3433_Good**	3.0	90.00
Pterostylis chaetophora / Pterostylis chaetophora	**3433_Good**	3.7	110.00
Tetratheca juncea / Black-eyed Susan	**3433_Good**	3.7	110.00

Credit Retirement Options

Like-for-like credit retirement options

Callistemon linearifolius / Netted Bottle Brush	Spp	IBRA subregion
	Callistemon linearifolius / Netted Bottle Brush	Any in NSW
Callocephalon fimbriatum / Gang-gang Cockatoo	Spp	IBRA subregion
	Callocephalon fimbriatum / Gang-gang Cockatoo	Any in NSW
Cercartetus nanus / Eastern Pygmy-possum	Spp	IBRA subregion
	Cercartetus nanus / Eastern Pygmy-possum	Any in NSW
Grevillea parviflora subsp. parviflora / Small-flower Grevillea	Spp	IBRA subregion
	Grevillea parviflora subsp. parviflora / Small-flower Grevillea	Any in NSW
Hieraaetus morphnoides / Little Eagle	Spp	IBRA subregion
	Hieraaetus morphnoides / Little Eagle	Any in NSW

NSW GOVERNMENT

BAM Biodiversity Credit Report (Like for like)

Lophoictinia isura / Square-tailed Kite	Spp	IBRA subregion
	Lophoictinia isura / Square-tailed Kite	Any in NSW
Petaurus norfolcensis / Squirrel Glider	Spp	IBRA subregion
	Petaurus norfolcensis / Squirrel Glider	Any in NSW
Pterostylis chaetophora / Pterostylis chaetophora	Spp	IBRA subregion
	Pterostylis chaetophora / Pterostylis chaetophora	Any in NSW
Tetratheca juncea / Black-eyed Susan	Spp	IBRA subregion
	Tetratheca juncea / Black-eyed Susan	Any in NSW

APPENDIX 8: GENERAL FLORA & FAUNA, MAY 2024. FAUNA SURVEY REPORT.

FAUNA SURVEY and ASSESSMENT

for Proposed Development at

Lot C, DP 163627
256 Paterson Road
Bolwarra, NSW

As requested by

HGBE Properties Pty Ltd
1 Hartley Drive, Thornton

April 2024

Reference: GFF 24007

Prepared by
Greg Little BSc - Principle Consultant Mob 0414 562169
General Flora and Fauna (GFF)
PO Box 77
Boolaroo, NSW, 2284

FAUNA SURVEY and ASSESSMENT

Over site
Lot C, DP 163627
256 Paterson Road
Bolwarra, NSW

April 2024

1.0 INTRODUCTION

1.1 Background

This report describes the findings of a vertebrate fauna survey over the above mentioned "**site**", on which development is proposed, and assesses the likely impact of the proposed development on threatened fauna species, populations and ecological communities.

The survey of fauna included survey for BAM Candidate species.

1.2 Proposed Development

The proposed development will -

- Clear existing native vegetation for subdivision of the site into larger residential dwelling allotments
- Retain on the site as much of the existing native vegetation as possible as habitat for threatened and common species

1.3 Scope

For the purposes of this assessment, the survey was limited mainly to the site, however, circumstances elsewhere on adjacent land is considered. Vegetation and habitat across the site was surveyed by observation, listening, trapping, spotlighting and bird plots etc.

Methods used for the survey are in general accordance with methods detailed in Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities (DEC, 2004). The methods used should satisfy survey requirements of local guidelines such as the LMCC Flora and Fauna Survey Guidelines, Vn4.2 (LMCC, 2012) plus NSW and EPBC Act threatened fauna survey guidelines.

The potential impact of the proposed development on BAM Candidate Species and Biodiversity Conservation Act listed threatened species is assessed (**Appendix E**).

Recommendations are made to minimize the impact of the proposed development on the natural environment, threatened species and endangered ecological communities on the site and in the local area.

1.4 Literature Search

A literature search generated the following information applicable to the site –

- a list of BC Act listed threatened fauna species from the NSW Bionet wildlife database recorded from within 10km of the site.

- Various Federal, State and Local Council guidelines such as the Flora and Fauna Survey Guidelines (Vn4.2) of Lake Macquarie City Council.
- Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities, Working Draft, (DEC, 2004).
- An EPBC Act Protected Matters Report from the Department of the Environment and Heritage web site.
- Numerous documents, guidelines, reports and books etc although not directly referenced in this report may be referred to for information on aspects of the local area and identification, distribution and ecology of flora and fauna encountered in this study (see **7.0 References**).

A list of all BAM Candidate fauna species for the site was provided.

1.5 Licences and Approvals

This flora and fauna survey was conducted under:

- NPWS Scientific Investigation Licence Number SL100973
- Animal Research Authority issued by the Director-General of NSW Agriculture.
- Approval of the Animal Care and Ethics Committee of the Director-General of NSW Agriculture.

1.6 Survey Limitations

It is unlikely that all the species of vertebrate fauna, including threatened species, using or likely to use the site would be found during the field survey for this assessment.

2.0 SITE DESCRIPTION

2.1 General site description

The "**site**" is located within a landscape of rolling low hills on Permian sediments (Matthai, 1995) about 5km north-east of Maitland (**Fig-1**) and is accessed directly off Paterson Road, Bolwarra. The site is a roughly rectangular shaped, north-south aligned area of land of approximately 7.2 hectares (**Fig-2**) most of which slopes gently down to the north, east and west. A single man-made, shallow and ephemeral pond (**Photo-3**) is found on the west edge of the site (**Fig-3**). A minor drainage depression runs north-westward from the south-west portion of the site, through the pond.

The Hunter River to the west and south plus the Paterson River to the east are both about 2km from the site.

Aerial photographs (**Fig-2**) show that the site supports a partial cover of native forest vegetation of approximately 4ha. Other parts of the site are cleared to pasture grass and scattered trees and shrubs. Investigation finds that parts of the forest vegetation is in relatively good condition with an intact understory (**Photo-2**), however, much of the forest vegetation as seen in the aerial photo (**Fig-2**) is cleared underneath (**Photo-1**). Hollow bearing trees (**Fig-5**) are distributed through the forest vegetation but mainly in the north portion.

Cleared areas in the south-east portion of the site support a dwelling, sheds, gardens and farm machinery and are managed as low grass.

Native vegetation in the local region, within at least 5km of the site, is heavily cleared and fragmented (**Fig-6**) by clearing for roads, farmland and residential purposes. There are few intact remnants in this area and all are small and isolated from large areas of natural native vegetation.

Photo – 1 View through typical under scrubbed and managed section of the forest vegetation across the site.

Photo – 2 View through forest vegetation with relatively intact understory.

Photo – 3 View over shallow man-made pond in south-west portion of site.

Photo – 4 View over cleared and managed land typical along the east edge of site.

3.0 METHODS

3.1 Habitat

During this survey, attention was given to habitat for threatened fauna throughout the site. A diversity of habitats which include overstorey, understorey and groundcover vegetation, hollow bearing trees, ponds, streams, creeks, drainage lines, wetlands, mud flats, rock outcrops, cliffs, large rocks, dense and open vegetation, flowering and fruiting trees, fallen timber, leaf litter and bark litter etc are all important habitat components for a wide range of fauna.

Note was taken of the broad habitat types and any valuable or sensitive habitat found on the site that may be impacted by the proposed development.

3.2 Corridors

Investigation of the site as a potential corridor was made by site inspection and review of maps and aerial photographs. Comment is made as to whether the site forms an important corridor or is part of a broad corridor of vegetation or part of a fragmented chain of remnant islands or stepping-stones of vegetation and whether the proposed development is likely to compromise the corridor.

3.3 Disturbances

Obvious existing disturbances and possible historical disturbances on the site and disturbances indicated in available literature may be mentioned in this report. Disturbances may include any level of disturbance such as complete or partial clearing, stock grazing, tracks, fencing, roads, weeds, rubbish, bushfire etc.

3.4 Weeds

Weed species observed on the site may be discussed.

3.5 Stratification Units

Site "stratification units" according to DEC guidelines (DEC, 2004) will be determined according to broad topography, landforms, vegetation types and habitats across the site.

3.6 Vegetation

A separate flora survey and assessment is being conducted. Aerial photograph (**Fig-2**) interpretation indicates the "broad" vegetation found across the site.

3.7 Fauna survey

Fauna survey considerations suggested in the Wildlife Research in Australia: Practical and Applied Methods (Smith et al, 2022) plus design and methods in other guidelines such as LMCC guidelines (LMCC, 2012), LHCCREMS (Murray et al, 2002) and DECC (DEC, 2004) were employed. Trap, survey locations and results are indicated and presented in Figures, Appendices and Tables of this report:

(a) Elliot "A" small terrestrial mammal traps. 20 traps through natural native woodland/forest vegetation on the site were set over 4 nights, giving 80 trap nights. These were placed on the ground in appropriate locations on the site, each about 20m apart. Traps were baited with a mixture of peanut butter, rolled oats, honey and vanilla essence and were covered in plastic bags if it was likely to rain. Dead leaves, paperbark or dead grass were placed in each trap as nest material for animals. Traps were checked for captured animals and rebaited if necessary early each morning.

(b) Elliot “B” arboreal mammal traps. 8 traps were set in trees in natural woodland vegetation through the study area, set over 4 nights, giving 32 trap nights. These were positioned about 1.6m high on tree trunks in areas likely to support populations of arboreal mammals such as gliders. Traps were also located where they are less visible to people and therefore less vulnerable to disturbance. They were baited with a mixture of peanut butter, rolled oats, honey and vanilla essence and attached to a platform at a height of about 1.5 meters. Dead leaves, paperbark or dead grass were placed in each trap as nesting material and traps were covered in plastic bags if rain was likely. A 50% honey and water mixture was sprayed onto the tree trunk around and above each trap. They were checked for captured animals and rebaited as necessary early every morning.

(c) Cage traps (medium, terrestrial). 4 cage traps were set over 4 nights in the woodland vegetation, giving 16 trap nights. These were baited with a mixture of peanut butter, rolled oats, honey and vanilla essence plus a piece of chicken meat. Traps were covered with a piece of carpet for sun and rain protection and were checked for captured animals and rebaited as necessary early every morning.

(d) Bat call detection devices (Anabats). Two or three units were used on each of three nights for a minimum of 2 hours each per night. Anabats were used at suitable (passive) fixed locations on the site plus while hand held (active) and walking about the site.

(e) Nocturnal spotlight searches. Performed for more than 2 hours, at least 1 hour on each of three nights, over the site, using a suitably power torch or headlamp. A typical spotlighting transect followed tracks and gaps in vegetation throughout the site. Additional spotlighting occurred while otherwise moving about the site performing other activities during the night.

(f) Stag watching. Live or dead hollow bearing trees may be stag watched, if needed, for the presence of arboreal fauna.

(g) Owl-call playback. Was performed on three nights at a suitable central location on the site. Calls of threatened owls that could potentially occur on the site were played out early in the evening, after dark. Five or ten minutes of quiet were allowed prior to the calls and again after the calls before searching nearby trees, with a spotlight, for owls that have been attracted by the calls.

(h) Frog-call playback for threatened frogs was performed on this site. During night survey the call of threatened frog species was played out over ponds and pond side vegetation.

(i) Listening. From time to time spotlighting or other activities are interrupted by periods of still and quiet listening for animal calls and the sounds of animal movement in vegetation and on the ground.

(j) Diurnal (daytime) searches for reptiles were performed by using binoculars to search logs and track edges etc, raking leaf and bark litter and searching under logs, bark and rubbish etc. Any species found, including those observed incidentally, were recorded.

(k) Nocturnal and diurnal searching for frogs was performed by investigating potential habitat on the site, such as ponds, and by listening for calls. Any species observed or heard incidentally was recorded. Any unfamiliar frog calls would be recorded and compared against commercially available recordings.

(l) Bird sample plots, 20 minutes each, were performed on the site during periods when bird activity was high, usually in the morning or late afternoon. Incidental bird records were gained by observation and listening, both nocturnally and diurnally, while performing other activities about the study site.

(m) Signs of the presence of species by indications such as scats, tracks, scratches, diggings, fallen fruit and flower buds, chewed casuarina cones, burrows, nests, bones, skins etc were noted. Where determined the apparent species was recorded but noted that this may be unconfirmed unless the identification is positive.

Note – fauna survey effort was focused mainly within the native forest vegetation on the site.

The following threatened fauna survey methods are DEC (2004) survey guidelines.

PLEASE NOTE** - the DECC guidelines are for effort per 50 to 100 hectares of Stratification Unit, **native vegetation on the site totals less than 5 hectares in area, the whole site is about 7.2 hectares.

SU = Stratification Unit

Frogs Table 5.3, DEC

Method	Minimum Effort	Survey Period	This survey
Day habitat search	One hour per SU	According to seasonal activity of target sp.	Yes
Night habitat search	30 minutes, two separate occasions, per SU	According to seasonal activity of target sp.	Yes
Nocturnal call playback	Call playback, for each species, on two separate nights	According to seasonal activity of target sp.	Yes
Night watercourse search	Two hours per 200m of water body edge	According to seasonal activity of target sp.	Yes

Reptiles Table 5.4, DEC

Method	Effort / SU up to 100ha	Survey Period	This survey
Habitat search	30 min search on two separate days targeting specific habitat	November to March, preferred	Yes
Pitfall traps	24 trap nights, 6 traps x 4 consecutive nights	November to March, preferred	No, soil too hard, no threatened reptiles in local area
Spotlighting	30 minute search two separate occasions	November to March, preferred	Yes

Birds (diurnal) Table 5.5, DEC

Method	Minimum Effort	Survey Period	This survey
Area search	All birds recorded in 1ha area over 20 minutes	All year	Yes
Wetland census	1 hour census, dawn or dusk, each wetland	All year	No, no natural wetlands in study area
Water source census	20 minute census, dawn or dusk, each water source	All year	Yes

Birds (nocturnal) Table 5.7, DEC

Method	Minimum Effort	Survey Period	This survey
Call playback (night)	• Sites separated by 800 – 1000m • 5 different night visits per site for Powerful Owl, Barking Owl & Grass Owl • 6 different night visits per site for Sooty Owl • 8 different night visits per site for Masked Owl	All year	Three nights • Powerful Owl • Masked Owls • Barking Owl
Day habitat search	• Search for pellets and hollows • Flush Bush Stone-curlew by walking through potential habitat	All year	Yes
Stag watching	Watch potential roost or breeding hollows for 30 minutes prior to dark and 60 minutes after dark	All year	Not necessary – no owls heard or observed on or near site
Spotlighting	Search for Plains Wanderer & Bush Stone-curlew by foot or vehicle	All year	Yes

Mammals (non flying) Table 5.8, DEC

Method	Effort / SU up to 50ha plus additional effort for every 100ha	Animal sampled	This survey
Small Elliot Traps (Ell A)	120 trap nights over 3-4 consecutive nights	Small mammals	Yes – 20 traps, 4 nights = 80 trap nights
Large Elliot Traps (Ell B)	100 trap nights over 3-4 consecutive nights	Medium to large mammals	As per cage traps
Arboreal Elliot Traps (Ell B)	24 trap nights over 3-4 consecutive nights	Arboreal mammals	Yes – 8 traps, 4 nights = 32 trap nights
Wire Cage Traps	24 trap nights over 3-4 consecutive nights	Medium to large mammals	Yes – 4traps, 4 nights = 16 trap nights
Pitfall Traps & drift fence	24 trap nights over 3-4 consecutive nights	Small mammals	No Soil too hard
Hair tubes	10 large and 10 small tubes in pairs, over minimum 4 nights	Small & medium mammals	Yes - 4 x 90mm tubes, 10 nights
Arboreal hair tubes	3 tubes in each of 10 habitat trees, up to **100 ha**, minimum 4 nights	Arboreal mammals	Yes - 4 x 40mm tubes, 10 nights
Spotlighting on foot	1 hr x 1km / 200ha of SU, 2 nights	Arboreal & terrestrial mammals	Yes
Spotlighting from vehicle	1km of track @ 5km/hr / 200ha of SU, 2 nights	Arboreal & terrestrial mammals	No
Sand Plots	6 soil plots for 4 nights	Medium to large mammals	No, camera traps used instead
Call playback	2 sites (separate nights) / SU up to 200ha, plus 1 site / 100ha above 200ha	Gliders & koalas	No
Stag watching	Watch potential roost or breeding hollows, 30 minutes prior to dark & 60 minutes after dark	Gliders & possums	No
Search for scats and signs	30 minutes search	All mammals	Yes
Track search	1km of track, especially soft substrate	Medium to large mammals	Yes
Collection of predator scats	Opportunistic collection of predator scats for ID	All mammals	Yes

Bats Table 5.10, DEC

Methods	Effort / 100ha SU, targeting preferred habitat	Survey Period	This survey
Harp Trapping	4 trap nights over 2 nights	October to March, preferred	No, additional Anabats instead
Ultrasonic call recording	2 Anabats x 2 nights, recording entire night (minimum 4 hrs)	October to March, preferred	Yes (2-3 Anabat units)
Mist netting	For targeted survey: one net set min 2 hrs each of 2 nights	October to March, preferred	No
Trip Line	For targeted survey: min 2 hrs each of two nights	October to March, preferred	No
Spotlighting & transect walk	For targeted survey near likely food sources: min 2 hrs each of 2 nights	All year	Yes
Day habitat walk	Search for bat excreta at or near potential habitats	All year	Yes

3.8 BAM candidate species and threatened species

A list of fauna BAM Candidate Species was provided (**App E**). All fauna BAM candidate species are assessed (**App E**) for the impact of the proposed development on that species.

A list of BC Act listed threatened species from within a 10km radius of the site (**App E**) was obtained from the Bionet - Atlas of NSW Wildlife data. These species are found in Schedules of the Biodiversity Conservation Act 2016. All threatened species found within 10km radius of the site are assessed (**App E**) for the impact of the proposed development on that species.

3.9 Endangered Populations, Ecological Communities & Critical Habitat

Lists of "endangered populations", "endangered ecological communities" and "critical habitat" are found in the Biodiversity Conservation Act 2016.

These lists were reviewed and an assessment made of fauna populations, ecological communities and habitat found on the site or adjacent areas to determine if the proposed development would have an impact on any listed endangered population or critical habitat.

Listed Endangered Ecological Communities are assessed by a separate flora assessment of the site.

3.10 Locally and Regionally Significant Species and Communities

Due to their natural rarity or the historic extent of clearing affecting them there are a number of species and communities that are regionally or locally significant and may require some conservation consideration. Any regionally or locally significant species or communities found on the site or adjacent areas will be recorded and discussed. Regionally significant species and communities are those identified and listed by local government areas or councils.

3.11 EPBC Act 1999 - Matters of National Environmental Significance

Under the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) an action will require approval from the Australian Government Environment Minister if the action has, will have or is likely to have, a significant impact on a matter of National Environmental Significance.

This component of the report will be guided by the Matters of National Environmental Significance – "Significant Impact Guidelines", 1.1 Environment Protection and Biodiversity Conservation Act 1999.

3.12 Koala Habitat

A Koala habitat assessment of the site is conducted according to the Koala (Phascolarctos cinereus) Biodiversity Assessment Method Survey Guide (DPE, 2022).

4.0 RESULTS

4.1 Habitat

Broad habitats on the site are the remnant of natural native forest vegetation, hollow bearing trees, open grass pasture areas and a small pond.

Not found on the site are cliffs, rock outcrops, caves, mines, culverts, rainforest, low open heath, natural fresh or saltwater wetlands, permanent watercourses, mangroves, mudflats or other natural features (**Fig-3**).

The native forest vegetation including disturbed areas of forest and scattered trees across the site provides forage, refuge and breeding habitat for a limited variety of native fauna. Trees provide leaves, flowers, nectar, pollen, fruit and seeds etc as forage for a range of vertebrate and invertebrate fauna and these are then prey for other fauna. Refuge and breeding habitat on the site includes tree canopies, understorey and groundcover vegetation, logs, leaf litter and loose bark.

Managed grass areas of the site may provide open grass habitat for a small number of native fauna.

Seventeen (17) live and dead hollow bearing habitat trees (**Fig-5** & **App-J**) support a range of hollows, cracks, fissures and loose bark. These can potentially be used as refuge, nest, den, roost and breeding habitat by hollow dependent fauna such as owlet nightjars, owls, cockatoos, parrots, possums, gliders, lizards, snakes, frogs and insectivorous bats.

A single shallow and ephemeral man-made pond is located over a minor drainage depression in the south-west portion of the site (**Fig-3**). This small pond supports a light cover of water plants. While advantageous to some local native fauna, such as common local frogs, is not a necessary part of the natural environment and could be filled and removed with limited impact to local native fauna.

4.2 Corridors

Native vegetation in the local area, within several kilometres of the site, is heavily cleared and fragmented for roads, rural, utility, and residential purposes (**Fig-6**). The area supports only small and isolated remnants of native vegetation with tenuous corridor connections. The small remnant of native vegetation on the site is part of an already broken westward and northward corridor through an adjacent residential area.

By retaining native trees on the site the proposed development can maintain an existing corridor of vegetation similar to that existing through the adjacent residential areas.

4.3 Disturbances

Past management of the site appears to have cleared the original forest vegetation, from the south, east and north-east portions of the site, to pasture grass and scattered trees (**Photo-4**). These areas are now managed by slashing and mowing.

The forest vegetation has been under-scrubbed in the central portion (**Photo-1**) with the understory cleared and the groundcover managed by slashing. The west edge of the forest vegetation retains much of the original native understory and groundcover vegetation (**Photo-2**).

The small shallow pond (**Photo-3**) on the south-west edge of the site is man-made to capture surface water flowing after rain along the otherwise dry drainage depression running through that part of the site (**Fig-3**).

A dwelling, sheds, stored equipment, gardens etc are found on the south edge of the site. Other disturbances across the site include tracks, rubbish, fencing and weeds.

4.4 Weeds

A flora survey and assessment is subject of a separate report for this site.

Most weeds on the site appear to be associated with disturbances such as along tracks and cleared areas.

4.5 Stratification Units

For fauna survey purposes this site supports a single broad Stratification Unit, this being the forest vegetation (**Figs-2 & 3**).

4.6 Vegetation

A flora survey and assessment is subject of a separate report for this site. However, the site supports a remnant cover of vegetation identified as PCT 3433 Hunter Coastal Foothills Spotted Gum – Ironbark Forest. The trees, shrubs, herbs, grasses etc in the understory and groundcover of this forest vegetation provide habitat for a limited variety of native fauna. Water plants in the pond also help to provide habitat for native fauna such as frogs.

4.7 Fauna

74 species of common, threatened and introduced fauna were recorded on the site during this survey (**Chart-A**) including 68 native and 6 introduced species. All fauna recorded in or near the study area during this survey are listed in **Appendix A**.

Chart – A Showing number of species in each faunal group recorded in the study area.

	Natives	**Introduced**
Mammals	19	5
Birds	41	1
Reptiles	2	0
Frogs	6	0
Total	68	6

4.7.1 Mammals

Twenty-four (24) mammal species were recorded on the site during this survey of which 5 are introduced species. The only native terrestrial mammals recorded on the site (**App-A**) were Echidna (neighbour reported) and Red-necked Wallaby. Three (3) native arboreal mammal species were recorded on the site, these being Sugar Glider, Squirrel Glider and Common Brush-tail Possum. Other arboreal mammals such as Ring-tailed Possum may also occur on the site.

Flying mammals recorded on the site included Grey-headed Flying-fox and several (13) species of insectivorous bats. Grey-headed Flying-foxes were recorded on and near the site foraging in flowering eucalypt trees. However, a Flying-fox camp (day time roost) was not found on or near the site. Thirteen (13) species of insectivorous bats were recorded on the site (**App-A**) during this survey. Eight (8) of the insectivorous bats are tree hollow dependent and five (5) are dependent on caves or similar structures such as mines and larger culverts. Hollow dependent insectivorous bat species roost and breed in tree hollows, some may be using hollows, cracks, fissures and loose bark etc in live and dead hollow bearing trees found on the site (**Fig-5**). Cave dependent insectivorous bats, such as Horseshoe Bat, Bent-wing Bats, Pied Bat and Southern Myotis, may forage for insects through vegetation on the site but will be roosting and breeding in caves, mines or larger culverts elsewhere off site in the local region, maybe several kilometers from the site. Retaining trees and hollows, fallen timber plus natural understory and groundcover within the existing native forest vegetation will help retain habitat for mammals on the site.

Six (6) introduced terrestrial mammals were recorded on the site including Dogs, Cats, Fox, Black Rat and House Mouse.

4.7.2 Birds

Most of the fourty two (42) bird species recorded (**App-A**) from across the site are typical common native bushland birds of the local region. Forest and disturbed vegetation on the site supports a limited variety of local native birds.

No owls were recorded on the site during this survey. Larger forest owls are likely to forage for prey species such as birds, rats, possums and gliders etc in the local area. Vegetation on the site is likely to be a small part of a large foraging territory (about 1,000ha) used by larger forest owls. However, while there are numerous hollow bearing trees on the site with hollows suitable for prey species of owls there appear to be very few hollows potentially large enough as breeding or refuge habitat for larger forest owls. Nocturnal birds including Tawny Frogmouths were recorded on the site. More local native bird species including nocturnal birds are likely to be recorded on the site. Retaining trees and hollows, fallen timber, natural understory and groundcover within the existing native forest vegetation will help retain habitat for birds on the site.

A single (1) introduced bird, the Spotted Turtle-dove, was recorded on the site this survey.

4.7.3 Reptiles

Only two (2) common reptile species were recorded on the site during this survey (**App-A**). Terrestrial reptiles recorded include the Garden Skink and Robust Skink. Several other common reptile species are likely to be recorded on the site. Neighbours recalled seeing snakes on the site but could not identify the species. Retaining dead trees, fallen timber and dense natural groundcover with leaf litter within the existing native forest vegetation will help retain habitat for reptiles on the site.

4.7.4 Frogs

Six (6) common frog species were recorded across the site (**App-A**). Some were recorded in and around the small shallow ephemeral pond in the south-west edge portion of the site. Others such as Perons Tree Frog was recorded calling from hollows in trees on the site. The pond on the site may also support eels, fish, turtles and predatory insects and be visited by

cormorants and herons etc, all of which eat adult frogs, frog eggs and tadpoles. Retaining trees, hollows, fallen timber, natural understory and dense groundcover within the existing native forest vegetation, especially near the pond, will help retain habitat for frogs on the site.

4.8 BAM Candidate Species and Threatened Species

A list of 16 BAM Candidate Species of fauna was provided, plus, a list of 58 BC Act Threatened Species fauna was gained from the Bionet database within about 10km radius of the site. Some of these species overlap and are both BAM candidate and threatened species (**App-E**). Eight (8) of these were recorded on the site during this survey and are assessed in **Appendix E** of this report.

In summary, 16 BAM candidate fauna species and 58 threatened fauna species are recorded within about 10km radius of the site. Of the 58 threatened species there is potential habitat on the site for about 25 threatened fauna species. Eight (8) BAM and threatened fauna species were recorded on the site during this survey.

The following BAM Candidate Species were recorded on the site:

• *Petaurus norfolcensis*	Squirrel Glider	V
• *Pteropus poliocephalus*	Grey-headed Flying-fox	V
• *Myotis Macropus*	Southern Myotis	V
• *Miniopterus australis*	Little Bent-wing Bat	V
• *Miniopterus orianae oceanensis*	Large Bent-wing Bat	V

The following BC Act threatened fauna species were recorded on the site:

• *Petaurus norfolcensis*	Squirrel Glider	V
• *Pteropus poliocephalus*	Grey-headed Flying-fox	V
• *Chalinolobus dwyeri*	Large-eared Pied Bat	V
• *Micronomus norfolkensis*	Eastern Coastal Freetail Bat	V
• *Myotis Macropus*	Southern Myotis	V
• *Miniopterus australis*	Little Bent-wing Bat	V
• *Miniopterus orianae oceanensis*	Large Bent-wing Bat	V
• *Scoteanax rueppellii*	Greater Broad-nosed Bat	V

Squirrel Gliders were recorded mostly in the central portion of the forest vegetation on the site. This species is dependent on tree hollows for survival in the area.

Grey-headed Flying-foxes were recorded mostly in the north portion of forest on the site, either flying over or foraging in blossom in flowering eucalypts.

Eight (8) species of BAM candidate and threatened insectivorous bat species were recorded on the site. Greater Broad-nosed Bats and Eastern Coastal Freetail Bats are hollow dependent species and could be roosting and breeding in tree hollows on the site. Cave dependent insectivorous bats recorded on the site including Little and Large bent-wing Bats, Southern Myotis and Large-eared Pied Bats may forage in vegetation across the site but will likely be roosting and breeding in caves, mines or culverts off site and elsewhere in the local region possibly several kilometres distant.

Habitat for above mentioned BAM candidate and threatened fauna species can be conserved by the proposed development by retaining as many trees, including hollow bearing trees, as possible on the site.

4.9 Endangered Populations, Ecological Communities & Critical Habitat

4.9.1 Endangered Populations

This site does not support an Endangered Population of fauna.

4.9.2 Endangered Ecological Communities

A separate flora survey and assessment report will address "Endangered Ecological Communities" (EECs).

4.9.3 Critical Habitat

This site does not support Critical Habitat.

4.10 Regionally and locally significant matters

These are dealt with in **Appendix C** of this report. Regionally significant populations and ecosystems are addressed considering Maitland City Councils "Maitland Greening Plan" (last updated 2018).

Significant Fauna Species

- EPBC Act 1999 listed species; addressed elsewhere in this report
- BC Act 2016 listed species; addressed elsewhere in this report
- Fauna of Regional Significance
- Fauna identified as being significant including threatened fauna species listed under the Biodiversity Conservation Act 2016 are listed and dealt with elsewhere in this report.

Significant Vegetation Communities

- EPBC Act 1999 listed ecological communities; addressed elsewhere in a separate report
- BC Act listed ecological communities; addressed elsewhere in a separate report
- Native vegetation corridors; addressed elsewhere in this report

Significant Habitat

- Vegetation communities and flora are identified and discussed in a separate flora report for the site
- Habitat for significant species, including rock outcrop, hollow bearing trees, mudflats, dead stags, and intertidal areas; addressed elsewhere in this report
- Native vegetation corridors; addressed elsewhere in this report

Habitat/hollow bearing trees **-** several hollow bearing trees are found on the site (**Fig-5** and **App-J**). As many as possible of the hollow bearing trees should be retained on the site by the proposed development as habitat for species such as Squirrel Gliders and insectivorous bats.

Specific local population centres of threatened species **-** NSW Bionet data for Squirrel Gliders does not show a large number of Squirrel Gliders records clustered on or around the site. The site does not appear to be a specific local population centre for Squirrel Gliders.

Local corridor areas **-** Aerial photographs show existing vegetation on the site as a small remnant in the local area. A broken corridor of vegetation extends westward and north of the site through a mainly residential area.

4.11 EPBC Act 1999 - Matters of National Environmental Significance

The proposed development is assessed in **Appendix D** of this report according to the Matters of National Environmental Significance – "Significant Impact Guidelines", 1.1 Environment Protection and Biodiversity Conservation Act 1999.

The proposed development is unlikely to significantly impact Matters of National Environmental Significance under the EPBC Act.

4.12 Koala Habitat

Steps are followed in the Koala (*Phascolarctos cinereus*) Biodiversity Assessment Method Survey Guide (DPE, 2022) to determine if the site is Koala habitat (**Appendix H**).

There were no Koalas recorded on the site by visual observation, listening, SAT or spotlighting.

According to the Bionet database there are 442 records of Koalas (1980 to 2023) within 10km radius of the site, however, there are only 3 records (between 1980 and 2024) of Koala within a 3 kilometre radius of the site. Many existing native trees will likely be retained on the site thereby retaining potential habitat for this species.

It is therefore considered that the proposed development of the site is unlikely to have a significant impact on the local Koala population.

5.0 CONCLUSION

This fauna assessment finds that the approximately 7.2ha site (**Fig-3**) at 256 Paterson Road, Bolwarra, currently supports habitat suitable for some BAM Candidate Species and BC Act threatened species and common native fauna.

Native forest vegetation found in the north portion of the site is in relatively good condition and supports hollow bearing trees (**Fig-5**). A single man-made, shallow and ephemeral pond found on the south-west edge of the site is not a natural feature, has limited value to threatened native fauna and can be filled and removed if necessary.

Eight (8) BAM Candidate Species and BC Act threatened species of fauna were recorded on the site (see part **4.8** this report). These include Squirrel Glider, Grey-headed Flying-fox, Large-eared Pied Bat, Eastern Coastal Freetail Bat, Southern Myotis, Little Bent-wing Bat, Large Bent-wing Bat, and Greater Broad-nosed Bat.

For BAM Candidate Species recorded on site only the Squirrel Glider is likely to be impacted significantly if most of the forest vegetation and hollow bearing trees are removed. The Grey-headed Flying-fox, Southern Myotis, Little Bent-wing Bat and Large Bent-wing Bat are highly mobile, do not roost in vegetation on the site and will likely forage elsewhere in the local area.

Regarding the BC Act threatened species recorded on the site only the Squirrel Glider, Eastern Coastal Freetail Bat and Greater Broad-nosed Bat are likely to be impacted significantly if most of the forest vegetation and hollow bearing trees are removed. The Grey-headed Flying-fox, Large-eared Pied Bat, Southern Myotis, Little Bent-wing Bat and Large Bent-wing Bat are highly mobile, do not roost in vegetation on the site and will likely forage elsewhere in the local area.

As much as possible of the existing native forest vegetation, especially that with natural understory and groundcover vegetation, should be retained as habitat for these species by the proposed development. This action will also conserve habitat for common species and help maintain a remnant of native vegetation in the area. As many as possible of the hollow bearing trees on the site should be retained as habitat for these species by the proposed development.

The proposed development, with the adoption of the following recommendations, is unlikely to have a significant impact on BAM Candidate Species and BC Act threatened species.

6.1 Recommendations:

1. Sediment and erosion controls should be employed prior to any earth works and construction phases when the soils are likely to be disturbed.
2. Retain as much as possible of the existing native forest vegetation on the site.
3. Retain dead fallen timber and dead trees wherever possible. If necessary, dead and felled trees can be relocated into and scattered about the retained forest vegetation.
4. Retain as many as possible of the hollow bearing trees.
5. Use local native plant species for gardens and landscaping through the development.

Greg Little
General Flora and Fauna

7.0 REFERENCES

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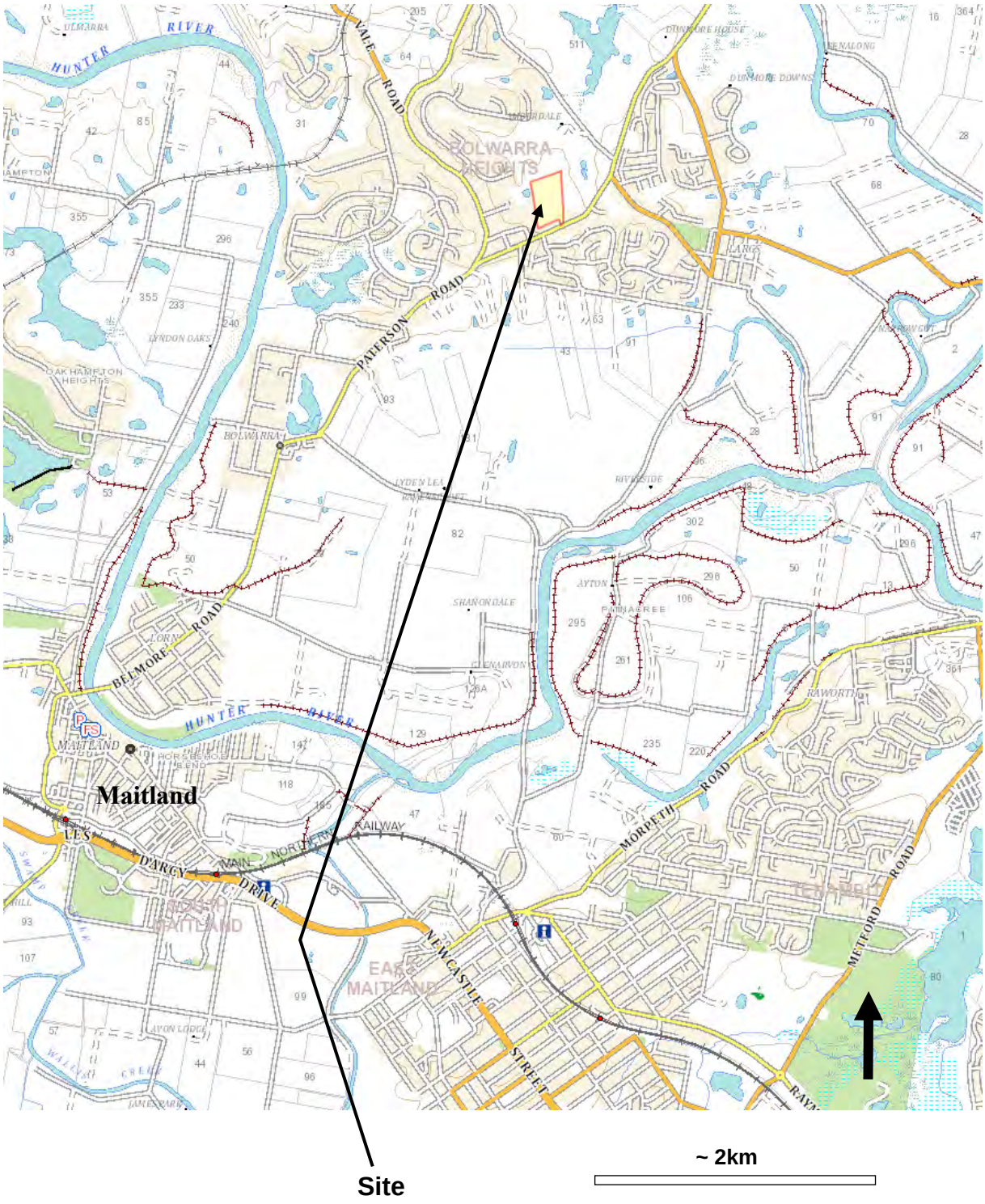

Figure 1 Showing location of site in relation to surrounding areas. The site is about 5km north-east of Maitland.

Map sourced SIX web site

Figure 2 Aerial photograph showing site (solid yellow line).

Derived from SIX web site.

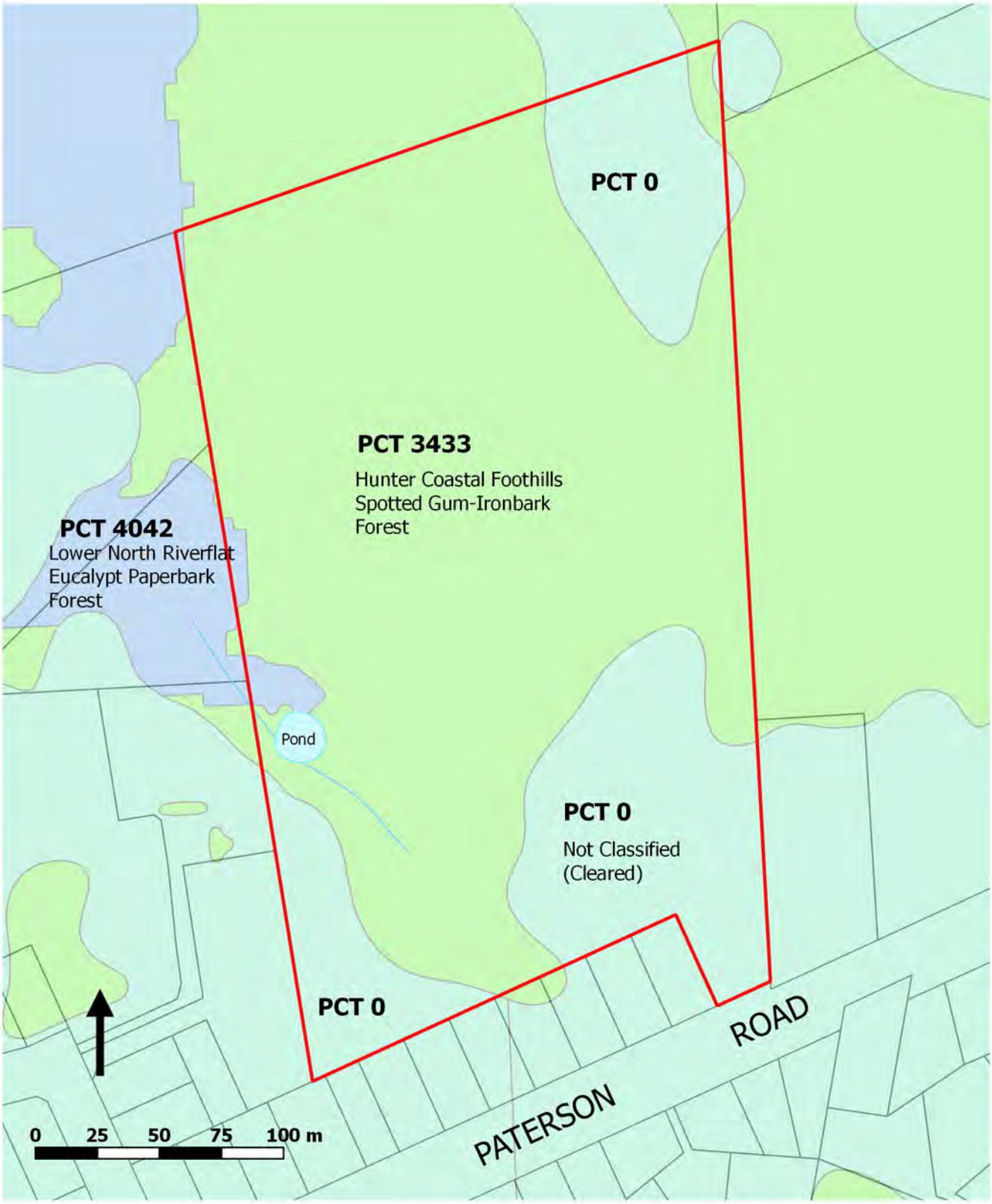

Figure - 3

General layout of site (red outline) plus approximate distribution of Plant Community Type (PCT) vegetation across the site, according to SEED vegetation mapping.

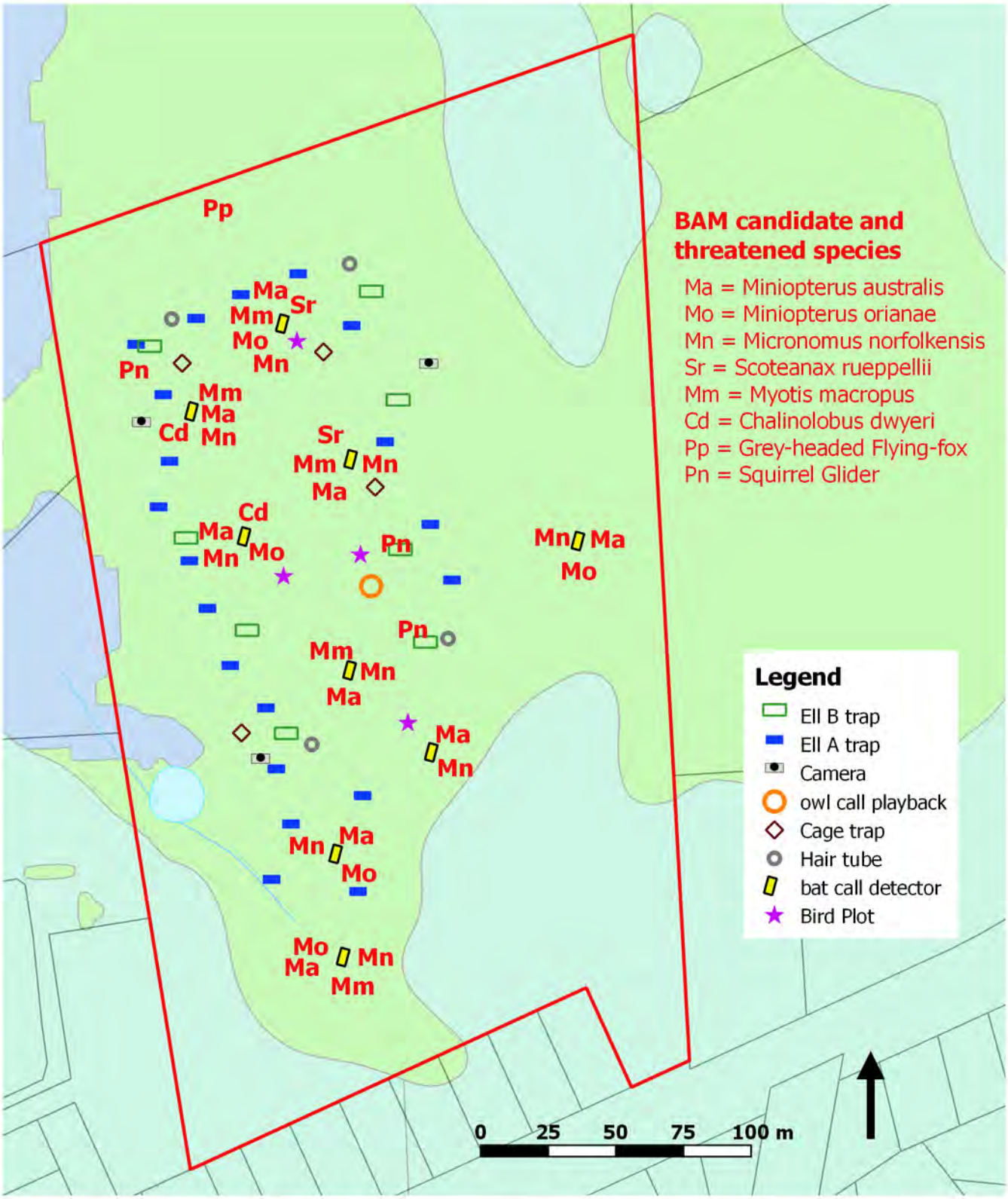

Figure - 4

Location of fauna survey equipment and recorded BAM candidate and BC Act threatened species.

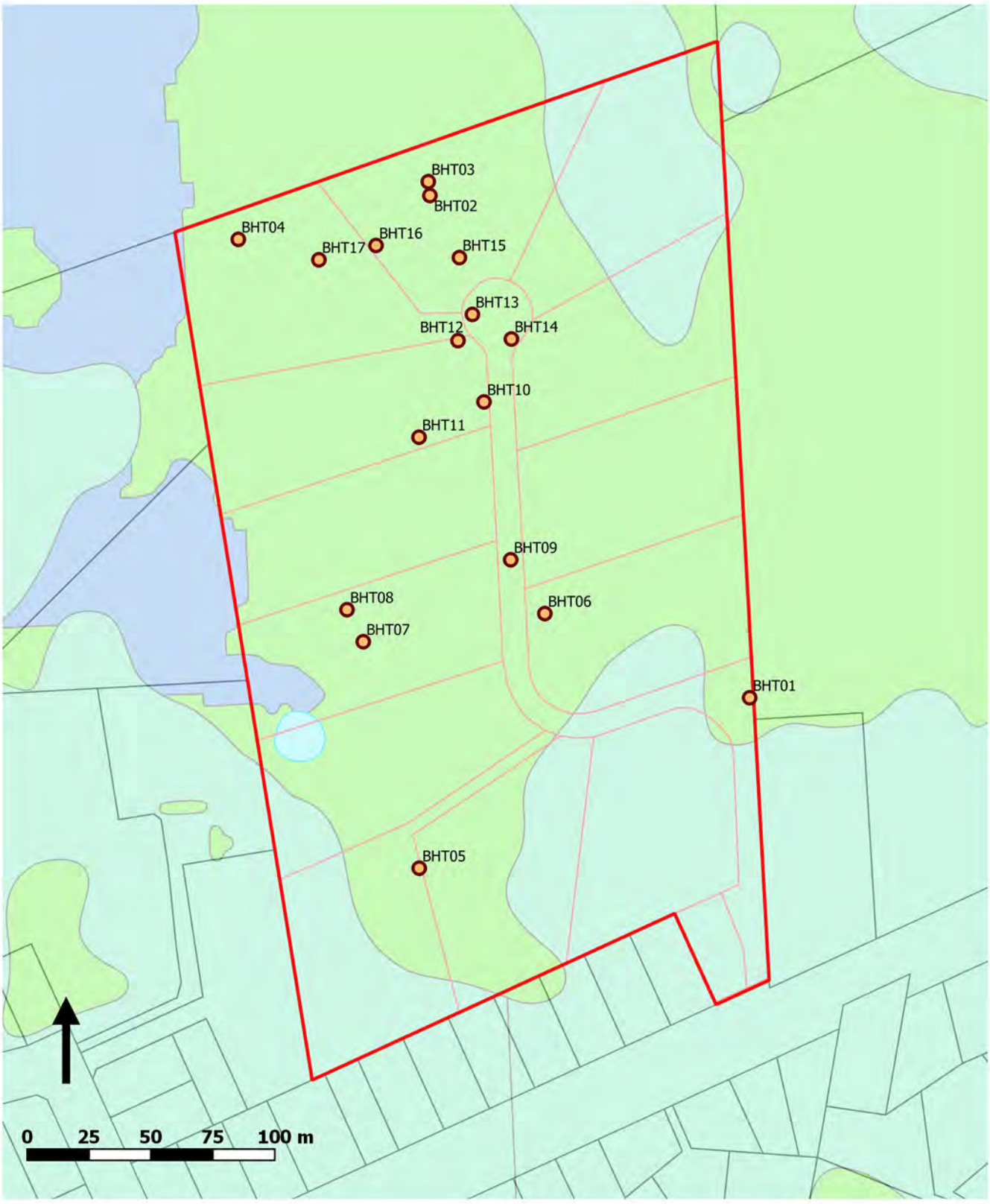

Figure - 5

Location of hollow bearing trees across the site, in relation to proposed subdivision.

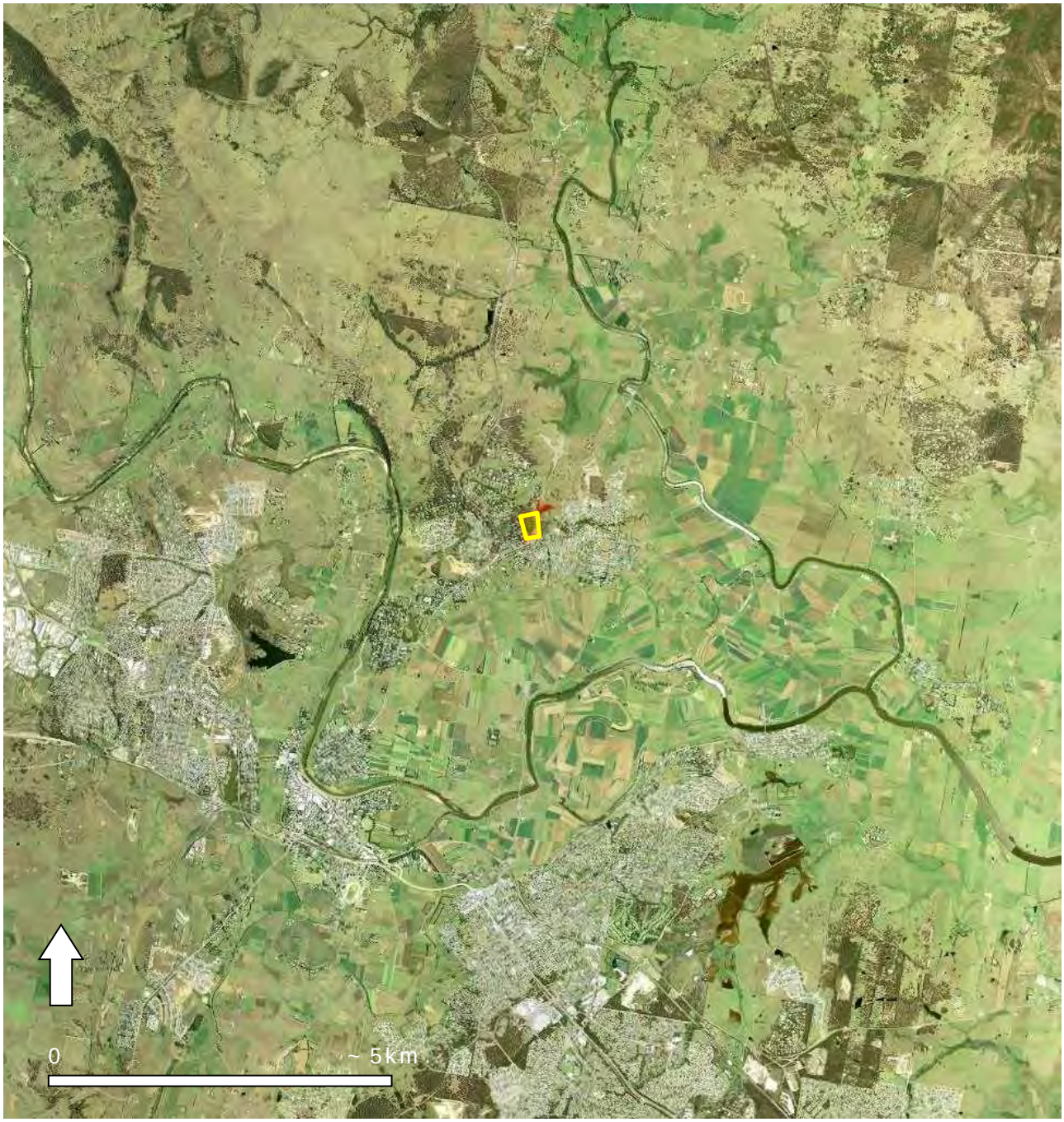

Figure - 6 Aerial photograph showing the heavily fragmented landscape of the local region within at least 5km radius of the site (yellow outline). A potential corridor of vegetation to the west and north of the site is tenuous.

TABLES

Location - Lot 256, Paterson Road, Bolwarra, NSW

Table-1 Owl call playback

Date	Location	Species	Response
29.4.24 night	Centre of native vegetation on site	Powerful Owl, Barking Owl, Masked Owl	• No response
2.5.24 night	Centre of native vegetation on site	Powerful Owl, Barking Owl, Masked Owl	• No response
7.5.24 night	Centre of native vegetation on site	Powerful Owl, Barking Owl, Masked Owl	• No response

Table-2 Spotlighting

Date	Location	Observations
29.4.24 night	Along tracks and through safely accessible parts of native vegetation throughout site	• Tawny Frogmouth • Red-necked Wallaby • Cat • Grey-headed Flying-fox (heard)
2.5.24 night	Along tracks and through safely accessible parts of native vegetation throughout site	• Red-necked Wallaby • Cat • Fox • Grey-headed Flying-fox
7.5.24 night	Along tracks and through safely accessible parts of native vegetation throughout site	• Brush-tailed Possum • Squirrel Glider • Grey-headed Flying-fox (heard) • Cat

Table-3 Reptile search

Date	Location	Method	Observations
24.4.24	Throughout site	Visual searches for reptiles sunning and foraging; turning rubbish, fallen timber and bark; raking in leaf litter, etc.	• Robust Skink • Garden Skink
29.4.24	Throughout site	Visual searches for reptiles sunning and foraging; turning rubbish, fallen timber and bark; raking in leaf litter, etc.	• Garden Skink
29.4.24 night	Throughout site	Visual spotlighting searches for reptiles on ground and along tracks.	• Nothing
30.4.24	Throughout site	Visual searches for reptiles sunning and foraging; turning rubbish, fallen timber and bark; raking in leaf litter, etc.	• Nothing
3.5.24	Throughout site	Visual searches for reptiles sunning and foraging; turning rubbish, fallen timber and bark; raking in leaf litter, etc.	• Nothing

Table-4 Frog search

Date	Location	Method	Observations
24.4.24	Pond on site	Listen, where possible search water edge and mud, search adjacent vegetation	• *Litoria fallax*
29.4.24	Pond on site	Listen, where possible search water edge and mud, search adjacent vegetation	• *Litoria fallax* • *Crinia signifera* • *Limnodynastes peroni*
29.4.24 night	Pond on site	Listen, spotlight search water edge, mud and adjacent vegetation	• *Crinia signifera* • *Limnodynastes peroni* • *Limnodynastes tasmaniensis*
30.4.24	Pond on site	Listen, where possible search water edge and mud, search adjacent vegetation	• *Crinia signifera*
2.5.24 night	Pond on site	Listen, spotlight search water edge, mud and adjacent vegetation	• *Litoria verreauxii* • *Crinia signifera* • *Limnodynastes peroni*
7.5.24 night	Pond on site	Listen, spotlight search water edge, mud and adjacent vegetation	• *Crinia signifera* • *Limnodynastes peroni*

Table-5 Frog call playback

Date	Location	Species	Response to call playback
29.4.24 night	Ponds in study area and elsewhere on site	Play out calls of – *Litoria aurea* *Litoria brevipalmata*	• *Nothing, no response*
2.5.24 night	Ponds in study area and elsewhere on site	Play out calls of – *Litoria aurea* *Litoria brevipalmata*	• *Nothing, no response*
7.5.24 night	Ponds in study area and elsewhere on site	Play out calls of – *Litoria aurea* *Litoria brevipalmata*	• *Nothing, no response*

Table-6 Tracks, scats and signs.

Date	Location	Observations
17.4.24 to 8.5.24	Throughout site	• Red-necked Wallaby scat • Fox scat • Scratches on some smooth bark trees, probably Brush-tailed Possum • Red-browed Finch nest

Table-7 Bat call collection and identification.

Date	Conditions	Unit	Time	Location	Species recorded
29.4.24	Overcast, still, warm	U007	1920-2035	Walked along tracks and fixed at centre north portion of native vegetation	• *Chalinolobus gouldii* C • *Nyctophilus sp.* Pr • *Miniopterus australis* C # • *Micronomus norfolkensis* C # • *Nyctinomus australis* Pr • *Myotis macropus* Pr #
29-30.4.24	Overcast, still, warm	U179	1700-0748	Centre portion in native vegetation on site	• *Chalinolobus gouldii* C • *Scoteanax rueppellii* # Pr • *Miniopterus australis* C # • *Micronomus norfolkensis* C # • *Myotis macropus* Pr #
29-30.4.24	Overcast, still, warm	U223	1700-0748	North centre portion of native vegetation on site	• *Chalinolobus gouldii* C • *Vespadelus vulturnus* C • *Scoteanax rueppellii* # Pr • *Scotorepens orion* Pr • *Miniopterus australis* C # • *Miniopterus orianae oceanensis* #C • *Micronomus norfolkensis* C # • *Myotis macropus* Pr #
2.5.24	Part cloud, still, mild	U007	1820-1945	Walked along tracks and fixed in south west portion of native vegetation	• *Chalinolobus gouldii* C • *Miniopterus australis* C # • *Miniopterus orianae oceanensis* C # • *Micronomus norfolkensis* C #
2-3.5.24	Part cloud, still, mild	U179	1805-0905	west centre portion of native vegetation on site	• *Chalinolobus gouldii* C • *Vespadelus vulturnus* Pr • *Rhinolophus megaphyllus* C • *Scotorepens orion* Pr • *Miniopterus australis* C # • *Miniopterus orianae oceanensis* #C • *Micronomus norfolkensis* C # • *Chalinolobus dwyeri* C # • *Chalinolobus morio* Pr
2-3.5.24	Part cloud, still, mild	U223	1802-0901	East centre portion of native vegetation on site	• *Chalinolobus gouldii* C • *Miniopterus australis* C # • *Miniopterus orianae oceanensis* #C • *Micronomus norfolkensis* C # • *Nyctinomus australis* Pr
7.5.24	Part cloud, still, mild	U007	1730-0730	Walked along tracks and fixed at south centre portion of native vegetation	• *Chalinolobus gouldii* C • *Miniopterus australis* C # • *Micronomus norfolkensis* C # • *Nyctinomus australis* Pr

7-8.5.24	Part cloud, still, mild	U179	1730-0730	North west portion of native vegetation on site	• *Rhinolophus megaphyllus* C • *Miniopterus australis* C # • *Micronomus norfolkensis* C # • *Myotis macropus* Pr # • *Chalinolobus dwyeri* C # • *Chalinolobus morio* Pr
7-8.5.24	Part cloud, still, mild	U223	1730-0730	South west portion of native vegetation on site	• *Miniopterus australis* C # • *Miniopterus orianae oceanensis* #C • *Micronomus norfolkensis* C # • *Myotis macropus* Pr #

= Threatened species Po = Possible, Pr = Probable, C = Confident

Reference -

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Note –

Insectivorous bats are active at night (nocturnal) foraging for insects. For safety they roost during daylight hours either in tree hollows or in natural caves. Cave dependent species may also roost in larger culverts, old mines or even buildings.

The above listed insectivorous bat species were recorded on the site, likely while foraging for insects. Some of these insectivorous bats will be roosting in tree hollows on the site or in tree hollows, caves, mines, culverts or buildings elsewhere in the local area. There are no caves, mines or culverts on the site.

Threatened species		**Non threatened species**	
Tree hollow dependent	**Cave dependent**	**Tree hollow dependent**	**Cave dependent**
Micronomus norfolkensis	*Miniopterus australis*	*Nyctophilus sp.*	*Rhinolophus megaphyllus*
Scoteanax rueppellii	*Miniopterus orianae oceanensis*	*Chalinolobus gouldii*	
	Myotis macropus	*Nyctinomus australis*	
	Chalinolobus dwyeri	*Vespadelus vulturnus*	
		Scotorepens orion	
		Chalinolobus morio	

APPENDIX - A Fauna species list

The following fauna species are potentially found in the region and may utilise habitat on the study site. Common and threatened species recorded on the site are indicated.

R = Recorded on site this 2024 survey	& = neighbour report seeing
? = Unconfirmed	n = observed or heard nearby but not on site
# = Threatened Species	s = sign, ie nest, feathers, scat etc

Scientific Name	Common Name		
MAMMALS			
ORNITHORHYNCHIDAE			
Ornithorhynchus anatinus	Platypus		
TACHYGLOSSIDAE			
Tachyglossos aculeatus	Echidna		&
DASYURIDAE			
Antechinus flavipes	Yellow-footed Antechinus		
Antechinus stuartii	Brown Antechinus		
Antechinus swainsonii	Dusky Antechinus		
Dasyurus maculatus	Spotted-tailed Quoll		
Dasyurus viverrinus	Eastern Quoll		
Phascogale tapoatafa	Brush-tailed Phascogale		
Planigale maculata	Common Planigale		
Sminthopsis murina	Common Dunnart		
PERAMELIDAE			
Isoodon macrourus	Northern Brown Bandicoot		
Isoodon obesulus	Southern Brown Bandicoot		
Perameles nasuta	Long-nosed Bandicoot		
PHASCOLARCTIDAE			
Phascolarctos cinereus	Koala		
VOMBATIDAE			
Vombatus ursinus	Common Wombat		
BURRAMYIDAE			
cercartetus nanus	Eastern Pygmy-possum		
PETAURIDAE			
Petaurus australis	Yellow-bellied Glider		
Petaurus breviceps	Sugar Glider		R
Petaurus norfolcensis	Squirrel Glider	#	R
PSEUDOCHEIRIDAE			
Petauroides volans	Greater Glider		
Pseudocheirus peregrinus	Common Ringtail Possum		
ACROBATIDAE			
Acrobates pygmaeus	Feathertail Glider		
PHALANGERIDAE			
Trichosurus caninus	Mountain Brushtail Possum		
Trichosurus vulpecula	Common Brushtail Possum		R
POTOROIDAE			
Aepyprymnus rufescens	Rufous Bettong		
Potorous tridactylus	Long-nosed Potoroo		
MACROPODIDAE			
Macropus dorsalis	Black-striped Wallaby		
Macropus giganteus	Eastern Grey Kangaroo		
Macropus parma	Parma Wallaby		
Macropus parryi	Whiptail Wallaby		
Macropus robustus	Common Wallaroo		
Macropus rufogriseus	Red-necked Wallaby		R
Petrogale penicillata	Brush-tailed Rock-wallaby		

Scientific Name	Common Name		
Thylogale stigmatica	Red-legged Pademelon		
Thylogale thetis	Red-necked Pademelon		
Wallabia bicolor	Swamp Wallaby		
PTEROPODIDAE (FRUIT BATS)			
Pteropus alecto	Black Flying-fox		
Pteropus poliocephalus	Grey-headed Flying-fox	#	R
Pteropus scapulatus	Little red Flying-fox		
Syconycteris australis	Common Blossum Bat		
EMBALLONURIDAE (SHEATHTAIL BATS)			
Saccolaimus flaviventris	Yellow-bellied Sheathtail Bat		
RHINOLOPHIDAE (HORSESHOE BATS)			
Rhinolophus megaphyllus	Eastern Horseshoe Bat		R
VESPERTILIONIDAE (EVENING BATS)			
Chalinolobus dwyeri	Large-eared Pied Bat	#	R
Chalinolobus gouldii	Gould's Wattled Bat		R
Chalinolobus morio	Chocolate Wattled Bat		R
Falsistrellus tasmaniensis	Eastern False Pipistrelle		
Miniopterus australis	Little Bentwing Bat	#	R
Miniopterus orianae oceanensis	Large Bentwing Bat	#	R
Myotis macropus	Southern Myotis	#	R
Nyctophilus corbeni	Corben's Long-eared Bat		
Nyctophilus geoffroyi	Lesser Longeared Bat		
Nyctophilus gouldi	Gould's Longeared Bat		
Nyctophilus sp.	Longeared Bat		R
Phoniscus papuensis	Golden-tipped Bat		
Scoteanax rueppellii	Greater Broadnosed Bat	#	R
Scotorepens balstoni	Inland Broadnosed Bat		
Scotorepens orion	Eastern Broadnosed Bat		R
Vespadelus darlingtoni	Large Forest Bat		
Vespadelus pumilus	Eastern Forest Bat		
Vespadelus regulus	Southern Forest Bat		
Vespadelus troughtoni	Eastern Cave Bat		
Vespadelus vulturnus	Little Forest Bat		R
MOLOSSIDAE (FREETAIL BATS)			
Micronomus norfolkensis	East-coast Freetail Bat	#	R
Mormopterus planiceps	Southern Freetail Bat		
Mormopterus ridei	Eastern Freetail Bat		
Nyctinomus australis	White-striped Freetail Bat		R
MURIDAE			
Hydromys chrysogaster	Water-rat		
Mastacomys fuscus	Broad-toothed Rat		
Melomys burtoni	Grassland Melomys		
*Mus musculus**	House Mouse		R
Pseudomys gracilicaudatus	Eastern Chestnut Mouse		
Pseudomys novaehollandiae	New Holland Mouse		
Pseudomys oralis	Hastings River Mouse		
Rattus fuscipes	Bush Rat		
Rattus lutreolus	Swamp Rat		
*Rattus norvegicus**	Brown Rat		
*Rattus rattus**	Black Rat		R
DUGONGIDAE			
Dugong dugon	Dugong		
OTARIIDAE			
Arctocephalus pusillus	Australian Fur-seal		
CANIDAE			
*Canis familiaris**	Domestic/feral Dog		R
Canis lupus dingo	Dingo		

	Scientific Name	Common Name		
	*Vulpes vulpes**	Fox	R	s
FELIDAE				
	*Felis catus**	Cat	R	
LEPORIDAE				
	*Lepus capensis**	Brown Hare		
	*Oryctolagus cuniculus**	Rabbit		
EQUIDAE				
	*Equus caballus**	Horse		
SUIDAE				
	*Sus scrofa**	Pig		
BOVIDAE				
	*Bos taurus**	Feral cattle		
	*Capra hircus**	Goat		
	*Ovis aries**	Sheep		
BIRDS				
CASUARIIDAE				
	Dromaius novaehollandiae	Emu		
MEGAPODIIDAE				
	Alectura lathami	Australian Brush-turkey		
PHASIANIDAE				
	Coturnix pectoralis	Stubble Quail		
	Coturnix ypsilophora	Brown Quail		
	Coturnix chinensis	King Quail		
	*Gallus gallus**	Red Junglefowl (Domestic chicken)		
ANSERANATIDAE				
	Anseranas semipalmata	Magpie Goose		
ANATIDAE				
	Dendrocygna eytoni	Plumed Whistling-duck		
	Dendrocygna arcuata	Wandering Whistling-duck		
	Oxyura australis	Blue-billed Duck		
	Biziura lobata	Musk Duck		
	Stictonetta naevosa	Freckled Duck		
	Cygnus atratus	Black Swan		
	Tadorna tadornoides	Australian Shelduck		
	Chenonetta jubata	Wood Duck	R	
	*Anas platyrhychos**	Mallard		
	Anas superciliosa	Pacific Black Duck	R	
	Anas rhynchotis	Australasian Shoveler		
	Anas gracilis	Grey Teal		
	Anas castanea	Chestnut Teal		
	Anas querquedula	Garganey		
	Malacorhynchus membranaceus	Pink-eared Duck		
	Aythya australis	Hardhead		
PODICIPEDIDAE				
	Tachybaptus novaehollandiae	Australasian Grebe		
	Poliocephalus poliocephalus	Hoary-headed Grebe		
	Podiceps cristatus	Great Crested Grebe		
ANHINGIDAE				
	Anhinga melanogaster	Darter		
PHALACROCORACIDAE				
	Phalacrocorax melanoleucos	Little Pied Cormorant		
	Phalacrocorax varius	Pied cormorant		
	Phalacrocorax sulcirostris	Little Black Cormorant		
	Phalacrocorax carbo	Great Cormorant		
PELECANIDAE				
	Pelecanus conspicillatus	Australian Pelican		

	Scientific Name	Common Name	
ARDEIDAE			
	Egretta novaehollandiae	White-faced Heron	R
	Egretta garzetta	Little Egret	
	Egretta sacra	Eastern Reef Egret	
	Ardea pacifica	White-necked Heron	
	Ardea alba	Great Egret	
	Ardea intermedia	Intermediate Egret	
	Ardea ibis	Cattle Egret	
	Butorides striatus	Striated Heron	
	Nycticorax caledonicus	Nankeen Night Heron	
	Ixobrychus minutus	Little Bittern	
	Ixobrychus flavicollis	Black Bittern	
	Botaurus poiciloptilus	Australasian Bittern	
THRESKIORNITHIDAE			
	Plegadis falcinellus	Glossy Ibis	
	Threskiornis molucca	Australian White Ibis	
	Threskiornis spinicollis	Straw-necked Ibis	
	Platalea regia	Royal Spoonbill	
	Platalea flavipes	Yellow-billed Spoonbill	
CICONIIDAE			
	Ephippiorhynchus asiaticus	Black-necked Stork	
ACCIPITRIDAE			
	Pandion haliaetus	Osprey	
	Aviceda subcristata	Pacific Baza	
	Elanus axillaris	Black-shouldered Kite	
	Lophoictinia isura	Square-tailed Kite	
	Milvus migrans	Black Kite	
	Haliastur sphenurus	Whistling Kite	
	Haliastur indus	Brahminy Kite	
	Haliaeetus leucogaster	White-bellied Sea-eagle	
	Circus assimilis	Spotted Harrier	
	Circus approximans	Swamp Harrier	
	Accipiter fasciatus	Brown Goshawk	R
	Accipiter novaehollandiae	Grey Goshawk	
	Accipiter cirrhocephalus	Collared Sparrowhawk	
	Aquila audax	Wedge-tailed Eagle	
	Hieraaetus morphnoides	Little Eagle	
FALCONIDAE			
	Falco berigora	Brown Falcon	
	Falco longipennis	Australian Hobby	
	Falco subniger	Black Falcon	
	Falco peregrinus	Peregrine Falcon	
	Falco cenchroides	Nankeen Kestrel	
RALLIDAE			
	Gallirallus philippensis	Buff-banded Rail	
	Rallus pectoralis	Lewins Rail	
	Porzana pusilla	Baillons Crake	
	Porzana fluminea	Australian Spotted Crake	
	Porzana tabuensis	Spotless Crake	
	Porphyrio porphyrio	Purple Swamphen	
	Gallinula tenebrosa	Dusky Moorhen	
	Fulica atra	Eurasian Coot	
TURNICIDAE			
	Turnix velox	Little Button-quail	
	Turnix varia	Painted Button-quail	
SCOLOPACIDAE			
	Gallinago hardwickii	Lathams Snipe	

	Scientific Name	Common Name	
	Limosa limosa	Black-tailed Godwit	
	Limosa lapponica	Bar-tailed Godwit	
	Numenius phaeopus	Whimbrel	
	Numenius madagascariensis	Eastern Curlew	
	Tringa stagnatilis	Marsh Sandpiper	
	Tringa nebularia	Common Greenshank	
	Tringa glareola	Wood Sandpiper	
	Xenus cinereus	Terek Sandpiper	
	Actitis hypoleucos	Common Sandpiper	
	Heteroscelus brevipes	Grey-tailed Tattler	
	Arenaria interpres	Ruddy Turnstone	
	Limnodromus semipalmatus	Asian Dowitcher	
	Calidris tenuirostris	Great Knot	
	Calidris canutus	Red Knot	
	Calidris alba	Sanderling	
	Calidris ruficollis	Red-necked Stint	
	Calidris melanotos	Pectoral Sandpiper	
	Calidris acuminata	Sharp-tailed Sandpiper	
	Calidris ferruginea	Curlew Sandpiper	
	Limicola falcinellus	Broad-billed Sandpiper	
	Philomachus pugnax	Ruff	
ROSTRATULIDAE			
	Rostratula benghalensis	Painted Snipe	
JACANIDAE			
	Irediparra gallinacea	Comb-crested Jacana	
BURHINIDAE			
	Burhinus grallarius	Bush Stone-curlew	
	Esacus neglectus	Beach Stone-curlew	
HAEMATOPODIDAE			
	Haematopus longirostris	Pied Oystercatcher	
	Haematopus fuliginosus	Sooty Oystercatcher	
RECURVIROSTRIDAE			
	Cladorhynchus leucocephalus	Banded Stilt	
	Himantopus himantopus	Pied Stilt	
	Recurvirostra novaehollandiae	Red-necked Avocet	
CHARADRIIDAE			
	Charadrius bicinctus	Double-banded Plover	
	Charadrius mongolus	Lesser Sand Plover	
	Charadrius ruficapillus	Red-capped Plover	
	Elseyornis melanops	Black-fronted Dotterel	
	Erythrogonys cinctus	Red-kneed Dotterel	
	Pluvialis fulva	Pacific Golden Plover	
	Pluvialis squatarola	Grey Plover	
	Vanellus miles	Masked Lapwing	R
	Vanellus tricolor	Banded Lapwing	
LARIDAE			
	Chlidonias hybridus	Whiskered Tern	
	Chlidonias leucopterus	White-winged Black Tern	
	Larus novaehollandiae	Silver Gull	
	Larus pacificus	Pacific Gull	
	Sterna albifrons	Little Tern	
	Sterna bergii	Crested Tern	
	Sterna caspia	Caspian Tern	
COLUMBIDAE			
	*Columba livia**	Feral Pigeon	
	Columba leucomela	White-headed Pigeon	
	*Streptopelia chinensis**	Spotted Turtle-dove	R

	Scientific Name	Common Name	
	Macropygia amboinensis	Brown Cuckoo-dove	
	Chalcophaps indica	Emerald Dove	
	Phaps chalcoptera	Common Bronzewing	
	Phaps elegans	Brush Bronzewing	
	Ocyphaps lophotes	Crested Pigeon	
	Geopelia cuneata	Diamond Dove	
	Geopelia striata	Peaceful Dove	
	Geopelia humeralis	Bar-shouldered Dove	
	Leucosarcia melanoleuca	Wonga Pigeon	
	Ptilinopus magnificus	Wompoo Fruit-dove	
	Ptilinopus superbus	Superb Fruit-dove	
	Ptilinopus regina	Rose-crowned Fruit-dove	
	Lopholaimus antarcticus	Topknot Pigeon	
CACATUIDAE			
	Calyptorhynchus lathami	Glossy Black-cockatoo	
	Calyptorhynchus funereus	Yellow-tailed Black-cockatoo	
	Callocephalon fimbriatum	Gang-gang Cockatoo	
	Cacatua roseicapilla	Galah	R
	Cacatua tenuirostris	Long-billed Corella	
	Cacatua sanguinea	Little Corella	R
	Cacatua galerita	Sulphur-crested Cockatoo	R
PSITTACIDAE			
	Trichoglossus haematodus	Rainbow Lorikeet	R
	Trichoglossus chlorolepidotus	Scaly-breasted Lorikeet	R
	Glossopsitta concinna	Musk Lorikeet	
	Glossopsitta pusilla	Little Lorikeet	
	Alisterus scapularis	King Parrot	R
	Platycercus elegans	Crimson Rosella	
	Platycercus eximius	Eastern Rosella	R
	Lathamus discolor	Swift Parrot	
	Psephotus haematonotus	Red-rumped Parrot	
	Neophema pulchella	Turquoise Parrot	
	Pezoporus wallicus	Ground Parrot	
CUCULIDAE			
	Cuculus saturatus	Oriental Cuckoo	
	Cuculus pallidus	Pallid Cuckoo	
	Cacomantis variolosus	Brush Cuckoo	
	Cacomantis flabelliformis	Fan-tailed Cuckoo	
	Chrysococcyx osculans	Black-eared Cuckoo	
	Chrysococcyx basalis	Horsefields Bronze-cuckoo	
	Chrysococcyx lucidus	Shining Bronze-cuckoo	
	Chrysococcyx minutillus	Little Bronze-cuckoo	
	Eudynamys scolopacea	Common Koel	
	Scythrops novaehollandiae	Channel-billed Cuckoo	
CENTROPODIDAE			
	Centropus phasianinus	Pheasant Coucal	
STRIGIDAE			
	Ninox strenua	Powerful Owl	
	Ninox connivens	Barking Owl	
	Ninox novaeseelandiae	Southern Boobook Owl	
TYTONIDAE			
	Tyto tenebricosa	Sooty Owl	
	Tyto novaehollandiae	Masked Owl	
	Tyto capensis	Grass Owl	
	Tyto alba	Barn Owl	
PODARGIDAE			
	Podargus strigoides	Tawny Frogmouth	R

Scientific Name	Common Name	
CAPRIMULGIDAE		
Eurostopodus mystacalis	White-throated Nightjar	
Eurostopodus argus	Spotted Nightjar	
AEGOTHELIDAE		
Aegotheles cristatus	Owlet-nightjar	
APODIDAE		
Hirundapus caudacutus	Spine-tailed Swift	
Apus pacificus	Fork-tailed Swift	
ALCEDINIDAE		
Alcedo azurea	Azure Kingfisher	
HALCYONIDAE		
Dacelo novaeguineae	Laughing Kookaburra	R
Halcyon macleayii	Forest Kingfisher	
Halcyon pyrrhopygia	Red-backed Kingfisher	
Todiramphus sanctus	Sacred Kingfisher	
MEROPIDAE		
Merops ornatus	Rainbow Bee-eater	
CORACIIDAE		
Eurystomus orientalis	Dollarbird	
PITTIDAE		
Pitta versicolor	Noisy Pitta	
MENURIDAE		
Menura novaehollandiae	Superb Lyrebird	
ATRICHORNITHIDAE		
Atrichornis rufescens	Rufous Scrub-bird	
CLIMACTERIDAE		
Cormobates leucophaeus	White-throated Treecreeper	
Climacteris erythrops	Red-browed Treecreeper	
Climacteris picumnus	Brown Treecreeper	
MALURIDAE		
Malurus cyaneus	Superb Fairy-wren	R
Malurus lamberti	Variegated Fairy-wren	
Malurus melanocephalus	Red-backed Fairy-wren	
Stipiturus malachurus	Southern Emu-wren	
PARDALOTIDAE		
Pardalotus punctatus	Spotted Pardalote	R
Pardalotus striatus	Striated Pardalote	
Pycnoptilus floccosus	Pilotbird	
Origma solitaria	Rockwarbler	
Sericornis citreogularis	Yellow-throated Scrubwren	
Sericornis frontalis	White-browed Scrubwren	R
Sericornis magnirostris	Large-billed Scrubwren	
Hylacola pyrrhopygia	Chestnut-rumped Heathwren	
Chthonicola sagittata	Speckled Warbler	
Smicrornis brevirostris	Weebill	
Gerygone mouki	Brown Warbler	
Gerygone levigaster	Mangrove Warbler	
Gerygone fusca	Western Warbler	
Gerygone olivacea	White-throated Warbler	
Acanthiza pusilla	Brown Thornbill	
Acanthiza reguloides	Buff-rumped Thornbill	
Acanthiza chrysorrhoa	Yellow-rumped Thornbill	
Acanthiza nana	Yellow Thornbill	
Acanthiza lineata	Striated Thornbill	R
Aphelocephala leucopsis	Southern Whiteface	
MELIPHAGIDAE		
Acanthagenys rufogularis	Spiny-cheeked Honeyeater	

	Scientific Name	Common Name	
	Anthochaera carunculata	Red Wattlebird	R
	Anthochaera chrysoptera	Little Wattlebird	
	Plectorhyncha laceolata	Striped Honeyeater	
	Philemon corniculatus	Noisy Friarbird	R
	Philemon citreogularis	Little Friarbird	
	Xanthomyza phrygia	Regent Honeyeater	
	Entomyzon cyanotis	Blue-faced Honeyeater	R
	Manorina melanophrys	Bell Miner	
	Manorina melanocephela	Noisy Miner	R
	Meliphaga lewinii	Lewins Honeyeater	
	Lichenostomus chrysops	Yellow-faced Honeyeater	R
	Lichenostomus virescens	Singing Honeyeater	
	Lichenostomus leucotis	White-eared Honeyeater	
	Lichenostomus melanops	Yellow-tufted Honeyeater	
	Lichenostomus fuscus	Fuscous Honeyeater	
	Lichenostomus penicillatus	White-plumed Honeyeater	
	Melithreptus gularis	Black-chinned Honeyeater	
	Melithreptus brevirostris	Brown-headed Honeyeater	
	Melithreptus lunatus	White-naped Honeyeater	R
	Lichmera indistincta	Brown Honeyeater	
	Grantiella picta	Painted Honeyeater	
	Phylidonyris pyrrhoptera	Crescent Honeyeater	
	Phylidonyris novaehollandiae	New Holland Honeyeater	
	Phylidonyris nigra	White-cheeked Honeyeater	
	Phylidonyris melanops	Tawny-crowned Honeyeater	
	Acanthorhynchus tenuirostris	Eastern Spinebill	R
	Myzomela sanguinolenta	Scarlet Honeyeater	R
	Epthianura albifrons	White-fronted Chat	
PETROICIDAE			
	Microeca fascinans	Jacky Winter	
	Petroica multicolor	Scarlet Robin	
	Petroica goodenovii	Red-capped Robin	
	Petroica phoenicea	Flame Robin	
	Petroica rosea	Rose Robin	R
	Melanodryas cucullata	Hooded Robin	
	Tregellasia capito	Pale-yellow Robin	
	Eopsaltria australis	Eastern Yellow Robin	
ORTHONYCHIDAE			
	Orthonyx temminckii	Logrunner	
POMATOSTOMIDAE			
	Pomatostomus temporalis	Grey-crowned Babbler	
	Pomatostomus superciliosus	White-browed Babbler	
CINCLOSOMATIDAE			
	Psophodes olivaceus	Eastern Whipbird	
	Cinclosoma punctatum	Spotted Quail-thrush	
NEOSITTIDAE			
	Daphoenositta chrysoptera	Varied Sittella	
PACHYCEPHALIDAE			
	Colluricincla harmonica	Grey Shrike-thrush	
	Falcunculus frontatus	Crested Shrike-tit	
	Pachycephala olivacea	Olive Whistler	
	Pachycephala pectoralis	Golden Whistler	R
	Pachycephala rufiventris	Rufous Whistler	
DICRURIDAE			
	Monarcha melanopsis	Black-faced Monarch	
	Monarcha trivirgatus	Spectacled Monarch	
	Myiagra rubecula	Leaden Flycatcher	

	Scientific Name	Common Name	
	Myiagra cyanoleuca	Satin Flycatcher	
	Myiagra inquieta	Restless Flycatcher	
	Grallina cyanoleuca	Magpie-lark	R
	Rhipidura rufifrons	Rufous Fantail	
	Rhipidura fuliginosa	Grey Fantail	R
	Rhipidura leucophrys	Willy Wagtail	R
	Dicrurus bracteatus	Spangled Drongo	
CAMPEPHAGIDAE			
	Coracina novaehollandiae	Black-faced Cuckoo-shrike	R
	Coracina lineata	Barred Cuckoo-shrike	
	Coracina papuensis	White-bellied Cuckoo-shrike	
	Coracina tenuirostris	Cicadabird	
	Coracina maxima	Ground Cuckoo-shrike	
	Lalage sueurii	White-winged Triller	
	Lalage leucomela	Varied Triller	
ORIOLIDAE			
	Oriolus sagittatus	Olive-backed Oriole	
	Sphecotheres viridis	Figbird	
ARTAMIDAE			
	Artamus leucorynchus	White-breasted Woodswallow	
	Artamus personatus	Masked Woodswallow	
	Artamus superciliosus	White-browed Woodswallow	
	Artamus cyanopterus	Dusky Woodswallow	
	Artamus minor	Little Woodswallow	
	Cracticus torquatus	Grey Butcherbird	R
	Cracticus nigrogularis	Pied Butcherbird	R
	Gymnorhina tibicen	Australian Magpie	R
	Strepera graculina	Pied Currawong	R
	Strepera versicolor	Grey Currawong	
PARADISAEIDAE			
	Ptiloris paradiseus	Paradise Riflebird	
CORVIDAE			
	Corvus coronoides	Australian Raven	R
	Corvus tasmanicus	Forest Raven	
	Corvus mellori	Little Raven	
	Corvus orru	Torresian Crow	
CORCORACIDAE			
	Corcorax melanorhamphos	White-winged Chough	
PTILONORHYNCHIDAE			
	Ailuroedus crassirostris	Green Catbird	
	Sericulus chrysocephalus	Regent Bowerbird	
	Ptilonorhynchus violaceus	Satin Bowerbird	
ALAUDIDAE			
	Mirafra javanica	Singing Bushlark	
	*Alauda arvensis**	Skylark	
MOTACILLIDAE			
	Anthus novaeseelandiae	Richards Pipit	
PASSERIDAE			
	*Passer domesticus**	House Sparrow	
	Taeniopygia guttata	Zebra Finch	
	Taeniopygia bichenovii	Double-barred Finch	R
	Neochmia modesta	Plum-headed Finch	
	Neochmia temporalis	Red-browed Finch	R
	Stagonopleura guttata	Diamond Firetail Finch	
	*Lonchura punctulata**	Nutmeg Mannikin	
	Lonchura castaneothorax	Chestnut-breasted Mannikin	
FRINGILLIDAE			

	Scientific Name	Common Name	
	*Carduelis carduelis**	European Goldfinch	
DICAEIDAE			
	Dicaeum hirundinaceum	Mistletoebird	
HIRUNDINIDAE			
	Cheramoeca leucosternus	White-backed Swallow	
	Hirundo neoxena	Welcome Swallow	R
	Hirundo nigricans	Tree Martin	
	Hirundo ariel	Fairy Martin	
PYCNONOTIDAE			
	*Pycnonotus jocosus**	Red-whiskered Bulbul	
SYLVIIDAE			
	Acrocephalus stentoreus	Clamorous Reed-warbler	
	Megalurus timoriensis	Tawny Grassbird	
	Megalurus gramineus	Little Grassbird	
	Cincloramphus mathewsi	Rufous Songlark	
	Cincloramphus cruralis	Brown Songlark	
	Cisticola exilis	Golden-headed Cisticola	
ZOSTEROPIDAE			
	Zosterops lateralis	Silvereye	R
MUSCICAPIDAE			
	Zoothera heinei	Russet-tailed Thrush	
	Zoothera lunulata	Bassian Thrush	
	*Turdus merula**	Blackbird	
STURNIDAE			
	*Sturnus vulgaris**	Starling	
	*Acridotheres tristis**	Indian Myna	
REPTILES			
CHELONIIDAE			
	Chelonia mydas	Green Turtle	
CHELUIDAE			
	Chelodina longicollis	Long-necked Turtle	
	Emydura macquarii gunabarra	Hunter River Turtle	
GEKKONIDAE			
	Diplodactylus vittatus	Stone Gecko	
	Oedura lesueurii	Lesueur's Velvet Gecko	
	Oedura robusta	Robust Velvet Gecko	
	Phyllurus platurus	Southern Leaf-tailed Gecko	
	Underwoodisauris milii	Thick-tailed Gecko	
PYGOPODIDAE			
	Delma plebeia		
	Lialis burtonis	Burton's Legless Lizard	
	Pygopus lepidopodus	Common Scaly-foot	
AGAMIDAE			
	Amphibolurus nobbi	Nobbi	
	Amphibolurus muricatus	Jacky Lizard	
	Hypsilurus spinipes	Southern Angle-headed Dragon	
	Physignathus lesueurii	Eastern Water Dragon	
	Pogona barbata	Bearded Dragon	
	Tympanocryptis diemensis	Mountain Dragon	
VARANIDAE			
	Varanus gouldii	Sand Monitor	
	Varanus rosenbergi	Rosenbergs Goanna	
	Varanus varius	Lace Monitor	
SCINCIDAE			
	Acritoscincus platynotum	Red-throated Skink	
	Anomalopus swansoni		

	Scientific Name	Common Name	
	Anomalopus verreauxi		
	Calyptotis ruficauda		
	Carlia tetradactyla		
	Carlia vivax		
	Cryptoblepharus virgatus		
	Ctenotus robustus	Robust Skink	R
	Ctenotus taeniolatus	Copper-tailed Skink	
	Cyclodomorphus casuarinae	She-oak Skink	
	Egernia cunninghami	Cunninghams Skink	
	Egernia major	Land Mullet	
	Egernia mcpheei		
	Egernia striolata	Tree Skink	
	Egernia whitii	Whites Skink	
	Eulamprus heatwolei		
	Eulamprus kosciuskoi	Alpine Water Skink	
	Eulamprus murrayi	Murrays Skink	
	Eulamprus quoyii	Eastern Water Skink	
	Eulamprus tenuis	Yellow-bellied Skink	
	Hemiergis decresiensis		
	Hemisphaeriodon gerrardii	Pink Tongued Skink	
	Lampropholis caligula		
	Lampropholis delicata	Garden Skink	R
	Lampropholis guichenoti	Garden Skink	
	Lygisaurus foliorum		
	Morethia boulengeri		
	Ophioscincus truncatus		
	Pseudemoia entrecasteauxii		
	Pseudemoia platynota	Red-throated Skink	
	Saiphos equalis	Three-toed Skink	
	Saproscincus challengeri	Challengers Skink	
	Saproscincus mustelinus	Weasel Skink	
	Tiliqua scincoides	Blue-tongued Lizard	
TYPHLOPIDAE			
	Ramphotyphlops nigrescens		
	Ramphotyphlops proximus		
	Ramphotyphlops wiedii		
BOIDAE			
	Morelia spilota spilota	Diamond Python	
COLUBRIDAE			
	Boiga irregularis	Brown Tree Snake	
	Dendrelaphis punctulata	Green Tree Snake	
ELAPIDAE			
	Acanthophis antarcticus	Common Death Adder	
	Austrelaps superbus	Copperhead	
	Cacophis krefftii	Dwarf Crowned Snake	
	Cacophis squamulosus	Golden Crowned Snake	
	Demansia psammophis	Yellow-faced Whip Snake	
	Drysdalia coronoides	White-lipped Snake	
	Furina diadema	Red-naped Snake	
	Hemiaspis signata	Black-bellied Swamp Snake	
	Hoplocephalus bungaroides	Broad-headed Snake	
	Hoplocephalus bitorquatus	Pale-headed Snake	
	Hoplocephalus stephensii	Stephens Banded Snake	
	Notechis scutatus	Tiger Snake	
	Pseudechis guttatus	Blue-bellied Black Snake	
	Pseudechis porphyriacus	Red-bellied Black Snake	
	Pseudonaja textilis	Eastern Brown Snake	

Scientific Name	Common Name	
Rhinoplocephalus nigrescens	Eastern Small-eyed Snake	
Tropidechis carinatus	Rough-scaled Snake	
Vermicella annulata	Bandy-bandy	
HYDROPHIIDAE		
Hydrophis elegans		
Pelamis platurus	Yellow-bellied Sea Snake	
FROGS		
MYOBATRACHIDAE		
Adelotus brevis	Tusked Frog	
Crinia signifera	Brown Froglet	R
Crinia tinnula	Wallum Frog	
Heleioporous australiacus	Giant Burrowing Frog	
Lechriodus fletcheri	Fletchers Frog	
Limnodynastes dumerilii	Banjo Frog	
Limnodynastes ornatus	Ornate Burrowing Frog	
Limnodynastes peronii	Striped Marsh Frog	R
Limnodynastes tasmaniensis	Spotted Marsh Frog	R
Mixophyes fasciolatus	Great Barred Frog	
Mixophyes balbus	Great Barred Frog	
Mixophyes iteratus	Great Barred Frog	
Paracrinia haswelli	Haswells Froglet	
Philoria sphagnicolus	Sphagnum Frog	
Pseudophryne australis	Red-crowned Toadlet	
Pseudophryne bibronii	Bibron's Toadlet	
Pseudophryne coriacea	Red-backed Toadlet	
Uperoleia fusca	Dusky Toadlet	
Uperoleia laevigata	Smooth Toadlet	
Uperoleia mahonyi	Mahony's Toadlet	
Uperoleia rugosa	Eastern Burrowing Toadlet	
Uperoleia tyleri	Tyler's Toadlet	
HYLIDAE		
Litoria aurea	Green and Golden Bell Frog	
Litoria brevipalmata	Green-thighed Frog	
Litoria caerulea	Green Tree Frog	
Litoria chloris	Red-eyed Tree Frog	
Litoria citropa	Blue Mountains Tree Frog	
Litoria daviesae		
Litoria dentata	Bleating Tree Frog	
Litoria fallax	Dwarf Green Tree Frog	R
Litoria freycineti	Freycinet's Frog	
Litoria gracilenta	Dainty Tree Frog	
Litoria jervisiensis	Heath Frog	
Litoria latopalmata	Broad-palmed Frog	
Litoria lesueuri	Lesueur's Frog	
Litoria nasuta	Rocket Frog	
Litoria peronii	Peron's Tree Frog	R
Litoria phyllochroa	Green Leaf Tree Frog	
Litoria revelata	Whirring Tree Frog	
Litoria subglandulosa	New England Tree Frog	
Litoria tyleri	Tyler's Tree Frog	
Litoria verreauxii	Verreaux's Tree Frog	R

APPENDIX – B Site Visit Record

Site: 256 Paterson Road, Bolwarra, NSW

Date	Time	Weather conditions	Activity
17.4.24	1245-1410	Part cloud, light breeze, warm	Initial site inspection, habitat investigation
24.4.24	10.30-13.40	Overcast, still, warm	Fauna observations, Koala search and survey, bird plot, reptile search, frog search, hollow bearing tree locate, habitat investigation
29.4.24	1400-1715	Light cloud, still, warm	Set traps, fauna observations, bird plot, reptile search, frog search, Koala search
29.4.24 night	1715-2040	Light cloud, still, warm	Fauna observations, reptile search, frog search, Koala search, spotlighting, frog call playback, bat call recording, owl call playback, listening
30.4.24	0700-1030	Overcast, light breeze, mild	Check traps, set field cameras and hair tubes, fauna observations, koala search, bird plot, reptile search, frog search
1.5.24	0715-0930	Overcast, still, mild	Check traps, fauna observations, Koala search, habitat investigation
2.5.24	0700-0815	Overcast, still, cool	Check traps, fauna observations, Koala search
2.5.24 night	1745-2000	Part cloud, still, mild	Fauna observations, spotlighting, frog search, frog call playback, bat call recording, owl call playback, listening, Koala search
3.5.24	0700-1130	Part cloud, still, mild	Check traps, pull in traps, fauna observations, bird plot, Koala search, reptile search
7.5.24 night	1720-2000	Part cloud, still, mild	Fauna observations, spotlighting, frog search, bat call recording, owl call playback, listening, Koala search
8.5.24	0700-1030	Part cloud, still, mild	Collect cameras, hair tubes and bat call detectors, fauna observations, bird plot

APPENDIX – C Regionally Significant Populations and Ecosystems

Regionally significant populations and ecosystems are addressed considering Maitland City Councils "Maitland Greening Plan" (last updated 2018).

Significant Fauna Species

- EPBC Act 1999 listed species; addressed elsewhere in this report
- BC Act 2016 listed species; addressed elsewhere in this report
- Fauna of Regional Significance
- Fauna identified as being significant including threatened fauna species listed under the Biodiversity Conservation Act 2016 are listed and dealt with elsewhere in this report.

Significant Vegetation Communities

- EPBC Act 1999 listed ecological communities; addressed elsewhere in a separate report
- BC Act listed ecological communities; addressed elsewhere in a separate report
- Native vegetation corridors; addressed elsewhere in this report

Significant Habitat

- Vegetation communities and flora are identified and discussed in a separate flora report for the site
- Habitat for significant species, including rock outcrop, hollow bearing trees, mudflats, dead stags, and intertidal areas; addressed elsewhere in this report
- Native vegetation corridors; addressed elsewhere in this report

APPENDIX - D EPBC Act matters

Under the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) an action will require approval from the Australian Government Environment Minister if the action has, will have or is likely to have, a significant impact on a matter of National Environmental Significance.

This component of the report will be guided by the Matters of National Environmental Significance – "Significant Impact Guidelines", 1.1 Environment Protection and Biodiversity Conservation Act 1999.

The matters of national environmental significance are:

- World Heritage Properties
- National Heritage Places
- Wetlands of International Importance (Ramsar wetland)
- Nationally Threatened Species and Ecological Communities
- Migratory species (protected under international agreements ie CAMBA & JAMBA)
- Commonwealth Marine areas
- The Great Barrier Reef Marine Park
- Nuclear actions (including uranium mining)
- A water resource, in relation to coal seam gas development and large coal mining development

An EPBC Act Protected Matters Report was generated using the EPBC Act Protected Matters Search Tool on the Department of the Environment and Heritage web site.

Report created:	**15 April 2024**
Search Type:	**Point**
Buffer:	**10 km**
Coordinates:	

Summary

World Heritage Properties:	**None**
National Heritage Places:	**None**
Wetlands of International Importance (Ramsar wetland):	**1**
Great Barrier Reef Marine Park:	**None**
Commonwealth Marine Areas:	**None**
Listed Threatened Ecological Communities:	**8**
Listed Threatened Species:	**57**
Listed Migratory Species:	**18**

a) World Heritage Properties

Significant Impact Criteria
An action is likely to have a significant impact on the World Heritage values of a declared **World Heritage property** if there is a real chance or possibility that it will cause:

- one or more of the World Heritage values to be lost
- one or more of the World Heritage values to be degraded or damaged
- one or more of the World Heritage values to be notably altered, modified, obscured or diminished

Response to criteria
The site is not part of, adjacent to or within 10km of a World Heritage Property. The proposed development / action is unlikely to have a significant impact on World Heritage values.

b) National Heritage Places

Significant Impact Criteria
An action is likely to have a significant impact on the National Heritage values of a **National Heritage place** if there is a real chance or possibility that it will cause:

- one or more of the National Heritage values to be lost
- one or more of the National Heritage values to be degraded or damaged
- one or more of the National Heritage values to be notably altered, modified, obscured or diminished

Response to criteria
The site is not part of, adjacent to or within 10km of a National Heritage Place. The proposed development / action is unlikely to have a significant impact on National Heritage values.

c) Wetlands of International Importance (Ramsar wetland)

Significant Impact Criteria
An action is likely to have a significant impact on the ecological character of a declared **Ramsar wetland** if there is a real chance or possibility that it will result in:

- areas of the wetland being destroyed or substantially modified
- a substantial and measurable change in the hydrological regime of the wetland, for example, a substantial change to the volume, timing, duration, and frequency of ground and surface water flows to and within the wetland
- the habitat or lifecycle of native species, including invertebrate fauna and fish species, dependent upon the wetland being seriously affected
- a substantial and measurable change in the water quality of the wetland – for example, a substantial change in the level of salinity, pollutants or nutrients in the wetland, or water temperature which may adversely impact on biodiversity, ecological integrity, social amenity or human health, or
- an invasive species that is harmful to the ecological character of the wetland being established (or an existing invasive species being spread) in the wetland.

Response to criteria
The subject land and site is located in a straight line at least 15 kilometres north-west of the "**Hunter Estuary Wetlands**". Surface water flows northward from the site via minor tributaries into the Paterson River which then flows southward into the Hunter River. The distance from the site via watercourses to the Hunter Estuary Wetlands will be far greater than 15km.

The proposed development is unlikely to affect the Hunter Estuary Wetlands.

d) Commonwealth Marine Areas

Note - the Commonwealth marine area is any part of the sea, including the waters, seabed, and airspace, within Australia's exclusive economic zone and/or over the continental shelf of Australia, that is not State or Northern Territory waters. The Commonwealth marine area stretches from 3 to 200 nautical miles from the coast.

Significant Impact Criteria
An action is likely to have a significant impact on the environment in a **Commonwealth Marine area** if there is a real chance or possibility that it will:

- result in a known or potential pest species becoming established in the Commonwealth marine area
- modify, destroy, fragment, isolate or disturb an important or substantial area of habitat such that an adverse impact on marine ecosystem functioning or integrity in a Commonwealth Marine area results
- have a substantial adverse effect on a population of a marine species or cetacean including its life cycle (for example, breeding, feeding, migration behavior, life expectancy) and spatial distribution
- result in a substantial change in air quality or water quality (including temperature) which may adversely impact on biodiversity, ecological integrity; social amenity or human health
- result in persistent organic chemicals, heavy metals, or other potentially harmful chemicals accumulating in the marine environment such that biodiversity, ecological integrity, social amenity or human health may be adversely affected, or
- have a substantial adverse impact on heritage values of the Commonwealth Marine area, including damage or destruction of an historic shipwreck.

Response to criteria
The site is greater than 1km inland from the coast and activities for the proposed development are unlikely to have a significant impact at the coast. The site is not part of or within a Commonwealth Marine area. The proposed development / action is unlikely to have a significant impact on a Commonwealth Marine area.

e) Threatened Ecological Communities

Significant Impact Criteria
An action is likely to have a significant impact on a **critically endangered or endangered ecological community** if there is a real chance or possibility that it will:

- reduce the extent of an ecological community
- fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines
- adversely affect habitat critical to the survival of an ecological community
- modify or destroy abiotic (non living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns
- cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting
- cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to:
  - assisting invasive species, that are harmful to the listed ecological community, to become established, or
  - causing regular mobilization of fertilizers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of a species in the ecological community, or
- interfere with the recovery of an ecological community.

Response to criteria
The site is not part of or adjacent to a critically endangered or endangered ecological community listed in the EPBC Act Protected Matters Report (15.4.24) and identified as

- **Central Hunter Valley eucalypt forest and woodland**
- **Coastal Swamp Oak (Casuarina glauca) Forest of NSW and South East Queensland ecological community**
- **Coastal Swamp Sclerophyll Forest of NSW and South East Qld**
- **Kurri sand swamp woodland of the Sydney Basin bioregion**
- **Lowland Rainforest of Subtropical Australia**
- **River-flat eucalypt forest on coastal floodplains of southern NSW and eastern Vic**
- **Subtropical eucalypt floodplain forest and woodland of the NSW North Coast and South East Qld bioregions**
- **White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland**

The site is not within the current extent of "Central Hunter Valley eucalypt forest and woodland". Furthermore, the presence of Red Ironbark (*Eucalyptus fibrosa*) as a common tree on the site precludes the vegetation community on the site from being identified as Central Hunter Valley eucalypt forest and woodland.

According to "BioNet Vegetation Classification - Community Profile Reports" for PCT's occurring on the site "Subtropical eucalypt floodplain forest and woodland of the NSW North Coast and South East Qld bioregions" is listed as an EPBC Act TEC under PCT 4042. According to current vegetation mapping PCT 4042 occurs as a very small patch of much less than 0.5ha on the centre west edge of the site.

The proposed development / action is unlikely to have a significant impact on a critically endangered or endangered ecological community.

f) Threatened species

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

- lead to a long-term decrease in the size of a population
- reduce the area of occupancy of the species
- fragment an existing population into two or more populations
- adversely affect habitat critical to the survival of a species
- disrupt the breeding cycle of a population
- modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline
- result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species habitat
- introduce disease that may cause the species to decline, or
- interfere with the recovery of the species.

Response to criteria
71 threatened species under the EPBC Act are known for the local region within about 10km radius of the site.

Listed Threatened Species of fauna for which there is potential habitat on the site and that could potentially be recorded on or near the site include:

Birds		
Anthochaera phrygia	Regent Honeyeater	Endangered
Lathamus discolor	Swift Parrot	Critically Endangered
Frogs	None likely	
Mammals		
Pteropus poliocephalus	Grey-headed Flying-fox	Vulnerable
Chalinolobus dwyeri	Large-eared Pied Bat	Vulnerable

Phascolarctos cinereus	Koala	Vulnerable

Reptiles None likely

The **Regent Honeyeater** and **Swift Parrot** could potentially forage in flowering Spotted Gum trees on the site, when these trees are in flower. **Regent Honeyeaters** visit the coast during times of forage resource shortage in their normal inland range and could potentially visit and forage in flowering Spotted Gum trees on the site. **Swift Parrots** migrate from Tasmania during winter to the Victorian and NSW east coast and could also potentially visit and forage in flowering Spotted Gum trees on the site, when these trees are in flower. Spotted Gum trees are found through the native vegetation on the site and many will likely be retained by the proposed development. The proposed development is unlikely to significantly affect these species as many of the Spotted Gum trees are likely to be retained on the site as potential forage habitat for these species.

Grey-headed Flying-foxes, recorded on the site during this survey, use flowering eucalypt trees as forage habitat, including Spotted Gum and Ironbark trees found across the site. No roost "camp" of this species was found on the site or adjacent areas. This species is likely to forage on blossoms in flowering eucalypt trees on the site but roosts in a day time "camp" elsewhere in the local region. Considering that many of the existing trees will be retained on the site the proposed development is unlikely to have a significant impact on this species.

Large-eared Pied Bats were recorded on the site during this survey. This cave roosting species may forage for insects through vegetation across the site but will roost in caves elsewhere in the local region. Considering that many of the existing trees will be retained on the site the proposed development is unlikely to have a significant impact on this species.

Koala feed trees are found on the site. There are 442 records of **Koalas** found within 10km radius of the site, on the Bionet database, since 1980. Most of the 442 records are distant from and north-east of the site. There are only three (3) records of Koalas on the database within 3 kilometer radius of the site. Considering that Koala feed trees, will be retained on the site the proposed development is unlikely to have a significant impact on this species.

The proposed development / action is unlikely to have a significant impact on critically endangered or endangered fauna species.

g) Migratory Species

Significant Impact Criteria

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

- substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species
- result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species, or
- seriously disrupt the lifecycle (breeding, feeding, migration or resting behavior) of an ecologically significant proportion of the population of a migratory species.

Response to criteria

Listed Migratory Species of fauna listed in the EPBC Act Protected Matters Report for which there is potential habitat on the site and that could potentially be recorded on or near the study site include:

No migratory species likely to occur on or use habitat on the site

The proposed development / action is unlikely to have a significant impact on a migratory species.

APPENDIX - E BAM candidate and threatened fauna species list

Site - 256 Paterson Road, Bolwarra, NSW

Threatened species data gained from the Bionet website of the NSW Government Office of Environment and Heritage from within 10km radius of site.

Note - 58 species from Bionet 10km radius plus 4 additional species from BAM candidate species list

E1 = Schedule 1 Endangered; E2 = Scedule 1, Part 2 Endangered; E4A = Schedule 1A, Part 4, Critically Endangered;
V = Schedule 2 Vulnerable.

Y = Yes; P = Potential; N = No, R = Recorded

	Scientific name	Common name	NSW Status	BAM Candidate Species	BAM Survey months	Habitat on site?	Survey?	Recorded on site?
1	*Litoria aurea*	Green and Golden Bell Frog	E1	BAM	Nov-Mar	N	Y	N
2	*Litoria littlejohni*	Littlejohn's Tree Frog	E1			N	NA	N
3	*Caretta caretta*	Loggerhead Turtle	E1			N	NA	N
4	*Dromaius novaehollandiae*	Emu population Nth Coast a Pt Stephens	E2			N	NA	N
5	*Anseranas semipalmata*	Magpie Goose	V			N	NA	N
6	*Oxyura australis*	Blue-billed Duck	V			N	NA	N
7	*Stictonetta naevosa*	Freckled Duck	V			N	NA	N
8	*Ptilinopus magnificus*	Wompoo Fruit-Dove	V			N	NA	N
9	*Ptilinopus regina*	Rose-crowned Fruit-Dove	V			N	NA	N
10	*Hirundapus caudacutus*	White-throated Needletail	V			N	NA	N
11	*Ephippiorhynchus asiaticus*	Black-necked Stork	E1			N	NA	N
12	*Botaurus poiciloptilus*	Australasian Bittern	E1			N	NA	N
13	*Ixobrychus flavicollis*	Black Bittern	V			N	NA	N
14	*Circus assimilis*	Spotted Harrier	V			N	NA	N
15	*Haliaeetus leucogaster*	White-bellied Sea-Eagle	V	BAM	Jul-Dec	N	Y	N
16	*Hamirostra melanosternon*	Black-breasted Buzzard	V			N	Y	N
17	*Lophoictinia isura*	Square-tailed Kite	V			P	Y	N
18	*Pandion cristatus*	Eastern Osprey	V	BAM	Apr-Nov	N	Y	N
19	*Falco subniger*	Black Falcon	V			N	Y	N
20	*Burhinus grallarius*	Bush Stone-curlew	E1			P	Y	N
21	*Irediparra gallinacea*	Comb-crested Jacana	V			N	NA	N
22	*Rostratula australis*	Australian Painted Snipe	E1			N	NA	N
23	*Sternula albifrons*	Little Tern	E1			N	NA	N
24	*Callocephalon fimbriatum*	Gang-gang Cockatoo	E1			N	Y	N
25	*Calyptorhynchus lathami lathami*	South-eastern Glossy Black-Cockatoo	V	BAM	Jan-Sep	N	Y	N
26	*Glossopsitta pusilla*	Little Lorikeet	V			P	Y	N
27	*Lathamus discolor*	Swift Parrot	E1	BAM	?	P	Y	N

	Scientific name	Common name	NSW Status	BAM Candidate Species	BAM Survey months	Habitat on site?	Survey?	Recorded on site?
28	*Neophema pulchella*	Turquoise Parrot	V			P	Y	N
29	*Ninox connivens*	Barking Owl	V			P	Y	N
30	*Ninox strenua*	Powerful Owl	V			Y	Y	N
31	*Tyto novaehollandiae*	Masked Owl	V			Y	Y	N
32	*Climacteris picumnus victoriae*	Brown Treecreeper (east ssp)	V			N	Y	N
33	*Chthonicola sagittata*	Speckled Warbler	V			N	Y	N
34	*Anthochaera phrygia*	Regent Honeyeater	E4A			P	Y	N
35	*Epthianura albifrons*	White-fronted Chat	V			N	Y	N
36	*Melithreptus gularis gularis*	Black-chinned Honeyeater (east ssp)	V			Y	Y	N
37	*Pomatostomus temporalis temporalis*	Grey-crowned Babbler (east ssp)	V			Y	Y	N
38	*Daphoenositta chrysoptera*	Varied Sittella	V			Y	Y	N
39	*Artamus cyanopterus cyanopterus*	Dusky Woodswallow	V			P	Y	N
40	*Melanodryas cucullata cucullata*	South-eastern Hooded Robin	E1,P			N	Y	N
41	*Petroica boodang*	Scarlet Robin	V			P	Y	N
42	*Stagonopleura guttata*	Diamond Firetail	V			N	Y	N
43	*Dasyurus maculatus*	Spotted-tailed Quoll	V			N	Y	N
44	*Phascogale tapoatafa*	Brush-tailed Phascogale	V	BAM	Dec-Jun	P	Y	N
45	*Phascolarctos cinereus*	Koala	E1	BAM	Jan-Dec	P	Y	N
46	*Petaurus norfolcensis*	Squirrel Glider	V	BAM	Jan-Dec	P	Y	Y
47	*Petauroides volans*	Southern Greater Glider	E1			N	Y	N
48	*Pteropus poliocephalus*	Grey-headed Flying-fox	V	BAM	Oct-Dec	Y	Y	Y
49	*Saccolaimus flaviventris*	Yellow-bellied Sheathtail-bat	V			Y	Y	N
50	*Micronomus norfolkensis*	Eastern Coastal Free-tailed Bat	V			Y	Y	Y
51	*Chalinolobus dwyeri*	Large-eared Pied Bat	V			P	Y	Y
52	*Falsistrellus tasmaniensis*	Eastern False Pipistrelle	V			N	Y	N
53	*Myotis macropus*	Southern Myotis	V	BAM	Oct-Mar	P	Y	Y
54	*Scoteanax rueppellii*	Greater Broad-nosed Bat	V			Y	Y	Y
55	*Vespadelus troughtoni*	Eastern Cave Bat	V			N	Y	N
56	*Miniopterus australis*	Little Bent-winged Bat	V	BAM	Dec-Feb	P	Y	Y
57	*Miniopterus orianae oceanensis*	Large Bent-winged Bat	V	BAM	Dec-Feb	P	Y	Y
58	*Pseudomys novaehollandiae*	New Holland Mouse	P			N	Y	N
59	*Limicola falcinellus*	Broad-billed Sandpiper	V	BAM	Sep-Feb	N	NA	N
60	*Litoria brevipalmata*	Green-thighed Frog	V	BAM	Sep-Apr	N	Y	N
61	*Delma impar*	Striped Legless Lizard	V	BAM	Sep-Dec	N	NA	N
62	*Crinia tinnula*	Wallum Froglet	V	BAM	Jan-Dec	N	NA	N

APPENDIX – E (cont'd) BAM candidate species assessment details

Green and Golden Bell Frog ***Litoria aurea***

Survey time	Nov-Mar
Was the survey conducted during the survey time	No
Was this species recorded on the site	No
Where recorded	Not
How many	None
Potential habitat	The pond (see **Fig-3**) is potential habitat. There are no records of this species within 7km of the site on the Bionet database.
Is the habitat suitable - why	Not suitable
Is the habitat not suitable - why	The small pond on the site is surrounded by and shaded by trees and does not support waterplants such as Bullrush (*Typha sp*.) or Spikerush (*Eleocharis sp*.) (NSW EES profile, 01 Dec 2017).
Impact	No impact – this species is unlikely to be found at the pond on the site and therefore not impacted by the proposed development.

White-bellied Sea-Eagle ***Haliaeetus leucogaster***

Survey time	Jul-Dec
Was the survey conducted during the survey time	No
Was this species recorded on the site	No
Where recorded	Not
How many	None
Potential habitat	No
Is the habitat suitable - why	Not suitable
Is the habitat not suitable - why	Not breeding habitat as there were no large stick nests typical of this species observed in trees on the site. Not foraging habitat as the site is not a large area of open water including larger rivers, swamps, lakes and the sea (NSW EES profile, 19 Sep 2019).
Impact	No impact – this species does not nest or occur on the site and therefore not impacted by the proposed development.

Eastern Osprey ***Falco subniger***

Survey time	Apr-Nov
Was the survey conducted during the survey time	Yes
Was this species recorded on the site	No
Where recorded	Not
How many	None
Potential habitat	No
Is the habitat suitable - why	Not suitable
Is the habitat not suitable - why	Not breeding habitat as there were no large stick nests typical of this species observed in trees on the site and the site is not within 1km of the sea. Not foraging habitat as the site does not support fish in clear open water, plus is not a coastal area, the mouth of a large river, lagoon or lake (NSW EES profile, 18 Dec 2020).

Impact	No impact – this species does not nest or occur on the site and therefore not impacted by the proposed development.

South-eastern Glossy Black-Cockatoo ***Calyptorhynchus lathami lathami***

Survey time	Jan-Sep
Was the survey conducted during the survey time	Yes
Was this species recorded on the site	No
Where recorded	Not
How many	None
Potential habitat	None
Is the habitat suitable - why	Not suitable
Is the habitat not suitable - why	For forage, there are very few She-oak trees (*Casuarina* and *Allocasuarina* species) in vegetation on the site (NSW EES profile, 31 Jan 2024).
Impact	No impact – this species does not nest or forage on the site and therefore not impacted by the proposed development.

Swift Parrot ***Lathamus discolor***

Survey time	? (assumed to be autumn and winter at this location in NSW)
Was the survey conducted during the survey time	Yes. Migrates to the Australian south-east mainland between February and October (NSW EES profile, 23 Sep 2022).
Was this species recorded on the site	No
Where recorded	Not
How many	None
Potential habitat	Spotted Gum trees on site when in flower.
Is the habitat suitable - why	This species could potentially forage in Spotted Gum trees on site when in flower (NSW EES profile, 23 Sep 2022).
Is the habitat not suitable - why	This species will not use tree hollows on site because this species breeds only in Tasmania (NSW EES profile, 23 Sep 2022).
Impact	No impact – this species does not nest or occur on the site and therefore not impacted by the proposed development.

Brush-tailed Phascogale ***Phascogale tapoatafa***

Survey time	Dec-Jun
Was the survey conducted during the survey time	Yes
Was this species recorded on the site	No
Where recorded	Not
How many	None
Potential habitat	The native forest/woodland vegetation
Is the habitat suitable - why	No
Is the habitat not suitable - why	habitat on the site is unsuitable because it is an isolated small remnant surrounded by several kilometres of cleared open farmland and residential areas where cats, dogs and foxes are common.
Impact	No impact – this species is unlikely to occur on the site and therefore not impacted by the proposed development.

Koala ***Phascolarctos cinereus***

Survey time	Jan-Dec
Was the survey conducted during the survey time	Yes
Was this species recorded on the site	No
Where recorded	Not
How many	None
Potential habitat	Native trees in native forest/woodland vegetation
Is the habitat suitable - why	Numerous Koala feed trees such as Spotted Gum on site
Is the habitat not suitable - why	habitat on the site is unsuitable because it is an isolated small remnant surrounded by several kilometres of cleared open farmland and residential areas where dogs and foxes are common.
Impact	No impact – this species is unlikely to occur on the site and therefore not impacted by the proposed development.

Squirrel Glider ***Petaurus norfolcensis***

Survey time	Jan-Dec
Was the survey conducted during the survey time	Yes
Was this species recorded on the site	Yes
Where recorded	See **Fig-3**, mainly the centre and north portions of the native vegetation
How many	Three (3)
Potential habitat	Native forest/woodland vegetation and associated tree hollows
Is the habitat suitable - why	Native eucalypt trees and understory vegetation plus tree hollows
Is the habitat not suitable - why	habitat on the site is unsuitable, **in the long term**, because it is an isolated small remnant surrounded by several kilometres of cleared open farmland and residential areas where cats, dogs and foxes are common.
Impact	Yes impact – this species does occur on the site and therefore it is likely there will be some impacted by the proposed development on the local population

Grey-headed Flying-fox ***Pteropus poliocephalus***

Survey time	Oct-Dec
Was the survey conducted during the survey time	No
Was this species recorded on the site	Yes
Where recorded	See **Fig-3**, was heard in trees at north edge of site plus observed flying over and through vegetation on the site
How many	One (1)
Potential habitat	Trees in native forest/woodland vegetation on site
Is the habitat suitable - why	Native eucalypt trees when in flower are used as forage habitat
Is the habitat not suitable - why	The site is not used as a day time roost and/or breeding “camp” by large numbers of Flying-foxes
Impact	No impact – this species does occur on the site, numerous trees will be retained on the site as forage habitat, therefore no impact by the proposed development.

Southern Myotis	***Myotis macropus***
Survey time	Oct-Mar
Was the survey conducted during the survey time	No
Was this species recorded on the site	Yes
Where recorded	See **Fig-3**, was recorded in the forest/woodland vegetation
How many	At least 1
Potential habitat	Trees in native forest/woodland vegetation on site
Is the habitat suitable - why	This species may be flying through the site between areas of suitable habitat. It could potentially be roosting in a hollow bearing tree on the site.
Is the habitat not suitable - why	The site is not suitable as "generally roost close to water in caves, mine shafts, hollow-bearing trees, storm water channels, buildings, wharves, bridges and in dense foliage; forage over streams and pools catching insects and small fish by raking their feet across the water surface (NSW EES profile, 07 Aug 2020).
Impact	No impact – this species does occur on the site, numerous trees will be retained on the site as forage habitat, therefore no impact by the proposed development.

Little Bent-winged Bat	***Miniopterus australis***
Survey time	Dec-Feb
Was the survey conducted during the survey time	No
Was this species recorded on the site	Yes
Where recorded	See **Fig-3**, was recorded in the forest/woodland vegetation
How many	At least 1
Potential habitat	Trees in native forest/woodland vegetation on site
Is the habitat suitable - why	This species will forage through the forest/woodland vegetation on the site
Is the habitat not suitable - why	This species roosts in caves, tunnels, tree hollows, abandoned mines, stormwater drains, culverts, bridges and sometimes buildings during the day (NSW EES profile, 24 Mar 2020).
Impact	No impact – this species does occur on the site, numerous trees will be retained on the site as forage habitat, therefore no impact by the proposed development.

Large Bent-winged Bat	***Miniopterus orianae oceanensis***
Survey time	Dec-Feb
Was the survey conducted during the survey time	No
Was this species recorded on the site	Yes
Where recorded	See **Fig-3**, was recorded in the forest/woodland vegetation
How many	At least 1
Potential habitat	Trees in native forest/woodland vegetation on site
Is the habitat suitable - why	This species will hunt in forested areas, catching moths and other flying insects above the tree tops (NSW EES profile, 09 Sep 2019).
Is the habitat not suitable - why	For this species "caves are the primary roosting habitat, but also use derelict mines, storm-water tunnels, buildings and other man-made structures" (NSW EES profile, 09 Sep 2019).
Impact	No impact – this species does occur on the site, numerous trees will be retained on the site as forage habitat, therefore no impact by the proposed development.

Broad-billed Sandpiper ***Limicola falcinellus***

Survey time	Sep-Feb
Was the survey conducted during the survey time	No
Was this species recorded on the site	No
Where recorded	Not
How many	None
Potential habitat	None on site or nearby. This species is not listed within records of the Bionet database for within 10km radius of the site.
Is the habitat suitable - why	No
Is the habitat not suitable - why	According to the current Australian Government DCCEEW Species Profile and Threats Database, habitat description, Broad-billed Sandpiper occurs in sheltered parts of the coast, favouring estuarine mudflats but also occasionally occur on saltmarshes, shallow freshwater lagoons, saltworks and sewage farms, and in areas with large soft intertidal mudflats, which may have shell or sandbanks nearby. Occasionally they occur on reefs or rocky platforms. They have also been recorded in creeks, swamps and lakes near the coast, particularly those with bare mudflats or sand exposed by receding water. They often favour mud among, or fringed by, mangroves, particularly on the seaward side and sometimes occur in estuaries edged by saltmarsh. They are rarely recorded inland. Foraging occurs on exposed flats of soft mud or wet sand at edges of coastal and near-coastal wetlands, often around channels on mudflats or in accumulated mud in swales between shell banks.
Impact	No impact – this species does not occur on or near the site, therefore no impact by the proposed development.

Green-thighed Frog ***Litoria brevipalmata***

Survey time	Sep-Apr
Was the survey conducted during the survey time	Yes
Was this species recorded on the site	No
Where recorded	Not
How many	None
Potential habitat	None on site or nearby. This species is not listed within records of the Bionet database for within 10km radius of the site.
Is the habitat suitable - why	No
Is the habitat not suitable - why	Green-thighed Frogs occur in a range of habitats from rainforest and moist eucalypt forest to dry eucalypt forest and heath, typically in areas where surface water gathers after rain. It prefers wetter forests in the south of its range, but extends into drier forests in northern NSW and southern Queensland. Breeding occurs following heavy rainfall from spring to autumn, with larger temporary pools and flooded areas preferred (OEH profile, 20 Dec 2023).
Impact	No impact – this species is unlikely to occur on the site, therefore no impact by the proposed development.

Striped Legless Lizard ***Delma impar***

Survey time	Sep-Dec
Was the survey conducted during the survey time	No
Was this species recorded on the site	No
Where recorded	Not
How many	None
Potential habitat	None on site or nearby. This species is not listed within records of the Bionet database for within 10km radius of the site.
Is the habitat suitable - why	No
Is the habitat not suitable - why	The Striped Legless Lizard occurs in the Southern Tablelands, the South West Slopes, the **Upper Hunter** and possibly on the Riverina. Found mainly in Natural Temperate Grassland…(OEH profile, 28 Nov 2023).
Impact	No impact – this species does not occur on the site, therefore no impact by the proposed development.

Wallum Froglet ***Crinia tinnula***

Survey time	Jan-Dec
Was the survey conducted during the survey time	Yes
Was this species recorded on the site	No
Where recorded	Not
How many	None
Potential habitat	None on site or nearby. This species is not listed within records of the Bionet database for within 10km radius of the site.
Is the habitat suitable - why	No
Is the habitat not suitable - why	Wallum Froglets are found in a wide range of habitats, usually associated with acidic swamps on coastal sand plains. They typically occur in sedgelands and wet heathlands. They can also be found along drainage lines within other vegetation communities and disturbed areas, and occasionally in swamp sclerophyll forests (OEH profile, 20 Dec 2023).
Impact	No impact – this species does not occur on the site, therefore no impact by the proposed development.

2 *Litoria littlejohni* Littlejohn's Tree Frog
No habitat on site.

Occurs in upper reaches of permanent stream or perched swamp habitat (OEH profile, 08 Apr 2024)

3 *Caretta caretta* Loggerhead Turtle
No habitat on site

Occurs only in marine habitat such as the ocean.

4 *Dromaius novaehollandiae* Emu population Nth Coast a Pt Stephens
No habitat on site.

Occurs in coastal habitat such as in the Port Stephens LGA (21 Jan 2020).

5 *Anseranas semipalmata* Magpie Goose
No habitat on site.

Mainly found in shallow wetlands (less than 1 m deep) with dense growth of rushes or sedges. Equally at home in aquatic or terrestrial habitats; often seen walking and grazing on land; feeds on grasses, bulbs and rhizomes. Activities are centred on wetlands, mainly those on floodplains of rivers and large shallow wetlands formed by run-off (OEH profile, 04 Oct 2018).

6 *Oxyura australis* Blue-billed Duck
No habitat on site.

Most common in the southern Murray-Darling Basin area. It is generally only during summer or in drier years that they are seen in coastal areas. The Blue-billed Duck prefers deep water in large permanent wetlands and swamps with dense aquatic vegetation (OEH profile, 18 Mar 2022).

7 *Stictonetta naevosa* Freckled Duck
No habitat on site.

In the breeding range this species prefers densely vegetated waters especially floodwaters and creeks vegetated with Lignum and Canegrass; in coastal regions prefers swamps and lakes with dense thickets of melaleuca, Casuarina or Leptpspermum (Marchant & Higgins, 1990). During the dry season or drought occupies large permanent open waters particularly lakes and reservoirs >100ha; rests on open shores, very shallow water at edges of sandbars, spits and islands; feeding in muddy margins and shallow water (Marchant & Higgins, 1990). Also recorded from rivers, billabongs, farm dams, sewage ponds, salt pans, saline and freshwater meadows, shallow fresh swamps and open parts of deep fresh swamps. During droughts when birds move into coastal districts in large numbers, use of small wetlands increases but preference remains for open aspect (Marchant & Higgins, 1990). Tidal wetlands avoided.

8 *Ptilinopus magnificus* Wompoo Fruit-Dove
No habitat on site.

Occurs in, or near rainforest, low elevation moist eucalypt forest and brush box forests. Feeds on a diverse range of tree and vine fruits and is locally nomadic, following ripening fruit. It is rare south of Coffs Harbour (OEH profile, 12 Feb 2018).

9 *Ptilinopus regina* Rose-crowned Fruit-Dove
No habitat on site.

Rose-crowned Fruit-doves occur mainly in sub-tropical and dry rainforest and occasionally in moist eucalypt forest and swamp forest, where fruit is plentiful. They feed entirely on fruit from vines, shrubs, large trees and palms, and are thought to be locally nomadic as they follow the ripening of fruits (OEH profile, 11 Oct 2022).

10 *Hirundapus caudacutus* White-throated Needletail
No habitat on site.

Breeds in Siberia, Mongolia, Korea and Japan (09 Apr 2024) has been recorded roosting in trees in forests and woodlands (DCCEEW, 18 Feb 2009).

11 *Ephippiorhynchus asiaticus* Black-necked Stork
No habitat on site.

Floodplain wetlands (swamps, billabongs, watercourses and dams) of the major coastal rivers are the key habitat in NSW for the Black-necked Stork. Secondary habitat includes minor floodplains, coastal sandplain wetlands and estuaries (OEH profile, 01 Dec02017).

12 *Botaurus poiciloptilus* Australasian Bittern
No habitat on site.

Favours permanent freshwater wetlands with tall, dense vegetation, particularly bullrushes (*Typha* spp.) and spikerushes (*Eleocharis* spp.) (OEH profile, 01 Dec 2017).

13 *Ixobrychus flavicollis* Black Bittern
No habitat on site.

Inhabits both terrestrial and estuarine wetlands, generally in areas of permanent water and dense vegetation. Where permanent water is present, the species may occur in flooded grassland, forest, woodland, rainforest and mangroves. During the day, roosts in trees or on the ground amongst dense reeds (OEH profile, 08 Mar 2018).

14 *Circus assimilis* Spotted Harrier
No habitat on site.

Occurs in grassy open woodland including Acacia and mallee remnants, inland riparian woodland, grassland and shrub steppe. It is found most commonly in native grassland, but also occurs in agricultural land, foraging over open habitats including edges of inland wetlands (OEH profile, 01 Dec 2017).

16 *Hamirostra melanosternon* Black-breasted Buzzard
No habitat on site.

Lives in a range of inland habitats, especially along timbered watercourses which is the preferred breeding habitat. Also hunts over grasslands and sparsely timbered woodlands (OEH profile, 01 Dec 2017).

17 *Lophoictinia isura* Square-tailed Kite
Potential habitat for this species may be found on the subject land. This species was not recorded on or near the subject land during this survey. Many existing native trees within the subject land will likely be retained by the proposed development thereby conserving potential habitat for this species on the site.

This species prefers heathlands, woodlands, forests, tropical and subtropical rainforest, timbered watercourses, hills and gorges (Pizzey, 1998). Typically found in forested and wooded lands of tropical and temperate Australia; many common vegetation associations used; in southern Australia predominantly eucalypt open forest and woodland (Marchant & Higgins, 1993). Feeds mostly on passerines and foliage insects and sometimes small mammals and lizards; nests often near water in forest or open woodland in tree to about 18m (Marchant & Higgins, 1993).

19 *Falco subniger* Black Falcon
No habitat on site.

The Black Falcon is widely, but sparsely, distributed in New South Wales, mostly occurring in inland regions (05 Mar 2024).

20 *Burhinus grallarius* Bush Stone-curlew
Potential habitat for this species may be found on the site. This species was not recorded on the site during this survey. The small remnant of disturbed forest vegetation on the site is surrounded by kilometres of cleared

farmland and residential areas that are not ideal habitat for this species. Foxes, cats and dogs recorded on the site will prey on and deter this ground dwelling species from inhabiting this site. Many of the existing native trees, including hollow bearing trees, on the site will likely be retained as habitat for this species, by the proposed development.

This species prefers lightly timbered open forest and woodland or partly cleared farmland with remnants of woodland, with a groundcover of short sparse grass and few or no shrubs; floor may be carpeted with dry leaves and often with some fallen dead timber (Marchant & Higgins, 1993).

21 *Irediparra gallinacea* Comb-crested Jacana

No habitat on site.

Inhabit permanent freshwater wetlands, either still or slow-flowing, with a good surface cover of floating vegetation, especially water-lilies, or fringing and aquatic vegetation (OEH profile, 21 Jun 2018).

22 *Rostratula australis* Australian Painted Snipe

No habitat on site.

Prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber (OEH profile, 01 Dec 2017).

23 *Sternula albifrons* Little Tern

No habitat on site.

Almost exclusively coastal, preferring sheltered environments; however may occur several kilometres from the sea in harbours, inlets and rivers (with occasional offshore islands or coral cay records). Nests in small, scattered colonies in low dunes or on sandy beaches just above high tide mark near estuary mouths or adjacent to coastal lakes and islands (OEH profile, 13 Oct 2021).

24 *Callocephalon fimbriatum* Gang-gang Cockatoo

No habitat on site. Bionet data records show not occurring within 10km radius of site.

In spring and summer, generally found in tall mountain forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. In autumn and winter, the species often moves to lower altitudes in drier more open eucalypt forests and woodlands, particularly box-gum and box-ironbark assemblages, or in dry forest in coastal areas and often found in urban areas (OEH profile, 09 Mar 2022).

26 *Glossopsitta pusilla* Little Lorikeet

Potential habitat for Little Lorikeets may be found on the subject land. Individuals of this highly mobile species might visit flowering eucalypt trees on the subject land, plus, there are hollows in hollow bearing trees on the site that could provide nest hollows for this species. However, no individuals of this species were heard or observed on or near the subject land or site during this survey, even while other lorikeet species were loud and busy in flowering trees on and near the site. It will be recommended that as many of the hollow bearing trees as possible be retained by the proposed development. Many of the existing native trees, including hollow bearing trees, on the site will likely be retained as habitat for this species, by the proposed development.

Little Lorikeets are nomadic and prefer dry, open eucalypt forests and woodlands, feeding primarily on nectar and pollen of tall flowering eucalypts plus sometimes *Angophora* and *Melaleuca*, plus fruits of mistletoes (Higgins 1999). They nest in hollows mostly in living, smooth-barked eucalypts (Higgins 1999). Can appear at a location at any time of year to feed on flowering eucalypts. Nests, most typically selecting hollows in the limb or trunk of smooth-barked Eucalypts, entrance is small (3 cm) and usually high above the ground (2–15 m) (OEH profile, 1.12.17).

28 *Neophema pulchella* Turquoise Parrot

Potential forage, refuge and breeding habitat for this species may be found on the site. This species was not recorded on the study site during this survey. Many existing native trees will likely be retained on the site, including hollow bearing trees, thereby conserving potential forage, refuge and breeding habitat for this species on the site.

Inhabit foothills of Great Divide, including steep rocky ridges and gullies, rolling hills, valleys and river flats and sometimes nearby plains; occurs in eucalypt woodlands and open forests, with groundcover of grasses and sometimes low understorey of shrubs (Higgins, 1999). Often in farmland, mainly pasture with remnant trees, living or dead; prefer ecotone between forest and pasture or other grassland (Higgins, 1999).

29 *Ninnox connivens* Barking Owl

Potential forage habitat for this species may be found on the site. The site may provide suitable forage habitat for this species as part of a larger foraging area. Larger hollows for the species to roost or breed in are not found on the site. Owl call playback during this survey did not elicit a response from this species on or near the site and the species was not heard calling on or near the site during night survey. Many existing native trees will likely be retained on the site, including hollow bearing trees, thereby conserving potential habitat for this species and its prey species on the site.

This species prefers open forests, woodlands, paperbark woodlands, dense scrubs, foothills, river red gums, other large trees near watercourses in open country (Pizzey, 1998). Ideal habitat for this species is open country with a choice of large trees for roosting and nesting (Hollands, 1991). Barking Owls feed primarily on insects but include birds and mammals such as gliders and rabbits in the diet during breeding when large hollows in live eucalypts are required (Garnett and Crowley, 2000). Feeds mainly on insects outside of breeding season and more birds and mammals during breeding (Higgins, 1999). It appears that most mammals preyed on are smaller arboreal mammals.

30 *Ninox strenua* Powerful Owl

Potential habitat for this species is found on the site. The Powerful Owl was not recorded on the site during this survey. This owl may utilise the site as part of a larger foraging area as there are typical prey species such as Squirrel Gliders found in the native vegetation on the site. Eucalypt trees with hollows are found on the site, however, trees and hollows on the site may not be large or tall enough for this species. Many existing native trees will likely be retained on the site, including hollow bearing trees, thereby conserving potential habitat for this owl and its prey species on the site.

This species prefers to occupy a large territory in mountain forests, gullies and forest margins, sparser hilly woodlands, coastal forests, woodlands, scrubs etc (Higgins, 1999). It will also utilise exotic pine plantations and large trees in forest in or near urban areas (Pizzey, 1998). The Powerful Owl always roosts in the open, on a branch, during the day and when roosting in dense vegetation may be low to the ground (Hollands, 1991). The nest site is typically a large vertical hollow such as broken off trunks of trees but also in horizontal or hollow spouts, usually in living trees but sometimes in dead trees (Higgins, 1999). Powerful Owls inhabit a range of vegetation types, including woodland, forests and rainforest, requires large tracts of forest or woodland habitat, 400 to 4,000ha, but can occur in fragmented landscapes; Powerful Owls nest in large tree hollows in large eucalypts (80-240cm dbh); the main prey are medium sized arboreal marsupials such as Greater Glider, Common Ringtail Possum and Sugar Glider plus birds and flying-foxes; as most prey species require hollows and a shrub layer, these are important habitat components for this owl (OEH profile, 13 Mar 2024).

31 *Tyto novaehollandiae* Masked Owl

Potential habitat for this species may be found on the site. The Masked Owl was not recorded on the site during this survey. This owl may utilise the site as part of a larger foraging area as there are typical prey species such as Squirrel Gliders and Rats found in the native vegetation on the site. Eucalypt trees with hollows are found on the site, however, trees and hollows on the site may not be large or tall enough for this species as nest habitat. Many existing native trees will likely be retained on the site, including hollow bearing trees, thereby conserving potential habitat for this owl and its prey species on the site.

This species prefers forests, open woodlands, farmlands with large trees, adjacent cleared country, timbered watercourses, paperbark woodlands and caves (Pizzey, 1998). The species is mostly recorded in open forest and woodland with a sparse understorey adjacent to open habitats such as cleared farmland, grassland, sedgeland and wetlands etc (Higgins, 1999). Studies indicate that this species will utilise a territory greater than 1000hectares (Higgins, 1999). Feeds mainly on small to medium terrestrial mammals such as rats but also some arboreal mammal species and birds (Higgins, 1999). Masked Owls nest in “a large hollow in a living or dead tree” (Hollands, 1991) and generally roost in hollows during the day. Masked Owls lives in dry eucalypt forests and woodlands from sea level to 1100 m; a forest owl, but often hunts along the edges of forests, including roadsides; the typical diet consists of tree-dwelling and ground mammals, especially rats; pairs have a large home-range of 1000 hectares or more, depending on prey availability; roosts and breeds in moist eucalypt forested gullies, using large tree hollows or sometimes caves for nesting (OEH profile, 13 Mar 2024).

32 *Climacteris picumnus victoriae* Brown Treecreeper (east ssp)

No habitat on site. A single record in the 10km radius Bionet database is from Paterson, 10km north of the site, in 1952.

It is less commonly found on coastal plains and ranges. The eastern subspecies lives in eastern NSW in eucalypt woodlands through central NSW and in coastal areas with drier open woodlands such as the Snowy River Valley, Cumberland Plains, Hunter Valley and parts of the Richmond and Clarence Valleys. Declines have occurred in remnant vegetation fragments smaller than 300 hectares, that have been isolated or fragmented for more than 50 years. Found in eucalypt woodlands (including Box-Gum Woodland) and dry open forest of the inland slopes and plains inland of the Great Dividing Range; mainly inhabits woodlands dominated by stringybarks or other rough-barked eucalypts, usually with an open grassy understorey, sometimes with one or more shrub species; also found in mallee and River Red Gum (Eucalyptus camaldulensis) Forest bordering wetlands with an open understorey of acacias, saltbush, lignum, cumbungi and grasses; usually not found in woodlands with a dense shrub layer; fallen timber is an important habitat component for foraging; also recorded, though less commonly, in similar woodland habitats on the coastal ranges and plains (OEH profile, 25 Feb 2024).

33 *Chthonicola sagittata* Speckled Warbler

No habitat on site.

The Speckled Warbler is most frequently reported from the hills and tablelands of the Great Dividing Range, and rarely from the coast. There has been a decline in population density throughout its range, with the decline exceeding 40% where no vegetation remnants larger than 100ha survive. The Speckled Warbler lives in a wide range of Eucalyptus dominated communities that have a grassy understorey, often on rocky ridges or in gullies. Typical habitat would include scattered native tussock grasses, a sparse shrub layer, some eucalypt regrowth and an open canopy. Large, relatively undisturbed remnants are required for the species to persist in an area (OEH profile, 18 Oct 2022).

34 *Xanthomyza phrygia* Regent Honeyeater

Potential habitat for this species may be found on the site. This species may be an irregular and transitory visitor, from its preferred habitat west of the Great Divide, to flowering eucalypts on the site and adjacent areas. The species was not recorded on or near the site during this survey. Many existing native trees will likely be retained on the site thereby retaining potential habitat for this species.

This nomadic species prefers dry open forest and woodlands with a range of eucalypt species, especially ironbarks (Morcombe, 2000), but will also utilise farmland, streets and gardens (Pizzey, 1998). Found mainly on and west of the Great Divide in NSW with few recent records of the species on the coasts although the species will visit the coast, possibly in response to poor food supply in core breeding areas (Higgins *et al*, 2001).

35 *Epthianura albifrons* White-fronted Chat

No habitat on site.

In NSW, it occurs mostly in the southern half of the state, in damp open habitats along the coast, and near waterways in the western part of the state. Along the coastline, it is found predominantly in saltmarsh vegetation but also in open grasslands and sometimes in low shrubs bordering wetland areas (OEH profile, 13 Dec 2021).

36 *Melithreptus gularis gularis* Black-chinned Honeyeater

Potential habitat for this species may be found on the site. This species may be an irregular and transitory visitor to the eucalypts, when in flower, on the site from its preferred habitat west of the Great Divide. The species was not found on the site during this survey. Many existing native trees will likely be retained on the site thereby retaining potential habitat for this species.

This nomadic species prefers forest and woodland of eucalypts, paperbarks and tree lined watercourses of arid regions (Morcombe, 2000). This seasonally nomadic species prefers drier eucalypt forests and woodlands, timber on watercourses, often with no understorey, scrubs and Ironbark forests on the western slopes (Pizzey, 1998).

37 *Pomatostomus temporalis temporalis* Grey-crowned Babbler

Potential habitat for this species may be found on the site. This species was not recorded on the site during this survey. No nests of this species were observed in trees or shrubs on the site, suggesting this species does not use the site. The presence of dogs, cats and foxes on the site has probably removed this often ground dwelling species from the site. Many existing native trees will likely be retained on the site thereby retaining potential habitat for this species.

This readily observed sedentary species is found in open forests, woodlands, scrublands, farmlands and outer suburbs (Pizzey & Knight, 2007). Found mainly in open forests and woodlands with an open shrub layer, sparse groundcover, fallen timber and leaf litter (Higgins & Peter, 2002).

38 *Daphoenositta chrysoptera* Varied Sittella

Potential habitat for this species is found on the site. This species may be an irregular visitor, searching for insects in trees, to the site. The species was not recorded on the site during this survey. Many existing native trees will likely be retained on the site thereby retaining potential habitat for this species.

This readily observed sedentary species forages and breeds mainly in dry open forest and woodlands but not heavier rainforests (Pizzey & Knight, 2007) preferring areas with rough-barked trees such as Stringybarks and Ironbarks (Higgins & Peter, 2002). Feeds on insects taken from beneath bark and in crevices on rough bark on larger branches and trunk in canopy, working from upper to lower branches (Higgins & Peter, 2002).

39 *Artamus cyanopterus cyanopterus* Dusky Woodswallow

Potential habitat for this species may be found on the site. The species was not recorded on the site or nearby areas during this survey. Many existing native trees will likely be retained on the site thereby retaining potential habitat for this species.

While records show a wide distribution and occurrence, coast to inland in NSW, in a variety of habitats including woodland, forest, mallee, shrubland, heathland, moist forest, rainforest etc, the Dusky Woodswallow is considered to be a woodland dependent bird. The majority of breeding records for this species occur on the western slopes of the Great Dividing Range, a region dominated by woodland and open dry forest (NSW Scientific Committee, preliminary determination 04/12/15).

40 *Melanodryas cucullata cucullata* South-eastern Hooded Robin

No habitat on site. A single record in the 10km radius Bionet database is from Paterson, 10km north of the site, in 1952.

The Hooded Robin is common in few places, and rarely found on the coast. The south-eastern form (subspecies *cucullata*) is found from Brisbane to Adelaide and throughout much of inland NSW. Prefers lightly wooded country, usually open eucalypt woodland, acacia scrub and mallee, often in or near clearings or open areas. Requires structurally diverse habitats featuring mature eucalypts, saplings, some small shrubs and a ground layer of moderately tall native grasses (OEH profile, 01 Dec 2023).

41 *Petroica boodang* Scarlet Robin

Potential habitat for this species may be found on the site. This species was not recorded on the site during this survey. Many existing native trees will likely be retained on the site thereby retaining potential habitat for this species.

This readily observed species is found in foothill forests, woodlands, watercourses and in autumn and winter more open habitats including golf courses, parks, gardens and orchards (Pizzey & Knight, 2007). Found mainly in eucalypt forests and woodlands with an open understorey, in autumn and winter may disperse to more open habitats including urban areas (Higgins & Peter, 2002).

42 *Stagonopleura guttata* Diamond Firetail

No habitat on site. A single record in the 10km radius Bionet database is from Paterson, 10km north of the site, in 1952.

The Diamond Firetail is endemic to south-eastern Australia, extending from central Queensland to the Eyre Peninsula in South Australia. Not commonly found in coastal districts, though there are records from near Sydney, the Hunter Valley and the Bega Valley. Found in grassy eucalypt woodlands, including Box-Gum Woodlands and Snow Gum Woodlands. Also occurs in open forest, mallee, Natural Temperate Grassland, and in

secondary grassland derived from other communities. Often found in riparian areas (rivers and creeks), and sometimes in lightly wooded farmland (OEH profile, 25 Feb 2024).

43 *Dasyurus maculatus* Spotted-tailed Quoll

No habitat on site. While there are 16 records (1980-2021) in the 10km radius Bionet database most records are north-east of the site. There are no records within 5km radius of the site. This small site is surrounded by several kilometres of cleared farmland and residential areas with numerous cats, dogs and foxes present.

This species is found in eastern NSW, eastern Victoria, south-east and north-eastern Queensland, and Tasmania. Recorded across a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline. Quolls use hollow-bearing trees, fallen logs, other animal burrows, small caves and rock outcrops as den sites (OEH profile, 24 Sep 2020).

47 *Petauroides volans* Southern Greater Glider

No habitat on site. The site is not a large contiguous area of suitable habitat, is not a smaller fragment connected to larger patches of habitat, and does not have a cool microclimate. There are only 3 records from Butterwick and Beresfield during 1995-1998 in the 10km radius Bionet database. No records of this species within 6km of the site.

The Southern Greater Glider occurs in eastern Australia, in eucalypt forests and woodlands, where it has a broad distribution from around Proserpine in Queensland, south through NSW and the Australian Capital Territory into Victoria (OEH profile, 28 Mar 2023). Habitat critical to survival for the greater glider (southern and central) may be broadly defined as - large contiguous areas of eucalypt forest, which contain mature hollow-bearing trees and a diverse range of the species preferred food species in a particular region; and smaller or fragmented habitat patches connected to larger patches of habitat, that can facilitate dispersal of the species and/or that enable recolonization; and cool microclimate forest/woodland areas (e.g. protected gullies, sheltered high elevation areas, coastal lowland areas, southern slopes); and areas identified as refuges under future climate changes scenarios; and short-term or long-term post-fire refuges (i.e. unburnt habitat within or adjacent to recently burnt landscapes) that allow the species to persist, recover and recolonise burnt areas (DCCEEW conservation advice, 5 Jul 2022).

49 *Saccolaimus flaviventris* Yellow-bellied Sheathtailed-Bat

Forage, refuge and breeding habitat for this species may be found over the study site. Potentially suitable hollow bearing trees are found on the site for this species to breed and roost in. Open areas on the site are available for this species as forage habitat. The species was not recorded on the site during this survey. Many existing native trees, including hollow bearing trees, will likely be retained on the site thereby retaining potential habitat for this species.

This widespread species forages for insects above the canopy and roosts in tree hollows (Strahan, 1998). Insectivorous bats are known to travel widely from roost trees to favoured forage areas. Roosts singly or in groups of up to six, in tree hollows and buildings; in treeless areas they are known to utilise mammal burrows; when foraging for insects, flies high and fast over the forest canopy, but lower in more open country; forages in most habitats across its very wide range, with and without trees (OEH profile 18 Mar 2022).

50 *Micronomus norfolkensis* Eastern Coastal Free-tailed Bat

Forage habitat for this species is found across site. This species was recorded on the site during night bat call detection survey. Native vegetation on the site supports trees with potentially suitable hollows for this species as breeding habitat. Many existing native trees, including hollow bearing trees, will likely be retained on the site thereby retaining potential habitat for this species.

This species forages in dry eucalypt forest and woodland (Strahan, 1998). The species roosts in tree hollows, usually in hollow spouts of large mature trees, and forages in dry eucalypt forest and woodland, showing a preference for open spaces in woodland or forest and are more active in the upper slopes of forest areas rather than riparian zones (Churchill, 2008). Very little is known about this species.

51 *Chalinolobus dwyeri* Large-eared Pied Bat

Forage habitat for this species is found on the site. This species was recorded once on the site during this survey. There are no caves, old mines or suitable deep culverts on the site in which individuals or a population would roost or breed. While individuals of this species can forage through vegetation across the site they will be

roosting in caves elsewhere in the local region. Many existing native trees will likely be retained on the site thereby retaining potential forage habitat for this species.

This species forages in tall open eucalypt forest, dry sclerophyll forest, woodland, wet sclerophyll forest and rainforest and roosts predominantly in caves and mines (Churchill, 1998). Roosts in caves, crevices in cliffs, old mine workings and in the disused, bottle-shaped mud nests of the Fairy Martin; frequenting low to mid-elevation dry open forest and woodland close to these features; they remain loyal to the same cave over many years; found in well-timbered areas containing gullies, probably forages for small, flying insects below the forest canopy (OEH profile, 1.12.17).

52 *Falsistrellus tasmaniensis* Eastern False Pipistrelle

No habitat on site.

The Eastern False Pipistrelle is found on the south-east coast and ranges of Australia, from southern Queensland to Victoria and Tasmania. Prefers moist habitats, with trees taller than 20m (OEH profile, 07 Sep 2017). Found in south-east Australia its distribution extends from the coast over the Great Dividing Range with a preference for wet, high-elevation forests. In the northern part of its range it is restricted to higher elevations. Uncommon on ridge top forests where soil fertility is low (Baker et al, 2023).

54 *Scoteanax rueppellii* Greater Broad-nosed Bat

Habitat for this species is found on the site. This species was recorded on the site during night bat call detection survey. Native vegetation on the subject land supports trees with potentially suitable hollows for this species as roost and breeding habitat. Many existing native trees, including hollow bearing trees, will likely be retained on the site thereby retaining potential habitat for this species.

This slow flying species forages within 20m of the ground along tree lines often adjacent to cleared paddocks and prefers moist gullies in mature coastal forest but also forages in gullies of dry sclerophyll forest, woodland, wet sclerophyll forest and roosts in hollow tree trunks and branches (Churchill, 1998). This species utilises a variety of habitats from woodland through to moist and dry eucalypt forest and rainforest, though it is most commonly found in tall wet forest. Although this species usually roosts in tree hollows, it has also been found in buildings. Forages after sunset, flying slowly and directly along creek and river corridors at an altitude of 3 - 6 m. Open woodland habitat and dry open forest suits the direct flight of this species as it searches for beetles and other large, slow flying insects; this species has been known to eat other bat species (OEH profile, 1.12.17).

55 *Vespadelus troughtoni* Eastern Cave Bat

No habitat on site. There are no cliffs or rocky overhangs near the site.

The Eastern Cave Bat is found in a broad band on both sides of the Great Dividing Range from Cape York to Kempsey, with a single record from southern NSW, east of the ACT. A cave-roosting species that is usually found in dry open forest and woodland, near cliffs or rocky overhangs; has been recorded roosting in disused mine workings (OEH profile, 01 Dec 2017).

58 *Pseudomys novaehollandiae* New Holland Mouse

No habitat on site. There is no heathland, heathy understory or vegetated sand dunes on the site.

Known to inhabit open heathlands, woodlands and forests with a heathland understorey and vegetated sand dunes (OEH profile, 20 Dec 2023).

APPENDIX – F Fauna trapping results

Trap site locations and transects are indicated in figures of this report.

Site - **256 Paterson Road, Bolwarra, NSW**

Co-ordinates, centre of study area - **367804 E 6381414 N**, all fauna recorded within about 130m

Note - trapped fauna were released as soon as possible after identification to reduce stress, unless handling is required for identification, therefore details such as sex and weight of individuals are often not recorded.

Trap results (Elliot A & B & Cage) **M** = Male **F** = Female

Date	Trap type	Species captured	No.	Sex	Wgt (g)	Comment
29.4.24	All	-		-	-	Set traps
30.4.24	All	Nothing caught		-	-	Check traps
1.5.24	A13	House Mouse		-	-	Check traps
"	B2	Squirrel Glider		-	-	Check traps
2.5.24	A14	Black Rat		-	-	Check traps
"	B5	Squirrel Glider		-	-	Check traps
3.5.24	B1	Squirrel Glider		-	-	Check traps
"	B2	Squirrel Glider		-	-	Check traps

Camera trap results

Unit No	Date set	Date collected	Location	Species recorded
TC1	30.4.24	8.5.24	South-west portion of vegetation on site	• Black Rat
TC3	30.4.24	8.5.24	North-west portion of vegetation on site	• Nothing
TC4	30.4.24	8.5.24	North-east portion of vegetation on site	• Nothing

Hair tube results (hair analysis by Georgeanna Story of Scats About)

Date set	Date collected	Unit	Size & type	Location	Mammal ID – definite/probable
30.4.24	8.5.24	HT01	40mm & 90mm	South-east portion of vegetation on site	• Brush-tailed Possum
30.4.24	8.5.24	HT02	40mm & 90mm	South-west portion of vegetation on site	• Sugar Glider
30.4.24	8.5.24	HT03	40mm & 90mm	North-east portion of vegetation on site	• Brush-tailed Possum • *Rattus sp.*
30.4.24	8.5.24	HT04	40mm & 90mm	North-west portion of vegetation on site	• Nothing, no hairs

40mm = 40mm arboreal hair tube, 90mm = 90mm ground hair tube

APPENDIX - G Bird Sample Plots

All birds heard or observed on the site from the survey location were recorded.

Bird sample - Plot 1

Date - 24.4.24 **Time -** 1100-1120
Site - 256 Paterson Rd, Bolwarra
Co-ordinates - 56 H 367798 6381433
Bird Plot location - centre of vegetation on site
Habitat description - partially cleared forest
Conditions - overcast, still, warm

Bird sample - Plot 2

Date - 29.4.24 **Time -** 1405-1425
Site - 256 Paterson Rd, Bolwarra
Co-ordinates - 56 H 367751 6381508
Bird Plot location - north centre of vegetation on site
Habitat description - partially cleared forest
Conditions - light cloud, still, warm

Bird sample - Plot 3

Date - 30.4.24 **Time -** 0710-0730
Site - 256 Paterson Rd, Bolwarra
Co-ordinates - 56 H 367828 6381360
Bird Plot location - south centre of vegetation on site
Habitat description - partially cleared forest
Conditions - overcast, light breeze, mild

Bird sample - Plot 4

Date - 3.5.24 **Time -** 0900-0920
Site - 256 Paterson Rd, Bolwarra
Co-ordinates - 56 H 367750 6381417
Bird Plot location - west centre of vegetation on site
Habitat description - partially cleared forest
Conditions - part cloud, still, mild

Scientific Name	Common Name	BP 1	BP 2	BP 3	BP4
Anthochaera carunculata	Red Wattlebird	1		3	
Cacatua galerita	Sulphur-crested Cockatoo		2		
Corvus coronoides	Australian Raven				4
Cracticus nigrogularis	Pied Butcherbird		2		4
Cracticus torquatus	Grey Butcherbird	1	2	3	
Dacelo novaeguineae	Laughing Kookaburra	1		3	
Entomyzon cyanotis	Blue-faced Honeyeater				4
Gymnorhina tibicen	Magpie	1	2	3	4
Hirundo neoxena	Welcome Swallow		2		
Lichenostomus chrysops	Yellow-faced Honeyeater	1	2	3	4
Manorina melanocephela	Noisy Miner	1	2	3	4
Neochmia temporalis	Red-browed Finch				4
Pardalotus punctatus	Spotted Pardalote	1	2		
Platycercus eximius	Eastern Rosella	1	2		
Rhipidura fuliginosa	Grey Fantail	1			4
Trichoglossus chlorolepidotus	Scayly-breasted Lorikeet	1			
Trichoglossus haematodus	Rainbow Lorikeet	1	2	3	4

APPENDIX – H Koala Habitat Assessment

INTRODUCTION

This Koala habitat assessment is conducted according to the Koala (Phascolarctos cinereus) Biodiversity Assessment Method Survey Guide (DPE, 2022).

Digital shape files associated with this Koala habitat assessment component of the report can be made available if required.

Site - **Lot C, DP 163627**
256 Paterson Road, Bolwarra, NSW

On the dates indicated in a table below Greg Little of General Flora and Fauna (GFF) conducted survey and searches for Koalas across site. Koala searches were also conducted while performing other activities and while moving across the site.

Scope
Under the Biodiversity Assessment Method (BAM) the Koala (Phascolarctos cinereus) Biodiversity Assessment Method Survey Guide (DPE, 2022) must be applied, as a minimum, when conducting surveys for Koalas. Reporting requirements are to be as per App F Biodiversity Assessment Report (BAR) – required information (DPE, 2022).

Biodiversity Offset Scheme (BOS)
The proposed development may clear or otherwise disturb an area of land greater than the threshold allowed under the BOS entry requirements. For a lot size of 1ha to 40ha the "threshold for clearing above which the BAM and offsets scheme apply" is 0.5ha or more.

The site and nearby areas are not shaded (purple) on the BVM.

TARGETED SPECIES SURVEYS

According to the Appendix B **Decision key** – koala survey (p37 DPE, 2022), for this site, a targeted survey requiring the "Spot Assessment Technique" (SAT) and "spotlighting" is required.

Survey objectives
1. establish Koala presence on the subject land, and
2. estimate the area of koala habitat on the subject land

Survey design
A decision key for targeted Koala surveys (App B of DPE, 2022) outlines the approach for determining when a targeted survey is necessary and the appropriate methods in accordance with the guide (DPE, 2022).

Suitable Habitat
Suitable habitat for Koala is any PCT
- associated with Koala in the TBDC (Threatened Biodiversity Data Collection), and
- with a minimum of one Koala use tree present

Koala use trees are listed in Appendix C of Biodiversity Assessment Method Survey Guide (DPE, 2022).

Assess suitable habitat –
- for each PCT associated with Koalas the presence of Koala use trees is determined from the flora survey of the subject land.
- if no Koala use trees are present on the subject land then refer to part 3.2.2 of the guide (DPE. 2022).

Suitable habitat continuity -
Determine if the subject land is part of continuous or discontinuous habitat for Koalas. Depending on the size of the subject land this may require some aerial photograph interpretation and mapping for the report (see part 3.2.3 of DPE, 2022).

Survey timing – to be conducted at optimal time for Koala detection. Survey timing for each method is detailed in Chapter 4 (DPE, 2022).

- Spot Assessment Technique – may be undertaken all year round, during daylight hours
- Spotlighting - may be undertaken all year round, at night

Survey effort –
Minimum survey effort requires two standard survey methods to be met, including a scat detection method and a non-scat detection method, such as

- Spot Assessment Technique
- Spotlighting

SURVEY METHODS

As decided by decision key for targeted Koala surveys (App B of DPE, 2022). A summary of survey methods is found in Appendix E (DPE, 2022).

Spot Assessment Technique (SAT)
Limitations, timing and method according to part 4.1 of the Biodiversity Assessment Method Survey Guide (DPE, 2022).

May be undertaken all year round, during daylight hours

Select survey locations, at grid intersections, using a grid with -

- 150m spacing, for suitable for habitat <50ha
- 250m spacing, for suitable habitat >50ha

Upload to GPS the co-ordinates of each grid intersections that is centred within suitable habitat, to be used for SAT survey.

Areas of suitable habitat <5ha require a minimum of three SAT sites, located in different PCT's, where relevant. The total number of SAT sites for larger areas to be determined as per part 4.1.3 (DPE, 2022).

The SAT protocol (as per part 4.1.3) for each SAT site to be undertaken as follows –

1. Within suitable habitat, locate and mark tree closest to the SAT grid intersection co-ordinates. This is the centre tree.
2. Identify 29 nearest trees around the centre tree, within the suitable habitat.
3. Undertake a radial search for Koala scat beneath each of the 30 trees, within 1m of the base of each tree. Minimum of two (2) minutes for each tree.
4. Start each search with brief search of undisturbed litter, then with more thorough search by disturbing litter.
5. The search of each tree is concluded when (a) a Koala scat is detected or (b) the search time ends with no Koala scat detected.
6. Where the search time ends with no Koala scat detected, the SAT survey must continue at the next nearest tree.

All 30 trees (minimum) at each SAT site must be sampled until a scat is detected, or, all have been sampled.
Koala presence within an area of suitable habitat is confirmed by detection of a Koala scat.

Spotlighting
Limitations, timing and method according to part 4.3 of the Biodiversity Assessment Method Survey Guide (DPE, 2022).

May be undertaken all year round, at night. Two (2) nights of spotlighting are required.

For suitable habitat >5ha, 2 x 200m transects, spaced 100m apart, required for every 5ha of suitable habitat. Longer transects to be used in larger areas of suitable habitat. For suitable habitat <5ha, a single 200m transect may be used.

Coordinates for the start point of each transect must be uploaded into GPS for location in the field. End point coordinates of transect must be collected by GPS.

Spotlight intensity must be less than 1,500 lm. Minimum spotlight intensity requirements are 750-1100 lm (50-75W) in all forest types.

Koala presence within an area of suitable habitat is confirmed by direct observation, of a Koala.

SPECIES POLYGON

Where a targeted survey confirms presence of Koalas on subject land then a species polygon must be mapped according to part 5 of the guide (DPE, 2022).

RESULTS

A summary of the documentation required for a targeted Koala survey is provided in Appendix F (DPE, 2022).

Koala records information

Document any Koala records on the subject land, past or present.

There are 442 records of Koalas, gained from the NSW Bionet wildlife atlas (17.4.24) dated from 1980 to 2024, from within 10km radius of the site. Most records are north-east of the site and east of the Paterson River. However, there are only 3 records from within about 3km of the site. No Koalas were heard or observed on the site during Koala survey or searches for this current assessment.

Suitable habitat

Table, detailing

- *All PCT's on the subject land associated with Koalas in the TBDC*
- *Presence of Koala use trees in each PCT (presence / absence)*

See table below for suitable Koala habitat on the site (see **Fig-3** of report)

PCT	PCT name	Koala use trees	Presence/distribution
0	Not Classified (cleared and disturbed)	Mostly absent	Site and adjacent areas
3433	Hunter Coastal Foothills Spotted Gum-Ironbark Forest	present	Most of site and adjacent areas
4042	Lower North Riverflat Eucalypt Paperbark Forest	present	Small area on centre east edge of site

Map, identifying

- *Suitable habitat for Koalas*
- *PCT's and vegetation zones*
- *Areas of continuous and discontinuous habitat*
- *Barriers to Koala movement*

Fig-3 of the report shows the area of the site and adjacent land mapped with PCT's listed above that are suitable habitat for Koalas.

According to the "Definitions for the purpose of this guide" Koala BAM survey guide (DPE, 2022) the habitat surrounding the subject land is "continuous". However, suitable habitat for Koalas within several kilometres radius from the site (**Fig-6**) remains, mostly to the west and north of the site, only as scattered single trees and clusters within residential areas and small fragmented remnants within heavily cleared farmland.

Existing barriers to Koala movement to and across the site are -

- To the west about 2km is the Hunter River and to the east about 2km is the Paterson River.
- To the west and south of the site are residential allotments with fences and dogs
- To the north and east are rural allotments with barbed wire fences, open areas and dogs

Information,

- *If no suitable habitat identified, include justification.*
- *Describe extent of suitable habitat, including justification for continuous and discontinuous suitable habitat*
- *Document and justify exclusion of any vegetation zones (on basis of condition) from suitable habitat*
- *Describe any barriers to Koala movement creating discontinuous suitable habitat*
- *Identify the KMR (Koala modelling region) regional Koala use tree list used is*

According to vegetation mapping (**Fig-3**) and aerial photography (**Fig-2**) the site and adjacent areas support "continuous" suitable habitat for Koalas. This is because areas of native vegetation (vegetation zones) across the site and adjacent areas are separated by less than 500m (see p3 definition, DPE, 2022).

The Koala modelling region (KMR) regional Koala use tree list used for this report is "Table 4 – Koala use trees – Central Coast KMR".

Data, Parallel field transects GPS tracklog (where Koala use trees were not detected for a PCT associated with Koala)

GPS tracking data (shape file) is available if required. However, the limited area of native vegetation plus cleared understory and numerous tracks on the site allowed for complete survey, day and night, of trees on the subject land for the presence of Koalas.

Survey methods

Table, survey summary, detailing

- *Dates*
- *Start and finish time*
- *Survey method*
- *Meteorological condition*

See table below

Date	Time	Conditions	Activity
24.4.24	1040-1340	Overcast, still, warm	Koala survey (SAT) and day search
29.4.24	1400-1715	Light cloud, still, warm	Koala day search
29.4.24	1715-2040	Light cloud, still, warm	Koala night search, spotlighting
30.4.24	0700-1030	Overcast, light breeze, mild	Koala day search
1.5.24	0715-0930	Overcast, still, mild	Koala day search
2.5.24	1745-2000	Part cloud, still, mild	Koala night search, spotlighting
3.5.24	0700-1130	Part cloud, still, mild	Koala day search
7.5.24	1720-2000	Part cloud, still, mild	Koala night search, spotlighting

Table, incidental Koala detections, detailing

- *GPS coordinates*
- *Estimated age, sex, and health condition*

No Koalas were recorded during this survey across the site, during targeted survey or incidentally.

Information, describing methods used, including

- *Justification of survey methods used (ie suitability for the subject land)*
- *Describe any limitations or assumptions to surveys*
- *Detail any variations from recommended approach*
- *Meteorological conditions – document use of weather station or details of portable device*

- *Koala surveyor – name and credentials*
- *Supporting personnel for field surveys – names*
- *Other specialists – names and credentials*

Survey methods used were the SAT and spotlighting as these were the most practical considering the size and location of the subject land.

There were no limitations to the surveys. It was assumed that considering the small area of native vegetation of approximately 4ha on the site if Koalas were present they would be observed.

No variations from the recommended approach.

Meteorological conditions were determined for this survey by visual and sensual methods.

Koala surveyor was Greg Little BSc. Greg has been conducting flora and fauna surveys, including Koala surveys by visual and spotlighting survey, for over 20 years. Greg has used the SAT method since at least 2005.

No supporting personnel or specialists used.

Spot Assessment Technique (SAT)

Map, survey site locations, identifying

- *Suitable habitat (identify vegetation zones and PCT's)*
- *Location of all SAT sites*
- *Location of all Koala detections*

Fig-3 of the report shows the extent of suitable Koala habitat (PCT 3433 and PCT 4042) on the subject land/study area.

A SAT was conducted at a location in the centre of the area of native vegetation on the site.

No Koalas were detected during this survey anywhere on the subject land or elsewhere across the site or adjacent land.

Table, Koala detections, detailing SAT sites, including

- *GPS coordinates*
- *Number of trees sampled*
- *Tree species sampled*
- *Scat present/absent*
- *Estimated age, sex and health condition (where observed)*

See table below

SAT ID	Date	Coordinates of central tree	Tree species and number sampled	No of trees sampled	Scat present/absent
1	24.4.24	56 H 367789 E, 6381405 N	• Spotted Gum • Broad-leaved Ironbark	35	absent

Information,

- *Description of grid spacing used*
- *Justification for any variation to the minimum sampling effort (30 trees)*

Considering the limited area of native woodland vegetation on the subject land no grid spacing was used. Additional single trees were incidentally surveyed by the SAT method elsewhere across the site during the course of this survey.

Spotlighting

Map, survey site locations, identifying

- *Suitable habitat (identify vegetation zones and PCT's)*
- *Location of all transects*
- *Location of all Koala detections*

Fig-2 (aerial photo) & **Fig-3** (PCT's) show the subject land which supports suitable habitat for Koalas. All of the site was surveyed by spotlighting, at night. Adjacent areas were also investigated. No Koalas were observed.

The area of native vegetation on the site was carefully traversed during night spotlighting activity by a walking north-south transect on tracks through the centre of native vegetation on the site plus by random meander throughout vegetation on the site.

No Koalas were detected on the site during spotlighting activities.

Table, Koala detections, detailing
- *GPS coordinates*
- *Estimated age, sex and health condition*

See table below

Date	Action	Koala presence/absence	GPS coordinates	Estimated age, sex & health
29.4.24	Spotlighting & listening	absent	NA	NA
2.5.24	Spotlighting & listening	absent	NA	NA
7.5.24	Spotlighting & listening	absent	NA	NA

Information,
- *Spotlight make, model, year of manufacture, intensity (lm or W)*
- *Justification for any variation to transect length/configuration*
- *Justification for use of vehicle (where relevant)*

Equipment used
Torch - Led Lenser, P14, 800 lm; headlamp - Led Lenser, MH7, 600 lm; headlamp - Led Lenser, H15R, 1000 lm to 2500 lm.

Considering the area and shape of native vegetation on the site, the spotlight survey transect was configured by an approximately 250m transect along existing north-south vehicular tracks through the centre of the native vegetation on the site. Additional spotlighting was conducted along other tracks through the native vegetation and elsewhere throughout the site.

Vehicle not used.

Species Polygon
Map, Koala species polygon, including
- *Area of suitable habitat representing the species polygon*
- *Location of all Koala detections*
- *Unit of measure*

No Koalas recorded on or near the subject land or elsewhere on or near site, therefore, no species polygon or GPS locations required.

- *Justification for area of species polygon* NA

CONCLUSION

There were no Koalas recorded on the site by visual observation, listening, SAT or spotlighting. According to the Bionet database there are 442 records of Koalas (1980 to 2023) within 10km radius of the site, however, there are only 3 records (between 1980 and 2024) of Koala within a 3 kilometre radius of the site. Many existing native trees will likely be retained on the site thereby retaining potential habitat for this species. It is therefore considered that the proposed development of the site is unlikely to have a significant impact on the local Koala population.

APPENDIX - I Threatened species co-ordinates

Site - Lot C, 256 Paterson Road, Bolwarra, NSW

Map zone - 56

Approximate co-ordinate locations of threatened species recorded on the site

Species name	Common name	Unit/date	Easting	Northing
Miniopterus australis	Little Bent-wing Bat	U007/290424	367818	6381445
Miniopterus australis	Little Bent-wing Bat	U179/290424	367758	6381369
Miniopterus australis	Little Bent-wing Bat	U223/290424	367805	6381517
Miniopterus australis	Little Bent-wing Bat	U007/020524	367776	6381310
Miniopterus australis	Little Bent-wing Bat	U179/020524	367774	6381422
Miniopterus australis	Little Bent-wing Bat	U223/020524	367887	6381415
Miniopterus australis	Little Bent-wing Bat	U007/070524	367844	6381341
Miniopterus australis	Little Bent-wing Bat	U179/070524	367730	6381475
Miniopterus australis	Little Bent-wing Bat	U223/070524	367802	6381261
Miniopterus orianae oceanensis	Large Bent-wing Bat	U223/290424	367805	6381517
Miniopterus orianae oceanensis	Large Bent-wing Bat	U007/020524	367776	6381310
Miniopterus orianae oceanensis	Large Bent-wing Bat	U179/020524	367774	6381422
Miniopterus orianae oceanensis	Large Bent-wing Bat	U223/020524	367887	6381415
Miniopterus orianae oceanensis	Large Bent-wing Bat	U223/070524	367802	6381261
Micronomus norfolkensis	East-coast Freetail Bat	U007/290424	367818	6381445
Micronomus norfolkensis	East-coast Freetail Bat	U179/290424	367758	6381369
Micronomus norfolkensis	East-coast Freetail Bat	U223/290424	367805	6381517
Micronomus norfolkensis	East-coast Freetail Bat	U007/020524	367776	6381310
Micronomus norfolkensis	East-coast Freetail Bat	U179/020524	367774	6381422
Micronomus norfolkensis	East-coast Freetail Bat	U223/020524	367887	6381415
Micronomus norfolkensis	East-coast Freetail Bat	U007/070524	367844	6381341
Micronomus norfolkensis	East-coast Freetail Bat	U179/070524	367730	6381475
Micronomus norfolkensis	East-coast Freetail Bat	U223/070524	367802	6381261
Scoteanax rueppellii	Greater Broad-nosed Bat	U179/290424	367758	6381369
Scoteanax rueppellii	Greater Broad-nosed Bat	U223/290424	367805	6381517
Myotis macropus	Southern Myotis	U007/290424	367818	6381445
Myotis macropus	Southern Myotis	U179/290424	367758	6381369
Myotis macropus	Southern Myotis	U223/290424	367805	6381517
Myotis macropus	Southern Myotis	U179/070524	367730	6381475
Myotis macropus	Southern Myotis	U223/070524	367802	6381261
Chalinolobus dwyeri	Large-eared Pied Bat	U179/020524	367774	6381422
Chalinolobus dwyeri	Large-eared Pied Bat	U179/070524	367730	6381475
Pteropus poliocephalus	Grey-headed Flying-fox	heard	367754	6381540
Petaurus norfolcensis	Squirrel Glider	Ell B2	367820	6381410
Petaurus norfolcensis	Squirrel Glider	Ell B1	367830	6381376
Petaurus norfolcensis	Squirrel Glider	Ell B5	367779	6381341
Petaurus norfolcensis	Squirrel Glider	Ell B2	367820	6381410

APPENDIX - J Habitat tree data

The location of the following habitat (hollow bearing) trees are indicated in a Figure of this report.
BHT = Hollow bearing tree
Hollow size (mm) - >200, 100-200, 0-100 Height above ground (m) - >10, 5-10, 0-5 Canopy connection - connected, close, isolated

BHT No.	Easting	Northing	Tree Species	Hgt (~m)	dbh (~m)	Hollow size (~mm)	Hgt above ground (~m)	Canopy connection	Comment
01	367920	6381338	Spotted Gum	20	0.8	100-200	8	connected	main branch hollow
"	"	"	"	"	"	100-200	9	"	main branch hollow
"	"	"	"	"	"	0-100	10	"	main branch hollow
02	367788	6381539	Spotted Gum	20	0.6	0-100	5	connected	main branch hollow
"	"	"	"	"	"	0-100	10	connected	main branch hollow
03	367787	6381544	Spotted Gum	20	0.7	0-100	5	connected	main branch hollow
04	367711	6381520	Spotted Gum	20	0.8	0-100	5	close	main branch hollow
"	"	"	"	"	"	0-100	7	close	main branch hollow
"	"	"	"	"	"	0-100	9	close	main branch hollow
05	367787	6381268	Dead, Ironbark	15	0.6			close	loose bark, cracks and fissures
06	367837	6381371	Spotted Gum	20	0.6	0-100	12	connected	main branch hollow
07	367764	6381359	Spotted Gum	20	0.7	0-100	12	connected	main branch hollow
08	367757	6381372	Spotted Gum	20	0.7	>200	10	connected	main branch hollow
09	367823	6381393	Spotted Gum	15	0.7	>200	4	connected	vertical main stem hollow
10	367811	6381456	Broad-leaved Ironbark	20	0.4	0-100	3m	connected	main branch hollow
11	367785	6381441	Spotted Gum	20	0.5	0-100	10	connected	main branch hollow
"	"	"	"	"	"	0-100	13	connected	main branch hollow
12	367800	6381480	Dead	15	0.5			close	cracks and fissures, no bark
13	367806	6381491	Dead	15	0.6	100-200	10	connected	cracks and fissures
14	367822	6381481	Spotted Gum	20	0.6	0-100	5	connected	main branch hollow
15	367800	6381514	Dead	12	0.5	0-100	6	close	cracks and fissures
"	"	"	"	"	"	0-100	10	close	"
16	367767	6381518	Spotted Gum	20	0.4	100-200	7	connected	main branch hollow
17	367744	6381512	Spotted Gum	20	0.4	0-100	8	close	main branch hollow

APPENDIX 9: EPBC ACT PROTECTED MATTERS REPORT, JULY, 2024

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected. Please see the caveat for interpretation of information provided here.

Report created: 02-Jul-2024

Summary
Details
- Matters of NES
- Other Matters Protected by the EPBC Act
- Extra Information

Caveat
Acknowledgements

Summary

Matters of National Environment Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance (Ramsar	1
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	6
Listed Threatened Species:	43
Listed Migratory Species:	17

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at https://www.dcceew.gov.au/parks-heritage/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Lands:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	24
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None
Habitat Critical to the Survival of Marine Turtles:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have

State and Territory Reserves:	None
Regional Forest Agreements:	1
Nationally Important Wetlands:	None
EPBC Act Referrals:	2
Key Ecological Features (Marine):	None
Biologically Important Areas:	None
Bioregional Assessments:	1
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

Wetlands of International Importance (Ramsar Wetlands) [Resource Information]

Ramsar Site Name	Proximity
Hunter estuary wetlands	10 - 20km upstream from Ramsar site

Listed Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.
Status of Vulnerable, Disallowed and Ineligible are not MNES under the EPBC Act.

Community Name	Threatened Category	Presence Text
Central Hunter Valley eucalypt forest and woodland	Critically Endangered	Community may occur within area
Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community	Endangered	Community may occur within area
Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland	Endangered	Community may occur within area
Lowland Rainforest of Subtropical Australia	Critically Endangered	Community may occur within area
River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria	Critically Endangered	Community likely to occur within area
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Critically Endangered	Community may occur within area

Listed Threatened Species [Resource Information]

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act.
Number is the current name ID.

Scientific Name	Threatened Category	Presence Text
BIRD		

Scientific Name	Threatened Category	Presence Text
Anthochaera phrygia Regent Honeyeater [82338]	Critically Endangered	Foraging, feeding or related behaviour likely to occur within area
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat likely to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Callocephalon fimbriatum Gang-gang Cockatoo [768]	Endangered	Species or species habitat likely to occur within area
Calyptorhynchus lathami lathami South-eastern Glossy Black-Cockatoo [67036]	Vulnerable	Species or species habitat likely to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat may occur within area
Climacteris picumnus victoriae Brown Treecreeper (south-eastern) [67062]	Vulnerable	Species or species habitat likely to occur within area
Erythrotriorchis radiatus Red Goshawk [942]	Endangered	Species or species habitat may occur within area
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat likely to occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]	Vulnerable	Species or species habitat likely to occur within area

Scientific Name	Threatened Category	Presence Text
Grantiella picta		
Painted Honeyeater [470]	Vulnerable	Species or species habitat likely to occur within area
Hirundapus caudacutus		
White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area
Lathamus discolor		
Swift Parrot [744]	Critically Endangered	Species or species habitat likely to occur within area
Melanodryas cucullata cucullata		
South-eastern Hooded Robin, Hooded Robin (south-eastern) [67093]	Endangered	Species or species habitat may occur within area
Neophema chrysostoma		
Blue-winged Parrot [726]	Vulnerable	Species or species habitat may occur within area
Numenius madagascariensis		
Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Rostratula australis		
Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area
Stagonopleura guttata		
Diamond Firetail [59398]	Vulnerable	Species or species habitat likely to occur within area
Tringa nebularia		
Common Greenshank, Greenshank [832]	Endangered	Species or species habitat may occur within area
FROG		
Litoria aurea		
Green and Golden Bell Frog [1870]	Vulnerable	Species or species habitat likely to occur within area
MAMMAL		
Chalinolobus dwyeri		
Large-eared Pied Bat, Large Pied Bat [183]	Endangered	Species or species habitat likely to occur within area

Scientific Name	Threatened Category	Presence Text
Dasyurus maculatus maculatus (SE mainland population)		
Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat likely to occur within area
Notamacropus parma		
Parma Wallaby [89289]	Vulnerable	Species or species habitat may occur within area
Petauroides volans		
Greater Glider (southern and central) [254]	Endangered	Species or species habitat may occur within area
Petaurus australis australis		
Yellow-bellied Glider (south-eastern) [87600]	Vulnerable	Species or species habitat likely to occur within area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT)		
Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Endangered	Species or species habitat known to occur within area
Potorous tridactylus tridactylus		
Long-nosed Potoroo (northern) [66645]	Vulnerable	Species or species habitat may occur within area
Pseudomys novaehollandiae		
New Holland Mouse, Pookila [96]	Vulnerable	Species or species habitat likely to occur within area
Pteropus poliocephalus		
Grey-headed Flying-fox [186]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
PLANT		
Caladenia tessellata		
Thick-lipped Spider-orchid, Daddy Long-legs [2119]	Vulnerable	Species or species habitat may occur within area
Cryptostylis hunteriana		
Leafless Tongue-orchid [19533]	Vulnerable	Species or species habitat may occur within area
Eucalyptus glaucina		
Slaty Red Gum [5670]	Vulnerable	Species or species habitat likely to occur within area

Scientific Name	Threatened Category	Presence Text
Euphrasia arguta [4325]	Critically Endangered	Species or species habitat may occur within area
Persicaria elatior Knotweed, Tall Knotweed [5831]	Vulnerable	Species or species habitat likely to occur within area
Prasophyllum sp. Wybong (C.Phelps ORG 5269) a leek-orchid [81964]	Critically Endangered	Species or species habitat may occur within area
Pterostylis gibbosa Illawarra Greenhood, Rufa Greenhood, Pouched Greenhood [4562]	Endangered	Species or species habitat may occur within area
Rhizanthella slateri Eastern Underground Orchid [11768]	Endangered	Species or species habitat may occur within area
Rhodamnia rubescens Scrub Turpentine, Brown Malletwood [15763]	Critically Endangered	Species or species habitat may occur within area
Rhodomyrtus psidioides Native Guava [19162]	Critically Endangered	Species or species habitat may occur within area
Syzygium paniculatum Magenta Lilly Pilly, Magenta Cherry, Daguba, Scrub Cherry, Creek Lilly Pilly, Brush Cherry [20307]	Vulnerable	Species or species habitat may occur within area
Thesium australe Austral Toadflax, Toadflax [15202]	Vulnerable	Species or species habitat may occur within area
REPTILE		
Delma impar Striped Legless Lizard, Striped Snake-lizard [1649]	Vulnerable	Species or species habitat may occur within area

Listed Migratory Species [Resource Information]

Scientific Name	Threatened Category	Presence Text
Migratory Marine Birds		

Scientific Name	Threatened Category	Presence Text
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Cuculus optatus Oriental Cuckoo, Horsfield's Cuckoo [86651]		Species or species habitat known to occur within area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat likely to occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat likely to occur within area
Symposiachrus trivirgatus as Monarcha trivirgatus Spectacled Monarch [83946]		Species or species habitat may occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat may occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]	Vulnerable	Species or species habitat likely to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pandion haliaetus Osprey [952]		Species or species habitat likely to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]	Endangered	Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species		[Resource Information]
Scientific Name	Threatened Category	Presence Text
Bird		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area overfly marine area
Bubulcus ibis as Ardea ibis Cattle Egret [66521]		Species or species habitat may occur within area overfly marine area

Scientific Name	Threatened Category	Presence Text
Calidris acuminata Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area overfly marine area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area overfly marine area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat may occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]	Vulnerable	Species or species habitat likely to occur within area overfly marine area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area overfly marine area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat likely to occur within area overfly marine area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area overfly marine area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat likely to occur within area overfly marine area

Scientific Name	Threatened Category	Presence Text
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area overfly marine area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area overfly marine area
Neophema chrysostoma Blue-winged Parrot [726]	Vulnerable	Species or species habitat may occur within area overfly marine area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pandion haliaetus Osprey [952]		Species or species habitat likely to occur within area
Pterodroma cervicalis White-necked Petrel [59642]		Species or species habitat may occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat likely to occur within area overfly marine area
Rostratula australis as Rostratula benghalensis (sensu lato) Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area overfly marine area
Sterna striata White-fronted Tern [799]		Migration route may occur within area
Symposiachrus trivirgatus as Monarcha trivirgatus Spectacled Monarch [83946]		Species or species habitat may occur within area overfly marine area

Scientific Name	Threatened Category	Presence Text
Tringa nebularia		
Common Greenshank, Greenshank [832]	Endangered	Species or species habitat may occur within area overfly marine area

Extra Information

Regional Forest Agreements [Resource Information]

Note that all areas with completed RFAs have been included. Please see the associated resource information for specific caveats and use limitations associated with RFA boundary information.

RFA Name	State
North East NSW RFA	New South Wales

EPBC Act Referrals [Resource Information]

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action			
Hunter Natural Gas Pipeline	2004/1902	Not Controlled Action	Completed
Improving rabbit biocontrol: releasing another strain of RHDV, sthrn two thirds of Australia	2015/7522	Not Controlled Action	Completed

Bioregional Assessments [Resource Information]

SubRegion	BioRegion	Website
Hunter	Northern Sydney Basin	BA website

Caveat

1 PURPOSE

This report is designed to assist in identifying the location of matters of national environmental significance (MNES) and other matters protected by the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) which may be relevant in determining obligations and requirements under the EPBC Act.

The report contains the mapped locations of:

- World and National Heritage properties;
- Wetlands of International and National Importance;
- Commonwealth and State/Territory reserves;
- distribution of listed threatened, migratory and marine species;
- listed threatened ecological communities; and
- other information that may be useful as an indicator of potential habitat value.

2 DISCLAIMER

This report is not intended to be exhaustive and should only be relied upon as a general guide as mapped data is not available for all species or ecological communities listed under the EPBC Act (see below). Persons seeking to use the information contained in this report to inform the referral of a proposed action under the EPBC Act should consider the limitations noted below and whether additional information is required to determine the existence and location of MNES and other protected matters.

Where data are available to inform the mapping of protected species, the presence type (e.g. known, likely or may occur) that can be determined from the data is indicated in general terms. It is the responsibility of any person using or relying on the information in this report to ensure that it is suitable for the circumstances of any proposed use. The Commonwealth cannot accept responsibility for the consequences of any use of the report or any part thereof. To the maximum extent allowed under governing law, the Commonwealth will not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance

3 DATA SOURCES

Threatened ecological communities

For threatened ecological communities where the distribution is well known, maps are generated based on information contained in recovery plans, State vegetation maps and remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species

Threatened, migratory and marine species distributions have been discerned through a variety of methods. Where distributions are well known and if time permits, distributions are inferred from either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc.) together with point locations and described habitat; or modelled (MAXENT or BIOCLIM habitat modelling) using

Where little information is available for a species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc.).

In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More detailed distribution mapping methods are used to update these distributions

4 LIMITATIONS

The following species and ecological communities have not been mapped and do not appear in this report:

- threatened species listed as extinct or considered vagrants;
- some recently listed species and ecological communities;
- some listed migratory and listed marine species, which are not listed as threatened species; and
- migratory species that are very widespread, vagrant, or only occur in Australia in small numbers.

The following groups have been mapped, but may not cover the complete distribution of the species:

- listed migratory and/or listed marine seabirds, which are not listed as threatened, have only been mapped for recorded
- seals which have only been mapped for breeding sites near the Australian continent

The breeding sites may be important for the protection of the Commonwealth Marine environment.

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact us page.

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