Flora and Fauna Assessment of No 10 and 20 Brooks Point Road, Appin NSW

(Reference Number: 27032022)

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Revision	Details	Date	Amended By
A	Draft Flora & Fauna Assessment	27/03/2022	John Whyte
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C	Amended Flora & Fauna Assessment	23/11/2022	John Whyte
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Signed: 

Date: ..... 2nd of August 2023

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1. Introduction

Enviro Ecology has been engaged by Mis Kellie Hassab of Beveridge Williams C-/O property owner (Appin Farmers) to prepare a Flora and Fauna Assessment in support of a rezoning over No 10 Brooks Point Road, Appin. The study area is comprised of the following lots 1, 4 & 5 in DP 249446, Lots 1 & 2 in DP 584515 and lot 3 in DP 249446 (Figure 1-1).

The proposed development is to rezone the subject property from rural zone to permit low and medium density housing. The subject rezoning proposes a R2 Low Density Residential and C2 Environmental Management Zones. The proposed zones respond to the natural landscape character of the site and will ensure ecologically important land is protected. This will require making corresponding amendments to the Wollondilly Local Environmental Plan 2011 (WLEP).

This report examines the terrestrial flora assemblages and faunal species and their habitats within the location of the future rezoning (Figure 1-2). The report then determines the impacts of future zoning upon local biodiversity. It summarises proposed mitigation measures as well as the assessment under the *Environmental Planning and Assessment Act 1979* and under the (Commonwealth) *Environment Protection and Biodiversity Conservation Act 1999*.

1.1 Terminology

This report uses the following terminology:

- Study area: Lots 1, 4 and 5 DP 249446 (No. 10), and Lot 1 DP 584515 and Lot 3 DP 249446 (No. 20) defined as the yellow boundary on the aerial photograph see (Figure 1-1).
- BC Act abbreviates the *Biodiversity Conservation Act 2016;*
- EPBC Act abbreviates the *Environment Protection and Biodiversity Conservation Act 1999;*
- EP&A Act abbreviates the *Environmental Planning and Assessment Act 1979*;
- DPIE abbreviates Department of Planning, Industry & Environment formerly the NSW Office of Environment & Heritage;
- LGA abbreviates Local Government Area;
- Threatened species refers to those flora and fauna species listed as vulnerable, endangered or critically endangered under the BC Act or EPBC Act
- EEC abbreviates Endangered Ecological Community; and
- WSUD abbreviates Water Sensitive Urban Design.

1.2 Legislative context

This report addresses the requirements of the *Environmental Planning and Assessment Act 1979* (EP&A Act). The study area is located within the Wollondilly City Council, a Local Government Area (LGA).

All proposals assessed under the *Environmental Planning and Assessment Act 1979* must include an examination of the threatened biodiversity, or their habitats, that are likely to occur within the development area or that may be indirectly affected by the construction and operation of a proposal. In the event that threatened biodiversity is within the vicinity of a proposal, the application must also include an assessment of the potential impact.

1.3 Key Acts and Policies

1.3.1 NSW Environmental Planning and Assessment Act 1979

The Environmental Planning and Assessment Act 1979 (NSW EP&A Act) forms the legal and policy platform for proposal assessment and approval in NSW and aims to 'encourage the proper management, development and conservation of natural and artificial resources'. All development in NSW is assessed in accordance with the provisions of the EP&A Act and EP&A Regulation 2000.

1.3.2 NSW Biodiversity Conservation Act 2016

The NSW Biodiversity Conservation Act 2016 (BC Act), the NSW Biodiversity Conservation Regulation 2017 (BC Regulation) and amendments to the Local Land Services Act 2013 (LLS Act) commenced on 25 August 2017. The legislation aims to deliver "a strategic approach to conservation in NSW whilst supporting improved farm productivity and sustainable development". The BC Act repeals several pre-existing Acts, most notably the Threatened Species Conservation Act 1995, the Nature Conservation Trust Act 2001 and the Native Vegetation Act 2003. Relevant provisions from each of the repealed Acts has been saved and incorporated into the new legislative framework. Transitional arrangements are in place to ensure a smooth transition from the repealed legislation to the BC Act.

1.3.3 NSW Biodiversity Values Map

Preparation of a BDAR is required for activities that impact areas identified as having high biodiversity value by the NSW Biodiversity Values Map (BV Map) (OEH, 2020d). EE reviewed the NSW Biodiversity Values Map (BC Map) on 24th of November 2021 found that the subject property is mapped as containing areas of high biodiversity value within the Project Site. Future development located within the NSW Biodiversity Values map will require the preparation of a biodiversity development assessment report or alternatively the site may be subject to a bio certification proposal.

1.3.4 NSW Biosecurity Act 2015

The NSW Biosecurity Act 2015 provides a streamlined statutory framework to protect the NSW economy, environment and community from the negative impact of pests, diseases and weeds. The primary object of the Act is to provide a framework for the prevention, elimination and minimisation of biosecurity risks posed by biosecurity matter, dealing with biosecurity matter, carriers and potential carriers, and other activities that involve biosecurity matter, carriers or potential carriers. In NSW, all plants are regulated with a general biosecurity duty to prevent, eliminate or minimise any biosecurity risk they may pose. Any person who deals with any plant, who knows (or ought to know) of any biosecurity risk, has a duty to ensure the risk is prevented, eliminated or minimised, so far as is reasonably practicable.

Priority weeds recorded within the Project Site are addressed in this report.

1.3.5 NSW Water Management Act

Controlled activities carried out in, on or under waterfront land are regulated by the NSW Water Management Act 2000 (WM Act). The NSW Office of Water (known as DPI Water) administers the WM Act and is required to assess the impact of any proposed controlled activity to ensure that no more than minimal harm will be done to waterfront land as a consequence of carrying out the controlled activity. Waterfront land includes the bed and bank of any river, lake or estuary and all land within 40 metres of the highest bank of the river, lake or estuary. This means that a controlled activity approval must be obtained from the Office of Water before commencing the controlled activity.

A 1st order watercourse is located within the study area therefore, the project site constitutes water front land.

1.3.6 Environment Protection and Biodiversity Conservation Act 1999

The purpose of the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) is to ensure that actions likely to cause a significant impact on ‘matters of national environmental significance’ undergo an assessment and approval process. Under the EPBC Act, an action includes a proposal, a development, an undertaking, an activity or a series of activities, or an alteration of any of these things. An action that ‘has, will have or is likely to have a significant impact on a matter of national environmental significance’ is deemed to be a ‘controlled action’ and may not be undertaken without prior approval from the Australian Minister for the Environment.

The EPBC Act identifies matters of NES as:

- World heritage properties
- National heritage places
- Wetlands of international importance (Ramsar Wetlands)
- Threatened species and ecological communities
- Migratory species
- 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..

As part of the current investigation, matters of national environmental significance (and their habitats) that are predicted to occur within the locality (applying a 10 kilometre buffer) were obtained from the on-line Protected Matters Search Tool (DoEE, 2021a). The EPBC Act has been further addressed in this assessment through:

- Targeted field surveys for EPBC listed threatened biota and migratory species;
- Assessment of potential impacts on EPBC listed threatened species and migratory biota;
- Identification of suitable impact mitigation and environmental management measures for EPBC listed threatened species and migratory biota; and
- Identification of the need for an EPBC referral based on the EPBC Significant Impact Guidelines (DEWHA, 2013)

1.3.7 State Environmental Planning Policy (Biodiversity and Conservation) 2021 (Chapter 4 Koala Habitat Protection)

State Environmental Planning Policy (Biodiversity and Conservation) chapter 4 Koala Habitat Protection aims to encourage the “proper conservation and management of areas of natural vegetation that provide habitat for Koalas (*Phascolarctos cinereus*) to ensure a permanent free-living population over their present range and reverse the current trend of Koala population decline”. The SEPP is currently being amended by the NSW Department of Planning and Environment. Key changes to the amended SEPP relate to the following:

- Definitions of koala habitat;
- List of Koala feed tree species;
- List of councils to which the SEPP applies; and
- Various changes to the development assessment process.

Wollondilly LGA is identified in Schedule 2 of State Environmental Planning Policy (Biodiversity and Conservation) 2021 and therefore consideration of SEPP is required.

1.4 Site Description

The planning and cadastral details of the subject property are provided in (Table 1-1). The property is bordered by rural residential to the north & and west to the south by Brooks Point Road and to the east by Appin Road (Figure 1-1).

Table 1-1 Site details

Location	Lots 1, 4 and 5 DP 249446 (No. 10), and Lot 1 DP 584515 and Lot 3 DP 249446 (No. 20)
Subject properties	39ha
Topographic Map	Wollondilly 1:25000
Local Government Area	Wollondilly
Elevation	286-290m AHD
Slope	The entire subject property slopes in a slight north-westerly direction.
Aspect	East-west
Vegetation	Shale Sandstone Transition Forest & Exotic Grassland

1.5 Study objectives

The objectives of this report are to:

- Conduct a fauna survey and habitat assessments to determine the likelihood of occurrence of threatened or Migratory species of animal occurring within the study area.
- Conduct a floral survey to identify any threatened species of plant present or considered likely to occur within the proposal area & determine and describe the characteristics and condition of the vegetation communities and flora.
- Determine the presence, or likelihood of occurrence, of threatened biodiversity listed under the *Biodiversity Conservation Act 2016* or *Environment Protection and Biodiversity Conservation Act 1999* occurring within the study area.
- Describe and assess likely impacts of the rezoning on biodiversity.
- Undertake significance assessments for threatened biodiversity that occur or have potential habitat within the study area.
- Propose amelioration measures to mitigate or minimise impacts on the ecological values of the study area.

Figure 1-1 Study Area

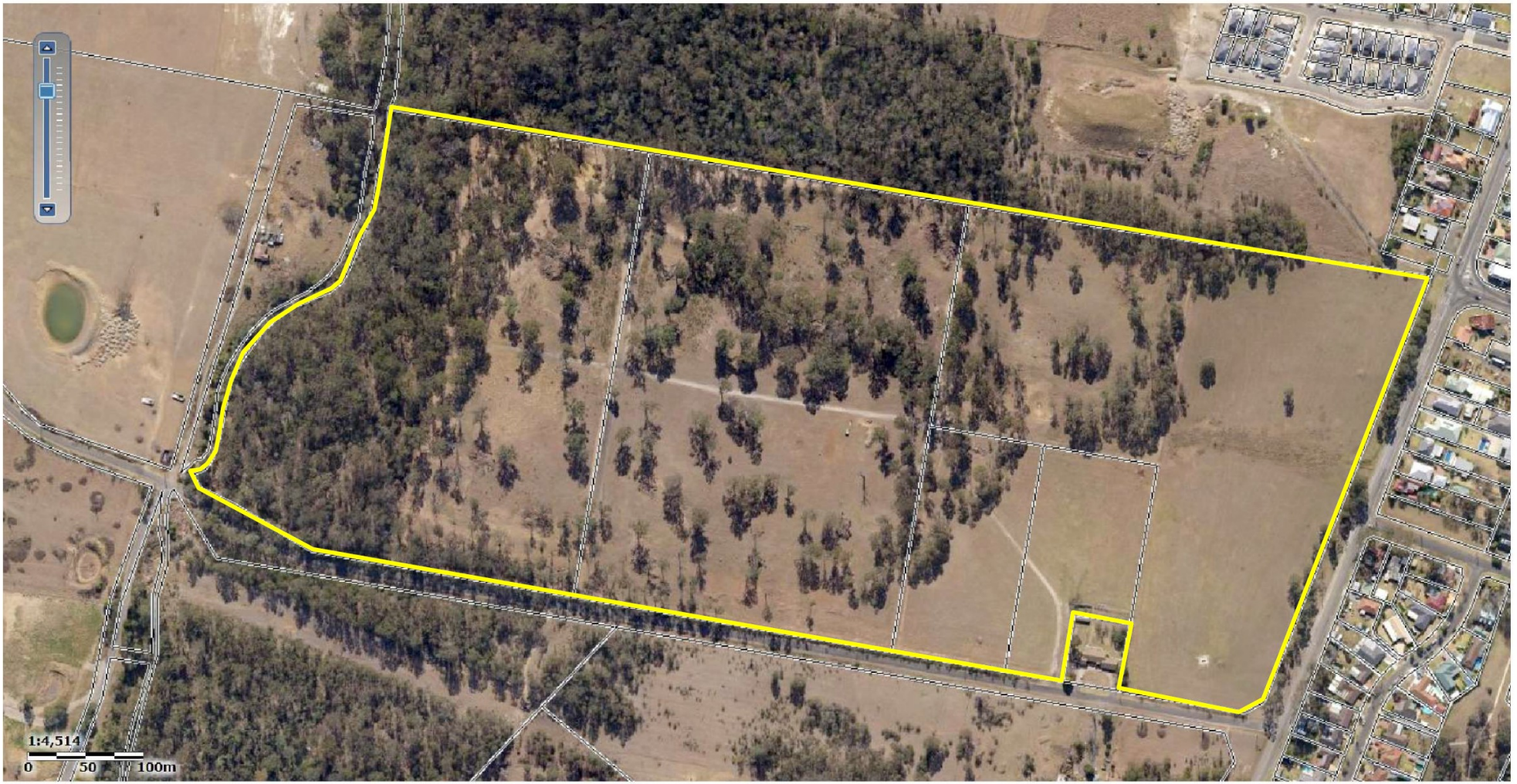
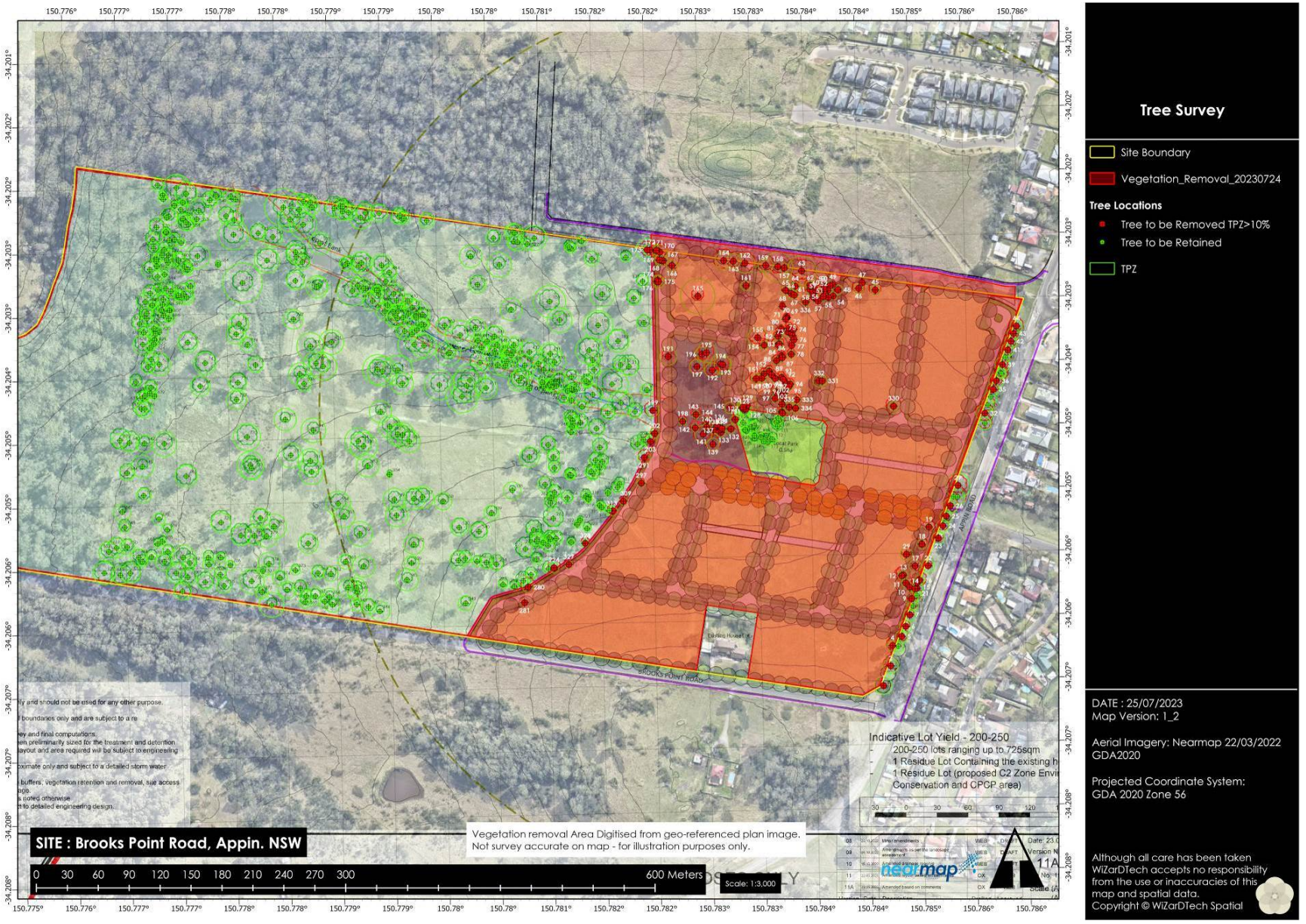


Figure 1-2 Proposed Development



2. Methodology

This ecological assessment was based on the results of a desktop review and site inspections on the 11th, 21st-23rd, 28th-30th of December 2022 by Mr John Whyte B.Bio.Sc (Majors Botany & Zoology) B.Bio.Sc (Majors Botany & Zoology). This assessment has been prepared to identify potential impacts as a result of the proposed activity upon biodiversity.

2.1 Licensing

All work was carried out under the appropriate licences, including a scientific licence (SL100292) issued under part 2 *Biodiversity Conservation Act 2016,* and an Animal Research Authority issued by the Department of Industries and Investment formerly the Department of Industries & Investment (Agriculture).

2.2 Nomenclature

Names of plants used in this document follow Harden (Harden 1992; Harden 1993; Harden 2000; Harden 2002) with updates from PlantNet (Royal Botanic Gardens 2022). Scientific names are used in this report for species of plant. Scientific and common names of plants are listed in Appendices A and C.

Names of vertebrates follow the Census of Australian Vertebrates (CAVS) database maintained by the Department of Sustainability and Environment (Department of Sustainability and Environment 2022). Common names are used in the report for species of animal. Scientific names are included in species lists found in Appendices B and D.

2.3 Database searches and literature review

This assessment included a review of:

- Topographic maps & Aerial photographs
- Vegetation mapping of the area
- A review of *Native Vegetation of Southeast NSW: A Revised Classification and Map for the Coast and Eastern Tablelands. Version 12*, Department of Environment and Climate Change, Hurstville (Tozer, Turner et al. 2016) & Native Vegetation Maps of the Cumberland Plain - Western Sydney (NSW National Parks and Wildlife Service 2008).
- Database searches, as summarised in Table 2-1.

Table 2-1 Database searches

Database	Search date	Area searched	Reference
Bionet Atlas of NSW Wildlife	24th of November 2021	Locality (10 km)	(Department of Planning, Industry and Environement 2021)
PlantNet Database	24th of November 2021	Locality (10 km)	(Royal Botanic Gardens 2021)
Protected Matters Search Tool	24th of November 2021	Locality (10 km)	(Department of Sustainability and Environment 2021)

2.4 Field Survey

Inspections of the site were undertaken on the 11th, 21st-23rd, 28th-30th of December 2022. This included:

- Seven BAM Plots & a random meander survey recording all species of plant encountered within the study area (Figure 2-1)
- Searching for specialised fauna habitat resources such as roosting/nesting hollows, foraging resources e.g. feed trees
- Targeted surveys for flora and fauna (Sections 2.5 & 2.6)
- Opportunistic fauna surveys during the flora survey

2.5 Vegetation Mapping

All plant species detected within the Project Site were identified to species level (Appendix A). Native vegetation types were identified based on dominant flora species present within each structural layer (i.e. canopy, shrub and ground layers). Exotic or highly modified native vegetation was defined based on structure and species composition. Boundaries of vegetation types and communities were marked with a hand-held GPS and mapped using geographical information system (GIS) software.

Vegetation types within the Project Site were assessed against identification criteria for State and Commonwealth listed threatened ecological communities (DoEE, 2020b; OEH, 2020f). Vegetation and habitats were compared with descriptions provided in the Bionet Vegetation Information System (OEH, 2020e) to identify Plant Community Types (PCTs).

The vegetation condition of each PCT was defined as either 'moderate to good' or 'low' based on the definitions presented in Table 2-3. Vegetation condition was then used to delineate vegetation zones as required by the BAM (OEH, 2017b).

Table 2-2 Vegetation Condition Definitions

Vegetation Condition	Definition
Moderate-good	Vegetation retaining the species complement and structural characteristics of the pre-European equivalent. Such vegetation has changed very little over time and displays resilience to weed invasion due to intact groundcover, shrub and canopy layers.
Low	Vegetation retaining a native canopy with a modified understorey due to disturbance. This condition class may also contain weed incursions.

2.6 Flora Surveys

A combination of quadrat and traverse flora surveys was used to assess native floral diversity, dominant species, condition of vegetation communities and search for Threatened species within the study area. The flora survey effort was determined to exceed the suggested minimum survey requirements of the *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities (Working Draft)* (refer to table 3-2, Department of Environment and Conservation 2004).

Table 2-3 Suggested survey technique and effort for plant quadrats

Survey technique	**Suggested minimum effort per stratification unit**
Quadrat	1 quadrat for areas <2 ha
	2 quadrats for area 2-50 ha
	3 quadrats for areas 51-250 ha

	5 quadrats for areas 251-500 ha
	10 quadrats for areas 5,001-1,000 ha, plus 1 additional quadrat for each extra 100 ha thereof
Random Meander	30 minutes for each quadrat sampled within the same stratification unit as the quadrat

Source: *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities* (Working Draft) (Department of Environment and Conservation 2004).

2.6.1 Vegetation Survey Plots (BAM Plots)

Following delineation of vegetation zones within the Project Site, 400m² floristic plot/transects (BAM Plots) were sampled. Plot/ transects were positioned to sample areas that were most representative of the floristic characteristics of each PCT vegetation zone. The number of plot/transects sampled in each vegetation zone was based on the requirements of the BAM (OEH, 2020b), which are presented in Table 2-4.

Table 2-4 Minimum number of plots and transects required per zone area

Vegetation Zone Area (ha)	Minimum number of plots/transects
<2	1 plot/transect
>2-5	**2 plot/transect**
>5-20	3 plot/transect
>20-50	4 plot/transect
>50-100	5 plot/transect
>100-250	6 plot/transect
>250-1000	7 plot/transect
>1000	8 plot/transect

Vegetation integrity was determined using data collected from vegetation survey plot/ transects (BAM Plots) by examining the vegetation composition, structure and function attributes as follows:

- The assessment of vegetation composition was based on the number of native plant species (richness) observed within the 400m² plot/transect (standard 20m x 20m BAM Plot);
- The assessment of vegetation structure was based on the % of foliage cover for each plant growth form group within the 400m² plot (standard 20m x 20m BAM plot); and
- The assessment of vegetation function was based on an assessment of the following attributes within the 1000m² plot (20m x 50m BAM Plot):
  - Number of large trees
  - Tree regeneration
  - Tree stem size class
  - Total length of fallen logs
  - Litter cover (i.e. assessed using five 1m² quadrats along the 50m transect)
  - High threat exotic vegetation cover
  - Hollow bearing trees

For a more detailed description of how vegetation integrity was calculated, refer to the BAM (OEH, 2020b).

2.6.2 Random meander surveys

Random meander surveys are a variation of the transect type survey and were completed in accordance with the technique described by Cropper (1993), whereby the recorder walks in a random manner throughout the site recording all species observed. The survey is continued until no additional species are observed within a patch. Random meander surveys also allow the boundaries between various vegetation communities and condition of vegetation to be recorded and are valuable for recording species that may not occur within quadrats including, Threatened species (Department of Environment and Conservation 2004).

Individual random meander surveys were separated whenever there was a significant change in vegetation community type or condition. For each random meander survey, the vegetation community was determined based on the dominant canopy species and the structure formation in accordance with Specht (1981) with reference to existing mapped vegetation communities. A random meander was conducted throughout the entire study area.

2.7 Terrestrial fauna

2.7.1 Fauna habitats

Fauna habitat assessments were undertaken to assess the likelihood of Threatened species of animal (those species identified from the literature and database review) to occur within the study area. Fauna habitat characteristics assessed included the:

- Structure and floristics of the canopy, understorey and ground vegetation, including the presence of flowering and fruiting trees providing potential foraging resources
- Presence of hollow-bearing trees providing roosting and breeding habitat for arboreal mammals, birds and reptiles
- Composition of the ground cover vegetation, leaf litter, rocky outcrops and fallen timber to provide protection for ground-dwelling mammals, reptiles and amphibians
- Presence of waterways (ephemeral or permanent) and water bodies.

The assessment of these fauna habitat characteristics enabled an overall assessment of fauna habitat condition within the study area (refer Table 2-5).

Table 2-5 Fauna Habitat Condition Classes

Fauna habitat condition class	Description
Good	A full range of fauna habitat components are usually present (e.g. old growth trees, fallen timber, feeding and roosting resources) and habitat linkages to other remnant ecosystems in the landscape are intact.
Moderate	Some fauna habitat components may be missing (e.g. old growth trees, fallen timber), although linkages with other remnant habitats in the landscape are usually intact, but sometimes degraded.
Poor	Many fauna habitat elements in low quality remnants have been lost, including old growth trees (e.g. due to past timber harvesting or land clearing) and fallen timber, and tree canopies are often highly fragmented. Habitat linkages with other remnant ecosystems in the landscape have usually been severely compromised by extensive past clearing.

2.7.2 Fauna survey

The presence of faunal species within the study area was determined primarily through consideration of suitable habitats, with species of animal identified opportunistically during the vegetation survey, habitat assessments and through direct targeted surveys. Although recording Threatened species during field survey can confirm their presence in an area, a lack of Threatened species records does not necessarily indicate the absence of the species from the study area when suitable habitat is present. By the very nature of their rarity, Threatened species are often difficult to detect. Suitable habitat is, therefore, an important factor to consider when determining the potential presence of Threatened species.

The following fauna surveys detailed below were conducted within the study area due to the presence of the following fauna habitat characteristics: ground cover vegetation, leaf litter, rocky outcrops and fallen timber and potential to provide protection for ground-dwelling mammals, reptiles and amphibians.

The assessment of these fauna habitat characteristics enabled an overall assessment of fauna habitat condition within the study area.

2.7.3 Diurnal Birds

Diurnal birds were recorded within the study area over 3.5 hour observation periods on two mornings & six afternoons. During the survey the entire study area was traversed and birds were identified either from sightings or characteristic calls. The number of each species and the activity at the time of sighting (foraging, breeding, or flying) was also recorded.

Additional birds species not recorded during this survey period were also opportunistically recorded throughout the study area whilst completing vegetation surveys and habitat assessments.

Birds were observed and identified using binoculars. Calls were generally identified in the field by the observer. If an unknown call was heard it is recorded and identified using reference libraries.

2.7.4 Nocturnal Birds

The presence of Masked Owl (*Tyto novaehollandiae*), Sooty Owl (*Tyto tenebricosa*) and the Powerful Owl (*Ninox strenua*) were targeted by broadcasting taped calls through a 15 watt Toa 'Fauna-tech' amplifier. Calls were played for 5-minute periods at 5-minute intervals during the five site visits. This was followed with quiet listening and spotlighting. Nocturnal calls for birds were not played until nocturnal spotlight survey and call playback surveys were completed for the nocturnal Squirrel & Greater Gliders were completed.

Searches for evidence of Owl roosts and potential Owl roosting / breeding hollows were made during surveys of the study area. Any whitewash, or regurgitated pellets found were noted.

2.7.5 Arboreal and Terrestrial Mammals

Assessment was made of 'found' scats, chew markings, diggings, runways and scratches during visits to the site.

The presence of Squirrel & Greater Gliders from the locality was targeted by broadcasting taped calls through a 15 watt Toa 'Fauna-tech' amplifier. Calls were played for 5-minute periods at 5-minute intervals during the five night site visits. This was followed with quiet listening and spotlighting.

Spotlighting for nocturnal mammalian fauna was carried out using a Led Lenser H14 Head torch (220 Lumens) and a hand held lamp of 750,000 candlelight power (100W halogen globe). This technique involved walking amongst the treed area of the study area so that a maximum number of trees could be observed this occurred for approximately 2.5 hours after dark during five evening site visits. (Figure 2-1).

2.7.6 Amphibians

Frog searches were completed at all locations where frogs were heard vocalising to confirm species identification. Species were recorded by sightings, captures and call characteristics.

Amphibians were surveyed by vocal call identification, by using a recorder to record male calls in suitable places and then comparing these to known calls. Amphibians were also surveyed by habitat searches.

Any amphibians found are visually identified and when required to be examined are handled with Latex gloves and kept moist until release. Spotlighting for nocturnal amphibians was also carried out using a hand held X21 Led Lenser torch which emits 1050 lumens of light and a Led Lenser head torch 220 lumens. This technique involved walking amongst the subject property.

Species of herpetofauna were also opportunistically recorded whilst completing vegetation surveys and habitat assessments.

2.7.7 Microbat Surveys

Anabat Express detectors (Titley Scientific) were deployed over 5 consecutive nights in two locations (21st-23rd, 28th-30th of December 2022) to collect microbat call data. The locations of where each Anabat was deployed are presented in Figure 2-1.

Analysis of all bat calls was completed. Calls were identified using zero-crossing analysis and AnalookW software by visually comparing the time-frequency graph and call characteristics (e.g. characteristic frequency and call shape) with reference calls and/or species call descriptions from published guidelines.

The Bat calls of NSW: Region based guide to the echolocation calls of microchiropteran bats (Pennay, Law, & Reinhold, 2004) was used to assist call analysis. Call identification was also assisted by consulting distribution information for possible species (Churchill, 2009; Duffy, Lumsden, Caddle, Chick, & Newell, 2000; Pennay et al., 2004) and records from the Bionet Atlas (OEH, 2018a). No reference calls were collected during the survey.

A call (pass) was defined as a sequence of three or more consecutive pulses of similar frequency and shape. Calls with less than three defined consecutive pulses of similar frequency and shape were not identified to species level, but were used as part of the activity count for the survey area. Due to variability in the quality of calls and the difficulty in distinguishing some species the identification of each call was assigned a confidence rating (Duffy et al., 2000; Mills, Norton, Parnaby, Cunningham, & Nix, 1996) as summarised in Table 2-5. Due to the high level of variability within a bat call and overlap in call characteristics between some species, a conservative approach was taken when analysing calls.

Table 2-6 Confidence rating applied to Anabat calls

Identification	Description
D – Definite	Species identification not in doubt.
PR – Probable	Call most likely to represent a particular species, but there exists a low probability of confusion with species of similar call type or call lacks sufficient detail.
SG – Species Group	Call made by one of two or more species. Call characteristics overlap making it difficult to distinguish between species. For example the calls of *Chalinolobus gouldii* and *Ozimops* species and various *Nyctophilus* species can be easily confused during the analysis process and are therefore grouped together.

Based on local records and habitat availability within the Project Site, microbat species that were targeted during the survey included the following threatened species:

2.7.8 Reptiles

Searches for reptiles in likely localities such as under rubbish debris, branches and leaf litter throughout the study area. Surveys were undertaken during diurnal visits to the site.

Figure 2-1 Flora and Fauna Survey Locations

2.7.9 Weather Conditions

A summary of the weather conditions prior to and during the survey period are presented in Table 2-7. Although no rainfall was received during the survey period, the temperatures were considered to be conducive to fauna activity within the Project Site including target threatened fauna species.

Table 2-7 Weather Conditions during the Survey Period

Date	Daily Rainfall (mm)	Daily Minimum Temp (°C)	Daily Maximum Temp (°C)
11-12-2021	30.0	11.5	22.3
21-12-2021	1.0	16.6	34.2
22-12-2021	0	17.2	28.5
23-12-2021	0	19.4	27.7
28-12-2021	11.0	13.9	22.1
29-12-2021	0	11.1	24.4
30-12-2021	0	11.6	28.5

Weather conditions sourced from Bureau of Meteorology Weatherzone application. Weather Station: 068159 (Booalbyn 5.5km away AWS) for rainfall data. Campbelltown (Mount Annan) NSW 16.4km away. Station: 068257 for temperature data.

2.7.10 Fauna Survey Effort Summary

A summary of the flora and fauna survey effort is presented in Table 2-8.

Table 2-8 Flora and Fauna Survey Effort Summary

Field Survey Technique	Target Species	Survey Effort	No. units	Dates	Time
Threatened Flora Surveys	All flora (Appendix C)	7 days	-	11th, 21-23rd, 28-30th of December	8.30am-4.30pm
Flora quadrats		1 days	7 Plots	11th of December 2021	8.30am-4.30pm
Flora Survey Plot/Transects	As above	1 days	7 Plots	11th of December 2021	8.30am-4.30pm
Fauna Habitat Assessment	All fauna species	7 days	-	11th, 21-23rd, 28-30th of December	8.30am-4.30pm
Diurnal Opportunistic Fauna Surveys	All fauna species	6 days	-	11th, 21-23rd, 28-30th of December	8.30am-4.30pm
Dawn Bird Surveys	All birds including the following threatened bird species	3 mornings/3 afternoons	-	21-23rd, 28-30th of December	8.30am-4.30pm
Amphibian Survey	All amphibians.	5 nights	-	21-23rd, 28-30th of December	7.30-10.45pm
Reptile Survey	All reptiles.	6 days	-	11th, 21-23rd, 28-30th of December	8.30am-4.30pm
Nocturnal Spotlighting	Nocturnal fauna species and the following threatened species: • Grey-headed Flying-fox • Greater Glider • Squirrel Glider • Nocturnal Owls	6 nights	-	21-23rd, 28-30th of December	7.30-10.45pm
Microbat Surveys	Microbat species as identified in Appendix D	6 nights	2 Anabats	21-23rd, 28-30th of December	7.30pm-10.30am

2.8 Likelihood of occurrence

Following collation of database records and species and community profiles, as returned by the Bionet Atlas of NSW (OEH, 2018a) and the EPBC Protected Matters Search Tool (DoEE, 2021a), a 'likelihood of occurrence' assessment was prepared with reference to the broad habitats contained within the Project Site (Appendicies C & D). Likelihood of occurrence was based on species distribution and habitat preferences, and the quality of potential habitat present, as defined in Table 2-9.

Table 2-9 Key to Likelihood of Occurrence for Threatened Species

Likelihood	Criteria
Present	The species was observed in the proposal site during the current survey.
High	It is highly likely that a species inhabits the proposal site and is dependent on identified suitable habitat (ie for breeding or important life cycle periods such as winter flowering resources), has been recorded recently in the locality (10 km) and is known or likely to maintain resident populations in the proposal site. Also includes species known or likely to visit the proposal site during regular seasonal movements or migration.
Moderate	Potential habitat is present in the proposal site. Species unlikely to maintain sedentary populations; however, may seasonally use resources within the proposal site opportunistically or during migration. The species is unlikely to be dependent (ie for breeding or important life cycle periods such as winter flowering resources) on habitat within the proposal site, or habitat is in a modified or degraded state. Includes cryptic flowering flora species that were not seasonally targeted by surveys and that have not been recorded.
Low	It is unlikely that the species inhabits the proposal site and has not been recorded recently in the locality (10 km). It may be an occasional visitor, but habitat similar to the proposal site is widely distributed in the local area, meaning that the species is not dependent (ie for breeding or important life cycle periods such as winter flowering resources) on available habitat. Specific habitat is not present in the proposal site or the species are a non-cryptic perennial flora species that were specifically targeted by surveys and not recorded.
None	Suitable habitat is absent within the Project Site.

2.9 Limitations

Within the study area varying degrees of non-uniformity of flora and fauna habitats are encountered. Hence no sampling technique can entirely eliminate the possibility that a species is present within a study area (e.g. species of plant present in the seed bank). The conclusions in this report are based upon data acquired for the study area and the environmental field surveys and are, therefore, merely indicative of the environmental condition of the study area at the time of survey, including the presence or otherwise of species. It should also be recognised that conditions of the study area, including the presence of threatened species, can change with time.

Habitat assessments were completed for all threatened fauna species identified as a result of the database searches (Table 2-1) to determine whether or not suitable habitat for threatened fauna species occurred within the study area. This is a more conservative approach and is likely to include species that are difficult to detect.

3. Results

3.1 Vegetation mapping

Two vegetation mapping projects have mapped the vegetation within the study area, these are: A Revised Classification and Map for the Coast and Eastern Tablelands. Native Vegetation Maps of the Cumberland Plain - Western Sydney (NSW National Parks and Wildlife Service 2013) & The Revised Classification and Map for the Coast and Eastern Tablelands vegetation (Tozer, Turner et al. 2010).

The Revised Classification and Map for the Coast and Eastern Tablelands vegetation (Tozer, Turner et al. 2010) vegetation mapping project was found to be the most accurate mapping project & vegetation communities have been aligned where appropriate to the vegetation communities. Vegetation community names have been aligned with Plant community Names (PCT).

3.1.1 Plant Community Types

An analysis of the floristic structure and species composition of the vegetation using the Bionet Vegetation Information System (OEH 2022b) determined that Plant Community Type (PCTs) and one non-native community 'Exotic Grassland" is present within the Study area. The floristic composition of the "Exotic Grassland" can be found in Appendix G "Plots 1 & 3".

- **1395 -** PCT 1395 - Cumberland shale - sandstone Ironbark forest

Table 3-1 Vegetation Community Characteristics – PCT 1395 - Cumberland shale - sandstone Ironbark forest (Low Condition)

Vegetation Community	Floristic Structure and Composition
Vegetation Formation (Keith, 2004)	Grassy Woodlands
Vegetation Class (Keith, 2004)	Coastal Valley Grassy Woodlands
PCT Equivalent (PCT Code) (OEH, 2019e)	Cumberland shale - sandstone Ironbark forest (PCT 1395)
PCT Scientific Name (OEH, 2022e)	*Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion*
Conservation Status (BC Act and EPBC Act)	Not listed under the EPBC Act.
Cleared Status (OEH, 2022e)	80%
Approximate area (ha) within the study area	Approximately 3.49 hectares of the community occurs within the study area.
General Vegetation Structure	The community has an open woodland structure with a sparse shrub & ground layer dominated by grasses & forbs.
Floristic Composition	See Appendix G
Soil Type and Geology	Shale-Sandstone
Evidence of Disturbance	High weed occurrences
Vegetation Zones	Low
BAM Plots/transects	P2

Photograph 3-1 PCT 1395 - Cumberland shale - sandstone Ironbark forest (Low Condition) Plot 2

Table 3-2 Vegetation Community Characteristics – PCT 1395 - Cumberland shale - sandstone Ironbark forest (Moderate Condition)

Vegetation Community	Floristic Structure and Composition
Vegetation Formation (Keith, 2004)	Grassy Woodlands
Vegetation Class (Keith, 2004)	Coastal Valley Grassy Woodlands
PCT Equivalent (PCT Code) (OEH, 2019e)	Cumberland shale - sandstone Ironbark forest (PCT 1395)
PCT Scientific Name (OEH, 2022e)	*Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion*
Conservation Status (BC Act and EPBC Act)	Listed as an endangered ecological community under the EPBC Act.
Cleared Status (OEH, 2022e)	80%
Approximate area (ha) within the Project Site	Approximately 3.73 hectares of the community occurs within the study area.
General Vegetation Structure	The community has a woodland-open woodland structure with a sparse shrub layer and a sparse groundcover dominated by grasses & forbs.
Floristic Composition	See Appendix G
Soil Type and Geology	Shale Sandstone
Evidence of Disturbance	Moderate weed occurrences
Vegetation Zones	Moderate
BAM Plots/transects	P4, P5

Photograph 3-2 PCT 1395 - Cumberland shale - sandstone Ironbark forest (Moderate Condition) Plot 4

Table 3-3 Vegetation Community Characteristics PCT 1395 - Cumberland shale - sandstone Ironbark forest (Good Condition)

Vegetation Community	Floristic Structure and Composition
Vegetation Formation (Keith, 2004)	Grassy Woodlands
Vegetation Class (Keith, 2004)	Coastal Valley Grassy Woodlands
PCT Equivalent (PCT Code) (OEH, 2019e)	Cumberland shale - sandstone Ironbark forest (PCT 1395)
PCT Scientific Name (OEH, 2019e)	*Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion*
Conservation Status (BC Act and EPBC Act)	Listed as an endangered ecological community under the EPBC Act.
Cleared Status (OEH, 2019e)	80%
Approximate area (ha) within the Project Site	Approximately 6.12 hectares of the community occurs within the study area.
General Vegetation Structure	The community has a woodland structure with a dominant shrub layer and groundcover dominated by grasses & forbs.
Floristic Composition	See Appendix G
Soil Type and Geology	Shale-sandstone
Evidence of Disturbance	Low weed occurrences
Vegetation Zones	Good
BAM Plots/transects	P6, P7

Photograph 3-3 PCT 1395 - Cumberland shale - sandstone Ironbark forest (Good Condition) Plot 6

3.1.1 Plant Community Type Justification

One PCT 1395 Cumberland shale - sandstone Ironbark forest with three conditions (Low/Moderate/Good) was recorded from the study area.

3.1.2 Vegetation Zone Mapping

Vegetation communities were delineated and mapped based on species composition, structure and condition assessments following the methods described in **Section**. A revised vegetation map based on this assessment is presented in Figure 3-1. The condition assessment determined that one three vegetation zone occurs within the Project Site as follows:

- PCT 1395 - Cumberland shale - sandstone Ironbark forest (PCT 1395) Low
- PCT 1395 - Cumberland shale - sandstone Ironbark forest (PCT 1395) Moderate
- PCT 1395 - Cumberland shale - sandstone Ironbark forest (PCT 1395) Good

Figure 3-1 Field verified vegetation communities from the study area

3.2 Species of plant

A total of one hundred twenty-four (124) species of plant was recorded from the study area, of which eighty-eight (88) were native (Appendix A).

Thirty-six (36) species of weed were recorded from the study area (Appendix A). One weed: *Lantana camara* (Lantana) a weed of national significance (WON)* was recorded from the study area.

3.3 Species of animal

3.3.1 Amphibians

Two common species of frog: Common Eastern Froglet (*Crinia signifera*) & Peron's Tree Frog was recorded calling adjacent to the 1st order watercourse located within the central portion of the study area during surveys.

No threatened frogs listed under the BC or EPBC Acts were identified within the study area, the habitat within the study area was not suitable for any threatened frogs species listed under both the BC & EPBC Acts.

3.3.2 Reptiles

Two common species of reptile the Garden Skink (*Lampropholis guichenoti*) & the Eastern Water Skink (*Eulamprus quoyii*) were recorded within the study area. No other reptile species were identified during the site inspections.

3.3.3 Birds

Eighteen species of bird were identified within the study area (Appendix B). The vegetation within the study area provides a range of foraging opportunities for birds.

The lack of native diversity of tree and shrub species within the two vegetation communities provided limited nectar resources to maintain bird populations throughout the year.

No Glossy Black-cockatoo (*Calyptorhynchus lathami*) or Gang-gang Cockatoo (*Callocephalon fimbriatum*). No Glossy-black or Gang-gang Cockatoos were identified from the study area despite targeted surveys being undertaken.

3.3.4 Mammals

Habitat for mammals was limited within the study area with remnant trees providing suitable foraging and marginal roosting/nesting habitat for mammals. Common species likely to utilise the remnant trees are those species adapted to urban/rural development e.g. the Brush-tailed Possum and the Common Ring-tail Possum. Habitats for threatened mammals were limited.

The blossoms of the canopy trees within the study area provide suitable foraging resources for the Grey-headed Flying-fox (*Pteropus poliocephalus*); this species was not however recorded from the study area during the site inspections. All foraging trees for this species are proposed to be retained within the study area.

No suitable caves for threatened cave dwelling bats were recorded from the study area. Numerous hollow-bearing trees were identified during the fauna surveys which would provide a suitable roosting site for hollow-dependent microbats species to utilise. The greater majority of hollow-bearing trees are concentrated to the west and are located within the larger lots these hollow-bearing trees should be retainable give the size of the allotments proposed.

3.3.5 Fauna habitat types

The suitability, size and configuration of the terrestrial fauna habitats were found to correlate broadly with the structure, floristics, connectivity and quality of the local vegetation community described above. These habitats mostly comprised of the Exotic Grassland & PCT 1395 Shale Sandstone Transition Woodland communities.

The condition class of the habitats within the Exotic Grassland community was assessed as being in a poor condition whilst PCT 1395 was found to be in three conditions low, moderate and good.

3.3.6 Fauna microhabitat features

Tree hollows

Hollows develop in *Eucalypts* when the tree is under some form of stress, heartwood decay is present and the tree is sufficiently large to persist when decayed (Gibbons and Lindenmayer 2002). As such, hollows are more likely to occur in older and larger trees; however the abundance and size of hollows may vary within and between species.

Tree hollows typically provide den and nesting habitat for a range of common birds and arboreal mammal species (Gibbons and Lindenmayer 2002), including providing potential habitat for a number of Threatened species including microchiropteran bats and large forest owls. Whether or not tree hollows are used by animals, and which species use them, depends on a number of factors, including hollow characteristics (diameter, height, depth), the number of hollows in a tree, tree health, size, location and spacing (Gibbons and Lindenmayer 2002). Almost all hollow-bearing trees occuring within the subject property are to be retained within the western portion of the study area and are not located within the rezoning area. Trees within the proposed rezoning area lack hollows due to their small size.

Feeding resources

Fauna occurring in the project locality are likely to use a range of foraging resources including both native and exotic species. Floral feeding resources were limited within the study area notwithstanding Eucalypts provide some seasonal foraging resources for mobile species to utilise when in flower.

3.3.7 State Environmental Planning Policy (Biodiversity and Conservation) 2021 chapter 4 (Koala Habitat Protection)

The site is located in the Wollondilly Local Government Area, which is listed under Schedule 2 of State Environmental Planning Policy (Biodiversity and Conservation). The likelihood of the site to be 'potential koala habitat' or 'core koala habitat' was assessed. Under chapter 4 "(Koala Habitat Protection) 2021" of the State Environmental Planning Policy (Biodiversity and Conservation) 2021 the following definitions apply:

'Koala Development Application Map'- means the State Environmental Planning Policy (Koala Habitat Protection) 2021— Koala Development Application Map.

'Core koala habitat' –

(a) an area of land where koalas are present, or

(b) an area of land—

(i) which has been assessed by a suitably qualified and experienced person in accordance with the Guideline as being highly suitable koala habitat, and

(ii) where koalas have been recorded as being present in the previous 18 years. Koala habitat

was assessed by inspecting all feed trees to identify indicative scratches on the trunk and droppings around the bases of feed trees.

The subject property is mapped on the Koala Development Application Map. The subject property form's part of Central Coast Koala Management Area (CCKMA). The SEPP applies to all zones within the Wollondilly LGA.

The subject property does not form part of an approved Koala plan of management.

No Koalas were observed during the fauna survey and there was no evidence of previous Koala habitation in the area. The subject site is also not considered to be 'Core Koala Habitat' as defined by SEPP.

As such the subject site is not considered to comprise Potential Koala Habitat as defined under SEPP no further assessment under this Policy is required.

3.4 Koala Assessment Report (KAR)

This KAR is required due to the following:

• the subject site is within Wollondilly, which is one of the applicable LGAs identified in the SEPP;

• While there is no applicable Koala Plan of Management, the proposed development area of the subject site is shown on the Koala Development Application Map as supporting highly suitable Koala habitat; and

• The subject site has an area of greater than 1 hectare,

3.4.1 KOALA HABITAT VALUES

The features of the development area described in section 1 above and are illustrated in Photographs above. The location of the development area is shown in Figure 1-1.

In accordance with the Koala Habitat Protection SEPP 2021, the following survey activities were undertaken to determine the presence of Koalas:

• Scat search. All trees within the development area were searched for signs of Koala use on 15th of July 2023, per the Scat Assessment Technique described in Phillips and Callaghan (2011). No Koala scats were found beneath trees within the development area.

Schedule 1 of the SEPP identifies Fee tree species, two Koala feed tree species were recorded from the subject lands these being *Eucalyptus punctata* (Grey Gum) & *Eucalyptus tereticornis* (Forest Red Gum).

A number of Koala use trees as listed under schedule 3 were also recorded these being: *Eucalyptus acmenioides*, *Eucalyptus crebra* (Narrow- leaved Ironbark), *Eucalyptus eugenioides* (Thin-leaved Stringybark), *Eucalyptus paniculata* (Grey Ironbark), *Eucalyptus pilularis* (Blackbutt), *Eucalyptus piperita* (Sydney Peppermint) & *Eucalyptus mollucana* (Grey Box).

Native tree canopies, and the observations on site confirm its potential as Koala habitat due to the dominance of Eucalyptus species recorded throughout PCT 1395 - Cumberland shale - sandstone Ironbark forest (PCT 1395).

The trees within the development are widely spaced which means Koalas would need to come to the ground to move between feed trees.

A Koala recorded is known from property immediately adjacent to the north. The trees onsite are considered to have the potential to contribute in a small way to corridor habitat for the local Koala population. The development has been sited within more disturbed land to the east ensuring Koala corridor connectivity is maintained within forest areas to the west.

3.4.2 Avoid, Minimise, and Ameliorate Impacts for Koala's

The proposed development location maximises tree retention by being located within grazing lands avoiding the forest at the western end of the study area.

The development location is positioned so that the minimum number of trees are impacted upon. Other site constraints e.g. watercourse and flooding limit re-positioning of the development onsite. The development footprint will result in the removal of two hundred & thirty-three (233) of which the majority are Koala use trees not feed trees.

3.4.3 Compensate Unavoidable Impacts

The two hundred & thirty-three (233) trees to be removed will be offset by compensatory plantings and through the provision of a vegetation management plan (VMP) to be conditioned with the consent. The VMP will seeks to retain and enhance the residual vegetation to the west of the development footprint.

• Plantings will exploit existing gaps in the forest areas;

• As a safety measure, plantings are to be located so that their canopies do not encroach with the proposed APZ;

• Planting locations will avoid stormwater infrastructure (both proposed and existing);

• No less than 600 Koala Feed trees comprising of 15L pot trees are recommended to be used so that

o they replace the mature trees to be removed as quickly as possible; and

o the trees' growing points are out of reach as quickly as possible; and

The proposal will therefore result in a small change to the number and configuration of trees on site. The residual impact to the existing Koala habitat therefore comprises the loss of the canopies trees until their replacement plantings reach a similar size. This is a short-term impact.

However, irrespective of the compensatory plantings, the potential Koala food trees to be removed are not considered to be critical to the continued functioning of the site as potential Koala habitat due to the following:

• Many more Koala Feed Trees will be retained;

• The existing continuity of tree canopy will be maintained across the majority of the subject lands as the development footprint is located within highly disturbed grazing lands and located at a distance of 450m from the forest edge to the west;

• The distribution of fencing will remain unchanged;

• The design of fencing will remain unchanged;

• The existing connected corridors will not be interrupted.

3.4.4 Management and Protection of Habitat

Notwithstanding this relatively insignificant area of habitat and the small impact of the proposal, maintaining rather than diminishing the available habitat for the Koala and other fauna species is considered to be important. This is equally applicable to the other ecological services and amenity that trees afford to the local community.

During construction and operation, the potential for direct and indirect harm to Koala habitat will be actively managed by the implementation of a number of mitigation measures to be detailed under the vegetation management plan.

3.5 Riparian

The usage of the riparian land within the study area will be guided by two key legislative requirements – the Fisheries Management Act 1994 (FM Act) and the Water Management Act 2000 (WM Act).

The FM Act lists threatened aquatic species which require consideration when addressing the potential impacts of a proposed development. If a proposed development is likely to significantly affect a threatened species, population, or their habitats, then a Species Impact Statement (SIS) is required to be prepared. The NSW Department of Primary Industries (DPI Water) administers the WM Act and is required to assess activities carried out on waterfront land. Waterfront land includes the bed and bank of any river, lake or estuary and all land within 40 m of the highest bank of the river, lake or estuary. Certain activity within this land is defined as a 'controlled activity' and requires approval from DPI Water.

DPI Water requires a Vegetated Riparian Zone (VRZ) adjacent to a creek channel to provide a protective buffer between catchment land uses and aquatic habitat.

The study area supports a 1st order watercourse and 3rd order watercourse. The 1st order watercourse requires a 10m setback defined from the top of bank a total vegetated riparian zone of 20m. The proposal is generally consistent with the requirements of the *Water Management Act 2005* (Table 3-4). The 1st order watercourse which flows in an westerly direction is highly modified within the proposed development area, the proposal seeks to retain the natural bed and bank of the 1st order watercourse. Development is proposed within an areas lacking defined bed or bank "riparian features" currently occupied by grazing pasture.

The western boundary of the study area adjoins Ousedale Creek a third order watercourse as per (Table 3-4) a 30m setback is required to the east of the top of bank. The proposed rezoning has been designed to retain and protect the onsite watercourses and is fully compliant with the WM Act.

Figure 3-2 The Strahler System

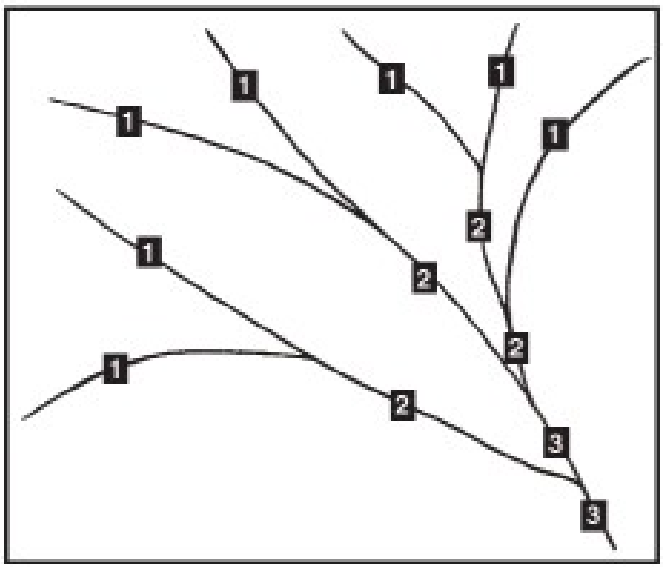


Table 3-4 Riparian Corridor Widths

Watercourse type	VRZ width (each side of watercourse)	Total RC width
1st order	10 metres	20 m + channel width
2nd order	20 metres	40 m + channel width
3rd order	30 metres	60 m + channel width
4th order and greater (includes estuaries, wetlands and any parts of rivers influenced by tidal waters)	40 metres	80 m + channel width

3.6 Threatened biodiversity

This section details the threatened biodiversity recorded or likely to occur within the study area. This is based on those species recorded or predicted to occur within the locality from database searches (Table 2-1) and the nature of the habitats observed within the vicinity of the proposed works during field surveys (Appendices C and D).

No flora and fauna species were considered to have medium or high likelihood of occurrence within the study area; as such no significance assessment has been prepared.

3.6.1 Threatened ecological communities

Eleven endangered ecological communities were identified from desktop review to occur within the locality of the study area (Table 3-5).

Table 3-5 Endangered Ecological Communities known from the Locality

Scientific Name	Level of Threat
Blue Gum High Forest in the Sydney Basin Bioregion	Critically Endangered Ecological Community
Blue Mountains Shale Cap Forest in the Sydney Basin Bioregion	Endangered Ecological Community
Coastal Saltmarsh in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	Endangered Ecological Community
Cumberland Plain Woodland in the Sydney Basin Bioregion	Critically Endangered Ecological Community
Maroota Sands Swamp Forest	Endangered Ecological Community
Montane Peatlands and Swamps of the New England Tableland, NSW North Coast, Sydney Basin, South East Corner, South Eastern Highlands and Australian Alps bioregions	Endangered Ecological Community
River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	Endangered Ecological Community
Shale/Sandstone Transition Forest	Endangered Ecological Community
Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	Endangered Ecological Community
Sydney Turpentine-Ironbark Forest	Endangered Ecological Community
Western Sydney Dry Rainforest in the Sydney Basin Bioregion	Endangered Ecological Community

PCT 1395 Narrow-leaved Ironbark-Broad-leaved Ironbark-Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion identified from the subject property is commensurate of Shale Sandstone Transition Forest.

No other endangered ecological communities listed under the *Environment Protection and Biodiversity Conservation Act 1999* were recorded from the study area or immediately adjacent.

3.6.2 Endangered populations

No threatened populations were identified from the desktop review to occur within the locality of the study area.

3.6.3 Threatened Flora

Twenty-five threatened species of plant listed under the *BC Act* and/or *EPBC Act* were predicted to occur within the locality of the study area based on database searches (refer Appendix B).

Based on targeted surveys within the study area none are considered to have suitable habitat within the study area. No further consideration is required for threatened flora species.

3.6.4 Threatened fauna

Fifty-three threatened fauna species were identified as a result of the database searches as occurring or having potential to occur within the locality of the study area (Appendix D).

Based on the habitat assessment and targeted surveys there is potential habitat within the study area for twelve threatened fauna species that may be impacted

through the removal of foraging habitat (Appendix D). Impact assessments have been prepared for these species (Appendices E & F).

3.6.5 Migratory species

Migratory species are protected under the international agreement to which Australia is a signatory, including the Japan-Australia Migratory Bird Agreement, the China-Australia Migratory Bird Agreement and the Bonn Convention on the Conservation of Migratory Species of Wild Animals. Migratory species are considered Matters of National Environmental Significance and are protected under the *Environment Protection and Biodiversity Conservation Act 1999*.

Eleven migratory species were identified from the Department of Sustainability and Environment (Department of Sustainability and Environment 2022) within the locality (Appendix D). None were recorded during the site inspections. Two migratory species were considered to have suitable habitat within the study area (Table 3-6).

Table 3-6 Migratory Species considered to have suitable habitat within the study area

Scientific Name	Common Name	EPBC Act
Birds		
Monarcha melanopsis	Black-faced Monarch	M
Rhipidura rufifrons	Rufous Fantail	M

The study area is not considered to be important habitat for any Migratory species in accordance with the EPBC Act.

3.7 Critical habitat

Critical habitat is listed under both the *Biodiversity Conservation Act 2016* and the *Environment Protection and Biodiversity Conservation Act 1999.* Critical habitat is the whole or any part or parts of an area or areas of land comprising the habitat of an endangered species, an endangered population or an endangered ecological community that is critical to the survival of the species, population or ecological community (Department of Environment and Conservation 2004).

The Directors-Generals of both the State and Federal departments of environment (Department of Environment and Climate Change and the Department of the Environment, Water, Heritage and the Arts respectively) maintain a register of critical habitat. Habitat that is not listed on these register, however consistent with the definition above, may also be considered as critical habitat.

No listed critical habitat occurs within the study area and no critical habitat is likely to be affected by the proposal.

4. Impacts

The following discussion presents an assessment of the potential impacts of the proposal on biodiversity within the study area.

4.1 Impacts on threatened species, endangered populations and endangered ecological communities

Twelve threatened fauna species listed under the *BC Act* and/ or the *EPBC Act* were recorded, predicted to occur, or have habitat within the vicinity (10 km radius) of the study area.

Impact assessments have been prepared for these species which has concluded that the proposal is not likely to have a significant impact upon threatened species, endangered populations or endangered ecological communities (Appendices E & F).

4.2 Vegetation impacts

Future development will result in the loss of 0.08ha of Shale Sandstone Transition Forest (good) condition which represents a loss of 1.27%. 0.66ha or 17.59% of moderate condition Shale Sandstone Transition Forest will be lost and 1.22ha or 34.92% of Low condition PCT 1395 will be removed as a result of future development.

Remnant trees have been identified to be retained with the large lots (Figure 1-1) whilst it has been assumed for the purpose of preparing this report that all vegetation within proposed small-medium size lots will be lost. The calculations presented below assume the future loss of vegetation within proposed access roads and small/medium residential allotments.

Table 4-1 Vegetation impacts

PCT	Condition	Site Area m2	Removal Area m2	Removal %
GRASSLAND	GRASSLAND	231853.7	119189.6	51.4
PCT 1395	LOW	34863.2	10923.2	31.3
PCT 1395	MODERATE	37302	5050.8	13.5
PCT 1395	GOOD	61169.7	0	0

The proposal seeks however to retain greater than 100% of PCT 1395 (good condition) and 86.5% of PCT 1395 (moderate) within the study area.

The greater majority of moderate condition vegetation will be retained and protected. The implementation of a site-specific vegetation management plan (VMP) will enhance the residual vegetation. The VMP will focus on weed removal and enhancement of the vegetation through assisted regeneration further enhancing the onsite biodiversity values within the study area.

4.3 Tree impacts

A detailed survey has been undertaken over the subject property by Beveridge Williams over the subject lands. The survey has not surveyed every tree onsite and there is large vegetated portion of the subject lands that supports 100's of trees within the west which are to be retained and protected.

An assessment of the loss of trees has been considered in accordance with AS 4970-2009 Protection of Trees on Construction Sites. A total of six hundred and nineteen (619) trees have been surveyed within the subject lots (Figure 3-1).

4.4 Trees protection Zone

A number of methods to determine the likely extent of root zones and appropriate setbacks for tree protection zones for trees on development sites have been developed in the past. The key criteria used in determining setbacks is the tree's trunk diameter at breast height (DBH) in conjunction with other factors including the sensitivity of the species in question to environmental disturbance/change, the age of the tree and the tree's health and vigour at the time.

The Australian Standard AS 4970-2009 Protection of Trees on Construction Sites also identified a 'Tree Protection Zone' (TPZ) of 12 times the tree's DBH. The Australian Standard also provides a formula for calculating the 'Structural Root Zone' of trees on development sites.

The tree protection zones identified above have been calculated using Australian Standard AS 4970-2009 Protection of Trees on Construction Sites and are the optimum setback from trees where disturbance (e.g., soil level changes, compaction, excavation etc) should be minimised to reduce potential impacts on the long-term health of trees. Preferably, no more than 10% of the root protection zone should be disturbed with compensation made by extension of other areas of the TPZ to compensate for the area(s) disturbed.

Where greater than 10% of the tree protection zone is potentially disturbed the tree's, viability needs to be investigated and demonstrated by the project arborist. The structural root zone is the area where disturbance of any sort should be avoided as it is the areas required for tree stability.

4.5 Trees to be removed within future development area

Following assessment of the six hundred and nineteen (619) trees on the site it is considered the following two hundred & thirty-three (233) trees would be removed to accommodate future development over the subject lands.

Table 4-2 Trees to be removed

Tree Number	Spread (m)	DBH (m)	Height (m)	TPZ (m)	TPZ impact %
1	10	0.7	18	8.4	28.3
2	15	0.6	18	7.2	15.5
4	12	0.45	18	5.4	47.7
9	10	0.5	18	6	18.1
10	8	0.3	18	3.6	91.5
11	12	0.35	17	4.2	100
12	14	0.3	15	3.6	100
13	14	0.4	18	4.8	100

Tree Number	Spread (m)	DBH (m)	Height (m)	TPZ (m)	TPZ impact %
17	12	0.5	18	6	94.4
18	10	0.4	14	4.8	100
19	12	0.3	12	3.6	100
29	18	1	15	12	17.6
29	18	1	15	12	100
45	12	0.4	15	4.8	100
46	12	0.4	16	4.8	100
47	5	0.2	12	2.4	100
48	10	0.4	12	4.8	100
49	5	0.25	14	3	100
50	5	0.25	14	3	100
51	6	0.3	16	3.6	100
52	14	0.4	16	4.8	100
53	6	0.25	15	3	100
54	10	0.3	15	3.6	100
55	7	0.2	10	2.4	100
56	10	0.4	16	4.8	100
57	8	0.2	10	2.4	100
58	5	0.2	12	2.4	100
59	6	0.3	14	3.6	100
60	5	0.2	12	2.4	100
61	10	0.3	14	3.6	100
62	10	0.4	16	4.8	100
63	20	1.2	18	14.4	99.8
64	8	0.35	18	4.2	100
65	8	0.4	18	4.8	100
66	8	0.4	18	4.8	100
67	8	0.3	15	3.6	100
68	5	0.25	15	3	100
69	6	0.2	12	2.4	100
70	6	0.25	12	3	100
71	6	0.2	12	2.4	100
72	8	0.25	16	3	100
73	10	0.4	16	4.8	100
74	8	0.25	16	3	100
75	6	0.25	12	3	100
76	6	0.2	10	2.4	100
77	6	0.2	10	2.4	100
78	8	0.3	10	3.6	100
80	5	0.25	16	3	100
81	8	0.3	16	3.6	100
82	8	0.3	16	3.6	100
83	5	0.3	15	3.6	100
84	12	0.4	18	4.8	100
86	8	0.25	14	3	100
87	8	0.25	14	3	100
88	8	0.3	15	3.6	100

Tree Number	Spread (m)	DBH (m)	Height (m)	TPZ (m)	TPZ impact %
89	8	0.25	16	3	100
90	8	0.3	16	3.6	100
91	8	0.25	15	3	100
92	7	0.2	12	2.4	100
93	9	0.25	15	3	100
94	8	0.3	15	3.6	100
95	8	0.3	15	3.6	100
96	10	0.3	17	3.6	100
97	7	0.2	12	2.4	100
97	7	0.2	12	2.4	100
98	10	0.3	15	3.6	100
99	10	0.3	17	3.6	100
102	6	0.25	15	3	100
103	6	0.25	15	3	100
105	8	0.35	15	4.2	100
106	8	0.3	13	3.6	100
108	12	0.3	17	3.6	100
109	12	0.3	17	3.6	100
110	12	0.3	17	3.6	100
111	12	0.25	17	3	100
112	10	0.35	16	4.2	100
113	8	0.4	16	4.8	100
114	6	0.3	10	3.6	100
115	8	0.4	15	4.8	100
117	7	0.3	15	3.6	100
118	9	0.4	17	4.8	100
119	3	0.3	10	3.6	100
121	10	0.4	17	4.8	100
122	10	0.4	17	4.8	100
123	8	0.4	16	4.8	100
124	5	0.3	12	3.6	100
125	12	0.4	17	4.8	100
126	12	0.5	17	6	100
127	12	0.55	17	6.6	100
128	7	0.5	16	6	100
129	15	0.8	18	9.6	100
130	15	0.4	18	4.8	100
131	8	0.4	17	4.8	100
132	8	0.4	16	4.8	100
133	8	0.4	17	4.8	100
134	2	0.25	8	3	100
135	5	0.3	15	3.6	100
136	9	0.35	17	4.2	100
137	8	0.35	17	4.2	100
138	8	0.3	15	3.6	100
139	15	0.5	18	6	100
140	8	0.3	16	3.6	100

Tree Number	Spread (m)	DBH (m)	Height (m)	TPZ (m)	TPZ impact %
141	20	0.7	18	8.4	100
142	10	0.3	15	3.6	100
143	10	0.3	15	3.6	100
144	8	0.3	16	3.6	100
145	8	0.45	15	5.4	100
149	12	0.4	16	4.8	100
150	9	0.4	16	4.8	100
151	8	0.3	16	3.6	100
152	8	0.3	16	3.6	100
154	10	0.3	15	3.6	100
155	16	0.8	18	9.6	100
157	8	0.4	15	4.8	100
158	16	1.2	18	14.4	98.3
159	12	0.6	18	7.2	100
161	8	0.4	16	4.8	100
162	20	0.8	18	9.6	100
163	15	0.6	15	7.2	100
164	20	0.7	18	8.4	100
165	12	1.4	15	16.8	100
166	12	0.45	20	5.4	100
167	12	0.4	16	4.8	99.3
168	7	0.3	16	3.6	95.4
169	8	0.4	18	4.8	62.1
170	15	0.6	18	7.2	71.3
171	10	0.4	18	4.8	48.9
172	10	0.5	20	6	19.4
173	14	0.9	20	10.8	31.5
174	8	0.45	16	5.4	36.4
175	12	0.5	18	6	45.4
176	7	0.3	10	3.6	17.9
191	12	0.7	18	8.4	98.7
192	14	0.6	18	7.2	100
193	15	0.7	18	8.4	100
194	15	0.8	18	9.6	100
195	15	0.8	18	9.6	100
196	14	0.6	18	7.2	100
197	14	0.6	18	7.2	100
198	8	0.3	15	3.6	100
200	9	0.5	18	6	77.7
210	20	1.3	20	15.6	31.9
215	12	0.5	20	6	37.6
217	10	0.5	20	6	11.9
224	12	0.4	16	4.8	14.3
238	8	0.3	15	3.6	100
250	14	0.6	18	7.2	52.8
257	15	0.8	18	9.6	10.3
258	12	0.5	18	6	18.9

Tree Number	Spread (m)	DBH (m)	Height (m)	TPZ (m)	TPZ impact %
264	12	0.4	20	4.8	46.1
265	10	0.4	15	4.8	34.3
266	10	0.4	15	4.8	50.6
285	12	0.5	20	6	100
286	10	0.5	18	6	100
287	14	0.5	18	6	100
288	10	0.5	18	6	100
289	12	0.4	18	4.8	100
291	12	0.5	16	6	41.3
297	6	0.3	12	3.6	100
301	10	0.3	18	3.6	100
305	12	0.4	18	4.8	100
307	6	0.25	12	3	100
309	8	0.3	15	3.6	100
313	10	0.4	15	4.8	100
314	8	0.4	16	4.8	100
315	8	0.3	15	3.6	100
316	7	0.3	15	3.6	100
317	6	0.3	14	3.6	100
318	8	0.3	14	3.6	100
319	6	0.25	16	3	100
320	10	0.35	20	4.2	100
321	5	0.3	8	3.6	100
322	6	0.3	10	3.6	100
323	8	0.3	12	3.6	100
327	9	0.3	17	3.6	100
328	8	0.3	15	3.6	100
330	15	0.4	15	4.8	100
331	15	0.4	15	4.8	100
332	15	0.5	15	6	100
333	8	0.3	13	3.6	100
334	10	0.35	14	4.2	100
335	14	0.4	18	4.8	100
336	8	0.3	16	3.6	100
346	8	0.8	12	9.6	50.6
356	16	0.9	14	10.8	46.1
357	14	0.9	14	10.8	27.6
375	8	0.5	11	6	25.8
376	10	1	15	12	34
385	15	0.9	18	10.8	38.2
386	15	1	17	12	10
390	15	1.1	15	13.2	36.1
394	12	1	12	12	39
395	10	0.9	12	10.8	14.3
404	15	1.1	17	13.2	38
406	10	1.2	16	14.4	28.5
407	17	1.2	18	14.4	26

Tree Number	Spread (m)	DBH (m)	Height (m)	TPZ (m)	TPZ impact %
430	12	0.9	16	10.8	11.8
431	15	0.9	18	10.8	29.1
441	12	0.9	15	10.8	28.5
443	16	0.8	18	9.6	48.3
444	12	1.2	16	14.4	13.6
462	12	0.7	18	8.4	27.8
469	12	1.1	18	13.2	14.9
493	8	0.7	14	8.4	34.5
494	10	0.9	16	10.8	27.9
517	8	0.9	14	10.8	24.1
522	12	0.6	14	7.2	66.3
523	8	0.6	13	7.2	61.9
524	8	0.7	13	8.4	55.5
525	10	0.7	12	8.4	33
525	10	0.7	12	8.4	30.1
527	7	0.5	16	6	61.3
528	20	1	18	12	57.7
595	8	0.4	15	4.8	14.8
596	8	0.6	18	7.2	63.8
597	10	0.5	18	6	21.7
611	20	1	20	12	37.9
612	20	1.6	20	19.2	12
638	18	0.8	20	9.6	36.1
639	20	0.6	20	7.2	61.6
640	20	0.7	20	8.4	31.6
650	12	0.6	18	7.2	22.8
651	16	0.8	20	9.6	11.1
681	12	0.7	18	8.4	34.7
683	10	0.4	18	4.8	12.4
685	10	0.5	18	6	48.9
691	14	1	20	12	36.6
692	14	0.5	20	6	60.1
704	8	0.5	16	6	23.1
707	12	0.4	18	4.8	91.9
723	18	1	20	12	36.8
735	20	1.1	20	13.2	14.2
742	18	0.7	18	8.4	18.4

4.6 Trees identified as a priority for retention/protection.

The identification of trees as priorities for retention based upon a number of factors including species, dimensions, health, maturity, Safe Use and Life Expectancy (SULE) and Landscape Significance. Following assessment of the six hundred and nineteen (619) within and adjacent to the development area it is considered that three hundred and eighty-six (386) trees warrant consideration as priorities for retention/protection within the site (Figure 4-1).

Figure 4-1 Tree protection zones

4.7 Key threatening processes

Key Threatening Process under the *Biodiversity Conservation Act* that are likely to further increase within the study area are:

- Clearing of native vegetation.
- Invasion of native plant communities by exotic perennial grasses.
- Removal of hollow-bearing Trees
- Infection of native plants by *Phytophthora cinnamomi* - key threatening process listing. The proposal has potential to introduce or spread *Phytophthora cinnamomi* within the development area and into adjacent bushland. Mitigation measures are to be implemented to prevent spread of *Phytophthora cinnamomi*. Mitigation measures have been put in place to reduce the chance of infection of *Phytophthora cinnamomi* into the study area.
- Human Caused Climate Change.

4.8 Conservation and Management Recommendation

The following recommendations have been made for the planning proposal based on best practice principles to protect ecological values in the study area. The recommendations should continue to be followed through the design and planning phases.

4.8.1 Terrestrial Ecology

• The likely planning approval at the development stage would be to obtain Biodiversity Certification of the entire site. This would allow for consideration of in-perpetuity management for some areas of vegetation. This would secure the lands for conservation and be funded. If this was pursued, consideration would be given to future uses such as recreation and road crossings to ensure the conservation site does not prevent other beneficial uses or infrastructure requirements.

• The management of weeds in the study area will need to be considered further. Areas proposed for retention would require varying levels of weed management.

• Where habitat features are to be cleared, removed or modified, compensatory habitat could be incorporated into the planning of the site.

• Services and infrastructure should be located outside of the conservation areas or services co-located if the conservation areas cannot be avoided

• Local provenance species should be used in rehabilitation works and within street/neighbourhood landscaping.

4.9 Mitigation measures

4.9.1 Fencing of the construction zone

When accessing construction sites, contractors are to use only the designated access sealed driveway. Upon commencing of clearing of vegetation machinery are to enter vegetation at right angles to the access track to avoid impacts upon retained vegetation. Suitable fixed fencing (e.g. three strand stock fencing) and colour tape or Para-webbing should be used to delineate the maximum allowable extent of the construction zone. If any tape is disturbed, it is to be immediately replaced along the appropriate alignment. Construction work outside this area will constitute a non-conformance with the contract terms.

Fences and Para-webbing delineating the construction zone are to remain intact during construction period. If any of these barriers are disturbed, it is to be repaired or replaced as soon as practicable.

4.9.2 Animal welfare

Animal injury has potential to occur throughout various construction operations. In the event that any sick, injured or orphaned native animals are located during construction, WIRES should be contacted to assist in capture, handling and welfare of the animal (contact No: 13000 WIRES or 1300 094 737).

A suitably qualified ecologist or wildlife handler should be on site during the felling of trees specifically. The qualified Ecologist is to hold a licence issued by the Office of Environment & Heritage and a current Animal Ethics licence issued by the Department of Industries and Investment.

4.9.3 Truck and machine wash down areas

Vehicles and other equipment to be used in clearing within the construction zone and general construction equipment (such as excavators etc) are to be received completely free of soil, seeds and plant material before entering the site to prevent the introduction of exotic plant species and pathogens. Equipment failing inspection should be sent away for cleaning. Appropriate records of inspections shall be maintained.

Build ups of mud, soil and organic matter present on vehicles during wet and muddy conditions shall be manually removed prior to vehicles entering/leaving the construction site. It is recommended that rumble bars be installed at the entry to the site to assist with soil removal.

Works and vehicular movements shall cease if wet and muddy conditions develop/persist during construction zone clearing to limit the movement of soil and organic matter onto, through and from the construction zones, minimising the potential for the spread of weeds.

4.9.4 Nest boxes

No less than forty (40) nest-boxes are required to be installed within retained bushland under the supervision of an Ecologist.

4.9.5 Vegetation management plan & Cumberland Plain Conservation Plan

The subject property is identified as forming part of the Cumberland Plain Conservation Plan. The proposal is generally consistent with the objectives of the plan in that development has been sited to avoid impacts on areas identified for protection as either “Native vegetation” or “Protected Koala Habitat and Restoration” under that plan (Figure 4-1).

Native vegetation is identified as the light green on Figure 4-1 is to be retained, protected and enhanced. Area identified as dark green are identified as “Protected Koala Habitat and Restoration” (Figure 4-1).

A vegetation management plan (VMP) should be conditioned with the development consent. The VMP should cover all lands outside of the development footprint as defined within the body of this report. The VMP should focus on identification of management actions to retain, protect and enhance the residual onsite vegetation.

The proposal is consistent with the objectives of Cumberland Plain Conservation Plan. The VMP will identify management actions with regards to weeding, planting, maintenance and monitoring of the onsite biodiversity values which is consistent with the objectives of Cumberland Plain Conservation Plan in protecting Native vegetation” & areas mapped as “Protected Koala Habitat and Restoration”.

The proposed development provides an opportunity to enhance a large area of land identified under the Cumberland Plain Conservation Plan. In the absence of development over the subject lands the onsite biodiversity values will continue to be degraded through existing grazing practices. Development has been sited for the most part within “certified urban capable land” and has been positioned to avoid lands identified as “avoided land” under the Cumberland Plain Conservation Plan.

Figure 4-2 Cumberland Plain Conservation Plan

The following mitigation measures outlined in Table 4-3 from the CPCM are to be adhered to be conditioned with the consent.

Table 4-3 Mitigation measures identified in the Cumberland Plains Conservation Plans

Mitigation Measure	Rationale for Measure
Do not plant koala feed trees, as listed in *Koala SEPP Schedule 2 Koala use tree species* in open space and recreation areas.	Koala feed trees and/or endangered ecological communities are contained to open space and recreational areas in precinct design in certified urban-capable land
Dog-proof fenced areas are to be designated within open space and public recreation areas	Provides protection to fauna, including koala, up-front in precinct design for public spaces
Dog-proof fencing is a design requirement for each residential lot in accordance with Council requirements	Provides protection to fauna, including, koala up-front in precinct design for residential areas
Where planned linear infrastructure such as gas and electricity transmission crosses existing koala-exclusion fencing, consider appropriate access treatments such as gates to ensure integrity of koala-exclusion fencing.	Minimises indirect impacts to koala populations due to urban development. This action is consistent with a critical action for this species under Chief Scientist & Engineer's Koala Report (2020)
Signpost areas adjoining koala habitat with signage indicating koalas are in the area, the permitted/prohibited activities, and associated penalties that apply for non-compliance.	Promotes permitted activities and educates public in areas adjoining koala habitat

5. Significance Assessments

5.1 Background to the Five Part Test

No threatened flora are considered likely to be impacted upon as a result of the proposed development therefore no Significance assessments are considered to be required for those species identified as containing suitable habitat within the subject site (Table 5-1).

The proposed development will not likely result in a significant impact to any Threatened species or community (Table 5-1).

Table 5-1 Summary of significance assessments

Species Name	Common Name	Conservation Status	
		State [1]	National [2]
Endangered Ecological communities			
Shale Sandstone Transition Forest	Shale Sandstone Transition Forest	CE	E
Threatened Fauna			
Bird			
Callocephalon fimbriatum	Gang-gang Cockatoo	V	
Calyptorhynchus lathami	Glossy Black-Cockatoo	V	
Ninox strenua	Powerful Owl	V	
Glossopsitta pusilla	Little Lorikeet	V	
Mammals			
Chalinolobus dwyeri	Large-eared Pied Bat	V	V
Falsistrellus tasmaniensis	Eastern False Pipistrelle	V	
Miniopterus schreibersii	Eastern Bent-wing Bat	V	
Pteropus poliocephalus	Grey-headed Flying-fox	V	V
Mormopterus norfolkensis	Eastern Freetail-bat	V	
Saccolaimus flaviventris	Yellow-bellied Sheathtail Bat	V	
Scoteanax rueppellii	Greater Broad-nosed Bat	V	
Petaurus norfolcensis	Squirrel Glider	V	

Notes:

1. State conservation status: V= Vulnerable, E1 = Endangered, (*Biodiversity Conservation Act 2016* and *Fisheries Management Act 1994*). * indicates species listed under the *Fisheries Management Act 1994.*

2. National conservation status: V = Vulnerable, (*Environment Protection and Biodiversity Conservation Act 1999*)

6. Conclusions

Extensive flora and fauna survey has been undertaken for the study area and identified a range of ecological values including One critically endangered ecological community known as Shale Sandstone Transition Forest listed under the *Biodiversity Conservation Act 2016* was recorded from the study area. Shale Sandstone Transition Woodland was found in three conditions low, moderate & good. The proposal seeks to retain 100% of the good, 86.5% of the moderate & 69% of the low condition Shale Sandstone Transition Woodland within the study area.

Targeted surveys did not identify any threatened flora, endangered population's, listed under the *BC* or the *EPBC Acts* within the study area.

Impacts to areas of very high and high ecological constraint has been avoided with development layout. The areas of very high to high ecological constraint contained native vegetation listed as critically endangered under the BC Act or EPBC Act, provided habitat for a number of threatened species. The areas of exotic pasture were considered more suitable for development and the proposal has been sited accordingly within this vegetation type.

The study area was identified as containing suitable foraging habitat for twelve species of fauna: the Gang-gang Cockatoo, Glossy Black-Cockatoo, Powerful Owl, Little Lorikeet, Large-eared Pied Bat, Eastern False Pipistrelle, Eastern Bent-wing Bat, Grey-headed Flying-fox, Eastern Freetail-bat, Yellow-bellied Sheathtail Bat, Greater Broad-nosed Bat & the Squirrel Glider.

Significance assessments were undertaken for these Threatened fauna species. These assessments concluded that the proposal was unlikely to have a significant impact on these species. This was based on the following criteria:

- The security of larger threatened flora populations within the locality of the study area
- relatively small size of foraging and roosting habitat to be removed as part of the proposal
- larger areas of better quality vegetation were noted at the time of the survey to the north & north-east and within reserves and retained elsewhere within the study area.
- these species are all highly mobile and would utilise vegetation within the locality and not the study area exclusively

As such, the project is unlikely to have a significant impact on the ecological features of the local area.

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Appendix A

Species of flora recorded

Table 7-1 Flora species recorded within the study area

Family Name	Scientific Name	Common Name	Native
Adiantaceae			
	Cheilanthes sieberi	Mulga Fern	Y
Apocynaceae			
	Parsonsia straminea	Common Silkpod	Y
Asparagaceae			
	Asparagus aethiopicus	Asparagus Fern	N
Asphodelaceae			
	Bulbine bulbosa	Bulbine Lily	Y
Asteraceae			
	Bidens pilosa	Cobbler's Pegs	N
	Cassinia aculeata	Dolly Bush	Y
	Cirsium vulgare	Spear Thistle	N
	Conyza albida	Tall Fleabane	N
	Conyza bonariensis	Flaxleaf Fleabane	N
	Euchiton gymnocephalus	Creeping Cudweed	Y
	Euchiton involucratus	Star Cudweed	Y
	Hypochaeris glabra	Smooth Catsear	N
	Hypochaeris radicata	Catsear	N
	Onopordum acanthium		N
	Ozothamnus diosmifolius	White Dogwood	Y
	Senecio madagascariensis	Fireweed	N
	Sonchus oleraceus	Common Sowthistle	N
	Taraxacum officinale	Dandelion	N
Campanulaceae			
	Wahlenbergia gracilis	Sprawling or Australian Bluebell	Y
Caprifoliaceae			
	Lonicera japonica	Japanese Honeysuckle	N
Casuarinaceae			
	Allocasuarina littoralis	Black Sheoak	Y
Clusiaceae			
	Hypericum gramineum	Small St John's Wort	Y
	Hypericum japonicum		Y
Convolvulaceae			
	Dichondra repens	Kidney Weed	Y
Cyperaceae			
	Gahnia sieberiana		Y
	Lepidosperma laterale		Y
Dennstaedtiaceae			
	Pteridium esculentum	Bracken	Y
Dilleniaceae			
	Hibbertia aspera		Y
Epacridaceae			
	Leucopogon setiger		Y
Euphorbiaceae			
	Bertya cunninghamii		Y
Fabaceae (Faboideae)			
	Glycine clandestina		Y
	Glycine tabacina		Y
	Hardenbergia violacea	False Sarsaparilla	Y
	Hovea linearis		Y
	Trifolium repens	White Clover	N
	Vicia sativa		N
Fabaceae (Mimosoideae)			
	Acacia floribunda	White Sally	Y
	Acacia implexa	Hickory Wattle	Y
	Acacia irrorata	Green Wattle	Y
	Acacia linifolia	Flax-leaved Wattle	Y
	Acacia mearnsii	Black Wattle	Y

	Acacia ulicifolia	Prickly Moses	Y
Gentianaceae			
	Centaurium erythraea	Common Centaury	N
Goodeniaceae			
	Goodenia hederacea		Y
	Goodenia ovata		Y
Haloragaceae			
	Gonocarpus teucrioides		Y
Juncaceae			
	Juncus continuus		Y
Lauraceae			
	Cassytha glabella		Y
	Cassytha pubescens		Y
Lobeliaceae			
	Lobelia alata	Angled Lobelia	Y
	Pratia purpurascens	Whiteroot	Y
Lomandraceae			
	Lomandra glauca	Pale Mat-rush	Y
	Lomandra longifolia	Spiny-headed Mat-rush	Y
	Lomandra multiflora		Y
	Lomandra obliqua		Y
Myrtaceae			
	Angophora subvelutina	Broad-leaved Apple	Y
	Eucalyptus acmenioides		Y
	Eucalyptus crebra	Narrow-leaved Ironbark	Y
	Eucalyptus eugenioides	Thin-leaved Stringybark	Y
	Eucalyptus paniculata	Grey Ironbark	Y
	Eucalyptus pilularis	Blackbutt	Y
	Eucalyptus piperita	Sydney Peppermint	Y
	Eucalyptus mollucana	Grey Box	Y
	Eucalyptus punctata	Grey Gum	Y
	Eucalyptus tereticornis	Forest Red Gum	Y
	Kunzea ambigua	Tick Bush	Y
Oleaceae			
	Ligustrum lucidum	Large-leaved Privet	N
	Ligustrum sinense	Small-leaved Privet	N
Oxalidaceae			
	Oxalis perennans		Y
Passifloraceae			
	Passiflora sp.	Passionfruit	Y
Phormiaceae			
	Dianella caerulea		Y
	Dianella revoluta		Y
	Stypandra glauca	Nodding Blue Lily	Y
Pittosporaceae			
	Billardiera scandens	Appleberry	Y
	Bursaria spinosa	Native Blackthorn	Y
	Pittosporum undulatum	Sweet Pittosporum	Y
Plantaginaceae			
	Plantago lanceolata	Lamb's Tongues	N
Poaceae			
	Andropogon virginicus	Whisky Grass	N
	Anisopogon avenaceus	Oat Speargrass	Y
	Anthoxanthum odoratum	Sweet Vernal Grass	N
	Aristida ramosa		Y
	Aristida vagans	Threeawn Speargrass	Y
	Austrodanthonia fulva		Y
	Austrostipa pubescens		Y
	Austrostipa scabra	Speargrass	Y
	Austrostipa sp.		Y
	Avena fatua	Wild Oats	N

	Bothriochloa sp.		Y
	Briza maxima	Quaking Grass	N
	Briza minor	Shivery Grass	N
	Bromus catharticus	Prairie Grass	N
	Cymbopogon refractus	Barbed Wire Grass	Y
	Cynodon dactylon	Common Couch	Y
	Echinopogon caespitosus		Y
	Ehrharta erecta	Panic Veldtgrass	N
	Entolasia marginata	Bordered Panic	Y
	Entolasia stricta	Wiry Panic	Y
	Eragrostis brownii	Brown's Lovegrass	Y
	Eragrostis curvula	African Lovegrass	N
	Holcus lanatus	Yorkshire Fog	N
	Lolium perenne	Perennial Ryegrass	N
	Microlaena stipoides		Y
	Notodanthonia longifolia	Long-leaved Wallaby Grass	Y
	Oplismenus aemulus		Y
	Panicum simile	Two-colour Panic	Y
	Paspalum dilatatum	Paspalum	N
	Paspalum distichum	Water Couch	Y
	Pennisetum clandestinum	Kikuyu Grass	N
	Setaria gracilis	Slender Pigeon Grass	N
	Themeda australis	Kangaroo Grass	Y
	Vulpia bromoides	Squirrel Tail Fesque	N
Proteaceae			
	Banksia spinulosa		Y
	Hakea dactyloides	Broad-leaved Hakea	Y
	Persoonia linearis	Narrow-leaved Geebung	Y
Ranunculaceae			
	Clematis aristata		Y
Rosaceae			
	Rubus fruiticosus	Blackberry complex	N
Rubiaceae			
	Opercularia aspera	Coarse Stinkweed	Y
	Pomax umbellata		Y
Scrophulariaceae			
	Veronica plebeia	Trailing Speedwell	Y
Solanaceae			
	Solanum nigrum	Black-berry Nightshade	N
	Solanum prinophyllum	Forest Nightshade	Y
Thymelaeaceae			
	Pimelea linifolia		Y
Verbenaceae			
	Verbena bonariensis	Purpletop	N
	Verbena rigida	Veined Verbena	N
Violaceae			
	Viola hederacea	Ivy-leaved Violet	Y

Appendix B

Species of animal recorded

Table 7-2 Fauna species recorded during flora and fauna survey

Family Name	Common Name	Scientific Name	Observation Type	BC Act
Amphibians				
Hylidae	Peron's Tree Frog	*Litoria peronii*	O	
Myobatrachidae	Common Eastern Froglet	*Crinia signifera*	O	
Reptiles				
Scincidae	Eastern Water Skink	*Eulamprus quoyii*	O	
Scincidae	Garden Skink	*Lampropholis guichenoti*	O	
Birds				
Artamidae	Australian Magpie	*Gymnorhina tibicen*	O	
Cacatuidae	Galah	*Cacatua roseicapilla*	O	
Cacatuidae	Long-billed Corella	*Cacatua tenuirostris*	O	
Cacatuidae				
Cacatuidae	Sulphur-crested Cockatoo	*Cacatua galerita*	O	
Corvidae	Australian Raven	*Corvus coronoides*	O	
Dicruridae	Grey Fantail	*Rhipidura fuliginosa*	O	
Dicruridae	Magpie-lark	*Grallina cyanoleuca*	O	
Dicruridae	Willie Wagtail	*Rhipidura leucophrys*	O	
Halcyonidae	Laughing Kookaburra	*Dacelo novaeguineae*	O	
Hirundinidae	Welcome Swallow	*Hirundo neoxena*	O	
Maluridae	Superb Fairy-wren	*Malurus cyaneus*	O	
Meliphagidae	Little Wattlebird	*Anthochaera chrysoptera*		
Meliphagidae	Noisy Friarbird	*Philemon corniculatus*		
Meliphagidae	Noisy Miner	*Manorina melanocephala*	O	
Pardalotidae	Yellow Thornbill	*Acanthiza nana*	O	
Psittacidae	Crimson Rosella	*Platycercus elegans*	O	
Psittacidae	Eastern Rosella	*Platycercus eximius*	O	
Sturnidae	Common Myna	*Acridotheres tristis*	O	
Mammals				
Phalangeridae	Common Brushtail Possum	*Trichosurus vulpecula*	Sp	
Petauridae	Common Ringtail Possum	*Pseudocheirus peregrinus*	Sp	
Molossidae	Eastern Freetail-bat	*Mormopterus norfolkensis*	A	V
Molossidae	White-striped freetail bat	*Austronomus australis*	A	
Vespertilionidae	Chocolate Wattled Bat	*Chalinolobus morio*	A	
Vespertilionidae	Eastern Bent-wing Bat	*Miniopterus schreibersii*	A	V
Vespertilionidae	Eastern Forest Bat	*Vespadelus pumilus*	A	
Vespertilionidae	Gould's Wattled Bat	*Chalinolobus gouldii*	A	
Vespertilionidae	Greater Broad-nosed Bat	*Scoteanax rueppellii*	A	V
Canidae	Fox	*Vulpes vulpes*	Sc	
Leporidae	Rabbit	*Oryctolagus cuniculus*	Sc, Sp	

Key:

A - Anabat II	C	-	Call Identification
D - Diggings	Ct	-	Cage Trap
E - Elliot Trap	Fl	-	Flying over study area
O - Observation	P	-	Call Playback Response
F - Feather	S	-	Habitat Search
Sp - Spotlight	Sc	-	Scat, Track

Appendix C

Threatened flora species recorded in the locality

Appendix C Threatened Flora species recorded in the locality

This appendix details the Threatened species of plant that have either been recorded in the local area based on records the Bionet *Atlas of NSW Wildlife* Office of Environment & Heritage, 2021, data received 24th of November 2021 and records from the Royal Botanical Gardens. Threatened species with habitat likely to occur in the locality were also considered based on records from the *EPBC Protected Matters Search Tool* Department of Planning, Industry and Environement 2021, data received 24th of November 2021.

Table 7-3 Threatened flora species recorded in the locality

Family Name	Scientific Name	Common Name	BC Act1	EPBC Act3	ROTAP2	Habitat	Likelihood of occurrence within the study area
Araliaceae	*Astrotricha crassifolia*	Thick-leaf Star-hair	V	V	2V	Occurs near Patonga and in the Royal National Park and inland to Glen Davis where it grows in dry sclerophyll woodland on sandstone {Harden, 1993 #4; Harden, 1992 #3; Department of Environment and Climate Change, 2007 #1653}.	Low Targeted surveys have been undertaken for this species which failed to detect this species within the subject site. No impact assessment is considered to be warranted for this species.
Epacridaceae	*Epacris purpurascens var. purpurascens*		V		2K	Occurs in Gosford and Sydney districts where it grows in sclerophyll forest, scrub and swamps {Harden, 1992 #3}. Usually found in sites with a strong shale influence {NSW National Parks and Wildlife Service, 2002 #67}.	Low Targeted surveys have been undertaken for this species which failed to detect this species within the subject site. No impact assessment is considered to be warranted for this species.
Epacridaceae	*Leucopogon exolasius*	Woronora Beard-heath	V	V	2V	Restricted chiefly to the Woronora and Grose Rivers and Stokes Creek, Sydney catchments and the Royal National Park. One old record from the Grose River. Grows in woodland on sandstone {Royal Botanic Gardens, 2004 #9}.	Low Targeted surveys have been undertaken for this species which failed to detect this species within the subject site. No impact assessment is considered to be warranted for this species.
Fabaceae (Faboideae)	*Pultenaea aristata*		V	V	2V	Occurs from Helensburgh to Mt Keira where it grows in moist, dry sclerophyll woodland to heath on sandstone {Harden, 2002 #5}. Also grows within upland swamps on the Illawarra Plateau (pers obs).	**Low** No suitable habitat exists from the study area for this species.
Fabaceae (Faboideae)	*Pultenaea pedunculata*		E1			Restricted to Wianamatta Shales of the Cumberland Plain from Bankstown to Liverpool and on the South Coast in the Southeast	Low Targeted surveys have been undertaken for this species which failed to detect this species within the subject site. No impact assessment is considered to be warranted

Family Name	Scientific Name	Common Name	BC Act1	EPBC Act3	ROTAP2	Habitat	Likelihood of occurrence within the study area
						Corner Bioregion at Bournda. If grows on a variety of soils in dry sclerophyll forest and disturbed sites {Harden, 2000 #2; NSW Scientific Committee, 1999 #727; NSW National Parks and Wildlife Service, 2002 #726}. It is largely confined to loamy soils in dry gullies in populations in the Windellama area {Department of Environment and Climate Change, 2008 #1913}.	for this species.
Fabaceae (Mimosoideae)	*Acacia bynoeana*	Bynoe's Wattle	E1	V	3V	Occurs south of Dora Creek-Morisset area to Berrima and the Illawarra region and west to the Blue Mountains. It grows mainly in heath and dry sclerophyll forest on sandy soils {Harden, 2002 #5}. Seems to prefer open, sometimes disturbed sites such as trail margins and recently burnt areas. Typically occurs in association with Corymbia gummifera, Eucalyptus haemastoma, E. gummifera, E. parramattensis, E. sclerophylla, Banksia serrata and Angophora bakeri {NSW National Parks and Wildlife Service, 1999 #61}.	Low Targeted surveys have been undertaken for this species which failed to detect this species within the subject site. No impact assessment is considered to be warranted for this species.
Fabaceae (Mimosoideae)	*Acacia pubescens*	Downy Wattle	V	V	3Va	Restricted to the Sydney Region from Bilpin to the Georges River and also at Woodford where it usually grows in open sclerophyll forest and woodland on clay soils. Typically it occurs at the intergrade between shales and sandstones in gravely soils often with ironstones {Harden, 2002 #5;NSW National Parks and Wildlife Service, 2003 #14}.	Low Targeted surveys have been undertaken for this species which failed to detect this species within the subject site. No impact assessment is considered to be warranted for this species.

Family Name	Scientific Name	Common Name	BC Act1	EPBC Act3	ROTAP2	Habitat	Likelihood of occurrence within the study area
Grammitaceae	*Grammitis stenophylla*	Narrow-leaf Finger Fern	E1			Fern which occurs in coastal regions from Queensland to the NSW south coast where it grows on rocks in rainforest and in wet sclerophyll forest {Harden, 2000 #2}.	**Low** No suitable habitat exists from the study area for this species.
Myrtaceae	*Eucalyptus benthamii*	Nepean River Gum	V	V	2Vi	Restricted to Wallacia to Camden areas, Nepean River and Kedumba Creek, and Reedy and Cedar creeks in the central Blue Mountains. Grows on sandy flats or ridges near streams {Fairley, 2002 #15}.	**Low** No suitable habitat exists from the study area for this species.
Myrtaceae	*Eucalyptus camfieldii*	Heart-leaved Stringybark	V	V	2Vi	Occurs from Tomago to the Royal National Park where it grows in coastal shrub heath in sandy soils on sandstone {Harden, 2002 #5}.	**Low** No suitable habitat exists from the study area for this species.
Myrtaceae	*Eucalyptus nicholii*	Narrow-leaved Black Peppermint	V	V	3V	Occurs from Niangala to Glenn Innes where it grows in grassy sclerophyll woodland on shallow relatively infertile soils on shales and slates (Harden, 1991; DLWC, 2001). Endemic on the NSW Northern Tablelands, of limited occurrence, particularly in the area from Walcha to Glen Innes; often on porphyry or granite (Brooker and Kleinig 1999).	**Low** No suitable habitat exists from the study area for this species.
Myrtaceae	*Melaleuca biconvexa*	Biconvex Paperbark	V	V		Occurs as disjunct populations in coastal New South Wales from Jervis Bay to Port Macquarie, with the main concentration of records is in the Gosford/Wyong area {NSW Scientific Committee, 1998 #145}. Grows in damp places, often near streams, or low-lying areas on alluvial soils of low slopes or sheltered aspects {Harden, 2002 #5; Department of Environment and Climate	**Low** No suitable habitat exists from the study area for this species.

Family Name	Scientific Name	Common Name	BC Act1	EPBC Act3	ROTAP2	Habitat	Likelihood of occurrence within the study area
						Change, 2008 #1913}.	
Myrtaceae	*Melaleuca deanei*		V	V	3R	Occurs in coastal districts, including western Sydney (e.g. Baulkham Hills, Liverpool shires) from Berowra to Nowra where it grows in wet heath on sandstone and shallow/skeletal soils near streams or perched swamps {James, 1997 #69; Harden, 2002 #5}.	**Low** No suitable habitat exists from the study area for this species.
Myrtaceae	*Rhodamnia rubescens*	Scrub Turpentine	CE	CE		Found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest usually on volcanic and sedimentary soils. This species is characterised as highly to extremely susceptible to infection by Myrtle Rust. Myrtle Rust affects all plant parts.	**Low** No suitable habitat exists from the study area for this species.
Myrtaceae	*Syzygium paniculatum*	Magenta Lilly Pilly	V	V	3Ri	Occurs between Buladelah and St Georges Basin where it grows in subtropical and littoral rainforest on sandy soils or stabilized dunes near the sea {Harden, 2002 #5}. On the south coast the Magenta Lilly Pilly occurs on grey soils over sandstone, restricted mainly to remnant stands of littoral (coastal) rainforest. On the central coast Magenta Lilly Pilly occurs on gravels, sands, silts and clays in riverside gallery rainforests and remnant littoral rainforest communities {Department of Environment and Climate Change, 2008 #1913}.	**Low** No suitable habitat exists from the study area for this species.
Orchidaceae	*Genoplesium baueri*		V		3R	Grows in sparse sclerophyll forest and moss gardens over sandstone; from the Hunter Valley to Nowra district {Royal Botanic	**Low** No suitable habitat exists from the study area for this species.

Family Name	Scientific Name	Common Name	BC Act1	EPBC Act3	ROTAP2	Habitat	Likelihood of occurrence within the study area
						Gardens, 2004 #9}.	
Orchidaceae	*Prasophyllum affine*	Kinghorn Point Leek Orchid	E1	E	2E	Occurs south of the Sydney region where it grows in heath, avoiding swampy habitats {Harden, 1993 #4}. Prefers grey-brown silty soils {Bishop, 2000 #12; NSW National Parks and Wildlife Service, 1999 #146}.	**Low** No suitable habitat exists from the study area for this species.
Proteaceae	*Grevillea parviflora ssp. parviflora*	Small-flower Grevillea	V	V		Mainly known from the Prospect area (but now extinct there) and lower Georges River to Camden, Appin and Cordeaux Dam areas, with a disjunct populations near Putty, Cessnock and Cooranbong. Grows in heath or shrubby woodland in sandy or light clay soils usually over thin shales {NSW Scientific Committee, 1998 #78; Harden, 2002 #5}.	Low Targeted surveys have been undertaken for this species which failed to detect this species within the subject site. No impact assessment is considered to be warranted for this species.
Proteaceae	*Grevillea raybrownii*		V		2K	All natural remnant sites occur within a habitat that is both characteristic and consistent between sites. Generally occurs on ridgetops and, less often, slopes and benches of Hawkesbury Sandstone and Mittagong Formation It occurs in Eucalyptus open forest and woodland with a shrubby understorey on sandy, gravelly loam soils derived from sandstone that are low in nutrients.	**Low** No suitable habitat exists from the study area for this species.
Proteaceae	*Persoonia acerosa*	Mossy Geebung	V	V	2V	Occurs from the central Blue Mountains south to Hill Top. Grows on sandstone in heath, dry sclerophyll forest, scrubby low-woodland on low fertility soils {Department of Environment and Conservation, 2005 #762; NSW National Parks and Wildlife Service, 2000 #339}.	Low Targeted surveys have been undertaken for this species which failed to detect this species within the subject site. No impact assessment is considered to be warranted for this species.

Family Name	Scientific Name	Common Name	BC Act1	EPBC Act3	ROTAP2	Habitat	Likelihood of occurrence within the study area
						This species prefers ridge-tops and plateaux with sandy topsoil over clayey subsoil. Typically associated with Eucalyptus sieberi, E. piperita, E. sclerophylla (occasionally E. stricta and E. ligustrina), Lambertia formosa, Leptospermum trinervium, Hakea dactyloides, Platysace linearifolia, Petrophile pulchella, A. terminalis, and Acacia obtusifolia {NSW National Parks and Wildlife Service, 2000 #339}. This species seems to benefit from the reduced competition and increased light available on disturbance margins including roadsides {Department of Environment and Conservation, 2005 #762}.	
Proteaceae	*Persoonia bargoensis*		E1	V	2V	Grows in woodland to dry sclerophyll forest, on sandstone and laterite. Restricted to the Bargo area {Harden, 2002 #5}.	Low Targeted surveys have been undertaken for this species which failed to detect this species within the subject site. No impact assessment is considered to be warranted for this species.
Proteaceae	*Persoonia hirsuta*		E1	E	3Ki	Occurs in central coast and central tableland districts where it grows in woodland to dry sclerophyll forest on sandstone {Harden, 2002 #5} and rarely shale {NSW Scientific Committee, 1998 #64}. Often occurs in areas with clay influence, in the ecotone between shale and sandstone {James, 1997 #69}.	Low Targeted surveys have been undertaken for this species which failed to detect this species within the subject site. No impact assessment is considered to be warranted for this species.
Rhamnaceae	*Pomaderris brunnea*		V	V	2V	Confined to the Colo and Upper Nepean Rivers where it grows in open forest {Harden, 2000 #2}; in western Sydney (Camden to Picton area) known from sandy alluvium on levee and	Low Targeted surveys have been undertaken for this species which failed to detect this species within the subject site. No impact assessment is considered to be warranted for this species.

Family Name	Scientific Name	Common Name	BC Act1	EPBC Act3	ROTAP2	Habitat	Likelihood of occurrence within the study area
						creek banks {James, 1997 #69}.	
Rhamnaceae	*Pomaderris sericea*		E1	V	3Vi	In Victoria it grows in low shrubland on rock within the flood level of the river. There are only two Silky Pomaderris records in NSW that give details of habitat so it is difficult to generalise about the habitat preferences of the species. Both of these records, however, are from open forest on sandstone. The Bundanoon collection was made at the foot of a cliff.	**Low** No suitable habitat exists from the study area for this species.
Thymelaeaceae	*Pimelea curviflora var. curviflora*		V	V		Confined to coastal areas around Sydney where it grows on sandstone and laterite soils. It is found between South Maroota, Cowan, Narrabeen, Allambie Heights, Northmead and Kellyville, but its former range extended south to the Parramatta River and Port Jackson region including Five Dock, Bellevue Hill and Manly. Usually occurs in woodland in the transition between shale and sandstone, often on Lucas Heights soil landscape {NSW Scientific Committee, 1998 #65; James, 1997 #69; James, 1999 #68; Harden, 2000 #2}.	Low Targeted surveys have been undertaken for this species which failed to detect this species within the subject site. No impact assessment is considered to be warranted for this species.

1) V= Vulnerable, E1 = Endangered (BC Act) E2= Endangered Population **2)** ROTAP (Rare or Threatened Australian Plants, Briggs and Leigh 1996) is a conservation rating for Australian plants. 1 = Species only known from one collection. 2 = Species with a geographic range of less than 100km in Australia. 3 = Species with a geographic range of more than 100km in Australia, X = Species presumed extinct; no new collections for at least 50 years. E = Endangered species at risk of disappearing from the wild state if present land use and other causal factors continue to operate, V = Vulnerable species at risk of long-term disappearance through continued depletion. R = Rare, but not currently considered to be endangered. K = Poorly known species that are suspected to be threatened. C = Known to be represented within a conserved area. a = At least 1,000 plants are known to occur within a conservation reserve(s). i = Less than 1,000 plants are known to occur within a conservation reserve(s). The reserved population size is unknown. t = The total known population is reserved. + = The species has a natural occurrence overseas. **3)** V = Vulnerable, E = Endangered *(Environment Protection and Biodiversity Conservation Act 1999*).

Appendix D

Threatened fauna species recorded in the locality

Appendix D Threatened Fauna species recorded in the locality

This appendix details the Threatened species of plant that have either been recorded in the local area based on records the *Atlas of NSW Wildlife* Office of Environment & Heritage, 2021, data received 24th of November 2021 and records from the Royal Botanical Gardens. Threatened species with habitat likely to occur in the locality were also considered based on records from the *EPBC Protected Matters Search Tool* Department of Planning, Industry and Environement 2021, data received 24th of November 2021.

Table 7-4 Threatened fauna species recorded in the locality

Scientific Name	Common Name	BC Act	EPBC Act	Habitat	Likelihood of occurrence within the study area
Amphibians					
Heleioporus australiacus	Giant Burrowing Frog	V	V	Appears to exist as two distinct populations: a northern population largely confined to the sandstone geology of the Sydney Basin, from Wollemi National Park in the north and extending south to Jervis Bay; and a southern population occurring in disjunct pockets from about Narooma south into eastern Victoria. In the northern population there is a marked preference for sandstone ridge-top habitat and broader upland valleys. In these locations the frog is associated with small headwater creek-lines and along slow flowing to intermittent creek-lines. The vegetation is typically woodland, open woodland and heath and may be associated with 'hanging swamp' seepage lines and where small pools form from the collected water. They have also been observed occupying artificial ponded structures such as fire dams, gravel 'borrows', detention basins and box drains that have naturalised over time and are still surrounded by other undisturbed habitat. In the southern population, records from Narooma, Bega, Bombala and eastern Victoria appear to be associated with Devonian igneous and sedimentary formations and Ordovician metamorphics and are generally from more heavily timbered areas. However, again there appears to be an association with ridge-tops, headwaters and slow flowing streams. Do not appear to inhabit areas that have been cleared for agriculture or for urban development. Breed in summer and autumn in burrows in the banks of small creeks. Often spends significant periods of time underground during unfavourable conditions and to avoid detection during the day. (Cogger 2000; NSW National Parks and Wildlife Service 2001).	**Low** No suitable habitat was recorded from the study area for this species.
Litoria littlejohni	Heath Frog	V	V	Distributed along the eastern slopes of the Great Dividing Range from Watagan State Forest near Wyong, south to Buchan in north-eastern Victoria. It appears to be restricted to sandstone woodland and heath communities at mid to high altitude. It forages both in the tree canopy and on the ground, and it has been observed sheltering under rocks on high exposed ridges during summer. It is not known from coastal habitats (NSW Scientific Committee 2000).	**Low** No suitable habitat was recorded from the study area for this species.

Scientific Name	Common Name	BC Act	EPBC Act	Habitat	Likelihood of occurrence within the study area
Mixophyes balbus	Stuttering Frog	E1	V	Terrestrial species, found in rainforest, Antarctic beech forest or wet sclerophyll forest. The species depends on freshwater streams and riparian vegetation for breeding and habitation. No records are known from riparian habitat that has been disturbed (Cogger 2000; NSW Scientific Committee 2003).	**Low** No suitable habitat was recorded from the study area for this species.
Mixophyes iteratus	Giant Barred Frog	E1	E	Terrestrial species which occurs in rainforests, antarctic beech or wet sclerophyll forests. Feeds on insects and smaller frogs (Cogger 2000). The species is associated with permanent flowing drainages, from shallow rocky rainforest streams to slow-moving rivers in lowland open forest. It is not known to utilise still water areas (NSW Scientific Committee 1999). More prevalent at lower altitudes and in larger streams than its congeners, although has been recorded up to 1000 metres asl. (NSW National Parks and Wildlife Service 1999).	**Low** No suitable habitat was recorded from the study area for this species.
Pseudophryne australis	Red-crowned Toadlet	V		Occurs within 160 km of Sydney where it is restricted to Hawkesbury Sandstone. It breeds in deep grass and debris adjacent to ephemeral drainage lines. When not breeding individuals are found scattered on sandstone ridges under rocks and logs (Cogger 2000).	**Low** A targeted survey was undertaken for this species which failed to detect this species within the study area
Fish					
Macquaria australasica	Macquarie Perch		E	The natural range of Macquarie Perch included the upper and middle reaches of the Murray-Darling basin as well as the Shoalhaven and Hawkesbury Rivers. However, this species has recently been sighted in only a few localities within these river systems. Preferred habitat is deep holes covered with rocks, and spawning occurs above shallow running water. Macquarie Perch is a schooling species (Department of the Environment and Water Resources, 2007).	**Low** No suitable habitat was recorded from the study area for this species.
Prototroctes maraena	Australian Grayling		V	It is a mid-water, freshwater species that occurs most commonly in clear, gravely streams with a moderate flow. Prefers deep, slow flowing pools (NSW Fisheries 2004).	**Low** No suitable habitat was recorded from the study area for this species.
Invertebrates					
Petalura gigantea	Giant Dragonfly	E1		Found in permanent wetlands, both coastal and upland from moss Vale northwards to southern Queensland (Department of Environment and Conservation 2005).	**Low** No suitable habitat was recorded from the study area for this species.
Birds					
Apus pacificus	Fork-tailed Swift		M	Breeds from central Siberia eastwards through Asia, and is migratory, wintering south to Australia. Individuals never settle voluntarily on the ground and spend most of their lives in the air, living on the insects they catch in their beaks (Higgins 1999).	**Low** No suitable habitat was recorded from the study area for this species.

Scientific Name	Common Name	BC Act	EPBC Act	Habitat	Likelihood of occurrence within the study area
Ardea alba	Great Egret		M	Great Egrets occur throughout most of the world. They are common throughout Australia, with the exception of the most arid areas. Great Egrets prefer shallow water, particularly when flowing, but may be seen on any watered area, including damp grasslands. Great Egrets can be seen alone or in small flocks, often with other egret species, and roost at night in groups. In Australia, the breeding season of the Great Egret is normally October to December in the south and March to May in the north. This species breeds in colonies, and often in association with cormorants, ibises and other egrets. (Australian Museum 2003).	**Low** A targeted survey was undertaken for this species which failed to detect this species within the study area
Ardea ibis	Cattle Egret		M	*Subsepecies A. i. coromanda* is found across the Indian subcontinent and Asia as far north as Korea and Japan, and in South-east Asia, Papua New Guinea and Australia (McKilligan 2005).	**Low** A targeted survey was undertaken for this species which failed to detect this species within the study area
Callocephalon fimbriatum	Gang-gang Cockatoo	V		Occurs in wetter forests and woodland from sea level to an altitude over 2000 metres, timbered foothills and valleys, coastal scrubs, farmlands and suburban gardens (Pizzey and Knight 1997).	**Low** A targeted survey was undertaken for this species which failed to detect this species within the study area
Calyptorhynchus lathami	Glossy Black-Cockatoo	V		Occurs in eucalypt woodland and forest with Casuarina/Allocasuarina spp. Characteristically inhabits forests on sites with low soil nutrient status, reflecting the distribution of key Allocasuarina species. The drier forest types with intact and less rugged landscapes are preferred by the species. Nests in tree hollows (NSW National Parks and Wildlife Service 1999; Garnett and Crowley 2000).	**Low** A targeted survey was undertaken for this species which failed to detect this species within the study area
Falco subniger	Black Falcon	V		The Black Falcon is widely, but sparsely, distributed in New South Wales, mostly occurring in inland regions. Some reports of 'Black Falcons' on the tablelands and coast of New South Wales are likely to be referable to the Brown Falcon. In New South Wales there is assumed to be a single population that is continuous with a broader continental population, given that falcons are highly mobile, commonly travelling hundreds of kilometres (Marchant & Higgins 1993). The Black Falcon occurs as solitary individuals, in pairs, or in family groups of parents and offspring.	**Low** A targeted survey was undertaken for this species which failed to detect this species within the study area
Ninox strenua	Powerful Owl	V		A sedentary species with a home range of approximately 1000 hectares it occurs within open eucalypt, casuarina or callitris pine forest and woodland. It often roosts in dense vegetation including rainforest of exotic pine plantations. Generally feeds on medium-sized mammals such as possums and gliders but will also eat birds, flying-foxes, rats and insects. Prey are generally hollow dwelling and require a shrub layer and owls are more often found in areas with more old trees and hollows than average stands (Garnett and Crowley 2000).	**Low/Medium** Suitable habitat for this species was recorded from the subject site. Despite this no individuals were recorded during targeted surveys.

Scientific Name	Common Name	BC Act	EPBC Act	Habitat	Likelihood of occurrence within the study area
Tyto tenebricosa	Sooty Owl	V		Occurs in wet eucalypt forest and rainforest on fertile soils with tall emergent trees. Typically found in old growth forest with a dense understorey but also occurs in younger forests if nesting trees are present nearby. It nests in large hollows within eucalypts and occasionally caves. It hunts in open and closed forest for a range of arboreal and terrestrial mammals including introduced species and sometimes birds (Garnett and Crowley 2000).	**Low** A targeted survey was undertaken for this species which failed to detect this species within the study area
Tyto novaehollandiae	Masked Owl	V		Occurs within a diverse range of wooded habitats including forests, remnants and almost treeless inland plains. This species requires large-hollow bearing trees for roosting and nesting and nearby open areas for foraging. They typically prey on terrestrial mammals including rodents and marsupials but will also take other species opportunistically. Also known to occasionally roost and nest in caves {Garnett, 2000 #21}.	**Low** A targeted survey was undertaken for this species which failed to detect this species within the study area
Climacteris picumnus	Brown Treecreeper	V		Occurs in eucalypt woodland and adjoining vegetation. Feeds on ants, beetles and larvae on trees and from fallen timber and leaf litter. Usually nests in hollows (Garnett and Crowley 2000).	**Low** A targeted survey was undertaken for this species which failed to detect this species within the study area.
Burhinus grallarius	Bush Stone-curlew	E1		Require sparsely grassed, lightly timbered, open forest of woodland. In southern Australia they often occur where there is a well structured litter layer and fallen timber debris. Feed on a range of invertebrates and small vertebrates, as well as seeds and shoots (NSW National Parks and Wildlife Service 1999; NSW National Parks and Wildlife Service 2003).	**Low** No suitable habitat was recorded from the study area for this species.
Hieraaetus morphnoides	Little Eagle	V		The little eagle is a medium sized bird, the Little Eagle occupies open eucalypt forest, woodland or open woodland. Sheoak or Acacia Woodlands of interior NSW are also used. Nest in tall living trees within a remnant patch, where pairs build a large nest stick nest in winter.	**Low** A targeted survey was undertaken for this species which failed to detect this species within the study area
Artamus cyanopterus	Dusky Woodswallow	V		Habitat; woodlands and dry open sclerophyll forest usually dominated by eucalypts including mallee associations. It has been recorded from shrublands and heathlands and various forms of modified habitat including regenerating forest and very occasionally in moist forest and rainforests.	**Low** A targeted survey was undertaken for this species which failed to detect this species within the study area
Melithreptus gularis gularis	Black-chinned Honeyeater	V		Found in dry eucalypt woodland particularly those containing ironbark and box. Occurs within areas of annual rainfall between 400-700 mm. Feed on insects, nectar and lerps {Garnett, 2000 #21}.	**Low** A targeted survey was undertaken for this species which failed to detect this species within the study area.

Scientific Name	Common Name	BC Act	EPBC Act	Habitat	Likelihood of occurrence within the study area
Petroica phoenicea	Flame Robin	V		Breeds in upland tall moist eucalypt forest and woodland often on ridges and slopes. Prefers clearing or areas with open understorey. The groundlayer of breeding habitat is dominated by native grasses and shrub layer may be either sparse or dense. Occasionally occurs in temperate rainforest and also in herb fields heathlands shrublands and sedgeland in high altitudes.	**Low** A targeted survey was undertaken for this species which failed to detect this species within the study area
Daphoenositta chrysoptera	Varied Sittella	V		Inhabits eucalypt forests and woodlands, especially those containing rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland. Feeds on arthropods gleaned from crevices in rough or decorticating bark, dead branches, standing dead trees and small branches and twigs in the tree canopy.	**Low** A targeted survey was undertaken for this species which failed to detect this species within the study area
Glossopsitta pusilla	Little Lorikeet	V		Forages primarily in the canopy of open Eucalyptus forest and woodland, yet also finds food in Angophoras, Melaleucas and other tree species. Riparian habitats are particularly used, due to higher soil fertility and hence greater productivity. Isolated flowering trees in open country, e.g. paddocks, roadside remnants and urban trees also help sustain viable populations of the species. Feeds mostly on nectar and pollen, occasionally on native fruits such as mistletoe, and only rarely in orchards	**Low** A targeted survey was undertaken for this species which failed to detect this species within the study area.
Haliaeetus leucogaster	White-bellied Sea-Eagle	V	M	Occurs in coastal areas including islands, estuaries, inlets, large rivers, inland lakes and reservoirs. Builds a huge nest of sticks in tall trees near water, on the ground on islands or on remote coastal cliffs (Pizzey and Knight 1997).	**Low** No suitable habitat was recorded from the study area for this species.
Hirundapus caudacutus	White-throated Needletail		M	Occurs in airspace over forests, woodlands, farmlands, plains, lakes, coasts and towns. Breeds in the northern hemisphere and migrates to Australia in October-April (Pizzey and Knight 1997).	**Low** A targeted survey was undertaken for this species which failed to detect this species within the study area.
Lathamus discolor	Swift Parrot	E1	E	Breeding occurs in Tasmania, majority migrates to mainland Australia in autumn, over-wintering, particularly in Victoria and central and eastern NSW, but also south-eastern Queensland as far north as Duaringa. Until recently it was believed that in New South Wales, swift parrots forage mostly in the western slopes region along the inland slopes of the Great Dividing Range but are patchily distributed along the north and south coasts including the Sydney region, but new evidence indicates that the forests on the coastal plains from southern to northern NSW are also extremely important. In mainland Australia is semi-nomadic, foraging in flowering eucalypts in eucalypt associations, particularly box-ironbark forests and woodlands. Preference for sites with highly fertile soils where large trees have high nectar production, including along drainage lines and isolated rural or urban remnants, and for sites with flowering *Acacia pycnantha*, is indicated. Sites used vary from year to year. (Garnett and Crowley 2000),(Swift Parrot Recovery Team 2001).	**Low** No suitable habitat was recorded from the study area for this species.

Scientific Name	Common Name	BC Act	EPBC Act	Habitat	Likelihood of occurrence within the study area
Merops ornatus	Rainbow Bee-eater		M	Usually occur in open or lightly timbered areas, often near water. Breed in open areas with friable, often sandy soil, good visibility, convenient perches and often near wetlands. Nests in embankments including creeks, rivers and sand dunes. Insectivorous, most foraging is aerial, in clearings (Higgins 1999).	**Low** No suitable habitat was recorded from the study area for this species.
Monarcha melanopsis	Black-faced Monarch		M	Occurs in rainforests, eucalypt woodlands, coastal scrubs, damp gullies in rainforest, eucalypt forest and in more open woodland when migrating (Pizzey and Knight 1997).	**Low/Medium** A targeted survey was undertaken for this species which failed to detect this species within the study area.
Myiagra cyanoleuca	Satin Flycatcher		M	Occurs in heavily vegetated gullies, in forests and taller woodlands. During migration it is found in coastal forests, woodlands, mangroves, trees in open country and gardens (Pizzey and Knight 1997).	**Low** A targeted survey was undertaken for this species which failed to detect this species within the study area.
Stagonopleura guttata	Diamond Firetail	V		Occurs in a range of eucalypt dominated communities with a grassy understorey including woodland, forest and mallee. Most populations occur on the inland slopes of the dividing range. Feed on seeds, mostly of grasses {Garnett, 2000 #21}.	**Low** A targeted survey was undertaken for this species which failed to detect this species within the study area
Lophoictinia isura	Square-tailed Kite	V		This species hunts primarily over open forest, woodland and mallee communities as well as over adjacent heaths and other low scrubby habitats in wooded towns. It feeds on small birds, their eggs and nestlings as well as insects. Seems to prefer structurally diverse landscapes (Garnett and Crowley 2000).	**Low/Medium** A targeted survey was undertaken for this species which failed to detect this species within the study area.
Pyrrholaemus sagittatus	Speckled Warbler	V		Occurs in a wide range of eucalypt dominated vegetation with a grassy understorey and is often found on rocky ridges or in gullies. It feeds on seeds and insects and builds domed nests on the ground {Garnett, 2000 #21}.	**Low** A targeted survey was undertaken for this species which failed to detect this species within the study area
Petroica boodang	Scarlet Robin	V		The Scarlet Robin lives in dry eucalypt forests and woodlands. The understorey is usually open and grassy with few scattered shrubs. This species lives in both mature and regrowth vegetation. It occasionally occurs in mallee or wet forest communities, or in wetlands and tea-tree swamps. Scarlet Robin habitat usually contains abundant logs and fallen timber: these are important components of its habitat.	**Low** A targeted survey was undertaken for this species which failed to detect this species within the study area.

Scientific Name	Common Name	BC Act	EPBC Act	Habitat	Likelihood of occurrence within the study area
Rhipidura rufifrons	Rufous Fantail		M	Occurs in a range of habitats including the undergrowth of rainforests/wetter eucalypt forests/gullies, monsoon forests paperbarks, sub-inland and coastal scrubs, mangroves, watercourses, parks and gardens. When migrating they may also be recorded on farms, streets and buildings. Migrates to SE Australia in October-April to breed, mostly in or on the coastal side of the Great Dividing Range (Pizzey and Knight 1997).	**Low** A targeted survey was undertaken for this species which failed to detect this species within the study area.
Melanodryas cucullata	Hooded Robin	V		Found in south-eastern Australia, generally east of the Great Dividing Range. Found in eucalypt woodland and mallee and acacia shrubland. This is one of a suite of species that has declined in woodland areas in south-eastern Australia {Traill, 2000 #42; Garnett, 2000 #21}.	**Low** A targeted survey was undertaken for this species which failed to detect this species within the study area
Xanthomyza phrygia	Regent Honeyeater	E1	EM	Occurs mostly in box-ironbark forests and woodland and prefers the wet, fertile sites such as along creek flats, broad river valleys and foothills. Riparian forests with *Casuarina cunninghamiana* and *Amyema cambagei* are important for feeding and breeding. Important food trees include *Eucalyptus sideroxylon* (Mugga Ironbark), *E. albens* (White Box) , *E. melliodora* (Yellow Box) and *E. leucoxylon* (Yellow Gum) (Garnett and Crowley 2000).	**Low** No suitable habitat was recorded from the study area for this species.
Invertebrates					
Meridolum corneovirens	Cumberland Plain Land Snail	E1		Restricted to the Cumberland Plain and Castlereagh Woodlands of Western Sydney and also along the fringes of River Flat Forest, especially where it meets Cumberland Plain Woodland. It is typically found under logs and other debris, amongst leaf litter and bark around bases of trees. It is also sometimes found under grass clumps and where possible it will burrow into loose soil {NSW National Parks and Wildlife Service, 1999 #41}.	**Low** A targeted survey was undertaken for this species which failed to detect this species within the study area
Mammals					
Bettongia gaimardi	Tasmanian Bettong	E4	X	*Bettongia gaimardi* is found in terrestrial, temperate habitats including grasslands, grassy woodlands, dry eucalyptus forests, and sclerophyll forests (i.e., forests containing plants with hard, short and usually spiky leaves). This species is found from sea level to elevations around 1,000 m.	**Low** No suitable habitat was recorded from the study area for this species.
Chalinolobus dwyeri	Large-eared Pied Bat	V	V	Occurs in moderately wooded habitats and roosts in caves, mine tunnels and the abandoned, bottle-shaped mud nests of Fairy Martins. Thought to forage below the forest canopy for small flying insects (Churchill 1998).	**Low/Medium** Suitable habitat for this species was recorded from the study area. An Impact Assessment has been prepared for this species (Appendix E).

Scientific Name	Common Name	BC Act	EPBC Act	Habitat	Likelihood of occurrence within the study area
Dasyurus maculatus	Spotted-tailed Quoll	V	E	Occurs from the Bundaberg area in south-east Queensland, south through NSW to western Victoria and Tasmania. In NSW, it occurs on both sides of the Great Dividing Range and north-east NSW represents a national stronghold (NSW National Parks and Wildlife Service 1999). Occurs in wide range of forest types, although appears to prefer moist sclerophyll and rainforest forest types, and riparian habitat. Most common in large un-fragmented patches of forest. It has also been recorded from dry sclerophyll forest, open woodland and coastal heathland, and despite its occurrence in riparian areas, it also ranges over dry ridges. Nests in rock caves and hollow logs or trees. Feeds on a variety of prey including birds, terrestrial and arboreal mammals, small macropods, reptiles and arthropods (NSW National Parks and Wildlife Service 1999; NSW National Parks and Wildlife Service 1999).	**Low** No suitable habitat was recorded from the study area for this species.
Falsistrellus tasmaniensis	Eastern False Pipistrelle	V		Usually roosts in tree hollows in higher rainfall forests. Sometimes found in caves (Jenolan area) and abandoned buildings. Forages within the canopy of dry sclerophyll forest. It prefers wet habitats where trees are more than 20 metres high (Churchill 1998).	**Low/Medium** Suitable habitat for this species was recorded from the study area. An Impact Assessment has been prepared for this species (Appendix E).
Phascolarctos cinereus	Koala	V		Found in sclerophyll forest. Throughout New South Wales, Koalas have been observed to feed on the leaves of approximately 70 species of eucalypt and 30 non-eucalypt species. However, in any one area, Koalas will feed almost exclusively on a small number of preferred species. The preferred tree species vary widely on a regional and local basis. Some preferred species in NSW include Forest Red Gum *Eucalyptus tereticornis*, Grey Gum E. *punctata*, Monkey Gum *E. cypellocarpa* and Ribbon Gum *E. viminalis*. In coastal areas, Tallowwood *E. microcorys* and Swamp Mahogany *E. robusta* are important food species, while in inland areas White Box E. albens, Bimble Box *E. populnea* and River Red Gum *E. camaldulensis* are favoured (NSW National Parks and Wildlife Service 1999; NSW National Parks and Wildlife Service 2003).	**Low** A targeted survey was undertaken for this species which failed to detect this species within the study area.
Cercartetus nanus	Eastern Pygmy-possum	V		Found in a range of habitats from rainforest through sclerophyll forest to tree heath. It feeds largely on the nectar and pollen of banksias, eucalypts and bottlebrushes and sometimes soft fruits. It nests in very small tree holes, between the wood and bark of a tree, abandoned birds nests and shredded bark in the fork of trees {Turner, 1995 #25}.	**Low** No suitable habitat was recorded from the study area for this species.
Isoodon obesulus	Southern Brown Bandicoot	E1	E	Occurs in a variety of habitats in south-eastern Australia, including heathland, shrubland, dry sclerophyll forest with heathy understorey, sedgeland and woodland. Many of the habitats are prone to fire (NSW National Parks and Wildlife Service 1999).	**Low** No suitable habitat was recorded from the study area for this species.
Miniopterus schreibersii	Eastern Bent-wing Bat	V		Usually found in well timbered valleys where it forages on small insects above the canopy. Roosts in caves, old mines, stormwater channels and sometimes buildings and often return to a particular nursery cave each year (Churchill 1998).	**Low/Medium** Suitable habitat for this species was recorded from the study area. An Impact Assessment has been prepared for this species (Appendix E).

Scientific Name	Common Name	BC Act	EPBC Act	Habitat	Likelihood of occurrence within the study area
Petrogale penicillata	Brush-tailed Rock-wallaby	E1	V	Occurs in inland and sub-coastal south eastern Australia where it inhabits rock slopes. It has a preference for rocks which receive sunlight for a considerable part of the day. Windblown caves, rock cracks or tumbled boulders are used for shelter. Occur in small groups or "colonies" each usually separated by hundreds of metres (NSW National Parks and Wildlife Service 2003).	**Low** No suitable habitat was recorded from the study area for this species.
Phascolarctos cinereus	Koala	V		Found in sclerophyll forest. Throughout New South Wales, Koalas have been observed to feed on the leaves of approximately 70 species of eucalypt and 30 non-eucalypt species. However, in any one area, Koalas will feed almost exclusively on a small number of preferred species. The preferred tree species vary widely on a regional and local basis. Some preferred species in NSW include Forest Red Gum *Eucalyptus tereticornis*, Grey Gum *E. punctata*, Monkey Gum *E. cypellocarpa* and Ribbon Gum *E. viminalis*. In coastal areas, Tallowwood *E. microcorys* and Swamp Mahogany *E. robusta* are important food species, while in inland areas White Box *E. albens*, Bimble Box *E. populnea* and River Red Gum *E. camaldulensis* are favoured (NSW National Parks and Wildlife Service 1999; NSW National Parks and Wildlife Service 2003).	**Low** No suitable habitat was recorded from the study area for this species.
Potorous tridactylus	Long-nosed Potoroo	V	V	Disjunct distribution along coastal south-east Australia from near Gladstone in Queensland, to south-west Victoria and in Tasmania. Found from sea level up to 1500 metres in altitude generally in areas with rainfall greater than 760 millimetres. In NSW, it is found throughout coastal and sub-coastal areas. Occurs in a range of habitats: coastal forest and woodland with a moderately dense heathy understorey, dense coastal scrubs or heath, wet and dry sclerophyll forest and sub-tropical, warm temperate and cool temperate rainforest of the eastern slopes and highlands. Often associated with gullies and forest ecotones. Open areas are used for foraging while areas of dense groundcover or understorey provide areas for shelter and protection from predators. Relatively thick ground cover is a major habitat requirement and it seems to prefer areas with light sandy soils. Feeds at dusk on roots, tubers, fungi, insects and their larvae and other soft bodied animals in the soil. Moves up and down slope as food resources become seasonally available (Johnston 1995; NSW National Parks and Wildlife Service 1999).	**Low** No suitable habitat was recorded from the study area for this species.
Pseudomys fumeus	Smoky Mouse	E1	E	The Smoky Mouse is currently limited to a small number of sites in western, southern and eastern Victoria, south-east NSW and the ACT. In NSW there are 3 records from Kosciuszko National Park and 2 records adjacent to the park in Bondo and Ingbyra State Forests; the remainder are centred around Mt Poole, Nullica State Forest and the adjoining S. E. Forests National Park. The Smoky Mouse appears to prefer heath habitat on ridge tops and slopes in sclerophyll forest, heathland and open-forest from the coast (in Victoria) to sub-alpine regions of up to 1800 metres, but sometimes occurs in ferny gullies. Seeds and fruits from leguminous shrubs form the main summer and autumn diet, with some invertebrates, e.g., Bogong Moths in the high country. Hypogeal (truffle-like) fungi dominate in winter and spring, with some flowers, seeds and soil invertebrates. May occur singly, as pairs or small communal groups based around patches of heath, sometimes comprising a male and up to five females sharing a burrow system. Breeding is in spring with one or two litters produced of up to four young. Nesting burrows have been found in rocky localities among tree roots and under the skirts of Grass Trees *Xanthorrhoea spp*. The persistence of colonies appears to be very ephemeral. It is not known how much this is due to natural fluctuations in food availability, but predation from feral carnivores appears to be implicated.	**Low** No suitable habitat was recorded from the study area for this species.

Scientific Name	Common Name	BC Act	EPBC Act	Habitat	Likelihood of occurrence within the study area
Petauroides volans	Greater Glider	V		The Greater Glider inhabits Eucalytus forests and woodlands as this species feeds excusively on Eucalyptus buds and leaves. They occupy tree hollows in the day and tree canopies at night (Department of Environment and Climate Change 2007).	**Low** No suitable habitat was recorded from the study area for this species.
Petaurus australis	Yellow-bellied Glider	V		Restricted to tall, mature eucalypt forest in high rainfall areas of temperate to sub-tropical eastern Australia. Feeds on nectar, pollen, the sap of eucalypts and sometimes insects. Preferred habitats are productive, tall open sclerophyll forests where mature trees provide helter and nesting hollows and year round food resources are available from a mixture of eucalypt species {NSW National Parks and Wildlife Service, 1999 #44; NSW National Parks and Wildlife Service, 2003 #45}.	**Low** No suitable habitat was recorded from the study area for this species.
Petaurus norfolcensis	Squirrel Glider	V		Found in dry sclerophyll forest and woodland but not found in dense coastal ranges. Nests in hollows and feeds on gum of acacias, eucalypt sap and invertebrates {NSW National Parks and Wildlife Service, 1999 #39}.	**Low** Sub-optimal habitat for this species was recorded from the project site. Despite this no individuals were recorded during targeted nocturnal spotlighting and diurnal day surveys. An Impact Assessment has been prepared for this (Appendix E).
Pteropus poliocephalus	Grey-headed Flying-fox	V	V	Occurs in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps. Urban gardens and cultivated fruit crops also provide habitat for this species. Feeds on the flowers and nectar of eucalypts and native fruits including lilly pillies. It roosts in the branches of large trees in forests or mangroves (Churchill 1998; NSW National Parks and Wildlife Service 2001).	**Low/Medium** Suitable habitat for this species was recorded from the study area. An Impact Assessment has been prepared for this species (Appendix E).
Mormopterus norfolkensis	Eastern Freetail-bat	V		Thought to live in sclerophyll forest and woodland. Small colonies have been found in tree hollows or under loose bark. It feeds on insects above the forest canopy or in clearings at the forest edge (Churchill 1998).	**Low/Medium** Suitable habitat for this species was recorded from the study area. An Impact Assessment has been prepared for this species (Appendix E).
Myotis adversus	Large-footed Myotis	V		Colonies occur in caves, mines, tunnels, under bridges and buildings. Colonies always occur close to bodies of water where this species feeds on aquatic insects (Churchill 1998).	**Low/Medium** Suitable habitat for this species was recorded from the study area. An Impact Assessment has been prepared for this species (Appendix E).

Scientific Name	Common Name	BC Act	EPBC Act	Habitat	Likelihood of occurrence within the study area
Kerivoula papuensis	Golden-tipped Bat	V		Predominantly distributed throughout Indonesia, New Guinea and the Phillipines, the species has been observed on the east coast of NSW and Victoria. Prefers moist dense vegetation in coastal forests, near to where wet and dry forests meet and often in the vicinity of creeks. Possibly prefers ecotonal habitats (such as creek lines) for feeding and passage and an ability to manoeuvre in dense vegetation {Strahan, 1995 #185}.	**Low/Medium** Suitable habitat for this species was recorded from the study area. An Impact Assessment has been prepared for this species (Appendix E).
Saccolaimus flaviventris	Yellow-bellied Sheathtail Bat	V		Occurs in eucalypt forest where it feeds above the canopy and in mallee or open country where it feeds closer to the ground. Generally a solitary species but sometimes found in colonies of up to 10. It roosts in tree hollows. Thought to be a migratory species (Churchill 1998).	**Low/Medium** Suitable habitat for this species was recorded from the study area. An Impact Assessment has been prepared for this species (Appendix E).
Scoteanax rueppellii	Greater Broad-nosed Bat	V		The preferred hunting areas of this species include tree-lined creeks and the ecotone of woodlands and cleared paddocks but it may also forage in rainforest. Typically it forages at a height of 3-6 metres but may fly as low as one metre above the surface of a creek. It feeds on beetles, other large, slow-flying insects and small vertebrates. It generally roosts in tree hollows but has also been found in the roof spaces of old buildings (Churchill 1998).	**Low/Medium** Suitable habitat for this species was recorded from the study area. An Impact Assessment has been prepared for this species (Appendix E).
Reptiles					
Hoplocephalus bungaroides	Broad-headed Snake	E1	V	A nocturnal species that occurs in association with communities occurring on Triassic sandstone within the Sydney Basin. Typically found among exposed sandstone outcrops with vegetation types ranging from woodland to heath. Within these habitats they generally use rock crevices and exfoliating rock during the cooler months and tree hollows during summer (Webb and Shine 1994; Webb and Shine 1998).	**Low** No suitable habitat was recorded from the study area for this species.

1) V= Vulnerable, E1 = Endangered (BC Act) E2= Endangered Population 2) ROTAP (Rare or Threatened Australian Plants, Briggs and Leigh 1996) is a conservation rating for Australian plants. 1 = Species only known from one collection. 2 = Species with a geographic range of less than 100km in Australia. 3 = Species with a geographic range of more than 100km in Australia, X = Species presumed extinct; no new collections for at least 50 years. E = Endangered species at risk of disappearing from the wild state if present land use and other causal factors continue to operate, V = Vulnerable species at risk of long-term disappearance through continued depletion. R = Rare, but not currently considered to be endangered. K = Poorly known species that are suspected to be threatened. C = Known to be represented within a conserved area. a = At least 1,000 plants are known to occur within a conservation reserve(s). i = Less than 1,000 plants are known to occur within a conservation reserve(s). The reserved population size is unknown. t = The total known population is reserved. + = The species has a natural occurrence overseas. **3)** V = Vulnerable, E = Endangered *(Environment Protection and Biodiversity Conservation Act 1999*).

Appendix E

BC Assessments of Significance

Assessment of Significance

The threatened species test of significance is used to determine if a development or activity is likely to significantly affect threatened species or ecological communities, or their habitats. It is applied as part of the Biodiversity Offsets Scheme entry requirements and for Part 5 activities under the *Environmental Planning and Assessment Act 1979*.

The test of significance is set out in s.7.3 of *the Biodiversity Conservation Act 2016*.

If the activity is likely to have a significant impact, or will be carried out in a declared area of outstanding biodiversity value, the proponent must either apply the Biodiversity Offsets Scheme or prepare a species impact statement (SIS).

The environmental impact of activities that will not have a significant impact on threatened species will continue to be assessed under s.111 of the Environmental Planning and Assessment Act 1979.

If a proposed activity will have a significant impact or will be carried out in an area of outstanding biodiversity value, and the proponent does not opt in to the Biodiversity Offsets Scheme, a SIS must be prepared and agreement sought from the Chief Executive of Office of Environment and Heritage.

The requirements of an SIS are set out in s.7.6 of the Biodiversity Conservation Regulation 2017. The proponent must also seek and comply with the Office of Environment and Heritage Chief Executive's requirements for SIS preparation.

The "subject site" is defined as the area directly affected by the proposal.

The "study area" is the subject site and any additional areas which are likely to be affected by the proposal, either directly or indirectly. The study area extends as far as is necessary to take all potential impacts into account.

The "local occurrence" of a community is that which occurs in the study area or beyond to include those areas where the movement of individuals and genetic exchange can be demonstrated

The "risk of extinction" is the likelihood that the local occurrence of the community will become extinct in either the short or long term as a result of direct or indirect impacts arising from the proposal.

The "composition" of the community includes both plant and animal species as well as its physical structure

The following 5 part test of significance relies on the ecological assessment provided in Sections 2 & 3, & Appendices C & D above and should be read as such. It is considered that the study area provides potential habitat for the following threatened species and will be assessed accordingly in the following five-part test:

Species Name		Conservation Status	
		State [1]	National [2]
Endangered Ecological communities			
Shale Sandstone Transition Forest	Shale Sandstone Transition Forest	CE	E
Threatened Fauna			
Bird			
Callocephalon fimbriatum	Gang-gang Cockatoo	V	
Calyptorhynchus lathami	Glossy Black-Cockatoo	V	
Ninox strenua	Powerful Owl	V	
Glossopsitta pusilla	Little Lorikeet	V	
Mammals			
Chalinolobus dwyeri	Large-eared Pied Bat	V	V
Falsistrellus tasmaniensis	Eastern False Pipistrelle	V	
Miniopterus schreibersii	Eastern Bent-wing Bat	V	
Pteropus poliocephalus	Grey-headed Flying-fox	V	V
Mormopterus norfolkensis	Eastern Freetail-bat	V	
Saccolaimus flaviventris	Yellow-bellied Sheathtail Bat	V	
Scoteanax rueppellii	Greater Broad-nosed Bat	V	
Petaurus norfolcensis	Squirrel Glider	V	

The '5 part test of significance' is as follows.

7.3 Test for determining whether proposed development or activity likely to significantly affect threatened species or ecological communities, or their habitats

The '5 part test of significance' is as follows.

(1) The following is to be taken into account for the purposes of determining whether a proposed development or activity is likely to significantly affect threatened species or ecological communities, or their habitats:

(a) in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,

Detailed flora investigations of the study area, together with habitat assessments and targeted surveys, have resulted in the identification of potential habitat for a variety of threatened species. An assessment of these species is as follows:

Gang-gang Cockatoo (*Callocephalon fimbriatum)*

The Gang-gang Cockatoo is associated with a variety of woodland and forest habitats, and occasionally more open areas in south–eastern New South Wales and Victoria. This species has been observed in eucalypt forests and exotic trees, and is known to feed on the seeds of native shrubs and trees, in addition to some exotic species such as the Hawthorn and Cupressus species. The Gang-gang Cockatoo nests in hollows in large, dead trees.

The subject site contains suitable foraging habitat for this species. This species was not recorded during the site survey. The surrounding area contains extensive amounts of high quality foraging habitat for this species. Therefore, it is considered that the proposal is not likely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

***Calyptorhynchus lathami* (Glossy Black-Cockatoo)**

The Glossy Black-cockatoo inhabits mountain forests, coastal woodland, open forest and trees bordering watercourses where there are substantial stands of *Allocasuarina*. They choose trees with larger cone crops but show no sign of selecting trees on the basis of cone size – concentrating foraging in trees with a high ratio of total seed weight to cone weight (Crowley and Garnett 2001). They breed in hollow trees or stumps usually in Eucalypts. It is considered that potential foraging habitat exists from the subject site due to the occurrence of *casuarina* sp. Despite the presence of potential habitat, this species was not recorded during the fauna survey. It is considered that the proposal is unlikely to disrupt the life cycle of this species such that a viable local population would be placed at risk of extinction.

***Glossopsitta pusilla* (Little Lorikeet)**

Little Lorikeets mostly occur in dry, open eucalypt forests and woodlands. They have been recorded from both old-growth and logged forests in the eastern part of their range, and in remnant woodland patches and roadside vegetation on the western slopes. In south-east Queensland (McAlpine, Heyenga et al. 2007), Little Lorikeets were more likely to occupy forest sites with relatively short to intermediate logging rotations (15–23 years) and sites that have had short intervals (2.5– 4 years) between fires. They feed primarily on nectar and pollen in the tree canopy, particularly on profusely-flowering eucalypts, but also on a variety of other species including melaleucas and mistletoes. On the western slopes and tablelands White Box *Eucalyptus albens* and Yellow Box *E. melliodora* are particularly important food sources for pollen and nectar respectively. They are also reported as feeding on fruits, particularly those of mistletoes (Higgins and Peter 2002). Despite the presence of potential habitat, this species was not recorded during the fauna survey. It is considered that the proposal is unlikely to disrupt the life cycle of this species such that a viable local population would be placed at risk of extinction.

***Ninox strenua* (Powerful Owl)**

The Powerful Owl inhabits mature rainforest and wet and dry eucalypt forest utilising Eucalypt forests and woodlands and adjacent cleared areas for foraging. Large trees with hollows at least 0.5m deep are required for shelter and breeding (Department of Environment and Conservation 2005). Mated pairs of Powerful Owl roost together or separately, maintaining several roost sites throughout their territory which are used in rotation shifting with the availability of prey. This species was recorded during the targeted surveys. It is considered that the subject site provides marginal foraging habitat for this species. No suitable nesting/roosting sites. It is considered that the proposal is unlikely to disrupt the life cycle of this species such that a viable local population would be placed at risk of extinction.

***Chalinolobus dwyeri* (Large-eared Pied Bat)**

It is probable that the Large-eared Pied Bat forages for insects below the forest canopy. During the day these bats may roost in caves, mine tunnels and the abandoned nests of Fairy Martins (Hoye and Dwyer 1998). The Large-eared Pied Bat may also utilise tree hollows (Schultz, Coles et al. 1999). The Large-eared Pied Bat is mainly found in drier habitat including dry sclerophyll and woodland, east and west of the Great Dividing Ranges. However Hoye (Hoye and Dwyer 1998) suggest that from records of the species in subalpine

woodland, moist eucalypt forest and near rainforest, it may tolerate a greater range of habitats. The distribution of this bat ranges from inland and south-eastern QLD to central-eastern and north-eastern NSW. It is considered that the study area provides potential foraging habitat for this species. Despite the presence of potential habitat within the study area, the proposal is unlikely to disrupt the life cycle of this species such that a viable local population would be placed at risk of extinction.

***Falsistrellus tasmaniensis* (Eastern False Pipistrelle)**

The Eastern False Pipistrelle usually roosts in tree hollows in higher rainfall forests. Sometimes found in caves (Jenolan area) and abandoned buildings. Forages within the canopy of dry sclerophyll forest. It prefers wet habitats where trees are more than 20 metres high. It is considered that the study area provides potential foraging habitat for this species. Despite the presence of potential habitat within the study area, the proposal is unlikely to disrupt the life cycle of this species such that a viable local population would be placed at risk of extinction.

***Miniopterus schreibersii* (Eastern Bent-wing Bat)**

The Eastern Bentwing-bat is confined to areas where there are caves with potential temperature, humidity and physical dimensions to permit breeding. This species occupies a range of habitats, mainly near the coast and utilises caves, old mines, stormwater channels, under bridges and occasionally buildings for roosting. It is considered that the study area provides potential foraging habitat for this species. Despite the presence of potential habitat within the study area, the proposal is unlikely to disrupt the life cycle of this species such that a viable local population would be placed at risk of extinction.

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

The Grey-headed Flying-fox is found in a variety of habitats including rainforest, mangroves, paperbark swamps, wet and dry sclerophyll forests and cultivated areas (Churchill 2008). Grey-headed Flying Foxes congregate in large camps of up to 200,000 individuals, depending on availability of surrounding blossoming plants, from early until late summer (Churchill 2008). Camps are commonly formed in gullies, typically not far from water and in vegetation with a dense canopy. Roost sites are an important resource where mating, birth and rearing of young occurs as well as providing refuge (Strahan 1995) These bats eat the fruit or blossoms of more than 80 species of plants. Their major food source is eucalypt blossom and native fruits from a variety of tree species. Native figs (*Ficus spp*) account for a large percentage of the fruit eaten. They are also known to rain orchids of cultivated fruit. The Grey headed Flying-fox has a nightly feeding range of 20 to 50km from their camp (Churchill 2008).

It is considered that the study area provides potential foraging habitat for this species. The proposal is unlikely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

***Mormopterus norfolkensis* (Eastern Freetail-bat)**

The Eastern Freetail-bat forages above and within the canopy of open forests and woodlands, feeding on small insects. The Eastern Freetail-bat is thought to roost predominantly in tree hollows and occasionally in buildings. It is considered that the study area provides potential foraging habitat for this species. It is considered that the proposal is unlikely to disrupt the life cycle of this species such that a viable local population would be placed at risk of extinction.

***Saccolaimus flaviventris* (Yellow-bellied Sheathtail Bat)**

The Yellow-bellied Sheathtail-bat inhabits open country, mallee, eucalypt forests, rainforests, heathland and water bodies. The Yellow-bellied Sheathtail-bat roosts in tree hollows and has been found inhabiting the abandoned nests of Sugar Gliders. It is considered that the study area provides potential foraging habitat for this species. It is considered that the proposal is unlikely to disrupt the life cycle of this species such that a viable local population would be placed at risk of extinction.

***Scoteanax rueppellii* (Greater Broad-nosed Bat)**

The Greater Broad-nosed Bat inhabits open forests and woodlands, foraging throughout these forest types and also along creeks and small river systems. This species roosts in tree hollows and occasionally old buildings. Despite the presence of potential habitat within the study area, the proposal is unlikely to disrupt the life cycle of this species such that a viable local population would be placed at risk of extinction.

***Petaurus norfolcensis* (Squirrel Glider)**

The Squirrel Glider inhabits dry sclerophyll forest and woodland nesting in small tree hollows (Quin 1995). The presence of mature, hollow-bearing eucalypts is a critical characteristic of habitat occupied by Squirrel Gliders as they are utilised for nesting and breeding (Quin 1995). It is considered that the study area provides potential foraging habitat for this species, no suitable denning “hollw-bearing trees” were recorded from the subject site. It is considered that the proposal is unlikely to disrupt the life cycle of this species such that a viable local population would be placed at risk of extinction.

(b) in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:

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

Response:

PCT 1395 - Cumberland shale - sandstone Ironbark forest conforms with Cumberland shale - sandstone Ironbark forest which is listed as a critically endangered ecological community. The proposed development has been sited to retain and protect the greater occurrence of the extent of this vegetation type within the subject property as such the proposal is unlikely to place this community at risk of extinction.

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

PCT 1395 - Cumberland shale - sandstone Ironbark forest conforms with Cumberland shale - sandstone Ironbark forest which is listed as a critically endangered ecological community. The proposed development has been sited to retain and protect the greater occurrence of the extent of this vegetation type within the subject property as such the proposal is unlikely to modify the composition of the local occurrence such that the onsite vegetation is placed at community at risk of extinction.

(c) in relation to the habitat of a threatened species or ecological community:

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

Response:

i.) The proposal will entail the direct removal of 0.05ha of Shale Sandstone Transition Forest (moderate) condition which represents a loss of 13.5% of the onsite occurrence. 1.09ha or 31.3% of low condition Shale Sandstone Transition Forest will be removed/modified as a result of future development. Modification of this small area represents a small loss of the local extent of similar habitat.

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

Response:

i.) The removal/modification of 0.05ha of Shale Sandstone Transition Forest (moderate) condition which represents a loss of 13.5% of the onsite occurrence. 1.09ha or 31.3% of low condition Shale Sandstone Transition Forest will be removed/modified which provides foraging habitat for threatened fauna species.

ii.) Despite this the proposal will not fragment or isolate currently connected areas of habitat. Connectivity of vegetation across the study area will remain connected to surrounding lands.

All threatened fauna species which are potentially to be impacted upon are highly mobile and capable of flight and movement across large distances and would not utilise the habitats within the study area exclusively.

Therefore, it is considered that known habitat for a threatened species within the local area and the region are unlikely to become isolated or fragmented as a result of the proposal, as such it is considered that the proposal is unlikely to create an important impact on the long-term survival of threatened species in the locality and is not considered to be significant.

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

Response:

PCT 1395 - Cumberland shale - sandstone Ironbark forest conforms with Cumberland shale - sandstone Ironbark forest which is listed as a critically endangered ecological community. The proposed development has been sited to retain and protect 100% of the onsite occurrence “good condition” of this vegetation type which is to be retained and protected within the subject property

as such the habitat to be removed, modified, fragmented is not considered to be important to the long-term survival of the onsite CEEC.

(d) whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),

Response:

The proposed development or activity is not likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly) within the provisions of the *BC Act* (1995).

(e) whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.

Response:

The proposal is likely to entail or perpetuate the following key threatening process (KTP) under the *BC Act* within the site.

- Clearing of native vegetation.
- Loss of hollow-bearing trees
- Infection of native plants by *Phytophthora cinnamomi*.
- Human Caused Climate Change.

Conclusion

The proposal will entail the removal/modification of 0.05ha of Shale Sandstone Transition Forest (moderate) condition which represents a loss of 13.5% of the onsite occurrence. 1.09ha or 31.3% of low condition Shale Sandstone Transition Forest will be removed/modified which provides foraging habitat for threatened fauna species.

The proposed development has been sited to retain and protect 100% of the good condition Shale Sandstone Transition Forest community.

Critical habitat will not be affected and the proposal will not interfere with the recovery actions for threatened species. The impact to habitats for threatened species, endangered populations & endangered ecological communities from the locality is not considered to be significant.

Appendix F

EPBC Significance Assessment

EPBC Assessment of Significance (Grey-headed Flying-fox)

Under the *Environment Protection and Biodiversity Conservation Act 1999*, an action is likely to have a significant impact on a vulnerable species if it affects an important population of the species. Under the Principle Significant Impact Guidelines (Department of the Environment and Heritage 2006) an important population is a population that is necessary for a species' long-term survival and recovery. This may include populations identified in recovery plans, and/or that are:

- key source populations either for breeding or dispersal
- populations that are necessary for maintaining genetic diversity
- populations that are near the limit of the species range.

The animals that may use the site are not considered to be part of an important population.

Will the action lead to a long-term decrease in the size of an important population of a species?

Grey-headed Flying-fox utilising the study area would not constitute an important population.

The proposal will entail the removal/modification of 0.05ha of Shale Sandstone Transition Forest (moderate) condition which represents a loss of 13.5% of the onsite occurrence. 1.09ha or 31.3% of low condition Shale Sandstone Transition Forest will be removed/modified which provides foraging habitat for this species. Modification of this small area represents a small loss of the local extent of similar habitat. Clearing of this small area of habitat represents a small loss of the local extent of similar habitat. No Grey-headed Flying-fox camps will be affected by the proposal. As such, the proposal is unlikely to lead to a long-term decrease in the size of the local population.

Will the action reduce the area of occupancy of an important population?

Grey-headed Flying-fox utilising the site would not be part of an important population. The Grey-headed Flying-fox is a highly mobile and it may travel up to 50 km each night to forage. Therefore, the local population would not be restricted to habitat resources within the site only.

Will the action fragment an existing important population into two or more populations?

Grey-headed Flying-foxes using the site for foraging purposes would not be part of an important population.

Will the action adversely affect habitat critical to the survival of a species?

No critical habitat has been listed for Grey-headed Flying-fox under the *Environment Protection and Biodiversity Conservation Act 1999*. Known Grey-headed Flying-fox camps may however be considered critical to the survival of local populations. No camps were identified within or near the study area.

Will the action disrupt the breeding cycle of an important population?

Grey-headed Flying-foxes using the study area would not be part of an important population.

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

The study area contains suitable foraging resources for Grey-headed Flying-fox. The action is unlikely to significantly decrease the availability of foraging habitat in the locality. The proposal will entail the removal/modification of 0.05ha of moderate and 1.09ha of Low condition Shale Sandstone Transition Forest which provides foraging habitat for this species. Modification of this small area represents a small loss of the local extent of similar habitat. The large home range of this species allows offsite foraging resources to be accessed and isolation of habitat would not result from the development.

It is unlikely that the development would isolate and decrease the availability of quality habitat to the extent that the species is likely to decline.

Will the action result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species´ habitat?

It is highly unlikely that invasive species (such as introduced predators) that are harmful to the Grey-headed Flying-fox would become more established as a result of the action.

Will the action introduce disease that may cause the species to decline?

The proposal would not increase the likelihood of a disease becoming established or proliferating in the local population that would result in a decline of the species.

Will the action interfere with the recovery of the species?

No recovery or threat abatement plans have been prepared for this species. Therefore it is considered that the proposal is unlikely to interfere within the recovery of the Grey-headed Flying-fox.

Conclusion

The Grey-headed Flying-fox is unlikely to be significantly affected by the proposal.

EPBC Assessment of Significance (Large-eared Pied Bat)

Under the *Environment Protection and Biodiversity Conservation Act 1999*, an action is likely to have a significant impact on a vulnerable species if it affects an important population of the species. Under the Principle Significant Impact Guidelines (Department of the Environment and Heritage 2006) an important population is a population that is necessary for a species' long-term survival and recovery. This may include populations identified in recovery plans, and/or that are:

key source populations either for breeding or dispersal
populations that are necessary for maintaining genetic diversity
populations that are near the limit of the species range.
The animals that may use the site are not considered to be part of an important population.

Will the action lead to a long-term decrease in the size of an important population of a species?

Large-eared Pied Bats utilising the site would not constitute an important population. The proposal will entail the removal/modification of 0.05ha of moderate and 1.09ha of Low condition Shale Sandstone Transition Forest which provides foraging habitat for this species. Modification of this small area represents a small loss of the local extent of similar habitat. No Large-eared Pied Bat roosting sites will be affected by the proposal. As such, the proposal is unlikely to lead to a long-term decrease in the size of the local population.

Will the action reduce the area of occupancy of an important population?

Large-eared Pied Bats utilising the site would not be part of an important population. Development of the study area will remove suitable foraging habitat for this species. The Large-eared Pied Bat is a highly mobile species. Therefore, the local population would not be restricted to habitat resources within the site only.

Will the action fragment an existing important population into two or more populations?

Large-eared Pied Bat utilising the foraging resources within the study area would not be part of an important population.

Will the action adversely affect habitat critical to the survival of a species?

No critical habitat has been listed for Large-eared Pied Bat under the *Environment Protection and Biodiversity Conservation Act 1999*. Known Large-eared Pied Bat maternity caves may however be considered critical to the survival of local populations. No maternity caves were identified within or near the study area.

Will the action disrupt the breeding cycle of an important population?

Large-eared Pied Bats using the study area would not be part of an important population. The breeding patterns of the Large-eared Pied Bat are not likely to be disrupted as this species breeds within a maternity caves, which were absent from the study area. As such it is considered that the proposal is unlikely to disrupt the breeding cycle of an important population of Large-eared Pied Bats.

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

The study area contains foraging resources for Large-eared Pied Bat. The action is unlikely to significantly decrease the availability of foraging habitat in the locality despite the removal/modification of 0.05ha of moderate and 1.09ha of Low condition Shale Sandstone Transition Forest community from within the study area. The large-eared Pied Bat has a large home range as such this species would not feed exclusively within the study area.

It is unlikely that the development would isolate and decrease the availability of quality habitat to the extent that the species is likely to decline.

Will the action result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species´ habitat?

It is highly unlikely that invasive species (such as introduced predators) that are harmful to the Large-eared Pied Bat would become more established as a result of the action.

Will the action introduce disease that may cause the species to decline?

The proposal would not increase the likelihood of a disease becoming established or proliferating in the local population that would result in a decline of the species.

Will the action interfere with the recovery of the species?

No recovery or threat abatement plans have been prepared for this species. Therefore it is considered that the proposal is unlikely to interfere within the recovery of the Large-eared Pied Bat.

Conclusion

The Large-eared Pied Bat is unlikely to be significantly affected by the proposal.

Appendix G

BAM Plot data

BAM Site – Field Survey Form

Site Sheet no: 1 of 2

		Survey Name	Plot Identifier	Recorders	
Date	11/12/2021	Appin	007	John Whyte	
Zone 56	Datum GDA (94)	**IBRA region**	Sydney Basin	**Zone ID**	Low
Easting	Northing	**Dimensions**	20m x 20m (0.04 ha)	**Orientation of midline**	See Figure 1-2

Vegetation Class	Coastal Valley Grassy Woodlands		Confidence: **H** M L
Plant Community Type	Cumberland shale - sandstone Ironbark Forest (PCT 1395)	EEC: YES	Confidence: **H** M L

Record easting and northing from the plot marker. If applicable, orient picket so that perforated rib points along direction of midline.
Dimensions (Shape) of 0.04 ha base plot inside 0.1 ha FA plot should be identified, magnetic bearing taken along midline.

BAM Attribute (400 m² plot)		Sum values
Native Richness of	Trees	3
	Shrubs	7
	Grasses etc.	8
	Forbs	6
	Ferns	0
	Other	3
Native Cover of	Trees	45
	Shrubs	13.4
	Grasses etc.	57.9
	Forbs	0.8
	Ferns	0
	Other	0.3
High Threat Weed cover		0.1

BAM Attribute (20 x 50 m plot)		# Tree Stems Count	
dbh	Euc*	Non Euc	Hollows†
Mark large tree threshold for Euc* & Non Euc	**80 + cm** 0	-	No. of Hollows:
50 – 79 cm	3	--	10,5x2,(3)
30 – 49 cm	8	-	
20 – 29 cm	10	-	
10 – 19 cm	11	-	
5 – 9 cm	3	-	
< 5 cm	7	-	
Length of logs (m) (≥10 cm diameter, >50 cm in length)	Tally space		Total 24m

Record number of **living** eucalypt* (Euc*) and **living** non-eucalypt (Non Euc) stems separately

* includes all species of *Eucalyptus*, *Corymbia*, *Angophora*, *Lophostemon* and *Syncarpia*

† Record total number of stems by size class with hollows (including dead stems/trees)

Counts must apply to each size class when the **number of living tree stems** within the size class is ≤ 10. Estimates can be used when the number of living tree stems within a class is > 10. Estimates should draw from the number series: 10, 20, 30…, 100, 200, 300

For a **multi-stemmed tree**, only the largest living stem is included in the count/estimate. For **hollows** count only the presence of a stem containing hollows, not the count of hollows in that stem.

BAM Attribute (1 x 1 m plots)	Litter cover (%)					Bare ground cover (%)					Cryptogam cover (%)					Rock cover (%)				
Subplot score (% in each)	2	2	2	4	7	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0
Average of the 5 subplots	3.4					0.4					0					0				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots located on alternate sides and 5 m from the plot midline at the locations 5, 15, 25, 35, and 45 m along the midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Within these 1 m x 1 m plots assessors may also record the cover of rock, bare ground and cryptogam soil crusts. Collection of these data is optional – the data do not currently contribute to assessment scores, they hold potential value for future vegetation integrity assessment attributes and benchmarks, and for enhancing PCT description

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)	2	-	
Cultivation (inc. pasture)		-	
Soil erosion		-	
Firewood collection	2	-	
Grazing	2	-	
Fire damage			
Storm damage		-	
Weediness	2	-	
Other		-	

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

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

400 m^2 plot: Sheet 2 of 2	Survey Name	Plot Identifier	Recorders
Date: 11/12/2021	Appin	007	John Whyte

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
TG	*Eucalyptus acmenoides*		5			
TG	*Eucalyptus punctata*		10			
TG	*Allocasuarina littoralis*		30			
SG	*Leucopogon setiger*		5			
SG	*Bursaries spinosa*		1			
GG	*Echinopogon caespitosus*		.2			
FG	*AcDaisy*		.3			
GG	*Austrostipa Sp*		15			
GG	*Entolasia marginata*		40			
OG	*Persoonia straminea*		.1			
SG	*Hibbertia aspera*		.2			
OG	*Cassytha glabella*		.1			
FG	*Glycine tabacina*		.1			
E	*Setaria gracillis*		.1			
SG	*Hakea dacyloides*		5			
FG	*Viola hederaceae*		.2			
SG	*Kunzea ambigua*		.2			
EG	*Cheilanthes siberii*		.1			
FG	*Dichondra repens*		.1			
E	*Briza sp*		.1			
OG	*Clematis aristata*		.1			
FG	*Bulbine bulbosa*		.1			
SG	*Persoonia linearis*		1			
GG	*Themeda australis*		.2			
GG	*Austrodanthonia fulva*		2			
OG	*Passiflora sp*		.1			
GG	*Gahnia siberiana*		.1			
GG	*Lepidosperma laterale*		.1			
E	*Solanum sp weed*		.1			
SG	*Ozothamnus dismofolius*		1			
GG	*Echinopogon ovatus*		.2			
E	*Onopordum acanthium*		.1			
FG	*Glycine tabacina*		.1			
HTE	*Asparagus aethiopicus*		.1			
FG	*Lobelia alata*		.1			
GG	*Notodanthonia longifolia*		.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) **Abundance:** 1, 2, 3, …, 10, 20, 30, … 100, 200, …, 1000, …

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

BAM Site – Field Survey Form

Site Sheet no: 1 of 2

		Survey Name	Plot Identifier	Recorders	
Date	11/12/2021	Appin road	006	John Whyte	
Zone 56	Datum GDA (94)	**IBRA region**	Sydney Basin	**Zone ID**	Low
Easting	Northing	**Dimensions**	20m x 20m (0.04 ha)	**Orientation of midline**	See Figure 1-2

Vegetation Class	Coastal Valley Grassy Woodlands		Confidence: **H** M L
Plant Community Type	Cumberland shale - sandstone Ironbark Forest (PCT 1395)	EEC: YES	Confidence: **H** M L

Record easting and northing from the plot marker. If applicable, orient picket so that perforated rib points along direction of midline.
Dimensions (Shape) of 0.04 ha base plot inside 0.1 ha FA plot should be identified, magnetic bearing taken along midline.

BAM Attribute (400 m² plot)		Sum values
Native Richness of	Trees	5
	Shrubs	10
	Grasses etc.	9
	Forbs	3
	Ferns	2
	Other	2
Native Cover of	Trees	17
	Shrubs	14.1
	Grasses etc.	26.1
	Forbs	7.2
	Ferns	1.1
	Other	0.2
High Threat Weed cover		0

BAM Attribute (20 x 50 m plot)	Euc*	Non Euc	# Tree Stems Count: Hollows†
dbh			
Mark large tree threshold for Euc* & Non Euc	**80 + cm** 0	-	No. of Hollows:
50 – 79 cm	4	--	
30 – 49 cm	5	-	15,12, 5,
20 – 29 cm	6	-	
10 – 19 cm	1	-	
5 – 9 cm	0	-	
< 5 cm	3	-	
Length of logs (m) (≥10 cm diameter, >50 cm in length)	Tally space		Total 11m

Record number of **living** eucalypt* (Euc*) and **living** non-eucalypt (Non Euc) stems separately

* includes all species of *Eucalyptus*, *Corymbia*, *Angophora*, *Lophostemon* and *Syncarpia*

† Record total number of stems by size class with hollows (including dead stems/trees)

Counts must apply to each size class when the **number of living tree stems** within the size class is ≤ 10. Estimates can be used when the number of living tree stems within a class is > 10. Estimates should draw from the number series: 10, 20, 30…, 100, 200, 300

For a **multi-stemmed tree**, only the largest living stem is included in the count/estimate. For **hollows** count only the presence of a stem containing hollows, not the count of hollows in that stem.

BAM Attribute (1 x 1 m plots)	Litter cover (%)					Bare ground cover (%)					Cryptogam cover (%)					Rock cover (%)				
Subplot score (% in each)	60	40	65	45	50	1	10	1	0	0	0	0	0	0	0	0	0	0	0	0
Average of the 5 subplots	52					2.4					0					0				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots located on alternate sides and 5 m from the plot midline at the locations 5, 15, 25, 35, and 45 m along the midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Within these 1 m x 1 m plots assessors may also record the cover of rock, bare ground and cryptogam soil crusts. Collection of these data is optional – the data do not currently contribute to assessment scores, they hold potential value for future vegetation integrity assessment attributes and benchmarks, and for enhancing PCT description

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)	1	-	
Cultivation (inc. pasture)	1	-	
Soil erosion		-	
Firewood collection	1	-	
Grazing		-	
Fire damage			
Storm damage		-	
Weediness	1	-	
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: 11/12/2021	Appin	006	John Whyte

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
TG	*Eucalyptus crebra*		5			
TG	*Eucalyptus punctata*		2			
TG	*Eucalyptus pilularis*		2			
TG	*Eucalyptus piperita*		7			
TG	*Eucalyptus acmenoides*		1			
GG	*Styphandra gluaca*		1			
SG	*Austrostipa scabra*		10			
GG	*Lepidosperma laterale*		.2			
FG	*Daisy*		6			
GG	*Entolasia marginata*		15			
EG	*Pteredium esculateum*		1			
SG	*Persoonia linearis*		.1			
SG	*Hibberta aspera*		.2			
EG	*Cheilanthes siberii*		.1			
GG	*Echinopogon caesiptosa*		.3			
SG	*Banksia spinulosa*		.2			
SG	*Pimelea linifolia*		.1			
GG	*Panicum simile*		2			
E	*Setaria gracillis*		.1			
FG	*Viola hederaceae*		1			
OG	*Clematis aristida*		.1			
GG	*Austrodanthonia fulva*		1			
SG	*Ozothamnus dismofolius*		.1			
SG	*Kunzea ambigua*		2			
SG	*Acacia floribunda*		1			
FG	*Pomax umbellata*		.2			
OG	*Cassytha glabella*		.1			
GG	*Entolasia stricta*		2			
SG	*Goodenia ovata*		.2			
GG	*Lomandra longifolia*		.1			
GG	*Notodanthonia longifolia*		5			
SG	*Leucopogan setiger*		.2			

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) **Abundance:** 1, 2, 3, …, 10, 20, 30, … 100, 200, …, 1000, …

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

BAM Site – Field Survey Form

Site Sheet no: 1 of 2

		Survey Name	Plot Identifier	Recorders	
Date	11/12/2021	Appin road	005	John Whyte	
Zone 56	Datum GDA (94)	**IBRA region**	Sydney Basin	**Zone ID**	Low
Easting	Northing	**Dimensions**	20m x 20m (0.04 ha)	**Orientation of midline**	See Figure 1-2
Vegetation Class		Coastal Valley Grassy Woodlands			Confidence: **H** M L
Plant Community Type		Cumberland shale - sandstone Ironbark Forest (PCT 1395)		EEC: YES	Confidence: **H** M L

Record easting and northing from the plot marker. If applicable, orient picket so that perforated rib points along direction of midline.
Dimensions (Shape) of 0.04 ha base plot inside 0.1 ha FA plot should be identified, magnetic bearing taken along midline.

BAM Attribute (400 m² plot)		Sum values
Native Richness of	Trees	1
	Shrubs	8
	Grasses etc.	10
	Forbs	10
	Ferns	0
	Other	0
Native Cover of	Trees	35
	Shrubs	31
	Grasses etc.	34.4
	Forbs	16.7
	Ferns	0
	Other	0
High Threat Weed cover		1.1

BAM Attribute (20 x 50 m plot)	# Tree Stems Count		
dbh	Euc*	Non Euc	Hollows†
Mark large tree threshold for Euc* & Non Euc	**80 + cm** 2	-	No. of Hollows:
50 – 79 cm	2	--	1x10cm
30 – 49 cm		-	
20 – 29 cm		-	
10 – 19 cm	1	-	
5 – 9 cm	1	-	
< 5 cm	7	-	
Length of logs (m) (≥10 cm diameter, >50 cm in length)	Tally space		Total 2m

Record number of **living** eucalypt* (Euc*) and **living** non-eucalypt (Non Euc) stems separately

* includes all species of *Eucalyptus*, *Corymbia*, *Angophora*, *Lophostemon* and *Syncarpia*

† Record total number of stems by size class with hollows (including dead stems/trees)

Counts must apply to each size class when the **number of living tree stems** within the size class is ≤ 10. Estimates can be used when the number of living tree stems within a class is > 10. Estimates should draw from the number series: 10, 20, 30…, 100, 200, 300

For a **multi-stemmed tree**, only the largest living stem is included in the count/estimate. For **hollows** count only the presence of a stem containing hollows, not the count of hollows in that stem.

BAM Attribute (1 x 1 m plots)	Litter cover (%)					Bare ground cover (%)					Cryptogam cover (%)					Rock cover (%)				
Subplot score (% in each)	5	2	3	1	1	3	15	10	12	11	0	0	0	0	0	0	0	0	0	0
Average of the 5 subplots	2.4					10.2					0					0				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots located on alternate sides and 5 m from the plot midline at the locations 5, 15, 25, 35, and 45 m along the midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Within these 1 m x 1 m plots assessors may also record the cover of rock, bare ground and cryptogam soil crusts. Collection of these data is optional – the data do not currently contribute to assessment scores, they hold potential value for future vegetation integrity assessment attributes and benchmarks, and for enhancing PCT description

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)	3	-	
Cultivation (inc. pasture)		-	
Soil erosion		-	
Firewood collection	3	-	
Grazing		-	
Fire damage			
Storm damage		-	
Weediness	1	-	
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: 11/12/2021	Appin	005	John Whyte

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
TG	*Eucalyptus eugenoides*		35			
GG	*Austrostipa pubescens*		7			
SG	*Kunzea ambigua*		25			
FG	*Cassinia aculeata*		10			
E	*Setaria gracillis*		1			
SG	*Acacia linifolia*		5			
GG	*Lomandra longifolia*		1			
EG	*Cheilanthes siberii*		.3			
SG	*Leucopogan setiger*		.2			
FG	*Opecularia yellow flower*		.1			
FG	*Veronica plebia*		.2			
SG	*Goodenia ovata*		.2			
GG	*Themeda australis*		20			
E	*Sochus olearus*		.1			
SG	*Hibberta aspera*		.2			
E	*Centaurium erythraea*		.1			
FG	*Pratia purpurascens*		.1			
SG	*Bursaria spinosa*		.1			
GG	*Lomandra gluaca*		.1			
HTE	*Pennesetium clandestinum*		1			
E	*Conyza albida*		.1			
FG	*Oxallis perrenans*		.1			
E	*Briza sp*		1			
SG	*Persoonia linearis*		.2			
GG	*Eragrostis brownii*		.1			
HTE	*Andropogan virginicus*		.1			
FG	*Pomax umbellata*		.1			
GG	*Austrodanthonia fulva*		.2			
FG	*Euchiton gymnocephalus*		.1			
FG	*Bertya cunninghamii*		.1			
GG	*Entolasia stricta*		5			
GG	*Gahnia siberiana orange fruit*		.1			
GG	*Echinopogon caesiptosa*		.1			
GG	*Austrostipa pubescens*		2			
SG	*Hovea linearis*		.1			
FG	*Bulbine bulbosa*		.1			
FG	*Glycine clandestina*		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) **Abundance:** 1, 2, 3, …, 10, 20, 30, … 100, 200, …, 1000, …

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

BAM Site – Field Survey Form

Site Sheet no: 1 of 2

		Survey Name	Plot Identifier	Recorders	
Date	11/12/2021	Appin road	004	John Whyte	
Zone 56	Datum GDA (94)	**IBRA region**	Sydney Basin	**Zone ID**	Low
Easting	Northing	**Dimensions**	20m x 20m (0.04 ha)	**Orientation of midline**	See Figure 1-2

Vegetation Class	Coastal Valley Grassy Woodlands		Confidence: **H** M L
Plant Community Type	Cumberland shale - sandstone Ironbark Forest (PCT 1395)	EEC: YES	Confidence: **H** M L

Record easting and northing from the plot marker. If applicable, orient picket so that perforated rib points along direction of midline.
Dimensions (Shape) of 0.04 ha base plot inside 0.1 ha FA plot should be identified, magnetic bearing taken along midline.

BAM Attribute (400 m² plot)		Sum values
Native Richness of	Trees	3
	Shrubs	5
	Grasses etc.	4
	Forbs	9
	Ferns	0
	Other	0
Native Cover of	Trees	25.1
	Shrubs	1.7
	Grasses etc.	21.2
	Forbs	6.8
	Ferns	0
	Other	0
High Threat Weed cover		12.2

BAM Attribute (20 x 50 m plot)	# Tree Stems Count		
dbh	Euc*	Non Euc	Hollows†
Mark large tree threshold for Euc* & Non Euc	**80 + cm** 5	-	No. of Hollows:
50 – 79 cm	1	--	5cm,10cm, 20cm, 25, 15, 5 hollows. 17cm
30 – 49 cm	1	-	
20 – 29 cm		-	
10 – 19 cm	1	-	
5 – 9 cm		-	
< 5 cm	2	-	
Length of logs (m) (≥10 cm diameter, >50 cm in length)	Tally space		Total 0m

Record number of **living** eucalypt* (Euc*) and **living** non-eucalypt (Non Euc) stems separately

* includes all species of *Eucalyptus*, *Corymbia*, *Angophora*, *Lophostemon* and *Syncarpia*

† Record total number of stems by size class with hollows (including dead stems/trees)

Counts must apply to each size class when the **number of living tree stems** within the size class is ≤ 10. Estimates can be used when the number of living tree stems within a class is > 10. Estimates should draw from the number series: 10, 20, 30…, 100, 200, 300

For a **multi-stemmed tree**, only the largest living stem is included in the count/estimate. For **hollows** count only the presence of a stem containing hollows, not the count of hollows in that stem.

BAM Attribute (1 x 1 m plots)	Litter cover (%)					Bare ground cover (%)					Cryptogam cover (%)					Rock cover (%)				
Subplot score (% in each)	10	20	30	12	30	0	0	1	2	1	0	0	0	0	0	0	0	0	0	0
Average of the 5 subplots	20.4					0.8					0					0				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots located on alternate sides and 5 m from the plot midline at the locations 5, 15, 25, 35, and 45 m along the midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Within these 1 m x 1 m plots assessors may also record the cover of rock, bare ground and cryptogam soil crusts. Collection of these data is optional – the data do not currently contribute to assessment scores, they hold potential value for future vegetation integrity assessment attributes and benchmarks, and for enhancing PCT description

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)	3	-	
Cultivation (inc. pasture)		-	
Soil erosion		-	
Firewood collection	3	-	
Grazing	3	-	
Fire damage			
Storm damage		-	
Weediness	2	-	
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: 11/12/2021	Appin	004	John Whyte

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
TG	*Angophora sp*		5			
GG	*Themeda australis*		15			
FG	*Viola hederacea*		5			
SG	*Bursaria spinosa*		.2			
E	*Conyza albida*		7			
TG	*Eucalyptus punctata*		20			
E	*Sonchus olearus*		1			
E	*Centaurium erythraea*		.2			
SG	*Leucopogan setiger*		.2			
E	*Briza sp*		1			
E	*Verbena brasillensis*		.1			
FG	*Opercularia aspera*		.2			
FG	*Veronica plebia*		1			
SG	*Hibbertia aspera*		1			
EG	*Chilelanthes siberii*		.1			
GG	*Microlaena stipoides*		5			
FG	*Wahlenbergia gracillis*		.2			
FG	*Pratia purpurascens*		.1			
FG	*Oxallis perrenans*		.1			
E	*Cirsium vulgare*		.1			
GG	*Echinopogon caesiptosa*		1			
HTE	*Senecio madgarensis*		.1			
GG	*Lomandra longifolia*		.1			
OG	*Daisy*		.1			
SG	*Goodenia ovata*		.1			
SG	*Kunzea ambigua*		.1			
E	*Trifolium repens*		.2			
TG	*Allocasuarina littoralis*		.1			
E	*Setaria gracillis*		.1			
GG	*Austristipa avanceues*		.1			
HTE	*Eragrostis curvula*		2			
FG	*Euchiton gymnocephalus*		.1			
FG	*Glycine clandestina*		.2			
E	*Angalis arvensis*		.1			
E	*Vulpia sp*		.1			
E	*Yorkshire fog*		.1			
SG	*Acacia ulicifolia*		.1			
HTE	*Paspalum dialatum*		10			
FG	*Solanum prinophyllum*		.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) **Abundance:** 1, 2, 3, …, 10, 20, 30, … 100, 200, …, 1000, …

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

BAM Site – Field Survey Form

Site Sheet no: 1 of 2

		Survey Name	Plot Identifier	Recorders	
Date	11/12/2021	Appin road	003	John Whyte	
Zone 56	Datum GDA (94)	**IBRA region**	Sydney Basin	**Zone ID**	Low
Easting	Northing	**Dimensions**	20m x 20m (0.04 ha)	**Orientation of midline**	See Figure 1-2

Vegetation Class	Exotic Grassland		Confidence: **H** M L
Plant Community Type	Exotic Grassland	EEC: No	Confidence: **H** M L

Record easting and northing from the plot marker. If applicable, orient picket so that perforated rib points along direction of midline.
Dimensions (Shape) of 0.04 ha base plot inside 0.1 ha FA plot should be identified, magnetic bearing taken along midline.

BAM Attribute (400 m² plot)		Sum values
Native Richness of	Trees	0
	Shrubs	0
	Grasses etc.	3
	Forbs	1
	Ferns	0
	Other	0
Native Cover of	Trees	0
	Shrubs	0
	Grasses etc.	1.3
	Forbs	0.1
	Ferns	0
	Other	0
High Threat Weed cover		20

BAM Attribute (20 x 50 m plot)	Euc*	Non Euc	# Tree Stems Count: Hollows†
dbh			
Mark large tree threshold for Euc* & Non Euc — **80 + cm**	0	-	No. of Hollows:
50 – 79 cm	0	--	
30 – 49 cm	0	-	
20 – 29 cm	0	-	
10 – 19 cm	0	-	
5 – 9 cm	0	-	
< 5 cm	0	-	
Length of logs (m) (≥10 cm diameter, >50 cm in length)	Tally space		Total 0m

Record number of **living** eucalypt* (Euc*) and **living** non-eucalypt (Non Euc) stems separately

* includes all species of *Eucalyptus*, *Corymbia*, *Angophora*, *Lophostemon* and *Syncarpia*

† Record total number of stems by size class with hollows (including dead stems/trees)

Counts must apply to each size class when the **number of living tree stems** within the size class is ≤ 10. Estimates can be used when the number of living tree stems within a class is > 10. Estimates should draw from the number series: 10, 20, 30…, 100, 200, 300

For a **multi-stemmed tree**, only the largest living stem is included in the count/estimate. For **hollows** count only the presence of a stem containing hollows, not the count of hollows in that stem.

BAM Attribute (1 x 1 m plots)	Litter cover (%)					Bare ground cover (%)					Cryptogam cover (%)					Rock cover (%)				
Subplot score (% in each)	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Average of the 5 subplots	0.6					0					0					0				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots located on alternate sides and 5 m from the plot midline at the locations 5, 15, 25, 35, and 45 m along the midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Within these 1 m x 1 m plots assessors may also record the cover of rock, bare ground and cryptogam soil crusts. Collection of these data is optional – the data do not currently contribute to assessment scores, they hold potential value for future vegetation integrity assessment attributes and benchmarks, and for enhancing PCT description

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)	3	-	
Cultivation (inc. pasture)	3	-	
Soil erosion		-	
Firewood collection		-	
Grazing	3	-	
Fire damage			
Storm damage		-	
Weediness	3	-	
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	11/12/2021	Appin	003	John Whyte

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
HTE	*Paspalum dialatum*			15			
E	*Soncus olearus*			.1			
E	*Plantago lancelata*			5			
E	*Avena fatua*			1			
E	*Yorkshire fog*			85			
GG	*Microlaena stipoides*			.2			
FG	*Oxallis perrenans*			.1			
GG	*Themeda australis*			1			
E	*Pink stars*			.1			
GG	*Bothriochloa Sp*			.1			
HTE	*Pennisetum clandestinum*			5			
E	*Juncus cognatus*			.1			
E	*Conyza albida*			.1			
E	*Briza minor*			.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) **Abundance:** 1, 2, 3, …, 10, 20, 30, … 100, 200, …, 1000, …

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

BAM Site – Field Survey Form

Site Sheet no: 1 of 2

		Survey Name	Plot Identifier	Recorders	
Date	11/12/2021	Appin road	002	John Whyte	
Zone 56	Datum GDA (94)	**IBRA region**	Sydney Basin	**Zone ID**	Low
Easting	Northing	**Dimensions**	20m x 20m (0.04 ha)	**Orientation of midline**	See Figure 1-2

Vegetation Class	Coastal Valley Grassy Woodlands		Confidence: **H** M L
Plant Community Type	Cumberland shale - sandstone Ironbark Forest (PCT 1395)	EEC: Yes	Confidence: **H** M L

Record easting and northing from the plot marker. If applicable, orient picket so that perforated rib points along direction of midline.
Dimensions (Shape) of 0.04 ha base plot inside 0.1 ha FA plot should be identified, magnetic bearing taken along midline.

BAM Attribute (400 m² plot)		Sum values
Native Richness of	Trees	3
	Shrubs	1
	Grasses etc.	3
	Forbs	5
	Ferns	0
	Other	1
Native Cover of	Trees	33
	Shrubs	.1
	Grasses etc.	21.1
	Forbs	8.3
	Ferns	0
	Other	.1
High Threat Weed cover		12.1

BAM Attribute (20 x 50 m plot)	Euc*	Non Euc	# Tree Stems Count: Hollows†
dbh			
Mark large tree threshold for Euc* & Non Euc	**80 + cm**	0	- / No. of Hollows:
50 – 79 cm	5	--	
30 – 49 cm	6	-	
20 – 29 cm		-	
10 – 19 cm		-	
5 – 9 cm		-	
< 5 cm	3	-	
Length of logs (m) (≥10 cm diameter, >50 cm in length)	Tally space		Total: 7m

Record number of **living** eucalypt* (Euc*) and **living** non-eucalypt (Non Euc) stems separately

* includes all species of *Eucalyptus*, *Corymbia*, *Angophora*, *Lophostemon* and *Syncarpia*

† Record total number of stems by size class with hollows (including dead stems/trees)

Counts must apply to each size class when the **number of living tree stems** within the size class is ≤ 10. Estimates can be used when the number of living tree stems within a class is > 10. Estimates should draw from the number series: 10, 20, 30…, 100, 200, 300

For a **multi-stemmed tree**, only the largest living stem is included in the count/estimate. For **hollows** count only the presence of a stem containing hollows, not the count of hollows in that stem.

BAM Attribute (1 x 1 m plots)	Litter cover (%)					Bare ground cover (%)					Cryptogam cover (%)					Rock cover (%)				
Subplot score (% in each)	12	1	4	1	3	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Average of the 5 subplots	4.2					0.4					0					0				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots located on alternate sides and 5 m from the plot midline at the locations 5, 15, 25, 35, and 45 m along the midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Within these 1 m x 1 m plots assessors may also record the cover of rock, bare ground and cryptogam soil crusts. Collection of these data is optional – the data do not currently contribute to assessment scores, they hold potential value for future vegetation integrity assessment attributes and benchmarks, and for enhancing PCT description

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)	3	-	
Cultivation (inc. pasture)	3	-	
Soil erosion		-	
Firewood collection	3	-	
Grazing	3	-	
Fire damage			
Storm damage		-	
Weediness	2	-	
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: 11/12/2021	Appin	002	John Whyte

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
TG	*Eucalyptus terticornis*			25			
TG	*Eucalyptus mollucana*			7			
E	*Solanum weed*			.1			
HTE	*Plantago lancelata*			1			
FG	*Oxallis perrenans*			.3			
E	*Vulpia sp*			2			
FG	*Viola hederaceae*			7			
E	*Verbena rigida*			.1			
HTE	*Pennesetium clandestinum*			10			
GG	*Microlaena stipoides*			20			
E	*Conyza albida*			.2			
E	*Solanum mauritium*			.1			
HTE	*Eragrostis curvula*			1			
E	*Sonchus olearus*			1			
GG	*Panicum simile*			2			
OG	*Einadia nutans*			.1			
E	*Rumex crispus*			1			
SG	*Bursaria spinosa*			.1			
HTE	*Senecio madgarensis*			.2			
E	*Cirsium vulgare*			.2			
GG	*Echinopogon caesiptosa*			1			
FG	*Glycine clandestina*			1			
FG	*Wahlenbergia communis*			2			
E	*Onopordum acanthium*			.1			
E	*Lolium perrenium*			.1			
E	*Sida rhombifolia*			.1			
FG	*Geranium homeanium*			.1			
E	*Solanum nigrum*			.1			
E	*Verbena brasillensis*			.1			
FG	*Veronica plebia*			.1			
E	*Angalis arvensis*			.1			
TG	*Eucalyptus globoidea*			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) **Abundance:** 1, 2, 3, …, 10, 20, 30, … 100, 200, …, 1000, …

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

BAM Site – Field Survey Form

Site Sheet no: 1 of 2

		Survey Name	Plot Identifier	Recorders	
Date	11/12/2021	Appin road	001	John Whyte	
Zone 56	Datum GDA (94)	**IBRA region**	Sydney Basin	**Zone ID**	Low
Easting	Northing	**Dimensions**	20m x 20m (0.04 ha)	**Orientation of midline**	See Figure 1-2

Vegetation Class	Exotic Grassland		Confidence: **H** M L
Plant Community Type	Exotic Grassland	EEC: No	Confidence: **H** M L

Record easting and northing from the plot marker. If applicable, orient picket so that perforated rib points along direction of midline.
Dimensions (Shape) of 0.04 ha base plot inside 0.1 ha FA plot should be identified, magnetic bearing taken along midline.

BAM Attribute (400 m² plot)		Sum values
Native Richness of	Trees	0
	Shrubs	0
	Grasses etc.	0
	Forbs	0
	Ferns	1
	Other	0
Native Cover of	Trees	0
	Shrubs	0
	Grasses etc.	0
	Forbs	0.1
	Ferns	0
	Other	0
High Threat Weed cover		5

BAM Attribute (20 x 50 m plot)	Euc*	Non Euc	# Tree Stems Count: Hollows†
dbh			
Mark large tree threshold for Euc* & Non Euc	**80 + cm** 0	-	No. of Hollows:
50 – 79 cm	0	--	
30 – 49 cm	0	-	
20 – 29 cm	0	-	
10 – 19 cm	0	-	
5 – 9 cm	0	-	
< 5 cm	0	-	
Length of logs (m) (≥10 cm diameter, >50 cm in length)	Tally space		Total 0m

Record number of **living** eucalypt* (Euc*) and **living** non-eucalypt (Non Euc) stems separately

* includes all species of *Eucalyptus*, *Corymbia*, *Angophora*, *Lophostemon* and *Syncarpia*

† Record total number of stems by size class with hollows (including dead stems/trees)

Counts must apply to each size class when the **number of living tree stems** within the size class is ≤ 10. Estimates can be used when the number of living tree stems within a class is > 10. Estimates should draw from the number series: 10, 20, 30…, 100, 200, 300

For a **multi-stemmed tree**, only the largest living stem is included in the count/estimate. For **hollows** count only the presence of a stem containing hollows, not the count of hollows in that stem.

BAM Attribute (1 x 1 m plots)	Litter cover (%)					Bare ground cover (%)					Cryptogam cover (%)					Rock cover (%)				
Subplot score (% in each)	0	0	0	0	0	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0
Average of the 5 subplots	0					0.6					0					0				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots located on alternate sides and 5 m from the plot midline at the locations 5, 15, 25, 35, and 45 m along the midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Within these 1 m x 1 m plots assessors may also record the cover of rock, bare ground and cryptogam soil crusts. Collection of these data is optional – the data do not currently contribute to assessment scores, they hold potential value for future vegetation integrity assessment attributes and benchmarks, and for enhancing PCT description

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		-	
Firewood collection		-	
Grazing		-	
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 m^2 plot: Sheet 2 of 2	Survey Name	Plot Identifier	Recorders
Date: 11/12/2021	Appin	001	John Whyte

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
E	*Holcus lanatus*		90			
HTE	*Paspalum dialatum*		5			
E	*Setaria gracillis*		2			
E	*Avena fatua*		1			
E	*Vulpia sp*		1			
E	*Verbena rigida*		.1			
E	*Vicia sativa*		1			
E	*Juncus cognatus*		.1			
E	*Angalis arvensis*		.1			
FG	*Oxallis perrenans*		.1			
E	*Briza minima*		.1			
E	*Lolium perrenium*		.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) **Abundance:** 1, 2, 3, …, 10, 20, 30, … 100, 200, …, 1000, …

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