Transport for NSW

Biodiversity Assessment Report for REF

Appin Road and St Johns Road Intersection Upgrade, Bradbury, NSW

January 2025

Cover image extracted from Google Earth Street View (2023) [Ambarvale, NSW].

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Executive summary

A Biodiversity Assessment has been conducted as Transport for NSW ('Transport') are proposing upgrade and improvement works of the Appin Road and St Johns Road intersection, located in Bradbury, NSW. This Biodiversity Assessment Report (BAR) has been carried out by Lesryk Environmental Pty Ltd ('Lesryk') to accompany the Review of Environmental Factors (REF) being prepared for the proposal. This report assesses the biodiversity impact of the proposal to meet the requirements of the NSW *Environment Planning and Assessment Act 1979* (EP&A Act).

With reference to section 1.1 of the REF prepared for the proposal by WSP Australia Pty Ltd (WSP), on behalf of Transport, the proposed scope of works broadly include:

- Widening of Appin Road and St Johns Road to expand each carriageway by one lane, including high entry angle left-turns at the intersection
- Provision for cyclists in the northbound and southbound direction on Appin Road through a dedicated southbound cycle lane and wider sealed road shoulders
- Various regrading works
- Inclusion of road furniture, street lighting, stormwater drainage infrastructure, landscaping, line marking, traffic signal adjustments and signage; in addition to adjustments, relocation and provision of new utility services
- Establishment of construction site compounds for the duration of the construction period. Five sites have been considered, of which one site is located within Flynn Reserve, (Bradbury), one within Woodland Road Reserve (St Helens Park), two sites within Rosemeadow Reserve (Rosemeadow), and one to the east of Dickens Road, Rosemeadow (about 415 metres north-east of Rosemeadow Reserve).

To permit the proposal, based on a worst-case estimate, about 1.2 hectares (ha) of vegetation mapped as Plant Community Type (PCT) '0 - Not native vegetation/Unclassified' would require disturbance/removal, within which an estimated 93 trees (16 small, 65 medium sized and 12 large) would be removed; comprised of four hollow-bearing trees, and 84 Koala (*Phascolarctos cinereus*) feed and use trees as listed under Schedules 1 and 3 of *State Environment Planning Policy (Biodiversity Conservation) 2021* (BCSEPP). No extra-large trees would require removal. It is recommended trees are to be retained where possible.

In line with Transport for NSW's *Tree and Hollow Replacement Guidelines* (2023) (EMF-BD-GD-0129), to replace the loss of the 93 trees, 388 trees are required to be re-planted and three artificial hollows (habitat boxes) established locally within the project boundary or on land adjacent or close to the project with landowner's consent. Where this cannot be accommodated for locally [or only partially], Transport for NSW will be required to transfer up to $47,000 into the Conservation Fund.

No threatened ecological communities, flora or fauna species listed, or currently being considered for listing, under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) or NSW *Biodiversity Conservation Act 2016* (BC Act), were recorded during the course of the field survey.

Though not recorded during the current investigation, as they have been previously recorded within, or near the study area, and as suitable habitat is present and is to be impacted by the proposal (i.e., four hollow-bearing trees and Koala habitat trees), it was considered appropriate to adopt a precautionary approach to the potential presence of the following threatened species listed under the Commonwealth EPBC Act and/or NSW BC Act:

- Koala (*Phascolarctos cinereus*) – listed as Endangered (EPBC and BC Acts)
- Hollow-dependent fauna:
    - Squirrel Glider (*Petaurus norfolcensis*) – Vulnerable (BC Act)
    - Gang-gang Cockatoo (*Callocephalon fimbriatum*) – Endangered (EPBC Act) and Vulnerable (BC Act)
    - Little Lorikeet (*Glossopsitta pusilla*) – Vulnerable (BC Act)
    - Varied Sittella *(Daphoensitta chrysoptera)* – Vulnerable (BC Act)

- Hollow-dependent microbats:
  - Yellow-bellied Sheathtail-bat (*Saccolaimus flaviventris*) – Vulnerable (BC Act)
  - Eastern False Pipistrelle (*Falsistrellus tasmaniensis*) – Vulnerable (BC Act)
  - Eastern Coastal Free-tailed Bat (*Micronomus norfolkensis*) – Vulnerable (BC Act)
  - Southern Myotis (*Myotis macropus*) – Vulnerable (BC Act)
  - Greater Broad-nosed Bat (*Scoteanax rueppellii*) – Vulnerable (BC Act)
  - Golden-tipped Bat *(Phoniscus papuensis)* – Vulnerable (BC Act)
  - Little Bent-winged Bat *(Miniopterus australis)* – Vulnerable (BC Act).

Assessments provided within this report, referencing EPBC Act Significant Impact Guidelines and the criteria provided under Section 7.3 of the BC Act, concluded that the conducting of the proposed Appin Road and St Johns intersection upgrade works would not have a significant impact on the potentially occurring threatened fauna species, or their habitats. Therefore, the matter does not require referral to the Federal Minister for the Environment and Water as a controlled action, nor is the preparation of a Species Impact Statement [or alternatively a Biodiversity Development Assessment Report] considered necessary.

Mitigation measures to reduce any ecological impact as a result of the proposed work have been recommended in Section 6 of this report. Two primary measures include:

- Minimising impact through detailed design, and
- Adhering to Transport's *Biodiversity Management Guidelines* (Transport 2024).

In addition, the following key mitigation measures have been provided:

- Limit vegetation removal to the minimum required to successfully permit the proposal
- In accordance with the *Tree and hollow replacement guidelines* (Transport 2023), and a Tree and Hollow Replacement Plan to be prepared (as part of the Construction Environment Management Plan prepared within the REF):
  - Re-plant 388 trees to replace the removal of 93 trees; the location and species of planted trees to be determined in consultation with Campbelltown City Council and Transport Landscape Advisor
  - Establish three artificial hollows (based on the 20% occupancy rate calculation of a cumulative five hollows from within the four hollow-bearing trees to be removed, equating to one 'occupied' hollow requiring replacement – at three artificial hollows per each 'occupied' hollow removed)
  - Should planting and hollow replacement within the project boundary or on land adjacent or close to the project not occur [or only partially], Transport for NSW would be required to transfer up to $47,000 into the Conservation Fund.
- An Erosion and Sediment Control Plan is to be prepared, this aimed at minimising soil erosion and the off-site transfer of sediment.
- Consider retaining trees through project design, where possible.

Adoption of these mitigation measures would ensure that the proposed works are carried out in an ecologically sustainable manner.

1. Introduction

1.1 Proposal background

At the request of bd infrastructure, on behalf of Transport, a BAR has been prepared, this required to assess the undertaking of road works that are proposed to be carried out at the intersection of Appin and St Johns Roads, Bradbury, NSW (Figure 1-1).

Appin Road is a strategically important arterial road. Regionally, it connects motorists travelling between Sydney's south-west region and the Illawarra. It also provides a link between the M1 Princes Motorway and the M31 Hume Motorway (through Wilton Road in the south, and Narellan Road in the north) and is utilised for the transportation of freight via road from Port Kembla to the south-western region of Sydney.

The objectives of the proposed intersection upgrade works are to achieve the following outcomes:

- address inadequate infrastructure
- improving quality and safety at this location for motorists.

To achieve the works, the combined total proposal impact footprint is about 13.8 ha. Despite this area extending an approximate 2.2-kilometre (km) length of Appin Road and a 130-meter (m) length of St Johns Road, the disturbance footprint is expected to be much less than this, with vegetation to be removed/disturbed encompassing an area of about 1.2 ha.

Within the area investigated, Transport are proposing to:

- Widen the existing lanes present on Appin Road
- Install upgrades and infrastructure where required
- Remove street-scape vegetation.

It is acknowledged a REF and associated BAR was prepared by WSP and Roads and Maritime Services in November 2018, this encompassing larger staged upgrade works of a 5.4 km section of Appin Road between Mount Gilead and Ambarvale, which incorporates the assessed study area for this report. Whilst these works are independent of the current proposal, where applicable, information within these documents have been drawn upon and incorporated into relevant components of this BAR.

Lesryk has been engaged to conduct the Biodiversity Assessment and Investigation to consider and assess all ecological matters affecting, or likely to affect, the environment as a result of the proposed intersection works. This BAR will accompany the REF being prepared for the proposal, this produced in compliance with the requirements of Division 5.1 of the EP&A Act.

1.2 The proposal

With reference to information provided by bd Infrastructure, on behalf of Transport for NSW, the proposed scope of works broadly include (bd infrastructure 2023):

- Widening of Appin Road at St Johns Road to upgrade the existing northbound and southbound carriageway from two lanes to three lanes in each direction, with a right-turn lane on the northern approach to St Johns Road
- High entry angle left-turn from Appin Road southbound into St Johns Road
- Widening of St Johns Road into the median to provide two right-turn lanes from St Johns Road into Appin Road northbound and a separate left-turn lane with a high entry angle left turn into Appin Road southbound
- Provision for cyclists in the northbound and southbound direction on Appin Road through a dedicated southbound cycle lane and wider sealed road shoulders
- Regrading of the vertical alignment along Appin Road (to be 50 mm above the existing levels) to address impacts to the existing pavement
- Regrading of proposed cut batters on the southern tie-in to allow for planting and assist ongoing maintenance

- Inclusion of road furniture, street lighting, stormwater drainage infrastructure, landscaping, line marking, traffic signal adjustments and signage
- Provision of a flat area around the base of proposed street lighting posts to allow for maintenance access (water, power, communications)
- Adjustments, relocation and provision of new utility services
- Establishment of five construction site compounds for the duration of the construction period (the locations of these provided below).

Detailed plans for the proposal have been provided by AECOM, on behalf of Transport, in Appendix A.

To permit the intersection upgrade works, vegetation management is required, including the removal of roadside trees.

Five options for use as a compound site were considered as part of this assessment (Figure 1-1), these being:

- Option 1: An approximate 3320 m^2 area located within open, cleared grassland on the southern side of Woodland Road [Lot 95, DP800661].
- Option 2: An approximate 6360 m^2 area of open, cleared grassland located within Flynn Reserve [Lot 1, DP 746511], on the northern side of Woodland Road.
- Option 3: An approximate 1500 m^2 area [Lot 18, DP 700702 & Lot 19, DP 700704], located within open, cleared grassland on the eastern side of Dickens Road, Rosemeadow.
- Option 4: An approximate 2000 m^2 area [Lot 25/700703], located within open, cleared grassland on the eastern side of Copperfield Drive, Rosemeadow.
- Option 5: An approximate 3500 m^2 area [Lot 25/700703 and Lot 38/700703], located within open, cleared grassland on the eastern side of Copperfield Drive, Rosemeadow.

Unless a specific aspect of the proposed work is referred to, the work would hereafter be referred to as 'the proposed work'.

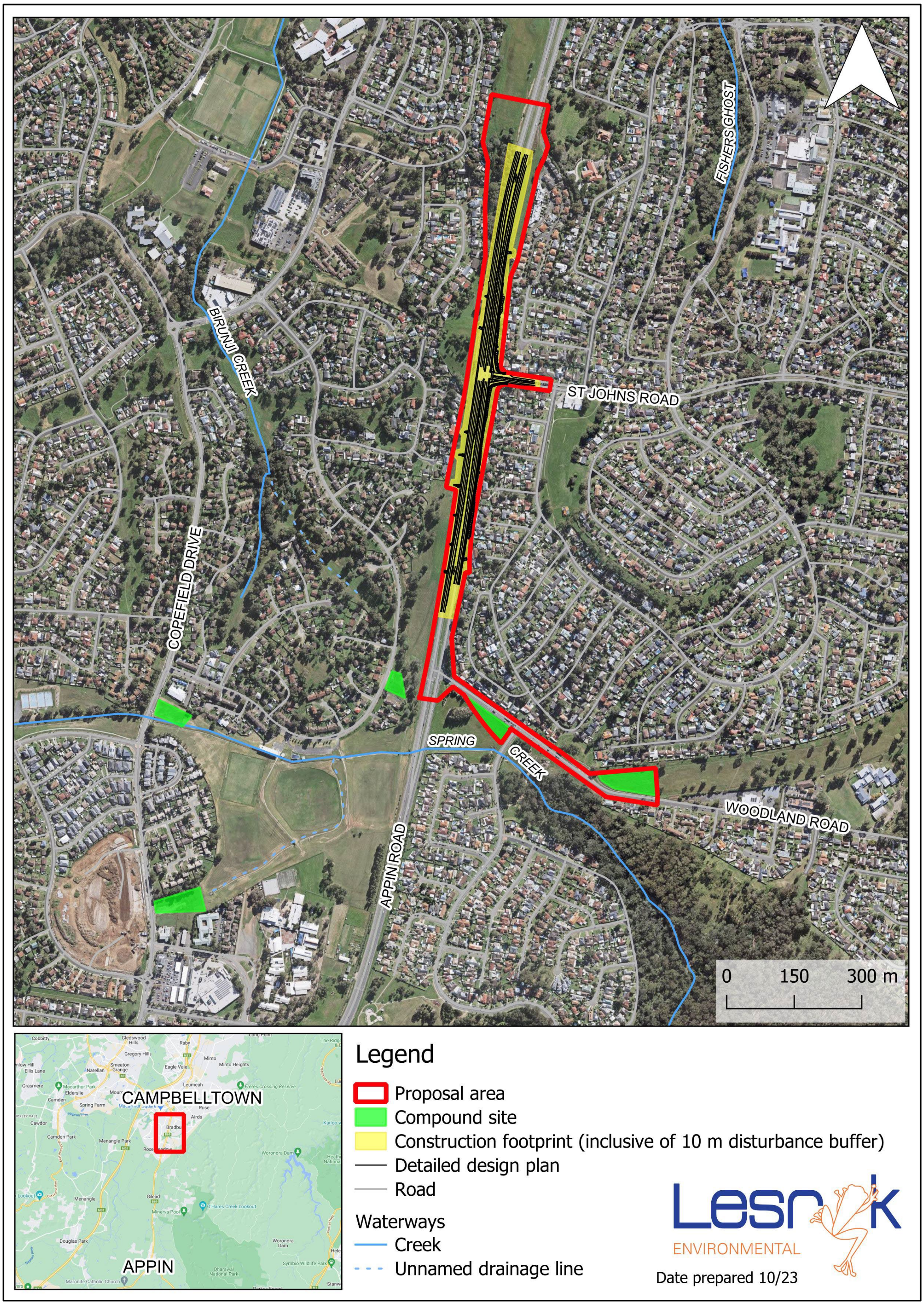
Based on a worst-case estimate, the total activity footprint (i.e., impact footprint in which 'disturbances would occur') would be about 13.8 ha, including five potential compounds/stockpile areas (these totalling 1.67 ha). To permit the proposal, an expected 1.2 ha of exotic and native vegetation would require disturbance/removal, this inclusive of the clearing of 93 mature trees that consist of:

- 12 large (DBH 50 – 100 cm)
- 65 medium (DBH 20 – 50 cm)
- 16 small (DBH 5 – 20 cm)
- four of which are considered to be hollow-bearing.

The following machinery/equipment would be used during the course of the proposed work:

- Asphalt truck and sprayer
- Backhoe
- Bulldozer D9
- Chainsaw
- Compactor
- Compressor
- Concrete pump
- Concrete truck
- Generator
- Loader
- Roller (vibratory)
- Paving laying machine
- Road Truck
- Scissor lift
- Smooth drum roller
- Profiler

The proposal is anticipated to commence in September 2024, and take between nine to twelve months to complete.



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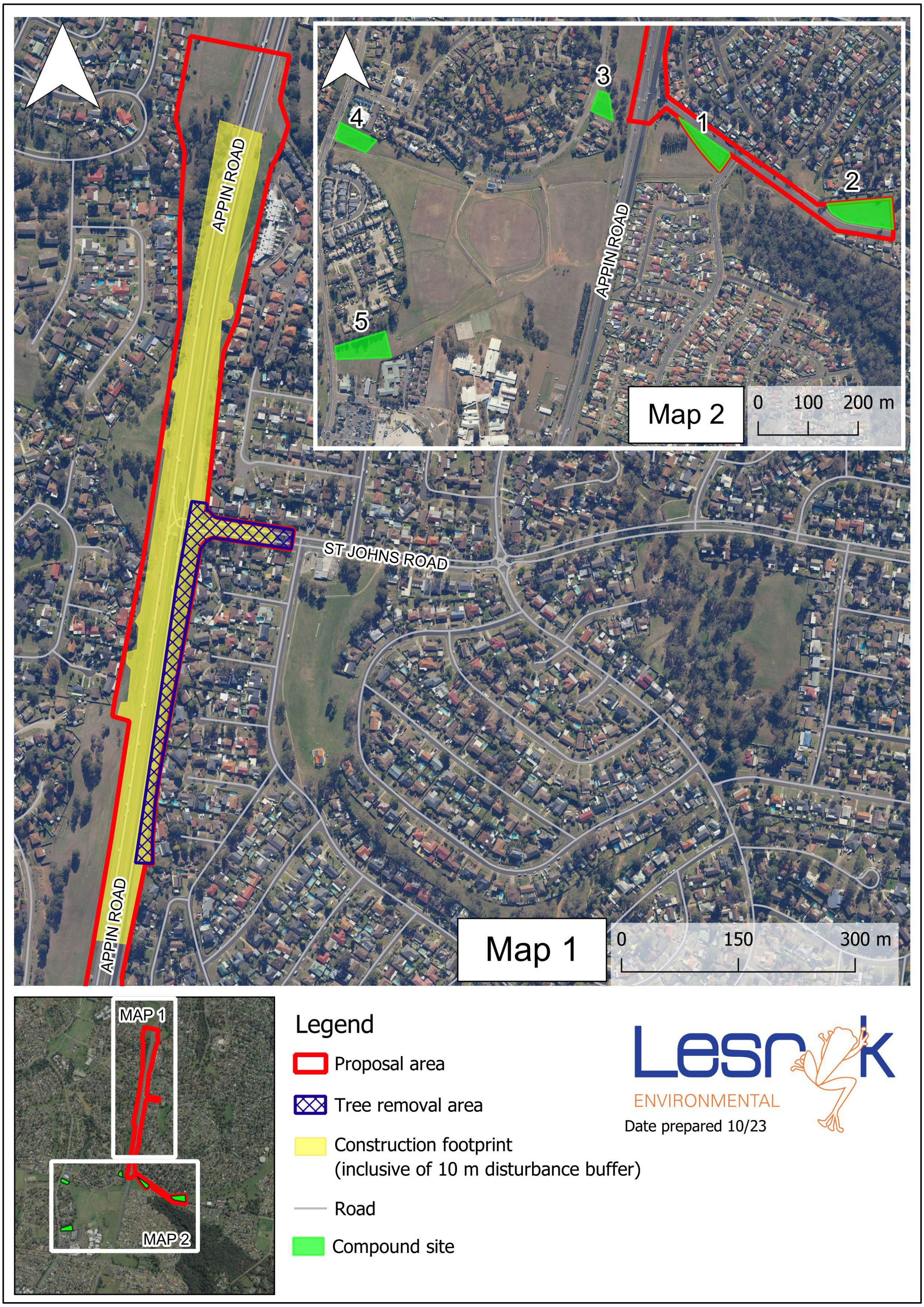
1.2.1 Assessment areas

Based on a worst-case estimate, the proposed Appin and St Johns Roads intersection upgrade work would require a work area (i.e., construction and vegetation removal footprint, including road and hardstand areas in which 'disturbances would occur') totalling about 13.8 ha (Figure 1-2), this composed of:

- A construction footprint (i.e disturbance areas inclusive of road/hardstand areas, not including the stockpiles) of about 6.1 ha.
- The associated roadside verges and central median of 1.3 km length of Appin Road and a 130 m section of St Johns Road.
- Tree and vegetation removal of an estimated 460 m long section of the Appin Road south bound lane road verge (extending south of St Johns Road), this being between 15-20 m wide, encompassing an area of about 1.2 ha. This includes the removal of 93 mature native trees, four of which are hollow-bearing.
- A 10 m buffer of those features present beyond the construction footprint to consider the movement of personnel and vehicles/machinery
- Five potential compound sites totalling about 16,630 m^2 in size:
    - Compound site 1 is located within an open, grassed area of Woodland Road Reserve [Lot 95, DP800661] (~2,930 m^2).
    - Compound site 2 is located within an open, grassed area of Flynn Reserve [Lot 1, DP 746511] (~5,500 m^2).
    - Compound site 3 is located within an open, grassed area to the north-east of Rosemeadow Reserve [Lot 18, DP 700702 & Lot 19, DP 700704] (~1,550 m^2).
    - Compound site 4 is located within an open, grassed area of Rosemeadow Reserve, north-west of Rosemeadow Reserve [Lot 25/700703] (~2,390 m^2).
    - Compound site 5 is located within an open, grassed area of Rosemeadow Reserve, south-west of Rosemeadow Reserve [Lot 25/700703 and Lot 38/700703] (~4,200 m^2).

The operational footprint of the proposal would be much less than the total expected disturbances and work area of 13.8 ha, considering not all compound sites listed above would be required to permit the proposal.

The study area is defined as the subject site (proposal impact footprint) and any additional areas which are likely to be affected by the proposal, either directly or indirectly.


APPIN ROAD
ST JOHNS ROAD
APPIN ROAD
Map 1
0 150 300 m
APPIN ROAD
1
2
3
4
5
Map 2
0 100 200 m
MAP 1
MAP 2
Legend
Proposal area
Tree removal area
Construction footprint
(inclusive of 10 m disturbance buffer)
Road
Compound site
Lesryk
ENVIRONMENTAL
Date prepared 10/23

1.3 Legislative context

A REF is prepared to satisfy Transport duties under s.5.5 of the EP&A Act to "examine and take into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of that activity" and s.5.5 in making decisions on the likely significance of any environmental impacts. This biodiversity impact assessment forms part of the REF being prepared for the Intersection Road Upgrade Project and assesses the biodiversity impacts of the proposal to meet the requirements of the EP&A Act.

The BC Act requires that the significance of the impact on threatened species, populations and threatened ecological communities or their habitats is assessed using a five-part test in Section 7.3 of the BC Act. Where a significant impact is likely to occur, a SIS must be prepared in accordance with the Environment Agency Head's requirements, or a BDAR must be prepared by an accredited assessor in accordance with the BAM.

In September 2015, a "strategic assessment" approval was granted by the Federal Minister in accordance with the EPBC Act. The approval applies to Transport's road activities being assessed under Division 5.1 (formerly Part 5) of the EP&A Act with respect to potential impacts on nationally listed threatened species, ecological communities and migratory species.

As a result, Transport road proposals assessed via a REF:

- Must address and consider potential impacts on EPBC Act listed threatened species, populations, ecological communities, and migratory species, including application of the "avoid, minimise, mitigate and offset" hierarchy
- Do not require referral to the Department of Climate Change, Energy, the Environment and Water (DCCEEW) for these matters, even if the activity is likely to have a significant impact
- Must use the BAM to calculate credits that would offset significant impacts on EPBC Act listed threatened species, populations, ecological communities, and migratory species.

To assist with this, assessments are required for all relevant biodiversity values in accordance with the *Matters of National Environmental Significance: Significant impact guidelines 1.1. Environment Protection and Biodiversity Conservation Act 1999* (DoE 2013).

2. Methods

2.1 Personnel

Personnel involved in the assessment undertaken within the proposal area, and their qualifications, are identified in Table 2-1.

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Mr Deryk Engel	Director and Senior Ecologist. Project management, report review and quality assurance	B.Env.Sc. (Hons)
Ms Chelsea Tiller	Field ecologist, BAR write-up	B.Soc.Sc
Mrs Jessica Davis	Botanist, site investigation, contribution to BAR	B.Env.Sc. (Hons)
Mr Michael Fawcett	Botanist, site investigation, contribution to BAR	Dipl. Conservation Ecosystem Management
Ms Kirsty Bloomfield	Background research, BAR preparation and review	–

2.2 Background research

Prior to carrying out any fieldwork, known databases and any previous studies conducted in the region were reviewed to identify the diversity of ecological communities, flora and fauna species known to be present, or potentially occurring, in the study region. The identification of those known or potentially occurring native species and communities within this portion of the Campbelltown LGA, particularly those listed under the Schedules to the EPBC, BC and/or FM Acts, thereby permits the tailoring of the field survey strategies to the detection of these plants and animals, their vegetation associations and/or necessary habitat requirements. By identifying likely species, particularly any threatened plants and animals, either the most appropriate species-specific survey techniques may be selected [should their associated vegetation communities/habitat requirements be present] or a precautionary approach to their presence adopted.

The carrying out of a literature search also ensures that the results from surveys conducted during different climatic, seasonal and date periods are considered and drawn upon as required. This approach therefore increases the probability of considering the presence of, and possible impact on, all known and likely native species, particularly any plants and animals that are of regional, State and/or national conservation concern. This approach also avoids issues inherent with a one off 'snap-shot' study.

A list of all databases, date these were accessed, and the search area employed is provided in Table 2-2.

Other reports and documents referred to are provided within the bibliography section of this report.

All these databases and reports were reviewed and drawn upon where relevant. While reviewing these documents, particular attention was paid to identifying relevant ecological matters listed, or currently being considered for listing, under the Schedules of the EPBC and/or BC Acts, plants, animals and ecological communities that have been recorded in the region and which may occur within, or in the vicinity of, the study area.

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Database/Information sources	Date accessed	Search area
Protected Matters Search Tool (PMST) (DCCEEW 2023a)	June 2023	10 km buffer on study area
Register of critical habitat (DCCEEW 2023e)	June 2023	N/A
BioNet Atlas (NSW DCCEEW 2023a)	June 2023	10 km buffer on study area
Areas of Outstanding Biodiversity Value register (NSW DCCEEW 2023b)	June 2023	N/A
NSW WeedWise Database (DPI 2023a)	June 2023	Campbelltown LGA
Fisheries NSW Spatial Data Portal (DPI 2023b)	June 2023	Sydney Metro layer
NSW State Vegetation Type Map (State Government of NSW and DPE 2022)	June 2023	Study area
BioNet Vegetation Classification database (NSW Government 2023c)	June 2023	N/A
Biodiversity Values Map and Threshold Tool (NSW Government 2023d)	June 2023	Study area
PlantNet (2023)	June 2023	N/A
SEED map viewer (NSW Government 2023e)	June 2023	Study area
Threatened biodiversity profiles (OEH 2023)	June 2023	N/A
Groundwater Dependent Ecosystems Atlas (BoM 2023b)	June 2023	Study area
National Flying-fox monitoring viewer (DCCEEW 2023f)	June 2023	Study area

Nomenclature follows that in texts, or within the EPBC, BC and FM Acts. Field guides and standard texts used include:

- Brooker and Kleinig (1999) [used to identify eucalypt]
- Costermans (1992) [other vegetation]
- Cogger (2014) [reptiles and frogs]
- Anstis (2017) [frogs]
- Churchill (2008) [flying mammals]
- Simpson and Day (2010) [birds]
- Van Dyck and Strahan (2008) [non-flying mammals], and
- Triggs (1996) [identification of scats, tracks and markings]

It is noted that the current accepted scientific names for some of the threatened fauna species previously recorded in this locality are not consistent with the names used/provided under either the EPBC and/or BC Acts. In these instances, nomenclature used within this report follows the current approved scientific conventions.

Where applicable, any Threatened Ecological Communities (TEC) were classified and named according to the NSW Scientific Committee's Final and Preliminary Determinations [various dates].

The conservation significance of those ecological communities, plants and animals recorded is made with reference to:

- The EPBC, BC and FM Acts
- Vegetation mapping of the study region (State Government and DPE 2022), and
- The BioNet Vegetation Classification database (NSW Government 2023c).

2.3 Vegetation assessment

2.3.1 Vegetation mapping

Vegetation of the locality has been mapped and described in the SVTM (SVTM Version C1.1.M1.1) (State Government and DPE 2022). This mapping identifies the most likely PCT to occur in the polygon. Refer to Section 3.1 for further details.

2.3.2 Vegetation survey and classification

The purpose of the vegetation survey was to confirm the dominant species with reference to the mapped PCTs, assess the condition of the vegetation, search for threatened species or their habitats and identify weeds.

Surveys were conducted by traversing accessible areas of the proposal area and, as far as possible, identifying all plants present as well as documenting dominant species in each stratum (refer to Figure 1-2 for the area surveyed).

No surveys conducted in accordance with the BAM were completed for this project as it was not considered necessary. Therefore, associated template tables have been removed from this report.

2.4 Threatened species assessment

A biodiversity assessment of the study area was carried out by Chelsea Tiller, Jessica Davis and Michael Fawcett on 22 June 2023. The purpose of the field investigation was to identify those vegetation communities, fauna habitats, plants and animals present within, and in close proximity to, the study area that are of State and/or national conservation significance as listed under the Schedules to the EPBC and BC Acts.

While conducting the habitat assessments, efforts were made to identify features such as known vegetation associations, geological features (e.g., caves or suitable cave substitutes), feed trees, mature trees with hollows, connectivity of fauna corridors, aquatic environments and other habitat features important to the lifecycle requirements of those threatened plants and animals previously recorded in the study region (as listed in Appendix B).

The survey methods employed during the field investigation were:

- The identification of those plants present within, and proximate to, the areas of likely disturbance, including both direct and indirect impact
- The identification of the structure of the vegetation communities and fauna habitats present within, and close to, the proposed work areas
- The direct observation of those fauna species present within, or near to, the proposed work areas
    - Diurnal call identifications of fauna species present were identified in the field
- The identification of any indirect evidence such as tracks, scats, scratching, and diggings that would suggest the presence of a particular fauna species
- Leaf litter and ground debris searches for sheltering reptiles and amphibians
- Targeted searches for any species of State and/or national conservation concern, as listed under the EPBC and BC Act, or their likely habitat areas, which were identified during the literature review stage of the project.

Where required, a more detailed description on one or more of the survey methods employed is provided below.

To assist with the site investigations, binoculars were used to help with the identification of plant species and the presence of habitat features such as nests or hollows.

2.4.1 Habitat suitability assessment

An assessment of available habitat for each threatened species, population or community identified in the database searches, and their likelihood of occurrence, is provided in Appendix B.

2.4.2 Targeted flora surveys

Targeted (species specific) surveys for threatened plants were considered based on the results of the literature review, including consideration of the habitat requirements of those threatened flora species identified as potentially occurring in the study area (see Appendix B), air photography interpretation and the site specifics of the study area. As such, a visual assessment for the presence/absence of threatened flora species associated with the project area's PCTs in the TBDC **was undertaken.**

The survey methods employed, and level of effort required were generally based on the descriptions provided in the following publications:

- The *Threatened Species Survey and Assessment – Guidelines for developments and activities* (working draft) (DEC 2004)
- The *Surveying threatened plants and their habitats: NSW survey guide for the Biodiversity Assessment Method* (State of NSW and DPIE 2020b).

2.4.3 Targeted fauna surveys

Based on the observations made during the diurnal investigations, the disturbed and modified nature of the areas investigated (i.e., road corridor) and the identification of those habitats present, it was not considered necessary to employ any species-specific fauna survey methods (e.g., nocturnal surveys, echolocation targeting Yangochiroptera [hereafter referred to as microbats]). Those survey methods that were conducted to target threatened species are as follows.

Diurnal investigation

During the field investigation birds were identified using visual identification of observed individuals or aural identification of their vocalisations. Any opportunistic observations obtained while carrying out other field activities were also recorded.

If present, other features such as the presence of water bodies, culverts, caves and large logs were also inspected.

Ground debris searches

Ground debris searches were carried out on foot within the limited number of vegetated portions of the proposed work areas. This involved conducting random meanders through these areas and turning over any occurrences of natural debris or urban refuse. Leaf litter accumulations around the bases of any trees were also searched.

While conducting the ground debris searches, tracks, diggings and characteristic scats were also searched for, and identified in the field.

Native tree removal count

Within the proposed work areas, the individual native trees that are likely to require removal were identified and recorded (Appendix C). Within each area where tree removal work would be required (to permit the road widening and upgrade remediation), the position of those native trees that were ≥ 5 cm at DBH at 1 m of height were recorded through use of the iPAD™ application 'Field Maps' by Esri's ArcGIS (Esri 2022) which incorporates a GPS tool. In addition, for each tree expected to be cleared, the following data was collected (and is presented in Appendix C):

- Status: whether the tree is alive or dead
- Species identification, if alive, and
- Height and DBH (indicative).

No access restrictions to those trees present within the study area were encountered.

The growth form of those plants present within the road work areas was determined with reference to DPE's native species by growth form database (DPE 2022).

Hollow-bearing tree survey

Within the surveyed study area, the position of those mature trees that were, or were considered to be, hollow-bearing (potentially used by microbats, birds and arboreal mammals), were recorded through use of a Garmen™ hand-held GPS.

Hollow-bearing trees were generally recorded in accordance with methods described in the Operation Manual for BioMetric 3.1 (DECCW 2011), in that hollows were only recorded if the:

- Entrance could be seen from the ground
- Hollow appeared to have depth, or
- Hollow was at least 1 m above the ground (basal hollows were only recorded if they continued up into the tree above 1 m).

That stated, if a tree presented a dead vertical limb or branch that could potentially be hollow-bearing, and was of predicted sufficient diameter to be utilised by a native species, it was also recorded based on the adoption of a precautionary approach.

For each recorded hollow-bearing tree, the following data was collected (and is presented in Appendix C):

- Status: whether the tree is alive or dead
- Species identification, if alive
- Height and DBH
- Approximate number of hollows and position in the tree (e.g. trunk, limb, basal or fissure, termitaria), and
- Estimated size classes of hollows:
    - Small 5-50 mm
    - Medium 50-150 mm
    - Large > 150 mm.

The survey methods employed and level of effort required were generally based on descriptions provided in the following:

- DEC (2004) *Threatened Species Survey and Assessment – Guidelines for developments and activities* (working draft)
- DECC (2009) *Threatened species survey and assessment guidelines - field survey methods for fauna: Amphibians*
- DEWHA survey guidelines for Australia's threatened bats, bird and frogs (DEWHA 2010a, 2010b, 2010c)
- DSEWPC survey guidelines for Australia's threatened mammals and reptiles (DSEWPC 2011a, 2011b, 2011c)
- The 'Species credit' threatened bats and their habitats NSW survey guide for the Biodiversity Assessment Method (State of NSW and OEH 2018c), and
- The NSW Survey Guide for Threatened Frogs: A guide for the survey of threatened frogs and their habitats for the Biodiversity Assessment Method (State of NSW and DPIE 2020c).

2.5 Aquatic surveys

One named, mapped waterway is present within the study area, this being Spring Creek; traversing in a west-east orientation under Appin Road, via a culvert within the southern portion of the subject site, before discharging into Georges River about 1.9 km to the east. Beyond the study area, and unaffected by the proposal, Birunji Creek and Fishers Ghost Creek are located [at their nearest] about 400 m west and east, respectively, to Appin Road. An ephemeral unnamed drainage line of Spring Creek also occurs about 110 m west of Appin Road, well beyond the study area.

With reference to the Fisheries NSW Spatial Data Portal (DPI 2023b), Spring Creek is not identified as Key Fish Habitat (KFH) [search: Sydney Metro].

With reference to the *Policy and Guidelines for Fish Habitat Conservation and Management* (DPI 2013) and the Strahler Stream Order Classification System (DPI 2023c), within the study area, Spring Creek is a 2nd order waterway and considered to be Class 4 'Unlikely fish habitat', identified as:

Unlikely fish habitat – Named or unnamed waterway with intermittent flow following rain events only, little or no defined drainage channel, little or no flow or free-standing water or pools after rain events (e.g., dry gullies or shallow floodplain depressions with no permanent aquatic flora present).

As Spring Creek is not identified as KFH, nor a Class 1 or Class 2 waterway, and the proposed intersection upgrade work within the existing modified and disturbed alignment of Appin and St Johns Road is terrestrial, no detailed aquatic survey was required. Refer to Section 5.1.4 of this BAR for potential aquatic impacts as a result of the proposal.

2.6 Limitations

By the completion of the field investigation a total of about 10.5 person hours of active searches had been accumulated. Given the disturbed nature, physical condition and size of the proposed work areas, this length of time is considered more than adequate when endeavouring to determine the diversity of native species present, their habitats and vegetation associations, and the conservation status of each of these.

During the field investigation, no adverse climatic or seasonal constraints were encountered and access to all parts of the study area that required investigation was possible. For reference, the weather conditions experienced during the site investigation were cold temperatures [~6°C], 100% cloud cover, a light breeze, and cloudy conditions.

While not considered to compromise the scientific rigor of the field assessment, no specific surveys (i.e., nocturnal work) were carried out. To overcome this limitation:

- Database searches were conducted for threatened species, populations and ecological communities known to occur within the region, and
- The precautionary principle was adopted where necessary (i.e., suitable habitat for those threatened species known to occur, or that have been previously recorded within the surrounding locality, was identified).

Not all animals and plants can be fully accounted for within any given study area. The presence of threatened species is not static; it changes across time, often in response to longer term natural forces that can, at any time, be dramatically influenced by human-made disturbances.

This report is based upon data acquired from the current investigation; however, it should be recognised that the data gathered is indicative of the environmental conditions of the site at the time the field work was conducted.

3. Existing environment

For reference, a photographic record of the area investigated is provided in Appendix D.

The study area is located within the road corridor of Appin Road, and extends into the corridor of the intersecting Woodland and St Johns Roads. Appin Road follows a relatively straight north-south trajectory, with a local relief of about 15 m within the investigated length of roadway.

The pre-existing intersection and road verges to be upgraded are sealed, with narrow highly modified vegetated corridors that vary significantly in width, separating the road from nearby residential properties.

Vegetation within the study area varies between open maintained grassed **areas, and** isolated stands containing those trees recorded during the field investigation. The north-west corridor is highly vegetated with exotic and native ground-covers, shrub and trees. The south-eastern corridor of the Appin and St Johns Roads intersection appears to be maintained regularly, with exotic grasses dominating the ground cover vegetation. Trees present within these locations are mostly species that are consistent with those found in nearby bushland, with some that are likely to have been previously planted.

Surrounding the area investigated are heavily urbanised suburbs, with Ambarvale present to the west, and Bradbury located to the east (Figure 1-1). Bushland extends from the southern extent of the study area, near Woodland Road, extending to Holsworthy Military Reserve and the nearest national park, being Dharawal National Park about 4.5 km south-east of the site (Figure 1-1).

One named, mapped waterway, Spring Creek, traverses west-east via a culvert beneath Appin Road in the southern extent of the subject site. The proposal would not have a direct or indirect impact on any of those waterways present. Ephemeral drainage lines are present where stormwater runoff is concentrated; the runoff typically diverted by table drains to culverts within the study area.

Reference to the Biodiversity Values Map and Threshold Tool (BVMTT) (NSW Government 2023d), no mapped Biodiversity Values are identified within the study area.

Reference to the Soil Landscape of the Wollongong Port Hacking 1:100,000 Sheet report (Hazelton and Tille 1990) and mapping (State Government and NSW DCCEEW 1992) indicates the study area is located within the Blacktown soil landscape (Figure 3-1). The geology of the Blacktown landscape is formed on Wianamatta Group (Ashfield Shale with laminate and dark grey siltstone; Bringelly Shale with occasional calcareous claystone, laminate and coal). The soils consist of shallow to moderately deep (<150 cm) Red Podzolic Soils and Brown Podzolic Soils that occur of crests, upper slopes and well-drained areas; deep (150-300 cm) Yellow Podzolic Soils and Soloths on lower slopes and in drainage depressions and localised areas of poor drainage. The limitations of the Blacktown landscape are that it is moderately reactive, contains highly plastic subsoils and has low soil fertility.

Reference to the SEED map viewer, an**d its EPI Protection** Layers (NSW Government 2023e), identified the study area is not mapped as containing any Acid Sulfate Soils or salinity.

For reference, Table 3-1 identifies attributes of the area investigated.

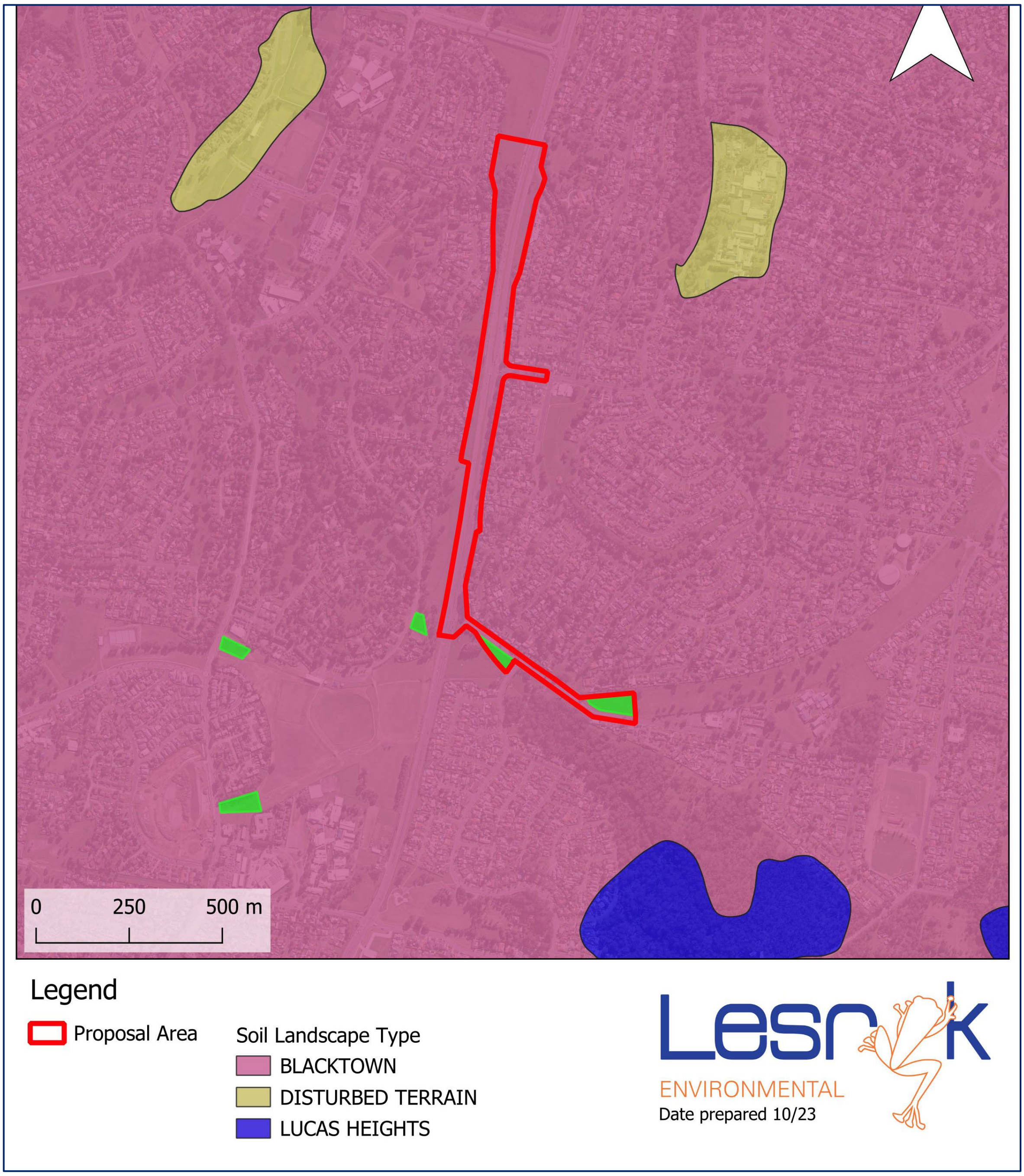

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Table 3-1: Site attributes

Site Attributes	
Estimated size (ha)	About 13.8 ha
ASL	Between 115 m and 140 m
Climate[1]	Mean summer high: 29.7 °C (January) Mean winter low: 3.0 °C (July) Average annual rainfall – 823.2 mm
Waterbody	Spring Creek
Critical habitat	No
IBRA Bioregion/Subregion	Sydney Basin / Cumberland
Mitchell Landscape	Cumberland – Cumberland Plain
Soil Landscape	Blacktown (Figure 3-1)
NPWS estate	No

3.1 Plant community types and vegetation zones

Reference to the SVTM (State Government of NSW and DPE 2022) identifies the PCTs presented in Figure 3-2 and Table 3-2 occur within, or in proximity to, the study area.

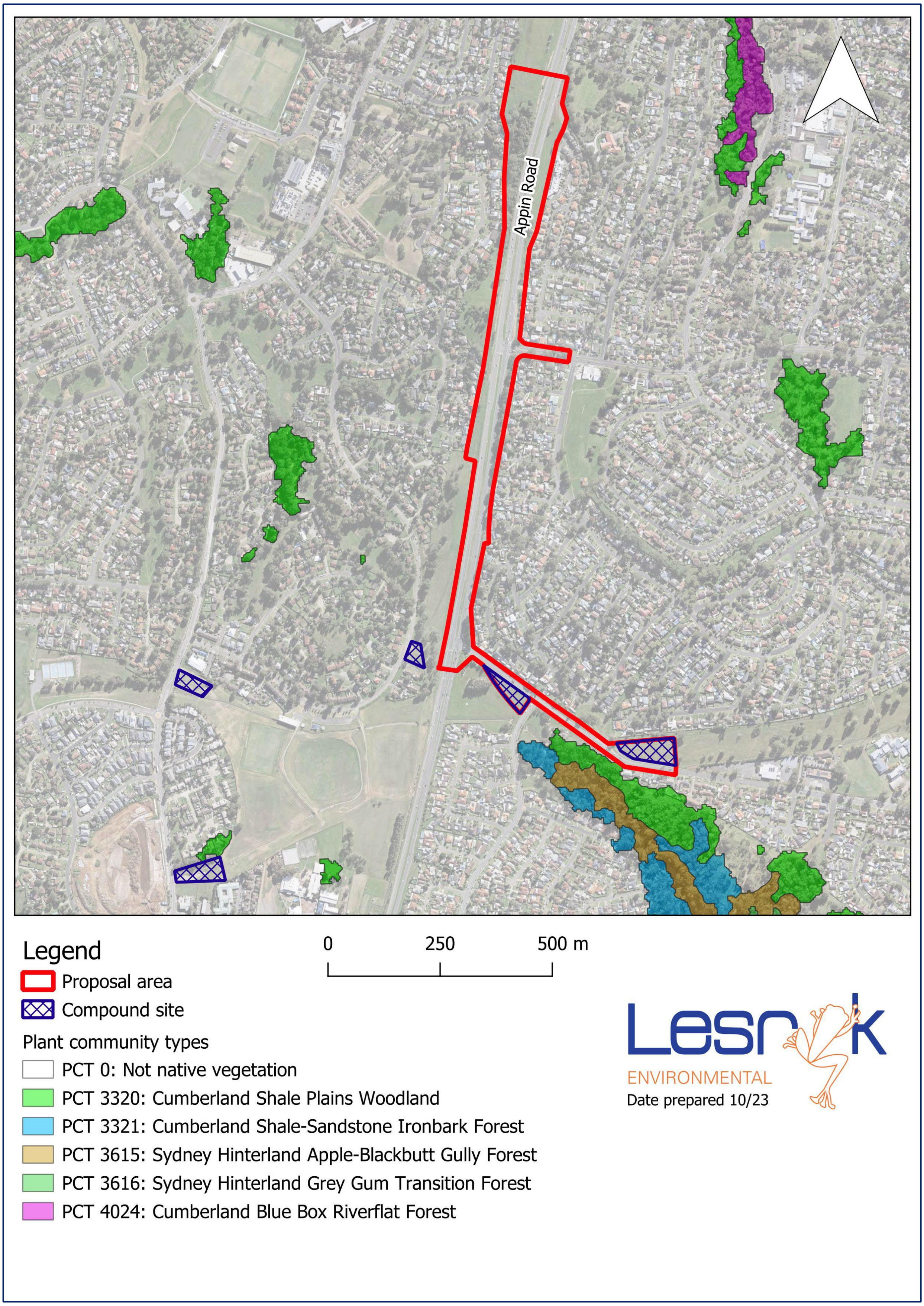
The entirety of the subject site/disturbance footprint is mapped as 'PCT 0 Not native vegetation/Unclassified vegetation', which generally refers to areas cleared of native vegetation and/or dominated by weeds.

The mapping of the study area was found to be reasonably accurate, as the proposal area did not conform to a native vegetation community (Figure 3-2). Although two sections of the study area were reasonably vegetated, these located to the north-west and south-east of the Appin Road and St Johns Road intersection, these areas were observed to be highly modified and disturbed, comprised of various native and exotic tree and shrub species.

The tree removal area was dominated by both remnant and planted eucalyptus species such as Narrow-leaved Red Ironbark (*Eucalyptus crebra*) and Spotted Gum (*Corymbia maculata*) lining Appin Road as the adjacent roadside verge. The vegetation present consisted primarily of a canopy, an absent midstory, sparse understory with little to no shrubs, and a ground cover dominated by exotic grasses and bare earthen ground. Those trees present ranged between 4 m - 20 m in height, with other tree species being Grey Box (*E. macrocarpa*), Forest Red Gum (*E. tereticornis*), Thin-leaved Stringybark (*E. eugenioides*), Turpentine (*Syncarpia glomulifera*), and Allo*casuarina* sp *in addition to the* Narrow-leaved Red Ironbark and Spotted Gum.

The vegetated north-west portion of the study area was found to be significantly disturbed and largely dominated by exotic ground covers and shrub species, with various native trees and shrubs identified throughout. Native trees consisted mostly of Forest Red Gum, Lemon-scented Gum (*Corymbia citriodora*) and Spotted Gum, with common native shrubs being Sydney Green Wattle (*Acacia decurrens*), Sickly Wattle (*Acacia falcata*) and Hickory Wattle (*Acacia implexa*). Exotic shrubs and trees included species such as Prickly Pear (*Opuntia* sp.), Small-leaved Privet (*Ligustrum sinense*), Large-leaved Privet (*Ligustrum lucidum*), with African Olive (*Olea europaea* subsp. *cuspidata*) dominating a large portion of the area. Exotic ground covers were primarily Blackberry (*Rubus fruticosus* agg. spp.), Rhodes Grass (*Chloris gayana*) and Coolatai Grass (*Hyparrhenia hirta*).

[1] Camden Airport AWS – This being the nearest operating weather station to the area investigated



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Veg. zone	Plant community type (PCT)	Threatened ecological community	Area (ha)	
			Subject land	Study area
Study area	PCT 0 – Not native vegetation	Not a TEC	1.2	13.8
Adjacent to the study area	PCT 3320 – Cumberland Plains Shale Woodland	Cumberland Plain Woodland in the Sydney Basin Bioregion listed as Critically Endangered under the BC Act Shale Gravel Transition Forest in the Sydney Basin Bioregion listed as Endangered under the BC Act Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest listed as Critically Endangered under the EPBC Act.	N/A	N/A
Beyond study area	PCT 3321 – Cumberland Shale-Sandstone Ironbark Forest	Shale Sandstone Transition Forest in the Sydney Basin Bioregion listed as Critically Endangered under the BC Act Shale Sandstone Transition Forest of the Sydney Basin Bioregion listed as Critically Endangered under the EPBC Act.	N/A	N/A
Beyond study area	PCT 3615 – Sydney Hinterland Apple-Blackbutt Gully Forest	Not a TEC	N/A	N/A

3.2 Threatened ecological communities

PCT 0 is the only vegetation that would be affected by the proposal, the other PCTs mentioned and mapped (see Table 3-2 above) being outside the extent of the proposed work areas. PCT 0 does not conform to a TEC.

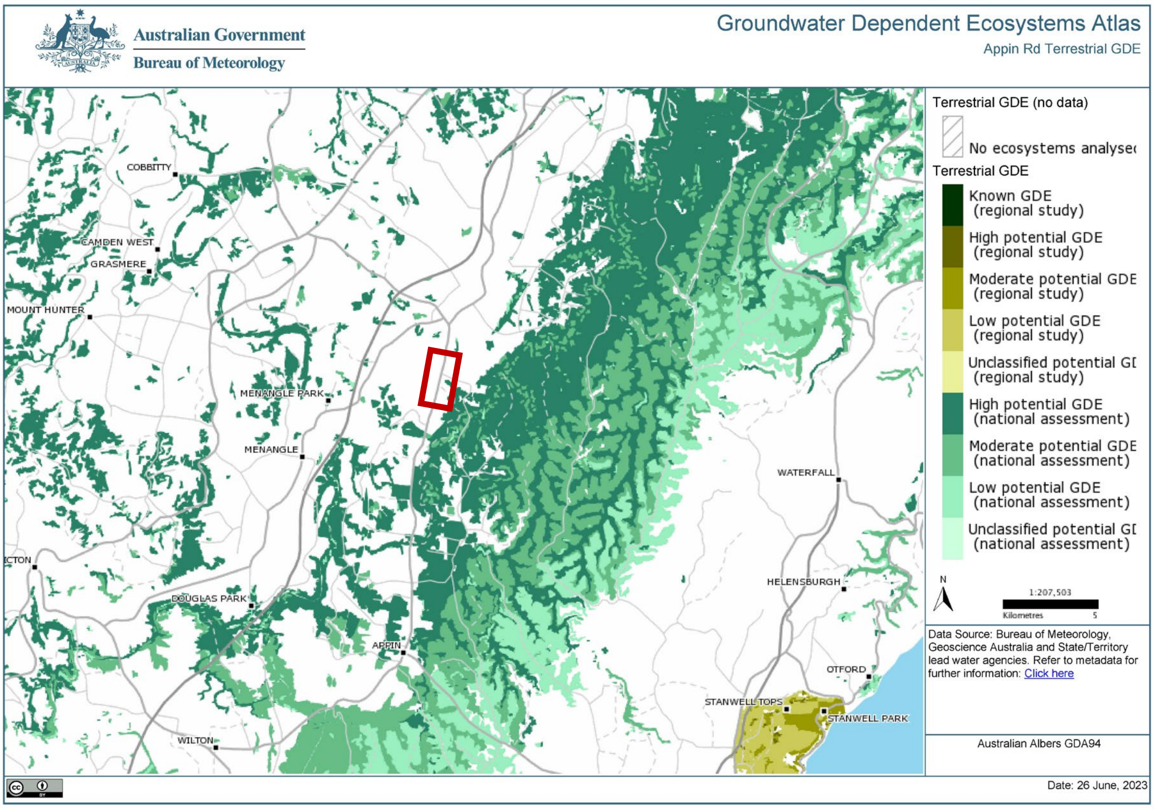
Although PCT 3320 and 3321 are associated with TECs, no disturbances to the vegetation beyond the boundaries of the proposed construction impact footprint are expected to occur. Upon inspection, the area directly adjacent to these mapped PCTs were found to be highly disturbed, open areas, dominated by exotic grasses.

3.3 Groundwater dependent ecosystems (GDE)

GDEs are communities (i.e., of plants, animals and other organisms) which have their species composition and natural ecological processes wholly or partially determined by groundwater (Serov *et al*. 2012).

Reference to the GDE Atlas (BoM 2023b) did not map any Terrestrial or Aquatic GDE within the study area. No subterranean GDE were identified or analysed for the study area (Figure 3-3 and Figure 3-4).

The level of water dependence of vegetation communities has been identified in the *Risk Assessment Guidelines for Groundwater Dependant Ecosystems* released by the NSW Department of Primary Industries (Serov *et al*. 2012).



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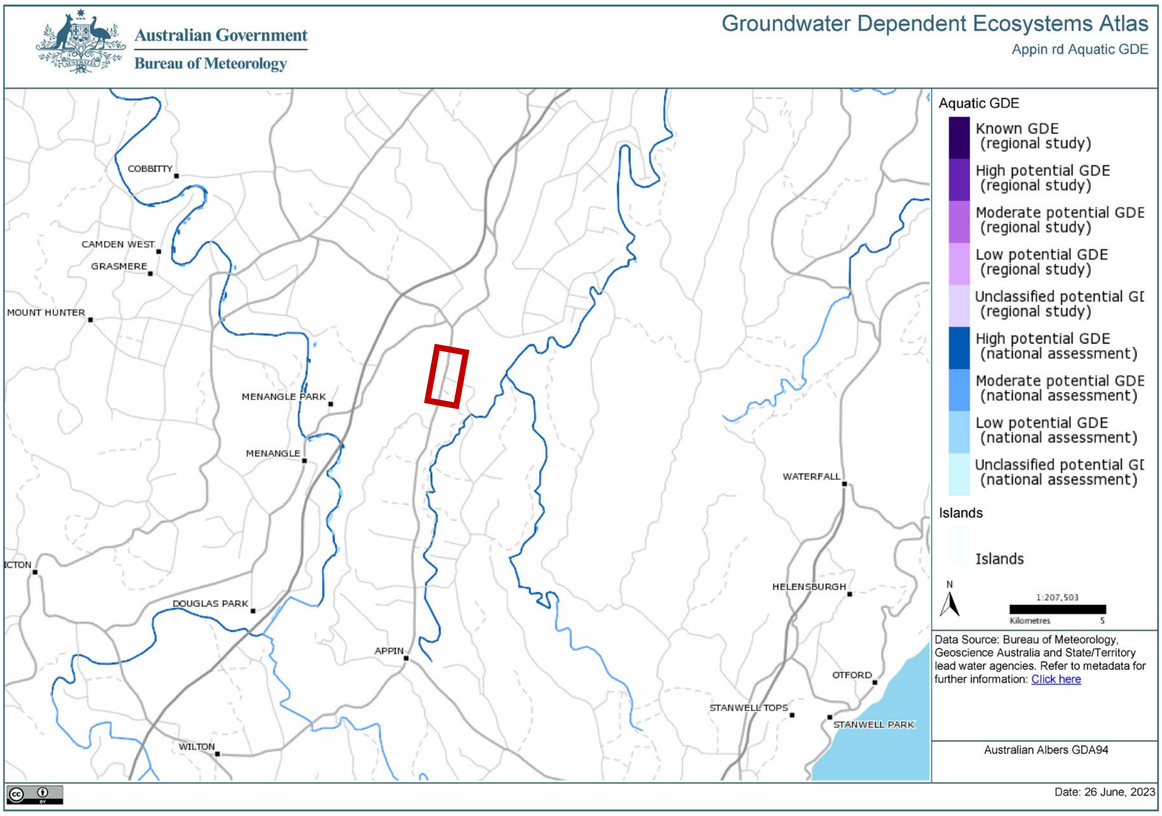


Figure 3-4: Aquatic groundwater dependent ecosystems (red box indicative of study area)

3.4 Threatened species

Prior to conducting the field investigation, a review of the DCCEEW PMST and BioNet databases (DCCEEW 2023a, NSW DCCEEW 2023a) identified 39 threatened flora species and 62 threatened fauna species, listed under the EPBC and/or BC Acts that have been previously recorded or are considered to have habitat within 10 km of the study area (Appendix B). Those flora and fauna species that have been previously recorded within 10 km of the study area as per the BioNet Atlas are presented in Figures 3-5 and 3-6 (note: the locations where some species were recorded overlap). Due to a lack of their necessary habitats within the area investigated, oceanic, estuarine, wetland and/or fish species were not considered.

While previously recorded within and/or predicted as having habitat within 10 km of the study area, the majority of threatened species identified during the literature search were assessed to have only a 'low' likelihood of occurrence, given the disturbed and highly modified condition of the road corridor investigated. These species would not occur within, or be reliant upon, the disturbed road corridor, with the majority of these animals and plants having specific habitat requirements (as identified in Appendix B), no significant components of which are present within, or close to, the proposed work areas. Better resources are present within the surrounding, larger stands of bushland.

In the case of fauna, numerous highly mobile threatened species with large territorial requirements (e.g., bats, birds, ground traversing mammals) may traverse or occupy the study area on occasion. Only those that have a documented association with those habitat components that were identified within the study area would be considered for assessment under the EPBC and/or BC Acts.

Reference to the National Flying-fox monitoring viewer (DCCEEW 2023f) did not identify any flying-fox camps present within, or near to, the study area. The nearest Flying-fox camp (Campbelltown [489]) is located 2 km north of the study area; last surveyed during 2021, with up to 2499 Grey-headed Flying-fox (*Pteropus poliocephalus*) being recorded. While individuals may fly over and/or forage within, and close to, the study area, the Grey-headed Flying-fox (Vulnerable EPBC and BC Acts) is not considered to be reliant on the vegetation that would be cleared to permit the Appin Road and St Johns Road intersection upgrade for any of its lifecycle requirements.

By the completion of the field survey, four native birds had been recorded within, or in proximity to, the study area (Table 3-3). In addition, one introduced species was also recorded. A list of recorded flora species is provided in Appendix E.

No threatened flora or fauna species listed under the EPBC or BC Acts were detected within the study area.

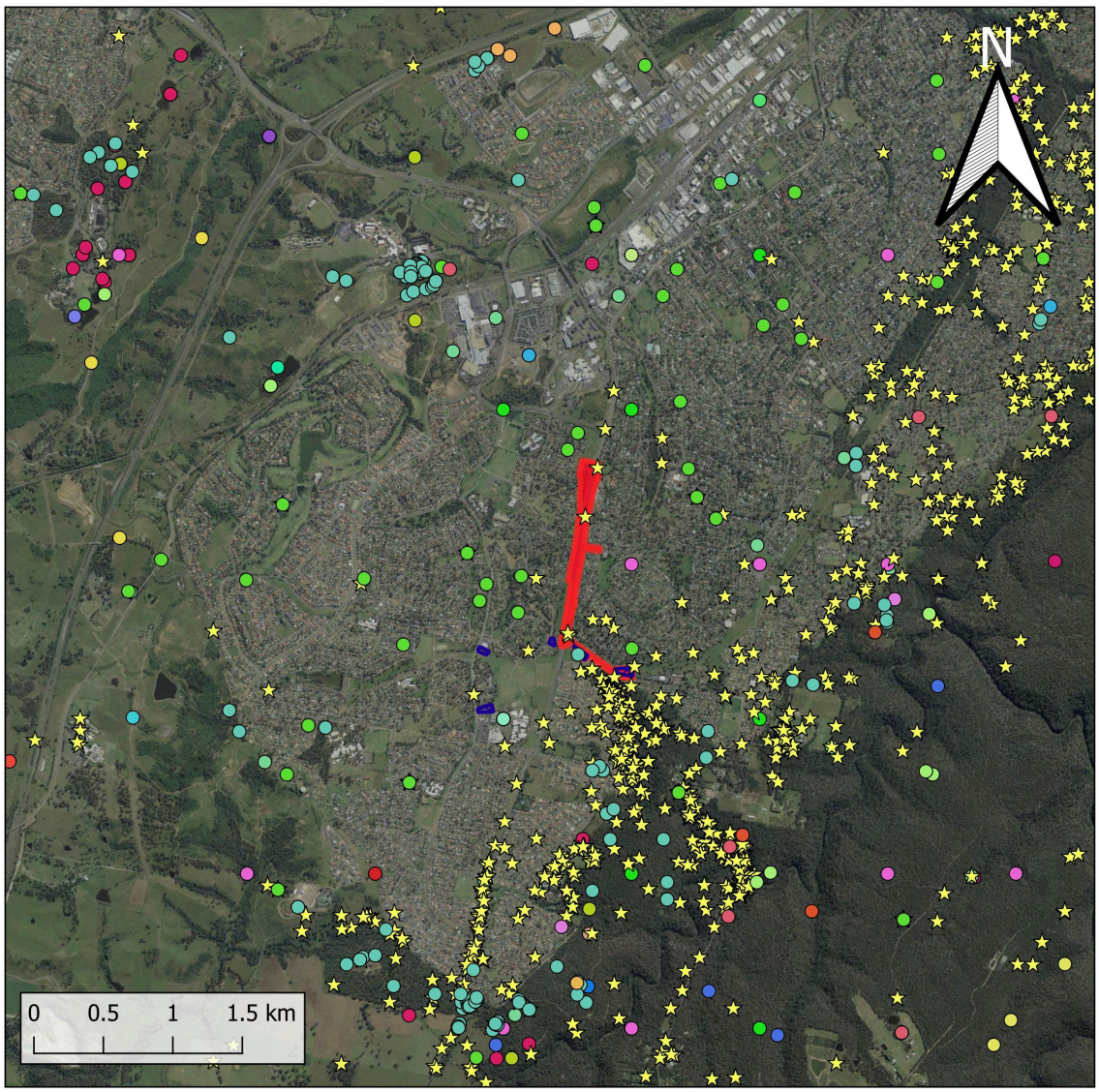
Similarly, during the course of the ecological investigations conducted to inform the previous BAR, no threatened plants or their necessary habitat were recorded during targeted threatened flora surveys (WSP and RMS 2018b).

Table 3-3: Recorded fauna species

KEY

*-introduced

Common name	Scientific name	Detection method
BIRDS		
Rainbow Lorikeet	*Trichoglossus haematodus*	Observed
Noisy Miner	*Manorina melanocephala*	Observed
Magpie-lark	*Grallina cyanoleuca*	Observed
Willie Wagtail	*Rhipidura leucophrys*	Observed
* Common Myna	*Sturnus tristis*	Observed



Legend

Proposal area
Compound site

Previously recorded threatened fauna
- Barking Owl
- Black-necked Stork
- Broad-headed Snake
- Cumberland Plain Land Snail
- Dural Land Snail
- Dusky Woodswallow
- Eastern Coastal Free-tailed Bat
- Eastern False Pipistrelle
- Eastern Pygmy-possum
- Freckled Duck
- Gang-gang Cockatoo
- Giant Burrowing Frog
- Glossy Black-Cockatoo
- Greater Broad-nosed Bat
- Green and Golden Bell Frog
- Grey-headed Flying-fox
- Koala
- Large Bent-winged Bat
- Little Eagle
- Little Lorikeet
- Masked Owl
- Powerful Owl
- Red-crowned Toadlet
- Regent Honeyeater
- Scarlet Robin
- Southern Myotis
- Square-tailed Kite
- Squirrel Glider
- Swift Parrot
- Varied Sittella
- White-bellied Sea-Eagle
- White-throated Needletail
- Yellow-bellied Glider
- Yellow-bellied Sheathtail-bat

Date prepared 10/23

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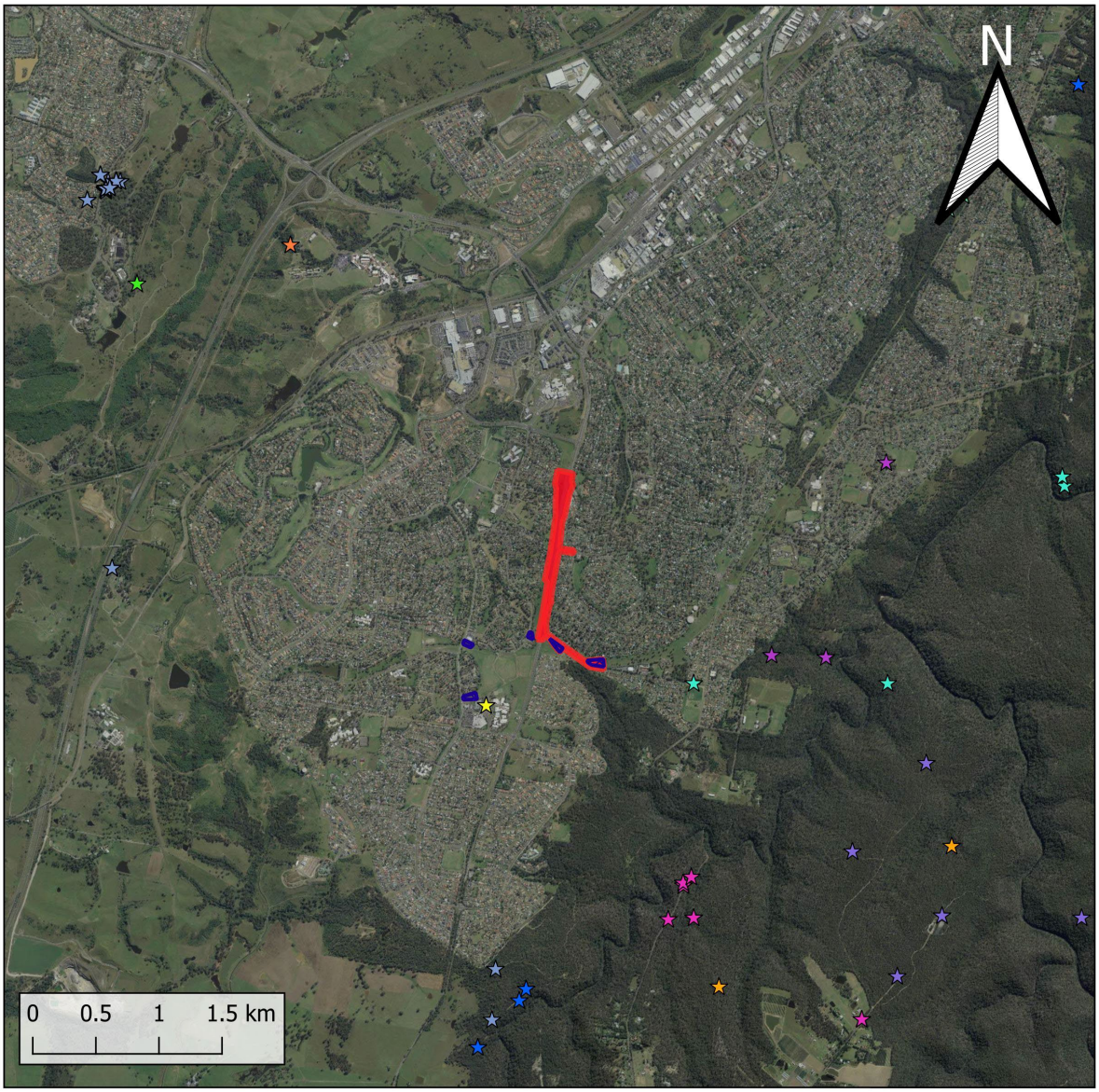

Legend

- Proposal area
- Compound site

Previously recorded threatened flora

- Genoplesium baueri
- Grevillea parviflora subsp. parviflora
- Hibbertia puberula
- Leucopogon exolasius
- Marsdenia viridiflora subsp. viridiflora
- Melaleuca deanei
- Persoonia hirsuta
- Pimelea spicata
- Pomaderris brunnea
- Prostanthera marifolia
- Syzygium paniculatum

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Date prepared 10/23

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With reference to Section 3.8.2 of the previous BAR (WSP and RMS 2018b), and Appendix B of this report per the BioNet database, as threatened species have been previously recorded within the study area (including the Cattle Egret (*Ardea ibis*), Little Lorikeet (*Glossopsitta pusilla*) and Cumberland Plain Land Snail (*Meridolum corneovirens*[2]), and as suitable habitat is present and is to be impacted by the proposal (i.e., four hollow-bearing trees and a number of Koala habitat trees), and as no targeted nocturnal work was conducted, it was considered appropriate to adopt a precautionary approach to the potential presence of the threatened species identified in Table 3-4. As the remaining species identified within Table 3.12, Section 3.8.2 of the previous BAR, lacked suitable habitat within the current study area, those species were not considered likely to be present.

It is acknowledged that the Cattle Egret (*Ardea (Bulbulcus) ibis*), listed as Marine under the EPBC Act, was recorded during the previous investigation (WSP and RMS 2018b) within agricultural land not present within the current assessed study area. As no suitable habitat is present for this species within, or proximate to, the impact footprint of the proposal, the Cattle Egret is not considered likely to occur. As such, no further legislative assessment for this species was considered necessary.

Targeted searches for the Cumberland Plain Land Snail did not reveal any individuals. Additionally, no discarded shells indicative of this animal was located. The site investigation identified that, within the area surveyed, no suitable habitat for this species is present. The area investigated is highly disturbed, being regularly slashed and mown.

Refer to Section 5.1.2 for further details in regard to the proposal's impact on the potentially occurring fauna species.

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<u>KEY</u>

Vulnerable (V), Endangered (E)

Species name	EPBC Act	BC Act	Identification method	Results
Koala *Phascolarctos cinereus*	E	E	Presence (distinctive scats) previously detected (WSP and RMS 2018b)	Species/Ecosystem credit species. Scats were previously recorded as part of the 2018 investigation. Suitable habitat within study area, with feed and use trees to be impacted. Assessment required.
Squirrel Glider *Petaurus norfolcensis*	—	V	Previously recorded (NSW DCCEEW 2023a)	Species credit species. Utilises hollows, and suitable habitat in the form of four hollow-bearing trees is proposed to be removed. Assessment required.
Golden-tipped Bat *Phoniscus papuensis*	—	V	Previously recorded (NSW DCCEEW 2023a)	Ecosystem credit species. Is a hollow-dependent microbat, and suitable habitat in the form of four hollow-bearing trees is proposed to be removed. Assessment required.
Yellow-bellied Sheathtail-bat *Saccolaimus flaviventris*	—	V	Previously recorded (NSW DCCEEW 2023a)	Ecosystem credit species. Is a hollow-dependent microbat, and suitable habitat in the form of four hollow-bearing trees is proposed to be removed. Assessment required.
Eastern False Pipistrelle *Falsistrellus tasmaniensis*	—	V	Previously recorded (NSW DCCEEW 2023a)	Ecosystem credit species. Is a hollow-dependent microbat, and suitable habitat in the form of four hollow-bearing trees is proposed to be removed. Assessment required.

[2] Reference to the previous BAR notes that all of the threatened species recorded were located south of the study area in areas where more developed remnant vegetation occurs (WSP and RMS 2018b).

Species name	EPBC Act	BC Act	Identification method	Results
Eastern Coastal Free-tailed Bat *Micronomus norfolkensis*	—	V	Previously recorded (NSW DCCEEW 2023a)	Ecosystem credit species. Is a hollow-dependent microbat, and suitable habitat in the form of four hollow-bearing trees is proposed to be removed. Assessment required.
Southern Myotis *Myotis macropus*	—	V	Previously recorded (NSW DCCEEW 2023a)	Species credit species. Utilises hollows, and suitable habitat in the form of four hollow-bearing trees is proposed to be removed. Assessment required.
Greater Broad-nosed Bat *Scoteanax rueppellii*	—	V	Previously recorded (NSW DCCEEW 2023a)	Ecosystem credit species. Utilises hollows, and suitable habitat in the form of four hollow-bearing trees is proposed to be removed. Assessment required.
Little Bent-winged Bat *Miniopterus australis*	—	V	Previously recorded (NSW DCCEEW 2023a)	Species/Ecosystem credit species. Utilises hollows, and suitable habitat in the form of four hollow-bearing trees is proposed to be removed. Assessment required.
Gang-gang Cockatoo *Callocephalon fimbriatum*	E	V	Previously recorded (NSW DCCEEW 2023a)	Species/Ecosystem Potential habitat within study area is to be removed. Assessment required.
Little Lorikeet *Glossopsitta pusilla*	—	V	Previously recorded (WSP and RMS 2018b)	Ecosystem Potential habitat within study area is to be removed. Assessment required.
Varied Sittella *Daphoensitta chrysoptera*	—	V	Previously recorded (NSW DCCEEW 2023a)	Ecosystem Potential habitat within study area is to be removed. Assessment required.

3.5 Areas of outstanding biodiversity value (AOBV)

The DCCEEW's Register of Critical Habitat (DCCEEW 2023e) and NSW DCCEEW's AOBV register (NSW DCCEEW 2023b) (in conjunction with Part 3 of the *Biodiversity Conservation Regulation 2017*) per listings provided under the EPBC and/or BC Acts, did not identify any gazetted areas of critical habitat or AOBV for any flora or fauna species, populations or communities occurring within or near to the proposed work areas.

3.6 Wildlife connectivity corridors

Limited wildlife connectivity currently exists between areas of vegetation east-west of the study area due to the presence of Appin Road (>20 m wide), which currently presents an adverse impact on east-west movement patterns of those ground traversing species recorded or expected to occur within the investigated area.

The area investigated, being the existing road corridor of a 2.2 km length of Appin Road and a 130 m length of connecting St Johns Road, is located within a heavily urbanised and disturbed landscape. Three reserves, these being Woodland Road Reserve, Pinaroo Reserve and Flynn Reserve, are located along the investigated 560 m length of Woodland Road, which intersects with Appin Road at the southern extent of the study area. Vegetation was observed to be sparse at these locations, being mostly grassy open areas with small sections of vegetation containing trees consistent with those species recorded (Appendix C). The south-eastern extent of the subject site along Woodland Road runs parallel to dense bushland within St Helens Park, and connects to nearby Holsworthy Military Reserve.

A relatively continuous vegetated corridor encompassing several conservation reserves and protected lands extends from [within the surrounding region] Dharawal National Park (about 4.5 km south-east of the study area area) to the Upper Nepean and Macquarie National Park on the south coast (about 60 km south of the

study area). The connectivity of this corridor is important for the dispersal, movement, interbreeding and migratory needs of a number of native species.

3.6.1 Koala corridors

Reference to the Koala corridors in south-west Sydney SEED dataset (State Government of NSW and NSW DCCEEW 2023) identifies that, proximate to the study area, mapped woodland/forest vegetation south adjacent of Woodland Road, beyond the existing road corridor and proposal impact footprint, is mapped as Koala Corridor. This mapped corridor extends beyond the study area to the east. Refer to Figure 5-2 within Section 5.1.2.

3.7 SEPP (Biodiversity and Conservation) 2021

Chapter 4 - Koala Habitat Protection 2021

The City of Campbelltown LGA is identified under Schedule 2 - LGAs of the SEPP and is within the Central Coast Koala Management Area. This Policy seeks to encourage the proper conservation and management of areas that provide habitat for Koalas.

Chapter 4 'Koala habitat protection 2021' of the SEPP only applies to development applications assessed under Part 4 of EP&A Act, not those considered under Part 5. That stated, it remains Transport's practice to consider the SEPP criteria as part of the environmental assessment process, and it is recommended that the proposal consider the mitigation measures and recommendations within the *Campbelltown Comprehensive Koala Plan Of Management* (Phillips 2018) that has been prepared for the Campbelltown LGA.

The study area contains one BCSEPP Schedule 1 Feed tree species, and five Schedule 3 Koala use trees species (Table 3-5). Of these, two Forest Red Gum individuals (feed tree) and 82 Koala use trees will require removal to permit the proposal.

Although considered and targeted, no evidence (i.e., sightings, calls, scats etc.) to suggest that the area investigated supported a resident Koala population were identified. During the course of the field investigation, no distinctive scratchings were noted on the trunks of the two Forest Red Gum individuals proposed for removal and no droppings were noted around their base or within their drip lines.

Reference to the BioNet Atlas (NSW DCCEEW 2023a) identified five previous Koala records within the study area, with the most recent detections of these being three sightings in 2019, one in 2018 and one in 2015. Beyond the limits of the proposal, numerous Koala sightings have previously been recorded in the surrounding locality, these outlined in Figure 3-5 (see page 16 above); the most recent being recorded on 30 April 2023 at 3:15 PM [location (E) 299066, (N) 6224507, across from the soccer field grandstand, about 680 m south-east of the proposed compound site on Woodland Road.

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Species	Koala Feed Tree (Schedule 1 of BCSEPP)	Koala Use Tree (Schedule 3 of BCSEPP)	Removal	Retain
Thin-leaved Stringy Bark *Eucalyptus eugenioides*	—	Y	6	1
Forest Red Gum *Eucalyptus tereticornis*	Y	—	2	20
Narrow-leaved Ironbark *Eucalyptus crebra*	—	Y	37	1
Spotted Gum *Corymbia maculata*	—	Y	28	32
Broad-leaved Paperbark *Melaleuca quinquenervia*	—	Y	0	1
Turpentine *Syncarpia glomulifera*	—	Y	11	0

In accordance with the following definitions provided under Chapter 4, Section 4.2 of the SEPP, the study area is not considered to constitute Core Koala habitat:

(a) an area of land which has been assessed by a suitably qualified and experienced person as being highly suitable koala habitat and where koalas are recorded as being present at the time of assessment of the land as highly suitable koala habitat, or

(b) an area of land which has been assessed by a suitably qualified and experienced person as being highly suitable koala habitat and where koalas have been recorded as being present in the previous 18 years.

3.7.1 Campbelltown Koala Plan of Management (CKPoM)

The purpose of the CKPoM is to "provide for the long-term maintenance of a viable, free-ranging koala population in the Campbelltown LGA." This vision is to be realised by way of the following aims:

a) To the maximum extent possible, enable persistence of a koala population of at least 300 koalas over the life of the Plan

b) To support the harmonious co-existence of the community with koalas

c) To provide regulatory and non-regulatory mechanisms to safeguard the future of the Campbelltown koala population.

Of the 10 objectives provided within the CKPoM to achieve the aims, two have relevance to the proposal; these being:

- Minimising koala mortalities due to vehicle-strike and domestic dog attacks
- Securing financial compensation through DAs for the removal of (P)KFTs, and shelter trees; and utilising funds to provide resources for koala habitat restoration and rehabilitation initiatives.

It is not considered that the proposed intersection works, this essentially upgrading the existing road network, will increase koala mortalities or domestic dog attacks beyond those that are currently occurring along this stretch of road.

While the proposal is not a Development Application, in line with the calculations per Transports's *Tree and Hollow Replacement Guidelines* (2023), to replace the loss of 93 trees (including Koala feed and use trees) expected to be removed to permit the proposal, Transport are required to re-plant 388 trees (and three artificial hollows) within the project boundary, or on land adjacent or close to the project with landowner's consent (Refer to Figure 5-1 in Section 5.1.1 for the surveyed locations of trees to be removed). Final determination of the location and species of trees to be planted is required through consultation with Campbelltown City Council and a Transport Landscape Advisor. Where tree and hollow replacement cannot be accommodated for locally [or only partially], Transport will be required to transfer up to $47,000 into the Transport Conservation Fund.

3.8 Matters of National Environmental Significance

By the completion of the field investigation no TEC, or threatened flora or fauna listed under the EPBC Act had been recorded within, or near to, the study area.

Though not recorded during the current investigation, as they have been previously recorded, and as suitable habitat is present and may be impacted by the proposal (i.e., four hollow-bearing trees and Koala habitat trees), it was considered appropriate to adopt a precautionary approach to the potential presence of the following threatened fauna species listed under the EPBC Act:

- Koala – listed as Endangered
- Gang-gang Cockatoo – listed as Endangered.

Reference to the PMST did not identify any World or national heritage listed places, nor Wetlands of international importance, within, or near to, the study area. Additionally, no TECs predicted to occur near the subject site would be reliant upon the fauna habitats or vegetation communities present, and none would be affected by the conducting of the activities proposed.

4. Avoidance and minimisation

The key part of Transport's management of biodiversity for this proposal is the application of the 'avoid, minimise, mitigate and offset' hierarchy as follows:

- Avoid and minimise the impact first
- Mitigate the impact where avoidance is not possible, and
- Offset where residual impact cannot be avoided.

4.1 Application of avoid and minimise principles

Given that the proposal is directly related to proposed intersection upgrade work of Appin and St Johns Roads, an alternative location is not feasible. The objectives of the proposal are to address inadequate infrastructure, improving quality and safety at this location for motorists. The proposed work would take place within and adjacent to the existing modified/disturbed road corridor and encompass a total construction/disturbance area of about 13.8 ha.

Designs for the intersection upgrades/improvements are currently being finalised. The design process will involve an assessment to consider suitable remediation options and select the most appropriate solution with regard to minimising impact on the ecological values of the subject site wherever possible.

While disturbance/removal of about 1.2 ha of native vegetation is unavoidable in order to achieve the overall objectives of the project, the amount and quality of vegetation to be cleared/disturbed is considered to provide minimal habitat resources for those species recorded, or potentially occurring, given the extent of similar retained vegetation within the surrounding locality. Vegetation clearance and work limits would be identified both on site maps/plans and on-site through the erection of temporary exclusion fencing, bunting or similar in accordance with Guide 2 of Transport's *Biodiversity Management Guidelines* (Transport 2024). Fencing etc. would be established at the outer limits of the drip line of any retained trees present and the areas marked as 'no-go zones', to avoid indirect impact. Vegetation clearance would be limited to the minimum required to successfully complete the proposal; with the selection of equipment to be used also aimed at minimising clearance requirements.

The proposal would require the removal of 93 trees (16 small, 65 medium and 12 large), comprised of four hollow-bearing trees and 82 Koala feed and use trees. Of those mature trees to be removed, avoidance of significant increases in canopy width would be applied; while hollow-bearing trees are recommended to be retained where possible. The proposed work would not clear all trees present within the proposal impact footprint, only those immediately adjacent to, and within, the road corridor that would otherwise prevent the undertaking the project should they remain. The retention of others within the investigated area will continue to maintain habitat connectivity.

To address the loss of 93 trees, 388 trees would be planted in line with Transport's *Tree and Hollow Replacement Guidelines* (2023) (EMF-BD-GD-0129). Where tree replacement cannot be accommodated locally [or only partially], payment of $47,000 must be made to the Transport's Conservation Fund.

To avoid the removal of additional vegetation, five temporary compound/stockpile sites required to assist the proposal would be located within existing cleared/disturbed areas directly off Woodland Road, within Woodland Road Reserve and Flynn Reserve, and within, and to the north-east of Rosemeadow Reserve, Rosemeadow, the closest site located about 350 m east beyond the limits of the proposal.

5. Impact assessment

Direct impacts as a result of conducting the scope of work proposed includes the disturbance/removal of up to 13.8 ha, of which only 1.2 ha of native and exotic vegetation, including the removal of 93 trees – comprised of four hollow-bearing trees and Koala feed and use trees would be disturbed.

As they have been previously recorded, and suitable habitat for threatened species considered likely to occur is to be impacted, precautionary assessments have been conducted on the following threatened species: Koala, Squirrel Glider, Yellow-bellied Sheathtail-bat, Eastern False Pipistrelle, Eastern Coastal Free-tailed Bat, Southern Myotis, Greater Broad-nosed Bat, Golden-tipped Bat, Little Bent-winged Bat, Gang-gang Cockatoo, Little Lorikeet and Varied Sittella.

Further potential indirect impact includes temporary noise and/or vibration levels, erosion, injury and/or mortality to fauna, edge effects, weed proliferation and introduction of pathogens.

No significant adverse impact is expected during the operational phase of the proposal.

Mitigation measures have been provided in Section 6 of this report.

5.1 Construction direct impacts

5.1.1 Removal of native vegetation

By the completion of the field survey a number of native and exotic plants were recorded within the area investigated (Appendix E). It is noted that Appendix E is not intended to be a comprehensive list of all species present within the area investigated, and only represents those plants that were recorded whilst conducting searches for:

- those native species and ecological communities of State and/or national conservation concern that are known, or expected to occur, in the locality, and
- weeds of significance that would require treatment (refer to Section 5.2.4).

Based on a worst-case estimate it is expected that 1.2 ha of native and exotic vegetation would be disturbed/removed to permit the proposal (Table 5-1). Similar resources will be retained within the study area and beyond. Post work, the site will not be permitted to naturally regenerate due to the expansion of the current road boundary.

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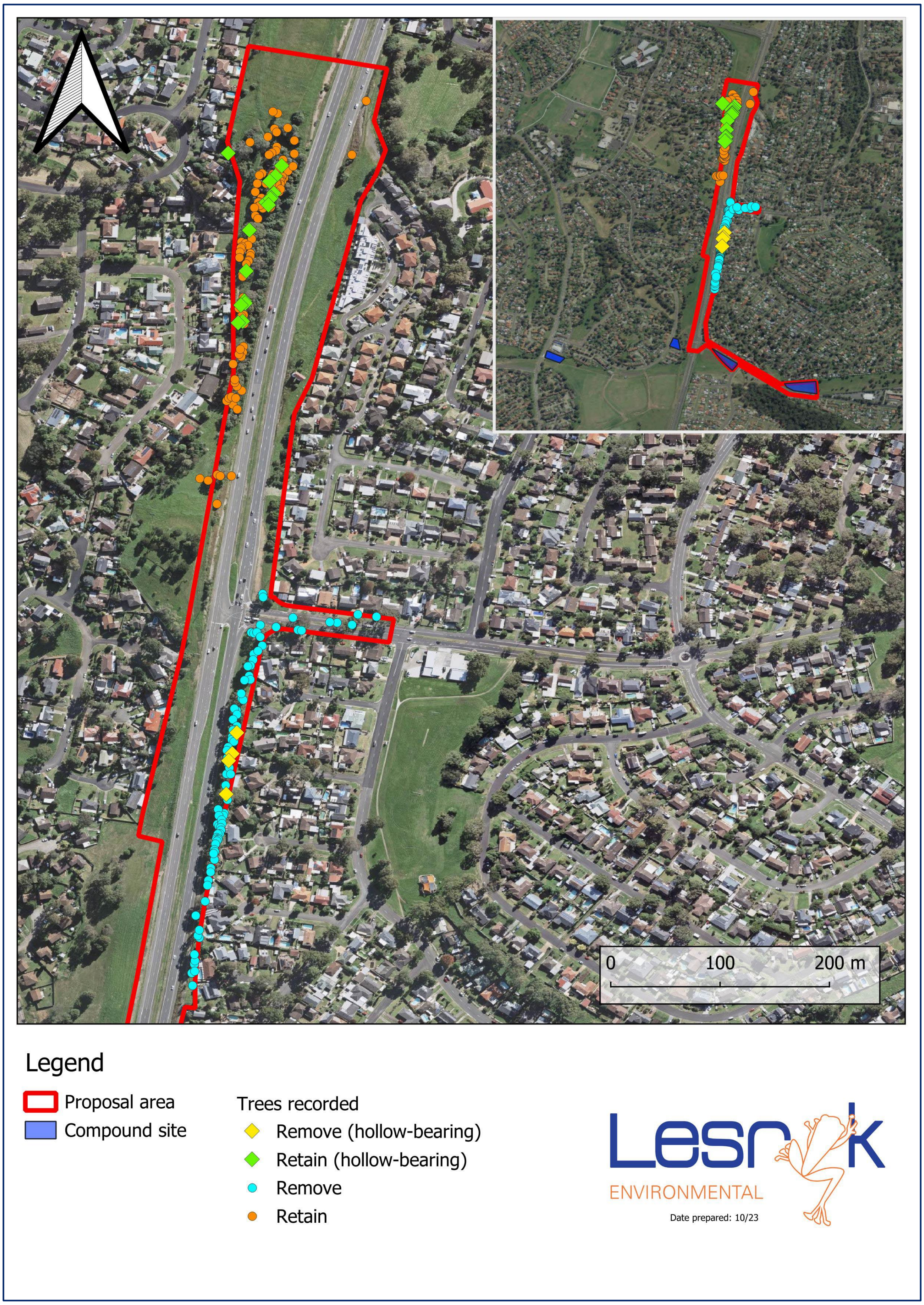
Veg. zone	Plant community type (PCT)	Broad condition class	TEC	Area to be impacted (ha or m^2)
Veg disturbance Area	PCT 0 – Not native vegetation	Disturbed	N/A	1.2 ha

By the completion of the investigation, 240 trees had been recorded; 93 of which are within the proposed impact footprint of the intersection upgrade work and face potential removal (Figure 5-1, Appendix C). The 93 trees are comprised of 16 small, 65 medium and 12 large trees; four of which are considered to be hollow-bearing, with 82 listed as Koala feed and use trees (refer to Section 5.1.2). Of the mature trees to be removed, avoidance of significant increases in canopy width would be applied. No extra-large trees require removal.

It is noted that, within the area investigated, three amenity trees were present: one Poplar tree (*Populus simonii*) to be retained, and two Brush Box trees (*Lophostemon confertus*) that are expected to be removed.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Proposal area
Compound site
Trees recorded
Remove (hollow-bearing)
Retain (hollow-bearing)
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Date prepared: 10/23

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Relevant to the proposal's impact on vegetation, the following Key Threatening Processes (KTP) listed under Schedule 4 of the BC Act are applicable:

- Clearing of native vegetation
- Loss of hollow-bearing trees.

Given the extent of similar resources within the study area and beyond, and provided recommended mitigation measures (refer to Section are adopted, the loss of 1.2 ha of native and exotic vegetation, this including the clearing of 93 trees, four of which are hollow-bearing, is not considered to significantly contribute to, or increase the impact of these KTP.

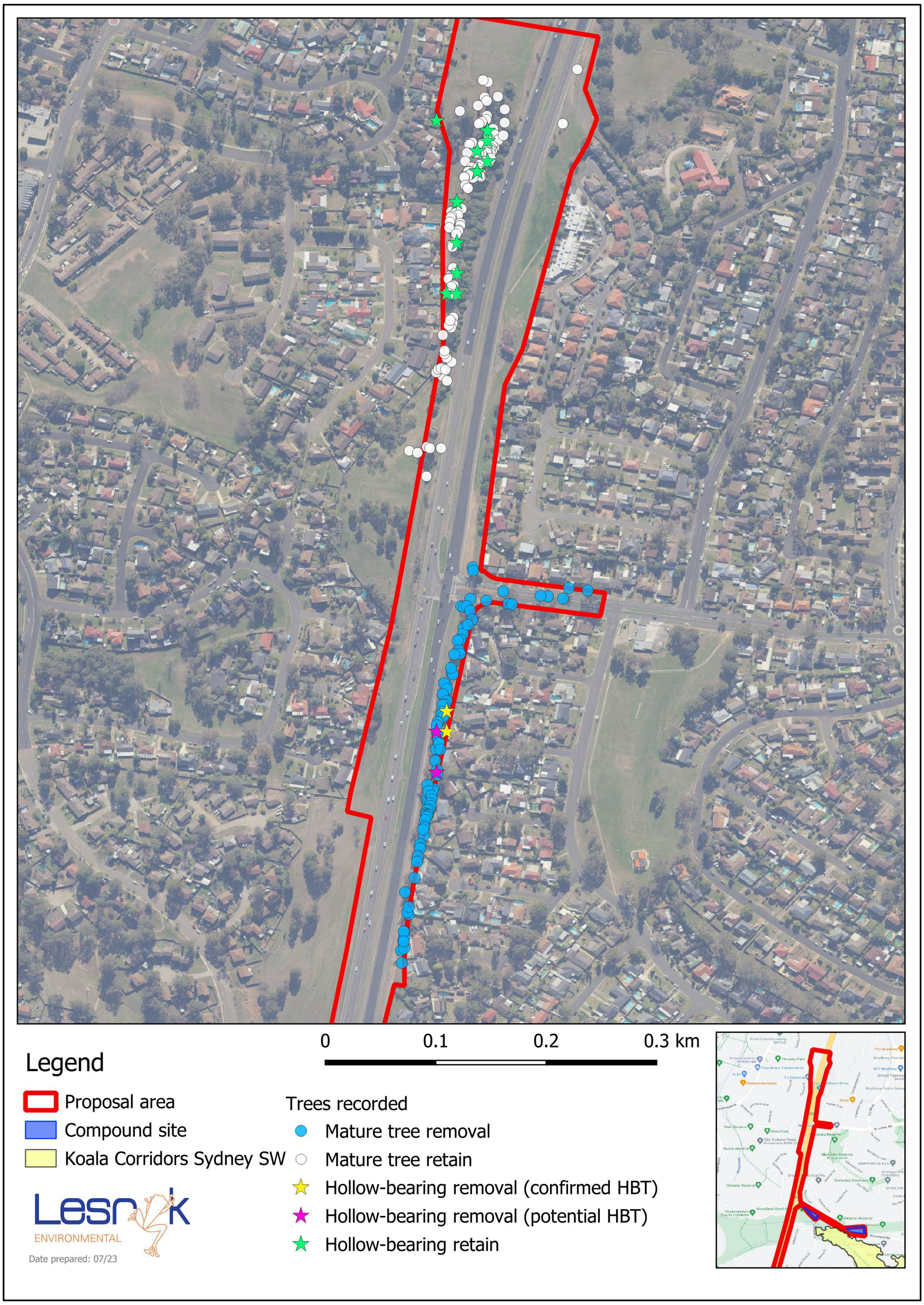
To minimize any impact associated with the removal of native vegetation, recommended mitigation measures are provided in Section 6. Additionally, those outcomes required per the *Tree and hollow replacement guidelines* for trees to be removed are provided in Section 7.2.

5.1.2 Removal of threatened fauna habitat

The four native birds recorded within, or in proximity to, the study area would not be solely reliant upon those habitats present within, or near to, the subject site such that the removal or disturbance of these would threaten the 'local' occurrence of these animals. These birds are protected, as defined by the BC Act, but are considered to be common to abundant throughout the surrounding region, all being well-conserved in the nearby conservation and protected lands areas. The species recorded are all expected to be present within both the study area and surrounding locality post-work.

Four hollow-bearing trees within the proposal impact footprint are proposed to be cleared (Figure 5-2). The hollow-bearing trees exhibited hollows between 5-25 mm in diameter, which could be occupied by hollow-dependent native fauna such as microbats, small to medium-sized birds and small to medium-sized arboreal mammals.

Additionally, two Koala feed trees and 82 Koala use trees listed under Schedules 1 and 3 of BCSEPP will require removal to permit the proposal (Figure 5-3).



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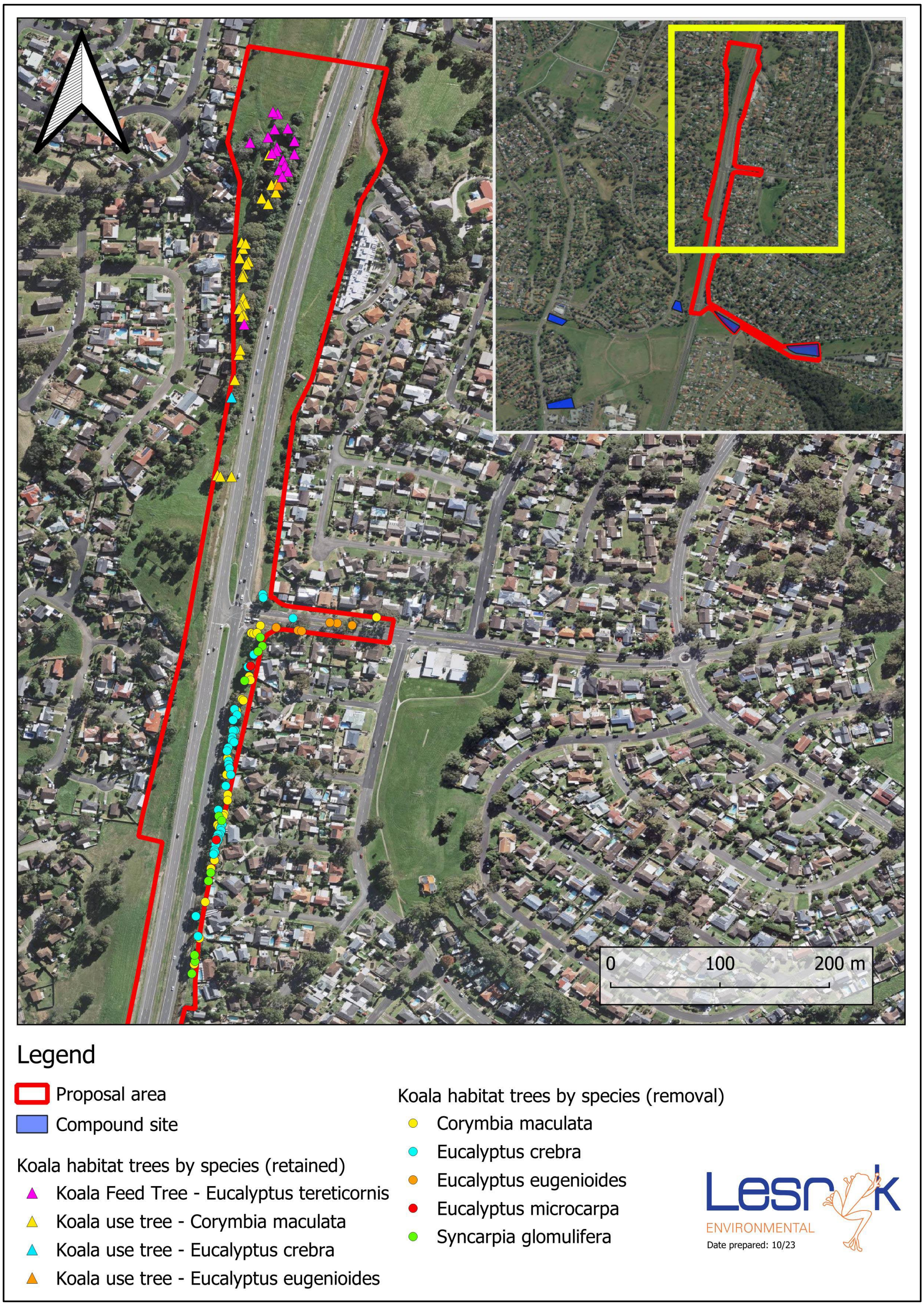

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While no threatened fauna species listed under the EPBC or BC Acts were recorded during the investigation, in reference to Section 3.4 of this BAR, Table 5-5 (below) identifies the threatened fauna considered to potentially occupy habitat within the study area that is to be impacted by the proposal.

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Species name	EPBC Act	BC Act	Credit type	Potential occurrence	Impact of associated habitat in subject land
Koala	E	E	Species/Ecosystem	High	Loss of two feed trees (Forest Red Gum *Eucalyptus tereticornis*). Loss of 82 use trees.
Squirrel Glider	—	V	Species	Moderate	Loss of four hollow-bearing trees
Yellow-bellied Sheathtail-bat	—	V	Ecosystem	Moderate	Loss of four hollow-bearing trees
Eastern False Pipistrelle	—	V	Ecosystem	Moderate	Loss of four hollow-bearing trees
Eastern Coastal Free-tailed Bat	—	V	Ecosystem	Moderate	Loss of four hollow-bearing trees
Southern Myotis	—	V	Species	Moderate	Loss of four hollow-bearing trees
Greater Broad-nosed Bat	—	V	Ecosystem	Moderate	Loss of four hollow-bearing trees
Golden-tipped Bat	—	V	Ecosystem	Moderate	Loss of four hollow-bearing trees
Little Bent-winged Bat	—	V	Species/Ecosystem	Moderate	Loss of four hollow-bearing trees
Gang-gang Cockatoo	E	V	Species/Ecosystem	Moderate	Potential habitat within study area is to be removed.
Little Lorikeet	—	V	Ecosystem	Moderate	Potential habitat within study area is to be removed.
Varied Sittella	—	V	Species	Moderate	Potential habitat within study area is to be removed.

The removal of up to 93 trees would not result in a significant amount of canopy vegetation being cleared along the investigated sections of Appin and St Johns Roads. Where possible, it is recommended hollow-bearing trees be retained.

It is acknowledged that, while previously recorded within 10 km of the proposed works, large hollow-dependent fauna [such as the Greater Glider (*Petauroides volans*) and Powerful Owl (*Ninox strenua*)] do not require consideration as they occupy trees with hollow entrance diameters of >30 cm; none of the plants present within the proposed tree removal area conforming to this.

During the site investigation, no obvious nests (including large stick nests) or dreys were observed. Within the proposed works area, no culverts that could potentially be occupied by cave-dependent microbats were noted. No rock outcrops are present within or adjacent to the proposed work boundary.

The BC Act listed KTP 'Loss of hollow-bearing trees' is addressed in Section 5.1.1 above.

To minimise any impact associated with the removal of four hollow-bearing trees and the numerous Koala habitat trees, recommended mitigation measures are provided in Section 6.

Removal of habitat within the study area would be carried out in accordance with Guide 4 of the *Biodiversity Management Guidelines* (Transport 2024).

5.1.3 Removal of threatened flora

No threatened flora species listed under the EPBC or BC Acts were recorded or considered likely to occur within the area investigated.

5.1.4 Aquatic impacts

As noted, the one waterway within the study area – Spring Creek (in the southern portion of the subject site) – is not identified as KFH, nor a Class 1 or Class 2 waterway.

The proposed intersection upgrade work within the existing modified and disturbed alignment of Appin and St Johns Roads is terrestrial and will not involve any significant drainage activities; therefore, the proposal is not considered to have an adverse direct or indirect impact on Spring Creek.

The subject site does not contain any native vegetation communities reliant on surface or ground water flows.

Reference to the Fisheries NSW Spatial Data Portal (DPI 2023b) did not map Spring Creek as distribution for any threatened fish species. As no threatened aquatic species, ecological communities or their habitats are considered to occur within the study area, no assessments of significance on these, referencing the EPBC Act Significant Impact Guidelines or the criteria listed under Part 7A, Division 12, s.221ZV of the FM Act, are required.

No consultation with **DPI Fisheries**, nor permits (e.g., s.201, 205 or 219) in accordance with the FM Act, is considered necessary.

No land identified by SEPP Resilience and Hazards 2021 (i.e., coastal wetlands), with reference to the SEED map viewer (NSW Government 2023e) occurs within, or near to, the study area.

No aquaculture, commercial or recreational fishing occurs within, or near to, the study area.

During the proposed work, construction activities have the potential to impact the water quality of nearby waterways (i.e., changes to turbidity and sedimentation) through erosion, off-site sediment movement and dirty water. Erosion and sediment control measures will be implemented and maintained in accordance with *Managing Urban Stormwater: Soils and Construction* (Landcom 2004). Temporary stockpile sites will be managed in accordance with Transport's Stockpile Site Management Guideline (EMS-TG-10).

5.1.5 Injury and mortality

Four hollow-bearing trees will require removal to permit the proposal. Mitigation measures have been provided in Section 6 to minimise any potential fauna impact associated with the removal of these trees.

Vegetation clearing to permit the proposal would involve the removal of up to about 1.2 ha of native and exotic vegetation (i.e., trees, groundcover vegetation, shrubs and natural ground debris). Given the proposal would be conducted within a previously modified and disturbed environment, there is minimal expectation that sheltering animals would be injured during the course of the proposed work.

During the construction phase of the proposal some urban adaptable, sheltering fauna species (i.e., frogs and ground-traversing mammals) could be present and be subject to injury. Mitigation measures to minimise the impact of the proposed work on animals (such as checking beneath vehicles/machinery prior to their use) have been provided to address this matter (Section 6).

Reference to the BioNet (NSW Department of Climate Change, Energy, Environment and Water 2023a), and the details provided in regards to the species records, notes that none of the fauna records for the area investigated pertain to vehicle struck injured/deceased animals.

Beyond current levels of impact due to the existing presence of Appin Road and St Johns Road, and the volume of traffic that typically use this network, the operational phase of the proposal is not expected to significantly increase injuring or mortality of fauna within the study area. With the removal of existing road side vegetation, the proposal is not expected to significantly alter vehicle strikes on those fauna species recorded or potentially occurring, than may be currently transpiring. Removal of road side plants may reduce the potential for any vehicles strikes as it would increase interactions between native fauan and motor vehicles. The proposal would not have an adverse impact on the long-term viability of these species or their local populations.

5.1.6 Groundwater dependent ecosystems (GDE)

No Terrestrial or Aquatic GDE is mapped within the study area (refer to Section 3.3).

In reference to the DPI (Office of Water)'s *Risk assessment guidelines for groundwater dependent ecosystems* (Serov *et al.* 2012), Table 5-6 summaries potential impacts to GDE. The proposed intersection upgrade work is not likely to result in changes to water quantity, water quality, an aquifer structure or land use to the extent that there is an expected impact to GDEs; and, with the adoption of mitigation measures, would not contribute to the off-site movement of sediment.

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Potential impact	Activities	Likelihood of impact from proposal
Changes to water quantity	Water extraction; removal of water bodies; river regulation; drainage of swamps; water extraction from dewatering; aquifer and river flow direction alteration.	The proposed work within the existing alignment of Appin Road and St Johns Road is terrestrial and would not involve any activities that directly or indirectly impact a waterway/drainage line. The proposal is not likely to result in changes to water quantity that may impact GDEs.
Changes to water quality	Nutrient enrichment; turbidity; salinity; pesticide and fertiliser use; effluent discharge; contaminated sites (nutrients, heavy metals hydrocarbons); irrigation and mining tail water; exposure of acid sulfate soils.	The proposal is not likely to lead to an increase in groundwater contamination. There is not likely to be any impacts to downstream waterways from disturbance of acid sulfate soils. Potential for turbidity from potential groundwater interaction during construction would be temporary and minimal. Therefore, the proposal is not likely to result in changes to water quality that may impact GDEs.
Changes to aquifer structure	Compaction of aquifer by dewatering; subsidence, fracturing and bedrock/stream bed cracking.	The proposed work does not involve dewatering. The proposal is not likely to result in changes to aquifer structure that may impact GDEs.
Changes to land use	Erosion and sedimentation; sealing of land surface by urban developments in highly porous recharge zones; sand and gravel extraction from alluviums and rivers; grazing; lakebed cropping; changes in drainage; modification of watercourse structure; afforestation or deforestation; fire; excavation for developments.	The CEMP would detail measures to prevent erosion and sedimentation impacts on local waterways, such as the use of sediment fencing. There is the potential for excavation works to intersect with the groundwater; however, it is unlikely an underlying aquifer would be impacted.

Potential impact	Activities	Likelihood of impact from proposal
		The proposal is therefore not likely to result in changes to land use that may impact GDEs.

5.2 Indirect and operational impacts

5.2.1 Edge effects on adjacent native vegetation and habitat

Weeds are readily spread (and are spreading) by existing dispersal factors such as wind, birds, water and the movement of vehicles along the investigated road. Clearing and opening up of new vegetation edges can facilitate the recruitment of these species and provide opportunity for the establishment of other weed species. These weeds are often able to out-compete native flora and fauna species and reduce the habitat values of these areas. While this is the case, edge effects beyond those that are currently occurring within the section of Appin Road and St Johns Road investigated are not expected to be exacerbated due to the carrying out of the proposed work.

5.2.2 Wildlife connectivity and habitat fragmentation

Based on a worst-case scenario, the site investigation identified that 1.2 ha of vegetation will require removal, including 93 trees, comprised of four hollow-bearing trees and numerous Koala habitat trees; this considered to affect terrestrial and arboreal mammals, reptiles and amphibians.

The proposal would not require fauna exclusion fencing and glider crossings.

In the operational phase of the proposal (post-work), flying species, and those highly tolerant of traversing urban environments/infrastructure, currently negotiating the proposed work areas of the road network, are considered to continue to do so post-work.

Temporary measures incorporated as part of the proposed work (i.e., erosion and sediment controls, exclusion fencing) would be established in accordance with applicable guidelines to prevent direct or indirect impact on fauna.

No migration of fauna species would be adversely impacted by the proposal.

5.2.3 Injury and mortality

The potential for fauna injury and mortality impact, beyond that identified during the construction phase of the proposal (Section 5.1.5) or currently occurring along Appin Road and St Johns Road at this location, would not increase during the operational phase of the proposal.

5.2.4 Invasion and spread of weeds

Under the *Biosecurity Act 2015*, 'all plants are regulated with a general biosecurity duty to prevent, eliminate or minimize 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 minimized, so far as is reasonably practicable.'

Of the introduced plants recorded, those listed under Schedule 3 of the NSW Biosecurity Regulation 2017, as a Priority Weed for the Greater Sydney Region (which includes Campbelltown LGA) (DPI 2023a), and that are a Weed of National Significance (Weeds Australia 2023)[3], are outlined in Table 5-4.

Treatment of these weeds prior to the commencement of the road works is recommended. That stated, it is noted these exotic species occur beyond the limits of the work. As such, dispersal of propagules from these adjacent areas into the study area is likely to occur post-work. As part of the ongoing maintenance of the road

[3] The list of WoNS is part of a combined State and Commonwealth initiative to combat invasive species.

corridor, regular treatment of weeds is recommended, though this may also require a multi-disciplinary approach with other government agencies.

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Weed	Schedule 3 of the NSW Biosecurity Regulation 2017	Weeds of National Significance (WoNS)	Priority weeds for the Greater Sydney region (including Campbelltown LGA)
Prickly Pear	☒	☒	☒
Blackberry	☒	☒	☒
Asparagus Fern	☒	☒	☒
Bridal Creeper	☒	☒	☒
Climbing Asparagus	☒	☐	☒
African Olive	☐	☒	☒
Coolatai Grass	☐	☒	☐

5.2.5 Invasion and spread of pests

Beyond the existing diversity of exotic species and pests recorded, or predicted to occur, the proposed works would not have an adverse impact on the introduction or increased presence of these. The works will not benefit any exotic pests at the expense of native species.

5.2.6 Invasion and spread of pathogens and disease

There is a risk that the proposal would introduce, spread or exacerbate the plant diseases caused by *Phytophthora cinnamomi* and Myrtle Rust (*Puccinia psidii*). These diseases are most likely introduced or spread through the importation or movement of soil, water and landscaping materials, either directly or through incidental attachment to machinery.

'Infection of native plants by *Phytophthora cinnamomi*' and 'Dieback caused by the root-rot fungus (*Phytophthora cinnamomi*)', are listed KTP's under the BC and EPBC Acts, respectively. 'Introduction and establishment of Exotic Rust Fungi of the order Pucciniales pathogenic on plants of the family Myrtaceae' is listed as a KTP under the BC Act and the disease is covered by the EPBC Act listing of 'Novel biota and their impact on biodiversity' as a KTP.

Although there was no obvious evidence for the presence of *Phytophthora cinnamomi* or Myrtle Rust in the vegetation of the study area, recommendations to disinfect vehicles and machinery prior to their use have been presented in Section 6.

5.2.7 Changes to hydrology

As identified in Section 4.1.4 of the previous BAR (WSP and RMS 2018b), the existing hydrological conditions of the study area are already influenced by altered landform and stormwater runoff as a result of surrounding landuses. Provided recommended mitigation measures are adopted, the proposal is not considered to significantly impact the hydrological or ecological integrity of the surrounding environment.

5.2.8 Noise, light, dust and vibration

During construction, activities associated with the proposal may cause additional noise and vibration; however, given the presence of the existing road corridor, it is not considered that the proposal would result in adverse changes to existing levels of noise, vibration and/or light from this existing source such that there would be a significant impact to native fauna species.

The proposed work impact is considered to be temporary and short-term. The Draft Construction Noise Guideline (NSW EPA 2020) would be referenced, as would compliance of all vehicles and machinery with industry noise guidelines.

5.3 Cumulative impacts

In consideration of the vegetation and habitat removal assessed within this report, the proposal is not expected to contribute to an adverse cumulative ecological impact in a local and regional context; nor is it considered to further contribute to the decline of any threatened species, populations or ecological communities within the locality.

The area investigated is also part of the overall upgrading works of 5.4 km of Appin Road between Mount Gilead in the south, and the intersection of St Johns Road, Bradbury, in the north. Although unrelated to the current proposal, this being the intersection upgrade, these works will result in the removal of vegetation, this being discussed in the approved REF prepared to consider that aspect of the activity (refer to s.6.12 of the approved REF) (RMS 2018). When considered with reference to the amount of vegetation to be removed as part of the proposal considered in the approved REF, the works associated with the Appin Road and St Johns Road intersection upgrade works are not considered to have an adverse cumulative impact.

Based on a worst-case estimate, the cumulative impact of the proposal would disturb/remove up to 1.2 ha of native and exotic vegetation, including 93 trees. The works will not remove any threatened species or TEC, nor significantly fragment or isolate areas of wildlife connectivity or habitat.

Through the proposed intersection upgrade works conducted at Appin and St Johns Roads, the cumulative beneficial impacts would include improvements to the safety and functionality of the roadway.

5.4 Assessments of significance

To consider the impact the proposed intersection upgrade works may have on the potentially occurring Koala and hollow-dependent fauna, assessments referencing the EPBC Act's Significant Impact Guidelines and criteria provided under Section 7.3 of the BC Act have been conducted (Appendix F); the findings of these summarised in Tables 5-9 and 5-10.

Table 5-5: Summary of BC Act significance assessments findings

Significance assessment question *(per Section 7.2 of the BC Act and Threatened Species Test of Significance Guidelines (OEH 2018))*						
Threatened species, or communities	**a**	**b**	**c**	**d**	**e**	**Likely significant impact?**
Koala	N	X	N	N	N	No
Squirrel Glider	N	X	N	N	N	No
Yellow-bellied Sheathtail-bat	N	X	N	N	N	No
Eastern False Pipistrelle	N	X	N	N	N	No
Eastern Coastal Free-tailed Bat	N	X	N	N	N	No
Southern Myotis	N	X	N	N	N	No
Greater Broad-nosed Bat	N	X	N	N	N	No
Golden-tipped Bat	N	X	N	N	N	No
Little Bent-winged Bat	N	X	N	N	N	No
Gang-gang Cockatoo	N	X	N	N	N	No
Little Lorikeet	N	X	N	N	N	No
Varied Sittella	N	X	N	N	N	No

Y = Yes (negative impact), N = No (no or positive impact), X = Yes/No answer not applicable, ... = unknown impact.

Table 5-6: Summary of EPBC Act significance assessments findings

Threatened species, or communities	Important population *(per Significant Impact Guidelines 1.1 (DoE 2013))*	Likely significant impact?
Koala	No	No
Gang-gang Cockatoo	No	No

Y = Yes (negative impact), N = No (no or positive impact), X = Yes/No answer not applicable, ... = unknown impact.

6. Mitigation

Table 6-1 provides a number of mitigation measures that aim to ensure that the proposed work carried out does not have an adverse impact on those environments that occur within or near to the study area.

Where applicable, safeguards are made with reference to Transport's *Biodiversity Management Guidelines* (Transport 2024).

Table 6-1: Mitigation measures

ID	Impact	Mitigation measure	Timing and duration	Likely efficacy of mitigation	Residual impacts anticipated?	Responsibility
B01	General	An Erosion Sediment Control Plan (ESCP) would be prepared for the proposal and would be in line with the publication *Managing Urban Stormwater: Soils & Construction Guidelines* (Landcom 2004).	Detailed design	Effective	N/A	Project Manager Contractor
B02		A Construction Environmental Management Plan (CEMP) would be prepared for the proposal.	Prior to construction	Effective	N/A	Project Manager Contractor
B03		A Tree and Hollow Replacement Plan is to be prepared (this can be prepared as part of the proposal's CEMP within the REF).	Prior to construction	Effective	N/A	Transport/Project Manager
B04		The temporary compound/stockpile sites will be restricted to the identified existing cleared areas adjacent to Woodland Road, Dickens Road, and Copperfield Drive. All temporary stockpiles to be managed in accordance with Transport's Stockpile Site Management Guidelines (EMS-TG-10)	Prior/during construction	Effective	N/A	Project Manager Contractor
B05		The unexpected species find procedure is to be followed under Biodiversity Guidelines: Protecting and managing biodiversity on Transport projects (Transport 2024) if threatened ecological communities and threatened fauna or flora not assessed in this biodiversity assessment, are identified in the proposal site.	During construction	Proven	N/A	Environment manager
B06		All personnel working on site will receive training to ensure awareness of environment protection requirements to be implemented during the project (i.e., site induction, 'toolbox' briefings).	Prior to construction	Effective	N/A	Project Manager Contractor
B07		Spill kits commensurate with the type and quantity of hazardous material used must be available on-site.	During construction	Effective	N/A	Project Manager
B08		If required, refuelling of machinery is to occur within an impervious bunded area located more than 50 m from any drainage line to prevent the escape of substances into the surrounding environment.	During construction	Effective	N/A	Contractor
B09	**Removal of native vegetation**	Native vegetation removal will be minimised through detailed design.	Detailed design	Effective	Loss of 1.2 ha of native/exotic vegetation, including 93 trees (composed of 16	Project Manager
B10		Vegetation clearance limits would be identified both on site maps/plans and on-site through the erection of temporary exclusion fencing, bunting or similar in accordance with *Guide 2: Exclusion Zones* (Transport 2024).	Prior to construction	Effective		Project Manager/ Environment manager/

ID	Impact	Mitigation measure	Timing and duration	Likely efficacy of mitigation	Residual impacts anticipated?	Responsibility
					small, 65 medium, 12 large).	Contractor
B11		Fencing etc. would be established at the outer limits of the drip line of any retained trees and the areas marked as 'no-go zones' to avoid direct impact.	Prior to construction	Effective		Project Manager/ Environment manager/ Contractor
B12		Pre-clearing surveys will be conducted in accordance with *Guide 1: Pre-clearing process* (Transport 2024).	Prior to construction	Effective		Ecologist/ Environment manager
B13		Vegetation removal will be conducted in accordance with *Guide 4: Clearing of vegetation and removal of bushrock* (Transport 2024).	During construction	Effective		Contractor
B14		Clearing of native vegetation would be limited to the minimum required to successfully permit the proposal.	During construction	Effective		Contractor
B15		Removed native and non-seed-bearing exotic vegetation would be mulched or re-used on-site (e.g., to stabilise disturbed areas).	During/post construction	Effective		Contractor
B16		Vegetation removal work is not to be conducted during periods of high winds.	During construction	Effective		Contractor
B17		To replace the loss of 93 trees, 388 trees will be planted per the *Tree and hollow replacement guidelines*.	Post-construction	Effective	No	Project Manager/ Environment Manager
B18		Should planting within the project boundary or on land adjacent or close to the project not occur, Transport would be required to transfer up to $47,000 into the Conservation Fund.	Pre-construction	Effective	No	Transport
B19		Native vegetation will be re-established in accordance with *Guide 3: Re-establishment of native vegetation* (Transport 2024).	Post-construction	Proven	No	Contractor
B20	**Removal of threatened fauna habitat**	Threatened fauna habitat (i.e., hollow-bearing trees, Koala feed/use trees) removal will be minimised through detailed design (i.e., with a view to retain these habitat features if possible).	Detailed design	Effective	Loss of fauna habitat.	Project Manager
B21		Habitat removal will be conducted in accordance with *Guide 4: Clearing of vegetation and removal of bushrock* (Transport 2024).	During construction	Effective		Contractor

ID	Impact	Mitigation measure	Timing and duration	Likely efficacy of mitigation	Residual impacts anticipated?	Responsibility
B22		Retained hollow-bearing trees would be clearly identified on-site prior to the commencement of work to ensure they are not indirectly impacted or cleared.	Prior to construction	Effective		Project Manager Ecologist/ Environment Manager
B23		Fauna will be managed in accordance with *Guide 9: Fauna handling* (Transport 2024).	During construction	Effective		Ecologist/licensed wildlife carer
B24		Up to one week prior to the removal of the four identified hollow-bearing trees, an ecologist is to inspect and mark the trees, identify potential fauna relocation sites and communicate requirements to the clearing contractor. An ecologist must be present on-site during the removal of the four hollow-bearing trees. The ecologist is to: • Develop lines of communication with the tree felling operator • Inspect each tree prior to its clearing • Inspect the tree once it is on the ground • Collect and relocate locally any sheltering fauna • Transport to a local veterinarian any animals that require treatment. Preference is to be given to removing the trees during the autumn/winter months when it is unlikely that any cavities would be occupied by breeding animals. During this period consideration is to be given to any sheltering fauna or over-wintering animals that may be present. Consideration is to be given to the use of soft fall techniques where fauna may be present within the hollow bearing trees and cannot be otherwise relocated prior to clearing.	Prior to construction During construction	Proven		Ecologist/licenced wildlife carer
B25		If an arborist [or similar] is to be employed, they would climb each identified hollow-bearing tree and provide confirmation if the predicted hollows are actual cavities. • Whilst examining the tree, the arborist is to use a hand-held torch to inspect any cavities for sheltering animals. A photographic record of the cavity is to be obtained, this included in a pre-clearing report that is submitted to the appropriate Transport Environmental representative. • If animals are observed sheltering in the cavity, the entrance is to be temporarily plugged through the placement of a breathable material (cloth bag, towel etc.). The limb/branch is then to be roped off; a chainsaw being used to remove this from the main	During construction	Effective		Contractor Ecologist/licenced wildlife carer

ID	Impact	Mitigation measure	Timing and duration	Likely efficacy of mitigation	Residual impacts anticipated?	Responsibility
		plant (the cut made at least 100 mm beyond the predicted limit of the cavity). The limb is to be gently lowered to the ground, relocated to the edge of the road corridor and the cloth plug removed (if possible, upon dusk). The sheltering animal is to be permitted to naturally disperse from the cavity. • If birds are present, particularly fledglings, these are to be collected and taken to a wildlife carer or veterinarian for assessment.				
B26		Prior to the trees' removal (if an excavator employed) these would be knocked several times to alert potential sheltering fauna and provide an opportunity for these animals to disperse. The trees would not be felled till approval from the ecologist is given.	During construction	Effective		Contractor Ecologist/licenced wildlife carer
B27		If possible, all vegetation around the hollow-bearing trees to be removed would be cleared 24 to 48 hours prior to the removal of the hollow-bearing trees. This approach isolates the hollow-bearing trees and reduces their habitat value (particularly for ground-traversing fauna that are exposed to predation).	During construction	Effective		Contractor
B28		Hollow-bearing limbs would be removed by chainsaw and lowered to the ground, the cut being about 100 mm below the bottom of the cavity. Once on the ground, the ecologist, or similar, would inspect the cavities for sheltering species.	During construction	Effective		Contractor Ecologist/licenced wildlife carer
B29		Felled habitat trees will be relocated, replaced or re-instated in accordance with *Guide 5: Re-use of woody debris and bushrock* (Transport 2024) to minimize loss or damage to native fauna habitats.	During construction	Effective		Contractor Environment Manager
B30		To replace the loss of a calculated one 'occupied' hollow from the cumulative five hollows from within four hollow-bearing trees to be removed, three artificial hollows as per the *Tree and hollow replacement guidelines* would be established. Artificial hollows would be provided in accordance with *Guide 8: Artificial hollows* (Transport 2024).	Post-construction	Effective	No	Project Manager/ Environment Manager
B31		Where hollow replacement cannot be accommodated for locally [or only partially], payment of $500 would be made into the Transport Conservation Fund for each hollow replacement required (Refer to Section 7.2).	Pre-construction	Effective	No	Transport

ID	Impact	Mitigation measure	Timing and duration	Likely efficacy of mitigation	Residual impacts anticipated?	Responsibility
B32	**Removal of threatened flora**	The unexpected species find procedure is to be followed (Transport 2024) if threatened flora species, not assessed in the biodiversity assessment, are identified in the proposal site.	During construction	Proven	No	Environment Manager
B33	**Changes to hydrology**	Changes to existing surface water flows will be minimised through detailed design.	Detailed design	Effective	Minor alteration to surface water flows.	Project Manager
B34	**Edge effects on adjacent native vegetation and habitat**	Exclusion zones will be set up at the limit of clearing in accordance *with Guide 2: Exclusion zones* (Transport 2024).	Prior to/during construction	Effective	No	Ecologist/ Project Manager
B35	**Injury and mortality of fauna**	Fauna will be managed in accordance with *Guide 9: Fauna handling* (Transport 2024).	During construction	Effective	While provided mitigation measures are effective in minimising fauna injury and mortality, they are unlikely to completely prevent it. Some loss of individuals of native animal species may occur during construction and operation of the road. However, the potential mortality of fauna is unlikely to significantly increase the likelihood of the loss of any local native animal populations.	Ecologist/licensed wildlife carer/ Environment Manager
B36		Inspections for the presence of any sheltering fauna would be carried out beneath vehicles/machinery prior to use.	During construction	Effective		Contractor
B37		Any sheltering native species would be collected and relocated locally by a licenced individual (nocturnal species to be released on dusk). If injured, native wildlife would be taken to a local veterinarian or wildlife carer for treatment. Once rehabilitated, these native animals must be released at their point of capture. Exotic injured wildlife would be taken to a local veterinarian and ethically treated.	During construction	Effective		Ecologist/licensed wildlife carer/ Environment Manager
B38		Minimising road-kill will be delivered in the detailed design of the road and associated infrastructure (e.g., fencing) and landscaping.	Detailed design	Effective		Project Manager

ID	Impact	Mitigation measure	Timing and duration	Likely efficacy of mitigation	Residual impacts anticipated?	Responsibility
B39	**Invasion and spread of weeds**	Weed species will be managed in accordance *with Guide 6: Weed management* (Transport 2024).	Prior/during construction	Effective	No	Botanist or similarly qualified personnel
B40		In accordance with the NSW *Biosecurity Act 2015*, any Blackberry, Prickly Pear, Asparagus Fern, Bridal Creeper, Climbing Asparagus, African Olive and Coolatai Grass identified on site would be controlled (i.e., treated in accordance with approved weed management techniques such as hand removal or application of a suitable herbicide), thereby resulting in its suppression.	Prior/during construction	Effective	No	Botanist or similarly qualified personnel
B41		A botanist is to identify the location of this exotic plant at the commencement of the works thereby ensuring their removal.	Prior/during construction	Effective	No	Botanist or similarly qualified personnel
B42		Weed contaminated green waste will be disposed of appropriately at a licensed landfill facility.	During/post construction	Effective	No	Contractor
B43		All vehicles/machinery would enter the site via stabilised areas to prevent the introduction and spread of weed seeds and/or pathogens.	During construction	Effective	No	Contractor
B44	Invasion and spread of pathogens and disease	Pathogens (e.g., *Phytophthora cinnamonmi*) will be managed in accordance with *Guide 2: Exclusion zones* and *Guide 7: Pathogen management* (Transport 2024), including the following hygiene protocols: • Before entering and leaving areas of native vegetation, or any adjacent bushland sites, workers are to remove excess soil and mud and then spray boots, tools, gloves and small equipment with recommended disinfectant supplied by the contractor (70% Methylated spirits / 30% Water) until runoff is clear. • Avoid unnecessary soil disturbance.	During construction	Effective	Minimal. With the implementation of measures, the risk of introducing pathogens would be low.	Contractor/ Project Manager
B45	Noise, light, dust and vibration	Residents within the study area (100 m radius from study area) will be notified prior to work commencing. The notification is to include: • The duration of work and working hours • How to lodge a complaint or obtain more information • Contact name and details.	Prior to construction	Effective	No	Project Manager
B46		Potential dust impact generated from activities (e.g., mulching) would be monitored (i.e., to ensure it is not reducing traffic visibility). If dust impact is more than manageable, work will stop and the work method reviewed.	During construction	Effective	No	Contractor

ID	Impact	Mitigation measure	Timing and duration	Likely efficacy of mitigation	Residual impacts anticipated?	Responsibility
B47		All plant/equipment to be used on site will be designed and operated to control the potential emission of smoky exhaust fumes into the atmosphere. All machinery/vehicles are to be operated within standard guidelines.	During construction	Effective	No	Contractor
B48		Construction activities would be limited to the period provided in the Draft Construction Noise Guideline (EPA 2020), and are subject to Transport Traffic Management Centre Road Occupancy Lane approvals and requirements. Night works are required as lane closures are not permitted during the day: • 8.00 pm to 5.00am Sunday to Thursday. • No work on public holidays.	During construction	Effective		Contractor

7. Offsets and other measures

7.1 Thresholds

The proposed works would trigger thresholds set out by *No Net Loss Guidelines* (Transport 2022a) listed in Table 7-1 (refer to Section 7.2 of this report).

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Impact	Threshold	Triggered
Works involving clearing of a CEEC	Where there is any clearing of an CEEC in 'moderate to good' condition	No
Works involving clearing of an EEC	Where clearing of a EEC ≥ 2 ha in 'moderate to good' condition	No
Works involving clearing of VEC	Where clearing of VEC ≥ 5 ha in 'moderate to good' condition	No
Works involving clearing of any habitat for a known species credit fauna species or clearing of breeding habitat (as defined by the TBDC) for dual-credit fauna species (excluding exotic and planted vegetation that cannot be assigned to a plant community type)	Where clearing ≥ 1 ha in 'moderate to good' condition	No
Works involving removal of known threatened flora species and their habitat	Where loss of individuals is ≥10 or where clearing of habitat is ≥ 1 ha	No
Type 1 or Type 2 key fish habitats	Where there is a net loss of habitat	No
Any residual biodiversity impact that doesn't require offsets in accordance with the No Net Loss Guideline is to be assessed against the requirements of the *Tree and Hollow Replacement Guideline.*	Any clearing of hollows and/or trees ≥5cm DBH	Yes – clearing of 93 trees, with four being hollow-bearing. Refer to Table 7.2 below.

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Study area	PCT 0	Not native vegetation/Unclassified	Not a TEC	1.2 ha	Tree replacement is required.

7.2 Biodiversity offset strategy/tree and hollow replacement plan

The proposed work will require the removal of 93 trees; four of which are hollow-bearing.

Transport's *Tree and hollow replacement guidelines* (Transport 2023) provides a calculation to assess the number of replacement plants and hollows (Table 7-3). In accordance with Section 2.4 of the *Tree and hollow replacement guidelines*, where tree replacement cannot be accommodated locally [or only partially], payment must be made to Transport's Conservation Fund as per the rates set out in Table 7-4. For trees with multiple stems/trunks, the replacement/payment required is only calculated for the largest stem DBH. To calculate hollow replacement, an occupancy rate of 20% is to be assumed; being that for every five hollows identified (or where less than five hollows will be impacted), assume one hollow will be occupied and requires replacement. Where hollows are inspected during the clearing process, actual occupation can be used as the basis for the replacement requirement.

¥%Ł þ ĊťĀ½**Tree replacement requirements**

Tree size	Tree replacement requirement
Small tree (DBH 5 – 20 cm)	Plant minimum two trees
Medium tree (DBH 20 – 50 cm)	Plant minimum four trees
Large tree (DBH 50 – 100 cm)	Plant minimum eight trees
Very Large tree (DBH > 100 cm)	Plant minimum 16 trees
Hollow replacement requirement	Provide three artificial hollows for every occupied hollow removed

¥%Ł þ Ċťā ½**Conservation Fund contribution**

Tree size	Tree replacement requirement
Small tree (DBH 5 – 20 cm)	$125
Medium tree (DBH 20 – 50 cm)	$500
Large tree (DBH 50 – 100 cm)	$1000
Very Large tree (DBH > 100 cm)	$2500
Hollow	$500

In accordance with Section 2.4 of the *Tree and hollow replacement guidelines*, the next step in the process is to determine whether the project is able to deliver the required tree and hollow replacement within the project boundary or on land adjacent or close to the project with landowner's consent (including travelling stock reserves, crown reserves, council managed reserves and private land). This option requires the preparation of a Tree and Hollow Replacement Plan or similar, which can be prepared as part of the proposal's CEMP addressed within the REF.

To offset the loss of 93 trees, 388 plants and three artificial hollows require replacing within the project boundary or on land adjacent or close to the project with landowner's consent (hollow replacement based on the 20% occupancy rate calculation of a cumulative five hollows from within four hollow-bearing trees, equating to one 'occupied' hollow requiring replacement – at three artificial hollows per each 'occupied' hollow removed) (Table 7-5).

Should planting and hollow replacement within the project boundary or on land adjacent or close to the project not occur, Transport would be required to transfer a total of $47,000 into the Conservation Fund (Table 7-5). It is acknowledged $2500 of the total $47,000 relates to the four hollow-bearing trees proposed for removal, and

their cumulative five hollows (comprised of $2000 for the hollow-bearing trees, plus $500 for 'occupied' hollows).

Should Transport choose to retain the four hollow-bearing trees proposed for removal, the loss of the remaining 89 trees would require 372 plantings or $44,500 to be paid to the Conservation Fund.

The works proposed do not meet any of the activities excluded from the requirement of replacing trees or hollows (Transport 2022b). The works proposed are not considered low-risk activities and the area in which the activity is to occur is unlikely to naturally regenerate given the suite of plants recorded and replacement of vegetated areas with road infrastructure.

¥%Ł‡þ ĊťĈ½Calculated tree replacement or (alternatively) cost transfer into Conservation Fund

Tree size	Estimated native tree removal (worst-case scenario)	Required number of replacement trees	Required cost transfer into Conservation Fund
Small tree (DBH 5 – 20 cm)	16	32	$2,000
Medium tree (DBH 20 – 50 cm)	65	260	$32,500
Large tree (DBH 50 – 100 cm)	12	96	$12,000
Very Large tree (DBH > 100 cm)	0	N/A	N/A
Hollow-bearing trees	4 trees [total 5 hollows]	one ‘occupied’ hollow replacement	$500
Total	93	388	$47,000

8. Conclusion

To permit the proposed upgrading of the Appin and St Johns Roads intersection, an estimated 1.2 ha of vegetation disturbance/removal is required, inclusive of the removal of 93 trees, four of which are hollow-bearing, with 84 identified as Koala feed and use trees. Loss of habitat for a number of potentially occurring threatened species is the primary impact of the proposal.

No TEC, threatened flora or fauna species, or their populations, listed or currently being considered for listing under the EPBC or BC Acts were recorded within the area investigated. Considering the quality and structure of the PCT present (PCT 0 – Not native vegetation), no threatened plants were considered likely to occur and/or rely on the study area for any of their lifecycle requirements.

Though not detected during the current investigation, as they have been previously recorded, and as suitable habitat is present and is to be impacted by the proposal, it was considered appropriate to adopt a precautionary approach to the potential presence of the following threatened species:

- Koala (*Phascolarctos cinereus*) – listed as Endangered (EPBC and BC Acts)
- Hollow-dependent fauna:
    - Squirrel Glider (*Petaurus norfolcensis*) – Vulnerable (BC Act)
    - Gang-gang Cockatoo (*Callocephalon fimbriatum*) – Endangered (EPBC Act) and Vulnerable (BC Act)
    - Little Lorikeet (*Glossopsitta pusilla*) – Vulnerable (BC Act)
    - Varied Sittella *(Daphoensitta chrysoptera)* – Vulnerable (BC Act)
    - Hollow-dependent microbats:
        - Yellow-bellied Sheathtail-bat (*Saccolaimus flaviventris*) – Vulnerable (BC Act)
        - Eastern False Pipistrelle (*Falsistrellus tasmaniensis*) – Vulnerable (BC Act)
        - Eastern Coastal Free-tailed Bat (*Micronomus norfolkensis*) – Vulnerable (BC Act)
        - Southern Myotis (*Myotis macropus*) – Vulnerable (BC Act)
        - Greater Broad-nosed Bat (*Scoteanax rueppellii*) – Vulnerable (BC Act)
        - Golden-tipped Bat *(Phoniscus papuensis)* – Vulnerable (BC Act)
        - Little Bent-winged Bat *(Miniopterus australis)* – Vulnerable (BC Act)

Assessments provided within this report, referencing the EPBC Act's Significant Impact Guidelines and the criteria provided under Section 7.3 of the BC Act, concluded that the proposed intersection upgrade work would not have a significant impact on these potentially occurring fauna species. Therefore, referral of the proposal as a controlled action to the Federal Minister for the Environment and Water is not required, nor is the preparation of a SIS triggered.

With reference to Chapter 4 of SEPP (Biodiversity and Conservation) 2021, the study area is not considered to constitute Core Koala Habitat. The preparation of a Koala Plan of Management is not required.

In line with the calculations per the *Tree and hollow replacement guidelines*, the removal of 93 trees to permit the proposed work, four of which are hollow-bearing, will require the planting of 388 trees and three artificial hollows within the project boundary, or on land adjacent or close to the project with landowner's consent (in accordance with a Tree and Hollow Replacement Plan). Where tree and hollow replacement cannot be accommodated for locally [or only partially], Transport will be required to transfer up to $47,000 into the Conservation Fund.

Mitigation measures have been recommended in Section 6, to reduce any ecological impact as a result of the proposed work. Two primary measures include:

- Minimising impact through detailed design, and
- Adhering to Transport's *Biodiversity Management Guidelines* (Transport 2024).

In addition, the following key mitigation measures have been provided:

- Limit vegetation removal to the minimum required to successfully permit the proposal
- In accordance with the *Tree and hollow replacement guidelines*, and a Tree and Hollow Replacement Plan to be prepared (as part of the CEMP to be prepared for the proposal):
    - To replace the removal of 93 trees, 388 trees will require planting
    - To replace the loss of four hollow-bearing trees and their cumulative five hollows, three artificial hollows (i.e., habitat box) are to be established
    - Should planting and hollow replacement within the project boundary or on land adjacent or close to the project not occur [or only partially], Transport would be required to transfer up to $47,000 into the Conservation Fund.
- Prepare an ESCP to minimise soil erosion and sediment transfer off-site
- Consider retaining trees through project design, where possible.

With adherence to those recommendations provided in this report, no ecological constraints to the proposal proceeding as planned were identified or considered likely to occur.

The adoption of the mitigation measures provided would ensure that the proposal is carried out in an ecologically sustainable manner.

9. Glossary

Term	Definition
Accredited person or assessor	Means as person accredited under section 6.10 (of the BC Act) to prepare reports in accordance with the BAM.
Artificial hollows	Artificial hollows, including hollows carved into a tree, nest boxes attached to trees and salvaged hollows can be used to provide supplementary breeding habitat and shelter for hollow-dependent fauna where hollows have been removed. When designed, built, installed and monitored correctly artificial hollows can provide an alternative to natural fauna habitat.
Biodiversity Assessment Method	The Biodiversity Assessment Method is established under section 6.7 of the BC Act. The BAM is established for the purpose of assessing certain impacts on threatened species and threatened ecological communities (TECs), and their habitats, and the impact on biodiversity values.
Biodiversity offsets	The gain in biodiversity values achieved from the implementation of management actions on areas of land, to compensate for losses to biodiversity values from the impacts of development (State Government of NSW and DPIE 2020c).
BioNet Atlas	The NSW DCCEEW database of flora and fauna records (formerly known as the NSW Wildlife Atlas). The Atlas contains records of plants, mammals, birds, reptiles, amphibians, some fungi, some invertebrates (such as insects and snails listed under the BC Act) and some fish.
BioNet Vegetation classification	Refers to the vegetation community-level classification for use in vegetation mapping programs and regulatory biodiversity impact assessment frameworks in NSW.
Construction footprint	The area to be directly impacted by the proposal during construction activities. See also definition for subject land.
Cumulative impact	The impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. Refer to Clause 228(2) of the EP&A Regulation 2000 for cumulative impact assessment requirements.
Direct impact	Direct impacts on biodiversity values include those related to clearing native vegetation and threatened species habitat and impacts on biodiversity values prescribed by the Biodiversity Conservation Regulation 2017 (the BC Regulation). This includes impacts from activities related to the construction or operational phase of the proposal (State Government of NSW and DPIE 2020c).
Habitat	An area or areas occupied, or periodically or occasionally occupied, by a species, population or ecological community, including any biotic or abiotic component (State Government of NSW and DPIE 2020c).
Indirect impact	Impacts that occur when the proposal affects native vegetation and threatened species habitat beyond the development footprint or within retained areas (e.g., transporting weeds or pathogens, dumping rubbish). This includes impacts from activities related to the construction or operational phase of the proposal and prescribed impacts (State Government of NSW and DPIE 2020c).
Landscape assessment area	The area which includes the subject land and a 1500 m buffer surrounding the outside edge of the boundary of the subject land or 500 m along each side of the centre line of a linear-shaped proposal.

Term	Definition
Local population	The population that occurs in the study area. The assessment of the local population may be extended to include individuals beyond the study area if it can be clearly demonstrated that contiguous or interconnecting parts of the population continue beyond the study area, according to the following definitions: • The local population of a threatened plant species comprises those individuals occurring in the study area or the cluster of individuals that extend into habitat adjoining and contiguous with the study area that could reasonably be expected to be cross-pollinating with those in the study area. • The local population of resident fauna species comprises those individuals known or likely to occur in the study area, as well as any individuals occurring in adjoining areas (contiguous or otherwise) that are known or likely to utilise habitats in the study area. • The local population of migratory or nomadic fauna species comprises those individuals that are likely to occur in the study area from time to time or return year to year.
Matter of national environmental significance	A MNES is any of the nine defined components protected by a provision of Part 3 of the EPBC Act.
Mitigation	Action to reduce the severity of an impact.
Native vegetation	Has the same meaning as in section 1.6 of the BC Act and section 60B of the LLS Act. In summary, a) trees (including any sapling or shrub or any scrub) b) understorey plants c) groundcover (being any type of herbaceous vegetation) d) plants occurring in a wetland. A plant is native to New South Wales if it was established in New South Wales before European settlement (BC Act). Native vegetation does not extend to marine vegetation (being mangroves, seagrasses or any other species of plant that at any time in its life cycle must inhabit water other than fresh water). Marine vegetation is covered by the provisions of the FM Act.
NSW (Mitchell) landscape	Landscapes with relatively homogeneous geomorphology, soils and broad vegetation types, mapped at a scale of 1:250,000 (State Government of NSW and DPIE 2020c).
Operational footprint	The area that will be subject to ongoing operational impacts from the proposal. This includes the road, surrounding safety verges and infrastructure, fauna connectivity structures and maintenance access tracks and compounds.
Patch size	An area of native vegetation that: • occurs on the development site or biodiversity stewardship site • includes native vegetation that has a gap of less than 100 m from the next area of native vegetation (or ≤30 m for non-woody ecosystems). Patch size may extend onto adjoining land that is not part of the development site or biodiversity stewardship site (State Government of NSW and DPIE 2020c).
PlantNET	An online database of the flora of New South Wales which contains currently accepted taxonomy for plants found in the State, both native and exotic.
Population	A group of organisms, all of the same species, occupying a particular area (DPIE 2020a).

Term	Definition
Species credit species	Threatened species or components of species habitat that are identified in the Threatened Species Data Collection as requiring assessment for species credits (State Government of NSW and DPIE 2020c). This is analogous with the definition of 'candidate species'.
Species credits	The class of biodiversity credits created or required for the impact on threatened species that cannot be reliably predicted to use an area of land based on habitat surrogates. Species that require species credits are listed in the Threatened Biodiversity Data Collection (State Government of NSW and DPIE 2020c).
Study area	The area directly affected by the proposal (subject land or construction footprint) and any additional areas likely to be affected by the proposal, either directly or indirectly.
Subject land	Land subject to a development, activity, clearing, biodiversity certification or a biodiversity stewardship proposal. It excludes the landscape assessment area which surrounds the subject land (i.e., the area of land in the 1500 m buffer zone around the subject land or 500m buffer zone for linear proposals). In the case of a biodiversity certification proposal, subject land includes the biodiversity certification assessment area (State Government of NSW and DPIE 2020c). See also definition for construction footprint.
Threatened Biodiversity Data Collection	A publicly assessable online database (registration required) which contains information for listed threatened species, populations and ecological communities (State Government of NSW and DPIE 2020c). Part of the BioNet database.
Tree	As per Australian Standard 4970-2009 a tree is considered to be a long-lived woody perennial plant greater than (or usually greater than) 3 m in height with one or relatively few main stems or trunks (or as defined by the determining authority).
Vegetation integrity (score)	The condition of native vegetation assessed for each vegetation zone against the benchmark for the PCT. The vegetation integrity score is the quantitative measure of vegetation condition calculated by the BAM-C (State Government of NSW and DPIE 2020c).
Vegetation zone	A relatively homogeneous area of native vegetation on a development site, clearing site, land to be biodiversity certified or biodiversity stewardship site that is the same PCT and has the same broad condition state (State Government of NSW and DPIE 2020c).

10. Abbreviations

Term	Definition
AOBV	Area of Outstanding Biodiversity Value
BAM	Biodiversity Assessment Method
BAR	Biodiversity Assessment Report
BC Act	*Biodiversity Conservation Act 2016* (NSW)
BC Regulation	Biodiversity Conservation Regulation 2017 (NSW)
BDAR	Biodiversity Development Assessment Report
BOS	Biodiversity Offset Scheme
CEEC	Critically Endangered Ecological Community
CEMP	Construction Environmental Management Plan
DCCEEW	Department of Climate Change, Energy, the Environment and Water (Commonwealth)
DPE	Department of Planning and Environment
DPI	Department of Primary Industries
EEC	Endangered ecological community
EIS	Environmental Impact Statement
EP&A Act	*Environment Planning and Assessment Act 1979* (NSW)
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth)
FM Act	*Fisheries Management Act 1994* (NSW)
GDE	Groundwater dependent ecosystems
IBRA	Interim Biogeographically Regionalisation of Australia
KFH	Key Fish Habitat
KTP	Key Threatening Process
LGA	Local Government Area
mm/cm/m/m2/km/ha	Millimetres, centimetres, metres, square metres, kilometres, hectares
MNES	Matters of national environmental significance
NSW	New South Wales
NSW DCCEEW	New South Wales Department of Climate Change, Energy, the Environment and Water
PCT	Plant community type
PMST	Protected Matters Search Tool
REF	Review of Environmental Factors
SEPP	State Environmental Planning Policy
SIS	Species Impact Statement
TBDC	Threatened Biodiversity Data Collection
TECs	Threatened ecological communities (VECs, EECs and CEECs)
Transport	Transport for NSW
VIS	Vegetation Information System
WoNS	Weeds of National Significance

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Appendix A: Detailed Engineering Design Plans

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Appendix B: Likelihood of Occurrence

Likelihood	Criteria
Recorded	The species was observed in the study area during the current survey or has been recorded within the past five years (known from a reputable source).
High	A species is considered highly likely to occur in the study area if: • There are previous credible records on BioNet within the study area from the last 10 years and suitable habitat is present. • The species is highly mobile, is dependent on identified suitable habitat within the study area (i.e., for breeding or important lifecycle periods such as winter flowering resources) and has been recorded recently (within five years) on BioNet in the locality. This also includes species known or likely to visit the study area during regular seasonal movements or migration.
Moderate	A species is considered moderately likely to occur in the study area if: • Any suitable habitat (e.g., foraging) is present in the study area, the species is highly mobile and has been recorded in the locality in the last 10 years on BioNet. The species may be unlikely to maintain sedentary populations, however, may seasonally use resources within the study area opportunistically or during migration. The species is unlikely to be dependent (i.e., for breeding or important life cycle periods such as winter flowering resources) on habitat within the study area. • The species is not highly mobile, is dependent on identified suitable habitat features (e.g., hollows, rocky outcrops) within the study area and has been recorded in the locality in the last 10 years on BioNet. • For flora species that are associated with PCTs in the study area (see TBDC) or have been recorded in the locality in the last 10 years on BioNet – the associated PCT/habitat present in the study area is not degraded and the species was not targeted by surveys in accordance with the BAM and relevant survey guidelines. In addition, for flora species known to occur in disturbed areas (e.g., orchids), records from any time within the locality may warrant inclusion in this category.
Low	A species is considered to have a low likelihood of occurring in the study area if: • For highly mobile species, the species may be an occasional visitor, but habitat similar to the study area is widely distributed in the locality, meaning that the species is not dependent (i.e., for breeding or important life cycle periods such as winter flowering resources) on habitats in the study area and the species has not been recorded in the locality in the last 10 years on BioNet. • The species is not highly mobile, is dependent on identified suitable habitat features (e.g., hollows, rocky outcrops) within the study area and has not been recorded in the locality in the last 10 years on BioNet. • For flora species that are associated with PCTs in the study area (see TBDC) and the species was not identified following targeted surveys in accordance with the BAM and relevant survey guidelines. Flora species that have been recorded in the locality on BioNet at any time, associated suitable habitat (see the TBDC) is not present in the study area, though similar habitats of the same vegetation formation is present in the study area.
Unlikely	Suitable habitat for the species is absent from the study area.

Key

V – vulnerable E – endangered CE – critically endangered M – migratory

Note: Species underlined are those which only the EPBC PMST predicted as having habitat in the search area. All other species have been recorded within 10 km of the study area.

Note: As these habitats are not present, no pelagic, estuarine, wetland or fish species have been included in the following table.
Given that the proposed work is not located within the Commonwealth marine area, this being from 3 to 200 nautical miles from the coast, no species listed as marine under the EPBC Act have been considered; nor has the marine status of any species been acknowledged.

* - habitat requirements were generally extracted from DCCEW (2023d), OEH (2023), Harden (1992-2002), Frith (2007), Churchill (2008), Cogger (2014) and Van Dyck and Strahan (2008) with other references used being identified in the bibliography.

Scientific name	Status		Habitat constraints and/or geographic limitations Distribution and habitat	BAM credit type	Number of records (source)	Likelihood of occurrence
	EPBC Act	BC Act				
Plants						
Bynoe's Wattle ***Acacia bynoeana***	V	E	**Occurs in heath or dry sclerophyll forest on sandy soils.**	Species	3 – BioNet PMST	Low. No suitable habitat.
Downy Wattle ***Acacia pubescens***	V	V	**Occurs in open woodland and forest, in a variety of plant communities.**	Species	3 – BioNet PMST	Associated with PCT 3320. Targeted during field investigation and not observed.
Allocasuarina glareicola	E	E	**Primarily restricted to the Richmond district, with an outlier population found at Voyager Point, Liverpool. Grows in Castlereagh woodland on lateritic soil. Found in open woodland.**	Species	PMST	Low. No suitable habitat.
Thick-leaf Star-hair **Astrotricha crassifolia**	V	V	**Occurs in dry sclerophyll woodland on sandstone.**	Species	PMST	As above.
Thick-lipped Spider-orchid ***Caladenia tessellata***	V	E	**Generally found in grassy sclerophyll woodland on clay loam or sandy soils.**	Species	PMST	As above.

Scientific name	Status		Habitat constraints and/or geographic limitations Distribution and habitat	BAM credit type	Number of records (source)	Likelihood of occurrence
	EPBC Act	BC Act				
Leafless Tongue Orchid *Cryptostylis hunteriana*	V	V	Does not appear to have well defined habitat preferences and is known from a range of communities, including swamp-heath and woodland.	Species	PMST	As above.
White-flowered Waxplant *Cynanchum elegans*	E	E	Usually occurs on the edge of dry rainforest vegetation but also in littoral rainforest, coastal scrub and aligned open forest and woodland.	Species	PMST	As above.
Camden White Gum *Eucalyptus benthamii*	V	CE	Occurs in open forest. Requires a combination of deep alluvial sands and a flooding regime that permits seedling establishment. Recruitment of juveniles appears to be most successful on bare silt deposits in rivers and streams.	Species	1 – BioNet PMST	Associated with PCT 3320. Targeted during field investigation and not observed.
Camfield's Stringybark *Eucalyptus camfieldii*	V	V	Localised and scattered distribution includes sites at Menai, Wattamolla and a few other sites in RNP (among others). Poor coastal country in shallow sandy soils overlying Hawkesbury sandstone. Coastal heath mostly on exposed sandy ridges. Occurs mostly in small scattered stands near the boundary of tall coastal heaths and low open woodland of the slightly more fertile inland areas.	Species	PMST	Low. No suitable habitat.
Wallangarra White Gum *Eucalyptus scoparia*	V	E	In NSW it is known from only three locations near Tenterfield, including Bald Rock National Park. Found in open eucalypt forest, woodland and heaths on well-drained granite/rhyolite hilltops, slopes and rocky outcrops, typically at high altitudes.	Species	1 - BioNet	As above.
Bauer's Midge Orchid *Genoplesium baueri*	E	E	Grows in dry sclerophyll forest and moss gardens over sandstone.	Species	1 – BioNet PMST	As above.
Small-flower Grevillea *Grevillea parviflora* subsp. *parviflora*	V	V	Occurs in a range of vegetation types from heath and shrubby woodland to open forest.	Species	3 – BioNet PMST	As above.

Scientific name	Status		Habitat constraints and/or geographic limitations Distribution and habitat	BAM credit type	Number of records (source)	Likelihood of occurrence
	EPBC Act	BC Act				
Wingless Raspwort *Haloragis exalata* subsp. *exalata*	V	V	Appears to require protected and shaded damp situations in riparian habitats.	Species	PMST	As above.
Hibbertia puberula		E	Occurs on sandy soil often associated with sandstone, or on clay. Habitats are typically dry sclerophyll woodland communities, although heaths are also occupied.	Species	68 - BioNet	Associated with PCT 3320. Targeted during field investigation and not observed.
Woronora Beard-heath *Leucopogon exolasius*	V	V	Occurs in woodland on sandstone.	Species	41 – BioNet PMST	Low. No suitable habitat.
Leucopogon fletcheri subsp. *fletcheri*		E	Occurs in dry eucalypt woodland or in shrubland on clayey lateritic soils, generally on flat to gently sloping terrain along ridges and spurs.	Species	339 - BioNet	As above.
Marsdenia viridiflora R. Br. subsp. *viridiflora* population in the Bankstown, Blacktown, Camden, Campbelltown, Fairfield, Holroyd, Liverpool and Penrith LGAs		EP	Grows in vine thickets and open shale woodland.	Species	12 - BioNet	As above.
Biconvex Paperbark *Melaleuca biconvexa*	V	V	Scattered and dispersed populations of this species are found in the Jervis Bay area in the south and the Gosford-Wyong area in the north. Generally, grows in damp places, often near streams or low-lying areas on alluvial soils of low slopes or sheltered aspects.	Species	PMST	As above.
Deane's Melaleuca *Melaleuca deanei*	V	V	Occurs in two distinct areas, in the Ku-ring-gai/Berowra and Holsworthy/Wedderburn areas. Occurs mostly in ridgetop woodland, with only 5% of sites in heath on sandstone.	Species	12 – BioNet PMST	As above.

Scientific name	Status		Habitat constraints and/or geographic limitations Distribution and habitat	BAM credit type	Number of records (source)	Likelihood of occurrence
	EPBC Act	BC Act				
Tall Knotweed *Persicaria elatior*	V	V	This species normally grows in damp places, especially beside streams and lakes. Occasionally in swamp forest or associated with disturbance.	Species	PMST	As above.
Bargo Geebung *Persoonia bargoensis*	V	E	Restricted to a small area south-west of Sydney on the western edge of the Woronora Plateau and the northern edge of the Southern Highlands. Occurs in woodland or dry sclerophyll forest on sandstone and on heavier, well drained, loamy, gravelly soils of the Wianamatta Shale and Hawkesbury Sandstone.	Species	PMST	As above.
Hairy Geenbung *Persoonia hirsuta*	E	E	Found in sandy soils in dry sclerophyll open forest, woodland and heath on sandstone.	Species	17 – BioNet PMST	As above.
Nodding Geebung *Persoonia nutans*	E	E	Restricted to the Cumberland Plain in western Sydney, between Richmond in the north and Macquarie Fields in the south. Southern populations occupy tertiary alluvium, but extend onto shale sandstone transition communities and into Cooks River/Castlereagh Ironbark Forest.	Species	PMST	Associated with PCT 3320. Targeted during field investigation and not observed.
Pimelea curviflora var. curviflora	V	V	Occurs on shaley/lateritic soils over sandstone and shale/sandstone transition soils on ridgetops and upper slopes amongst woodlands.	Species	PMST	Low. No suitable habitat.
Spiked Rice-flower Pimelea spicata	E	E	Found on well-structured clay soils. In the coastal Illawarra it occurs commonly in Coast Banksia open woodland with a better developed shrub and grass understorey. Coastal headlands and hilltops are the favoured sites.	Species	832 – BioNet PMST	As above.
Rufous Pomaderris *Pomaderris brunnea*	V	E	Grows in moist woodland or forest on clay and alluvial soils of flood plains and creek lines.	Species	53 – BioNet PMST	As above.
Cotoneaster Pomaderris *Pomaderris cotoneaster*	E	E	Recorded in a range of habitats in predominantly forested country. The habitats include forest with	Species	PMST	As above.

Scientific name	Status		Habitat constraints and/or geographic limitations Distribution and habitat	BAM credit type	Number of records (source)	Likelihood of occurrence
	EPBC Act	BC Act				
			deep, friable soil, amongst rock beside a creek, on rocky forested slopes and in steep gullies between sandstone cliffs.			
Seaforth Mintbush *Prostanthera marifolia*	CE	CE	Currently only known from the northern Sydney suburb of Seaforth and has a very highly restricted distribution within the Sydney Basin Bioregion. Occurs in localised patches in or in close proximity to the endangered Duffys Forest ecological community.	Species	1 - BioNet	As above.
Illawarra Greenhood *Pterostylis gibbosa*	E	E	All known populations grow in open forest or woodland, on flat or gently sloping land with poor drainage. Near Nowra, the species grows in an open forest of Spotted Gum *Corymbia maculata*, Forest Red Gum and Grey Ironbark *E. paniculata*.	Species	PMST	As above.
Sydney Plains Greenhood *Pterostylis saxicola*	E	E	Most commonly found growing in small pockets of shallow soil in depressions on sandstone rock shelves above cliff lines.	Species	34 – BioNet PMST	As above.
Prickly Bush-pea *Pultenaea aristata*	V	V	Restricted to the Woronora Plateau where it occurs in dry sclerophyll woodland or wet heath on sandstone.	Species	3 – BioNet PMST	As above.
Matted Bush-pea *Pultenaea pedunculata*		E	In NSW however, it is represented by just three disjunct populations, in the Cumberland Plains in Sydney, the coast between Tathra and Bermagui and the Windellama area south of Goulburn (where it is locally abundant). Occurs in a range of habitats. NSW populations are generally among woodland vegetation but plants have also been found on road batters and coastal cliffs. It is largely confined to loamy soils in dry gullies in populations in the Windellama area. In the Cumberland Plain the species favours sites in clay or sandy-clay soils (Blacktown Soil Landscape) on Wianamatta Shale-derived soils, usually close to	Species	9 - BioNet	As above.

Scientific name	Status		Habitat constraints and/or geographic limitations Distribution and habitat	BAM credit type	Number of records (source)	Likelihood of occurrence
	EPBC Act	BC Act				
			patches of Tertiary Alluvium (Liverpool area) or at or near the Shale-Sandstone interface (Appin). All sites have a lateritic influence with ironstone gravel (nodules) present. On the Cumberland Plain the species is recorded from Cumberland Plain Woodlands, the shale-soil form of Shale Sandstone Transition Forests and Cooks River/Castlereagh Ironbark Forest.			
Eastern Underground Orchid *Rhizanthella slateri*	E	V	Habitat requirements are poorly understood and no particular vegetation type has been associated with the species, although it is known to occur in sclerophyll forest.	Species	PMST	As above.
Scrub Turpentine *Rhodamnia rubescens*	CE	CE	Found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest usually on volcanic and sedimentary soils.	Species	PMST	As above.
Native Guava *Rhodomyrtus psidioides*	CE	CE	Pioneer species found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest often near creeks and drainage lines.	Species	PMST	As above.
Magenta Lilly Pilly *Syzygium paniculatum*	V	E	Found only in NSW, in a narrow, linear coastal strip from Upper Lansdowne to Conjola State Forest. On the south coast the Magenta Lilly Pilly occurs on grey soils over sandstone, restricted mainly to remnant stands of littoral (coastal) rainforest.	Species	4 – BioNet PMST	As above.
Kangaloon Sun Orchid *Thelymitra kangaloonica*	CE	CE	Only known from the southern tablelands of NSW in the Moss Vale/Kangaloon/Fitzroy Falls area where it occurs in swamps in sedgelands.	Species	PMST	As above.
Austral Toadflax *Thesium australe*	V	V	Occurs in grassland on coastal headlands or grassland and grassy woodland away from the coast.	Species	PMST	As above.

Scientific name	Status		Habitat constraints and/or geographic limitations Distribution and habitat	BAM credit type	Number of records (source)	Likelihood of occurrence
	EPBC Act	BC Act				
Swamp Everlasting *Xerochrysum palustre*	V		Grows in wetlands including sedge-swamps and shallow freshwater marshes, often on heavy black clay soils.	Species	PMST	As above.
Birds						
Freckled Duck *Stictonetta naevosa*		V	Prefer permanent freshwater swamps and creeks with heavy growth of Cumbungi, Lignum or Tea-tree. During drier times they move from ephemeral breeding swamps to more permanent waters such as lakes, reservoirs, farm dams and sewage ponds.	Ecosystem	1 - BioNet	Low. No suitable habitat.
Australasian Bittern *Botaurus poiciloptilus*	E	E	Occupies shallow, vegetated freshwater or brackish swamps, usually dominated by tall, dense reed beds of *Typha* sp., *Juncus* sp. and *Phragmites* sp. Nests on platforms of reeds and rushes, usually built over water in dense cover.	Ecosystem	1 – BioNet PMST	As above.
Spotted Harrier *Circus assimilis*		V	Occurs in grassy open woodland including Acacia and mallee remnants, inland riparian woodland, grassland and shrub steppe. It is found most commonly in native grassland, but also occurs in agricultural land, foraging over open habitats including edges of inland wetlands.	Ecosystem	1 - BioNet	As above.
White-throated Needletail *Hirundapus caudacutus*	V, M, Ma		Almost exclusively aerial. Takes insects on wing over a range of habitat types. Recorded most often above wooded areas, including open forest and rainforest.	Ecosystem	2 – BioNet PMST	As above.
Bush Stone-curlew *Burhinus grallarius*		E	Inhabits open forests and woodlands with a sparse grassy groundlayer and fallen timber.	Species	1 - BioNet	As above.
Square-tailed Kite *Lophoictinia isura*		V	Found in a variety of timbered habitats including dry woodlands and open forests. Shows a particular preference for timbered watercourses.	Species/Ecosystem	10 - BioNet	As above.

Scientific name	Status		Habitat constraints and/or geographic limitations Distribution and habitat	BAM credit type	Number of records (source)	Likelihood of occurrence
	EPBC Act	BC Act				
Red Goshawk *Erythrotriorchis radiatus*	E	CE	Very rare in NSW, extending south to about 30°S, with most records north of this, in the Clarence River Catchment, and a few around the lower Richmond and Tweed Rivers. Formerly, it was at least occasionally reported as far south as Port Stephens. In NSW, preferred habitats include mixed subtropical rainforest, *Melaleuca* swamp forest and riparian *Eucalyptus* forest of coastal rivers.	Species	PMST	As above.
White-bellied Sea-eagle *Haliaeetus leucogaster*	Ma	V	Found in coastal habitats (especially those close to the sea-shore) and around terrestrial wetlands in tropical and temperate regions of mainland Australia.	Species/Ecosystem	9 - BioNet	As above.
Little Eagle *Hieraaetus morphnoides*		V	Occupies open eucalypt forest, woodland or open woodland. Sheoak or *Acacia* woodlands and riparian woodlands of interior NSW are also used.	Species/Ecosystem	13 - BioNet	As above.
Grey Falcon *Falco hypoleucos*	V	V	Sparsely distributed in NSW, chiefly throughout the Murray-Darling Basin, with the occasional vagrant east of the Great Dividing Range. Usually restricted to shrubland, grassland and wooded watercourses of arid and semi-arid regions, although it is occasionally found in open woodlands near the coast.	Ecosystem	PMST	As above.
Australian Painted Snipe *Rostratula australis*	E, Ma	E	Prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber.	Ecosystem	PMST	As above.
Gang-gang Cockatoo *Callocephalon fimbriatum*	E	V	Prefers tall mountain forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests during summer, these being at higher altitudes. In winter, occurs at lower altitudes in drier, more open eucalypt forests and woodlands, or in dry forest in coastal areas.	Species/Ecosystem	34 – BioNet PMST	Moderate. May occupy hollow-bearing trees present. Ecological assessment conducted.

Scientific name	Status		Habitat constraints and/or geographic limitations Distribution and habitat	BAM credit type	Number of records (source)	Likelihood of occurrence
	EPBC Act	BC Act				
South-eastern Glossy Black-Cockatoo ***Calyptorhynchus lathami lathami***	V	V	**Inhabits eucalypt woodland and feeds almost exclusively on Casuarina fruits.**	Species/Ecosystem	6 - BioNet PMST	Low. No suitable habitat.
Little Lorikeet ***Glossopsitta pusilla***		V	**Forages primarily in the open Eucalypt forest and woodland canopies, particularly along water courses; occasionally in Angophoras, Melaleucas and other tree species, also riparian habitats are used.**	Ecosystem	35 - BioNet	Moderate. May occupy hollow-bearing trees present. Ecological assessment conducted.
Turquoise Parrot ***Neophema pulchella***		V	**Lives on the edges of eucalypt woodland adjoining clearings, timbered ridges and creeks in farmland.**	Ecosystem	1 - BioNet	Low. No suitable habitat.
Swift Parrot ***Lathamus discolor***	CE, Ma	E	**Eucalypt forests. When over-wintering on the mainland, this species is dependent on winter-flowering eucalypt species.**	Species/Ecosystem	179 – BioNet PMST	As above.
Powerful Owl ***Ninox strenua***		V	**Inhabits a range of vegetation types, from woodland and open sclerophyll forest to tall open wet forest and rainforest.**	Species/Ecosystem	35 - BioNet	As above.
Barking Owl ***Ninox connivens***		V	**Inhabits woodland and open forest, including fragmented remnants and partly cleared farmland.**	Species/Ecosystem	1 - BioNet	As above.
Masked Owl ***Tyto novaehollandiae***		V	**Lives in dry eucalypt forests and woodlands from sea level to 1100 m.**	Species/Ecosystem	3 - BioNet	As above.
Eastern Bristlebird ***Dasyornis brachypterus***	E	E	**Habitat for central and southern populations is characterised by dense, low vegetation including heath and open woodland with a heathy understorey.**	Species	1 – BioNet PMST	As above.
Brown Treecreeper (eastern subsp) ***Climacteris picumnus victoriae***	V	V	**The western boundary of the range of *Climacteris picumnus victoriae* runs approximately through Corowa, Wagga Wagga, Temora, Forbes, Dubbo and Inverell and along this line the subspecies intergrades with the arid zone subspecies of Brown**	Ecosystem	5 – BioNet PMST	As above.

Scientific name	Status		Habitat constraints and/or geographic limitations Distribution and habitat	BAM credit type	Number of records (source)	Likelihood of occurrence
	EPBC Act	BC Act				
			Treecreeper *Climacteris picumnus picumnus* which then occupies the remaining parts of the state. Found in eucalypt woodlands (including Box-Gum Woodland) and dry open forest of the inland slopes and plains inland of the Great Dividing Range; mainly inhabits woodlands dominated by stringybarks or other rough-barked eucalypts, usually with an open grassy understorey, sometimes with one or more shrub species.			
Pilotbird *Pycnoptilus floccosus*	V		Found in wet forested areas and heathland in eastern Victoria and south-eastern New South Wales. Forages on the ground, turning over leaf litter using strong legs.	Species	2 – BioNet PMST	As above.
Regent Honeyeater *Anthochaera phrygia*	CE	CE	Inhabits dry open forest and woodland. These woodlands have significantly large numbers of mature trees, high canopy cover and abundance of mistletoes.	Species/Ecosystem	3 – BioNet PMST	As above.
Painted Honeyeater *Grantiella picta*	V	V	Inhabits Boree, Brigalow and Box-Gum Woodlands and Box-Ironbark Forests. A specialist feeder on the fruits of mistletoes growing on woodland eucalypts and acacias. Prefers mistletoes of the genus *Amyema*.	Ecosystem	PMST	As above.
Black-chinned Honeyeater *Melithreptus gularis gularis*		V	Occupies mostly upper levels of drier open forests or woodlands dominated by box and ironbark eucalypts, especially Mugga Ironbark (*Eucalyptus sideroxylon*), White Box (*E. albens*), Inland Grey Box (*E. microcarpa*), Yellow Box (*E. melliodora*), Blakely's Red Gum (*E. blakelyi*) and Forest Red Gum (*E. tereticornis*).	Ecosystem	3 - BioNet	As above.
Varied Sittella		V	Inhabits eucalypt forests and woodlands, especially those containing rough-barked species and mature	Ecosystem	56 - BioNet	Moderate. May occupy hollow-bearing trees present. Ecological assessment conducted.

Scientific name	Status		Habitat constraints and/or geographic limitations Distribution and habitat	BAM credit type	Number of records (source)	Likelihood of occurrence
	EPBC Act	BC Act				
Daphoenositta chrysoptera			**smooth-barked gums with dead branches, mallee and *Acacia* woodland.**			
Dusky Woodswallow ***Artamus cyanopterus cyanopterus***		V	**Primarily inhabit dry, open eucalypt forests and woodlands, including mallee associations, with an open or sparse understorey of eucalypt saplings, acacias and other shrubs, and ground-cover of grasses or sedges and fallen woody debris.**	Ecosystem	125 - BioNet	Low. No suitable habitat.
Scarlet Robin ***Petroica boodang***		V	**Lives in dry eucalypt forests and woodlands. The understorey is usually open and grassy with few scattered shrubs.**	Species	10 - BioNet	As above.
Hooded Robin (south-eastern) ***Melanodryas cucullata cucullata***	E	V	**Prefers lightly wooded country, usually open eucalypt woodland, acacia scrub and mallee, often in or near clearings or open areas.**	Ecosystem	PMST	As above.
Diamond Firetail ***Stagonopleura guttata***		V	**Found in grassy eucalypt woodlands, including Box-Gum Woodlands and Snow Gum *Eucalyptus pauciflora* Woodlands. Also occurs in open forest, mallee, Natural Temperate Grassland, and in secondary grassland derived from other communities. Often found in riparian areas (rivers and creeks), and sometimes in lightly wooded farmland.**	Ecosystem	2 – BioNet PMST	As above.
Mammals						
Spotted-tailed Quoll ***Dasyurus maculatus***	E	V	**Recorded across a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline.**	Ecosystem	6 - BioNet	Low. No suitable habitat.
Southern Brown Bandicoot	E	E	**Generally, only found in heath or open forest with a heathy understorey on sandy or friable soils.**	Species	PMST	As above.

Scientific name	Status		Habitat constraints and/or geographic limitations Distribution and habitat	BAM credit type	Number of records (source)	Likelihood of occurrence
	EPBC Act	BC Act				
Isoodon obesulus obesulus						
Koala ***Phascolarctos cinereus***	**E**	**E**	**Open eucalypt forest and woodland, containing a variety of 'preferred' food tree species.**	Species/Ecosystem	2360 - BioNet	High. Suitable habitat present. Ecological Assessment conducted.
Eastern Pygmy-possum ***Cercartetus nanus***		**V**	**Found in a broad range of habitats from rainforest through sclerophyll (including Box-Ironbark) forest and woodland to heath, but in most areas woodlands and heath appear to be preferred, except in north-eastern NSW where they are most frequently encountered in rainforest. Feeds largely on nectar and pollen collected from banksias, eucalypts and bottlebrushes.**	Species	17 - BioNet	Low. No suitable habitat. Requires developed shrub layer and Banksias which are not present.
Parma Wallaby ***Notamacropus parma***	**V**	**V**	**Preferred habitat is moist eucalypt forest with thick, shrubby understorey, often with nearby grassy areas, rainforest margins and occasionally drier eucalypt forest.**	Species	PMST	Low. No suitable habitat.
Brush-tailed Rock-wallaby ***Petrogale penicillata***	**V**	**E**	**Occupy rocky escarpments, outcrops and cliffs with a preference for complex structures with fissures, caves and ledges.**	Species	PMST	As above.
Yellow-bellied Glider ***Petaurus australis***		**V**	**Occur in tall mature eucalypt forest generally in areas with high rainfall and nutrient rich soils.**	Ecosystem	2 - BioNet	As above.
Squirrel Glider ***Petaurus norfolcensis***		**V**	**Inhabits woodlands and dry sclerophyll forests, usually in diverse stands of shrubs and trees. Shelters and breeds in tree hollows, and is primarily an insectivorous animal but, has also been known to ingest plant exudates.**	Species	3 - BioNet	Moderate. May occupy hollow-bearing trees present. Ecological assessment conducted.

Scientific name	Status		Habitat constraints and/or geographic limitations Distribution and habitat	BAM credit type	Number of records (source)	Likelihood of occurrence
	EPBC Act	BC Act				
Southern Greater Glider ***Petauroides volans***	E	**E**	**Largely restricted to eucalypt forests and woodlands, utilising tree hollows (with diameters >18 cm).**	Species	2 – BioNet PMST	Low. No suitable habitat.
Grey-headed Flying-fox ***Pteropus poliocephalus***	**V**	**V**	**Occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops.**	Species	169 – BioNet PMST	As above.
Yellow-bellied Sheathtail-bat ***Saccolaimus flaviventris***		**V**	**Roosts singly or in groups of up to six, in tree hollows and buildings; in treeless areas they are known to utilise mammal burrows. Forages in most habitats across its very wide range, with and without trees; appears to defend an aerial territory.**	Ecosystem	10 - BioNet	Moderate. May occupy hollow-bearing trees present. Ecological assessment conducted.
Large-eared Pied Bat ***Chalinolobus dwyeri***	**V**	**V**	**Cave-roosting bat that forages in timbered woodland and dry sclerophyll forest.**	Species	13 – BioNet PMST	Low. No suitable habitat.
Golden-tipped Bat ***Phoniscus papuensis***		**V**	**Found in rainforest and adjacent wet and dry sclerophyll forest up to 1000 m. Also recorded in tall open forest, Casuarina-dominated riparian forest and coastal Melaleuca forests. Will fly up to 2 km from roosts to forage in rainforest and sclerophyll forest on mid and upper-slopes. Roost mainly in rainforest gullies on small first- and second-order streams.**	Ecosystem	2 - BioNet	Moderate. May occupy hollow-bearing trees present. Ecological assessment conducted.
Eastern False Pipistrelle ***Falsistrellus tasmaniensis***		**V**	**Prefers moist habitats, with trees taller than 20 m. Generally, roosts in hollow-bearing trees (eucalypts), but has also been found under loose bark on trees or in buildings.**	Ecosystem	20 - BioNet	Moderate. May occupy hollow-bearing trees present. Ecological assessment conducted.
Southern Myotis ***Myotis macropus***		**V**	**Generally, roost in groups of 10 - 15 close to water in caves, mine shafts, hollow-bearing trees, storm water channels, buildings, under bridges and in dense foliage. Forage over streams and pools**	Species	186 - BioNet	Moderate. May occupy hollow-bearing trees present. Ecological assessment conducted.

Scientific name	Status		Habitat constraints and/or geographic limitations Distribution and habitat	BAM credit type	Number of records (source)	Likelihood of occurrence
	EPBC Act	BC Act				
			catching insects and small fish by raking their feet across the water surface.			
Greater Broad-nosed Bat ***Scoteanax rueppellii***		V	**Utilises a variety of habitats from woodland through to moist and dry eucalypt forest and rainforest, though it is most commonly found in tall wet forest. Usually roosts in tree hollows but also in buildings.**	Ecosystem	25 - BioNet	Moderate. May occupy hollow-bearing trees present. Ecological assessment conducted.
Little Bent-winged Bat ***Miniopterus australis***		V	**Generally found in well-timbered areas. Roost in caves, tunnels, tree hollows, abandoned mines, stormwater drains, culverts, bridges and sometimes buildings during the day.**	Species/Ecosystem	9 - BioNet	Moderate. May occupy hollow-bearing trees present. Ecological assessment conducted.
Large Bent-winged Bat ***Miniopterus orianae oceanensis***		V	**Caves are the primary roosting habitat, but also use derelict mines, storm-water tunnels, buildings and other man-made structures.**	Species/Ecosystem	30 - BioNet	Low. No suitable habitat.
Eastern Coastal Free-tailed Bat ***Mormopterus norfolkensis/ Micronomus norfolkensis***		V	**Occur in dry sclerophyll forest, woodland, swamp forests and mangrove forests east of the Great Dividing Range. Roost mainly in tree hollows but will also roost under bark or in man-made structures.**	Ecosystem	35 - BioNet	Moderate. May occupy hollow-bearing trees present. Ecological assessment conducted.
New Holland Mouse ***Pseudomys novaehollandiae***	V		**Open heathland, open woodland with a heathland understorey and vegetated sand dunes.**	Ecosystem	PMST	Low. No suitable habitat.
Amphibians						
Giant Burrowing Frog ***Heleioporus australiacus***	V	V	**Found in heath, woodland and open dry sclerophyll forest on a variety of soil types except those that are clay based.**	Species	14 – BioNet PMST	Low. No suitable habitat.
Red-crowned Toadlet ***Pseudophryne australis***		V	**Occurs in open forests, mostly on Hawkesbury and Narrabeen Sandstones. Inhabits periodically wet**	Species	25 - BioNet	As above.

Scientific name	Status		Habitat constraints and/or geographic limitations Distribution and habitat	BAM credit type	Number of records (source)	Likelihood of occurrence
	EPBC Act	BC Act				
			drainage lines below sandstone ridges that often have shale lenses or cappings.			
Green and Golden Bell Frog *Litoria aurea*	V	E	Inhabits a variety of environments, including disturbed sites, ephemeral ponds, wetlands, marshes, dams and stream-sides, particularly those that contain one or more of the following aquatic plants: bullrush (Typha spp.), spikerush (*Eleocharis* spp.), *Juncus kraussii, Schoenoplectus littoralis* and *Sporobolus virginicus.*	Species	3 – BioNet PMST	As above.
Littlejohn's Tree Frog *Litoria littlejohni*	E	E	Breeds in the upper reaches of permanent streams and in perched swamps. Non-breeding habitat is heath-based forests and woodlands where it shelters under leaf litter and low vegetation.	Species	1 – BioNet PMST	As above.
Stuttering Frog *Mixophyes balbus*	V	E	Found in rainforest and wet, tall open forest in the foothills and escarpment on the eastern side of the Great Dividing Range.	Species	PMST	As above.
Watson's Tree Frog *Litoria watsoni*	E	E	This frog is a forest-dependent species, being recorded from a range of natural forest vegetation types at low to high elevations. The species is found in wet and dry forest, woodland, bushland and heathland. However, the species prefers moister areas, with most records from wet forest, followed by damp forest, and warm temperate rainforest. Breeds in long lasting pools that enable tadpoles to reach metamorphosis. Breeds September to February. Has a patchy distribution throughout its range, with very few records. Most records are from the Shoalhaven River catchment at the northern extent of the distribution (Barren Grounds Nature Reserve on the Budderoo Plateau and Parma Creek Nature Reserve. South of this region, infrequently recorded, and a notable range disjunction occurs between the	Not applicable.	PMST	As above.

Scientific name	Status		Habitat constraints and/or geographic limitations Distribution and habitat	BAM credit type	Number of records (source)	Likelihood of occurrence
	EPBC Act	BC Act				
			latitude of the Australian Capital Territory (ACT) and the NSW-Victorian border.			
Reptiles						
Rosenberg's Goanna *Varanus rosenbergi*		V	**Found in heath, open forest and woodland.**	Ecosystem	6 - BioNet	Low. No suitable habitat.
Striped Legless Lizard *Delma impar*	V	V	**Found mainly in Natural Temperate Grassland but has also been captured in grasslands that have a high exotic component.**	Species	PMST	As above.
Broad-headed Snake *Hoplocephalus bungaroides*	V	E	**Shelters in rock crevices and under flat sandstone rocks on exposed cliff edges during autumn, winter and spring.**	Species/Ecosystem	4 – BioNet PMST	As above.
Invertebrates						
Cumberland Land Snail *Meridolum corneovirens*		E	**Lives in small areas on the Cumberland Plain west of Sydney, from Richmond and Windsor south to Picton and from Liverpool west to the Hawkesbury and Nepean Rivers at the base of the Blue Mountains. Primarily inhabits Cumberland Plain Woodland; lives under litter of bark, leaves and logs, or shelters in loose soil around grass clumps. Occasionally shelters under rubbish.**	Species	157 - BioNet	Associated with PCT 3220. Targeted, but not observed during field investigation. Similarly, no discarded shell indictive of this snail were observed.
Dural Land Snail *Pommerhelix duralensis*	E	E	**The species has a strong affinity for communities in the interface region between shale-derived and sandstone-derived soils, with forested habitats that have good native cover and woody debris. It favours sheltering under rocks or inside curled-up bark.**	Species	1 - BioNet	As above.
Insect						

Scientific name	Status		Habitat constraints and/or geographic limitations Distribution and habitat	BAM credit type	Number of records (source)	Likelihood of occurrence
	EPBC Act	BC Act				
Sydney Hawk Dragonfly *Austrocordulia leonardi*	E	E	**Known distribution is extremely limited, being found in only three locations in a small area south of Sydney, from Audley to Picton. Most of the lifecycle of this species is spent as an aquatic larva. This species appears to have specific habitat requirements, including slow-flowing water in rocky rivers with steep sides that provide shady resting areas**	Not applicable	PMST	Low. No suitable habitat.

Appendix C: Tree classification and removal

Trees to be removed

VALUE KEY: N = Not hollow-bearing; H-C = Confirmed hollow-bearing; H-P = Potentially hollow-bearing; A = Amenity tree.

Tree ID	Latitude	Longitude	Status	Common Name	Scientific Name	Tree Height (m)	Tree size classification	DBH (cm)	Value	Hollow amount	Hollow diameter (cm)	Hollow orientation	Action	Notes
1	-34.088994	150.80623	Alive	Spotted Gum	*Corymbia maculata*	10	Large	51	N	-	-	-	Removal	
2	-34.089068	150.80614	Alive	Spotted Gum	*Corymbia maculata*	10	Large	51	N	-	-	-	Removal	
3	-34.089075	150.80617	Alive	Spotted Gum	*Corymbia maculata*	10	Large	51	N	-	-	-	Removal	
4	-34.089066	150.8062	Alive	Spotted Gum	*Corymbia maculata*	10	Large	51	N	-	-	-	Removal	
5	-34.088685	150.80626	Alive	Narrow-leaved red ironbark	*Eucalyptus crebra*	15	Medium	48	N	-	-	-	Removal	
6	-34.088718	150.80626	Alive	Narrow-leaved red ironbark	*Eucalyptus crebra*	5	Medium	21	N	-	-	-	Removal	
7	-34.089281	150.80617	Alive	Narrow-leaved red ironbark	*Eucalyptus crebra*	15	Large	70	N	-	-	-	Removal	
8	-34.089339	150.80616	Alive	Casuarina sp.	*Casuarina sp.*	6	Small	12	N	-	-	-	Removal	
9	-34.089396	150.80613	Alive	Grey box	*Eucalyptus microcarpa*	12	Medium	45	N	-	-	-	Removal	
10	-34.089403	150.80611	Alive	Narrow-leaved red ironbark	*Eucalyptus crebra*	12	Medium	45	N	-	-	-	Removal	
11	-34.089499	150.80612	Alive	Spotted Gum	*Corymbia maculata*	12	Medium	41	N	-	-	-	Removal	
12	-34.089535	150.80613	Alive	Spotted Gum	*Corymbia maculata*	12	Medium	42	N	-	-	-	Removal	
13	-34.089724	150.80605	Alive	Spotted Gum	*Corymbia maculata*	12	Medium	39	N	-	-	-	Removal	
14	-34.089737	150.80606	Alive	Spotted Gum	*Corymbia maculata*	12	Large	65	N	-	-	-	Removal	
15	-34.089111	150.80623	Alive	Turpentine	*Syncarpia glomulifera*	10	Medium	25	N	-	-	-	Removal	

Tree ID	Latitude	Longitude	Status	Common Name	Scientific Name	Tree Height (m)	Tree size classification	DBH (cm)	Value	Hollow amount	Hollow diameter (cm)	Hollow orientation	Action	Notes
16	-34.089841	150.806	Alive	Spotted Gum	*Corymbia maculata*	12	Medium	36	N	-	-	-	Removal	
17	-34.089199	150.80625	Alive	Turpentine	*Syncarpia glomulifera*	8	Medium	25	N	-	-	-	Removal	
18	-34.0893	150.8062	Alive	Turpentine	*Syncarpia glomulifera*	6	Small	15	N	-	-	-	Removal	
19	-34.0895	150.8061	Alive	Turpentine	*Syncarpia glomulifera*	8	Medium	32	N	-	-	-	Removal	
20	-34.0897	150.806	Alive	Casuarina sp.	*Casuarina sp.*	6	Medium	29	N	-	-	-	Removal	
21	-34.0903	150.8059	Alive	Spotted Gum	*Corymbia maculata*	12	Medium	39	N	-	-	-	Removal	
22	-34.0898	150.806	Alive	Narrow-leaved red ironbark	*Eucalyptus crebra*	6	Medium	20	N	-	-	-	Removal	
23	-34.0899	150.806	Alive	Narrow-leaved red ironbark	*Eucalyptus crebra*	15	Large	70	N	-	-	-	Removal	
24	-34.0905	150.8059	Alive	Spotted Gum	*Corymbia maculata*	12	Medium	32	N	-	-	-	Removal	
25	-34.0899	150.806	Alive	Narrow-leaved red ironbark	*Eucalyptus crebra*	12	Medium	21	N	-	-	-	Removal	
26	-34.09	150.806	Alive	Casuarina sp.	*Casuarina sp.*	4	Small	8	N	-	-	-	Removal	
27	-34.09	150.806	Alive	Narrow-leaved red ironbark	*Eucalyptus crebra*	15	Small	15	N	-	-	-	Removal	
28	-34.0907	150.8059	Alive	Spotted Gum	*Corymbia maculata*	15	Large	54	N	-	-	-	Removal	
29	-34.09	150.806	Alive	Narrow-leaved red ironbark	*Eucalyptus crebra*	9	Medium	25	N	-	-	-	Removal	
30	-34.0907	150.8059	Alive	Spotted Gum	*Corymbia maculata*	15	Medium	48	N	-	-	-	Removal	
31	-34.0901	150.806	Alive	Narrow-leaved red ironbark	*Eucalyptus crebra*	18	Medium	45	N	-	-	-	Removal	
32	-34.0909	150.8059	Alive	Spotted Gum	*Corymbia maculata*	15	Medium	42	N	-	-	-	Removal	
33	-34.0901	150.8059	Alive	Narrow-leaved red ironbark	*Eucalyptus crebra*	10	Medium	33	N	-	-	-	Removal	
34	-34.0909	150.8059	Alive	Spotted Gum	*Corymbia maculata*	15	Large	52	N	-	-	-	Removal	
35	-34.0901	150.806	Alive	Narrow-leaved red ironbark	*Eucalyptus crebra*	15	Medium	32	N	-	-	-	Removal	
36	-34.091	150.8058	Alive	Spotted Gum	*Corymbia maculata*	12	Medium	28	N	-	-	-	Removal	Triple trunk
37	-34.0902	150.8059	Alive	Narrow-leaved red ironbark	*Eucalyptus crebra*	8	Small	13	N	-	-	-	Removal	

Tree ID	Latitude	Longitude	Status	Common Name	Scientific Name	Tree Height (m)	Tree size classification	DBH (cm)	Value	Hollow amount	Hollow diameter (cm)	Hollow orientation	Action	Notes
38	-34.091	150.8058	Alive	Spotted Gum	*Corymbia maculata*	12	Medium	25	N	-	-	-	Removal	Six stems
39	-34.0902	150.8059	Alive	Narrow-leaved red ironbark	*Eucalyptus crebra*	10	Medium	25	N	-	-	-	Removal	
40	-34.0903	150.8059	Alive	Narrow-leaved red ironbark	*Eucalyptus crebra*	8	Medium	25	N	-	-	-	Removal	
41	-34.0913	150.8058	Alive	Spotted Gum	*Corymbia maculata*	12	Medium	39	N	-	-	-	Removal	
42	-34.0914	150.8057	Alive	Spotted Gum	*Corymbia maculata*	12	Medium	32	N	-	-	-	Removal	
43	-34.0904	150.8059	Alive	Narrow-leaved red ironbark	*Eucalyptus crebra*	10	Medium	48	N	-	-	-	Removal	
44	-34.0904	150.8059	Alive	Narrow-leaved red ironbark	*Eucalyptus crebra*	15	Medium	21	N	-	-	-	Removal	
45	-34.0917	150.8057	Alive	Spotted Gum	*Corymbia maculata*	15	Large	55	N	-	-	-	Removal	
46	-34.0904	150.8059	Alive	Narrow-leaved red ironbark	*Eucalyptus crebra*	15	Large	90	N	-	-	-	Removal	
47	-34.0921	150.8056	Alive	Spotted Gum	*Corymbia maculata*	15	Medium	39	N	-	-	-	Removal	
48	-34.0905	150.8059	Alive	Narrow-leaved red ironbark	*Eucalyptus crebra*	15	Small	13	N	-	-	-	Removal	
49	-34.0906	150.8059	Alive	Narrow-leaved red ironbark	*Eucalyptus crebra*	10	Medium	29	N	-	-	-	Removal	
50	-34.0923	150.8056	Alive	Spotted Gum	*Corymbia maculata*	8	Medium	27	N	-	-	-	Removal	
51	-34.0924	150.8056	Alive	Spotted Gum	*Corymbia maculata*	8	Medium	27	N	-	-	-	Removal	Triple trunk
52	-34.0908	150.8058	Alive	Narrow-leaved red ironbark	*Eucalyptus crebra*	15	Medium	30	N	-	-	-	Removal	
53	-34.0909	150.8058	Alive	Turpentine	*Syncarpia glomulifera*	7	Small	13	N	-	-	-	Removal	
54	-34.0909	150.8058	Alive	Turpentine	*Syncarpia glomulifera*	7	Medium	28	N	-	-	-	Removal	
55	-34.091	150.8059	Alive	Narrow-leaved red ironbark	*Eucalyptus crebra*	9	Small	13	N	-	-	-	Removal	
56	-34.091	150.8058	Alive	Narrow-leaved red ironbark	*Eucalyptus crebra*	12	Small	15	N	-	-	-	Removal	
57	-34.091	150.8058	Alive	Narrow-leaved red ironbark	*Eucalyptus crebra*	8	Medium	22	N	-	-	-	Removal	
58	-34.0911	150.8058	Alive	Narrow-leaved red ironbark	*Eucalyptus crebra*	15	Medium	25	N	-	-	-	Removal	

Tree ID	Latitude	Longitude	Status	Common Name	Scientific Name	Tree Height (m)	Tree size classification	DBH (cm)	Value	Hollow amount	Hollow diameter (cm)	Hollow orientation	Action	Notes
59	-34.0911	150.8058	Alive	Narrow-leaved red ironbark	*Eucalyptus crebra*	7	Small	15	N	-	-	-	Removal	
60	-34.0911	150.8058	Alive	Narrow-leaved red ironbark	*Eucalyptus crebra*	7	Small	15	N	-	-	-	Removal	
61	-34.0911	150.8058	Alive	Narrow-leaved red ironbark	*Eucalyptus crebra*	8	Medium	20	N	-	-	-	Removal	
62	-34.0911	150.8058	Alive	Grey box	*Eucalyptus microcarpa*	7	Small	8	N	-	-	-	Removal	
63	-34.0911	150.8058	Alive	Narrow-leaved red ironbark	*Eucalyptus crebra*	5	Small	6	N	-	-	-	Removal	
64	-34.0926	150.8056	Alive	Australian Silky Oak	*Grevillea robusta*	4	Small	7	N	-	-	-	Removal	
65	-34.0911	150.8058	Alive	Narrow-leaved red ironbark	*Eucalyptus crebra*	20	Medium	35	N	-	-	-	Removal	
66	-34.0912	150.8058	Alive	Narrow-leaved red ironbark	*Eucalyptus crebra*	20	Medium	25	N	-	-	-	Removal	
67	-34.0924	150.8056	Alive	Turpentine	*Syncarpia glomulifera*	5	Medium	21	N	-	-	-	Removal	
68	-34.0912	150.8058	Alive	Narrow-leaved red ironbark	*Eucalyptus crebra*	18	Medium	30	N	-	-	-	Removal	
69	-34.0912	150.8058	Alive	Narrow-leaved red ironbark	*Eucalyptus crebra*	20	Medium	45	N	-	-	-	Removal	
70	-34.0913	150.8058	Alive	Narrow-leaved red ironbark	*Eucalyptus crebra*	15	Medium	45	N	-	-	-	Removal	
71	-34.0924	150.8056	Alive	Brush Box	*Lophostemon confertus*	5	Medium	21	N	-	-	-	Removal	
72	-34.0914	150.8057	Alive	Turpentine	*Syncarpia glomulifera*	7	Small	15	N	-	-	-	Removal	
73	-34.0923	150.8056	Alive	Turpentine	*Syncarpia glomulifera*	7	Medium	35	N	-	-	-	Removal	
74	-34.0915	150.8057	Alive	Turpentine	*Syncarpia glomulifera*	7	Medium	25	N	-	-	-	Removal	
75	-34.0923	150.8056	Alive	Turpentine	*Syncarpia glomulifera*	7	Medium	22	N	-	-	-	Removal	
76	-34.0916	150.8057	Alive	Forest red gum	*Eucalyptus tereticornis*	8	Medium	22	N	-	-	-	Removal	
77	-34.0921	150.8056	Alive	Narrow-leaved red ironbark	*Eucalyptus crebra*	10	Medium	35	N	-	-	-	Removal	
78	-34.0919	150.8056	Alive	Narrow-leaved red ironbark	*Eucalyptus crebra*	15	Medium	32	N	-	-	-	Removal	

Tree ID	Latitude	Longitude	Status	Common Name	Scientific Name	Tree Height (m)	Tree size classification	DBH (cm)	Value	Hollow amount	Hollow diameter (cm)	Hollow orientation	Action	Notes
79	-34.092	150.8056	Alive	Forest red gum	*Eucalyptus tereticornis*	4	Small	12	N	-	-	-	Removal	
80	-34.089	150.8064	Alive	Thin-leaved stringybark	*Eucalyptus eugenioides*	8	Medium	37	N	-	-	-	Removal	
81	-34.089	150.8066	Alive	Thin-leaved stringybark	*Eucalyptus eugenioides*	10	Medium	45	N	-	-	-	Removal	
82	-34.089	150.8066	Alive	Thin-leaved stringybark	*Eucalyptus eugenioides*	10	Medium	45	N	-	-	-	Removal	
83	-34.0889	150.8066	Alive	Narrow-leaved red ironbark	*Eucalyptus crebra*	15	Large	70	N	-	-	-	Removal	
84	-34.089	150.8071	Alive	Thin-leaved stringybark	*Eucalyptus eugenioides*	10	Medium	37	N	-	-	-	Removal	
85	-34.089	150.807	Alive	Thin-leaved stringybark	*Eucalyptus eugenioides*	10	Medium	37	N	-	-	-	Removal	
86	-34.089	150.8069	Alive	Thin-leaved stringybark	*Eucalyptus eugenioides*	10	Medium	37	N	-	-	-	Removal	
87	-34.0889	150.8072	Alive	Liquid Amber	**Liquidambar styraciflua*	8	Medium	32	N	-	-	-	Removal	
88	-34.0889	150.8074	Alive	Spotted Gum	*Corymbia maculata*	12	Medium	47	N	-	-	-	Removal	
220	**-34.0903**	**150.8059**	**Alive**	**Spotted Gum**	***Corymbia maculata***	**12**	**Medium**	**39**	**H - P**	**1**	**<5**	**Horizontal**	**Removal**	
221	**-34.0907**	**150.8059**	**Alive**	**Spotted Gum**	***Corymbia maculata***	**12**	**Medium**	**32**	**H - P**	**1**	**<5**	**Vertical**	**Removal**	
227	**-34.0901**	**150.806**	**Alive**	**Spotted Gum**	***Corymbia maculata***	**12**	**Medium**	**37**	**H - C**	**1**	**8**	**Vertical**	**Removal**	
228	**-34.0903**	**150.806**	**Alive**	**Spotted Gum**	***Corymbia maculata***	**12**	**Medium**	**45**	**H - C**	**2**	**5-15**	**Horizontal/ Vertical**	**Removal**	
239	**-34.0924**	**150.8056**	**Alive**	**Brush Box**	***Lophostemon confertus***	**7**	**Medium**	**25**	**A**	**-**	**-**	**-**	**Removal**	**Triple trunk**

Trees to be retained

Tree ID	Latitude	Longitude	Status	Common Name	Scientific Name	Tree Height (m)	Tree size classification	DBH (cm)	Value	Hollow amount	Hollow diameter (cm)	Hollow orientation	Action	Notes
89	-34.0839	150.8064	Alive	Forest red gum	*Eucalyptus tereticornis*	6	Medium	35	N	-	-	-	Retain	

Tree ID	Latitude	Longitude	Status	Common Name	Scientific Name	Tree Height (m)	Tree size classification	DBH (cm)	Value	Hollow amount	Hollow diameter (cm)	Hollow orientation	Action	Notes
90	-34.0839	150.8064	Alive	Forest red gum	*Eucalyptus tereticornis*	6	Medium	31	N	-	-	-	Retain	
91	-34.0841	150.8064	Alive	Forest red gum	*Eucalyptus tereticornis*	9	Medium	45	N	-	-	-	Retain	
92	-34.0841	150.8064	Alive	Port Jackson fig	*Ficus rubiginosa*	5	Small	8	N	-	-	-	Retain	
93	-34.0841	150.8065	Alive	Forest red gum	*Eucalyptus tereticornis*	8	Medium	38	N	-	-	-	Retain	
94	-34.0842	150.8066	Alive	Forest red gum	*Eucalyptus tereticornis*	6	Small	8	N	-	-	-	Retain	
95	-34.0843	150.8064	Alive	Forest red gum	*Eucalyptus tereticornis*	5	Small	18	N	-	-	-	Retain	Double trunk
96	-34.0843	150.8064	Alive	Forest red gum	*Eucalyptus tereticornis*	8	Medium	41	N	-	-	-	Retain	
97	-34.0843	150.8063	Alive	Forest red gum	*Eucalyptus tereticornis*	6	Medium	32	N	-	-	-	Retain	
98	-34.0843	150.8063	Alive	Spotted Gum	*Corymbia maculata*	8	Medium	31	N	-	-	-	Retain	
99	-34.0843	150.8066	Alive	Forest red gum	*Eucalyptus tereticornis*	10	Large	55	N	-	-	-	Retain	
100	-34.0844	150.8065	Alive	Forest red gum	*Eucalyptus tereticornis*	10	Medium	41	N	-	-	-	Retain	
101	-34.0842	150.8063	Alive	Forest red gum	*Eucalyptus tereticornis*	8	Medium	31	N	-	-	-	Retain	
102	-34.0842	150.8061	Alive	Forest red gum	*Eucalyptus tereticornis*	15	Large	91	N	-	-	-	Retain	
103	-34.0844	150.8065	Alive	Forest red gum	*Eucalyptus tereticornis*	8	Medium	41	N	-	-	-	Retain	
104	-34.0845	150.8065	Alive	Forest red gum	*Eucalyptus tereticornis*	8	Medium	45	N	-	-	-	Retain	
105	-34.0845	150.8064	Alive	Forest red gum	*Eucalyptus tereticornis*	8	Medium	45	N	-	-	-	Retain	
106	-34.0845	150.8064	Alive	Lemon-scented gum	*Corymbia citriodora*	12	Medium	45	N	-	-	-	Retain	Triple trunk
107	-34.0846	150.8065	Alive	Lemon-scented gum	*Corymbia citriodora*	9	Medium	31	N	-	-	-	Retain	
108	-34.0845	150.8064	Alive	Forest red gum	*Eucalyptus tereticornis*	12	Large	55	N	-	-	-	Retain	Double trunk
109	-34.0846	150.8064	Alive	Lemon-scented gum	*Corymbia citriodora*	12	Medium	41	N	-	-	-	Retain	

Tree ID	Latitude	Longitude	Status	Common Name	Scientific Name	Tree Height (m)	Tree size classification	DBH (cm)	Value	Hollow amount	Hollow diameter (cm)	Hollow orientation	Action	Notes
110	-34.0844	150.8066	Alive	White cedar	*Melia azedarach*	8	Medium	25	N	-	-	-	Retain	
111	-34.0845	150.8063	Alive	Lemon-scented gum	*Corymbia citriodora*	10	Large	60	N	-	-	-	Retain	
112	-34.0846	150.8064	Alive	Lemon-scented gum	*Corymbia citriodora*	10	Medium	35	N	-	-	-	Retain	
113	-34.0846	150.8064	Alive	Lemon-scented gum	*Corymbia citriodora*	7	Small	7	N	-	-	-	Retain	
114	-34.0846	150.8064	Alive	Lemon-scented gum	*Corymbia citriodora*	7	Small	7	N	-	-	-	Retain	
115	-34.0846	150.8064	Alive	Lemon-scented gum	*Corymbia citriodora*	7	Small	7	N	-	-	-	Retain	
116	-34.0846	150.8064	Alive	Lemon-scented gum	*Corymbia citriodora*	7	Small	7	N	-	-	-	Retain	
117	-34.0846	150.8064	Alive	Lemon-scented gum	*Corymbia citriodora*	7	Small	7	N	-	-	-	Retain	
118	-34.0846	150.8064	Alive	Lemon-scented gum	*Corymbia citriodora*	7	Small	7	N	-	-	-	Retain	
119	-34.0846	150.8064	Alive	Lemon-scented gum	*Corymbia citriodora*	7	Small	7	N	-	-	-	Retain	
120	-34.0846	150.8064	Alive	Thin-leaved stringybark	*Eucalyptus eugenioides*	9	Small	18	N	-	-	-	Retain	
121	-34.0846	150.8064	Alive	Lemon-scented gum	*Corymbia citriodora*	10	Medium	22	N	-	-	-	Retain	
122	-34.0846	150.8064	Alive	Lemon-scented gum	*Corymbia citriodora*	8	Small	12	N	-	-	-	Retain	
123	-34.0846	150.8064	Alive	Lemon-scented gum	*Corymbia citriodora*	8	Small	12	N	-	-	-	Retain	
124	-34.0846	150.8064	Alive	Spotted Gum	*Corymbia maculata*	8	Small	10	N	-	-	-	Retain	Triple trunk
125	-34.0846	150.8063	Alive	Spotted Gum	*Corymbia maculata*	15	Medium	20	N	-	-	-	Retain	
126	-34.0846	150.8063	Alive	Lemon-scented gum	*Corymbia citriodora*	8	Small	5	N	-	-	-	Retain	
127	-34.0846	150.8063	Alive	Lemon-scented gum	*Corymbia citriodora*	8	Small	5	N	-	-	-	Retain	
128	-34.0843	150.8071	Alive	White cedar	*Melia azedarach*	5	Medium	20	N	-	-	-	Retain	
129	-34.0845	150.8062	Alive	Lemon-scented gum	*Corymbia citriodora*	10	Medium	35	N	-	-	-	Retain	
130	-34.0845	150.8062	Alive	Lemon-scented gum	*Corymbia citriodora*	10	Medium	35	N	-	-	-	Retain	Double trunk
131	-34.0846	150.8062	Alive	Lemon-scented gum	*Corymbia citriodora*	10	Small	17	N	-	-	-	Retain	
132	-34.0847	150.8062	Alive	Lemon-scented gum	*Corymbia citriodora*	10	Small	17	N	-	-	-	Retain	
133	-34.0838	150.8073	Alive	Australian Silky Oak	*Grevillea robusta*	4	Small	15	N	-	-	-	Retain	
134	-34.0847	150.8064	Alive	Lemon-scented gum	*Corymbia citriodora*	10	Small	15	N	-	-	-	Retain	
135	-34.0847	150.8064	Alive	Lemon-scented gum	*Corymbia citriodora*	10	Medium	35	N	-	-	-	Retain	

Tree ID	Latitude	Longitude	Status	Common Name	Scientific Name	Tree Height (m)	Tree size classification	DBH (cm)	Value	Hollow amount	Hollow diameter (cm)	Hollow orientation	Action	Notes
136	-34.0847	150.8064	Dead	Lemon-scented gum	*Corymbia citriodora*	8	Small	15	N	-	-	-	Retain	
137	-34.0847	150.8064	Alive	Spotted Gum	*Corymbia maculata*	8	Small	15	N	-	-	-	Retain	
138	-34.0848	150.8062	Alive	Spotted Gum	*Corymbia maculata*	15	Large	55	N	-	-	-	Retain	
139	-34.0847	150.8063	Alive	Sweet Pittosporum	*Pittosporum undulatum*	5	Small	5	N	-	-	-	Retain	
140	-34.0848	150.8063	Dead	N/A	*N/A*	5	Small	18	N	-	-	-	Retain	
141	-34.0848	150.8063	Alive	Spotted Gum	*Corymbia maculata*	15	Large	60	N	-	-	-	Retain	
142	-34.0848	150.8062	Alive	Lemon-scented gum	*Corymbia citriodora*	12	Small	12	N	-	-	-	Retain	
143	-34.0848	150.8062	Alive	Lemon-scented gum	*Corymbia citriodora*	5	Small	12	N	-	-	-	Retain	
144	-34.0848	150.8062	Alive	Lemon-scented gum	*Corymbia citriodora*	5	Small	12	N	-	-	-	Retain	
145	-34.0848	150.8062	Alive	Lemon-scented gum	*Corymbia citriodora*	5	Small	12	N	-	-	-	Retain	
146	-34.0848	150.8062	Alive	Lemon-scented gum	*Corymbia citriodora*	5	Small	12	N	-	-	-	Retain	
147	-34.0848	150.8063	Alive	Lemon-scented gum	*Corymbia citriodora*	5	Small	12	N	-	-	-	Retain	
148	-34.0848	150.8063	Alive	Lemon-scented gum	*Corymbia citriodora*	5	Small	12	N	-	-	-	Retain	
149	-34.0848	150.8063	Alive	Lemon-scented gum	*Corymbia citriodora*	5	Small	12	N	-	-	-	Retain	
150	-34.0848	150.8063	Alive	Lemon-scented gum	*Corymbia citriodora*	5	Small	12	N	-	-	-	Retain	
151	-34.0848	150.8063	Alive	Lemon-scented gum	*Corymbia citriodora*	5	Small	12	N	-	-	-	Retain	
152	-34.0849	150.8063	Alive	Lemon-scented gum	*Corymbia citriodora*	5	Small	12	N	-	-	-	Retain	
153	-34.0849	150.8063	Alive	Lemon-scented gum	*Corymbia citriodora*	5	Small	12	N	-	-	-	Retain	
154	-34.0848	150.8063	Alive	Lemon-scented gum	*Corymbia citriodora*	5	Small	12	N	-	-	-	Retain	
155	-34.0848	150.8063	Alive	Lemon-scented gum	*Corymbia citriodora*	8	Medium	25	N	-	-	-	Retain	
156	-34.0849	150.8063	Alive	Lemon-scented gum	*Corymbia citriodora*	8	Medium	22	N	-	-	-	Retain	
157	-34.0848	150.8062	Alive	Lemon-scented gum	*Corymbia citriodora*	8	Small	17	N	-	-	-	Retain	
158	-34.0849	150.8062	Alive	Lemon-scented gum	*Corymbia citriodora*	6	Small	5	N	-	-	-	Retain	
159	-34.0849	150.8062	Alive	Lemon-scented gum	*Corymbia citriodora*	6	Small	5	N	-	-	-	Retain	
160	-34.0849	150.8062	Alive	Lemon-scented gum	*Corymbia citriodora*	6	Small	5	N	-	-	-	Retain	
161	-34.0849	150.8062	Alive	Lemon-scented gum	*Corymbia citriodora*	6	Small	5	N	-	-	-	Retain	
162	-34.0849	150.8062	Alive	Lemon-scented gum	*Corymbia citriodora*	6	Small	5	N	-	-	-	Retain	

Tree ID	Latitude	Longitude	Status	Common Name	Scientific Name	Tree Height (m)	Tree size classification	DBH (cm)	Value	Hollow amount	Hollow diameter (cm)	Hollow orientation	Action	Notes
163	-34.0849	150.8062	Alive	Lemon-scented gum	*Corymbia citriodora*	6	Small	5	N	-	-	-	Retain	
164	-34.0849	150.8062	Alive	Lemon-scented gum	*Corymbia citriodora*	6	Small	5	N	-	-	-	Retain	
165	-34.0849	150.8062	Alive	Lemon-scented gum	*Corymbia citriodora*	6	Small	5	N	-	-	-	Retain	
166	-34.0849	150.8062	Alive	Lemon-scented gum	*Corymbia citriodora*	6	Small	5	N	-	-	-	Retain	
167	-34.0849	150.8062	Alive	Lemon-scented gum	*Corymbia citriodora*	6	Small	5	N	-	-	-	Retain	
168	-34.0849	150.8062	Alive	Lemon-scented gum	*Corymbia citriodora*	6	Small	5	N	-	-	-	Retain	
169	-34.0849	150.8062	Alive	Lemon-scented gum	*Corymbia citriodora*	6	Small	5	N	-	-	-	Retain	
170	-34.0849	150.8062	Alive	Lemon-scented gum	*Corymbia citriodora*	8	Medium	25	N	-	-	-	Retain	
171	-34.085	150.8062	Alive	Lemon-scented gum	*Corymbia citriodora*	8	Small	17	N	-	-	-	Retain	
172	-34.0853	150.8061	Alive	Spotted Gum	*Corymbia maculata*	10	Medium	32	N	-	-	-	Retain	
173	-34.0852	150.806	Alive	Spotted Gum	*Corymbia maculata*	10	Medium	32	N	-	-	-	Retain	
174	-34.0852	150.8061	Alive	Spotted Gum	*Corymbia maculata*	10	Medium	32	N	-	-	-	Retain	
175	-34.0875	150.8056	Alive	Lemon-scented gum	*Corymbia citriodora*	15	Small	13	N	-	-	-	Retain	
176	-34.0852	150.8061	Alive	Lemon-scented gum	*Corymbia citriodora*	10	Medium	32	N	-	-	-	Retain	
177	-34.0852	150.8061	Alive	Lemon-scented gum	*Corymbia citriodora*	10	Medium	25	N	-	-	-	Retain	
178	-34.0876	150.8057	Alive	Lemon-scented gum	*Corymbia citriodora*	15	Medium	35	N	-	-	-	Retain	
179	-34.0852	150.806	Alive	Lemon-scented gum	*Corymbia citriodora*	10	Medium	25	N	-	-	-	Retain	
180	-34.0853	150.806	Alive	Lemon-scented gum	*Corymbia citriodora*	8	Small	12	N	-	-	-	Retain	
181	-34.0853	150.806	Alive	Lemon-scented gum	*Corymbia citriodora*	8	Small	12	N	-	-	-	Retain	
182	-34.0853	150.806	Alive	Lemon-scented gum	*Corymbia citriodora*	8	Medium	25	N	-	-	-	Retain	
183	-34.0875	150.8058	Alive	Spotted Gum	*Corymbia maculata*	20	Large	70	N	-	-	-	Retain	
184	-34.0853	150.8061	Alive	Lemon-scented gum	*Corymbia citriodora*	8	Small	12	N	-	-	-	Retain	
185	-34.0853	150.8061	Alive	Lemon-scented gum	*Corymbia citriodora*	15	Medium	45	N	-	-	-	Retain	
186	-34.0875	150.8058	Alive	Spotted Gum	*Corymbia maculata*	15	Medium	23	N	-	-	-	Retain	
187	-34.0854	150.8061	Alive	Spotted Gum	*Corymbia maculata*	7	Medium	22	N	-	-	-	Retain	
188	-34.0875	150.8059	Alive	Spotted Gum	*Corymbia maculata*	5	Small	8	N	-	-	-	Retain	
189	-34.0854	150.8061	Alive	Spotted Gum	*Corymbia maculata*	15	Medium	48	N	-	-	-	Retain	

Tree ID	Latitude	Longitude	Status	Common Name	Scientific Name	Tree Height (m)	Tree size classification	DBH (cm)	Value	Hollow amount	Hollow diameter (cm)	Hollow orientation	Action	Notes
190	-34.0854	150.806	Alive	Spotted Gum	*Corymbia maculata*	15	Medium	41	N	-	-	-	Retain	
191	-34.0854	150.8061	Alive	Spotted Gum	*Corymbia maculata*	8	Medium	23	N	-	-	-	Retain	
192	-34.0868	150.806	Alive	Broad-leaved paperbark	*Melaleuca Quinqinivera*	8	Medium	32	N	-	-	-	Retain	
193	-34.0855	150.8061	Alive	Spotted Gum	*Corymbia maculata*	8	Small	19	N	-	-	-	Retain	
194	-34.0855	150.8061	Alive	Spotted Gum	*Corymbia maculata*	8	Small	19	N	-	-	-	Retain	
195	-34.0855	150.8061	Alive	Spotted Gum	*Corymbia maculata*	8	Small	15	N	-	-	-	Retain	
196	-34.0869	150.806	Alive	White cedar	*Melia azedarach*	6	Small	11	N	-	-	-	Retain	
197	-34.0857	150.8061	Alive	Spotted Gum	*Corymbia maculata*	12	Large	65	N	-	-	-	Retain	
198	-34.0868	150.8059	Alive	Lemon-scented gum	*Corymbia citriodora*	5	Small	5	N	-	-	-	Retain	
199	-34.0858	150.8061	Alive	Spotted Gum	*Corymbia maculata*	12	Medium	45	N	-	-	-	Retain	
200	-34.0867	150.8059	Alive	Lemon-scented gum	*Corymbia citriodora*	8	Small	12	N	-	-	-	Retain	
201	-34.0858	150.806	Alive	Spotted Gum	*Corymbia maculata*	12	Small	19	N	-	-	-	Retain	
202	-34.0867	150.8059	Alive	Narrow-leaved red ironbark	*Eucalyptus crebra*	8	Medium	33	N	-	-	-	Retain	
203	-34.0858	150.806	Alive	Spotted Gum	*Corymbia maculata*	12	Medium	32	N	-	-	-	Retain	
204	-34.0859	150.806	Alive	Spotted Gum	*Corymbia maculata*	12	Medium	32	N	-	-	-	Retain	
205	-34.0867	150.806	Alive	Lemon-scented gum	*Corymbia citriodora*	10	Medium	22	N	-	-	-	Retain	
206	-34.0859	150.8061	Alive	Spotted Gum	*Corymbia maculata*	12	Medium	29	N	-	-	-	Retain	
207	-34.0867	150.806	Alive	Lemon-scented gum	*Corymbia citriodora*	4	Small	5	N	-	-	-	Retain	
208	-34.0859	150.806	Alive	Spotted Gum	*Corymbia maculata*	12	Large	65	N	-	-	-	Retain	
209	-34.0866	150.806	Alive	Lemon-scented gum	*Corymbia citriodora*	15	Medium	45	N	-	-	-	Retain	
210	-34.0866	150.806	Alive	Lemon-scented gum	*Corymbia citriodora*	15	Medium	45	N	-	-	-	Retain	
211	-34.086	150.806	Alive	Lemon-scented gum	*Corymbia citriodora*	15	Medium	49	N	-	-	-	Retain	
212	-34.0866	150.806	Alive	Spotted Gum	*Corymbia maculata*	7	Medium	22	N	-	-	-	Retain	
213	-34.086	150.8061	Alive	Forest red gum	*Eucalyptus tereticornis*	10	Medium	28	N	-	-	-	Retain	
214	-34.0862	150.8061	Alive	Lemon-scented gum	*Corymbia citriodora*	7	Small	12	N	-	-	-	Retain	
215	-34.0863	150.8061	Alive	Lemon-scented gum	*Corymbia citriodora*	7	Small	12	N	-	-	-	Retain	

Tree ID	Latitude	Longitude	Status	Common Name	Scientific Name	Tree Height (m)	Tree size classification	DBH (cm)	Value	Hollow amount	Hollow diameter (cm)	Hollow orientation	Action	Notes
216	-34.0863	150.806	Alive	Australian Silky Oak	*Grevillea robusta*	8	Small	15	N	-	-	-	Retain	
217	-34.0863	150.806	Alive	Spotted Gum	*Corymbia maculata*	15	Large	65	N	-	-	-	Retain	
218	-34.0864	150.806	Alive	Lemon-scented gum	*Corymbia citriodora*	15	Large	50	N	-	-	-	Retain	
219	-34.0863	150.806	Alive	Spotted Gum	*Corymbia maculata*	15	Large	50	N	-	-	-	Retain	
222	**-34.0847**	**150.8064**	**Dead**	**N/A**	**N/A**	**15**	**Large**	**50**	**H - P**	**1**	**<5**	**Horizontal**	**Retain**	
223	**-34.0848**	**150.8063**	**Alive**	**Spotted Gum**	***Corymbia maculata***	**15**	**Large**	**95**	**H - P**	**1**	**<5**	**Horizontal**	**Retain**	
224	**-34.0851**	**150.8061**	**Alive**	**Forest red gum**	***Eucalyptus tereticornis***	**17**	**Very Large**	**150**	**H - P**	**1**	**<5**	**Horizontal**	**Retain**	
225	**-34.086**	**150.806**	**Alive**	**Lemon-scented gum**	***Corymbia citriodora***	**15**	**Medium**	**25**	**H - P**	**1**	**5**	**Horizontal**	**Retain**	
226	**-34.0844**	**150.8064**	**Dead**	**N/A**	**N/A**	**12**	**Medium**	**36**	**H - P**	**4**	**<5**	**Horizontal**	**Retain**	
229	**-34.0845**	**150.8064**	**Dead**	**Forest red gum**	***Eucalyptus tereticornis***	**8**	**Medium**	**35**	**H - C**	**1**	**15**	**Horizontal**	**Retain**	
230	**-34.0848**	**150.8063**	**Dead**	**N/A**	**N/A**	**5**	**Small**	**8**	**H - C**	**1**	**5**	**Horizontal/ Vertical**	**Retain**	
231	**-34.0858**	**150.8061**	**Alive**	**Spotted Gum**	***Corymbia maculata***	**12**	**Medium**	**45**	**H - C**	**1**	**5**	**Horizontal**	**Retain**	
232	**-34.0843**	**150.8059**	**Alive**	**Forest red gum**	***Eucalyptus tereticornis***	**15**	**Very Large**	**101**	**H - C**	**4**	**5-15**	**Horizontal/ Vertical**	**Retain**	
233	**-34.0855**	**150.8061**	**Dead**	**N/A**	**N/A**	**8**	**Medium**	**37**	**H - C**	**1**	**5**	**Horizontal/ Vertical**	**Retain**	
234	**-34.0848**	**150.8063**	**Dead**	**N/A**	**N/A**	**12**	**Medium**	**32**	**H - C**	**1**	**20**	**Vertical**	**Retain**	**1 m high hollow. No noted occupation**
235	**-34.0846**	**150.8063**	**Alive**	**Lemon-scented gum**	***Corymbia citriodora***	**15**	**Large**	**80**	**H - C**	**1-3**	**5-25**	**Horizontal/ Vertical**	**Retain**	
236	**-34.0848**	**150.8063**	**Alive**	**Lemon-scented gum**	***Corymbia citriodora***	**15**	**Large**	**85**	**H - C**	**1-3**	**5**	**Horizontal**	**Retain**	
237	**-34.0848**	**150.8063**	**Alive**	**Spotted Gum**	***Corymbia maculata***	**15**	**Large**	**60**	**H - C**	**1-3**	**5**	**Horizontal**	**Retain**	
238	**-34.086**	**150.8061**	**Dead**	**N/A**	**N/A**	**12**	**Medium**	**29**	**H - C**	**1-3**	**5**	**Horizontal**	**Retain**	
240	**-34.0878**	**150.8058**	**Alive**	**Poplar**	****Populus simonii***	**5**	**Medium**	**38**	**A**	**-**	**-**	**-**	**Retain**	

Appendix D: Photographic record of area investigated

	Character of vegetation along the north western boundary of the study area. Photograph taken facing north.
	Character of vegetation along the north western boundary of the study area. Appin Road present east of the vegetated slope. Photograph taken facing north.
	Character of vegetation located along to westbound verge of Appin Road and St Johns Road intersection. Photograph taken facing west from the westbound lane.

	Proposed compound site located within Woodland Road Reserve. Photograph taken facing west.
	Proposed compound site located within Flynn Reserve. Photograph taken facing north.

Appendix E: Flora recorded

Key
*-introduced species

FAMILY	Scientific Name	Common Name
PINOPSIDA		
Pinaceae	*Pinus radiata* *	Radiata Pine
MAGNOLIOPSIDA – FLOWERING PLANTS		
MAGNOLIIDAE - DICOTYLEDONS		
Apiaceae	*Foeniculum vulgare* *	Fennel
Apocynaceae	*Araujia sericifera**	Moth vine
Asteraceae	*Conyza bonariensis* *	Fleabane
	Sonchus oleraceus *	Sowthistle
Bignoniaceae	*Jacaranda mimosifolia* *	Jacaranda
Brassicaceae	*Brassica juncea* *	Indian Mustard
Cactaceae	*Opuntia sp.* *	Prickly-pear
Fabaceae: Caesalpiniaceae	*Senna pendula var. glabrata* *	Cassia
Fabaceae: Mimosoideae	*Acacia decurrens*	Sydney Green Wattle
	Acacia falcata	Sickle Wattle
	Acacia implexa	Hickory Wattle
	Acacia podalyriifolia	
Malvaceae	*Brachychiton acerifolius*	Illawarra Flame Tree
Meliaceae	*Melia azedarach*	White Cedar
Moraceae	*Ficus rubiginosa*	Port Jackson Fig
Myrtaceae	*Corymbia citriodora*	Lemon-scented Gum
	Corymbia maculata	Spotted Gum
	Eucalyptus crebra	Narrow-leaved Ironbark
	Eucalyptus eugenioides	Thin-leaved stringybark
	Eucalyptus tereticornis	Forest Red Gum
	Melaleuca nodosa	Ball Honeymyrtle
	Melaleuca quinquenervia	Broad-leaved Paperbark
	Syncarpia glomulifera	Turpentine
Oleaceae	*Ligustrum lucidum* *	Large-leaved Privett
	Ligustrum sinense *	Small-leaved Privett
	Olea europaea subsp. cuspidata *	African Olive
Pittosporaceae	*Bursaria spinosa subs. spinosa*	Blackthorn
	Pittosporum undulatum	Sweet Pittosporum
Proteaceae	*Grevillea robusta* *	Silky Oak
Rosaceae	*Rubus fruticosus agg. spp.* *	Blackberry
Salicaceae	*Populus sp.* *	Poplar
Verbenaceae	*Verbena bonariensis* *	Purpletop
LILIIDAE - MONOCOTYLEDONS		
Asparagaceae	*Asparagus asparagoides* *	Bridal Creeper
	Asparagus africanus *	Climbing Asparagus
	Asparagus aethiopicus *	Asparagus Fern
	Yucca sp. *	
Poaceae	*Cenchrus clandestinus* *	Kikuyu Grass
	Chloris gayana *	Rhodes grass
	Eragrostis curvula *	African Love Grass
	Hyparrhenia hirta *	Coolatai Grass

Appendix F: Assessments of Significance

1. Commonwealth - *Environment Protection and Biodiversity Conservation Act 1999*

As they have been previously recorded in the study area, and as suitable habitat and hollow-bearing trees are present in the proposal area, it was considered appropriate to adopt a precautionary approach to the potential presence of the following species:

- Koala – Endangered
- Gang-gang Cockatoo – Endangered.

The Significant Impact Guidelines prepared under the EPBC Act (DE 2013) are used to determine whether there is likely to be a significant impact on these MNES and as such whether the conducting of the proposed Appin Road and St Johns Road intersection upgrade, would require referral to the Federal Minister for the Environment and Water for further consideration or approval.

1.1 Koala – Endangered

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

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

Though considered and targeted, this species was not observed or heard calling during the course of the field inspection, and no indicative evidence (characteristic scats and scratchings on habitat use trees) were observed.

Reference to the SEED map viewer's NSW BioNet Koala Species Sightings layer (NSW Government 2023e) reveals previous records for the Koala primarily east of Appin Road (study area denoted with blue circle) (Plate 1A), within Dharawal National Park/Reserves and Holsworthy Barracks land.

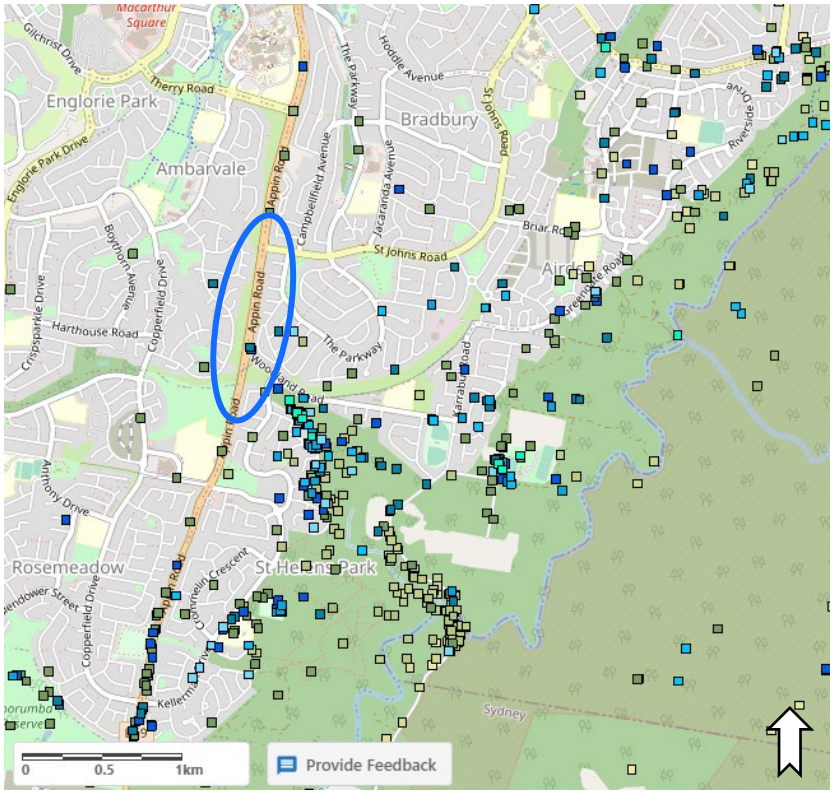

Plate 1A. Koala records (square icons) within study area

The proposed works would (based on a worst-case scenario) affect 1.2 ha of vegetation, this including the removal of two Forest Red Gums (Koala feed tree species) and 82 Koala use trees (comprised of five species) listed under Schedules 1 and 3 of BCSEPP. While Koala use trees would be cleared, the level of impact would not lead to a long-term decrease in the size of a viable local Koala population.

- *reduce the area of occupancy of the species*

The proposed action would not reduce a potential area of occupancy for the species. Extensive habitat in which viable populations of Koala are known to exist will be retained adjacent to, and beyond the limits of, the study area and in the wider region.

- *fragment an existing population into two or more populations*

The loss of 1.2 ha of vegetation, including 84 Koala feed and use trees, would not fragment an existing population into two or more populations. Extensive areas of suitable, continuous habitat would be retained adjacent to, and beyond the limits of, the study area and in the wider region.

- *adversely affect habitat critical to the survival of a species*

Habitat within the study area is not listed on the Australian Government's Register of Critical Habitat (DCCEEW 2023c). The amount of Koala habitat to be affected within the existing modified/disturbed environment of the road corridor is not considered critical to the survival of the Koala.

- *disrupt the breeding cycle of a population*

For reasons previously stated, the proposed works would not disrupt the breeding cycle of an important population.

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

The removal of 1.2 ha of vegetation, containing Koala habitat, occurs on the margins of more continuous habitat east of Appin Road, within Dharawal National Park/Reserves and Holsworthy Barracks land. As such, the proposal is not considered to modify, destroy, remove, isolate or decrease the availability or quality of Koala habitat to an extent such that the species is likely to decline. Extensive areas of suitable habitat would be retained adjacent to, and beyond the limits of, the study area and in the wider region.

- *result in invasive species that are harmful to an endangered species becoming established in the endangered species' habitat*

The proposal is not expected to exacerbate an existing situation in which invasive species are currently common.

- *introduce disease that may cause the species to decline*

Disease prevalence within the Koala include *Chlamydia pecorum* and the Koala retrovirus (KoRV), while Myrtle Rust poses a threat to Koala habitat (DCCEEW 2023d). Provided safeguards/mitigation measures identified within this report are adopted, the proposed works are not considered to introduce disease that may cause the species to decline.

- *interfere with the recovery of the species*.

A National Recovery Plan for the Koala has been prepared (DAWE 2022a). To progress the long-term recovery goal, three objectives are set for the 10-year life of the recovery plan that complement and build upon State and territory plans and strategies for the listed Koala, and the 2021 Conservation Advice, being:

1A. The area of occupancy and estimated size of populations that are declining, suspected to be declining, or predicted to decline are instead stabilised then increased.

1B. The area of occupancy and estimated size of populations that are suspected and predicated to be stable are maintained or increased.

2. Metropolitan processes are maintained or improved.

3. Partners, communities and individuals have a greater role and capability in listed Koala monitoring, conservation and management.

To meet these objectives, the following four supporting strategies and two on-ground (direct) strategies are identified:

<u>Supporting strategies:</u>

1. Build and share knowledge

2. Engage and partner with the community in listed Koala conservation
3. Increase the area of protected habitat for the listed Koala
4. Integrate listed Koala conservation into policy, statutory and land use plans.

<u>On-ground strategies:</u>

5. Strategically restore listed Koala habitat
6. Actively manage listed Koala metapopulations.

A number of actions are provided under each strategy, the majority not considered relevant to the proposal; however, under Strategy 5: 'Strategically restore listed Koala habitat', to replace the loss of 93 trees (and one 'occupied' hollow), the Tree and Hollow Replacement Plan to be undertaken by Transport is considered to align with Action 5c, which is to:

> *Implement on-ground revegetation or restoration programs in previously cleared areas of Koala habitat, following local-level restoration guidelines for the Koala where they exist (e.g., New South Wales Koala habitat revegetation guidelines [Wegner and Taws 2019* cited in DAWE 2022a*]). Actions should be undertaken in consultation with experts in Koala ecology and plan genetics, and should include experimental trialling of the establishment of climate resilient and nutritious feeding trees outside traditional ranges of Koala habitat trees.*

The proposal is not considered to interfere with the recovery of the Koala.

Conclusion

As the proposed works are considered unlikely to have a significant impact on the Koala, it is considered unnecessary that the matter be referred to the Federal Minister for the Environment and Water as a controlled action.

1.2 Gang-Gang Cockatoo – Endangered

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

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

An 'important population' is a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are:

— key source populations either for breeding or dispersal

— populations that are necessary for maintaining genetic diversity, and/or

— populations that are near the limit of the species range.

Though considered and targeted, this species was not observed or heard calling during the course of the field inspection, and no indicative evidence (chewed Eucalypt capsules) were observed.

While the proposed work will result in the disturbance of up to 1.2 ha of native vegetation, and require the clearing of four hollow-bearing trees, extensive areas of similar habitat available to the Gang-gang Cockatoo is present within the proximate bushland and Dharawal National Park. Therefore, the proposed intersection upgrade work is not considered to have an adverse impact on the Gang-gang Cockatoo, such that it would lead to a long-term decrease in the size of an important population.

- *reduce the area of occupancy of the species*

The proposed activity would not significantly reduce the area of occupancy of the species. Extensive areas of similar habitat available to the Gang-gang Cockatoo is present within the proximate reserves and Dharawal National Park.

- *fragment an existing population into two or more populations*

The loss of about 1.2 ha of native vegetation and four hollow-bearing trees would not result in a disturbance to this species' dispersal or movement patterns. Extensive areas of suitable habitat would be retained within the

study area and surrounding bushland; as such, the proposal would not cause any fragmentation of an existing Gang-gang Cockatoo population into two or more populations.

- *adversely affect habitat critical to the survival of a species*

Habitat within the study area is not listed on the Australian Government's Register of Critical Habitat (DCCEEW 2023c), and is not considered critical to the survival of the Gang-gang Cockatoo.

- *disrupt the breeding cycle of a population*

For reasons previously stated, the proposed work would not disrupt the breeding cycle of the Gang-gang Cockatoo.

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

The proposal is not considered to modify, destroy, remove, isolate or decrease a significant amount of available habitat to an extent such that the Gang-gang Cockatoo is likely to decline. As extensive areas of similar habitat extend well beyond the limits of the study area, the removal of about 1.2 ha of native vegetation and four hollow-bearing trees is not expected to have an adverse impact on the Gang-gang Cockatoo such that the long-term survival of this species in the locality would be affected.

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

It is unlikely that the proposal will result in the establishment of invasive species harmful to the Gang-gang Cockatoo.

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

The proposal is unlikely to introduce diseases that may cause the Gang-gang Cockatoo to decline.

- *interfere with the recovery of the species*

The OEH's Saving our Species strategy for the Gang-gang Cockatoo identifies three actions to help ensure that the species is secure in the wild in NSW for the long term (OEH 2023b) (Plate 2A). The first two identified actions are applicable to the proposed works.

Threat	Action description	Scale
Loss and degradation of breeding and foraging habitat from rural and urban development	Protect known and potential remnant gang-gang cockatoo habitat, particularly tall wet forest and dry sclerophyll forest vegetation communities with large trees supporting hollows that are 10cm in diameter or larger and manage these areas to allow ongoing regeneration of local native trees, shrubs and ground layer plants. Where possible, negotiate management agreements with landholders that are funded in perpetuity that allows ongoing recruitment of native local trees, shrubs and grasses.	Site, Area
Loss and degradation of breeding and foraging habitat from rural and urban development	Restore gang-gang cockatoo habitat in strategic locations close to known habitat and movement corridors, using appropriate local tree, shrub and ground cover species. Care must be taken to ensure that the removal of exotic berry-bearing shrubs and trees such as cotoneatser, hawthorn and pyracantha, that provide foraging habitat, is compensated for by planting of appropriate native foraging plant species such as acacias and eucalypts.	Site, Area
Loss of key breeding and foraging habitat from intensive wildfire events and inappropriate hazard reduction burns	Liaise with land managers and landholders managing fire to raise awareness about the importance of live and standing dead hollow-bearing trees, and to minimise losses of these trees when carrying out prescribed burns.	Site, Area

Plate 2A: Three actions identified in the Saving Our Species Strategy

While this is the case, it is acknowledged that no significant habitat for this species will be removed to permit the proposal. It is noted that although the clearing of four hollow-bearing trees may occur, extensive areas of similar habitat extend well beyond the limits of the study area, the removal of about 1.2 ha of native vegetation is not expected to have an adverse impact on the Gang-gang Cockatoo such that the long-term survival of this species in the locality would be affected.

Conclusion

As the proposal is not considered to have a significant impact on the Gang-gang Cockatoo, it is considered unnecessary that the matter be referred to the Federal Minister for the Environment and Water for further consideration or approval.

2. State – *Biodiversity Conservation Act 2016*

As they have been previously recorded, and as suitable habitat is present and is to be impacted by the proposal, it was considered appropriate to adopt a precautionary approach to the potential presence of the:

- Koala – listed as Endangered
- Hollow-dependent fauna being the previously recorded:
  - Squirrel Glider – Vulnerable
  - Yellow-bellied Sheathtail-bat – Vulnerable
  - Eastern False Pipistrelle – Vulnerable
  - Eastern Coastal Free-tailed Bat – Vulnerable
  - Southern Myotis – Vulnerable
  - Greater Broad-nosed Bat – Vulnerable
  - Golden-tipped Bat – Vulnerable
  - Little Bent-winged Bat – Vulnerable
  - Gang-gang Cockatoo – Vulnerable
  - Varied Sittella – Vulnerable
  - Little Lorikeet – Vulnerable.

The potential impact associated with the proposal on these threatened species, their local populations and habitat, is considered with reference to the assessment criteria provided under Section 7.3 of the BC Act (these commonly referred to as the 5-part test). These criteria are designed to determine whether there is likely to be a significant effect on these threatened species, or their habitat, and consequently whether a SIS [or BDAR] is required.

In accordance with the guidelines provided on the Assessment of Significance (State of NSW through NSW DPI 2008 and DECC 2007), due to the similarity of their habitat requirements, an assessment has been conducted on 'hollow-dependent' fauna as opposed to individual assessments being carried out each animal.

2.1 Koala – Five-part Test

(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,*

The Koala has a fragmented distribution throughout eastern Australia from north-east Queensland to the Eyre Peninsula in South Australia (OEH 2023a). In New South Wales, Koala populations are found on the central and north coasts, southern highlands, southern and northern tablelands, Blue Mountains, southern coastal forests, with some smaller populations on the plains west of the Great Dividing Range (OEH 2023a). Koalas are limited to areas of acceptable food trees (Strahan 2008); inhabiting eucalypt woodlands and forests (OEH 2023a). The overarching threats to the listed Koala are land use change and climate change; with other direct threats include disease (Koala retrovirus and Chlamydia), dogs and vehicles (DCCEEW 2023b).

The proposed works would (based on a worst-case scenario) affect 1.2 ha of vegetation, this including the removal of two Forest Red Gum individuals (Koala feed tree species) and 82 Koala use trees (comprised of five species) listed under Schedules 1 and 3 of BCSEPP. While Koala habitat trees would be cleared, the level of impact compared to the better quality, extensive habitat east of Appin Road within the surrounding conservation/protected land, is not considered to have an adverse effect on the lifecycle of the Koala such that a viable local population of the species is likely to 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,

(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,

Not applicable to fauna.

(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,

The proposal would impact approximately 1.2 ha of vegetation, including 84 Koala feed and use trees.

(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

Given the existing modified/disturbed alignment of Appin Road, Koala habitat is already fragmented within the study area. The removal of 1.2 ha of vegetation, containing Koala habitat, occurs on the margins of more continuous habitat east of Appin Road, within Dharawal National Park/Reserves and Holsworthy Barracks land; as such, the proposal is not considered to significantly fragment or isolate an area of habitat from other areas of habitat than what currently exists.

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

With reference to the SEED map viewer's NSW BioNet Koala Species Sightings layer in Plate 1A above (page 88), previous records for the Koala show that individuals only intermittently utilise the study area. The amount of marginal Koala feed and use tree habitat proposed for removal is considered to be relatively small (up to 1.2 ha) and occurs on the margins of more suitable, extensive habitat east of Appin Road in areas within Dharawal National Park and the Holsworthy region.

(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),*

The subject site is not listed as a declared AOBV under Part 3 of the BC Regulation 2017.

(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.*

Currently 36 KTP for mainland NSW are listed under Schedule 4 of the BC Act. Of these, 'clearing of native vegetation' will be applicable to the proposal, in regard to the Koala. The removal of 1.2 ha of vegetation is not considered to significantly contribute to this KTP such that the lifecycle requirements of the Koala will be compromised.

Expected impact on the Koala

The removal of 1.2 ha of vegetation, containing Koala habitat, occurs within the existing modified/disturbed alignment of Appin Road, where Koala habitat is already fragmented within the study area. Opportunistic individuals may utilise the study area; however, more suitable, extensive habitat occurs east of Appin Road within the surrounding conservation/protected areas.

It is considered that the proposal would not significantly impact the potential occurrence of the Koala, or its habitat. Therefore, the preparation of a SIS [or BDAR] that further considers the impact of the proposal on the Koala is not required.

2.2 Hollow-dependent fauna – Five-part Test

(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,

A number of hollow-bearing trees were recorded east and west of Appin Road within the study area; of these, four are proposed for removal, with 15 to be retained. The hollow diameters of the trees to be removed range between <5 – 15 cm, entrance sizes that can accommodate microbats, small to medium-sized birds and small to medium-sized arboreal mammals.

Twelve hollow-dependent/utilising threatened species (Yellow-bellied Sheathtail-bat, Eastern False Pipistrelle, Eastern Coastal Free-tailed Bat, Southern Myotis, Greater Broad-nosed Bat, Golden-tipped Bat, Little Bent-winged Bat, Squirrel Glider, Gang-gang Cockatoo and Little Lorikeet, Varied Sittella), have been previously recorded in the vicinity of the study area.

The four hollow-bearing trees proposed for removal are not unique, with similar plants being observed within the study area, and occurring beyond the boundary of the proposed works area in adjacent woodland/forest communities. Given the extent of suitable habitat to be retained and/or remain unaffected by the proposal, it is not considered that the loss of four hollow-bearing trees, plus some insect attracting vegetation, would have an adverse effect the lifecycle of the potentially occurring hollow-dependent fauna, such that a viable local population of these 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,

(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,

Not applicable to fauna.

(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,

The proposal would impact approximately 1.2 ha of vegetation, including four hollow-bearing trees.

(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

Given the existing modified/disturbed alignment of Appin Road, habitat is already fragmented within the study area. The removal of 1.2 ha of vegetation, including four hollow-bearing trees, occurs on the margins of more suitable, extensive habitat east of Appin Road, within Dharawal National Park/Reserves and Holsworthy Barracks land. Flying species, such as the microbats and birds, would be able to easily traverse the study area post works. The proposal is not considered to significantly fragment or isolate an area of habitat from other areas of habitat than what currently exists.

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

The habitat to be affected is not considered unique, or important to the long-term survival of hollow-dependent fauna in the locality. More suitable, extensive habitat will be retained and/or remain unaffected within the study area, and particularly east of Appin Road in adjacent woodland/forest communities.

(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),*

The subject site is not listed as a declared AOBV under Part 3 of the BC Regulation 2017.

(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.*

Currently 36 KTP for mainland NSW are listed under Schedule 4 of the BC Act. Of these, 'clearing of native vegetation' and 'loss of hollow-bearing trees' would be applicable to the proposal, in regard to hollow-dependent species. The removal of 1.2 ha of vegetation, including four hollow-bearing trees, is not considered to significantly contribute to these KTP such that the lifecycle requirements of hollow-dependent species will be compromised.

Expected impact on the Hollow-dependent fauna

The removal of 1.2 ha of vegetation, including four hollow-bearing trees, occurs within the existing modified/disturbed alignment of Appin Road, where habitat is already fragmented within the study area. Opportunistic individuals may utilise the study area; however, more suitable, extensive habitat occurs east of Appin Road within the surrounding conservation/protected areas.

It is not considered that the proposal would significantly impact the potential occurrence of the Yellow-bellied Sheathtail-bat, Eastern False Pipistrelle, Eastern Coastal Free-tailed Bat, Southern Myotis, Greater Broad-nosed Bat, Golden-tipped Bat, Little Bent-winged Bat, Squirrel Glider, Gang-gang Cockatoo and Little Lorikeet and Varied Sittella) have been previously recorded in the vicinity of the study area, or their habitat. Therefore, the preparation of a SIS [or BDAR] that further considers the impact of the proposal on these hollow-dependent/utilising fauna is not required.

NSW GOVERNMENT