

TRANSPORT FOR NSW

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CONFIDENTIAL

WOLLSTONECRAFT STATION UPGRADE BIODIVERSITY ASSESSMENT REPORT

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Wollstonecraft Station Upgrade Biodiversity Assessment Report

Transport for NSW

WSP
Level 27, 680 George Street
Sydney NSW 2000
GPO Box 5394
Sydney NSW 2001

Tel: +61 2 9272 5100
Fax: +61 2 9272 5101
wsp.com

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	NAME	DATE	SIGNATURE
Prepared by:	Troy Jennings; Tanya Bangel	17/03/2020	
Reviewed by:	Toby Lambert	17/03/2020	

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Approved by:	Toby Lambert	17/03/2020	
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GLOSSARY

*	Denotes exotic species
BAM	Biodiversity Assessment Methodology 2017 that supports the <i>Biodiversity Conservation Act 2016</i> (BC Act).
Biodiversity	The biological diversity of life is commonly regarded as being made up of the following three components: <ul style="list-style-type: none"> — Genetic diversity — the variety of genes (or units of heredity) in any population. — Species diversity — the variety of species. — Ecosystem diversity — the variety of communities or ecosystems.
Bioregion (region)	A bioregion defined in a national system of bioregionalisation. The site is in the Sydney Basin Bioregion as defined in the Interim Biogeographic Regionalisation for Australia (Thackway and Cresswell 1995).
Candidate species	Species assessed as having a moderate to high likelihood of occurrence within the study area.
Critical habitat	The whole or any part or parts of an area or areas of land comprising the habitat of an Endangered species, an Endangered population or an Endangered Ecological Community that is critical to the survival of the species, population or ecological community (Department of Environment and Conservation 2004). Critical habitat is listed under the <i>Environment Protection and Biodiversity Conservation Act 1999</i> (EPBC Act) with the Secretary (Department of the Environment and Energy) maintaining a register of this habitat. Capitalisation of the term ‘Critical Habitat’ in this report refers to the habitat listed specifically under Commonwealth legislation.
Cryptic species	An inconspicuous species which can be difficult to identify
Department of Environment and Energy	The department develops and implements national policy, programs and legislation to protect and conserve Australia’s natural environment and cultural heritage and administers the EPBC Act. The Commonwealth Department of the Environment was previously known as: <ul style="list-style-type: none"> — Department of Sustainability, Environment, Water, Population and Communities (SEWPAC) — Department of the Environment, Water, Heritage and the Arts (DEWHA) — Department of Environment and Heritage (DEH) — Department of the Environment and Water Resources (DEWR).
Ecological community	An assemblage of species occupying a particular area.
Environmental weed	Any plant that is not native to a local area that has invaded native vegetation.
Exotic	Introduced from outside the area (Stralberg, Jongsomjit et al. 2009). Used in the context of this report to refer to species introduced from overseas.
GPS	Global Positioning System – a navigational tool which uses radio receivers to pick up signals from four or more special satellites to provide precise determination of location.
Habitat	An area or areas occupied, or periodically or occasionally occupied, by a species, population or ecological community, including any biotic or abiotic components.

High Threat Weed	Vascular plants not native to Australia that if not controlled will invade and outcompete native species. A list of high threat weeds is available as part of the BAM Calculator (https://www.lmbc.nsw.gov.au/bamcalc).
Impact area	Is the land to which is likely to be directly impacted upon by the Proposal.
Indigenous	Native to the area: not introduced (Stralberg, Jongsomjit et al. 2009).
Introduced	Not native to the area: not indigenous (Stralberg, Jongsomjit et al. 2009). Refers to both exotic and non-indigenous Australian native species of plants and animals.
Key threatening processes	A process that threatens, or could threaten, the survival, abundance or evolutionary development of native species, populations or ecological communities (Department of Environment and Conservation 2004). Key threatening processes are listed under the <i>Biodiversity Conservation Act 2016</i> (BC Act), the <i>Fisheries Management Act 1994</i> (FM Act) and the EPBC Act. Capitalisation of the term ‘Key Threatening Processes’ in this report refers to those processes listed specifically under the relevant state and Commonwealth legislation.
Likely	Taken to be a real chance or possibility (Department of Environment and Conservation 2004).
Local population	The population that occurs in the study area. In cases where multiple populations occur in the study area or a population occupies part of the study area, impacts on each subpopulation must be assessed separately (Office of Environment and Heritage, 2017).
Locality	The area within a 10 kilometre radius of the study area.
Migratory species	Species listed as Migratory under the EPBC Act relating to international agreements to which Australia is a signatory. These include Japan-Australia Migratory Bird Agreement, China-Australia Migratory Bird Agreement, Republic of Korea-Australia Migratory Bird Agreement and the Bonn Convention on the Conservation of Migratory Species of Wild Animals. Capitalisation of the term ‘Migratory’ in this report refers to those species listed as Migratory under the EPBC Act.
NSW	New South Wales
Plant community type (PCT)	A NSW plant community type identified using the PCT classification system.
Priorities action statements (PAS)	Priorities action statements outline the broad strategies and detailed priority actions to be undertaken in NSW to promote the recovery of Threatened species, population and ecological communities and manage key threatening processes (Department of Environment and Climate Change 2007a).
Priority Weeds	An introduced species listed under the <i>Biosecurity Act 2015</i> . Under the Act, priority weeds have specific control measures for each region.
Proposal	The proposed works as described in detail in Section 1.3.
Protected species	Those species defined as protected under the <i>National Parks and Wildlife Act 1974</i> . Includes all native animals, as well as all native plants listed on Schedule 13 of the <i>National Parks and Wildlife Act 1974</i> (repealed).
Region	A bioregion defined in a national system of bioregionalisation. The Proposal is located within the Sydney Basin Bioregion as defined in the Interim Biogeographic Regionalisation for Australia (IBRA) (Thackway and Cresswell 1995).

Significant	Important, weighty or more than ordinary
Species richness	Species richness is simply the number of species present in a sample, community, or taxonomic group. Species richness is one component of the concept of species diversity, which also incorporates evenness, that is, the relative abundance of species (Matteson and Langellotto 2010).
Study area	Defined as the area subject to this assessment in which the Proposal is to occur.
Threatened biodiversity	Threatened species, populations or ecological communities as listed under the BC Act, FM Act or the EPBC Act.
Threatened species, populations and ecological communities	Species, populations and ecological communities listed as Vulnerable, Endangered or Critically Endangered (collectively referred to as threatened) under the TSC Act, FM Act or the EPBC Act. Capitalisation of the terms 'Vulnerable', 'Endangered' or 'Critically Endangered' in this report refers to listing under the relevant state and/or Commonwealth legislation.
Viable local population	A population that has the capacity to live, develop and reproduce under normal conditions, unless the contrary can be conclusively demonstrated through analysis of records and references (Department of Environment and Climate Change 2007b).
Weed	A plant growing out of place or where it is not wanted: often characterised by high seed production and the ability to colonise disturbed ground quickly (Stralberg, Jongsomjit et al. 2009). Weeds include both exotic and Australian native species of plant naturalised outside of their natural range.

ABBREVIATIONS

BAM	Biodiversity Assessment Methodology (2017)
BC Act	NSW <i>Biodiversity Conservation Act 2016</i>
CAMBA	China Australia Migratory Bird Agreement
EEC	Endangered Ecological Community
EP&A Act	NSW <i>Environmental Planning and Assessment Act 1979</i>
EPBC Act	Commonwealth <i>Environment Protection and Biodiversity Conservation Act 1999</i>
FM Act	NSW <i>Fisheries Management Act 1994</i>
HA	Hectares
ISCA	Infrastructure Sustainability Council of Australia
JAMBA	Japan Australia Migratory Bird Agreement
LEP	Local Environmental Plan
LGA	Local Government Area
MNES	Matters of National Environmental Significance
NSW	New South Wales
OEH	Office of Environment and Heritage
OEES	Office of Environment, Energy and Science
PCT	Plant Community Type
REF	Review of Environmental Factors
RoKAMBA	Republic of Korea Australia Migratory Bird Agreement
TAP	Transport Access Program
TfNSW	Transport for NSW
TSC Act	NSW <i>Threatened Species Conservation Act 1995</i> .

1 PROPOSAL BACKGROUND

1.1 PURPOSE OF THIS REPORT

Transport for NSW (TfNSW) proposes to upgrade Wollstonecraft Station (the Proposal) as part of the NSW Governments Transport Access Program (TAP).

This Biodiversity Assessment Report has been prepared as part of the Review of Environmental Factors (REF) for the proposal, to determine the impact of the proposal, test if it is likely to significantly affect threatened species in accordance with Section 7.3 of the *Biodiversity Conservation Act 2016* (BC Act) and recommend mitigation measures to avoid and/or minimise impact to biodiversity.

This report will also determine if a Species Impact Statement or Biodiversity Development Assessment Report (refer Section 7.8 (3) of the BC Act) must accompany the environmental assessment (the REF) under Part 5 Division 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

The key aims of this Biodiversity Assessment Report are to:

- present the results of desk-based and field-based investigations on biodiversity values within the study area
- provide a description of the biodiversity values and conservation significance within the study area
- undertake an evaluation of any impacts associated with the proposal (in the study area) including associated works implementing vegetation management actions
- undertake assessments of significance within the study area (five-part tests) as prescribed under Section 7.3 of the BC Act
- determine if a Species Impact Statement or Biodiversity Development Assessment must accompany the environmental assessment under Section 7.8 of the BC Act
- recommend relevant mitigation and management measures to minimise any impacts on biodiversity values within the study area
- provide evidence for the ISCA IS Version 1.2 rating during the design and construction phases of the Proposal
- identify trees for removal and tree replacement requirements in accordance with TfNSW's '*Vegetation Offset Guide*' (2019c).

This report also addresses biodiversity entities listed as Matters of National Environmental Significance (MNES) under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

1.2 LOCATION OF THE PROPOSAL

The Proposal is located within the suburb of Wollstonecraft in the North Sydney Council local government area (LGA), located approximately four kilometres north from Central Station. The Proposal is generally located within a medium to high- density residential neighbourhood bounded by local roads in the south including Shirley Road, Telopea Street and Belmont Avenue.




Wollstonecraft Station is serviced by two lines for intercity and regional connections including North Shore and Western Line (T1) and Northern Line (T9). Platform 1 provides train services northbound to Gordon and Greater Newcastle region. Platform 2 provides train services southbound towards Central Station.

The Proposal would be located predominantly within the boundaries of the existing station, as well as including the Shirley Road overbridge located on the southern side of the station.

The regional location of the Proposal is shown in Figure 1.1.



Legend

-  Railway Station
-  Railway
-  Local Government Area boundary
-  Study

1.3 DESCRIPTION OF THE PROPOSAL

The Proposal involves an Accessibility upgrade of Wollstonecraft Station as part of the Transport Access Program which would improve accessibility and amenity for customers. The Proposal would include the following key elements:

- formalised Kiss and Ride and compliant disabled parking spaces
- two new lifts for accessibility between platforms and street levels
- one unisex family accessible toilet and two unisex ambulant toilets
- accessible paths between new parking spaces, retail shops, and platforms including modifications to Shirley Road Overbridge and platform regrading
- upgrading and/or new wayfinding, lighting, CCTV, Public Address System, and Hearing loops to support the new infrastructure along the accessible paths.

2 LEGISLATIVE CONTEXT

Commonwealth, State and local government legislation and planning controls relevant to the protection of biodiversity and this Proposal are outlined briefly in this section. These statutory instruments provide conditions, matters for consideration and requirements to seek authorisation (licenses and approvals) to undertake various actions and activities.

2.1 COMMONWEALTH LEGISLATION

2.1.1 *ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT 1999*

Under the Commonwealth EPBC Act, any action that has, would have, or is likely to have a significant impact on a MNES or on Commonwealth land, triggers the Act and may require assessment and approval from the Commonwealth Minister for the Environment.

The nine matters of national environmental significance protected under the EPBC Act are:

- listed threatened species and ecological communities
- listed migratory species
- wetlands of international importance (listed under the Ramsar Convention)
- commonwealth marine areas
- world heritage properties
- national heritage places
- the Great Barrier Reef Marine Park
- nuclear actions (including uranium mines)
- a water resource, in relation to coal seam gas development and large coal mining development.

No Commonwealth listed threatened flora, fauna or ecological communities were recorded within the study area.

Database searches identified 55 EPBC Act listed threatened fauna (including 37 Migratory species) and 34 EPBC Act listed threatened flora species that are considered likely to utilise habitats or be present within the study area. No matters listed as National and World heritage property under the EPBC Act are likely to be impacted upon by the Proposal. All threatened biodiversity is discussed further in Section 5.

2.2 STATE LEGISLATION

2.2.1 *BIODIVERSITY CONSERVATION ACT 2016*

The BC Act outlines the framework for addressing impacts on biodiversity from development and clearing. It establishes a framework to avoid, minimise and offset impacts on biodiversity from development through the Biodiversity Offsets Scheme. The Biodiversity Offsets Scheme creates a transparent, consistent and scientifically based approach to biodiversity assessment and offsetting for all types of development that are likely to have a significant impact on biodiversity (Office of Environment and Heritage 2017).

The Biodiversity Offsets Scheme is not mandatory for activities approved under Part 5 of the EP&A Act although the determining authority must be satisfied that a proposed activity is unlikely to significantly affect threatened species in accordance with Section 7.3 of the BC Act.

If a proposed activity is determined likely to significantly affect threatened species, a Species Impact Statement or Biodiversity Development Assessment Report (refer Section 7.8 (3) of the BC Act) must accompany the environmental assessment (the REF) under Part 5 Division 5.1 of the EP&A Act.

Database searches identified 50 BC Act listed threatened fauna and 47 BC Act listed threatened flora species that are considered likely to utilise habitats or be present within the study area. Although no threatened biodiversity listed under the BC Act was recorded within the study area, vegetation present provides marginal quality foraging habitat for the Powerful Owl and Grey-headed Flying-fox. All threatened biodiversity is discussed further in Section 5.

2.2.2 *BIOSECURITY ACT 2015*

The *Biosecurity Act 2015* provides for risk-based management of biosecurity in NSW. It provides a statutory framework to protect the NSW economy, environment and community from the negative impact of pests, diseases and weeds.

The primary object of the Act is to provide a framework for the prevention, elimination and minimisation of biosecurity risks posed by biosecurity matter, dealing with biosecurity matter, carriers and potential carriers, and other activities that involve biosecurity matter, carriers or potential carriers.

In NSW, all plants are regulated with a general biosecurity duty to prevent, eliminate or minimise any biosecurity risk they may pose. Any person who deals with any plant, who knows (or ought to know) of any biosecurity risk, has a duty to ensure the risk is prevented, eliminated or minimised, so far as is reasonably practicable.

3 METHODS

3.1 DEFINITIONS

For this report the following definitions apply:

- Study area: defined as the area subject to this assessment in which the Proposal is to occur.
- Proposal area: is the land to which is likely to be directly impacted upon by the Proposal.
- Locality: is a 10-kilometre radius from the study area.
- Bioregion: for this study, the bioregion is the Sydney Basin as defined in the Interim Biogeographic Regionalisation for Australia (IBRA) (Thackway and Cresswell 1995).

All other definitions are provided in the glossary at the start of this document. The Proposal's study area is shown in Figure 1.1.

3.2 PERSONNEL

The contributors to the preparation of this report, their qualifications and roles are listed in Table 3.1.

Table 3.1 Contributors and their roles

NAME	QUALIFICATION	ROLE
Troy Jennings	Bachelor of Biodiversity and Conservation; Master of Wildlife Management & BAM accredited assessor	Ecologist – Reporting
Tanya Bangel	Bachelor of Environmental Management and Science (Hons); Diploma of Conservation and Land Management & BAM accredited assessor	Senior Ecologist – Field survey and reporting
Toby Lambert	Bachelor of Environmental Science & BAM accredited assessor	Principal Ecologist – Technical review
Jarryd Barton	Bachelor of Planning (Hons) & Certified Environmental Practitioner (CEnvP)	Quality control and review

All work was carried out under the appropriate licences, including a scientific licence as required under Part 2 of the NSW BC Act (License Number: SL100630), and an Animal Research Authority issued by the Department of Primary Industries (Agriculture).

3.3 NOMENCLATURE

Names of vegetation communities used in this report are based on the Plant Community Types (PCTs) used in the BioNet Vegetation Classification (Office of Environment, Energy & Science 2019c).

These names are cross-referenced with those used for threatened ecological communities listed under the BC Act and/or the EPBC Act. They are also cross-referenced with existing vegetation mapping using dominant species and structure of the communities in *'The Native Vegetation of the Sydney Metropolitan Area – Version 3.1'* (Office of Environment and Heritage 2016).

Names of plants used in this document follow PlantNet Royal Botanic Gardens (Royal Botanic Gardens 2020) for recent taxonomic changes. Scientific names are used in this report for species of plant. Scientific and common names (where available) are provided in plant lists in appendices. The names of introduced species are denoted with an asterisk (*).

For threatened species of plants, the names used in the OEES Threatened Species Website (Office of Environment, Energy & Science 2020d) are also provided in the tabulated data in appendices where these differ from the names used by PlantNet database.

Names of vertebrate fauna follow the Australian Faunal Directory maintained by the Department of the Environment (2020). Common names are used in the report for species of animal. Scientific names are included in species lists found in appendices.

3.4 DESKTOP ASSESSMENT

A desktop study was conducted to identify:

- the likely distribution of vegetation communities, based on previous mapping and aerial photograph interpretation, for targeted field verification
- a list of threatened species and populations of plants to consider during vegetation surveys and habitat assessment
- a list of threatened species and populations of animals and migratory animals to consider during field-based habitat assessment
- local landscape-scale features of potential significance to biodiversity; e.g. riparian zones and potential wildlife movement corridors
- evaluate baseline information and determine whether additional surveys, mapping and reporting is required to progress to a rezoning application.

The desktop study included analysis of the following information sources:

- topographic map and aerial photographs
- priority weeds in the Greater Sydney region (Department of Primary Industries 2020b)
- background documents provided regarding the Proposal including the Preliminary Environmental Assessment prepared for the Proposal
- *The Native Vegetation of the Sydney Metropolitan Area – Version 3.1 VIS_ID 4489* (Office of Environment and Heritage 2016).

In addition to the literature listed above database searches of threatened species, populations and communities were conducted in the locality and are summarised below in Table 3.2.

Table 3.2 Database searches

DATABASE	SEARCH DATE	AREA SEARCHES	REFERENCE
PlantNet Database	8 January 2020	North Sydney LGA	(Royal Botanic Gardens 2020)
OEES BioNet Atlas of NSW Wildlife	8 January 2020	10 kilometre x 10 kilometre centred on the study area	(Office of Environment, Energy & Science 2020a)
EPBC Protected Matters Search Tool	8 January 2020	10 kilometre x 10 kilometre centred on the study area	(Department of the Environment and Energy 2020)
NSW Department of Primary Industries (Fishing and Aquaculture) threatened Aquatic Fauna Database	8 January 2020	Relevant catchment (Sydney Metro)	(Department of Primary Industries 2020a)

3.4.1 DESKTOP ANALYSIS OF VEGETATION

Preliminary mapping of vegetation community boundaries was undertaken through analysis of existing vegetation mapping and aerial photograph interpretation. Analysis of the aerial photographs was used to identify areas of disturbance (e.g. buildings, vehicle tracks, dams and power lines), vegetation structure and likely native versus exotic species composition throughout the study area. This provided an initial definition of vegetation communities into simple structural and disturbance classifications for verification during field surveys.

3.5 FIELD SURVEY

A field survey of the study area was undertaken on the 10 January 2020 by WSP ecologist Tanya Bangel. This survey sought primarily to assess the extent and condition of vegetation and fauna habitat, especially for threatened species and ecological communities. The vegetation inspection was used to identify variations in vegetation condition that were not apparent in existing vegetation mapping and refine vegetation community boundaries.

Further detail on the methodology for the field survey is provided in the following sections.

3.5.1 FLORA SURVEY

The floristic diversity and possible presence of threatened species was assessed using the methodologies described below in Section 3.5.1.1 to Section 3.5.1.3.

3.5.1.1 FIELD VERIFICATION OF EXISTING VEGETATION

Vegetation within the study area and locality has been mapped at the regional scale in '*The Native Vegetation of the Sydney Metropolitan Area – Version 3.1 VIS_ID 4489*' (Office of Environment and Heritage 2016).

Data on geology, dominant canopy species, native diversity, vegetation structure and condition was collected across the study area to validate and refine this existing vegetation classification to determine their associated PCT in accordance with the BioNet Vegetation Information System (Office of Environment, Energy & Science 2020b).

3.5.1.2 MAPPING OF VEGETATION ZONES

Field validation (ground-truthing) of the existing vegetation classifications undertaken by regional vegetation mapping and previous ecological surveys of the study area was completed to confirm the vegetation structure, dominant canopy species, native diversity, condition and presence of threatened ecological communities. This was based on floristic sampling and vegetation integrity plots as described below.

Vegetation zones and conditions were identified and mapped following the Biodiversity Assessment Method (BAM) (Office of Environment & Heritage 2017). This was based on field verification of the PCT, class and formation as outlined in BioNet Vegetation Classification (Office of Environment, Energy & Science 2020b).

3.5.1.3 RANDOM MEANDER SURVEYS

Random meander surveys are a variation of the transect type survey and were completed in accordance with the technique described by Cropper (1993), whereby the recorder walks in a random meander throughout the study area recording dominant and key plant species (e.g. threatened species, priority weeds), boundaries between various vegetation communities and condition of vegetation. The time spent in each vegetation community was generally proportional to the size of the community and its species richness.

3.5.2 FAUNA SURVEY

3.5.2.1 FAUNA HABITAT ASSESSMENT

Fauna habitat assessments were undertaken to assess the likelihood of threatened species of fauna (those species known or predicted to occur within the locality from the literature and database review) occurring within the study area. Fauna habitat assessments were the primary assessment tool in assessing whether a threatened species is likely to occur within the study area.

Fauna habitat characteristics assessed included:

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

The following criteria were used to evaluate the condition of habitat values:

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

3.5.2.2 OPPORTUNISTIC RECORDING

Opportunistic sightings of animals were recorded including diurnal birds and reptiles. Evidence of animal activity, such as scats, diggings, scratch marks, nests/dreys, burrows etc., was also noted. This provided indirect information on animal presence and activity.

During these surveys, a hand-held GPS was used to record the locations of:

- hollow-bearing trees
- aquatic habitat
- rock outcrops.

3.6 LIKELIHOOD OF OCCURRENCE ASSESSMENT

The likelihood of threatened and migratory and threatened species populations occurring within the subject site was assessed against the criteria outlined in Table 3.3.

Species subject to likelihood of occurrence assessments were those identified during the desktop and field-based investigations and any additional species considered having the potential to occur in the professional opinion of contributors to this assessment.

Table 3.3 Likelihood of occurrence

LIKELIHOOD OF OCCURRENCE	CRITERIA
Known	The species was observed in the subject site either during the current survey or during another recent survey.
High	<p>A species has a high likelihood of occurrence if:</p> <ul style="list-style-type: none"> — the subject site contains or forms part of a large area of high-quality suitable habitat — important habitat elements (i.e. for breeding or important life cycle periods such as winter foraging periods) are abundant within the subject site — the species has been recorded recently in similar habitat in the locality — the subject site is likely to support a resident populations or to contain habitat that is visited by the species during regular seasonal movements or migration.
Moderate	<p>A species has a moderate likelihood of occurrence if:</p> <ul style="list-style-type: none"> — the subject site contains or forms part of a small area of high quality suitable habitat — the subject site contains or forms part of a large area of marginal habitat — important habitat elements (i.e. for breeding or important life cycle periods such as winter foraging periods) are sparse or absent within the subject site — the subject site is unlikely to support a resident populations or to contain habitat that is visited by the species during regular seasonal movements or migration but is likely to be used occasionally during seasonal movements and/or dispersal.
Low	<p>A species has a low likelihood of occurrence if:</p> <ul style="list-style-type: none"> — potentially suitable habitat exists but the species has not been recorded recently (previous 10 years) in the locality despite intensive survey (i.e. the species is considered to be locally extinct) — the species is considered to be a rare vagrant, likely only to visit the subject site very rarely; e.g. during juvenile dispersal or exceptional climatic conditions (e.g. extreme drought conditions in typical habitat of inland birds).
None	Potentially suitable habitat is absent from the subject site.

3.7 LIMITATIONS

Even where field surveys are undertaken, no sampling technique can totally eliminate the possibility that a species is present on a site. For example, some species of plant may be present in the soil seed bank and some fauna species use habitats on a sporadic or seasonal basis and may not be present on site during surveys. Where surveys were conducted outside the optimal time for detecting a particular species, or field surveys were of limited scope, a precautionary approach was taken and it was assumed that the species was present if suitable habitat was observed. Similarly, for areas of vegetation that were not accessible for field verification, vegetation was presumed to be of the community shown in what was considered to be the most accurate available pre-existing vegetation mapping.

The conclusions in this report are based upon the limited data acquired from the site during environmental field surveys and desktop assessment and are, therefore, merely indicative of the environmental condition of the site at the time of preparing the report, including the presence or otherwise of species and the distribution of vegetation types. Also, it should be recognised that site conditions, including the presence of threatened species, can change with time.

4 EXISTING ENVIRONMENT

4.1 LANDSCAPE CONTEXT

Wollstonecraft Station is located within the suburb of Wollstonecraft which is characterised by scattered remnant trees and native plantings interspaced with fragmented remnant bushland areas. The rail corridor traverses through this largely disturbed landscape which has been subject to a long history of vegetation clearing and urban development. Land uses in the locality include residential and commercial developments and its associated infrastructure (such as road, rail and service line easements).

These land uses, including the establishment and maintenance of the rail corridor, have resulted in the disturbance of the soils, geology and vegetation within the study area. As such, the native vegetation within the study area is highly modified. Although much of the study area and immediate surrounds is highly modified there are large intact bushland areas within the locality of high quality which provides habitat for threatened biodiversity (i.e. Smoothey Park, Gore Cover Reserve, Berry Island Reserve and Badangi Reserve). None of these areas occur within the study area nor are they considered likely to be directly impacted upon by the Proposal.

A summary of the study area in relation to administrative, resource management and biogeographical regions is provided in Table 4.1.

Table 4.1 Study area landscape and context summary

LANDSCAPE FEATURE	STUDY AREA
LGA	North Sydney Council
IBRA Bioregion, IBRA Subregion	Sydney Basin Bioregion, Pittwater Subregion
Local Land Service Region	Greater Sydney
Botanical Subdivision	Central Coast
Mitchell Landscape	Port Jackson Basin

4.2 VEGETATION COMMUNITIES

Two vegetation communities were recorded within or adjacent the study area during the field survey. These communities included one native Plant Community Type (PCT) and one non-native miscellaneous ecosystem. A description of the communities is provided below in Section 4.2.1 and Section 4.2.2 respectively. Figure 4.1 shows the location of these PCTs in relation to the study area.

4.2.1 PCT 1778 SMOOTH-BARKED APPLE – COAST BANKSIA / CHEESE TREE OPEN FOREST ON SANDSTONE SLOPES ON THE FORESHORES OF THE DROWNED RIVER VALLEYS OF SYDNEY

This native vegetation community was recorded within and immediately to the north of the Shirley Road within the north of the study area. The vegetation typically occurred as either regrowth (Photo 4.1) and/or as a highly modified forest with a canopy of urban native/exotic planted canopy trees (Photo 4.2).

PCT 1778 within the study area generally occurred on soils derived from sandstone geologies with minor shale enrichment. Dominant species within the study area included:

- Canopy – *Lophostemon confertus* (Brush Box), *Eucalyptus microcorys* (Tallowwood), *Corymbia maculata* (Spotted Gum), *Syagrus romanzoffiana** (Queen Palm), *Banksia integrifolia* (Coastal Banksia) and *Cinnamomum camphora** (Camphor Laurel).
- Midstorey – *Pittosporum undulatum* (Sweet Pittosporum), *Glochidion ferdinandi* var. *ferdinandi* (Cheese Tree), *Syncarpia glomulifera* subsp. *glomulifera* (Turpentine), *Acacia floribunda* (White Sally Wattle), *Allocasuarina torulosa* (Forest Oak), *Allocasuarina littoralis* (Black She-oak) and *Schefflera actinophylla** (Umbrella Tree).
- Groundcover – *Agapanthus praecox* subsp. *orientalis** (Agapanthus), *Hedera helix** (English Ivy), *Asparagus aethiopicus** (Asparagus Fern), *Tradescantia fluminensis** (Trad), *Nephrolepis cordifolia** (Fishbone Fern) and *Ehrharta erecta** (Panic Veldtgrass).

To the north of the study area, PCT 1778 is more dominated by native species characteristic of the community, including *Angophora costata* (Smooth-barked Apple), *Eucalyptus pilularis* (Blackbutt), *Pteridium esculentum* (Common Bracken), *Themeda triandra* (Kangaroo Grass) and *Lomandra longifolia* (Spiny-headed Mat-rush).

Based on floristic, geographical and geological characteristics, this vegetation type is considered consistent with the scientific description and distribution information outlined for PCT 1778 within the BioNet Vegetation Classification Database (Office of Environment, Energy and Science 2020).

PCT 1778 does not form part of any threatened ecological communities listed under either the BC Act or the EPBC Act.



Photo 4.1 Regrowth PCT 1778 within the rail corridor



Photo 4.2 Heavily modified PCT 1778 within study area



Legend

- Railway Station
- Railway
- Study Area
- Proposal Area

WSP Vegetation Mapping

- Miscellaneous ecosystem: Urban exotic/native
- PCT 1778 Smooth-barked Apple – Coast Banksia / Cheese Tree open forest on sandstone slopes of the foreshores of the drowned river valleys of Sydney - Highly modified

4.2.2 HIGHLY DISTURBED AREAS WITH NO OR LIMITED NATIVE VEGETATION

This non-native vegetation community occurs over most of the study area with all associated works being located within this vegetation type. This community includes the 'Urban exotic/native' miscellaneous ecosystem which was comprised of ornamental landscape plantings, exotic lawn and environmental weeds.

This miscellaneous ecosystem was comprised of planted ornamental trees (such as *Jacaranda mimosifolia** (Jacaranda), *Celtis sinensis** (Japanese Hackberry), *Tibouchina urvilleana** (Lasiandra), *Cupressus macrocarpa** (Golden Brunings Cypress) and *Hydrangea macrophylla** (Hydrangea)), with environmental weeds and exotic lawn including *Axonopus fissifolius** (Narrow-leaved Carpet Grass), *Cynodon dactylon* (Common Couch), *Paspalum dilatatum* (Paspalum) and *Stenotaphrum secundatum** (Buffalo Grass) being present (Photo 4.3 and Photo 4.4).



Photo 4.3 Miscellaneous ecosystem: Urban exotic/native garden beds



Photo 4.4 Miscellaneous ecosystems: Urban/exotic managed lawn and garden beds

4.3 FAUNA HABITATS

The fauna habitat within the study area is limited, with majority of vegetation occurring within the Proposal area consisting of planted ornamental native, exotic/native trees and shrubs and some remnant native vegetation.

Much of the vegetation within the study area has been previously cleared for rail infrastructure and urban development and what remains provides highly modified habitat. Where native vegetation persisted, the canopy was largely comprised of planted native trees (i.e. Tallowwood (*Eucalyptus microcorys*), Brush Box (*Lophostemon confertus*) and Spotted Gum (*Corymbia maculata*)) with a midstorey of regrowth native species (e.g. Cheese Tree (*Glochidion ferdinandi*), Turpentine (*Syncarpia glomulifera* subsp. *glomulifera*) & She-oaks (*Allocasuarina torulosa* and *Allocasuarina littoralis*)) and a predominately exotic understorey. The habitat and vegetation within the study area provides limited resources and generally lacks important features such as hollow bearing trees, rocky outcrops or fallen woody debris.

The study area does not provide any significant habitat for fauna and species likely to utilise resources are those that are well adapted to urban environments or those species that are highly mobile (i.e. birds and bats). The surrounding trees (both native and introduced) provide some foraging habitat (i.e. fruits and blossom) for mobile species (i.e. birds and bats) including foraging habitat for the Powerful Owl and Grey-headed Flying-fox. It is unlikely that these resources are heavily utilise or relied upon by majority of fauna but instead are intermittently used whilst foraging within the greater locality.

4.3.1 CONNECTIVITY

Connectivity values are limited within the study area due to fragmentation and barriers associated with the existing railway corridor and surrounding urban development. Additionally, remnant vegetation within the greater locality is also highly fragmented and connectivity between patches is predominately disconnected. Due to the highly fragmented nature of remnant vegetation within the Proposal area, species likely to utilise resources present are those that are well adapted to urban environments or those species that are highly mobile.

Given the Proposal involves only minor upgrades either side of the railway line within existing highly modified environments, habitat connectivity is unlikely to be significantly impacted by the Proposal. Minor impacts that may occur to connectivity because of the Proposal will be minimised and enhanced through the replacement of trees to be removed by the Proposal in accordance with the Transport for NSW Vegetation Offset Guide (2019c).

4.4 WEEDS

Three Priority Weeds listed under the *Biosecurity Act 2015* for the Greater Sydney Region were identified in the study area. Two of these tree Priority Weeds are also listed as Weeds of National Significance (WONs). A summary of these weeds and their associated duties are detailed below in Table 4.2.

Table 4.2 Weeds of concern within the study area (Department of Primary Industries 2020b)

SCIENTIFIC NAME	COMMON NAME	BIOSECURITY ACT DUTY	WONS
<i>Olea europea</i> var. <i>cuspidata</i> *	African Olive	Regional Recommended Measure (Proposal within core infestation area) – The plant or parts of the plant are not traded, carried, grown or released into the environment. Land managers prevent spread from their land where feasible. Land managers reduce impacts from the plant on priority assets.	No
<i>Asparagus aethiopicus</i> *	Asparagus Fern	Prohibition on dealings – Must not be imported into the State or sold.	Yes
<i>Anredera cordifolia</i> *	Madeira Vine	Prohibition on dealings – Must not be imported into the State or sold.	Yes

5 THREATENED BIODIVERSITY

5.1 THREATENED ECOLOGICAL COMMUNITIES

No threatened ecological communities were identified within the study area.

5.2 THREATENED FLORA

No threatened flora species were identified during site inspections. Background investigations identified 46 threatened flora species listed under the BC Act and/or EPBC Act that were considered to have the potential to occur within the locality of the study area (Appendix A). The study area is considered unlikely to provide habitat for any threatened flora species based on the availability of habitats present and results of the site inspection (Appendix A).

No assessments of significance for any threatened flora species listed under either the BC Act or EPBC Act are considered warranted to assess the impacts of the Proposal.

5.3 THREATENED FAUNA

No threatened fauna species were identified during site inspections. Background investigations identified 77 threatened fauna species listed under the BC Act and/or EPBC Act that have been previously recorded or have the potential to occur within the locality (Appendix B). The likelihood of these species occurring within the study area was determined based on field investigations and fauna habitat available.

Table 5.1 outlines each species considered to have a moderate to high likelihood to occur within the study area and be potentially impacted of the Proposal.

Table 5.1 Threatened fauna species considered likely to occur within the study area

COMMON NAME	SCIENTIFIC NAME	BC ACT ¹	EPBC ACT ²	LIKELIHOOD OF OCCURRENCE	IMPACT TO SPECIES OR HABITAT
Grey-headed Flying-fox	<i>Pteropus poliocephalus</i>	V	V	Moderate – potential foraging habitat within the study area. May occur as a fly-over whilst foraging in greater locality.	The habitat within the study area is foraging habitat only and represents a small proportion of available habitat within locality. Other habitats within the locality are of higher quality. It is considered unlikely that this species relies on habitat within the study area.
Powerful Owl	<i>Ninox strenua</i>	V	–	Moderate – potential suitable habitat identified within study area. May occur whilst foraging in greater locality. Potential foraging habitat and roosting habitat occurs within and adjacent to study area.	

(1) V = Vulnerable, E = Endangered, CE = Critically Endangered under the BC Act

(2) V = Vulnerable, E = Endangered, CE = Critically Endangered, M = Migratory under the EPBC Act

Based on available habitat and the potential impacts of the Proposal, it is considered two threatened fauna species, Grey-headed Flying-fox (*Pteropus poliocephalus*) and Powerful Owl (*Ninox strenua*), have a moderate likelihood of occurrence or have the potential to utilise the available habitat within the Proposal area.

Specific assessments of significance for any moderate to high likelihood threatened fauna species listed under either the BC Act or EPBC Act are considered warranted to assess the impacts of the Proposal. Assessments of significance have been undertaken for both identified species and are provided in Appendix D.

5.4 MIGRATORY SPECIES

Migratory species are protected under international agreements, to which Australia is a signatory, including JAMBA, CAMBA, RoKAMBA and the Bonn Convention on the Conservation of Migratory Species of Wild Animals. Migratory species are considered MNES and are protected under the EPBC Act.

A total of thirty-seven species listed as migratory under the EPBC Act were identified during background investigations (excluding marine species) that have been previously recorded or have the potential to occur within the locality (Appendix B). Of these, no species are considered likely to utilise the habitat present within the study area.

The habitats within the study area are unlikely to constitute important habitat for any of the listed species. The habitat present is unlikely to support significant proportions of the population of any migratory species, nor are the habitats critical to any life stage of these species. Due to their mobile nature, the identified species are likely to utilise higher quality habitat within the greater locality and where more extensive tracts of native vegetation occur. For these reasons migratory species are unlikely to be impacted by the proposal and are not further considered within this assessment.

6 POTENTIAL IMPACTS

Potential impacts to biodiversity resulting from the construction and operation phases of the Proposal have been considered below.

6.1 IMPACTS DURING CONSTRUCTION

6.1.1 DIRECT IMPACTS

6.1.1.1 REMOVAL OF VEGETATION

Direct impacts to biodiversity because of the Proposal are considered negligible due to the existing disturbed nature of the available habitat and the nature of the construction works to be undertaken. Vegetation clearing would be minimal and limited to approximately 0.14 ha of urban native/exotic ornamental plantings, environmental weeds and exotic lawn.

This clearing also includes the direct removal of 16 trees (Figure 6.1). The trees to be removed include four introduced ornamental trees and twelve native species (some of which are planted horticultural specimens). Ornamental tree species included *Cupressus macrocarpa** (Golden Brunnings Cypress), *Ginkgo biloba** (Ginkgo), *Cotoneaster sp.* (Cotoneaster) and *Celtis sinensis** (Japanese Hackberry). Native planted species included *Syzygium spp.* (Lillypilly) and *Livistona australis* (Cabbage Tree Palm). Native trees which appear to have self-sown which were recorded include *Pittosporum undulatum* (Sweet Pittosporum) and *Allocasuarina littoralis* (Black She-oak). The species recorded as of a young age cohort and do not bear hollows (Earthscape Horticultural Services 2020).

No impacts to patches of remnant native vegetation or high-quality fauna habitat are predicted because of the Proposal. Direct mortality or trauma to fauna is also expected to be minimal as habitat to be removed is of low quality (i.e. planted native trees and landscape gardens).

6.1.1.2 IMPACTS TO THREATENED FAUNA

Two threatened fauna (Grey-headed Flying-fox (*Pteropus poliocephalus*) and Powerful Owl (*Ninox strenua*)) are considered to have a moderate to high likelihood to occur within the Proposal area and as a result be potentially impacted by the Proposal. Assessments of Significance for both species have been undertaken (refer to Appendix D) and concluded that these species are not considered likely to be significantly impacted by the proposal. The mitigation measures outlined below in Section 7 would ensure that any possible indirect impacts would be minimised.

6.1.1.3 REMOVAL OF TREES

The removal of vegetation will be limited to 16 trees. Species to be impacted include; *Cupressus macrocarpa** (Golden Brunnings Cypress), *Ginkgo biloba** (Ginkgo), *Celtis sinensis** (Japanese Hackberry), *Syzygium spp.* (Lillypilly), *Cotoneaster sp.* (Cotoneaster), *Pittosporum undulatum* (Sweet Pittosporum), *Livistona australis* (Cabbage Tree Palm) and *Allocasuarina littoralis* (Black She-oak) (Figure 6.1). A total of 24 will be retained and excluded from impact (Earthscape Horticultural Services 2020).

The trees to be impacted due to the Proposal are comparatively low in ecological value and do not form part of any threatened ecological community or important habitat for threatened species.

The trees identified within the Proposal area do not contain important habitat features (i.e. hollows for breeding) for any potential threatened species known or predicted to occur within the locality. Given this, the Proposal is considered unlikely to significantly affect threatened species or ecological communities, or their habitats.

6.1.2 INDIRECT IMPACTS

6.1.2.1 POTENTIAL ENVIRONMENTAL IMPACT OF NOISE, LIGHT AND VIBRATIONS ON WILDLIFE

Many animals detect and depend on sound to communicate, navigate, evade danger and find food, but human-made noise can alter the behaviour of animals or interfere with their normal functioning. In some cases it can harm their health, reproduction, survivorship, habitat use, distribution, abundance, or genetic composition (Forman *et al.* 2000). However, variation in ambient noise, such as from wind or other animals, is part of the natural environment and many animals display behavioural adaptations to this variation. For example, certain species of frogs avoid vocalising during loud calling by cicadas or other frogs and some species will time their calls during brief periods of silence (Schwartz & Henderson 1991).

It is likely that noise from the existing rail corridor and arterial roads would already impact background levels of noise in the study area. However, construction and operation phases of the Proposal (along with its ancillary activities) may cause additional disturbance to animals. The impacts from noise emissions are likely to be localised close to the project and are not likely to have a significant long-term impact on wildlife populations, given that populations are already exposed to noise associated with the existing rail corridor. Furthermore, it is likely that most animal species would habituate to periodic noise disturbance from regular maintenance activities (Forman *et al.* 2000).

Artificial light that alters the natural patterns of light and dark in ecosystems is referred to as ‘ecological light pollution’ (Longcore and Rich 2004). Types of ecological light pollution include chronic or periodically increased illumination, unexpected changes in illumination, and direct glare (Longcore and Rich 2004).

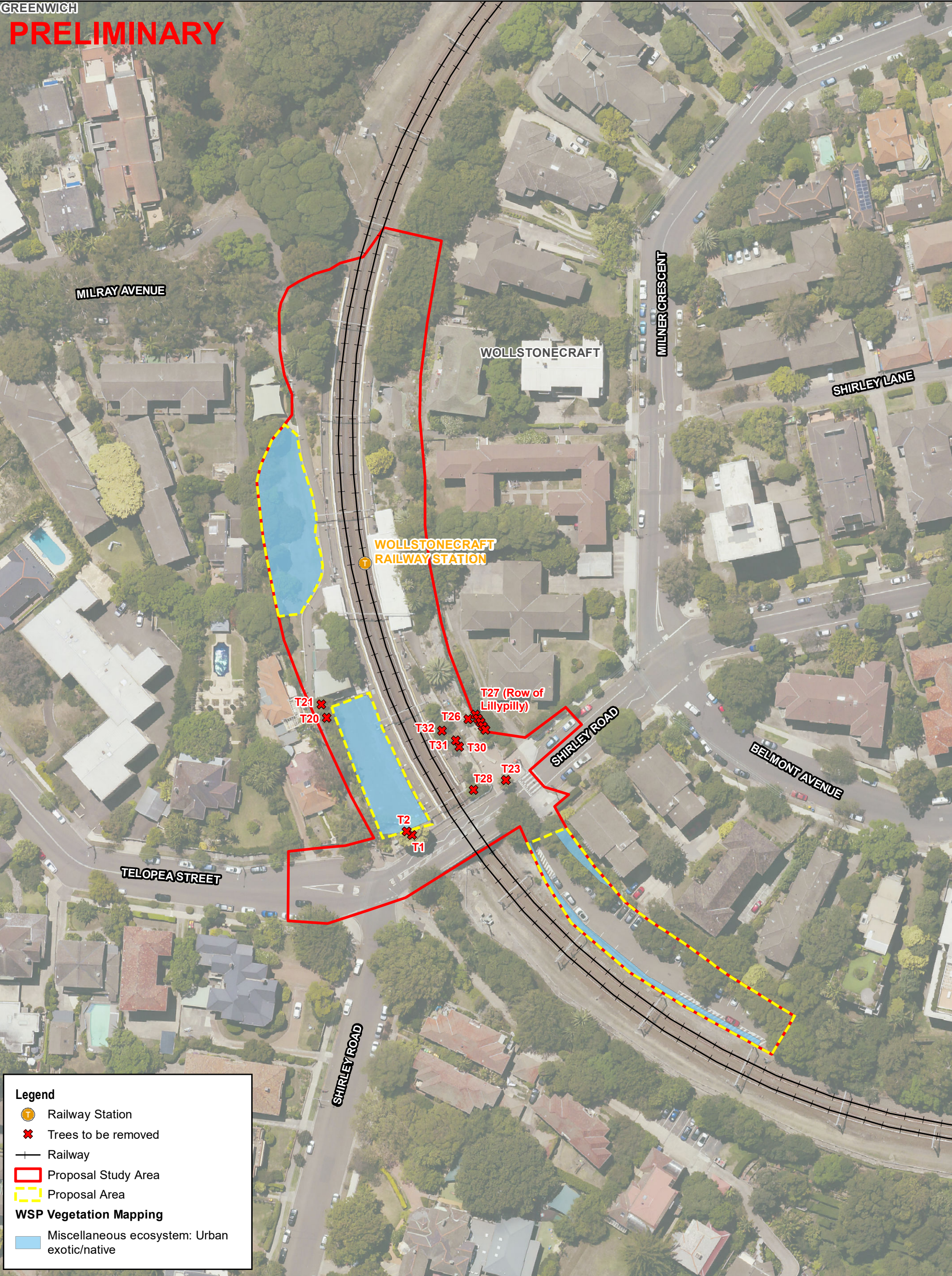
Under present conditions there is moderate light pollution within the study area associated with the existing train station and carpark. The increase of lighting during the construction and operation of the proposal is likely to be inconsequential and significant ecological light pollution impact to wildlife is unlikely.

6.1.2.2 WEEDS

The Proposal is unlikely to impact any Priority Weeds listed under the *Biosecurity Act 2015* for the Greater Sydney Region such that they would pose a risk to any areas of native vegetation.

6.2 IMPACTS DURING OPERATION

The operation of the Proposal is not anticipated to result in any further impacts to biodiversity. Following construction, no further clearing will be required by the Proposal.



Legend

- Railway Station
- Trees to be removed
- Railway
- Proposal Study Area
- Proposal Area

WSP Vegetation Mapping

- Miscellaneous ecosystem: Urban exotic/native

Map: PS118200_GIS_010_A2	Author: Trent.Bowman	
Date: 17/03/2020	Approved by: T.Bangel	

0 10 20
m

1:1,000

Coordinate system: GDA 1994 MGA Zone 56
Scale ratio correct when printed at A3

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Wollstonecraft Station Upgrade - Biodiversity Assessment Report

Figure 6.1
Vegetation removal associated with the Proposal



7 MITIGATION

Construction and operation of the Proposal must be undertaken in accordance with TfNSW's *Vegetation Management (Protection and Removal) Guideline*, TfNSW's *Fauna Management Guideline*, TfNSW's *Vegetation Offset Guide*, TfNSW's *Biodiversity Offsets Calculator* and generally in accordance with the ISCA IS Rating Tool. Specifically, the following measures would be undertaken to avoid and minimise impacts on biodiversity:

- All workers would be provided with an environmental induction prior to commencing work onsite. This induction would include information on the protection measures to be implemented to protect vegetation, penalties for breaches and locations of areas of sensitivity.
- Trees/vegetation nominated to be removed in the Proposal plans would be clearly demarcated onsite prior to construction, to avoid unnecessary vegetation removal. Trees to be retained would be protected through temporary protection measures discussed below.
- Site environmental representative should conduct a pre-clearance inspection to identify the presence of any active bird nests which may be erected prior to tree clearing. If identified, clearing of these trees should be postponed until the nestlings have fledged. Alternatively, a suitably qualified and licensed ecologist or spotter catcher should be engaged to relocate the nest to an appropriate location.
- Stockpiles, plant, equipment and materials storage would be located in existing cleared areas away from areas of native vegetation.
- Where the loss of trees is unable to be mitigated, Transport for NSW would replace trees removed because of the Proposal in accordance with the TfNSW's *Vegetation Offset Guide* (TfNSW, 2019c). In accordance with Section 5 of the guideline it is expected that 42 trees would be required to meet this offset requirement.
- Construction of the Proposal must be undertaken in accordance with TfNSW's *Vegetation Management (Protection and Removal) Guideline SD-111* (2019b) and TfNSW's *Fauna Management Guideline SD-113* (2019a).
- Tree Protection Zones (TPZs) would be established around trees to be retained, as nominated in the Arboricultural Impact Assessment Report (Earthscape Horticultural Services 2020). Tree protection would be undertaken in line with *AS 4970-2009 Protection of Trees on Development Sites* and would include exclusion fencing of TPZs and trunk protection.
- In the event of any tree to be retained becoming damaged during construction, the Contractor would immediately notify the TfNSW Project Manager and TfNSW Environment and Planning Manager to coordinate the response which may include contacting an arborist to inspect and provide advice on remedial action, where possible.
- If a threatened and/or protected flora or fauna species is identified during works associated with the Proposal, works near the species would stop immediately. An ecologist would be engaged to survey the area, in conjunction with TfNSW's Environmental Representative, to advise on management of the species on site.
- Should the detailed design or onsite works determine the need to remove or trim any additional trees, which have not been identified in the REF, the Contractor would be required to complete TfNSW's Tree Removal Application Form and submit it to TfNSW for approval.
- For new landscaping works, mulching and watering would be undertaken until plants are established.
- Weed control measures, consistent with TfNSW's *Weed Management and Disposal Guideline*, would be developed and implemented as part of the CEMP to manage the potential dispersal and establishment of weeds during the construction and operational phase of the Proposal. This would include the management and disposal of weeds in accordance with the *Biosecurity Act 2015*.

8 OFFSETTING

In accordance with the Transport for NSW Vegetation Offset Guide (2019c) individual trees should be offset in areas where individual trees will be impacted. Table 8.1 outlines the offsetting requirements for impacts associated with Proposals on trees which are determined based on the size (Diameter at Breast Height (DBH)) and number of trees to be removed.

Table 8.1 Offsetting for individual trees

TREE TYPE	OFFSET
Large tree (DBH greater than 60 cm)	Plant minimum 8 trees
Medium tree (DBH greater than 15 cm, but less than 60 cm)	Plant minimum 4 trees
Small young tree (DBH less than 15 cm DBH)	Plant minimum 2 trees

The offset requirement to compensate for impacts associated with the Proposal is outlined below in Table 8.2. The identification and trunk diameters of trees to be removed were obtained from Section 10.4, Appendix 3 and Appendix 4 of the Arboriculture Impact Assessment Report (Earthscape Horticultural Services 2020).

Table 8.2 Offsets required for the Proposal

TREE IDENTIFICATION NO.	SPECIES	TRUNK DIAMETER (mm)	OFFSET REQUIRED
T1	<i>Cupressus macrocarpa</i> (Golden Brunings Cypress)	700	8 trees
T2	<i>Ginkgo biloba</i> (Maidenhair Tree)	170	4 trees
T20	<i>Pittosporum undulatum</i> (Sweet Pittosporum)	80x3	2 trees
T21	<i>Cotoneaster sp.</i> (Cotoneaster)	50x4	2 trees
T23	<i>Livistona australis</i> (Cabbage Tree Palm)	274	4 trees
T26	<i>Livistona australis</i> (Cabbage Tree Palm)	300	4 trees
T27	Row of 6 <i>Syzygium spp.</i> (Lillypilly)	50	12 trees
T28	<i>Celtis sinensis</i> (Japanese Hackberry)	70	No offset required – tree is an invasive species which provides no heritage, streetscape, community/ public amenity or intrinsic value.
T30	<i>Pittosporum undulatum</i> (Sweet Pittosporum)	120	2 trees
T31	<i>Pittosporum undulatum</i> (Sweet Pittosporum)	120	2 trees
T32	<i>Allocasuarina littoralis</i> (Black She-oak)	120	2 trees
Total			42 trees

9 CONCLUSION

This Biodiversity Assessment Report has been prepared to inform a Review of Environmental Factors (REF) for the Wollstonecraft Station Upgrade. The findings from the desktop assessment and field investigations have identified minimal impacts to native vegetation and fauna habitat. The proposed activity occurs within an existing inner-city urban precinct and the biodiversity value of the existing environment is comparatively low.

A majority of vegetation observed within the Proposal area is comprised of ornamental planted exotic and native individual tree specimens that do not form part of any recognised native NSW Plant Community Type. The native vegetation community (PCT 1778) recorded within and adjacent to the Proposal area does not form part of any listed threatened ecological community and provides limited habitat for locally occurring flora and fauna. The proposed works will not impact on these areas of native vegetation.

The Proposal will result in the loss of 16 exotic ornamental and native trees (Earthscape Horticulture Services 2020). The impact of this vegetation loss is unlikely to constitute an impact to any important biodiversity value.

Threatened fauna species identified within the locality would likely intermittently utilise the planted vegetation as foraging habitat, however, the habitat is considered low in quality and unlikely to play an important role in the lifecycle of these species. Two threatened fauna species (Grey-headed Flying-fox (*Pteropus poliocephalus*) and Powerful Owl (*Ninox strenua*)) were considered to have a moderate likelihood to utilise the vegetation within the Proposal area. Assessments of Significance were undertaken for both species and they were not considered likely to be significantly impacted due to the Proposal.

The Proposal does not involve any likely significant impact to native plant community types, threatened terrestrial or aquatic species, threatened ecological communities or their habitat. The proposed activity is deemed unlikely to significantly affect threatened species in accordance with Section 7.3 of the BC Act. Given this, a Species Impact Statement or Biodiversity Development Assessment Report (refer Section 7.8 (3) of the BC Act) is not required to accompany the REF. The proposed activity is also unlikely to significantly affect Matters of National Environmental Significance and as such a referral of this activity is not deemed required under the EPBC Act.

The impacts to native biodiversity are predicted to be negligible and any residual or indirect impacts will be mitigated by undertaking works in accordance with TfNSW's *Vegetation Management (Protection and Removal) Guideline*, TfNSW's *Vegetation Offset Guide* and TfNSW's *Fauna Management Guideline*.

The mitigation measures outlined in Section 7 would ensure any potential impact to native biodiversity would result in no significant impact to biodiversity.

10 LIMITATIONS

SCOPE OF SERVICES

This report has been prepared in accordance with the scope of services set out in the contract, or as otherwise agreed, between the client and WSP (scope of services). In some circumstances the scope of services may have been limited by a range of factors such as time, budget, access and/or site disturbance constraints.

RELIANCE ON DATA

In preparing the report, WSP has relied upon data, surveys, analyses, designs, plans and other information provided by the client and other individuals and organisations, most of which are referred to in the report (the data). Except as otherwise stated in the report, WSP has not verified the accuracy or completeness of the data. To the extent that the statements, opinions, facts, information, conclusions and/or recommendations in the report (conclusions) are based in whole or part on the data, those conclusions are contingent upon the accuracy and completeness of the data. WSP will not be liable in relation to incorrect conclusions should any data, information or condition be incorrect or have been concealed, withheld, misrepresented or otherwise not fully disclosed to WSP.

ENVIRONMENTAL CONCLUSIONS

In accordance with the scope of services, WSP has relied upon the data provided for the preparation of the report. Within the limitations imposed by the scope of services, the surveys and preparation of this report have been undertaken and performed in a professional manner, in accordance with generally accepted practices and using a degree of skill and care ordinarily exercised by reputable environmental consultants under similar circumstances. No other warranty, expressed or implied, is made.

REPORT FOR BENEFIT OF CLIENT

The report has been prepared for the benefit of the client (and no other party). WSP assumes no responsibility and will not be liable to any other person or organisation for or in relation to any matter dealt with or conclusions expressed in the report, or for any loss or damage suffered by any other person or organisation arising from matters dealt with or conclusions expressed in the report (including without limitation matters arising from any negligent act or omission of WSP or for any loss or damage suffered by any other party relying upon the matters dealt with or conclusions expressed in the report). Except as provided below parties other than the client should not rely upon the report or the accuracy or completeness of any conclusions and should make their own enquiries and obtain independent advice in relation to such matters.

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APPENDIX A

THREATENED FLORA LIKELIHOOD OF OCCURRENCE ASSESSMENT



A1 THREATENED FLORA LIKELIHOOD OF OCCURRENCE WITHIN THE STUDY AREA

SCIENTIFIC NAME	COMMON NAME	BC ACT STATUS ¹	EPBC ACT STATUS ²	HABITAT ³	NATURE OF RECORD	LIKELIHOOD OF OCCURRENCE
<i>Acacia bynoeana</i>	Bynoe's Wattle	E	V	This species occurs in heath or dry sclerophyll forest on sandy soils and is generally associated with overstorey species such as Red Bloodwood, Scribbly Gum, Parramatta Red Gum, Saw Banksias and Narrow-leaved Apple.	EPBC Act Protected matters search, BioNet (5)	Low Although the species has been infrequently recorded within the locality, the study area does not contain associated habitat attributes such as vegetation formation, floristic assemblage or geological substrate. The occurrence of <i>Acacia bynoeana</i> within the study area is considered unlikely.
<i>Acacia pubescens</i>	Downy Wattle	V	V	Restricted to the Sydney Region from Bilpin to the Georges River and also at Woodford where it usually grows in open sclerophyll forest and woodland on clay soils. Typically it occurs at the intergrade between shales and sandstones in gravelly soils often with ironstones.	EPBC Act Protected matters search	Low This species has not been recorded within the locality. The study area does not contain associated habitat attributes such as vegetation formation, floristic assemblage or geological substrate. The occurrence of <i>Acacia pubescens</i> within the study area is considered unlikely.

SCIENTIFIC NAME	COMMON NAME	BC ACT STATUS ¹	EPBC ACT STATUS ²	HABITAT ³	NATURE OF RECORD	LIKELIHOOD OF OCCURRENCE
<i>Acacia terminalis</i> subsp. <i>terminalis</i>	Sunshine Wattle	E	E	This species is associated with coastal scrub and dry sclerophyll woodland on sandy soils.	PlantNet, EPBC Act Protected matters search, BioNet (40)	Low Although the species has been recorded frequently in the locality (including a record approx. 90 m of the study area) within PCT 1778, PCT 1778 recorded in the study area is in a highly modified condition and no individuals were recorded during the survey period. As such, the species is considered unlikely to occur within the study area nor be impacted upon by the Proposal.
<i>Allocasuarina glareicola</i>	—	E	E	Primarily restricted to the Richmond (NW Cumberland Plain) district, but with an outlier population found at Voyager Point, Liverpool. Grows on lateritic soil in open forest.	EPBC Act Protected matters search	Low This species has not been recorded within the locality. The study area does not contain associated habitat attributes such as vegetation formation, floristic assemblage or geological substrate. The occurrence of <i>Allocasuarina glareicola</i> within the study area is considered unlikely.

SCIENTIFIC NAME	COMMON NAME	BC ACT STATUS ¹	EPBC ACT STATUS ²	HABITAT ³	NATURE OF RECORD	LIKELIHOOD OF OCCURRENCE
<i>Allocasuarina portuensis</i>	Nielsen Park She-oak	E	E	The original known habitat of the Nielsen Park She-oak is at Nielsen Park, in Woollahra local government area. There are no plants left at the original site where it was discovered. However, propagation material has been planted successfully at a number of locations at Nielsen Park and other locations in the local area, e.g. Gap Bluff, Hermit Point and Vacluse House. The original habitat is tall closed woodland. Canopy species include: <i>Ficus rubiginosa</i> , <i>Angophora costata</i> , <i>Elaeocarpus reticulatus</i> and <i>Gloichidion ferdinandi</i> with a shrub layer of <i>Pittosporum revolutum</i> , <i>Kunzea ambigua</i> and <i>Monotoca elliptica</i> . The original habitat occurs above a sandstone shelf approximately 20 m above the harbour. The shallow sandy soils are highly siliceous, coarsely textured and devoid of a soil profile. The plantings have occurred on similar soils.	EPBC Act Protected matters search	Low This species has not been recorded within the locality and no individuals are left (all individuals remaining are propagated and planted). Although the study area does contain a vegetation association for the species is it highly modified and considered unlikely to provide habitat for the species. The occurrence of <i>Allocasuarina portuensis</i> within the study area is considered unlikely.

SCIENTIFIC NAME	COMMON NAME	BC ACT STATUS ¹	EPBC ACT STATUS ²	HABITAT ³	NATURE OF RECORD	LIKELIHOOD OF OCCURRENCE
<i>Amperea xiphoclada</i> var. <i>pedicellata</i>	—	E4	E4	<i>Amperea xiphoclada</i> var. <i>pedicellata</i> is known only from the type specimen collected in 1892 from Sydney, NSW. The species has not been observed since and is presumed to be extinct. <i>Amperea xiphoclada</i> var. <i>pedicellata</i> was previously widespread in heath, woodland and forest in low-fertility, sandy soils.	BioNet (1)	Low This species is only known from the type specimen collected in 1892 and is now presumed extinct in the wild. The study area does not contain associated habitat attributes such as vegetation formation, floristic assemblage or geological substrate. The occurrence of <i>Amperea xiphoclada</i> var. <i>pedicellata</i> within the study area is considered unlikely.
<i>Asterolasia elegans</i>	—	E	E	Occurs on Hawkesbury sandstone where it is found in sheltered forests on mid- to lower slopes and valleys, e.g. in or adjacent to gullies which support sheltered forest. Occurs north of Sydney, in the Baulkham Hills, Hawkesbury and Hornsby local government areas. Also likely to occur in the western part of Gosford local government area. Known from only seven populations, only one of which is wholly within a conservation reserve.	EPBC Act Protected matters search	Low This species has not been recorded within the locality. The study area does not contain associated habitat attributes such as vegetation formation, floristic assemblage or geological substrate. The occurrence of <i>Asterolasia elegans</i> within the study area is considered unlikely.

SCIENTIFIC NAME	COMMON NAME	BC ACT STATUS ¹	EPBC ACT STATUS ²	HABITAT ³	NATURE OF RECORD	LIKELIHOOD OF OCCURRENCE
<i>Caladenia tessellata</i>	Thick Lip Spider Orchid	E	V	Occurs south of Swansea where it grows on clay loam or sandy soils. Prefers low open forest with a heathy or sometimes grassy understorey. Within NSW, currently known from two disjunct areas; one population near Braidwood on the Southern Tablelands and three populations in the Wyong area on the Central Coast. Previously known also from Sydney and South Coast areas.	EPBC Act Protected matters search, BioNet (5)	Low This species has not been recorded recently in within the locality (records the locality are old, generally >100 years old). The study area does not contain associated habitat attributes such as vegetation formation, floristic assemblage or geological substrate. The occurrence of <i>Caladenia tessellata</i> within the study area is considered unlikely.
<i>Callistemon linearifolius</i>	Netted Bottle Brush	V	—	This species is associated with dry sclerophyll forest on the coast and adjacent ranges.	BioNet (4)	Low Although the species has been recorded infrequently within the locality, the study area does not contain associated habitat attributes such as vegetation formation, floristic assemblage or geological substrate. The occurrence of <i>Callistemon linearifolius</i> within the study area is considered unlikely.
<i>Camarophyllopsis kearneyi</i>		E	-	Known only from its type locality in Lane Cove Bushland Park in the Lane Cove local government area in the Sydney metropolitan region. Its occurrence appears to be limited to the Lane Cove Bushland Park. Surveys in potentially suitable habitats elsewhere in the Sydney Basin Bioregion have failed to find <i>Camarophyllopsis kearneyi</i> .	BioNet (1)	Low Known only from within Lane Cove LGA. The study area does not contain associated habitat attributes such as vegetation formation, floristic assemblage or geological substrate. The occurrence of <i>Camarophyllopsis kearneyi</i> within the study area is considered unlikely.

SCIENTIFIC NAME	COMMON NAME	BC ACT STATUS ¹	EPBC ACT STATUS ²	HABITAT ³	NATURE OF RECORD	LIKELIHOOD OF OCCURRENCE
<i>Cryptostylis hunteriana</i>	Leafless Tongue-orchid	V	V	Occurs south from the Gibraltar Range, chiefly in coastal districts but also extends on to tablelands. Grows in swamp-heath and drier forest on sandy soils on granite & sandstone. Occurs in small, localised colonies most often on the flat plains close to the coast but also known from some mountainous areas growing in moist depressions and swampy habitats.	EPBC Act Protected matters search	Low This species has not been recorded within the locality. The study area does not contain associated habitat attributes such as vegetation formation, floristic assemblage or geological substrate. The occurrence of <i>Cryptostylis hunteriana</i> within the study area is considered unlikely.
<i>Cynanchum elegans</i>	White-flowered Wax Plant	E	E	Occurs from the Gloucester district to the Wollongong area and inland to Mt Dangar where it grows in rainforest gullies, scrub and scree slopes. This species typically occurs at the ecotone between dry subtropical forest/woodland communities.	EPBC Act Protected matters search	Low This species has not been recorded within the locality. The study area does not contain associated habitat attributes such as vegetation formation or floristic assemblage. The occurrence of <i>Cynanchum elegans</i> within the study area is considered unlikely.
<i>Darwinia biflora</i>	—	V	V	Occurs from Cheltenham to Hawkesbury River where it grows in heath on sandstone or in the understorey of woodland on shale-capped ridges. Occurs on the edges of weathered shale-capped ridges, where these intergrade with Hawkesbury Sandstone. Associated overstorey species include <i>Eucalyptus haemastoma</i> , <i>Corymbia gummifera</i> and/or <i>E. squamosa</i> . The vegetation structure is usually woodland, open forest or scrub.	BioNet (164), EPBC Act Protected matters search	Low Although the species has been recorded frequently within the locality, the study area does not contain associated habitat attributes such as vegetation formation, floristic assemblage or geological substrate. The occurrence of <i>Darwinia biflora</i> within the study area is considered unlikely.

SCIENTIFIC NAME	COMMON NAME	BC ACT STATUS ¹	EPBC ACT STATUS ²	HABITAT ³	NATURE OF RECORD	LIKELIHOOD OF OCCURRENCE
<i>Deyeuxia appressa</i>	–	E	E	A highly restricted NSW endemic known only from two pre-1942 records in the Sydney area. Was first collected in 1930 at Herne Bay, Saltpan Creek, off the Georges River, south of Bankstown. Was then collected in 1941 from Killara, near Hornsby. Has not been collected since and may now be extinct in the wild due to the level of habitat loss and development that has occurred within these areas.	EPBC Act Protected matters search	Low This species has not been recorded within the locality and is presumed extinct in the Sydney area. The study area does not contain associated habitat attributes such as vegetation formation, floristic assemblage or geological substrate. The occurrence of <i>Deyeuxia appressa</i> within the study area is considered unlikely.
<i>Epacris purpurascens</i> subsp. <i>purpurascens</i>	–	V	–	Occurs in Gosford and Sydney districts where it grows in sclerophyll forest, scrub and swamps. Usually found in sites with a strong shale influence.	BioNet (111)	Low Although the species has been recorded frequently in the locality, the study area does not contain associated habitat attributes such as vegetation formation, floristic assemblage or geological substrate. The occurrence of <i>Epacris purpurascens</i> subsp. <i>purpurascens</i> within the study area is considered unlikely.
<i>Eucalyptus camfieldii</i>	Heart-leaved Stringybark	V	V	Occurs in scattered locations within a restricted distribution in a narrow band with the most northerly records in the Raymond Terrace area south to Waterfall. Grows in poor coastal country in shallow sandy soils overlying Hawkesbury sandstone, in 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.	BioNet (12), EPBC Act Protected matters search	Low Although the species has been recorded in the locality, the study area does not contain associated habitat attributes such as vegetation formation, floristic assemblage or geological substrate. The occurrence of <i>Eucalyptus camfieldii</i> within the study area is considered unlikely.

SCIENTIFIC NAME	COMMON NAME	BC ACT STATUS ¹	EPBC ACT STATUS ²	HABITAT ³	NATURE OF RECORD	LIKELIHOOD OF OCCURRENCE
<i>Eucalyptus nicholii</i>	Narrow-leaved Black Peppermint	V	V	This species is sparsely distributed but widespread on the New England Tablelands from Nundle to north of Tenterfield, being most common in central portions of its range. Found largely on private property and roadsides, and occasionally in conservation reserves. Planted as urban trees, windbreaks and corridors. Typically grows in dry grassy woodland, on shallow soils of slopes and ridges. Found primarily on infertile soils derived from granite or metasedimentary rock.	BioNet (6)	Low Although the species has been recorded in the locality, it is not known to occur naturally in the Sydney region (i.e. species is a commonly planted street tree i.e. records are likely cultivated specimens). The occurrence of <i>Eucalyptus nicholii</i> within the study area is considered unlikely.
<i>Eucalyptus pulverulenta</i>	Silver-leaved Gum	V	V	The Silver-leaved Gum is found in two quite separate areas, the Lithgow to Bathurst area and the Monaro (Bredbo to Bombala). Grows in shallow soils as an understorey plant in open forest, typically dominated by Brittle Gum (<i>Eucalyptus mannifera</i>), Red Stringybark (<i>E. macrorhynca</i>), Broad-leaved Peppermint (<i>E. dives</i>), Silvertop Ash (<i>E. sieberi</i>) and Apple Box (<i>E. bridgesiana</i>).	BioNet (1)	Low Although the species has been recorded in the locality, it is not known to occur naturally in the Sydney region (i.e. species is a commonly planted street tree i.e. records are likely cultivated specimens). The occurrence of <i>Eucalyptus pulverulenta</i> within the study area is considered unlikely.
<i>Genoplesium baueri</i>	Yellow Gnat-orchid	E	E	Grows in dry sclerophyll forest and moss gardens over sandstone. The species has been recorded from locations between Ulladulla and Port Stephens (OEH 2018).	BioNet (2), EPBC Act Protected matters search	Low Although recorded in the locality, the study area does not contain associated habitat attributes such as vegetation formation or floristic assemblage. The occurrence of <i>Genoplesium baueri</i> within the study area is considered unlikely.

SCIENTIFIC NAME	COMMON NAME	BC ACT STATUS ¹	EPBC ACT STATUS ²	HABITAT ³	NATURE OF RECORD	LIKELIHOOD OF OCCURRENCE
<i>Grevillea caleyi</i>	Caleys Grevillea	E	CE	Restricted to an 8 km square area around Terrey Hills, approximately 20 km north of Sydney. Occurs in three major areas of suitable habitat, namely Belrose, Ingleside and Terrey Hills/Duffys Forest within the Ku-ring-gai, Pittwater and Warringah Local Government Areas. All natural remnant sites occur within a habitat that is both characteristic and consistent between sites. All sites occur on the ridgetop between elevations of 170 to 240 m asl, in association with laterite soils and a vegetation community of open forest, generally dominated by <i>Eucalyptus sieberi</i> and <i>E. gummifera</i> .	BioNet (4), EPBC Act Protected matters search	Low Although recorded in the locality, the study area does not contain associated habitat attributes such as vegetation formation, floristic assemblage or geological substrate. The occurrence of <i>Grevillea caleyi</i> within the study area is considered unlikely.
<i>Haloragodendron lucasii</i>	—	E	E	The known locations of this species are confined to a very narrow distribution on the north shore of Sydney. Confined to the Sydney area where it grows in dry sclerophyll open forest on sheltered slopes near creeks on sandstone. Reported to grow in moist sandy loam soils in sheltered aspects, and on gentle slopes below cliff-lines near creeks in low open woodland. Associated with high soil moisture and relatively high soil-phosphorus levels.	EPBC Act Protected matters search	Low This species has not been recorded within the locality. The study area does not contain associated habitat attributes such as vegetation formation or floristic assemblage. The occurrence of <i>Haloragodendron lucasii</i> within the study area is considered unlikely.

SCIENTIFIC NAME	COMMON NAME	BC ACT STATUS ¹	EPBC ACT STATUS ²	HABITAT ³	NATURE OF RECORD	LIKELIHOOD OF OCCURRENCE
<i>Hibbertia spanantha</i>	Julians Hibbertia	CE	CE	Grows in forest with canopy species including <i>Eucalyptus pilularis</i> , <i>E. resinifera</i> , <i>Corymbia gummifera</i> and <i>Angophora costata</i> . The understorey is open with species of Poaceae, Orchidaceae, Fabaceae and Liliaceae. Flowering in October and November, but with an odd flower throughout the year. The soil is identified as a light clay occurring on a shale sandstone soil transition.	BioNet (2), EPBC Act Protected matters search	Low Although the species has been recorded infrequently the locality, the study area does not contain associated habitat attributes such as vegetation formation or geological substrate. The occurrence of <i>Hibbertia spanantha</i> within the study area is considered unlikely.
<i>Hygrocybe anomala</i> var. <i>ianthinomarginata</i>	—	V	—	Known in a few locations including in Lane Cove Bushland Park and the Blue Mountains in NSW and in areas of south-east Queensland. However little information exists for populations outside Lane Cove Bushland Park. Occurs in gallery warm temperate forests dominated by Lilly Pilly <i>Acmena smithii</i> , Grey Myrtle <i>Backhousia myrtifolia</i> , Cheese Tree <i>Glochidion ferdinandi</i> and Sweet Pittosporum <i>Pittosporum undulatum</i> . Associated with alluvial sandy soils of the Hawesbury Soil Landscapes. Occur as individuals or in groups, terrestrial rarely on wood and only if extremely rotten; substrates include soil, humus, or moss.	BioNet (1)	Low Known only from within Lane Cove and Blue Mountains. The study area does not contain associated habitat attributes such as vegetation formation, floristic assemblage or geological substrate. The occurrence of <i>Hygrocybe anomala</i> var. <i>ianthinomarginata</i> within the study area is considered unlikely.

SCIENTIFIC NAME	COMMON NAME	BC ACT STATUS ¹	EPBC ACT STATUS ²	HABITAT ³	NATURE OF RECORD	LIKELIHOOD OF OCCURRENCE
<i>Hygrocybe aurantipes</i>	—	V	—	Type locality, Lane Cove Bushland Park, Lane Cove Local Government Area. Other records from Blue Mountains National Park (Mt Wilson) and Hazelbrook. Occurs in gallery warm temperate forests dominated by Lilly Pilly (<i>Acmena smithii</i>), Grey Myrtle (<i>Backhousia myrtifolia</i>), Cheese Tree (<i>Glochidion ferdinandi</i>) and Sweet Pittosporum (<i>Pittosporum undulatum</i>). Associated with alluvial sandy soils of the Hawkesbury Soil Landscapes with naturally low fertility and erodible. Occur as individuals or in groups, terrestrial rarely on wood and only if extremely rotten; substrates include soil, humus, or moss.	BioNet (1)	Low Known only from within Lane Cove and Blue Mountains. The study area does not contain associated habitat attributes such as vegetation formation, floristic assemblage or geological substrate. The occurrence of <i>Hygrocybe aurantipes</i> within the study area is considered unlikely.
<i>Hygrocybe austropratensis</i>	—	V	—	Only know from type locality at Lane Cove Bushland Park, Lane Cove Local Government Area. Occurs in gallery warm temperate forests dominated by Lilly Pilly (<i>Acmena smithii</i>), Grey Myrtle (<i>Backhousia myrtifolia</i>), Cheese Tree (<i>Glochidion ferdinandi</i>) and Sweet Pittosporum (<i>Pittosporum undulatum</i>). Associated with alluvial sandy soils of the Hawkesbury Soil Landscapes with naturally low fertility and erodible. Occur as individuals or in groups, terrestrial rarely on wood and only if extremely rotten; substrates include soil, humus, or moss.	BioNet (1)	Low Known only from within Lane Cove. The study area does not contain associated habitat attributes such as vegetation formation, floristic assemblage or geological substrate. The occurrence of <i>Hygrocybe austropratensis</i> within the study area is considered unlikely.

SCIENTIFIC NAME	COMMON NAME	BC ACT STATUS ¹	EPBC ACT STATUS ²	HABITAT ³	NATURE OF RECORD	LIKELIHOOD OF OCCURRENCE
<i>Hygrocybe collucera</i>	–	V	–	Only know from type locality at Lane Cove Bushland Park, Lane Cove Local Government Area. Occurs in gallery warm temperate forests dominated by Lilly Pilly (<i>Acmena smithii</i>), Grey Myrtle (<i>Backhousia myrtifolia</i>), Cheese Tree (<i>Glochidion ferdinandi</i>) and Sweet Pittosporum (<i>Pittosporum undulatum</i>). Associated with alluvial sandy soils of the Hawkesbury Soil Landscapes with naturally low fertility and erodible. Occur as individuals or in groups, terrestrial rarely on wood and only if extremely rotten; substrates include soil, humus, or moss.	BioNet (1)	Low Known only from within Lane Cove LGA. The study area does not contain associated habitat attributes such as vegetation formation, floristic assemblage or geological substrate. The occurrence of <i>Hygrocybe collucera</i> within the study area is considered unlikely.
<i>Hygrocybe griseoramosa</i>	–	V	–	Only know from type locality at Lane Cove Bushland Park, Lane Cove Local Government Area. Occurs in gallery warm temperate forests dominated by Lilly Pilly (<i>Acmena smithii</i>), Grey Myrtle (<i>Backhousia myrtifolia</i>), Cheese Tree (<i>Glochidion ferdinandi</i>) and Sweet Pittosporum (<i>Pittosporum undulatum</i>). Associated with alluvial sandy soils of the Hawkesbury Soil Landscapes with naturally low fertility and erodible. Occur as individuals or in groups, terrestrial rarely on wood and only if extremely rotten; substrates include soil, humus, or moss.	BioNet (1)	Low Known only from within Lane Cove LGA. The study area does not contain associated habitat attributes such as vegetation formation, floristic assemblage or geological substrate. The occurrence of <i>Hygrocybe griseoramosa</i> within the study area is considered unlikely.

SCIENTIFIC NAME	COMMON NAME	BC ACT STATUS ¹	EPBC ACT STATUS ²	HABITAT ³	NATURE OF RECORD	LIKELIHOOD OF OCCURRENCE
<i>Hygrocybe lanecovens</i>	–	V	–	Only know from type locality at Lane Cove Bushland Park, Lane Cove Local Government Area. Occurs in gallery warm temperate forests dominated by Lilly Pilly (<i>Acmena smithii</i>), Grey Myrtle (<i>Backhousia myrtifolia</i>), Cheese Tree (<i>Glochidion ferdinandi</i>) and Sweet Pittosporum (<i>Pittosporum undulatum</i>). Associated with alluvial sandy soils of the Hawkesbury Soil Landscapes with naturally low fertility and erodible. Occur as individuals or in groups, terrestrial rarely on wood and only if extremely rotten; substrates include soil, humus, or moss.	BioNet (1)	Low Known only from within Lane Cove LGA. The study area does not contain associated habitat attributes such as vegetation formation, floristic assemblage or geological substrate. The occurrence of <i>Hygrocybe lanecoversnsis</i> within the study area is considered unlikely.
<i>Hygrocybe reesia</i>	–	V	–	Type locality, Lane cove Bushland Park, Lane Cove Local Government Area. Also recorded from Blue Mountains National Park in the Hazelbrook area. Also found in Tasmania. Occurs in gallery warm temperate forests dominated by Lilly Pilly (<i>Acmena smithii</i>), Grey Myrtle (<i>Backhousia myrtifolia</i>), Cheese Tree (<i>Glochidion ferdinandi</i>) and Sweet Pittosporum (<i>Pittosporum undulatum</i>). Associated with alluvial sandy soils of the Hawkesbury Soil Landscapes with naturally low fertility and erodible. Occur as individuals or in groups, terrestrial rarely on wood and only if extremely rotten; substrates include soil, humus, or moss.	BioNet (2)	Low Known only from within Lane Cove and Blue Mountains. The study area does not contain associated habitat attributes such as vegetation formation, floristic assemblage or geological substrate. The occurrence of <i>Hygrocybe reesia</i> within the study area is considered unlikely.

SCIENTIFIC NAME	COMMON NAME	BC ACT STATUS ¹	EPBC ACT STATUS ²	HABITAT ³	NATURE OF RECORD	LIKELIHOOD OF OCCURRENCE
<i>Hygrocybe rubronivea</i>	—	V	—	Known in a few locations including in Lane Cove Bushland Park and the Blue Mountains in NSW and in areas of south-east Queensland. However little information exists for populations outside Lane Cove Bushland Park. Occurs in gallery warm temperate forests dominated by Lilly Pilly <i>Acmena smithii</i> , Grey Myrtle <i>Backhousia myrtifolia</i> , Cheese Tree <i>Glochidion ferdinandi</i> and Sweet Pittosporum <i>Pittosporum undulatum</i> . Associated with alluvial sandy soils of the Hawesbury Soil Landscapes. Occur as individuals or in groups, terrestrial rarely on wood and only if extremely rotten; substrates include soil, humus, or moss.	BioNet (1)	Low Known only from within Lane Cove and Blue Mountains. The study area does not contain associated habitat attributes such as vegetation formation, floristic assemblage or geological substrate. The occurrence of <i>Hygrocybe rubronivea</i> within the study area is considered unlikely.
<i>Lasiopetalum joyceae</i>	—	V	V	Has a restricted range occurring on lateritic to shaley ridgetops on the Hornsby Plateau south of the Hawkesbury River. It is currently known from 34 sites between Berrilee and Duffys Forest. It grows in heath and open woodland in sandy soils on sandstone.	BioNet (1)	Low Although the species has been recorded in the locality, the study area does not contain associated habitat attributes such as vegetation formation, floristic assemblage or geological substrate. The occurrence of <i>Lasiopetalum joyceae</i> within the study area is considered unlikely.

SCIENTIFIC NAME	COMMON NAME	BC ACT STATUS ¹	EPBC ACT STATUS ²	HABITAT ³	NATURE OF RECORD	LIKELIHOOD OF OCCURRENCE
<i>Leptospermum deanei</i>	–	V	V	Occurs in Hornsby, Warringah, Ku-ring-gai and Ryde LGAs in woodland on lower hills and slopes or near creeks, sandy alluvial soil or sand over sandstone. Occurs in Riparian Scrub- e.g. <i>Tristaniopsis laurina</i> , <i>Baeckea myrtifolia</i> , Woodland (e.g. <i>Eucalyptus haemastoma</i>) and Open Forest (e.g. <i>Angophora costata</i> , <i>Leptospermum trinervium</i> and <i>Banksia ericifolia</i>). Only occurs near the watershed of Lane Cove River where it grows on forested slopes.	BioNet (1), EPBC Act Protected matters search	Low Although the species has been recorded in the locality, the study area does not contain associated habitat attributes such as vegetation formation, floristic assemblage or geological substrate. The occurrence of <i>Leptospermum deanei</i> within the study area is considered unlikely.
<i>Melaleuca biconvexa</i>	Biconvex Paperbark	V	V	Occurs as disjunct populations in coastal New South Wales from Jervis Bay to Port Macquarie, with the main concentration of records is in the Gosford/Wyong area. Grows in damp places, often near streams, or low-lying areas on alluvial soils of low slopes or sheltered aspects.	EPBC Act Protected matters search	Low This species has not been recorded within the locality. The study area does not contain associated habitat attributes such as vegetation formation, floristic assemblage or geological substrate. The occurrence of <i>Melaleuca biconvexa</i> within the study area is considered unlikely.
<i>Melaleuca deanei</i>	Deane's Paperbark	V	V	Occurs in two distinct areas, in the Ku-ring-gai/Berowra and Holsworthy/Wedderburn areas respectively. There are also more isolated occurrences at Springwood (in the Blue Mountains), Wollemi National Park, Yalwal (west of Nowra) and Central Coast (Hawkesbury River) areas. The species occurs mostly in ridgetop woodland, with only 5% of sites in heath on sandstone.	BioNet (7), EPBC Act Protected matters search	Low Although the species has been recorded infrequently within the locality, the study area does not contain associated habitat attributes such as vegetation formation, floristic assemblage or geological substrate. The occurrence of <i>Melaleuca deanei</i> within the study area is considered unlikely.

SCIENTIFIC NAME	COMMON NAME	BC ACT STATUS ¹	EPBC ACT STATUS ²	HABITAT ³	NATURE OF RECORD	LIKELIHOOD OF OCCURRENCE
<i>Persicaria elatior</i>	Tall Knotweed	V	V	This species normally grows in damp places, especially beside streams and lakes. Occasionally in swamp forest or associated with disturbance.	EPBC Act Protected matters search	Low Although the species has been recorded infrequently within the locality, the study area does not contain associated habitat attributes such as vegetation formation, floristic assemblage or geological substrate. The occurrence of <i>Persicaria elatior</i> within the study area is considered unlikely.
<i>Persoonia hirsuta</i>	Hairy Geebung	E	E	The species is distributed from Singleton in the north, along the east coast to Bargo in the south and the Blue Mountains to the west. It has a large area of occurrence, but occurs in small populations. Found in sandy soils in dry sclerophyll open forest, woodland and heath on sandstone or very rarely on shale. Often occurs in areas with clay influence, in the ecotone between shale and sandstone.	BioNet (3), EPBC Act Protected matters search	Low Although the species has been recorded infrequently within the locality, the study area does not contain associated habitat attributes such as vegetation formation, floristic assemblage or geological substrate. The occurrence of <i>Persoonia hirsuta</i> within the study area is considered unlikely.

SCIENTIFIC NAME	COMMON NAME	BC ACT STATUS ¹	EPBC ACT STATUS ²	HABITAT ³	NATURE OF RECORD	LIKELIHOOD OF OCCURRENCE
<i>Persoonia mollis</i> subsp. <i>maxima</i>	–	E	E	Restricted to the Hornsby Heights, Mt Colah area north of Sydney. It occurs on sheltered upper hillsides of narrow gullies of Hawkesbury sandstone characterised by steep sideslopes, rocky benches and broken scarps, with creeks fed by small streams and intermittent drainage depressions. It grows in moist, tall forest (<i>Angophora costata</i> , <i>Eucalyptus piperita</i> , <i>Corymbia gummifera</i>), often with warm temperate rainforest influences (<i>Syncarpia glomulifera</i> , <i>Ceratopetalum apetalum</i> , <i>Callicoma serratifolia</i>). Sometimes recorded in low densities on the dry upper-hillsides of gullies and in more exposed aspects in association with <i>E. haemastoma</i> and <i>E. punctata</i> .	EPBC Act Protected matters search	Low This species has not been recorded within the locality. The study area does not contain associated habitat attributes such as vegetation formation, floristic assemblage or geological substrate. The occurrence of <i>Persoonia mollis</i> subsp. <i>maxima</i> within the study area is considered unlikely.
<i>Pimelea curviflora</i> var. <i>curviflora</i>	–	V	V	Confined to coastal areas around Sydney where it grows on sandstone and laterite soils. It is found between South Maroota, Cowan, Narrabeen, Allambie Heights, Northmead and Kellyville, but its former range extended south to the Parramatta River and Port Jackson region including Five Dock, Bellevue Hill and Manly. Usually occurs in woodland in the transition between shale and sandstone, often on Lucas Heights soil landscape.	BioNet (4), EPBC Act Protected matters search	Low Although the species has been recorded infrequently within the locality, the study area does not contain associated habitat attributes such as vegetation formation or floristic assemblage. The occurrence of <i>Pimelea curviflora</i> var. <i>curviflora</i> within the study area is considered unlikely.

SCIENTIFIC NAME	COMMON NAME	BC ACT STATUS ¹	EPBC ACT STATUS ²	HABITAT ³	NATURE OF RECORD	LIKELIHOOD OF OCCURRENCE
<i>Pimelea spicata</i>	Spiked Rice-flower	E	E	This species occurs in two disjunct areas: in coastal districts from Lansdowne to Shellharbour, and in Cumberland Plain Woodland inland to Penrith. In western Sydney it grows on Wianamatta Shales in Greybox - Ironbark Woodland with <i>Bursaria spinosa</i> and <i>Themeda australis</i> . In the Illawarra, it occurs on well structured clay soils in grassland or open woodland.	EPBC Act Protected matters search	Low This species has not been recorded within the locality. This species has not been recorded within the locality. The study area does not contain associated habitat attributes such as vegetation formation, floristic assemblage or geological substrate. The occurrence of <i>Pimelea spicata</i> within the study area is considered unlikely.
<i>Prostanthera junonis</i>	Somersby Mintbush	E	E	Has a north-south range of approximately 19 km on the Somersby Plateau in the Gosford and Wyong local government areas. The species is restricted to the Somersby Plateau. It occurs on both the Somersby and Sydney Town soil landscapes on gently undulating country over weathered Hawkesbury sandstone within open forest/low woodland/open scrub. It occurs in both disturbed and undisturbed sites.	BioNet (2), EPBC Protected matters search	Low Although the species has been recorded in the locality, the study area does not contain associated habitat attributes such as vegetation formation, floristic assemblage or geological substrate. The occurrence of <i>Prostanthera junonis</i> within the study area is considered unlikely.
<i>Prostanthera marifolia</i>	Seaforth Mintbush	CE	CE	This species is currently only known from the northern Sydney suburb of Seaforth and is very highly restricted in distribution. Known records of this species occur near the endangered Duffys Forest ecological community. Habitat for this species has been recorded as deeply weathered clay-loam soils associated with ironstone and scattered shale lenses on ridgetops.	BioNet (7), EPBC Act Protected matters search	Low Although the species has been recorded infrequently within the locality, the study area does not contain associated habitat attributes such as vegetation formation, floristic assemblage or geological substrate. The occurrence of <i>Prostanthera marifolia</i> within the study area is considered unlikely.

SCIENTIFIC NAME	COMMON NAME	BC ACT STATUS ¹	EPBC ACT STATUS ²	HABITAT ³	NATURE OF RECORD	LIKELIHOOD OF OCCURRENCE
<i>Rhodamnia rubescens</i>	Scrub Turpentine	CE	—	Occurs in coastal districts north from Batemans Bay in New South Wales, approximately 280 km south of Sydney, to areas inland of Bundaberg in Queensland. Populations of <i>R. rubescens</i> typically occur in coastal regions and occasionally extend inland onto escarpments up to 600 m a.s.l. in areas with rainfall of 1,000–1,600 mm. Found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest usually on volcanic and sedimentary soils. This species is characterised as highly to extremely susceptible to infection by Myrtle Rust. Myrtle Rust affects all plant parts.	BioNet (2)	Low Although the species has been recorded infrequently within the locality, the study area does not contain associated habitat attributes such as vegetation formation, floristic assemblage or geological substrate. Furthermore, the species is not cryptic in nature and was not recorded during the site survey. The occurrence of <i>Rhodamnia rubescens</i> within the study area is considered unlikely.
<i>Sarcophilus hartmannii</i>	Hartman's Sarcophilus	V	V	From the Richmond River in northern NSW to Gympie in south-east Queensland. Favours cliff faces on steep narrow ridges supporting eucalypt forest and clefts in volcanic rock from 500 to 1,000 m in altitude. Also found occasionally at the bases of fibrous trunks of trees, including cycads and grass-trees.	BioNet (1)	Low Although the species has been recorded within the locality, the study area does not contain associated habitat attributes such as vegetation formation, floristic assemblage or geological substrate. The occurrence of <i>Sarcophilus hartmannii</i> within the study area is considered unlikely.

SCIENTIFIC NAME	COMMON NAME	BC ACT STATUS ¹	EPBC ACT STATUS ²	HABITAT ³	NATURE OF RECORD	LIKELIHOOD OF OCCURRENCE
<i>Syzygium paniculatum</i>	Magenta Lilly Pilly	E	V	Occurs between Bulahdelah and St Georges Basin where it grows in subtropical and littoral rainforest on sandy soils or stabilized dunes near the sea. On the south coast the Magenta Lilly Pilly occurs on grey soils over sandstone, restricted mainly to remnant stands of littoral (coastal) rainforest. On the central Coast, Magenta Lilly Pilly occurs on gravels, sands, silts and clays in riverside gallery rainforests and remnant littoral rainforest communities.	BioNet (13), EPBC Protected matters search	Low Although the species has been recorded infrequently in the locality, the study area does not contain associated habitat attributes such as vegetation formation, floristic assemblage or geological substrate. Furthermore, the species wasn't recorded within the study area during the site inspection. The occurrence of <i>Syzygium paniculatum</i> within the study area is considered unlikely.

SCIENTIFIC NAME	COMMON NAME	BC ACT STATUS ¹	EPBC ACT STATUS ²	HABITAT ³	NATURE OF RECORD	LIKELIHOOD OF OCCURRENCE
<i>Tetratheca glandulosa</i>	Glandular Pink-bell	V	—	Occurs from Mangrove Mountain to the Blue Mountains where it grows in sandy or rocky heath or scrub. Associated with shale-sandstone transition habitat where shale-cappings occur over sandstone, with associated soil landscapes such as Lucas Heights, Gynea, Lambert and Faulconbridge. Topographically, the plant occupies ridgetops, upper-slopes and to a lesser extent mid-slope sandstone benches. Soils are generally shallow, consisting of a yellow, clayey/sandy loam. Stony lateritic fragments are also common in the soil profile on many of these ridgetops. Vegetation structure varies from heaths and scrub to woodlands/open woodlands, and open forest. Vegetation communities correspond broadly to Benson & Howell's Sydney Sandstone Ridgetop Woodland (Map Unit 10ar). Common woodland tree species include: <i>Corymbia gummifera</i> , <i>C. eximia</i> , <i>Eucalyptus haemastoma</i> , <i>E. punctata</i> , <i>E. racemosa</i> , and/or <i>E. sparsifolia</i> , with an understorey dominated by species from the families Proteaceae, Fabaceae, and Epacridaceae.	BioNet (7)	Low Although the species has been recorded infrequently within the locality, the study area does not contain associated habitat attributes such as vegetation formation, floristic assemblage or geological substrate. The occurrence of <i>Tetratheca glandulosa</i> within the study area is considered unlikely.

SCIENTIFIC NAME	COMMON NAME	BC ACT STATUS ¹	EPBC ACT STATUS ²	HABITAT ³	NATURE OF RECORD	LIKELIHOOD OF OCCURRENCE
<i>Tetralthea juncea</i>	Black-eyed Susan	V	V	Confined to the northern portion of the Sydney Basin bioregion and the southern portion of the North Coast bioregion in the local government areas of Wyong, Lake Macquarie, Newcastle, Port Stephens, Great Lakes and Cessnock. It is usually found in low open forest/woodland with a mixed shrub understorey and grassy groundcover. However, it has also been recorded in heathland and moist forest. The majority of populations occur on low nutrient soils associated with the Awaba Soil Landscape. While some studies show the species has a preference for cooler southerly aspects, it has been found on slopes with a variety of aspects. It generally prefers well-drained sites below 200 m elevation and annual rainfall between 1000–1200 mm. The preferred substrates are sandy skeletal soil on sandstone, sandy-loam soils, low nutrients; and clayey soil from conglomerates, pH neutral.	BioNet (2)	Low Although the species has been recorded within the locality, the study area does not contain associated habitat attributes such as vegetation formation, floristic assemblage or geological substrate. The occurrence of <i>Tetralthea juncea</i> within the study area is considered unlikely.

SCIENTIFIC NAME	COMMON NAME	BC ACT STATUS ¹	EPBC ACT STATUS ²	HABITAT ³	NATURE OF RECORD	LIKELIHOOD OF OCCURRENCE
<i>Thesium australe</i>	Austral Toadflax	V	V	Austral Toad-flax is found in very small populations scattered across eastern NSW, along the coast, and from the Northern to Southern Tablelands. Occurs in grassland on coastal headlands or grassland and grassy woodland away from the coast. Often found in association with Kangaroo Grass (<i>Themeda australis</i>).	EPBC Protected matters search	Low The species has not been recorded in the locality. The study area does not contain associated habitat attributes such as vegetation formation, floristic assemblage or geological substrate. The occurrence of <i>Thesium australe</i> within the study area is considered unlikely.

- (1) Listed as Vulnerable (V), Endangered (E), Endangered populations (EP) or Critically Endangered (CE) under the NSW *Biodiversity Conservation Act 2016* (BC Act).
- (2) Listed as Vulnerable (V), Endangered (E) or Critically Endangered (CE) under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).
- (3) Habitat data derived from BioNet (Office of Environment & Heritage 2018).

APPENDIX B

THREATENED FAUNA LIKELIHOOD OF OCCURRENCE ASSESSMENT



B1 THREATENED FAUNA LIKELIHOOD OF OCCURRENCE WITHIN THE STUDY AREA

SCIENTIFIC NAME	COMMON NAME	BC ACT STATUS ¹	EPBC ACT STATUS ²	HABITAT ³	DATA SOURCE	LIKELIHOOD OF OCCURRENCE
Amphibians (4)						
<i>Heleioporus australiacus</i>	Giant Burrowing Frog	V	V	Found in heath, woodland and open dry sclerophyll forest on a variety of soil types except those that are clay based. Spends more than 95% of its time in non-breeding habitat in areas up to 300 m from breeding sites. Whilst in non-breeding habitat it burrows below the soil surface or in the leaf litter. Breeding habitat of this species is generally soaks or pools within first or second order streams. Species is dependent on hanging swamps on the top of sandstone plateaus and deeply dissected gullies that occur as erosion features in the Sydney Basin.	EPBC	Low – no suitable habitat identified within study area
<i>Litoria aurea</i>	Green and Golden Bell Frog	E1	V	Since 1990 there have been approximately 50 recorded locations in NSW, most of which are small, coastal, or near coastal populations. These locations occur over the species' former range, however they are widely separated and isolated. Large populations in NSW are located around the metropolitan areas of Sydney, Shoalhaven and mid north coast (one an island population). There is only one known population on the NSW Southern Tablelands. Inhabits marshes, dams and stream-sides, particularly those containing bullrushes (<i>Typha spp.</i>) or spikerushes (<i>Eleocharis spp.</i>). Optimum habitat includes water-bodies that are unshaded, free of predatory fish such as Plague Minnow (<i>Gambusia holbrooki</i>), have a grassy area nearby and diurnal sheltering sites available.	Bionet, EPBC	Low – no suitable habitat identified within study area

SCIENTIFIC NAME	COMMON NAME	BC ACT STATUS ¹	EPBC ACT STATUS ²	HABITAT ³	DATA SOURCE	LIKELIHOOD OF OCCURRENCE
<i>Mixophyes balbus</i>	Stuttering Frog	E1	V	Occur along the east coast of Australia from southern Queensland to north-eastern Victoria. Considered to have disappeared from Victoria and to have undergone considerable range contraction in NSW, particularly in south-east NSW. It is the only <i>Mixophyes</i> species that occurs in south-east NSW and in recent surveys it has only been recorded at three locations south of Sydney. The Dorrego region, in north-east NSW, appears to be a stronghold for this species. Found in rainforest and wet, tall open forest in the foothills and escarpment on the eastern side of the Great Dividing Range. Outside the breeding season adults live in deep leaf litter and thick understorey vegetation on the forest floor.	EPBC	Low – no suitable habitat identified within study area
<i>Pseudophryne australis</i>	Red-crowned Toadlet	V	–	The Red-crowned Toadlet has a restricted distribution. It is confined to the Sydney Basin, from Pokolbin in the north, the Nowra area to the south, and west to Mt Victoria in the Blue Mountains. Occurs in open forests, mostly on Hawkesbury and Narrabeen Sandstones. Inhabits periodically wet drainage lines below sandstone ridges that often have shale lenses or cappings. Shelters under rocks and amongst masses of dense vegetation or thick piles of leaf litter. Breeding congregations occur in dense vegetation and debris beside ephemeral creeks and gutters. Red-crowned Toadlets have not been recorded breeding in waters that are even mildly polluted or with a pH outside the range 5.5 to 6.5. Red-crowned Toadlets are quite a localised species that appear to be largely restricted to the immediate vicinity of suitable breeding habitat. Red-crowned Toadlets are usually found as small colonies scattered along ridges coinciding with the positions of suitable refuges near breeding sites.	BioNet	Low – no suitable habitat identified within study area

SCIENTIFIC NAME	COMMON NAME	BC ACT STATUS ¹	EPBC ACT STATUS ²	HABITAT ³	DATA SOURCE	LIKELIHOOD OF OCCURRENCE
Birds (54)						
<i>Actitis hypoleucos</i>	Common Sandpiper		M	The Common Sandpiper frequents a wide range of coastal wetlands and some inland wetlands, with varying levels of salinity. It is mostly encountered along muddy margins or rocky shores and rarely on mudflats. It has been recorded in estuaries and deltas of streams, banks farther upstream; around lakes, pools, billabongs, reservoirs, dams and claypans, and occasionally piers and jetties. The muddy margins utilised by the species are often narrow, and may be steep. The species is often associated with mangroves, and sometimes found in areas of mud littered with rocks or snags. Roost sites are typically on rocks or in roots or branches of vegetation, especially mangroves. The species is known to perch on posts, jetties, moored boats and other artificial structures, and to sometimes rest on mud or 'loaf' on rocks.	EPBC	Low – no suitable habitat identified within study area

SCIENTIFIC NAME	COMMON NAME	BC ACT STATUS ¹	EPBC ACT STATUS ²	HABITAT ³	DATA SOURCE	LIKELIHOOD OF OCCURRENCE
<i>Anthochaera phrygia</i> (syn. <i>Xanthomyza phrygia</i>)	Regent Honeyeater	CE	EM	Inhabits temperate woodlands and open forests of the inland slopes of south-east Australia. Birds are also found in drier coastal woodlands and forests in some years. There are only three known key breeding regions remaining: north-east Victoria (Chiltern-Albury), and in NSW at Capertee Valley and the Bundarra-Barraba region. In NSW the distribution is very patchy and mainly confined to the two main breeding areas and surrounding fragmented woodlands. It inhabits dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests of River Sheoak. Regent Honeyeaters inhabit woodlands that support a significantly high abundance and species richness of bird species. These woodlands have significantly large numbers of mature trees, high canopy cover and abundance of mistletoes. It feeds mainly on the nectar from a relatively small number of eucalypts that produce high volumes of nectar. Key eucalypt species include Mugga Ironbark, Yellow Box, White Box and Swamp Mahogany.	Bionet, EPBC	Low – no suitable habitat identified within study area
<i>Apus pacificus</i>	Fork-tailed Swift		M	Breeds in the northern hemisphere, wintering south to Australia. It is almost exclusively aerial, flying from less than 1 m to at least 300 m above ground. It mostly occurs over inland plains but sometimes above foothills or in coastal areas over cliffs, beaches, islands and well out to sea. It also occurs over towns and cities. It mostly occurs over dry and/or open habitats, including riparian woodland and tea-tree swamps, low scrub, heathland or saltmarsh, grassland, spinifex sandplains, farmland and sand-dunes. It sometimes occurs above forests. It probably roosts aerially, but has occasionally been observed to land.	EPBC	Low – although species may use aerial spaces above subject site is unlikely to occur within terrestrial vegetation within the site.
<i>Arenaria interpres</i>	Ruddy Turnstone		M	Occurs at beaches and coasts with exposed rock, stony or shell beaches, mudflats, exposed reefs and wave platforms.	EPBC	Low – no suitable habitat identified within study area

SCIENTIFIC NAME	COMMON NAME	BC ACT STATUS ¹	EPBC ACT STATUS ²	HABITAT ³	DATA SOURCE	LIKELIHOOD OF OCCURRENCE
<i>Artamus cyanopterus cyanopterus</i>	Dusky Woodswallow	V		Dusky woodswallows are widespread in eastern, southern and south western Australia. The species occurs throughout most of New South Wales, but is sparsely scattered in, or largely absent from, much of the upper western region. Most breeding activity occurs on the western slopes of the Great Dividing Range. 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. It has also been recorded in shrublands, heathlands and very occasionally in moist forest or rainforest. Also found in farmland, usually at the edges of forest or woodland.	Bionet	Low – marginal habitat within the study area. May occur irregularly whilst foraging in greater locality. Potential foraging habitat and roosting habitat occurs within remnant vegetation and areas adjacent to study area.
<i>Botaurus poiciloptilus</i>	Australasian Bittern	E1	E	Australasian Bitterns are widespread but uncommon over south-eastern Australia. In NSW they may be found over most of the state except for the far north-west. Favours permanent freshwater wetlands with tall, dense vegetation, particularly bullrushes (<i>Typha spp.</i>) and spikerushes (<i>Eleocharis spp.</i>). Feeding platforms may be constructed over deeper water from reeds trampled by the bird; platforms are often littered with prey remains. Breeding occurs in summer from October to January; nests are built in secluded places in densely-vegetated wetlands on a platform of reeds.	EPBC	Low – no suitable habitat identified within study area

SCIENTIFIC NAME	COMMON NAME	BC ACT STATUS ¹	EPBC ACT STATUS ²	HABITAT ³	DATA SOURCE	LIKELIHOOD OF OCCURRENCE
<i>Calidris (Crocethia) alba</i>	Sanderling	V	M	The Sanderling occurs in coastal areas around Australia. Inland records have occurred in most states of singles or small groups, birds probably on migration. In Australia, the species is almost always found on the coast, mostly on open sandy beaches exposed to open sea-swell, and also on exposed sandbars and spits, and shingle banks, where they forage in the wave-wash zone and amongst rotting seaweed. Sanderlings also occur on beaches that may contain wave-washed rocky outcrops. Less often the species occurs on more sheltered sandy shorelines of estuaries, inlets and harbours. Rarely, they are recorded in near-coastal wetlands, such as lagoons, hypersaline lakes, saltponds and samphire flats. There are rare inland records from sandy shores of ephemeral brackish lakes and brackish river-pools.	EPBC	Low – no suitable habitat identified within study area
<i>Calidris acuminata</i>	Sharp-tailed Sandpiper		M	Occurs in a variety of habitats: tidal mudflat, mangrove swamps, saltmarshes, shallow fresh, brackish, salt inland swamps and lakes; flooded and irrigated paddocks, sewage farms and commercial saltfields.	EPBC	Low – no suitable habitat identified within study area
<i>Calidris canutus</i>	Red Knot		EM	In Australasia the Red Knot mainly inhabit intertidal mudflats, sandflats and sandy beaches of sheltered coasts, in estuaries, bays, inlets, lagoons and harbours; sometimes on sandy ocean beaches or shallow pools on exposed wave-cut rock platforms or coral reefs. They are occasionally seen on terrestrial saline wetlands near the coast, such as lakes, lagoons, pools and pans, and recorded on sewage ponds and saltworks, but rarely use freshwater swamps. They rarely use inland lakes or swamps.	EPBC	Low – no suitable habitat identified within study area
<i>Calidris ferruginea</i>	Curlew Sandpiper	E1	M	Occurs in inter-tidal mudflats of estuaries, lagoons, mangrove channels and also around lakes, dams, floodwaters and flooded saltbush surrounding inland lakes.	Bionet, EPBC	Low – no suitable habitat identified within study area

SCIENTIFIC NAME	COMMON NAME	BC ACT STATUS ¹	EPBC ACT STATUS ²	HABITAT ³	DATA SOURCE	LIKELIHOOD OF OCCURRENCE
<i>Calidris melanotos</i>	Pectoral Sandpiper		M	In Australasia, the Pectoral Sandpiper prefers shallow fresh to saline wetlands. The species frequents coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands. It is usually found in coastal or near coastal habitat but occasionally further inland. It prefers wetlands that have open fringing mudflats and low, emergent or fringing vegetation, such as grass or samphire. It has also been recorded in swamp overgrown with lignum. They forage in shallow water or soft mud at the edge of wetlands.	EPBC	Low – no suitable habitat identified within study area
<i>Calidris ruficollis</i>	Red-necked Stint		M	Mostly found in coastal areas, including sheltered inlets, bays lagoons and estuaries. They also occur in shallow wetlands near the coast or inland, including lakes, waterholes and dams. They forage in mudflats, shallow water, sandy open beaches, flooded paddocks and in samphire feeding along the edges. The species roosts on sheltered beaches, spits, banks or islets, of sand, mud, coral or shingle. Occasionally they roost on exposed reefs or shoals and amongst seaweed, mud and cow-pats. During high tides they may also use sand dunes and claypans.	EPBC	Low – no suitable habitat identified within study area
<i>Calidris tenuirostris</i>	Great Knot	V	CEM	Generally a coastal species found on tidal mudflats and sandy ocean shores. A migratory species visiting Australian waters between September and March.	Bionet, EPBC	Low – no suitable habitat identified within study area

SCIENTIFIC NAME	COMMON NAME	BC ACT STATUS ¹	EPBC ACT STATUS ²	HABITAT ³	DATA SOURCE	LIKELIHOOD OF OCCURRENCE
<i>Callocephalon fimbriatum</i>	Gang-gang Cockatoo	V / EP	–	The Gang-gang Cockatoo is distributed from southern Victoria through south- and central-eastern New South Wales. In New South Wales, the Gang-gang Cockatoo is distributed from the south-east coast to the Hunter region, and inland to the Central Tablelands and south-west slopes. It occurs regularly in the Australian Capital Territory. It is rare at the extremities of its range, with isolated records known from as far north as Coffs Harbour and as far west as Mudgee. In spring and summer, generally found in tall mountain forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. In autumn and winter, the species often moves to lower altitudes in drier more open eucalypt forests and woodlands, particularly box-gum and box-ironbark assemblages, or in dry forest in coastal areas and often found in urban areas. May also occur in sub-alpine Snow Gum (<i>Eucalyptus pauciflora</i>) woodland and occasionally in temperate rainforests. Favours old growth forest and woodland attributes for nesting and roosting. Nests are located in hollows that are 10 cm in diameter or larger and at least 9 m above the ground in eucalypts.	Bionet	Low – marginal habitat within the study area. May occur as a fly-over or irregularly whilst foraging in greater locality. Potential foraging habitat and roosting habitat occurs within remnant vegetation and habitat adjacent to study area.

SCIENTIFIC NAME	COMMON NAME	BC ACT STATUS ¹	EPBC ACT STATUS ²	HABITAT ³	DATA SOURCE	LIKELIHOOD OF OCCURRENCE
<i>Calyptrorhynchus lathamii</i>	Glossy Black-Cockatoo	V	–	The species is uncommon although widespread throughout suitable forest and woodland habitats, from the central Queensland coast to East Gippsland in Victoria, and inland to the southern tablelands and central western plains of NSW, with a small population in the Riverina. Inhabits open forest and woodlands of the coast and the Great Dividing Range where stands of sheoak occur. Black Sheoak (<i>Allocasuarina littoralis</i>) and Forest Sheoak (<i>A. torulosa</i>) are important foods. Inland populations feed on a wide range of sheoaks, including Drooping Sheoak, <i>Allocasuarina diminuta</i> , and <i>A. gymnanthera</i> . Belah is also utilised and may be a critical food source for some populations. In the Riverina, birds are associated with hills and rocky rises supporting Drooping Sheoak, but also recorded in open woodlands dominated by Belah (<i>Casuarina cristata</i>). Feeds almost exclusively on the seeds of several species of she-oak (<i>Casuarina</i> and <i>Allocasuarina</i> species), shredding the cones with the massive bill. Dependent on large hollow-bearing eucalypts for nest sites.	BioNet	Low – marginal habitat within the study area. May occur as a fly-over or irregularly whilst foraging in greater locality. Potential foraging habitat and roosting habitat occurs within remnant vegetation and habitat adjacent to study area.
<i>Charadrius leschenaultii</i>	Greater Sand Plover	V	VM	Entirely coastal in NSW foraging on intertidal sand and mudflats in estuaries, and roosting during high tide on sand beaches or rocky shores. A migratory species it is found in New South Wales generally during the summer months.	EPBC	Low – no suitable habitat identified within study area
<i>Charadrius mongolus</i>	Lesser Sand Plover	V	EM	Migratory bird that migrates from the northern hemisphere to coastal areas of northern and east coast of Australia. The species is almost strictly coastal during the non-breeding season, preferring sandy beaches, mudflats of coastal bays and estuaries, sand-flats and dunes near the coast, occasionally frequenting mangrove mudflats (IUCN Redlist entry).	Bionet, EPBC	Low – no suitable habitat identified within study area

SCIENTIFIC NAME	COMMON NAME	BC ACT STATUS ¹	EPBC ACT STATUS ²	HABITAT ³	DATA SOURCE	LIKELIHOOD OF OCCURRENCE
<i>Cuculus opatus</i> (syn. <i>Cuculus saturatus</i>)	Oriental Cuckoo, Himalayan Cuckoo		M	A non-breeding migrant to Australia, it often inhabits rainforest, vine thickets, wet sclerophyll forest and open woodland and sometimes occurs in mangroves, wooded swamps and as vagrants in gardens. The population trend appears to be stable.	EPBC	Low – no suitable habitat identified within study area
<i>Dasyornis brachypterus</i>	Eastern Bristlebird	E1	E	The distribution of the Eastern Bristlebird has contracted to three disjunct areas of south-eastern Australia. There are three main populations: Northern - southern Queensland/northern NSW, Central - Barren Ground NR, Budderoo NR, Woronora Plateau, Jervis Bay NP, Booderee NP and Beecroft Peninsula and Southern - Nadgee NR and Croajingalong NP in the vicinity of the NSW/Victorian border. Habitat for central and southern populations is characterised by dense, low vegetation including heath and open woodland with a heathy understorey. In northern NSW the habitat occurs in open forest with dense tussocky grass understorey and sparse mid-storey near rainforest ecotone; all of these vegetation types are fire prone. Age of habitat since fires (fire-age) is of paramount importance to this species.	EPBC	Low – no suitable habitat identified within study area
<i>Daphoenositta chrysoptera</i>	Varied Sittella	V	–	The Varied Sittella is sedentary and inhabits most of mainland Australia except the treeless deserts and open grasslands. Distribution in NSW is nearly continuous from the coast to the far west. Inhabits eucalypt forests and woodlands, especially those containing rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland. Feeds on arthropods gleaned from crevices in rough or decorticating bark, dead branches, standing dead trees and small branches and twigs in the tree canopy.	Bionet	Low – marginal habitat within the study area. May occur as a fly-over or irregularly whilst foraging in greater locality. Potential foraging habitat and roosting habitat occurs within remnant vegetation and habitat adjacent to study area.

SCIENTIFIC NAME	COMMON NAME	BC ACT STATUS ¹	EPBC ACT STATUS ²	HABITAT ³	DATA SOURCE	LIKELIHOOD OF OCCURRENCE
<i>Gallinago hardwickii</i>	Latham's Snipe		M	Occurs in freshwater or brackish wetlands generally near protective vegetation cover. This species feeds on small invertebrates, seeds and vegetation. It migrates to the northern hemisphere to breed.	EPBC	Low – no suitable habitat identified within study area
<i>Glossopsitta pusilla</i>	Little Lorikeet	V	–	The Little Lorikeet is distributed widely across the coastal and Great Divide regions of eastern Australia from Cape York to South Australia. NSW provides a large portion of the species' core habitat, with lorikeets found westward as far as Dubbo and Albury. Nomadic movements are common, influenced by season and food availability, although some areas retain residents for much of the year and 'locally nomadic' movements are suspected of breeding pairs. Forages primarily in the canopy of open Eucalyptus forest and woodland, yet also finds food in Angophora, Melaleuca and other tree species. Riparian habitats are particularly used, due to higher soil fertility and hence greater productivity. Isolated flowering trees in open country, e.g. paddocks, roadside remnants and urban trees also help sustain viable populations of the species. Feeds mostly on nectar and pollen, occasionally on native fruits such as mistletoe, and only rarely in orchards.	Bionet	Low – marginal habitat within the study area. May occur as a fly-over or irregularly whilst foraging in greater locality. Potential foraging habitat occurs within remnant vegetation and vegetation adjacent to study area.
<i>Gallinago megala</i>	Swinhoe's Snipe		M	During the non-breeding season Swinhoe's Snipe occurs at the edges of wetlands, such as wet paddy fields, swamps and freshwater streams. The species is also known to occur in grasslands, drier cultivated areas (including crops of rapeseed and wheat) and market gardens. Habitat specific to Australia includes the dense clumps of grass and rushes round the edges of fresh and brackish wetlands. This includes swamps, billabongs, river pools, small streams and sewage ponds. They are also found in drying claypans and inundated plains pitted with crab holes.	EPBC	Low – no suitable habitat identified within study area

SCIENTIFIC NAME	COMMON NAME	BC ACT STATUS ¹	EPBC ACT STATUS ²	HABITAT ³	DATA SOURCE	LIKELIHOOD OF OCCURRENCE
<i>Gallinago stenura</i>	Pintail Snipe		M	During non-breeding period the Pin-tailed Snipe occurs most often in or at the edges of shallow freshwater swamps, ponds and lakes with emergent, sparse to dense cover of grass/sedge or other vegetation. The species is also found in drier, more open wetlands such as claypans in more arid parts of species' range. It is also commonly seen at sewage ponds; not normally in saline or inter-tidal wetlands.	EPBC	Low – no suitable habitat identified within study area
<i>Grantiella picta</i>	Painted Honeyeater	V	V	The Painted Honeyeater is nomadic and occurs at low densities throughout its range. The greatest concentrations of the bird and almost all breeding occurs on the inland slopes of the Great Dividing Range in NSW, Victoria and southern Queensland. During the winter it is more likely to be found in the north of its distribution. Inhabits Boree/Weeping Myall (<i>Acacia pendula</i>), Brigalow (<i>A. harpophylla</i>) 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 <i>Amyema</i> .	EPBC	Low – no suitable habitat identified within study area
<i>Haematopus longirostris</i>	Australian Pied Oystercatcher	E1		The species is distributed around the entire Australian coastline, although it is most common in coastal Tasmania and parts of Victoria, such as Corner Inlet. In NSW the species is thinly scattered along the entire coast, with fewer than 200 breeding pairs estimated to occur in the State. Favours intertidal flats of inlets and bays, open beaches and sandbanks. Forages on exposed sand, mud and rock at low tide, for molluscs, worms, crabs and small fish. Nests mostly on coastal or estuarine beaches although occasionally they use saltmarsh or grassy areas.	Bionet	Low – no suitable habitat identified within study area

SCIENTIFIC NAME	COMMON NAME	BC ACT STATUS ¹	EPBC ACT STATUS ²	HABITAT ³	DATA SOURCE	LIKELIHOOD OF OCCURRENCE
<i>Haliaeetus leucogaster</i>	White-bellied Sea-eagle	C	M	The White-bellied Sea-eagle is distributed around the Australian coastline, including Tasmania, and well inland along rivers and wetlands of the Murray Darling Basin. In New South Wales it is widespread along the east coast, and along all major inland rivers and waterways. Habitats are characterised by the presence of large areas of open water including larger rivers, swamps, lakes, and the sea. Occurs at sites near the sea or sea-shore, such as around bays and inlets, beaches, reefs, lagoons, estuaries and mangroves; and at, or in the vicinity of freshwater swamps, lakes, reservoirs, billabongs and saltmarsh. Terrestrial habitats include coastal dunes, tidal flats, grassland, heathland, woodland, and forest (including rainforest). Breeding habitat consists of mature tall open forest, open forest, tall woodland, and swamp sclerophyll forest close to foraging habitat. Nest trees are typically large emergent eucalypts and often have emergent dead branches or large dead trees nearby which are used as 'guard roosts'. Feed mainly on fish and freshwater turtles, but also waterbirds, reptiles, mammals and carrion.	Bionet	Low – no potential habitat within study area
<i>Hieraaetus morphnoides</i>	Little Eagle	V		The Little Eagle is found throughout the Australian mainland excepting the most densely forested parts of the Dividing Range escarpment. It occurs as a single population throughout NSW. Occupies open eucalypt forest, woodland or open woodland. Sheoak or Acacia woodlands and riparian woodlands of interior NSW are also used. Nests in tall living trees within a remnant patch, where pairs build a large stick nest in winter. Preys on birds, reptiles and mammals, occasionally adding large insects and carrion.	Bionet	Low – marginal habitat within study area, may irregularly occur flying over the study area whilst foraging in greater locality.

SCIENTIFIC NAME	COMMON NAME	BC ACT STATUS ¹	EPBC ACT STATUS ²	HABITAT ³	DATA SOURCE	LIKELIHOOD OF OCCURRENCE
<i>Hirundapus caudacutus</i>	White-throated Needletail		M	Widespread in eastern and south-eastern Australia. In eastern Australia, it is recorded in all coastal regions of Queensland and NSW, extending inland to the western slopes of the Great Divide and occasionally onto the adjacent inland plains. It is almost exclusively aerial, from heights of less than 1 m up to more than 1000 m above the ground. Because they are aerial, it has been stated that conventional habitat descriptions are inapplicable, but there are, nevertheless, certain preferences exhibited by the species. Although they occur over most types of habitat, they are probably recorded most often above wooded areas, including open forest and rainforest, and may also fly between trees or in clearings, below the canopy, but they are less commonly recorded flying above woodland. They also commonly occur over heathland, but less often over treeless areas, such as grassland or swamps. When flying above farmland, they are more often recorded above partly cleared pasture, plantations or remnant vegetation at the edge of paddocks. In coastal areas, they are sometimes seen flying over sandy beaches or mudflats and often around coastal cliffs and other areas with prominent updraughts, such as ridges and sand-dunes.	EPBC	Low - although species may use aerial spaces above subject site is unlikely to occur within terrestrial vegetation within the study area.

SCIENTIFIC NAME	COMMON NAME	BC ACT STATUS ¹	EPBC ACT STATUS ²	HABITAT ³	DATA SOURCE	LIKELIHOOD OF OCCURRENCE
<i>Ixobrychus flavicollis</i>	Black Bittern	V		The Black Bittern has a wide distribution, from southern NSW north to Cape York and along the north coast to the Kimberley region. The species also occurs in the south-west of Western Australia. In NSW, records of the species are scattered along the east coast, with individuals rarely being recorded south of Sydney or inland. Inhabits both terrestrial and estuarine wetlands, generally in areas of permanent water and dense vegetation. Where permanent water is present, the species may occur in flooded grassland, forest, woodland, rainforest and mangroves. Feeds on frogs, reptiles, fish and invertebrates, including snails, dragonflies, shrimps and crayfish, with most feeding done at dusk and at night. During the day, roosts in trees or on the ground amongst dense reeds.	Bionet	Low – no suitable habitat identified within study area
<i>Lathamus discolor</i>	Swift Parrot	E1	CE	Breeds in Tasmania during spring and summer, migrating in the autumn and winter months to south-eastern Australia from Victoria and the eastern parts of South Australia to south-east Queensland. In NSW mostly occurs on the coast and south west slopes. On the mainland they occur in areas where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations. Favoured feed trees include winter flowering species such as Swamp Mahogany Eucalyptus robusta, Spotted Gum Corymbia maculata, Red Bloodwood C. gummifera, Mugga Ironbark E. sideroxylon, and White Box E. albens. Commonly used lerp infested trees include Inland Grey Box E. microcarpa, Grey Box E. moluccana and Blackbutt E. pilularis.	Bionet, EPBC	Low – marginal habitat within study area. Irregular/sporadic occurrences during seasonal movements may occur.
<i>Limicola falcinellus</i>	Broad-billed Sandpiper	V	M	A migratory species that breeds in the northern hemisphere between June and August. Individuals feed both on exposed mudflats and while wading in water.	Bionet, EPBC	Low – no suitable habitat identified within study area

SCIENTIFIC NAME	COMMON NAME	BC ACT STATUS ¹	EPBC ACT STATUS ²	HABITAT ³	DATA SOURCE	LIKELIHOOD OF OCCURRENCE
<i>Lophoictinia isura</i>	Square-tailed Kite	V	–	The Square-tailed Kite ranges along coastal and subcoastal areas from south-western to northern Australia, Queensland, NSW and Victoria. In NSW, scattered records of the species throughout the state indicate that the species is a regular resident in the north, north-east and along the major west-flowing river systems. It is a summer breeding migrant to the south-east, including the NSW south coast, arriving in September and leaving by March. Found in a variety of timbered habitats including dry woodlands and open forests. Shows a particular preference for timbered watercourses. In arid north-western NSW, has been observed in stony country with a ground cover of chenopods and grasses, open acacia scrub and patches of low open eucalypt woodland. Is a specialist hunter of passerines, especially honeyeaters, and most particularly nestlings, and insects in the tree canopy, picking most prey items from the outer foliage.	Bionet	Low – marginal habitat within study area, may irregularly occur flying over the study area whilst foraging in greater locality.
<i>Limosa lapponica</i>	Bar-tailed Godwit		M	The Bar-tailed Godwit has been recorded in the coastal areas of all Australian states. It is widespread in the Torres Strait and along the east and south-east coasts of Queensland, NSW and Victoria, including the offshore islands. Found mainly in coastal habitats such as large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays. It is found often around beds of seagrass and, sometimes, in nearby saltmarsh. It has been sighted in coastal sewage farms and saltworks, saltlakes and brackish wetlands near coasts, sandy ocean beaches, rock platforms, and coral reef-flats. It is rarely found on inland wetlands or in areas of short grass, such as farmland, paddocks and airstrips, although it is commonly recorded in paddocks at some locations overseas.	EPBC	Low – no suitable habitat identified within study area

SCIENTIFIC NAME	COMMON NAME	BC ACT STATUS ¹	EPBC ACT STATUS ²	HABITAT ³	DATA SOURCE	LIKELIHOOD OF OCCURRENCE
<i>Limosa limosa</i>	Black-tailed Godwit	V	M	A coastal species found on tidal mudflats, swamps, shallow river margins and sewage farms. Also found inland on larger shallow fresh or brackish waters. A migratory species visiting Australia between September and May.	Bionet	Low – no suitable habitat identified within study area
<i>Monarcha melanopsis</i>	Black-faced Monarch		M	Occurs in rainforests, eucalypt woodlands, coastal scrubs, damp gullies in rainforest, eucalypt forest and in more open woodland when migrating.	EPBC	Low – marginal habitat available in study area.
<i>Monarcha trivirgatus</i>	Spectacled Monarch		M	Occurs in the understorey of mountain/lowland rainforests, thickly wooded gullies and waterside vegetation. Migrates to NE NSW in summer to breed.	EPBC	Low – no suitable habitat identified within study area
<i>Motacilla flava</i>	Yellow Wagtail		M	This species occurs in a range of habitats including estuarine habitats such as sand dunes, mangrove forests and coastal saltmarshes. This species also occurs in open grassy areas including disturbed sites such as sports grounds and has been recorded on the edges of wetlands, swamps, lakes and farm dams. This species migrates from Asia to Australia in spring-summer. It has been recorded in the estuarine areas of the Hunter River in Newcastle NSW and in QLD and the north of NT and WA.	EPBC	Low – no suitable habitat identified within study area

SCIENTIFIC NAME	COMMON NAME	BC ACT STATUS ¹	EPBC ACT STATUS ²	HABITAT ³	DATA SOURCE	LIKELIHOOD OF OCCURRENCE
<i>Myiagra cyanoleuca</i>	Satin Flycatcher		M	Widespread in eastern Australia. In Queensland, it is widespread but scattered in the east. In NSW, they are widespread on and east of the Great Divide and sparsely scattered on the western slopes, with very occasional records on the western plains. In Victoria, the species is widespread in the south and east, in the area south of a line joining Numurkah, Maldon, the northern Grampians, Balmoral and Nelson. Inhabit heavily vegetated gullies in eucalypt-dominated forests and taller woodlands, and on migration, occur in coastal forests, woodlands, mangroves and drier woodlands and open forests. Satin Flycatchers mainly inhabit eucalypt forests, often near wetlands or watercourses. They generally occur in moister, taller forests, often occurring in gullies. They also occur in eucalypt woodlands with open understorey and grass ground cover, and are generally absent from rainforest. In south-eastern Australia, they occur at elevations of up to 1400 m above sea level, and in the ACT, they occur mainly between 800 m above sea level and the treeline.	EPBC	Low – no suitable habitat identified within study area

SCIENTIFIC NAME	COMMON NAME	BC ACT STATUS ¹	EPBC ACT STATUS ²	HABITAT ³	DATA SOURCE	LIKELIHOOD OF OCCURRENCE
<i>Ninox connivens</i>	Barking Owl	V	—	<p>The Barking Owl is found throughout continental Australia except for the central arid regions. Although common in parts of northern Australia, the species has declined greatly in southern Australia and now occurs in a wide but sparse distribution in NSW. Core populations exist on the western slopes and plains and in some northeast coastal and escarpment forests. Inhabits woodland and open forest, including fragmented remnants and partly cleared farmland. It is flexible in its habitat use, and hunting can extend in to closed forest and more open areas. Sometimes able to successfully breed along timbered watercourses in heavily cleared habitats (e.g. western NSW) due to the higher density of prey on these fertile riparian soils. Preferentially hunts small arboreal mammals such as Squirrel Gliders and Common Ringtail Possums, but when loss of tree hollows decreases these prey populations the owl becomes more reliant on birds, invertebrates and terrestrial mammals such as rodents and rabbits. Requires very large permanent territories in most habitats due to sparse prey densities. Monogamous pairs hunt over as much as 6000 hectares, with 2000 hectares being more typical in NSW habitats.</p>	Bionet	<p>Low – no suitable habitat identified within study area. May occur whilst foraging in greater locality. Potential foraging habitat occurs within remnant vegetation and areas adjacent to study area.</p>

SCIENTIFIC NAME	COMMON NAME	BC ACT STATUS ¹	EPBC ACT STATUS ²	HABITAT ³	DATA SOURCE	LIKELIHOOD OF OCCURRENCE
<i>Ninox strenua</i>	Powerful Owl	V	–	The Powerful Owl is endemic to eastern and south-eastern Australia, mainly on the coastal side of the Great Dividing Range from Mackay to south-western Victoria. In NSW, it is widely distributed throughout the eastern forests from the coast inland to tablelands, with scattered records on the western slopes and plains suggesting occupancy prior to land clearing. Now at low densities throughout most of its eastern range, rare along the Murray River and former inland populations. It inhabits a range of vegetation types, from woodland and open sclerophyll forest to tall open wet forest and rainforest. It requires large tracts of forest or woodland habitat but can occur in fragmented landscapes as well. The species breeds and hunts in open or closed sclerophyll forest or woodlands and occasionally hunts in open habitats. It roosts by day in dense vegetation comprising species such as Turpentine Syncarpia glomulifera, Black She-oak <i>Allocasuarina littoralis</i> , Blackwood <i>Acacia melanoxylon</i> , Rough-barked Apple <i>Angophora floribunda</i> , Cherry Ballart <i>Exocarpus cupressiformis</i> and a number of eucalypt species. The main prey items are medium-sized arboreal marsupials, particularly the Greater Glider, Common Ringtail Possum and Sugar Glider.	Bionet	Moderate – potential suitable habitat identified within study area. May occur whilst foraging in greater locality. Potential foraging habitat and roosting habitat occurs within and adjacent to study area.
<i>Numenius madagascariensis</i>	Eastern Curlew		CEM	Inhabits coastal estuaries, mangroves, mud flats and sand pits. It is a migratory shorebird which generally inhabits sea and lake shore mud flats, deltas and similar areas, where it forages for crabs and other crustaceans, clam worms and other annelids, molluscs, insects and other invertebrates. Its migration route ranges from its wintering grounds in Australia to its breeding grounds in northern China, Korea and Russia.	EPBC	Low – no suitable habitat identified within study area

SCIENTIFIC NAME	COMMON NAME	BC ACT STATUS ¹	EPBC ACT STATUS ²	HABITAT ³	DATA SOURCE	LIKELIHOOD OF OCCURRENCE
<i>Numenius minutus</i>	Little Curlew		M	On passage the species shows a preference for foraging and resting in swampy meadows near lakes and along river valleys. It overwinters on dry inland grassland, bare cultivation, dry mudflats and coastal plains of black soil with scattered shallow pools of freshwater, swamps, lakes or flooded ground. It shows a preference for short grass swards of less than 20 cm tall, and occasionally occurs in dry saltmarshes, coastal swamps, mudflats or sandflats in estuaries, or on the beaches of sheltered coasts.	EPBC	Low – no suitable habitat identified within study area
<i>Numenius phaeopus</i>	Whimbrel		M	Migrates to Taiwan, Philippines, PNG, and a race breeding in NE Siberia is found on the north and south-eastern coastlines of Australia. Juveniles arrive to Australia from spring to early summer. Usually only juveniles remain in Australia but very occasionally adults in breeding plumage may be seen in Australian winters.	EPBC	Low – no suitable habitat identified within study area
<i>Pandion cristatus</i> (syn. <i>P. haliaetus</i>)	Eastern Osprey	V	M	Eastern Ospreys are found right around the Australian coast line, except for Victoria and Tasmania. They are common around the northern coast, especially on rocky shorelines, islands and reefs. The species is uncommon to rare or absent from closely settled parts of south-eastern Australia. There are a handful of records from inland areas. Favour coastal areas, especially the mouths of large rivers, lagoons and lakes. Feed on fish over clear, open water.	EPBC	Low – no suitable habitat identified within study area

SCIENTIFIC NAME	COMMON NAME	BC ACT STATUS ¹	EPBC ACT STATUS ²	HABITAT ³	DATA SOURCE	LIKELIHOOD OF OCCURRENCE
<i>Petroica boodang</i>	Scarlet Robin	V	–	The Scarlet Robin is found from south east Queensland to south east South Australia and also in Tasmania and south west Western Australia. In NSW, it occurs from the coast to the inland slopes. After breeding, some Scarlet Robins disperse to the lower valleys and plains of the tablelands and slopes. Some birds may appear as far west as the eastern edges of the inland plains in autumn and winter. The Scarlet Robin lives in dry eucalypt forests and woodlands. The understorey is usually open and grassy with few scattered shrubs. This species lives in both mature and regrowth vegetation. It occasionally occurs in mallee or wet forest communities, or in wetlands and tea-tree swamps. Scarlet Robin habitat usually contains abundant logs and fallen timber: these are important components of its habitat. The Scarlet Robin breeds on ridges, hills and foothills of the western slopes, the Great Dividing Range and eastern coastal regions; this species is occasionally found up to 1000 metres in altitude.	Bionet	Low – no suitable habitat identified within study area
<i>Pluvialis fulva</i>	Pacific Golden Plover		M	Prefers sandy, muddy or rocky shores, estuaries and lagoons, reefs, saltmarsh, and or short grass in paddocks and crops. The species is usually coastal, including offshore islands; rarely far inland. Often observed on beaches and mudflats, sandflats and occasionally rock shelves, or where these substrates intermingle; harbours, estuaries and lagoons.	EPBC	Low – no suitable habitat identified within study area

SCIENTIFIC NAME	COMMON NAME	BC ACT STATUS ¹	EPBC ACT STATUS ²	HABITAT ³	DATA SOURCE	LIKELIHOOD OF OCCURRENCE
<i>Ptilinopus superb</i>	Superb Fruit-Dove	V		The Superb Fruit-dove occurs principally from north-eastern in Queensland to north-eastern NSW. It is much less common further south, where it is largely confined to pockets of suitable habitat as far south as Moruya. There are records of vagrants as far south as eastern Victoria and Tasmania. Inhabits rainforest and similar closed forests where it forages high in the canopy, eating the fruits of many tree species such as figs and palms. It may also forage in eucalypt or acacia woodland where there are fruit-bearing trees. Part of the population is migratory or nomadic.	Bionet	Low – no suitable habitat identified within study area. Rare and intermittent occurrences cannot be discounted.
<i>Rhipidura rufifrons</i>	Rufous Fantail		M	Occurs in a range of habitats including the undergrowth of rainforests/wetter eucalypt forests/gullies, monsoon forests paperbarks, sub-inland and coastal scrubs, mangroves, watercourses, parks and gardens. When migrating they may also be recorded on farms, streets and buildings. Migrates to SE Australia in October-April to breed, mostly in or on the coastal side of the Great Dividing Range.	EPBC	Low – no suitable habitat identified within study area. Intermittent occurrences during seasonal movements cannot be discounted.
<i>Rostratula australis</i> (syn. <i>R. benghalensis</i>)	Australian Painted Snipe (Painted Snipe)	E1	VM	The Australian Painted Snipe is restricted to Australia. Most records are from the south east, particularly the Murray Darling Basin, with scattered records across northern Australia and historical records from around the Perth region in Western Australia. In NSW many records are from the Murray-Darling Basin including the Paroo wetlands, Lake Cowal, Macquarie Marshes, Fivebough Swamp and more recently, swamps near Balldale and Wanganella. Other important locations with recent records include wetlands on the Hawkesbury River and the Clarence and lower Hunter Valleys. Prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber. Nests on the ground amongst tall vegetation, such as grasses, tussocks or reeds.	EPBC	Low – no suitable habitat identified within study area

SCIENTIFIC NAME	COMMON NAME	BC ACT STATUS ¹	EPBC ACT STATUS ²	HABITAT ³	DATA SOURCE	LIKELIHOOD OF OCCURRENCE
<i>Tringa brevipes</i> (syn. <i>Heteroscelus brevipes</i>)	Grey-tailed Tattler		M	It is often found on sheltered coasts with reefs, rock platforms or with intertidal mudflats. It is also found at intertidal rocky, coral or stony reefs, platforms and islets that are exposed at low tide. It has also been found in embayments, estuaries and coastal lagoons, especially fringed with mangroves. It is rarely seen on open beaches and occasionally found around near-coastal wetlands, such as lagoons, lakes and ponds in sewage farms and saltworks. Inland records for the species are rare. The species forages in shallow water, hard intertidal substrates, rock pools, intertidal mudflats, mangroves, banks of seaweed and among rocks and coral rubble, over which water may surge. The species roosts in mangroves, dense stands of shrubs, snags, rocks, beaches, reefs, artificial structures (sea walls, oyster racks), occasionally in near-coastal saltworks and sewage ponds and rarely on sandy beaches or sand banks.	EPBC	Low – no suitable habitat identified within study area
<i>Tringa nebularia</i>	Common Greenshank		M	Occurs in a range of inland and coastal environments. Inland, it occurs in both permanent and temporary wetlands, billabongs, swamps, lakes floodplains, sewage farms, saltworks ponds, flooded irrigated crops. On the coast, it occurs in sheltered estuaries and bays with extensive mudflats, mangrove swamps, muddy shallows of harbours and lagoons, occasionally rocky tidal ledges. It generally prefers wet and flooded mud and clay rather than sand.	EPBC	Low – no suitable habitat identified within study area
<i>Tringa stagnatilis</i>	Marsh Sandpiper		M	Occurs in coastal and inland wetlands (salt or fresh water), estuarine and mangrove mudflats, beaches, shallow or swamps, lakes, billabongs, temporary floodwaters, sewage farms and saltworks ponds.	EPBC	Low – no suitable habitat identified within study area

SCIENTIFIC NAME	COMMON NAME	BC ACT STATUS ¹	EPBC ACT STATUS ²	HABITAT ³	DATA SOURCE	LIKELIHOOD OF OCCURRENCE
<i>Xenus cinereus</i>	Terek Sandpiper	V	M	In Australia widespread and common along north and east coasts than along south coastlines. It inhabits coastal areas, mostly saline intertidal mudflats in sheltered estuaries, embayments, harbours and lagoons; on islets, mudbanks or sandbanks and spits; often around mangroves.	Bionet, EPBC	Low – no suitable habitat identified within study area
Invertebrates (2)						
<i>Pommerhelix duralensis</i>	Dural Land Snail	E1	E	The species is a shale-influenced-habitat specialist, which occurs in low densities along the western and northwest fringes of the Cumberland IBRA subregion on shale-sandstone transitional landscapes. The species is definitely found within the Local Government Areas of The Hills Shire, Hawkesbury Shire and Hornsby Shire. Records from the Blue Mountains City, Penrith City and Parramatta City may represent this species. 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. It does not burrow nor climb. The species has also been observed resting in exposed areas, such as on exposed rock or leaf litter, however it will also shelter beneath leaves, rocks and light woody debris. Migration and dispersal is limited, with overnight straight-line distances of under 1 metre identified in the literature and studies. The main food sources are hyphae and fruiting bodies of native fungi. It is possible other detritus may be consumed.	EPBC	Low – no suitable habitat identified within study area. The study area is highly disturbed and regularly maintained (mown).

SCIENTIFIC NAME	COMMON NAME	BC ACT STATUS ¹	EPBC ACT STATUS ²	HABITAT ³	DATA SOURCE	LIKELIHOOD OF OCCURRENCE
<i>Synemon plana</i>	Golden Sun Moth	E	CE	Occurs in Natural Temperate Grasslands and grassy Box-Gum Woodlands in which groundlayer is dominated by wallaby grasses <i>Austrodanthonia</i> spp. Grasslands dominated by wallaby grasses are typically low and open - the bare ground between the tussocks is thought to be an important microhabitat feature for the Golden Sun Moth. Habitat may contain several wallaby grass species, which are typically associated with other grasses particularly spear-grasses <i>Austrostipa</i> spp. or Kangaroo Grass <i>Themeda australis</i> .	EPBC	Low – no suitable habitat identified within the study area. The study area is highly disturbed and regularly maintained (mown).
Mammals (16)						
<i>Cercartetus nanus</i>	Eastern Pygmy-possum	V	–	The Eastern Pygmy-possum is found in south-eastern Australia, from southern Queensland to eastern South Australia and in Tasmania. In NSW it extends from the coast inland as far as the Pilliga, Dubbo, Parkes and Wagga Wagga on the western slopes. 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; an important pollinator of heathland plants such as banksias; soft fruits are eaten when flowers are unavailable.	BioNet	Low – no suitable habitat identified within study area

SCIENTIFIC NAME	COMMON NAME	BC ACT STATUS ¹	EPBC ACT STATUS ²	HABITAT ³	DATA SOURCE	LIKELIHOOD OF OCCURRENCE
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	V	V	Found mainly in areas with extensive cliffs and caves, from Rockhampton in Queensland south to Bungonia in the NSW Southern Highlands. It is generally rare with a very patchy distribution in NSW. There are scattered records from the New England Tablelands and North West Slopes. Roosts in caves (near their entrances), crevices in cliffs, old mine workings and in the disused, bottle-shaped mud nests of the Fairy Martin (<i>Petrochelidon ariel</i>), frequenting low to mid-elevation dry open forest and woodland close to these features. Females have been recorded raising young in maternity roosts (c. 20-40 females) from November through to January in roof domes in sandstone caves and overhangs. They remain loyal to the same cave over many years. Found in well-timbered areas containing gullies.	BioNet, EPBC	Low – marginal habitat within the study area. May occur as a fly-over or irregularly whilst foraging in greater locality. Potential foraging habitat and roosting habitat occurs within and adjacent to study area.
<i>Dasyurus maculatus maculatus</i>	Spotted-Tailed Quoll	V	E	Found in eastern NSW, eastern Victoria, south-east and north-eastern Queensland, and Tasmania. Recorded across a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline. Individual animals use hollow-bearing trees, fallen logs, small caves, rock outcrops and rocky-cliff faces as den sites. Females occupy home ranges up to about 750 hectares and males up to 3500 hectares. Are known to traverse their home ranges along densely vegetated creeklines.	BioNet, EPBC	Low – no suitable habitat identified within study area. Study highly fragmented and isolated from extensive remnant patches.

SCIENTIFIC NAME	COMMON NAME	BC ACT STATUS ¹	EPBC ACT STATUS ²	HABITAT ³	DATA SOURCE	LIKELIHOOD OF OCCURRENCE
<i>Falsistrellus tasmaniensis</i>	Eastern False Pipistrelle	V	-	The Eastern False Pipistrelle is found on the south-east coast and ranges of Australia, from southern Queensland to Victoria and Tasmania. Prefers moist habitats, with trees taller than 20 m. Generally roosts in eucalypt hollows, but has also been found under loose bark on trees or in buildings.	BioNet	Low – marginal habitat within the study area. May occur as a fly-over or irregularly whilst foraging in greater locality. Potential foraging habitat and roosting habitat occurs within and adjacent to study area.
<i>Isoodon obesulus</i>	Southern Brown Bandicoot	E1	E	The Southern Brown Bandicoot has a patchy distribution. It is found in south-eastern NSW, east of the Great Dividing Range south from the Hawkesbury River, southern coastal Victoria and the Grampian Ranges, south-eastern South Australia, south-west Western Australia and the northern tip of Queensland. They are generally only found in heath or open forest with a heathy understorey on sandy or friable soils. They feed on a variety of ground-dwelling invertebrates and the fruit-bodies of hypogeous (underground-fruited) fungi. Their searches for food often create distinctive conical holes in the soil. Males have a home range of approximately 5–20 hectares whilst females forage over smaller areas of about 2–3 hectares.	BioNet, EPBC	Low – no suitable habitat identified within study area
<i>Miniopterus australis</i>	Little Bentwing-bat	V	–	Found along east coast and ranges of Australia from Cape York in Queensland to Wollongong in NSW. Moist eucalypt forest, rainforest, vine thicket, wet and dry sclerophyll forest, Melaleuca swamps, dense coastal forests and banksia scrub. Generally found in well-timbered areas. Little Bentwing-bats roost in caves, tunnels, tree hollows, abandoned mines, stormwater drains, culverts, bridges and sometimes buildings during the day, and at night forage for small insects beneath the canopy of densely vegetated habitats. Only five nursery sites /maternity colonies are known in Australia.	BioNet	Low – marginal habitat within the study area. May occur as a fly-over or irregularly whilst foraging in greater locality. Potential foraging habitat and roosting habitat occurs within and adjacent to study area.

SCIENTIFIC NAME	COMMON NAME	BC ACT STATUS ¹	EPBC ACT STATUS ²	HABITAT ³	DATA SOURCE	LIKELIHOOD OF OCCURRENCE
<i>Miniopterus schreibersii oceanensis</i>	Eastern Bentwing-bat	V	–	Eastern Bentwing-bats occur along the east and north-west coasts of Australia. Caves are the primary roosting habitat, but also use derelict mines, storm-water tunnels, buildings and other man-made structures. Populations disperse within about 300 km range of maternity caves. Hunt in forested areas, catching moths and other flying insects above the tree tops.	Bionet	Low – marginal habitat within the study area. May occur as a fly-over or irregularly whilst foraging in greater locality. Potential foraging habitat and roosting habitat occurs within and adjacent to study area.
<i>Mormopterus norfolkensis</i>	Eastern Freetail-bat	V	–	The Eastern Freetail-bat is found along the east coast from south Queensland to southern NSW. 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.	BioNet	Low – marginal habitat within the study area. May occur as a fly-over or irregularly whilst foraging in greater locality. Potential foraging habitat and roosting habitat occurs within and adjacent to study area.
<i>Myotis macropus</i>	Southern Myotis, Large-footed Myotis	V	–	The Southern Myotis is found in the coastal band from the north-west of Australia, across the top-end and south to western Victoria. It is rarely found more than 100 km inland, except along major rivers. 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 catching insects and small fish by raking their feet across the water surface.	Bionet	Low – no suitable habitat identified within study area

SCIENTIFIC NAME	COMMON NAME	BC ACT STATUS ¹	EPBC ACT STATUS ²	HABITAT ³	DATA SOURCE	LIKELIHOOD OF OCCURRENCE
<i>Petauroides volans</i>	Greater Glider		V	The Greater Glider has a restricted distribution in eastern Australia, from the Windsor Tableland in north Queensland to central Victoria, with an elevated range from sea level to 1200m above sea level. The species is largely restricted to eucalypt forests and woodlands, feeds exclusively on eucalypt leaves, buds, flowers and mistletoe. It is found in abundance in montane eucalypt forest with relatively old trees and an abundance of hollows. It also favours forests with a diversity of eucalypts to cater for seasonal variation in food abundance.	EPBC	Low – no suitable habitat identified within study area
<i>Petrogale penicillata</i>	Brush-tailed Rock-wallaby	E1	V	The range of the Brush-tailed Rock-wallaby extends from south-east Queensland to the Grampians in western Victoria, roughly following the line of the Great Dividing Range. However the distribution of the species across its original range has declined significantly in the west and south and has become more fragmented. In NSW they occur from the Queensland border in the north to the Shoalhaven in the south, with the population in the Warrumbungle Ranges being the western limit. Occupy rocky escarpments, outcrops and cliffs with a preference for complex structures with fissures, caves and ledges, often facing north. Browse on vegetation in and adjacent to rocky areas eating grasses and forbs as well as the foliage and fruits of shrubs and trees. Shelter or bask during the day in rock crevices, caves and overhangs and are most active at night. Highly territorial and have strong site fidelity with an average home range size of about 15 ha.	EPBC	Low – no suitable habitat identified within study area

SCIENTIFIC NAME	COMMON NAME	BC ACT STATUS ¹	EPBC ACT STATUS ²	HABITAT ³	DATA SOURCE	LIKELIHOOD OF OCCURRENCE
<i>Phascolarctos cinereus</i>	Koala	V	V	The Koala has a fragmented distribution throughout eastern Australia from north-east Queensland to the Eyre Peninsula in South Australia. In NSW it mainly occurs on the central and north coasts with some populations in the west of the Great Dividing Range. It was briefly historically abundant in the 1890s in the Bega District on the south coast of NSW, although not elsewhere, but it now occurs in sparse and possibly disjunct populations. Koalas are also known from several sites on the southern tablelands. Inhabit eucalypt woodlands and forests. Feed on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred browse species. Some preferred species include Forest Red Gum, Grey Gum. In coastal areas, Tallowwood and Swamp Mahogany are important food species, while in inland areas White Box, Bimble Box and River Red Gum are favoured. Home range size varies with quality of habitat, ranging from less than two ha to several hundred hectares in size.	Bionet, EPBC	Low – no suitable habitat identified within study area
<i>Pseudomys novaehollandiae</i>	New Holland Mouse		V	The New Holland Mouse has a fragmented distribution across Tasmania, Victoria, New South Wales and Queensland. Genetic evidence indicates that the New Holland Mouse once formed a single continuous population on mainland Australia and the distribution of recent subfossils further suggest that the species has undergone a large range contraction since European settlement. Total population size of mature individuals is now estimated to be less than 10,000 individuals although, given the number of sites from which the species is known to have disappeared between 1999 and 2009, it is likely that the species' distribution is actually smaller than current estimates. Known to inhabit open heathlands, woodlands and forests with a heathland understorey and vegetated sand dunes.	EPBC	Low – no suitable habitat identified within study area

SCIENTIFIC NAME	COMMON NAME	BC ACT STATUS ¹	EPBC ACT STATUS ²	HABITAT ³	DATA SOURCE	LIKELIHOOD OF OCCURRENCE
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	V	V	Grey-headed Flying-foxes are generally found within 200 km of the eastern coast of Australia, from Rockhampton in Queensland to Adelaide in South Australia. Occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy. Can travel up to 50 km from the camp to forage; commuting distances are more often <20 km. Feed on the nectar and pollen of native trees, in particular Eucalyptus, Melaleuca and Banksia, and fruits of rainforest trees and vines.	Bionet, EPBC	Moderate – potential foraging habitat within the study area. May occur as a fly-over whilst foraging in greater locality.
<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheathtail-bat	V	–	The Yellow-bellied Sheathtail-bat is a wide-ranging species found across northern and eastern Australia. In the most southerly part of its range – most of Victoria, south-western NSW and adjacent South Australia – It is a rare visitor in late summer and autumn. There are scattered records of this species across the New England Tablelands and North-West Slopes. 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.	BioNet	Low – marginal habitat within the study area. May occur as a fly-over or irregularly whilst foraging in greater locality. Potential foraging habitat and roosting habitat occurs within and adjacent to study area.

SCIENTIFIC NAME	COMMON NAME	BC ACT STATUS ¹	EPBC ACT STATUS ²	HABITAT ³	DATA SOURCE	LIKELIHOOD OF OCCURRENCE
<i>Scoteanax rueppellii</i>	Greater Broad-nosed Bat	V	–	The Greater Broad-nosed Bat is found mainly in the gullies and river systems that drain the Great Dividing Range, from north-eastern Victoria to the Atherton Tableland. It extends to the coast over much of its range. In NSW it is widespread on the New England Tablelands, however does not occur at altitudes above 500 m. Utilises a variety of habitats from woodland through to moist and dry eucalypt forest and rainforest, though it is most commonly found in tall wet forest. Although this species usually roosts in tree hollows, it has also been found in buildings. Forages after sunset, flying slowly and directly along creek and river corridors at an altitude of 3–6 m.	BioNet	Low – marginal habitat within the study area. May occur as a fly-over or irregularly whilst foraging in greater locality. Potential foraging habitat and roosting habitat occurs within and adjacent to study area.
Reptiles (1)						
<i>Hoplocephalus bungaroides</i>	Broad-headed Snake	E1	V	The Broad-headed Snake is largely confined to Triassic and Permian sandstones, including the Hawkesbury, Narrabeen and Shoalhaven groups, within the coast and ranges in an area within approximately 250km of Sydney. Shelters in rock crevices and under flat sandstone rocks on exposed cliff edges during autumn, winter and spring. Moves from the sandstone rocks to shelters in crevices or hollows in large trees within 500m of escarpments in summer.	EPBC	Low – no suitable habitat identified within study area

(1) Listed as Vulnerable (V), Endangered (E1), Endangered populations (E2) or Critically Endangered (CE) under the NSW *Biodiversity Conservation Act 2016* (BC Act).

(2) Listed as Vulnerable (V), Endangered (E) or Critically Endangered (CE) under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

(3) Habitat data derived from BioNet (Office of Environment & Heritage 2018).

Note: due to no marine habitat present within or adjacent to the study area, marine species were not included within the likelihood of occurrence.

APPENDIX C

FIELD SURVEY RESULTS



C1 FIELD SURVEY RESULTS

Table C.1 Flora species recorded

FAMILY	SCIENTIFIC NAME	COMMON NAME	BC ACT LISTING ¹	EPBC ACT LISTING ²
Exotic species recorded				
Alliaceae	<i>Agapanthus praecox subsp. orientalis</i> *	Agapanthus		
Anacardiaceae	<i>Pistachio chinensis</i> *	Chinese Pistachio		
Apiaceae	<i>Cyclosperma leptophyllum</i> *	Slender Celery		
Apocynaceae	<i>Nerium oleander</i> *	Oleander		
Apocynaceae	<i>Plumeria spp.</i> *	Frangipani		
Araceae	<i>Monstera deliciosa</i> *	Fruit Salad Plant		
Araliaceae	<i>Hedera helix</i> *	English Ivy		
Araliaceae	<i>Schefflera actinophylla</i> *	Umbrella Tree		
Araucariaceae	<i>Pinophyta spp.</i> *	Conifer		
Arecaceae	<i>Phoenix canariensis</i> *	Canary Island Date Palm		
Arecaceae	<i>Syagrus romanzoffiana</i> *	Queen palm		
Asparagaceae	<i>Asparagus aethiopicus</i> *	Asparagus Fern		
Asteraceae	<i>Conyza bonariensis</i> *	Flaxleaf Fleabane		
Asteraceae	<i>Lactuca serriola</i> *	Prickly Lettuce		
Asteraceae	<i>Taraxacum officinale</i> *	Dandelion		
Basellaceae	<i>Anredera cordifolia</i> *	Madeira Vine		
Berberidaceae	<i>Nandina domestica</i> *	Japanese Sacred Bamboo		
Bignoniaceae	<i>Jacaranda mimosifolia</i> *	Jacaranda		
Buxaceae	<i>Buxus spp.</i> *	Box Hedge		
Cannabaceae	<i>Celtis sinensis</i> *	Japanese Hackberry		
Commelinaceae	<i>Tradescantia fluminensis</i> *	Trad		
Cupressaceae	<i>Cupressus macrocarpa</i> *	Golden Brunings Cypress		
Didiereaceae	<i>Portulacaria afra</i> *	Money Tree		
Euphorbiaceae	<i>Euphorbia maculata</i> *	Spotted Spurge		
Fabaceae (Caesalpinioideae)	<i>Senna pendula var. glabrata</i> *			
Fabaceae (Faboideae)	<i>Erythrina crista-galli</i> *	Cockspur Coral Tree		

FAMILY	SCIENTIFIC NAME	COMMON NAME	BC ACT LISTING ¹	EPBC ACT LISTING ²
Fabaceae (Faboideae)	<i>Trifolium repens</i> *	White Clover		
Ginkgoaceae	<i>Ginkgo biloba</i> *	Ginkgo		
Hydrangeaceae	<i>Hydrangea macrophylla</i> *	Hydrangea		
Iridaceae	<i>Dietes grandiflora</i> *	Wild Iris		
Lauraceae	<i>Cinnamomum camphora</i> *	Camphor Laurel		
Lomariopsidaceae	<i>Nephrolepis cordifolia</i> *	Fishbone Fern		
Lythraceae	<i>Lagerstroemia indica</i> *	Crepe Myrtle		
Magnoliaceae	<i>Magnolia grandiflora</i> *	Magnolia		
Malvaceae	<i>Modiola caroliniana</i> *	Red-flowered Mallow		
Malvaceae	<i>Sida rhombifolia</i> *	Paddy's Lucerne		
Melastomataceae	<i>Tibouchina urvilleana</i> *	Lasiandra		
Moraceae	<i>Morus alba</i> *	White Mulberry		
Ochnaceae	<i>Ochna serrulata</i> *	Mickey Mouse Plant		
Oleaceae	<i>Fraxinus excelsior</i> *	European Ash		
Oleaceae	<i>Ligustrum lucidum</i> *	Large-leaved Privet		
Oleaceae	<i>Olea europea</i> var. <i>cuspidata</i> *	African Olive		
Ophiopogon	<i>Ophiopogon japonicus</i> *	Mondo Grass		
Papilionaceae	<i>Robinia pseudoacacia</i> *	Black Locust		
Plantaginaceae	<i>Plantago lanceolata</i> *	Lamb's Tongues		
Platanaceae	<i>Platanus x hispanica</i> 'Acerifolia'*	London Plane		
Plumbaginaceae	<i>Plumbago</i> spp. *	Plumbago		
Poaceae	<i>Axonopus fissifolius</i> *	Narrow-leaved Carpet Grass		
Poaceae	<i>Bromus catharticus</i> *	Prairie Grass		
Poaceae	<i>Ehrharta erecta</i> *	Panic Veldtgras		
Poaceae	<i>Paspalum dilatatum</i> *	Paspalum		
Poaceae	<i>Stenotaphrum secundatum</i> *	Buffalo Grass		
Rosaceae	<i>Cotoneaster glaucophyllus</i> *	Glaucous Cotoneaster		
Rutaceae	<i>Murraya paniculata</i> *	Murraya		
Solanaceae	<i>Solanum nigrum</i> *	Blackberry Nightshade		
Strelitziaceae	<i>Strelitzia reginae</i> *	Bird of Paradise		

FAMILY	SCIENTIFIC NAME	COMMON NAME	BC ACT LISTING ¹	EPBC ACT LISTING ²
Theaceae	<i>Camelia spp. *</i>	Camelia		
Theaceae	<i>Gordonia axillaris*</i>	Fried Egg Plant		
Ulmaceae	<i>Zelkova serrata*</i>	Japanese Zelkova		
Verbenaceae	<i>Duranta erecta*</i>	Sky Flower		
Zingiberaceae	<i>Hedychium gardnerianum*</i>	Ginger Lily		
Native species recorded				
Araliaceae	<i>Polyscias sambucifolia subsp. Long leaflets</i>	Elderberry Panax		
Arecaceae	<i>Livistona australis</i>	Cabbage Palm		
Aspleniaceae	<i>Asplenium australasicum</i>	Bird's Nest Fern		
Asteliaceae	<i>Cordyline stricta</i>	Narrow-leaved Palm Lily		
Casuarinaceae	<i>Allocasuarina littoralis</i>	Black She-oak		
Casuarinaceae	<i>Allocasuarina torulosa</i>	Forest Oak		
Chenopodiaceae	<i>Dysphania pumilo</i>	Small Crumbweed		
Convolvulaceae	<i>Dichondra repens</i>	Kidney Weed		
Cunoniaceae	<i>Ceratopetalum gummiferum</i>	New South Wales Christmas-bush		
Cyatheaceae	<i>Cyathea australis</i>	Black Tree-fern		
Cyperaceae	<i>Cyperus gracilis</i>	Slender Flat-sedge		
Dennstaedtiaceae	<i>Pteridium esculentum</i>	Common Bracken		
Dicksoniaceae	<i>Calochlaena dubia</i>	Rainbow Fern		
Doryanthaceae	<i>Doryanthes excelsa</i>	Giant Lily		
Ericaceae (Epacridoideae)	<i>Leucopogon juniperinus</i>	Prickly Beard-heath		
Euphorbiaceae	<i>Homalanthus populifolius</i>	Bleeding Heart		
Fabaceae (Faboideae)	<i>Hardenbergia violacea</i>	False Sarsaparilla		
Fabaceae (Mimosoideae)	<i>Acacia floribunda</i>	White Sally Wattle		
Fabaceae (Mimosoideae)	<i>Acacia longifolia subsp. longifolia</i>	Sydney Golden Wattle		
Lamiaceae	<i>Westringia fruticosa</i>	Coastal Rosemary		
Lauraceae	<i>Neolitsea dealbata</i>	Hairy-leaved Bolly Gum		
Lomandraceae	<i>Lomandra confertifolia</i>	Mat-rush		

FAMILY	SCIENTIFIC NAME	COMMON NAME	BC ACT LISTING ¹	EPBC ACT LISTING ²
Lomandraceae	<i>Lomandra longifolia</i>	Spiny-headed Bat-rush		
Malvaceae	<i>Brachychiton acerifolius</i>	Illawarra Flame Tree		
Moraceae	<i>Ficus rubignosa</i>	Port Jackson Fig		
Myrtaceae	<i>Angophora costata</i>	Smooth-barked Apple		
Myrtaceae	<i>Callistemon viminalis</i>	Weeping Bottlebrush		
Myrtaceae	<i>Corymbia maculata</i>	Spotted Gum		
Myrtaceae	<i>Eucalyptus microcorys</i>	Tallowwood		
Myrtaceae	<i>Eucalyptus pilularis</i>	Blackbutt		
Myrtaceae	<i>Eucalyptus punctata</i>	Grey Gum		
Myrtaceae	<i>Eucalyptus sideroxylon</i>	Mugga Ironbark		
Myrtaceae	<i>Lophostemon confertus</i>	Brush Box		
Myrtaceae	<i>Melaleuca styphelioides</i>	Prickly-leaved Tea Tree		
Myrtaceae	<i>Syncarpia glomulifera subsp. glomulifera</i>	Turpentine		
Myrtaceae	<i>Syzygium leuhmannii</i>	Small-leaved Lilly Pilly		
Phormiaceae	<i>Dianella caerulea var. producta</i>	Blue Flax-lily		
Phyllanthaceae	<i>Glochidion ferdinandi var. ferdinandi</i>	Cheese Tree		
Pittosporaceae	<i>Pittosporum undulatum</i>	Sweet Pittosporum		
Poaceae	<i>Cynodon dactylon</i>	Couch		
Poaceae	<i>Entolasia stricta</i>	Wiry Panic		
Poaceae	<i>Imperata cylindrica</i>	Blady Grass		
Poaceae	<i>Poa sieberiana</i>			
Poaceae	<i>Themeda triandra</i>	Kangaroo Grass		
Proteaceae	<i>Banksia integrifolia</i>	Coastal Banksia		
Proteaceae	<i>Grevillea banksii</i>	Red Silky Oak		
Proteaceae	<i>Grevillea linearifolia</i>	Linear-leaf Grevillea		
Proteaceae	<i>Grevillea robusta</i>	Silky Oak		
Proteaceae	<i>Macadamia integrifolia</i>	Macadamia Nut		
Rutaceae	<i>Zieria smithii</i>	Sandfly Zieria		
Sapindaceae	<i>Cupaniopsis anacardioides</i>	Tuckeroo		
Sapindaceae	<i>Dodonaea triquetra</i>	Large-leaf Hop-bush		

- (1) Listed as Vulnerable (V), Endangered (E1), Endangered populations (E2) or Critically Endangered (CE) under the NSW *Biodiversity Conservation Act 2016* (BC Act).
- (2) Listed as Vulnerable (V), Endangered (E) or Critically Endangered (CE) under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Table C.2 Fauna species recorded

COMMON NAME	SCIENTIFIC NAME	BC ACT LISTING ¹	EPBC ACT LISTING ²	NATIVE/ INTRODUCED	OBSERVATION TYPE ³
Australian Raven	<i>Corvus coronoides</i>	—	—	N	O
Noisy Miner	<i>Manorina melanocephala</i>	—	—	N	O
Bell Miner	<i>Manorina melanophrys</i>	—	—	N	O
Pie Currawong	<i>Strepera graculina</i>	—	—	N	O
Laughing Kookaburra	<i>Dacelo novaeguineae</i>	—	—	N	O
Australian Bush Turkey	<i>Alectura lathami</i>	—	—	N	O
Welcome Swallow	<i>Hirundo neoxena</i>	—	—	N	O
Rainbow Lorikeet	<i>Trichoglossus moluccanus</i>	—	—	N	O
Australian Magpie	<i>Cracticus tibicen</i>	—	—	N	O
Common Myna	<i>Acridotheres tristis</i>	—	—	I	O
Black Rat	<i>Rattus rattus</i>	—	—	I	O

- (1) Listed as Vulnerable (V), Endangered (E1), Endangered populations (E2) or Critically Endangered (CE) under the NSW *Biodiversity Conservation Act 2016* (BC Act).
- (2) Listed as Vulnerable (V), Endangered (E) or Critically Endangered (CE) under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).
- (3) Observation type: O = observed.

APPENDIX D

SIGNIFICANT IMPACT ASSESSMENTS



D1 GREY-HEADED FLYING-FOX

STATUS

The Grey-headed Flying-fox is listed as Vulnerable under the BC Act and EPBC Act.

DESCRIPTION

The Grey-headed Flying-fox is generally found within 200 km of the eastern coast of Australia, from Rockhampton to Adelaide. The species may be found in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps, while additional foraging is provided by urban gardens and cultivated fruit crops. The Grey-headed Flying-fox is a highly mobile species with a nightly feeding range of 20 to 50 km from a roosting camp. Diet typically comprises of a wide variety of flowering and fruiting plants (Tidemann 1995, Churchill 1998) with non-indigenous and exotic tree species introduced to the urban landscape providing additional foraging habitat for this species. Grey-headed Flying-foxes roost in large numbers, with up to tens of thousands of flying foxes using individual camps for mating, birth and rearing of young.

THREATS

Recognised threats to this community include:

- loss of roosting and foraging sites
- electrocution on powerlines, entanglement in netting and on barbed-wire
- heat stress
- conflict with humans
- incomplete knowledge of abundance and distribution across the species' range.

SPECIFIC IMPACTS

The Proposal area provides suitable foraging habitat in the form of native horticultural plantings and disturbed remnant native vegetation. Approximately 0.14 ha, representing potential foraging habitat will be removed as part of the Proposal, however this represents only a small component of locally occurring resources that are accessible to this species in the locality.

D1.1 BC ACT SIGNIFICANCE ASSESSMENT

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

The majority of the proposal area contains planted horticultural native vegetation and some disturbed remnant vegetation, with the majority of native tree species being of a semi-mature age class. Due to the relatively small amount of Grey-headed Flying-fox foraging habitat to be removed from within the proposal area and the abundance of similar and greater quality habitat elsewhere in the locality, the action proposed is unlikely 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. No roosting camps were identified within or near the Proposal area.

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

Not applicable

In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

- ***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***

Not applicable

- ***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

In relation to the habitat of a threatened species, population or ecological community:

- the extent to which habitat is likely to be removed or modified as a result of the action proposed
- a relatively small patch of horticultural plantings and disturbed remnant vegetation representing a small amount of foraging habitat would be affected by the Proposal. However, the Grey-headed Flying-fox would not be restricted to habitat resources within the study site as this species is likely to use similar habitat resources within the wider locality
- whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

Habitat connectivity is not likely to be affected by the Proposal. The majority of the Proposal area occurs on previously disturbed land and is dominated by horticultural plantings and disturbed remnant vegetation. Given that the Grey-headed Flying-fox is highly mobile, regularly foraging up to 50 km from camp sites, and that similar or greater quality foraging resources occur widely in the locality, it is considered unlikely that habitat would become further isolated or fragmented significantly beyond that currently existing within the subject site.

- ***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.***

While potential foraging habitat was observed in the Proposal area, no camps were recorded within or near the Proposal area. Grey-headed Flying-foxes regularly forage up to 50 km from roost sites (NSW National Parks and Wildlife Service 2001b). An abundance of similar or greater quality habitat is available in the wider locality. Therefore, the removal of a relatively small amount of suitable foraging habitat (0.14 ha) is not considered likely to significantly affect the availability of quality habitat for this species.

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

Areas of declared critical habitat under the *Threatened Species Conservation Act 1995*, are now labelled as 'Areas of Outstanding Biodiversity Values' (AOBVs) in NSW with the commencement of the BC Act. The *Biodiversity Conservation Regulation 2017* establishes the criteria for declaring AOBVs. The criteria have been designed to identify the most valuable sites for biodiversity conservation in NSW. The Proposal area will not impact any declared AOBVs nor are there any AOBVs identified for this species.

Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan

A Draft National Recovery Plan for the Grey-headed Flying-fox was published in 2009 (Department of Environment Climate Change and Water NSW 2009), which detailed 12 objectives to help recover this species (Table D.1). In addition, the Office of Environment and Heritage has assigned the species to the landscape species management stream under the Saving our Species program (Office of Environment and Heritage 2017). No priority sites have been identified within the study area or within the locality for the species.

Table D.1 Recovery actions for Grey-headed Flying-fox

ACTION TOOLBOX	LIKELY TO BE AFFECTED BY THE PROPOSAL AREA?
Identify and protect foraging habitat critical to the survival of Grey-headed Flying-foxes throughout their range.	Not applicable
Protect and increase the extent of key winter and spring foraging habitat of Grey-headed Flying-foxes.	Inconsistent - Proposal area will remove a small patch of foraging habitat
Identify roosting habitat critical to the survival of Grey-headed Flying-foxes.	Not applicable
Protect and enhance roosting habitat critical to the survival of Grey-headed Flying-foxes.	Not applicable
Substantially reduce deliberate destruction of Grey-headed Flying-foxes in fruit crops.	Not applicable
Reduce negative public attitudes toward Grey-headed Flying-foxes and reduce conflict with humans.	Not applicable
Increase public awareness and understanding of Grey-headed Flying-foxes and the recovery program, and to involve the community in recovery actions.	Not applicable
Monitor population trends in Grey-headed Flying-foxes so as to monitor the species' national distribution and status.	Not applicable
Assess and reduce the impact on Grey-headed Flying-foxes of electrocution on powerlines and entanglement in netting and on barbed-wire.	Not applicable
Improve knowledge of the demographics and population structure of Grey-headed Flying-foxes in order to increase understanding of the ecological requirements of the species.	Not applicable
Increase the effectiveness and efficiency of recovery initiatives for Grey-headed Flying-foxes by working cooperatively with conservation and management programs.	Not applicable
Maintain an effective Grey-headed Flying-fox National Recovery Team to oversee the implementation of the Grey-headed Flying-fox National Recovery Plan.	Not applicable

The Proposal area is inconsistent with one recovery objective, due to the removal of a small patch of roosting/ foraging habitat. The impact of a relatively small amount of suitable foraging habitat (0.14 ha), is not considered likely to significantly affect the recovery of the species.

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

With respect to Grey-headed Flying-fox, the Proposal is consistent with one Key Threatening Processes under the BC Act:

— clearing of native vegetation.

Approximately 0.14 ha of habitat would be impacted by the Proposal. The extent of native vegetation clearing and habitat removal associated with the Proposal area is considered relatively small in terms of the available habitat for these species within the surrounding landscape, although it is considered to be an incremental loss of suitable habitat locally.

Conclusion

The Proposal will remove a negligible area of horticultural plantings and disturbed remnant vegetation. As an abundance of similar and higher quality habitat occurs nearby and in the wider locality, and no breeding habitat is to be disturbed, the action proposed is unlikely to lead to a significant impact on the Grey-headed Flying-fox or its habitat.

D1.2 EPBC ACT SIGNIFICANCE ASSESSMENT FOR GREY-HEADED FLYING-FOX

Is this an important population?

Grey-headed Flying-foxes occur across a range of wooded habitats where their favoured food, eucalypt blossom occurs. They set up roosting camps in association with blossom and fruiting availability, which are usually situated in dense vegetation and associated with water. Grey-headed Flying-foxes can migrate up to 75 km north during the winter and during this time young flying-foxes establish camps.

The Proposal area does not contain suitable habitat for roosting camps and such habitat does not occur within its close vicinity. Therefore, a population of Grey-headed Flying-fox in the Proposal area is not considered to be important, as no roost sites would be affected by the Proposal.

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will result in one or more of the following:

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will result in one or more of the following.

Lead to a long-term decrease in the size of an important population of a species

Not applicable. Grey-headed Flying-fox in the subject site is not part of an important population (refer to above) and onsite habitats are not considered important for the maintenance of local flying-foxes.

Reduce the area of occupancy of an important population

Not applicable. Grey-headed Flying-fox in the subject site is not part of an important population (refer to above) and onsite habitats are not considered important for the maintenance of local flying-foxes.

Fragment an existing important population into two or more populations

Not applicable. Grey-headed Flying-fox in the subject site is not part of an important population (refer to above) and onsite habitats are not considered important for the maintenance of local flying-foxes.

Adversely affect habitat critical to the survival of a species

No critical habitat is listed for the Grey-headed Flying-fox under the EPBC Act.

Habitat critical to the survival of a species may also include areas that are not listed on the Register of Critical Habitat if they are necessary:

- for activities such as foraging, breeding, roosting, or dispersal
- for the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators)
- to maintain genetic diversity and long-term evolutionary development
- for the reintroduction of populations or recovery of the species or ecological community.

The Proposal will not adversely affect habitat considered critical to this species.

Disrupt the breeding cycle of an important population

Not applicable. Grey-headed Flying-fox in the subject site is not part of an important population (refer to above) and onsite habitats are not considered important for the breeding cycle of local flying-foxes.

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

No. The project would only affect a small area of suitable foraging habitat for this species (0.14 ha). As this species is known to forage up to 50 km from roost sites, the project is not likely to significantly affect the availability of quality habitat for this species to the extent that the species is likely to decline.

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

It is not likely that invasive species (such as introduced predators) that are potentially harmful to the Grey-headed Flying-fox would become further established as a result of the Proposal area.

Introduce disease that may cause the species to decline

No. It is not likely that disease would be increased by the Proposal.

Interfere substantially with the recovery of the species.

Due to the limited foraging habitat likely to be affected by the Proposal and as no roost camps are located in the close vicinity of the Proposal area, the proposed action is not likely to interfere with the recovery of this species.

Conclusion

While the proposed action will removal of a small area of potential foraging habitat, its loss is considered unlikely to have a significant impact on the Grey-headed Flying-fox, due to the abundance of similar and higher quality habitat locally and the small extent of marginal habitat.

D2 POWERFUL OWL

STATUS

The Powerful Owl (*Ninox strenua*) is listed as Vulnerable under to BC Act.

HABITAT AND ECOLOGY

The Powerful Owl is the largest owl in Australasia. It is a typical hawk-owl, with staring yellow eyes and no facial-disc (Garnett and Crowley 2000). It is a sedentary species with a home range of approximately 1000 hectares and occurs within open eucalypt, *Casuarina* or *Callitris* pine forest and woodland. It often roosts in denser vegetation including rainforest or exotic pine plantations. It generally feeds on medium-sized mammals such as possums and gliders but will also eat birds, flying-foxes, rats and insects. Prey are generally hollow dwelling or arboreal dwelling which often require a shrub layer, these are important habitat components for owls. Often Powerful Owls are found in areas with more old trees and hollows than average stands (Garnett and Crowley 2000).

THREATS

The OEH Threatened species profile lists the following threats to the species:

- fragmentation and loss of suitable woodland habitat
- loss of hollow-bearing trees and changes in forest structure
- disturbance during the breeding period
- high fire frequency
- road kills
- secondary poisoning
- predation of fledglings by foxes, dogs and cats.

SPECIFIC IMPACTS

The Powerful Owl was not recorded in the proposal area during field surveys informing this report. The Powerful Owl is however known to occur within the locality. Minor potential foraging habitat was identified in the proposal area, comprising of horticultural plantings, native plantings and remnant native vegetation. The proposal will necessitate the removal of 0.14 ha of potential foraging habitat for the species, which generally has low comparative ecological value.

D2.1 BC ACT SIGNIFICANCE ASSESSMENT

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

Powerful Owl was not recorded in the proposal area during field surveys informing this report. A small amount of potentially suitable foraging habitat (0.14 ha) is likely to be affected by the proposal.

Due to their mobility, large home range and the small extent of habitat in the proposal area, potential habitat occurring within the proposal area would likely provide marginal habitat opportunities within the home range for individuals. Furthermore, essential microhabitat elements, such as diversity of hollow-bearing trees and complex ground layer, necessary for their prey was generally not abundant in the proposal area. Locally occurring Powerful Owls are unlikely to be restricted to habitat within the proposal area, as similar and higher quality habitat occurs widely in the locality. Potential foraging habitat within the proposal area is considered of marginal quality and such habitat would at best represent a small component of locally occurring resources accessible to this species. Therefore, it is not likely to constitute important habitat for local Powerful Owls. The action proposed is unlikely lead to 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.

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

Not applicable

In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

- ***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***

Not applicable

- ***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

In relation to the habitat of a threatened species, population or ecological community:

- ***the extent to which habitat is likely to be removed or modified as a result of the action proposed***

The Proposal area is likely to affect approximately 0.14 ha of potential foraging habitat for the species.

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

Habitat connectivity is not likely to be affected by the Proposal. The Proposal area occurs within a small isolated patch of highly disturbed native vegetation. It is unlikely that the removal of 0.14 ha would significantly further fragment or isolate any previously undisturbed patches of habitat than what already exists. Furthermore, given these species' high mobility (some using home ranges up to 1500 ha) and that similar and likely more significant habitat occurs widely in the locality, it is not considered likely that habitat would become further isolated or fragmented significantly beyond that currently existing in the study area and wider locality.

- ***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.***

A small (0.14 ha) disturbed area of potential habitat is likely to be affected by the Proposal. Foraging opportunities will continue to exist and an abundance of similar and better quality foraging opportunities are found within the wider locality. Owing to the small extent of potential habitat to be affected and the high mobility of these species, the Proposal is not likely to significantly affect their long-term survival. However, the loss of such habitat must be considered an incremental loss of local habitat.

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

Areas of declared critical habitat under the *Threatened Species Conservation Act 1995*, are now labelled as 'Areas of Outstanding Biodiversity Values' (AOBVs) in NSW with the commencement of the BC Act. The *Biodiversity Conservation Regulation 2017* establishes the criteria for declaring AOBVs. The criteria have been designed to identify the most valuable sites for biodiversity conservation in NSW. The Proposal area is will not impact any declared AOBVs nor are there any AOBVs identified for these species.

Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan

A recovery plan listing a number of recovery actions has been prepared for Large Forest Owls (Department of Environment and Conservation 2006). The overall objective of the NSW Large Forest Owl Recovery Plan is to ensure that the large forest owl species persist in the wild in NSW in each region where they presently occur. No threat abatement plans have been prepared for these threatened species. The Office of Environment and Heritage has assigned these species as landscape management species under the Saving our Species program with a number of recovery actions

for the species. The Proposal area will not interfere significantly with any of the management actions within the Large Forest Owl Recovery Plan and is consistent with the recovery actions under Saving our Species program.

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

With respect to the Powerful Owl, the Proposal is consistent with one Key Threatening Process:

- clearing of native vegetation.

The extent of native vegetation clearing and habitat removal associated with the Proposal is considered relatively small and will not represent a significant loss in terms of the available habitat for these species within the surrounding landscape.

Conclusion

The Powerful Owl are a threatened forest owl species with a moderate likelihood of occurrence. Whilst potential habitat exists within the study area, impact to the very small, disturbed patch of habitat is considered unlikely to impact the life-cycle of the species. The Proposal area would likely only be visited irregularly as part of a larger home range. An abundance of similar and potentially more significant habitat occurs in the wider locality that is suitable for habitation by this species. Therefore, the Proposal is considered to represent an incremental loss of available local habitat and is not likely to have a significant impact upon the Powerful Owl.

ABOUT US

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