

TRANSPORT FOR NSW

# BEECROFT STATION UPGRADE BIODIVERSITY ASSESSMENT REPORT

OCTOBER 2018



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## Beecroft Station Upgrade Biodiversity Assessment Report

Transport for NSW

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# GLOSSARY

*	Denotes exotic species
BAM	Biodiversity Assessment Methodology 2017 that supports the <i>Biodiversity Conservation Act 2016</i> .
Biodiversity	The biological diversity of life is commonly regarded as being made up of the following three components: <ul style="list-style-type: none"><li>— Genetic diversity — the variety of genes (or units of heredity) in any population.</li><li>— Species diversity — the variety of species.</li><li>— Ecosystem diversity — the variety of communities or ecosystems.</li></ul>
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 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 the 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 Department of the Environment was previously known as: <ul style="list-style-type: none"><li>— Department of Sustainability, Environment, Water, Population and Communities (SEWPAC)</li><li>— Department of the Environment, Water, Heritage and the Arts (DEWHA).</li><li>— Department of Environment and Heritage (DEH).</li><li>— Department of the Environment and Water Resources (DEWR).</li></ul>
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 ( <a href="https://www.lmbc.nsw.gov.au/bamcalc">https://www.lmbc.nsw.gov.au/bamcalc</a> )
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 TSC Act, the 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 within the site, unless the existence of contiguous or proximal occupied habitat and the movement of individuals or exchange of genetic material across the boundary can be demonstrated as defined by Department of Environment and Climate Change (2007).
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 2007).
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 1.1.
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> .
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).
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 2007).
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

BC Act	<i>NSW Biodiversity Conservation Act 2016</i>
BAM	Biodiversity Assessment Methodology (2017)
CAMBA	China Australia Migratory Bird Agreement
EEC	Endangered Ecological Community
EPBC Act	<i>Commonwealth Environment Protection and Biodiversity Conservation Act 1999</i>
FM Act	<i>NSW Fisheries Management Act 1994</i>
HA	Hectares
JAMBA	Japan Australia Migratory Bird Agreement
LEP	Local Environmental Plan
MENS	Matters of National Environmental Significance
OEH	Office of Environment and Heritage
PCT	Plant Community Type
RoKAMBA	Republic of Korea Australia Migratory Bird Agreement
TSC Act	<i>NSW Threatened Species Conservation Act 1995.</i>

# 1 PROPOSAL BACKGROUND

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## 1.1 PURPOSE OF THIS REPORT

Transport for NSW (TfNSW) has identified the need to undertake a Biodiversity Assessment Report to inform the Review Environmental Factors (REF) for the Beecroft Station Upgrade (the Proposal).

This Biodiversity Assessment Report has been prepared to test if the proposed activity is likely to significantly affect threatened species in accordance with Section 7.3 of the *Biodiversity Conservation Act 2016* (BC Act). 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 (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 (on 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.

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## 1.2 BACKGROUND AND DESCRIPTION OF THE PROPOSAL

The Transport Access Program is an initiative to provide a better experience for public transport customers by delivering accessible, modern, secure and integrated transport infrastructure. Key benefits include:

- stations that are accessible to people with a disability, limited mobility and parents with prams
- modern buildings and facilities for all modes that meet the needs of a growing population
- modern interchanges that support an integrated network and allow seamless transfers between all modes for all customers.

The key features of the Proposal are:

- construction of two new lifts between the existing pedestrian walkway and Beecroft Station's island platform, and raising of the existing canopy roof of the booking office by about three metres to accommodate the lift shaft
- modification to the existing non-compliant ramp from Wongala Crescent to provide an accessible path of travel from Wongala Crescent to the new lift. Modifications would include re-grading the existing walkway and adding stairs
- provision of new bridge over the existing staircase, extension of the western platform (Platform 2) and movement of the existing platform fence/gate at the northern end of the platform to accommodate a new pedestrian circulation area in front of the new lift
- upgrades to accessible parking spaces within the Sutherland Road car park to allow for two accessible parking spaces
- upgrade of the existing footpaths including along the eastern side of Wongala Crescent and between the Sutherland Road car park and Beecroft Station
- provision of a new kiss-and-ride zone along Wongala Crescent
- relocation of taxi zone from Hannah Street to Wongala Crescent, adjacent to bus stop

- relocation of the communications room to the existing space adjacent to the family accessible toilet within the station building. This existing space would be increased, by moving the adjoining wall of the toilet, so there is enough room to fit the communications equipment
  - landscaping works around the western lift shaft and along eastern side of Wongala Crescent
  - ancillary works including adjustments to lighting, electrical upgrades, minor drainage works, new seating, improvement to station communications systems (including CCTV cameras), hearing loops, wayfinding signage and installation of TGSIs.
- 

## 1.3 LOCATION OF THE PROPOSAL

Beecroft Station is on the Main Northern Line (T1 service), about 27 kilometres from Central Station. It is within the Hornsby local government area (LGA), to which the *Hornsby Local Environment Plan 2013* (Hornsby LEP 2013) applies.

The Proposal is surrounded by a combination of urban and natural environments. The proposed works associated with the station platform and buildings would be located in an area zoned as SP2 Infrastructure (Rail). Works outside of the station platform and buildings, including the works to footpaths and access points, would be located in areas zoned R2 Low Density Residential and B2 Local Centre.

Beecroft Station and Gardens and Beecroft Railway Station Group and Bushland Corridor are listed as items of local heritage significance on the s170 Heritage and Conservation Register. Beecroft Station and Gardens is also listed under the Hornsby LEP 2013 heritage register as a local heritage item (I142).

The Beecroft town centre is adjacent to the Proposal, and comprises low scale retail and commercial uses and housing of mixed density. Residential areas to the east of the station are generally single and two-storey houses on tree lined streets.

Byles Creek and its associated unnamed drainage lines are located to the north and east of the Proposal and can be characterised as significant green corridors within the landscape, populated by mature, native vegetation.





Figure 1.1 Location of the Proposal

## 2 LEGISLATIVE CONTEXT

Local Government, State and Commonwealth 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.

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### 2.1 STATE LEGISLATION

#### 2.1.1 BIODIVERSITY CONSERVATION ACT 2016

The NSW *Biodiversity Conservation Act 2016* (BC Act) came into effect on the 25 August 2017. This Act repealed the *Threatened Species and Conservation Act 1995* (TSC Act), *Native Vegetation Act 2003* and parts of the *National Parks and Wildlife Act 1974*. All threatened entities previously listed under the TSC Act have now been listed under the schedules of the BC Act.

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).

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### 2.2 COMMONWEALTH LEGISLATION

#### 2.2.1 ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT 1999

Under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), any action that has, would have, or is likely to have a significant impact on a Matter of National Environmental Significance (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.



# 3 METHODOLOGY

## 3.1 DEFINITIONS

For the purpose of this report the following definitions apply:

- **Study area:** defined as the area in which the proposal is proposed to occur
- **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 (Thackway and Cresswell 1995).

All other definitions are provided in the Glossary at the start of this document. The Proposal locality and study area are 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
Mark Stables	Bachelor of Science (Hons) BAM accredited assessor	Principal Ecologist – survey and report preparation.
Clementine Watson	Bachelor of Environmental Science and Management, Completed BAM training	Ecologist – report preparation.
Alex Cockerill	Bachelor of Science (Hons) BAM accredited assessor	Ecology National Team Executive – Technical review
Emily Mitchell	BDevSt	GIS consultant – map preparation and data management

All work was carried out under the appropriate licences, including a scientific licence scientific licences 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 & Heritage 2018).

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 *Native vegetation of Southeast NSW: A Revised Classification and Map for the Coast and Eastern Tablelands* (Tozer, Turner et al. 2010).

Names of plants used in this document follow PlantNet Royal Botanic Gardens (Royal Botanic Gardens 2018) 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 OEH Threatened Species Website (Office of Environment & Heritage 2018) 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 (Department of Environment and Energy 2018). 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 2018)
- *Previous vegetation mapping, ecological studies and other relevant studies of the study area:*
  - *Native vegetation of Southeast NSW: A Revised Classification and Map for the Coast and Eastern Tablelands* (Tozer, Turner et al. 2010).

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	18/07/18	10 km radius centred on the study area	(Royal Botanic Gardens 2018)
OEH BioNet Atlas of NSW Wildlife	18/07/18	10 km x 10 km centred on the study area	(Office of Environment & Heritage 2018)
EPBC Protected Matters Search Tool	18/07/18	10 km x 10 km centred on the study area	(Department of the Environment and Energy 2018)
NSW Department of Primary Industries (Fishing and Aquaculture) threatened Aquatic Fauna Database	18/07/18	Relevant catchment (Sydney Metro)	(Department of Primary Industries 2018)

### 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.

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## 3.5 FIELD SURVEY

Field surveys were undertaken on the 24 July 2018. 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.

The field surveys undertaken are described in sections 3.5.1 to section 3.7.

### 3.5.1 FLORA SURVEY

The floristic diversity and possible presence of threatened species was assessed undertaking a random survey (Cropper 1993).

#### 3.5.1.1 FIELD VERIFICATION OF EXISTING VEGETATION

Vegetation within the study area and locality has been mapped at the regional scale in '*Native vegetation of the Southeast NSW: Revised Classification and Map for the Coast and Eastern Tablelands*' (Tozer, Turner et al. 2010).

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 Plant Community Type (PCT) in accordance with the BioNet Vegetation Classification (Office of Environment and Heritage 2017).

#### 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 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 for Environment & Heritage 2018).

#### 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 animal (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.

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## 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
<b>Known</b>	The species was observed in the subject site either during the current survey or during another recent survey.
<b>High</b>	<p>A species has a high likelihood of occurrence if:</p> <ul style="list-style-type: none"> <li>— the subject site contains or forms part of a large area of high quality suitable habitat</li> <li>— important habitat elements (i.e. for breeding or important life cycle periods such as winter foraging periods) are abundant within the subject site</li> <li>— the species has been recorded recently in similar habitat in the locality</li> <li>— 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.</li> </ul>
<b>Moderate</b>	<p>A species has a moderate likelihood of occurrence if:</p> <ul style="list-style-type: none"> <li>— the subject site contains or forms part of a small area of high quality suitable habitat</li> <li>— the subject site contains or forms part of a large area of marginal habitat</li> <li>— 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</li> <li>— 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.</li> </ul>
<b>Low</b>	<p>A species has a moderate likelihood of occurrence if:</p> <ul style="list-style-type: none"> <li>— 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)</li> <li>— 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).</li> </ul>
<b>None</b>	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 VEGETATION COMMUNITIES

### 4.1.1 HIGHLY DISTURBED AREAS WITH NO OR LIMITED NATIVE VEGETATION

All vegetation observed within the area of proposed works comprised of ornamental planted exotic and native garden specimens that do not form part of any recognised native NSW Plant Community Type.

Trees identified to occur near the proposed works included; *Araucaria cunninghamii* (Hoop Pine), *Araucaria bidwillii* (Bunya-bunya Pine), *Callistemon viminalis* (Weeping Bottlebrush), *Cinnamomum camphora*\* (Camphor Laurel\*) (Photo 4.1), *Elaeocarpus reticulatus* (Blueberry Ash), *Eucalyptus saligna* (Sydney Blue-gum), *Grevillea robusta* (Silky Oak), *Jacaranda mimosifolia* (Jacaranda) (Photo 4.2), *Lophostemon confertus* (Brush Box), *Platanus x hybrida*\* (London planetree\*), *Pyrus celleryana* (Callery Pear)\* and a single specimen of *Syncarpia glomulifera* (Turpentine) that occurs within the eastern carpark (Photo 4.4).

A patch of remnant native vegetation comprising of intergrades between two threatened ecological communities, being Blue Gum High Forest and Sydney Turpentine Ironbark Forest, occur to the east of the exiting access path to the eastern carpark. No works are proposed to occur within this area as part of the Proposal.



Photo 4.1 *Cinnamomum camphora*\* (Camphor Laurel\*) near proposed works



Photo 4.2 *Jacaranda mimosifolia* (Jacaranda) near proposed works



Photo 4.3 Upgrade area of eastern entry footpath near Sutherland Road



Photo 4.4 Single *Syncarpia glomulifera* (Turpentine) in eastern carpark



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## 4.2 FAUNA HABITATS

The fauna habitat within the study area is limited, with majority of vegetation in the form of planted ornamental native and exotic trees and shrubs. A majority of the original vegetation within the study area has been cleared for urban development and what remains is landscape gardens and plantings. The habitat and vegetation within the study area provides limited resources and lacks important features such as hollow bearing trees, rocky outcrops, dense litter layer 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). 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.

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## 4.3 WEEDS

No Priority Weeds listed under the *Biosecurity Act 2015* for the Greater Sydney Region were identified in the study area.

# 5 THREATENED BIODIVERSITY

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## 5.1 THREATENED ECOLOGICAL COMMUNITIES

No threatened ecological communities were identified within the study area. All vegetation observed within the study area comprised of ornamental planted exotic and native garden specimens that do not form part of any recognised native NSW Plant Community Type.

A patch of remnant native vegetation comprising of intergrades between two threatened ecological communities, being Blue Gum High Forest and Sydney Turpentine Ironbark Forest, occur to the east of the exiting access path to the eastern carpark.



Photo 4.1 Blue Gum High Forest and Sydney Turpentine Ironbark Forest adjacent to proposed works



Photo 4.2 Blue Gum High Forest and Sydney Turpentine Ironbark Forest adjacent to proposed works

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## 5.2 THREATENED FLORA

No threatened flora species were identified during sit inspections. Background investigations identified 42 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). Following field surveys, it is considered that the study area is unlikely to provide habitat to threatened flora species.

No specific assessment 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.

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## 5.3 THREATENED FAUNA

No threatened fauna were identified during site inspections. Background investigations identified 79 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.

Some threatened fauna which have previously been recorded within the locality may intermittently occur within the study area.

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## 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 Matters of NES and are protected under the EPBC Act.

A total of 33 species listed as migratory under the EPBC Act were identified during background investigations 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 mentioned species are likely to utilise higher quality habitat within the greater locality and where more extensive tracts of native vegetation occur.



# 6 POTENTIAL IMPACTS

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

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## 6.1 IMPACTS DURING CONSTRUCTION

### 6.1.1 DIRECT IMPACTS

Direct impacts to biodiversity as a result 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. In terms of impacts on existing vegetation, the works are considered minor and restricted to the removal of two planted native ornamental species being *Callistemon viminalis* (Weeping Bottlebrush) and *Elaeocarpus reticulatus* (Blueberry Ash).

Tree removal locations are shown in the *Arboricultural Impact Assessment Report* (Earthscape Horticultural Services, August 2018) included as part of the Review of Environmental Factors for the Proposal.

#### 6.1.1.1 IMPACTS TO THREATENED NATIVE VEGETATION

The Proposal would not lead to an impact on any remnant threatened native vegetation, and would avoid any direct or indirect impacts on the patch of remnant native Blue Gum High Forest and Sydney Turpentine Ironbark Forest to the east of the exiting access path to the eastern carpark.

### 6.1.2 IMPACTS TO THREATENED FAUNA

No threatened fauna is likely to be significantly impacted by the Proposal. It is unlikely that any threatened fauna identified within the locality would have a moderate to higher likelihood to utilise the habitat within the study area, nor are any threatened fauna likely to be reliant on the habitat to be removed or impacted. The mitigation measures outlined below in Section 7 would ensure that any possible indirect impacts would be minimised.

### 6.1.3 REMOVAL OF VEGETATION

Impacts on vegetation would be limited to the removal/disturbance of highly disturbed areas with no or limited native vegetation, of which most occur as landscaping on the western side of the station near the pedestrian underpass and would result in the removal of two planted native ornamental species being *Callistemon viminalis* (Weeping Bottlebrush) and *Elaeocarpus reticulatus* (Blueberry Ash). These trees are considered unlikely to provide important biodiversity value.

The vegetation to be impacted by the proposed activity does 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.

### 6.1.4 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 (Bowles 1997). 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

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).

### 6.1.5 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.

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## 6.2 IMPACTS DURING OPERATION

The operation of the Proposal is not anticipated to result in any further impacts to biodiversity.

# 7 AVOID, MINIMISE AND MITIGATE

Construction of the Proposal must be undertaken in accordance with TfNSW's *Vegetation Management (Protection and Removal) Guideline* and TfNSW's *Fauna Management Guideline*. Specifically, the following measures will be undertaken:

- 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. No works will occur within patch of remnant native Blue Gum High Forest and Sydney Turpentine Ironbark Forest to the east of the exiting access path to the eastern carpark and it is recommended that temporary fencing or power webbing is erected along the boundary of this area to restrict and unauthorized access during construction activities.
- Disturbance of vegetation would be limited to the minimum amount necessary to construct the Proposal. Trees nominated to be removed in the *Arboricultural Impact Assessment Report* (Earthscape Horticultural Services, August 2018) 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.
- Where the loss of trees is unable to be mitigated, Transport for NSW would replace trees removed as a result of the project in accordance with the TfNSW's *Vegetation Offset Guide* (2016). In accordance with Section 5 of the guideline it is expected that 4 trees would be required to meet this offset requirement.
- Tree Protection Zones (TPZs) would be established around trees to be retained, as nominated in the *Arboricultural Impact Assessment Report* (Earthscape Horticultural Services, August 2018). Tree protection would be undertaken in line with *AS 4970-2009 Protection of Trees on Development Sites* and would include exclusion fencing of TPZs.
- 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.
- Should the detailed design or onsite works determine the need to remove or trim any additional trees, which have not been identified in the Review of Environmental Factors for Beecroft Station Upgrade, 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 phase of the Proposal. This would include the management and disposal of weeds in accordance with the *Noxious Weeds Act 1993*.

## 8 CONCLUSIONS

This Biodiversity Assessment Report has been prepared to inform a REF for the Beecroft Station Upgrade. The findings from desktop assessment and field investigations identified minimal impacts to native vegetation and fauna habitat. Due to the Proposal occurring within an urban precinct the ecological value of the existing environment is low.

In terms of impacts on existing vegetation, the works are considered minor and restricted to the removal of two planted native ornamental species being *Callistemon viminalis* (Weeping Bottlebrush) and *Elaeocarpus reticulatus* (Blueberry Ash). Some disturbance and removal of landscape gardens are proposed as part of the works. The impact of this vegetation is unlikely to constitute important ecological value. The vegetation to be impacted would not be a significant impact to threatened biodiversity. The proposed works would not impact any significant habitat features (i.e. hollows for breeding) for potential species.

The Proposal would not lead to an impact on any native vegetation, and would avoid any direct or indirect impacts on the patch of remnant native Blue Gum High Forest and Sydney Turpentine Ironbark Forest to the east of the exiting access path to the eastern carpark.

The Proposal does not involve any impact to native vegetation, threatened terrestrial or aquatic species, endangered 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 would 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 have no significant impact to biodiversity.

# 9 LIMITATIONS

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## 9.1 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.

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## 9.2 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.

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## 9.3 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.

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## 9.4 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



Table 1 Threatened flora species likelihood of occurrence within the study area

SPECIES NAME	COMMON NAME	BC ACT <sup>1</sup>	EPBC ACT <sup>2</sup>	HABITAT	DATA SOURCE	LIKELIHOOD OF OCCURRENCE
<i>Cynanchum elegans</i>	White-flowered Wax Plant	E1	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 (Harden 1992). This species typically occurs at the ecotone between dry subtropical forest/woodland communities (James 1997, NSW National Parks and Wildlife Service 2002).	EPBC PMST	Low  The disturbed vegetation within the study area is unlikely to provide suitable habitat for this species.
<i>Allocasuarina glareicola</i>		E1	E	Primarily restricted to the Richmond (NW Cumberland Plain) district, but with an outlier population found at Voyager Point, Liverpool (Office of Environment & Heritage 2016). Grows on lateritic soil in open forest (Harden 2000).	EPBC PMST	Low  The disturbed vegetation within the study area is unlikely to provide suitable habitat for this species.
<i>Wilsonia backhousei</i>	Narrow-leafed Wilsonia	V		Occurs chiefly in the Sydney district but also common at Jervis Bay (Harden 2000). A salt tolerant species, it is found in intertidal saltmarshes and sometimes on seacliffs (NSW Scientific Committee 2000).	BioNet	Low  The disturbed vegetation within the study area is unlikely to provide suitable habitat for this species.
<i>Hibbertia spanantha</i>	Julians Hibbertia	CE	CE	Grows in forest with canopy species including Eucalyptus pilularis, E. resinifera, Corymbia gummifera and Angophora costata. 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.	EPBC PMST	Low  The disturbed vegetation within the study area is unlikely to provide suitable habitat for this species.

SPECIES NAME	COMMON NAME	BC ACT <sup>1</sup>	EPBC ACT <sup>2</sup>	HABITAT	DATA SOURCE	LIKELIHOOD OF OCCURRENCE
<i>Hibbertia superans</i>		E1		Occurs from Baulkham Hills to South Maroota in the northern outskirts of Sydney, where there are currently 16 known sites, and at one locality at Mount Boss, inland from Kempsey. The species occurs on sandstone ridgetops often near the shale/sandstone boundary. Occurs in both open woodland and heathland, and appears to prefer open disturbed areas, such as trackside (Office of Environment and Heritage 2012).	BioNet	Low The disturbed vegetation within the study area is unlikely to provide suitable habitat for this species.
<i>Tetratheca glandulosa</i>	Glandular Pink-bell	V	V	Occurs from Mangrove Mountain to the Blue Mountains where it grows in sandy or rocky heath or scrub (Harden 1992). 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 (Department of Environment and Climate Change 2008).	BioNet	Low The disturbed vegetation within the study area. Field surveys did not record any suitable habitat for the species.

SPECIES NAME	COMMON NAME	BC ACT <sup>1</sup>	EPBC ACT <sup>2</sup>	HABITAT	DATA SOURCE	LIKELIHOOD OF OCCURRENCE
<i>Epacris purpurascens</i> var. <i>purpurascens</i>	-	V		Occurs in Gosford and Sydney districts where it grows in sclerophyll forest, scrub and swamps (Harden 1992). Usually found in sites with a strong shale influence (NSW National Parks and Wildlife Service 2002).	BioNet	Low The disturbed vegetation within the study area. Field surveys did not record any suitable habitat for the species.
<i>Acacia bynoeana</i>	Bynoes Wattle	E1	V	Occurs south of Dora Creek-Morisset area to Berrima and the Illawarra region and west to the Blue Mountains. It grows mainly in heath and dry sclerophyll forest on sandy soils (Harden 2002). Seems to prefer open, sometimes disturbed sites such as trail margins and recently burnt areas. Typically occurs in association with <i>Corymbia gummifera</i> , <i>Eucalyptus haemastoma</i> , <i>E. gummifera</i> , <i>E. parramattensis</i> , <i>E. sclerophylla</i> , <i>Banksia serrata</i> and <i>Angophora bakeri</i> (NSW National Parks and Wildlife Service 1999).	BioNet, EPBC PMST	Low The disturbed vegetation within the study area is unlikely to provide suitable habitat for this species.
<i>Acacia clunies-rossiae</i>	Kowmung Wattle	V		Occurs in the Kowmung River and Coxs River districts; in valleys, on slopes and ridges, and along creeks where it grows in dry sclerophyll forest (Harden 2002), woodlands and shrublands, including Kowmung Wilderness Dry Woodland and Burragorang Ironbark Woodland (NSW National Parks and Wildlife Service 1999).	BioNet	Low The disturbed vegetation within the study area is unlikely to provide suitable habitat for this species.
<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 gravely soils often with ironstones (Harden 2002, NSW National Parks and Wildlife Service 2003).	BioNet, EPBC PMST	Low The disturbed vegetation within the study area is unlikely to provide suitable habitat for this species.

SPECIES NAME	COMMON NAME	BC ACT <sup>1</sup>	EPBC ACT <sup>2</sup>	HABITAT	DATA SOURCE	LIKELIHOOD OF OCCURRENCE
<i>Pelargonium sp.</i> <i>Striatellum (G. W. Carr 10345), syn.</i> <i>Pelargonium sp.</i> , <i>Pelargonium sp. 1</i>	Omeo Stork's-bill	E1	E	Known from only 4 locations in NSW, with three on lakebeds on the basalt plains of the Monaro and one at Lake Bathurst. The only other known population is at Lake Omeo, Victoria. It occurs at altitudes between 680 to 1030 m. It is known to occur in the local government areas of Goulburn-Mulwaree, Cooma-Monaro, and Snowy River, but may occur in other areas with suitable habitat; these may include Bombala, Eurobodalla, Palerang, Tumbarumba, Tumut, Upper Lachlan, and Yass Valley local government areas. It has a narrow habitat that is usually just above the high-water level of irregularly inundated or ephemeral lakes, in the transition zone between surrounding grasslands or pasture and the wetland or aquatic communities. It occurs with Serrated Tussock ( <i>Nassella trichotoma</i> ) and Curly Sedge ( <i>Carex bichenoviana</i> ), and less commonly with Creeping Hopbush ( <i>Dodonaea procumbens</i> ) and a bog-sedge ( <i>Schoenus nitens</i> ) on sandy soils or gravelly soils or amongst rocks. (Heritage; 2015)	EPBC PMST	Low  The disturbed vegetation within the study area is unlikely to provide suitable habitat for this species.
<i>Grammitis stenophylla</i>	Narrow-leaf Finger Fern	E1		A fern which occurs in coastal regions from Queensland to the NSW south coast. It grows in moist places, usually near streams, on rocks or in trees, in rainforest and moist eucalypt forest (Office of Environment and Heritage 2012).	BioNet	Low  The disturbed vegetation within the study area is unlikely to provide suitable habitat for this species.
<i>Haloragis exalata</i> <i>subsp. exalata</i>		V	V	Found in the south coast, central coast and north west slopes botanical regions where it appears to require protected and shaded damp situations in riparian habitats (Harden 2002, Department of Environment and Climate Change 2008).	EPBC PMST	Low  The disturbed vegetation within the study area is unlikely to provide suitable habitat for this species.

SPECIES NAME	COMMON NAME	BC ACT <sup>1</sup>	EPBC ACT <sup>2</sup>	HABITAT	DATA SOURCE	LIKELIHOOD OF OCCURRENCE
<i>Haloragodendron lucasii</i>		E1	E	The known locations of this species are confined to a very narrow distribution on the north shore of Sydney (Office of Environment and Heritage 2015). Confined to the Sydney area where it grows in dry sclerophyll open forest on sheltered slopes near creeks on sandstone (Harden 2002). 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 (Office of Environment and Heritage 2015).	EPBC PMST	Low The disturbed vegetation within the study area is unlikely to provide suitable habitat for this species.
<i>Callistemon linearifolius</i>	Netted Bottle Brush	V		Occurs chiefly from Georges to the Hawkesbury River where it grows in dry sclerophyll forest, open forest, scrubland or woodland on sandstone. Found in damp places, usually in gullies (Robinson 1994, Fairley and Moore 2002, Harden 2002). Within the Sydney region, recent records are limited to the Hornsby Plateau area near the Hawkesbury River (NSW Scientific Committee 1999).	BioNet	Low The disturbed vegetation within the study area is unlikely to provide suitable habitat for this species.
<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 (Harden 2002). Occurs on the edges of weathered shale-capped ridges, where these intergrade with Hawkesbury Sandstone. Associated overstorey species include Eucalyptus haemastoma, Corymbia gummifera and/or E. squamosa. The vegetation structure is usually woodland, open forest or scrub-heath (Department of Environment and Climate Change 2008).	BioNet, EPBC PMST	Low The disturbed vegetation within the study area. Field surveys did not record any suitable habitat for the species.



SPECIES NAME	COMMON NAME	BC ACT <sup>1</sup>	EPBC ACT <sup>2</sup>	HABITAT	DATA SOURCE	LIKELIHOOD OF OCCURRENCE
<i>Darwinia peduncularis</i>		V		Occurs from Hornsby to Hawkesbury River and west to Glen Davies where it grows in dry sclerophyll forest on sandstone hillsides and ridges (Harden 2002). Known to occur along watercourses (Benson 2001). Usually grows on or near rocky outcrops on sandy, well drained, low nutrient soil over sandstone (Department of Environment and Climate Change 2007).	BioNet	Low The disturbed vegetation within the study area is unlikely to provide suitable habitat for this species.
<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 (Office of Environment and Heritage 2012) . Associated species frequently include Brown Stringybark ( <i>E. capitellata</i> ), Scribbly Gum ( <i>E. haemastoma</i> ), Narrow-leaved Stringybark ( <i>E. oblonga</i> ), Silvertop Ash ( <i>E. sieberi</i> ), Smooth-barked Apple ( <i>Angophora costata</i> ), Dwarf Apple ( <i>A. hispida</i> ), Red Bloodwood ( <i>Corymbia gummifera</i> ), Scrub She-oak ( <i>Allocasuarina distyla</i> ), Slender Tea Tree ( <i>Leptospermum trinervium</i> ), and Fern-leaved Banksia ( <i>Banksia oblongifolia</i> ) (Leigh, Boden et al. 1984, Benson and McDougall 1998).	BioNet, EPBC PMST	Low The disturbed vegetation within the study area is unlikely to provide suitable habitat for this species.
<i>Eucalyptus nicholii</i>	Narrow-leaved Black Peppermint	V	V	Occurs from Niangala to Glenn Innes where it grows in grassy sclerophyll woodland on shallow relatively infertile soils on shales and slates, mainly on granite (Harden, 1991; DLWC, 2001). Endemic on the NSW Northern Tablelands, of limited occurrence, particularly in the area from Walcha to Glen Innes; often on porphyry or granite (Brooker and Kleinig 1999).	BioNet	Low The disturbed vegetation within the study area is unlikely to provide suitable habitat for this species.

SPECIES NAME	COMMON NAME	BC ACT <sup>1</sup>	EPBC ACT <sup>2</sup>	HABITAT	DATA SOURCE	LIKELIHOOD OF OCCURRENCE
<i>Eucalyptus scoparia</i>		E1	V	Occurs in Queensland and reaches its southern limit in NSW. In NSW it is known from three locations all near Tenterfield in the far northern New England Tableland Bioregion where it grows on well drained granitic hilltops, slopes and outcrops, often as scattered trees in open forest and woodland (Royal Botanic Gardens 2004).	BioNet	Low The disturbed vegetation within the study area is unlikely to provide suitable habitat for this species.
<i>Eucalyptus sp. Cattai</i>		E1		Occurs in the area between Colo Heights and Castle Hill in north-western Sydney, with historical records from central Sydney (Office of Environment and Heritage 2015). It grows as an emergent tree in scrub, heath and low woodland on sandy soils, generally on flat ridge tops. It usually occurs as isolated individuals or occasionally in small clustered groups (Harden 2002). Associated soils are laterised clays overlying sandstone (Office of Environment and Heritage 2015).	EPBC PMST	Low The disturbed vegetation within the study area is unlikely to provide suitable habitat for this species.
<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> ) (Office of Environment and Heritage 2012). Only occurs near the watershed of Lane Cove River where it grows on forested slopes (Harden 2002).	BioNet, EPBC PMST	Low The disturbed vegetation within the study area is unlikely to provide suitable habitat for this species.
<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 (NSW Scientific Committee 1998). Grows in damp places, often near streams, or low-lying areas on alluvial soils of low slopes or sheltered aspects (Harden 2002, Department of Environment and Climate Change 2008).	BioNet, EPBC PMST	Low The disturbed vegetation within the study area is unlikely to provide suitable habitat for this species.

SPECIES NAME	COMMON NAME	BC ACT <sup>1</sup>	EPBC ACT <sup>2</sup>	HABITAT	DATA SOURCE	LIKELIHOOD OF OCCURRENCE
<i>Melaleuca deanei</i>	Deanes 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 (Office of Environment and Heritage 2014).	BioNet, EPBC PMST	Low The disturbed vegetation within the study area is unlikely to provide suitable habitat for this species.
<i>Syzygium paniculatum</i>	Magenta Lilly Pilly	E1	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 (Harden 2002). On the south coast the Magenta Lilly Pilly occurs on grey soils over sandstone, restricted mainly to remnant stands of littoral (coastal) rainforest. On the central coast Magenta Lilly Pilly occurs on gravels, sands, silts and clays in riverside gallery rainforests and remnant littoral rainforest communities (Department of Environment and Climate Change 2008).	BioNet, EPBC PMST	Low The disturbed vegetation within the study area is unlikely to provide suitable habitat for this species. May occur as a planted specimen.
<i>Triplarina imbricata</i>	Creek Triplarina	E1	E	Occurs along the coast and adjacent ranged in the Tabulum and Nymboida districts where it grows in heath often in damp areas. It has been recorded along watercourses in low open forest in association with <i>Tristaniopsis laurina</i> (Harden 2000, NSW National Parks and Wildlife Service 2002).	BioNet	Low The disturbed vegetation within the study area is unlikely to provide suitable habitat for this species.
<i>Caladenia tessellata</i>	Thick Lip Spider Orchid	E1	V	Occurs south of Swansea where it grows on clay loam or sandy soils (Harden 1993). Prefers low open forest with a heathy or sometimes grassy understorey (Bishop 2000). 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 (NSW Scientific Committee 2002).	EPBC PMST	Low The disturbed vegetation within the study area is unlikely to provide suitable habitat for this species.

SPECIES NAME	COMMON NAME	BC ACT <sup>1</sup>	EPBC ACT <sup>2</sup>	HABITAT	DATA SOURCE	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 (Harden 1993, NSW National Parks and Wildlife Service 1999).	EPBC PMST	Low The disturbed vegetation within the study area is unlikely to provide suitable habitat for this species.
<i>Genoplesium baueri</i>	Bauers Midge Orchid	V	E	Grows in dry sclerophyll forest and moss gardens over sandstone. The species has been recorded from locations between Ulladulla and Port Stephens. About half the records were made before 1960 with most of the older records being from northern Sydney suburbs. The species has been recorded at locations now likely to be within the following conservation reserves: Berowra Valley Regional Park, Royal National Park and Lane Cove National Park. May occur in the Woronora, O'Hares, Metropolitan and Warragamba Catchments (Office of Environment and Heritage 2014).	BioNet, EPBC PMST	Low The disturbed vegetation within the study area is unlikely to provide suitable habitat for this species.
<i>Pterostylis nigricans</i>	Dark Greenhood	V		Occurs in north-east NSW, north from Evans Head, and in Queensland. Grows in coastal heathland with Heath Banksia ( <i>Banksia ericifolia</i> ), and lower-growing heath with lichen-encrusted and relatively undisturbed soil surfaces, on sandy soils.	BioNet	Low The disturbed vegetation within the study area is unlikely to provide suitable habitat for this species.
<i>Pterostylis saxicola</i>	Sydney Plains Greenhood	E1	E	Known now only from Freemans Reach to Picton district. Grows in Sydney Sandstone Gully Forest in shallow or skeletal soils over sandstone shelves, often near streams (Harden 1993, James 1997, Department of Environment and Climate Change 2007)	EPBC PMST	Low The disturbed vegetation within the study area is unlikely to provide suitable habitat for this species.

SPECIES NAME	COMMON NAME	BC ACT <sup>1</sup>	EPBC ACT <sup>2</sup>	HABITAT	DATA SOURCE	LIKELIHOOD OF OCCURRENCE
<i>Deyeuxia appressa</i>		E1	E	Highly restricted, known only from two pre-1942 records in the Sydney area; in 1930 at Herne Bay, Saltpan Creek, off the Georges River, south of Bankstown and in 1941 from Killara, near Hornsby. It 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. Flowers spring to summer and is mesophytic (grows in moist conditions). But, given that it hasn't been seen in over 60 years, almost nothing is known of the species' habitat and ecology (Office of Environment & Heritage 2012).	EPBC PMST	Low  The disturbed vegetation within the study area is unlikely to provide suitable habitat for this species.
<i>Persoonia hirsuta</i>	Hairy Geebung	E1	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 (Harden 2002, Office of Environment and Heritage 2015). Often occurs in areas with clay influence, in the ecotone between shale and sandstone (James 1997).	BioNet	Low  The disturbed vegetation within the study area is unlikely to provide suitable habitat for this species.
<i>Persoonia mollis</i> <i>subsp. maxima</i>		E1	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> (NSW National Parks and Wildlife Service 2000).	EPBC PMST	Low  The disturbed vegetation within the study area is unlikely to provide suitable habitat for this species.

SPECIES NAME	COMMON NAME	BC ACT <sup>1</sup>	EPBC ACT <sup>2</sup>	HABITAT	DATA SOURCE	LIKELIHOOD OF OCCURRENCE
<i>Persoonia nutans</i>	Nodding Geebung	E1	E	Confined to the Cumberland Plain where it grows in Castlereagh Scribbly Gum Woodlands and Agnes Banks Woodlands (James 1997, NSW National Parks and Wildlife Service 2001, Harden 2002).	BioNet	Low The disturbed vegetation within the study area is unlikely to provide suitable habitat for this species.
<i>Pomaderris prunifolia</i>	Plum-leaf Pomaderris	E2		Occurs on rocky slopes, often along creeks (Harden 2000). The population in Paramatta, Auburn, Strathfield and Bankstown LGAs is listed as Endangered under the TSC Act. Within the Endangered population, the only recent record of this species is from Rydalmere, where only 3 plants occur (NSW Scientific Committee 1999).	BioNet	Low The disturbed vegetation within the study area is unlikely to provide suitable habitat for this species.
<i>Galium australe</i>	Tangled Bedstraw	E1		Tangled Bedstraw is widespread in Victoria and Tasmania and is also found in South Australia (and ACT Territory in Jervis Bay). Following a taxonomic revision, many recent records in NSW have been re-determined as other species. Tangled Bedstraw has been recorded historically in the Nowra (Colymea) and Narooma areas and is extant in Nadgee Nature Reserve, south of Eden. Records in the Sydney area are yet to be confirmed. In NSW (and ACT Territory in Jervis Bay), Tangled Bedstraw has been recorded in Turpentine forest and coastal Acacia shrubland. In other States the species is found in a range of near-coastal habitats, including sand dunes, sand spits, shrubland and woodland (Office of Environment and Heritage 2014).	BioNet	Low The disturbed vegetation within the study area is unlikely to provide suitable habitat for this species.



SPECIES NAME	COMMON NAME	BC ACT <sup>1</sup>	EPBC ACT <sup>2</sup>	HABITAT	DATA SOURCE	LIKELIHOOD OF OCCURRENCE
<i>Asterolasia elegans</i>		E1	E	Known from only seven populations, north of Sydney in the Baulkham Hills, Hawkesbury and Hornsby LGAs; also likely to occur in the western part of Gosford LGA. Occurs on Hawkesbury sandstone in sheltered forests on mid- to lower slopes and valleys, e.g. in or adjacent to gullies which support sheltered forest. The canopy at known sites includes Turpentine ( <i>Syncarpia glomulifera</i> subsp. <i>glomulifera</i> ), Smooth-barked Apple ( <i>Angophora costata</i> ), Sydney Peppermint ( <i>Eucalyptus piperita</i> ), Forest Oak ( <i>Allocasuarina torulosa</i> ) and Christmas Bush ( <i>Ceratopetalum gummiferum</i> )(Office of Environment and Heritage 2015).	EPBC PMST	Low The disturbed vegetation within the study area is unlikely to provide suitable habitat for this species.
<i>Thesium australe</i>	Austral Toadflax	V	V	Grows in grassland or woodland often in damp sites. It is a semi-parasitic herb and hosts are likely to be <i>Themeda australis</i> and <i>Poa</i> spp. (Harden 1992, Department of Environment and Climate Change 2008).	EPBC PMST	Low The disturbed vegetation within the study area is unlikely to provide suitable habitat for this species.
<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 (Harden 2000, Fairley and Moore 2002, Office of Environment and Heritage 2012).	BioNet, EPBC PMST	Low The disturbed vegetation within the study area is unlikely to provide suitable habitat for this species.

SPECIES NAME	COMMON NAME	BC ACT <sup>1</sup>	EPBC ACT <sup>2</sup>	HABITAT	DATA SOURCE	LIKELIHOOD OF OCCURRENCE
<i>Pimelea curviflora</i> <i>var. 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 (James 1997, NSW Scientific Committee 1998, James, McDougall et al. 1999, Harden 2000).	BioNet, EPBC PMST	Low The disturbed vegetation within the study area is unlikely to provide suitable habitat for this species.
<i>Pimelea spicata</i>	Spiked Rice-flower	E1	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 (James 1997, Harden 2000, NSW National Parks and Wildlife Service 2000).	BioNet, EPBC PMST	Low The disturbed vegetation within the study area is unlikely to provide suitable habitat for this species.

**1** V = Vulnerable, E1 = Endangered species, E2 = Endangered population listed under the BC Act

**2** V = Vulnerable, E = Endangered, listed under the EPBC Act

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# APPENDIX B

## THREATENED FAUNA LIKELIHOOD OF OCCURRENCE





Table 1 Threatened fauna species likelihood of occurrence within the study area

SCIENTIFIC NAME	COMMON NAME	BC ACT <sup>1</sup>	EPBC ACT <sup>2</sup>	HABITAT	DATA SOURCE	LIKELIHOOD OF OCCURRENCE
<b>AMPHIBIANS (5)</b>						
<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 300m 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.	Bionet , EPBC PMST	Low Preferred habitat not present 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</i> spp.) or spikerushes ( <i>Eleocharis</i> spp.). 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 PMST	Low Preferred habitat not present within study area
<i>Litoria littlejohni</i>	Littlejohn's Tree Frog, Heath Frog	V	V	Has a distribution that includes the plateaus and eastern slopes of the Great Dividing Range from Watagan State Forest (90 km north of Sydney) south to Buchan in Victoria. The majority of records are from within the Sydney Basin Bioregion with only scattered records south to the Victorian border and this species has not been recorded in southern NSW within the last decade. Records are isolated and tend to be at high altitude. This species breeds in the upper reaches of permanent streams and in perched swamps. Non-breeding habitat is heath based forests and woodlands where it shelters under leaf litter and low vegetation, and hunts for invertebrate prey either in shrubs or on the ground.	EPBC PMST	Low Preferred habitat not present within study area

SCIENTIFIC NAME	COMMON NAME	BC ACT <sup>1</sup>	EPBC ACT <sup>2</sup>	HABITAT	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 Dorrigo 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 PMST	Low Preferred habitat not present 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 Preferred habitat not present within study area

SCIENTIFIC NAME	COMMON NAME	BC ACT <sup>1</sup>	EPBC ACT <sup>2</sup>	HABITAT	DATA SOURCE	LIKELIHOOD OF OCCURRENCE
<b>BIRDS (54)</b>						
<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 PMST	Low Preferred habitat not present 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.	Bionet	Low Preferred habitat not present within study area. May intermittently occur as a fly over.

SCIENTIFIC NAME	COMMON NAME	BC ACT <sup>1</sup>	EPBC ACT <sup>2</sup>	HABITAT	DATA SOURCE	LIKELIHOOD OF OCCURRENCE
<i>Ardea (Bulbulcus) ibis</i>	Cattle Egret		M	Widespread and common according to migration movements and breeding localities surveys. Breeds in colonies, either mono-specific or with other Egrets/Herons. In Australia the principal breeding sites are the central east coast from about Newcastle to Bundaberg. It also breeds in major inland wetlands in north NSW (notably the Macquarie Marshes). Occurs in tropical and temperate grasslands, wooded lands and terrestrial wetlands. It has occasionally been seen in arid and semi-arid regions however this is extremely rare. High numbers have been observed in moist, low-lying poorly drained pastures with an abundance of high grass; it avoids low grass pastures. It has been recorded on earthen dam walls and ploughed fields. It is commonly associated with the habitats of farm animals, particularly cattle, but also pigs, sheep, horses and deer. The Cattle Egret is known to follow earth-moving machinery and has been located at rubbish tips. It uses predominately shallow, open and fresh wetlands including meadows and swamps with low emergent vegetation and abundant aquatic flora. They have sometimes been observed in swamps with tall emergent vegetation.	Bionet	Low Preferred habitat not present within study area
<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 present within study area. May occur occasionally in wooded areas nearby.
<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</i> spp.) and spikerushes ( <i>Eleocharis</i> spp.). 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 PMST	Low Preferred habitat not present within study area

SCIENTIFIC NAME	COMMON NAME	BC ACT <sup>1</sup>	EPBC ACT <sup>2</sup>	HABITAT	DATA SOURCE	LIKELIHOOD OF OCCURRENCE
<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 PMST	Low Preferred habitat not present 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.	EPBC PMST	Low Preferred habitat not present 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 (Pizzey and Knight 2007).	EPBC PMST	Low Preferred habitat not present within study area
<i>Callocephalon fimbriatum</i>	Gang-gang Cockatoo	V		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 available in study area. May occur as a fly over, however preferred foraging resources not within study area.

SCIENTIFIC NAME	COMMON NAME	BC ACT <sup>1</sup>	EPBC ACT <sup>2</sup>	HABITAT	DATA SOURCE	LIKELIHOOD OF OCCURRENCE
<i>Calyptorhynchus 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. gymnathera</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 available in study area. May occur as a fly over, however preferred foraging resources not within 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 (Pizzey and Knight 2007).	EPBC PMST	Low Preferred habitat not present 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 (Garnett and Crowley 2000). 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).	EPBC PMST	Low Preferred habitat not present within study area
<i>Cuculus opatus</i> ( <i>syn. 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 PMST	Low Preferred habitat not present 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 decortivating bark, dead branches, standing dead trees and small branches and twigs in the tree canopy.	Bionet	Low Preferred habitat not present within study area



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<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 PMST	Low Preferred habitat not present within study area
<i>Diomedea antipodensis</i>	Antipodean Albatross	V	VM	Breeds on Antipodes and Campbell Islands, New Zealand, foraging across the southwest Pacific and the Tasman Sea, including waters off the coasts of NSW (Garnett and Crowley 2000). Essentially an oceanic species, usually uncommon in inshore habitats and not entering enclosed waters.	EPBC PMST	Low Preferred habitat not present within study area
<i>Diomedea antipodensis gibsoni</i>	Gibson's Albatross	V	VM	Breeds on Auckland Island, New Zealand, and forages throughout the Tasman Sea (Garnett and Crowley 2000) where it is commonly encountered off the NSW coast during seabird surveys in the Austral winter. An oceanic species uncommon in inshore habitats and avoiding enclosed waters.	EPBC PMST	Low Preferred habitat not present within study area
<i>Diomedea epomophora epomophora</i>	Southern Royal Albatross		VM	Breeds on Campbell, Adams, Enderby and Auckland Islands, south of New Zealand (Garnett and Crowley 2000). A southern ocean pelagic species occasionally observed off southern Australian coasts, but rare in the north (Garnett and Crowley 2000).	EPBC PMST	Low Preferred habitat not present within study area
<i>Diomedea epomophora sanfordi</i>	Northern Royal Albatross		EM	Breeds on Chatham Island and Taiaroa Head on South Island of New Zealand (Garnett and Crowley 2000). Observed regularly in Tasmanian and South Australian waters and extends into the southwest Atlantic, but more rarely off the NSW coast (Garnett and Crowley 2000).	EPBC PMST	Low Preferred habitat not present within study area
<i>Diomedea exulans</i>	Wandering Albatross	E1	VM	Southern circumpolar distribution, breeding in Australian territory on Macquarie and Heard Islands (Garnett and Crowley 2000). Also breeds in subantarctic islands in the southern Atlantic and Indian oceans (Garnett and Crowley 2000). A pelagic species visiting mainland Australian waters seasonally occasionally occurring within sight of the coast.	EPBC PMST	Low Preferred habitat not present within study area

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<i>Falco hypoleucos</i>	Grey Falcon	E1		Generally centred on inland drainage systems where the average rainfall is less than 500 millimetres. It is found in timbered lowland plains that are crossed by tree-lined water courses. Nests in the old nests of other birds, particularly raptors (Garnett and Crowley 2000).	Bionet	Low Preferred habitat not present 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 Presence of foraging habitat in form of blossom eucalypts. May occur intermittently to forage during blossoming periods, however, unlikely to rely on habitat.
<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 PMST	Low Preferred habitat not present within study area
<i>Hieraetus 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 Preferred habitat not present within study area

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<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.	Bionet	Low Marginal habitat for species within the study area, fly-overs cannot be discounted or potential for occurrence during seasonal movements.
<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 PMST	Low Preferred habitat not present within study area
<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 PMST	Low Preferred habitat not present within study area

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<i>Limosa lapponica menzbieri</i>	Northern Siberian Bar-tailed Godwit, Bar-tailed Godwit (menzbieri)		CEM	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. The migratory Bar-tailed Godwit (northern Siberian) does not breed in Australia. Occurs mainly in coastal habitats in coastal habitats which include large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays. It also has been recorded in coastal sewage farms and saltworks, saltflakes and brackish wetlands near coasts, sandy ocean beaches, rock platforms and coral reef-flats.	EPBC PMST	Low Preferred habitat not present within study area
<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 Preferred habitat not present within study area
<i>Macronectes giganteus</i>	Southern Giant-Petrel	E1	EM	A partly nomadic marine species that forages off the coast of New South Wales (Garnett and Crowley 2000).	EPBC PMST	Low Preferred habitat not present within study area
<i>Macronectes halli</i>	Northern Giant-Petrel	V	VM	Nomadic marine species, that nest as dispersed pairs, often amidst tussocks in dense vegetation. Forages in inshore waters of southern Australia and occasionally visits the coast of NSW (Garnett and Crowley 2000).	EPBC PMST	Low Preferred habitat not present within study area
<i>Merops ornatus</i>	Rainbow Bee-eater		M	Usually occur in open or lightly timbered areas, often near water. Breed in open areas with friable, often sandy soil, good visibility, convenient perches and often near wetlands. Nests in embankments including creeks, rivers and sand dunes. Insectivorous, most foraging is aerial, in clearings.	Bionet	Low Preferred habitat not present 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 PMST	Low Preferred habitat not present within study area

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<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 PMST	Low Preferred habitat not present 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 PMST	Low Preferred habitat not present within study area
<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 PMST	Low Preferred habitat not present within study area

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<i>Ninox connivens</i>	Barking Owl	V		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.	Bionet	Low Preferred habitat not present within study area
<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 Allocasuarina littoralis, Blackwood Acacia melanoxylon, Rough-barked Apple Angophora floribunda, Cherry Ballart Exocarpus cupressiformis 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	Low Marginal foraging habitat present within study area. Known to occur within area, however, available habitat limited in study area, unlikely to rely or utilise habitat on regular basis.
<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 PMST	Low Preferred habitat not present within study area

SCIENTIFIC NAME	COMMON NAME	BC ACT <sup>1</sup>	EPBC ACT <sup>2</sup>	HABITAT	DATA SOURCE	LIKELIHOOD OF OCCURRENCE
<i>Pachyptila turtur</i>	Fairy Prion		V	<p>The Fairy Prion is a marine bird which breeds on subantarctic and cool temperate islands within the South Pacific, including the Bass Strait Islands, Tasmania, and Macquarie Island. Fairy Prions are commonly seen offshore from mainland Australia, feeding across the continental shelf and in pelagic waters. The species is particularly common in Tasmania, but does also visit the South east coast of Australia and is often found beach cast.</p> <p>Fairy Prions mostly feed on euphausiids (e.g. krill), and other small crustaceans, with small fish also constituting a smaller portion of their diet. The species is a colonial breeder, which, when breeding, lays a single egg at the end of a burrow. The burrow is usually established in soil, or in crevices and caves in cliffs or rock falls (Merchant and Higgins 1990).</p>	EPBC PMST	Low Preferred habitat not present within study area
<i>Petroica boodang</i>	Scarlet Robin	V		<p>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.</p>	Bionet	Low Preferred habitat not present within study area
<i>Petroica phoenicea</i>	Flame Robin	V		<p>In NSW the Flame Robin breeds in upland moist eucalypt forests and woodlands, often on ridges and slopes, in areas of open understorey. It migrates in winter to more open lowland habitats. In winter lives in dry forests, open woodlands and in pastures and native grasslands, with or without scattered trees. In winter, occasionally seen in heathland or other shrublands in coastal areas. Occasionally occurs in temperate rainforest, and also in herbfields, heathlands, shrublands and sedgeland at high altitudes.</p> <p>The Flame Robin forages from low perches, feeding on invertebrates taken from the ground, tree trunks, logs and other woody debris. The robin builds an open cup nest of plant fibres and cobweb, which is often near the ground in a sheltered niche, ledge or shallow cavity in a tree, stump or bank (Higgins and Peter 2002, Office of Environment &amp; Heritage 2015).</p>	Bionet	Low Preferred habitat not present within study area



SCIENTIFIC NAME	COMMON NAME	BC ACT <sup>1</sup>	EPBC ACT <sup>2</sup>	HABITAT	DATA SOURCE	LIKELIHOOD OF OCCURRENCE
<i>Ptilinopus superbus</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 Preferred habitat not present within study area
<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 PMST	Low Preferred habitat not present within study area
<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 PMST	Low Preferred habitat not present within study area
<i>Sternula nereis nereis</i>	Fairy Tern (Australian)		V	Fairy Terns utilise a variety of habitats including offshore, estuarine or lacustrine (lake islands, wetlands, beaches and spits). The subspecies may migrate within southern Western Australia and Tasmania, where they are seen less frequently during the winter months. They are more sedentary in the north of Western Australia, and in South Australia and Victoria (Hill 1988). Fairy Terns nest in small colonies on coral shingle on continental islands or coral cays, on sandy islands and beaches inside estuaries, and on open sandy beaches (Hill 1988, Higgins and Davies 1996). They nest above the high water mark often in clear view of the water and on sites where the substrate is sandy and the vegetation low and sparse. Colonies tend to occupy areas rather than specific sites, and nest sites are often abandoned after one year, even if they have been successful (Saunders 1985).	EPBC PMST	Low Preferred habitat not present within study area

SCIENTIFIC NAME	COMMON NAME	BC ACT <sup>1</sup>	EPBC ACT <sup>2</sup>	HABITAT	DATA SOURCE	LIKELIHOOD OF OCCURRENCE
<i>Thalassarche bulleri</i>	Buller's Albatross		VM	Breeds on Snares and Solander Islands, New Zealand, foraging locally, but also foraging widely enough to cross the Tasman (Garnett and Crowley 2000). An oceanic species uncommon in inshore habitats and avoiding enclosed waters.	EPBC PMST	Low Preferred habitat not present within study area
<i>Thalassarche bulleri platei</i>	Northern Buller's Albatross		V	The Pacific Albatross is a non-breeding visitor to Australian waters. Foraging birds are mostly limited to the Pacific Ocean and the Tasman Sea, although birds do reach the east coast of the Australian mainland (EA 2001f). The Pacific Albatross is a marine, pelagic species. It occurs in subtropical and subantarctic waters of the South Pacific Ocean (Marchant & Higgins 1990). Habitat preferences are poorly known (Marchant & Higgins 1990). In New Zealand, the species has been observed in association with fishing boats close inshore and over waters of 180–360 m depth (Robertson & Jenkins 1981; Secker 1969) although it is not so strongly associated with fishing grounds as are other albatrosses (Bartle 1974). Occurrence within the Australian Fishing Zone is likely (Garnett & Crowley 2000), however, the threat from longline injury is considered low (AGDEH 2006q).	EPBC PMST	Low Preferred habitat not present within study area
<i>Thalassarche cauta cauta</i>	Shy Albatross	V	VM	An Australian territory endemic, which breeds on three islands off southern Tasmania; Albatross, Bass and Pedra Branca Islands (Marchant and Higgins 1990). Genetic data studies on shy-type albatross collected off New Zealand, Australia and South Africa, strongly suggest that most Shy Albatross remain close to the breeding grounds throughout the year, with few birds moving north beyond the southern NSW coast (Abbott 2006).	EPBC PMST	Low Preferred habitat not present within study area
<i>Thalassarche eremita</i>	Chatham Albatross		EM	Very restricted breeding on Pyramid Rock, Chatham Island (Garnett and Crowley 2000). Many disperse eastwards as far as South America, but it is occasionally encountered off eastern Australia's southern coasts (Garnett and Crowley 2000).	EPBC PMST	Low Preferred habitat not present within study area
<i>Thalassarche impavida</i>	Campbell Albatross		VM	Recently separated from the closely related Black-browed Albatross and only separable from this species in individuals of sufficient age to develop the distinctive amber iris. Breeds on Campbell Island New Zealand foraging locally during this period (Garnett and Crowley 2000). Outside the breeding season forages around New Zealand, the Central Pacific and Australia (Garnett and Crowley 2000).	EPBC PMST	Low Preferred habitat not present within study area

SCIENTIFIC NAME	COMMON NAME	BC ACT <sup>1</sup>	EPBC ACT <sup>2</sup>	HABITAT	DATA SOURCE	LIKELIHOOD OF OCCURRENCE
<i>Thalassarche melanophris</i>	Black-browed Albatross	V	VM	Nomadic marine species that breeds on subantarctic island outside Australian waters, but moves northwards in non-breeding seasons. The waters off southern Australia between Brisbane and Perth are the principal feeding area of birds (Garnett and Crowley 2000). Black-browed-type albatross are more regularly observed from shore than more pelagic albatross species.	EPBC PMST	Low Preferred habitat not present within study area
<i>Thalassarche salvini</i>	Salvin's Albatross		VM	An oceanic species that breeds on Bounty, Snares and Chatham Islands, south of New Zealand, and Crozet Island in the southern Indian Ocean (Garnett and Crowley 2000). Most individuals disperse east to the eastern Pacific Ocean from the breeding grounds, but a few individuals visit Australian waters, although few reach north of southern NSW.	EPBC PMST	Low Preferred habitat not present within study area
<i>Thalassarche steadi</i>	White-capped Albatross		VM	An oceanic species that breeds on Adams, Auckland, Bollons, Disappointment and Chatham Islands south of New Zealand (Garnett and Crowley 2000). Global population between 70,000 and 80,000 pairs the majority of which breed on Disappointment Island (Garnett and Crowley 2000). During the breeding season most birds remain around the breeding islands and into the Tasman Sea (Garnett and Crowley 2000). Outside of the breeding season genetic data from bycatch studies strongly indicates that White-capped Albatross wander widely in Australasian waters and west as far as South Africa (Abbott 2006).	EPBC PMST	Low Preferred habitat not present within study area
<b>FISH (3)</b>						
<i>Epinephelus daemeli</i>	Black Cod	V	V	Adult black cod are usually found in caves, gutters and beneath bombores on rocky reefs. They are territorial and often occupy a particular cave for life. Small juveniles are often found in coastal rock pools, and larger juveniles around rocky shores in estuaries. Black cod are opportunistic carnivores, eating mainly other fish and crustaceans. They can change from one colour pattern to another in just a few seconds. They are usually black in estuaries and banded around clear water reefs. Black cod are apparently slow growing. Smaller fish are mostly females, but they generally change sex to become males at around 100-110 cm in length.	EPBC PMST	Low Preferred habitat not present within study area

SCIENTIFIC NAME	COMMON NAME	BC ACT <sup>1</sup>	EPBC ACT <sup>2</sup>	HABITAT	DATA SOURCE	LIKELIHOOD OF OCCURRENCE
<i>Macquaria australasica</i>	Macquarie Perch		E	Macquarie Perch are found in the Murray-Darling Basin (particularly upstream reaches) of the Lachlan, Murrumbidgee and Murray rivers, and parts of south-eastern coastal NSW, including the Hawkesbury/Nepean and Shoalhaven catchments. Macquarie Perch are found in both river and lake habitats; especially the upper reaches of rivers and their tributaries. It prefers clear water and deep, rocky holes with lots of cover. As well as aquatic vegetation, additional cover may comprise of large boulders, debris and overhanging banks. Spawning occurs just above riffles (shallow running water).	EPBC PMST	Low Preferred habitat not present within study area
<i>Prototroctes maraena</i>	Australian Grayling		V	Occurs in streams and rivers on the eastern and southern flanks of the Great Dividing Range, from Sydney, southwards to the Otway Ranges of Victoria and in Tasmania. The species is found in fresh and brackish waters of coastal lagoons, from Shoalhaven River in NSW to Ewan Ponds in South Australia. The Australian Grayling is diadromous, spending part of its lifecycle in freshwater and at least part of the larval and/or juvenile stages in coastal seas. Adults (including pre spawning and spawning adults) inhabit cool, clear, freshwater streams with gravel substrate and areas alternating between pools and riffle zones such as the Tambo River, which is also known to have granite outcrops. The species has also been associated with clear, gravel-bottomed habitats in the Mitchell and Wonnangatta Rivers (Victoria) and in a muddy-bottomed, heavily silted habitat in the Tarwin River (Victoria). The species has been found over 100 km upstream from the sea.	EPBC PMST	Low Preferred habitat not present within study area
<b>INVERTEBRATES (1)</b>						
<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.	Bionet , EPBC PMST	Low Preferred habitat not present within study area

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<b>MAMMALS (15)</b>						
<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.	EPBC PMST	Low Preferred habitat not present within study area
<i>Dasyurus maculatus maculatus</i>	Spotted-Tailed Quoll (Southern Subspecies)	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 PMST	Low Preferred habitat not present within study area
<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 foraging habitat present within 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.	EPBC PMST	Low Preferred habitat not present within study area

SCIENTIFIC NAME	COMMON NAME	BC ACT <sup>1</sup>	EPBC ACT <sup>2</sup>	HABITAT	DATA SOURCE	LIKELIHOOD OF OCCURRENCE
<i>Miniopterus australis</i>	Little Bent-wing 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 foraging habitat present within study area.
<i>Miniopterus orianae oceanensis</i>	Eastern Bent-wing Bat	V		This species is found along the east coast of Australia from Cape York in Queensland to Castlemaine in Victoria. Habitat includes rainforest, wet and dry sclerophyll forest, monsoon forest, open woodland, Melaleuca forests and open grasslands. Roosts in caves, old mines, stormwater channels and sometimes buildings with populations centred on maternity caves that are used annually for the birth and development of young (Churchill 2008).	Bionet	Low Marginal foraging habitat present within study area.
<i>Mormopterus (Micronomus) 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 foraging habitat present within 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 Preferred habitat not present within study area
<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.	Bionet , EPBC PMST	Low Preferred habitat not present within study area

SCIENTIFIC NAME	COMMON NAME	BC ACT <sup>1</sup>	EPBC ACT <sup>2</sup>	HABITAT	DATA SOURCE	LIKELIHOOD OF OCCURRENCE
<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 PMST	Low Preferred habitat not present within study area
<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. Inhabits eucalypt woodlands and forests. Koalas 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. The preferred tree species vary widely on a regional and local basis. Some preferred species include Forest Red Gum <i>Eucalyptus tereticornis</i> , Grey Gum <i>E. punctata</i> . In coastal areas, Tallowwood <i>E. microcorys</i> and Swamp Mahogany <i>E. robusta</i> are important food species, while in inland areas White Box <i>E. albens</i> , Bimble Box <i>E. populnea</i> and River Red Gum <i>E. camaldulensis</i> are favoured (NSW National Parks and Wildlife Service 1999, NSW National Parks and Wildlife Service 2003, Heritage; 2015).	Bionet , EPBC PMST	Low Preferred habitat not present 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 PMST	Low Preferred habitat not present within study area



SCIENTIFIC NAME	COMMON NAME	BC ACT <sup>1</sup>	EPBC ACT <sup>2</sup>	HABITAT	DATA SOURCE	LIKELIHOOD OF OCCURRENCE
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	V	V	Grey-headed Flying-foxes are generally found within 200km 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 20km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy. Can travel up to 50km from the camp to forage; commuting distances are more often <20km. Feed on the nectar and pollen of native trees, in particular Eucalyptus, Melaleuca and Banksia, and fruits of rainforest trees and vines.	Bionet , EPBC PMST	Low Presence of foraging habitat in form of blossom eucalypts or fruiting trees. May occur intermittently to forage during blossoming periods or fruiting periods, however, unlikely to rely on habitat.
<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 foraging habitat present within study area.
<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 500m. 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 3-6m.	Bionet	Low Marginal foraging habitat present within study area.
<b>REPTILES (1)</b>						
<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 PMST	Low Preferred habitat not present within study area

**1** V = Vulnerable, E1 = Endangered species, E2 = Endangered population listed under the BC Act

**2** V = Vulnerable, E = Endangered, M = Migratory listed under the EPBC Act

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