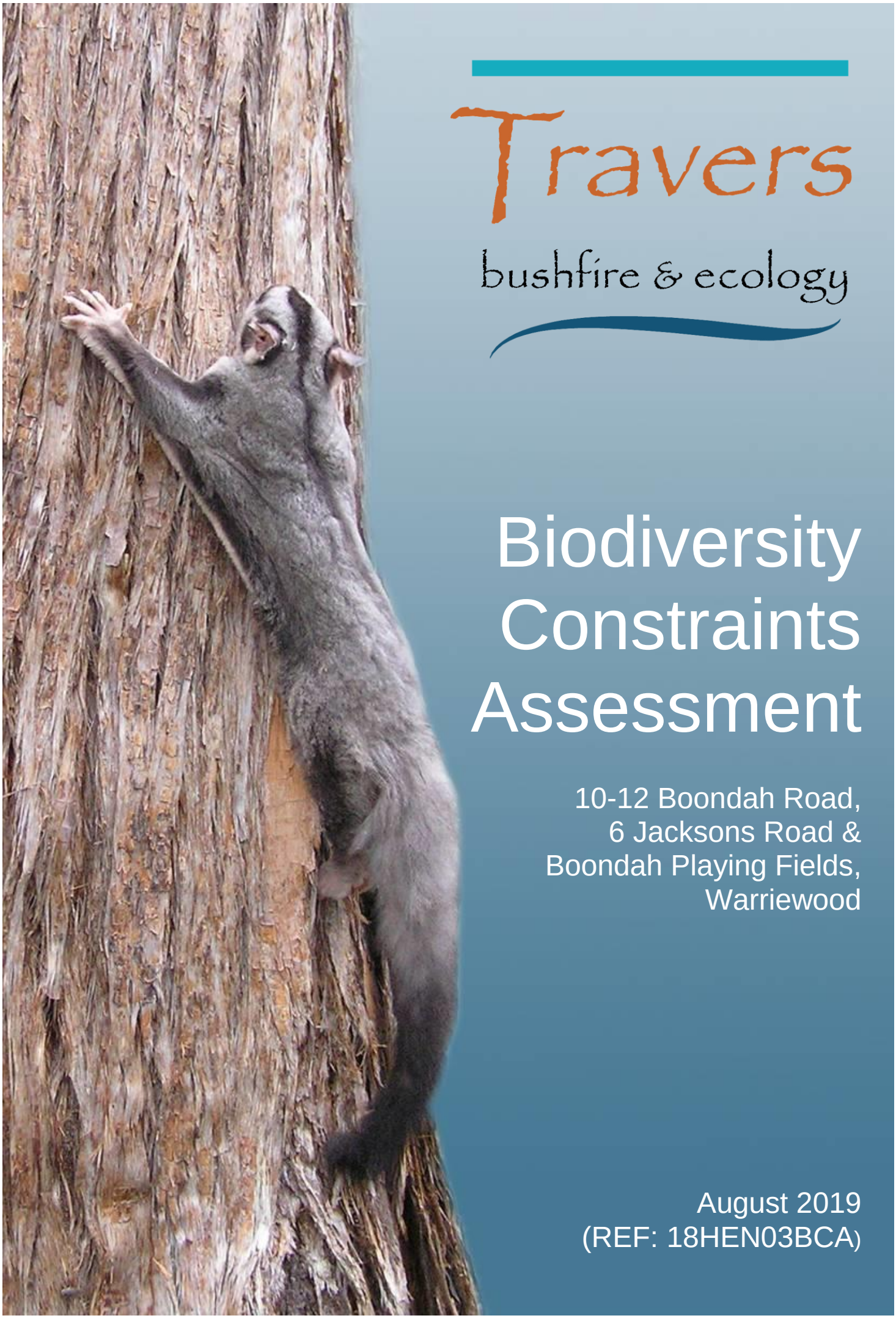

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Biodiversity Constraints Assessment

10-12 Boondah Road,
6 Jacksons Road &
Boondah Playing Fields,
Warriewood

August 2019
(REF: 18HEN03BCA)

Biodiversity Constraints Assessment

10-12 Boondah Road, 6 Jacksons Road &
Boondah Playing Fields
Warriewood

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File:	18HEN03BCA

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Disclaimer:

This report has been prepared to provide advice to the client on matters pertaining to the particular and specific development proposal as advised by the client and / or their authorised representatives. This report can be used by the client only for its intended purpose and for that purpose only. Should any other use of the advice be made by any person, including the client, then this firm advises that the advice should not be relied upon. The report and its attachments should be read as a whole and no individual part of the report or its attachments should be interpreted without reference to the entire report.

The mapping is indicative of available space and location of features which may prove critical in assessing the viability of the proposed works. Mapping has been produced on a map base with an inherent level of inaccuracy, the location of all mapped features are to be confirmed by a registered surveyor.

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List of abbreviations

APZ	asset protection zone
BAM	Biodiversity Assessment Method
BAR	Biodiversity Assessment Report
BC Act	*Biodiversity Conservation Act (2016)*
BC Reg	*Biodiversity Conservation Regulation (2017)*
BCAR	Biodiversity Certification Assessment Report
BDAR	Biodiversity Development Assessment Report
BOS	Biodiversity Offset Scheme
BPA	bushfire protection assessment
BSSAR	Biodiversity Stewardship Site Assessment Report
CEEC	Critically endangered ecological community
CM Act	*Coastal Management Act 2016*
DCP	development control plan
DEC	NSW Department of Environment and Conservation (superseded by DECC from April 2007)
DECC	NSW Department of Environment and Climate Change (superseded by DECCW from October 2009)
DECCW	NSW Department of Environment, Climate Change and Water (superseded by OEH from April 2011)
DEWHA	Commonwealth Department of Environment, Water, Heritage & the Arts (superseded by SEWPAC)
DOEE	Commonwealth Department of Environment & Energy
EEC	endangered ecological community
EPA	Environmental Protection Agency
EP&A Act	*Environmental Planning and Assessment Act (1979)*
EPBC Act	*Environment Protection and Biodiversity Conservation Act (1999)*
FM Act	*Fisheries Management Act*
IBRA	Interim Biogeographic Regionalisation for Australia
LEP	local environmental plan
LGA	local government area
LLS Act	*Local Land Services Act (2013*)
NES	national environmental significance
NPW Act	*National Parks and Wildlife Act (1974)*
NSW DPI	NSW Department of Industry and Investment
OEH	Office of Environment and Heritage
PCT	plant community type
PFC	projected foliage cover
RFS	NSW Rural Fire Service
ROTAP	rare or threatened Australian plants
SAII	Serious And Irreversible Impacts
SEPP	State Environmental Planning Policy
SEWPAC	Commonwealth Dept. of Sustainability, Environment, Water, Population & Communities (superseded by DOEE)
SIS	species impact statement
SULE	safe useful life expectancy
TEC	threatened ecological community
TPZ	tree preservation zone
TSC Act	*Threatened Species Conservation Act (1995) – Superseded by the Biodiversity Conservation Act (2016)*
VMP	vegetation management plan

Biodiversity Assessment

1.0 Background

Travers bushfire & ecology has been engaged to undertake a biodiversity constraints assessment for a proposed rezoning within Lots 3 and 4 DP26902 at 10-12 Boondah Road; Lot 9 DP806132 and Lots 7072 and 7073 DP93778 at 2–6 Jacksons Road, Warriewood within the Northern Beaches local government area (LGA). The extent of these lots is shown in Figure 1.

Survey has been previously undertaken by *Travers bushfire & ecology* in 2013 and 2016 within the subject lots and the immediate locality. Previous surveys have extended out to the Southern Buffer Area outlined in a previously prepared Warriewood Valley Strategic Review Report.

The proposal is to be assessed under the *Biodiversity Conservation Act* (BC Act), 2016.

Figure 1 – Land Subject to rezoning proposal (red)

1.1 Proposed rezoning

The proposed rezoning aims to facilitate medium density residential and recreational open space.

The site is currently zoned RU2 – Rural Landscape, RE1 – Public Recreation and SP2 – Infrastructure (refer Figure 2). The proposal seeks a rezoning of the site to R3 – Medium Density Residential and RE1 – Public Recreation (Figure 2).

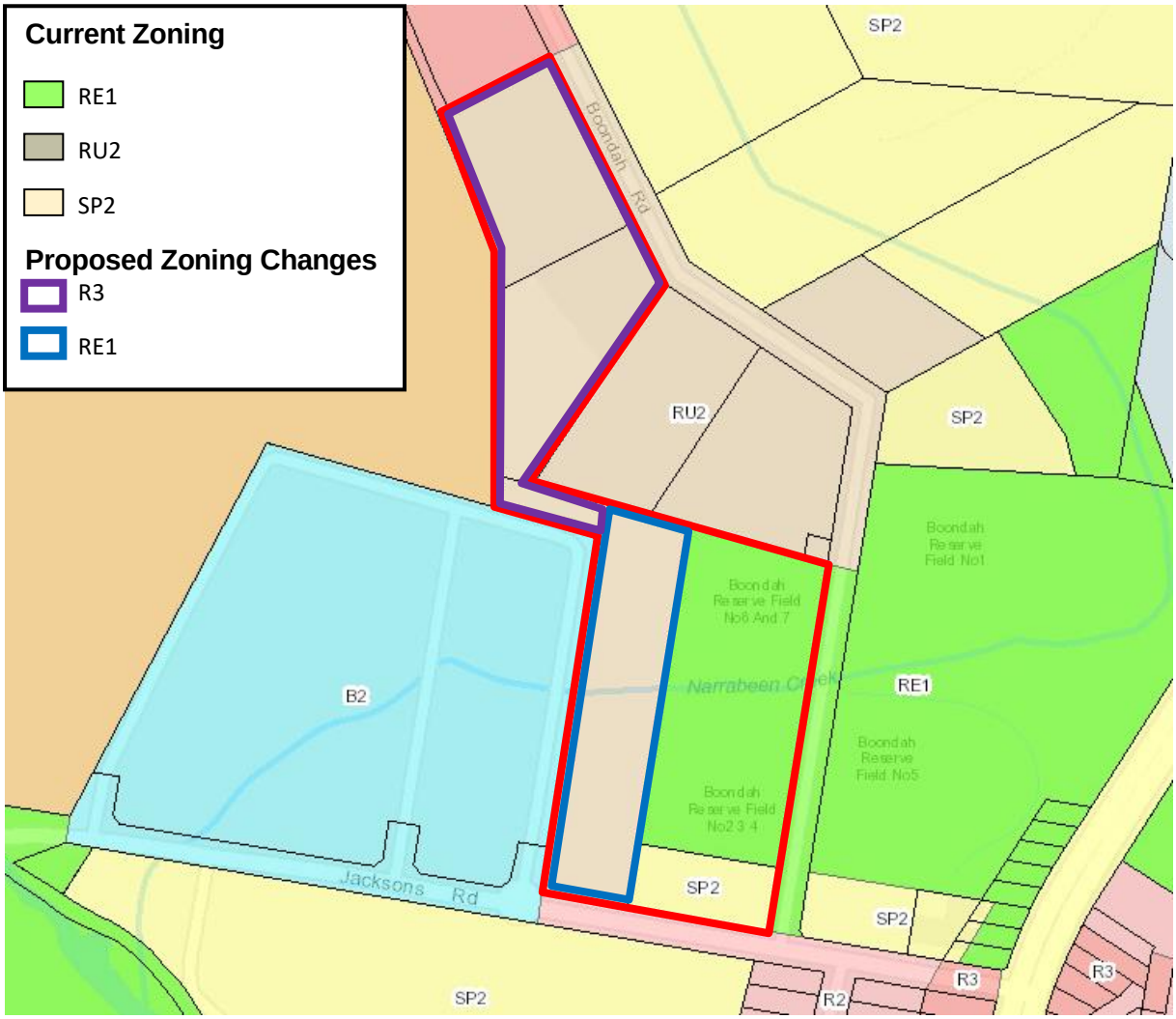


Figure 2 – Current and proposed zoning
(Source: Travers bushfire & ecology from client correspondence)

The *Pittwater Local Environmental Plan 2014* provides the following information regarding zoning:

Zone RU2 Rural Landscape

1 Objectives of zone

- To encourage sustainable primary industry production by maintaining and enhancing the natural resource base.
- To maintain the rural landscape character of the land.
- To provide for a range of compatible land uses, including extensive agriculture.

- To ensure that development in the area does not unreasonably increase the demand for public services or public facilities.
- To minimise conflict between land uses within this zone and land uses within adjoining zones.

2 Permitted without consent

Extensive agriculture; Home businesses; Home occupations

3 Permitted with consent

Agriculture; Animal boarding or training establishments; Bed and breakfast accommodation; Building identification signs; Business identification signs; Child care centres; Community facilities; Dual occupancies (attached); Dwelling houses; Environmental facilities; Environmental protection works; Farm buildings; Farm stay accommodation; Forestry; Function centres; Home-based child care; Home industries; Industrial retail outlets; Industrial training facilities; Information and education facilities; Landscaping material supplies; Places of public worship; Plant nurseries; Recreation areas; Respite day care centres; Roads; Roadside stalls; Rural industries; Rural supplies; Rural workers' dwellings; Secondary dwellings; Veterinary hospitals.

4 Prohibited

Any development not specified in item 2 or 3

Zone R3 Medium Density Residential

1 Objectives of zone

- To provide for the housing needs of the community within a medium density residential environment.
- To provide a variety of housing types within a medium density residential environment.
- To enable other land uses that provide facilities or services to meet the day to day needs of residents.
- To provide for a limited range of other land uses of a low intensity and scale, compatible with surrounding land uses.

2 Permitted without consent

Home businesses; Home occupations

3 Permitted with consent

Attached dwellings; Bed and breakfast accommodation; Boarding houses; Building identification signs; Business identification signs; Child care centres; Community facilities; Dual occupancies; Dwelling houses; Environmental protection works; Exhibition homes; Group homes; Health consulting rooms; Home-based child care; Home industries; Multi dwelling housing; Neighbourhood shops; Places of public worship; Residential flat buildings; Respite day care centres; Roads; Secondary dwellings; Semi-detached dwellings; Seniors housing; Serviced apartments; Veterinary hospitals.

4 Prohibited

Any development not specified in item 2 or 3.

Zone SP1 Special Activities

1 Objectives of zone

- To provide for special land uses that are not provided for in other zones.
- To provide for sites with special natural characteristics that are not provided for in other zones.
- To facilitate development that is in keeping with the special characteristics of the site or its existing or intended special use, and that minimises any adverse impacts on surrounding land.

2 Permitted without consent

Nil.

3 Permitted with consent

Building identification signs; Business identification signs; Environmental protection works; Roads; The purpose shown on the Land Zoning Map, including any development that is ordinarily incidental or ancillary to development for that purpose.

4 Prohibited

Any development not specified in item 2 or 3.

Zone RE1 Public Recreation

1 Objectives of zone

- To enable land to be used for public open space or recreational purposes.
- To provide a range of recreational settings and activities and compatible land uses.
- To protect and enhance the natural environment for recreational purposes.
- To allow development that does not substantially diminish public use of, or access to, public open space resources.
- To provide passive and active public open space resources, and ancillary development, to meet the needs of the community.

2 Permitted without consent

Building identification signs; Environmental protection works; Horticulture; Markets; Roads.

3 Permitted with consent

Child care centres; Community facilities; Environmental facilities; Information and education facilities; Kiosks; Public administration buildings; Recreation areas; Recreation facilities (indoor); Recreation facilities (outdoor); Respite day care centres; Restaurants or cafes; Signage; Take away food and drink premises; Water recreation structures.

4 Prohibited

Any development not specified in item 2 or 3

1.2 Preliminary concept development

A preliminary concept plan has been drafted in association with the proposed rezoning. The concept ground floor plan (refer Figure 3) provides for approximately one hundred and

twenty (120) units, spanning over five (5) building blocks (Buildings A, B, C, D & E). The actual dwelling mix and type will be determined at the development application stage.

1.3 Site description

Table 1 provides a summary of the planning, cadastral, topographical, and disturbance details of the subject lots.

Table 1 – Site features

Location	Lots 3 and 4 DP26902 at 10-12 Boondah Road; Lot 9 DP806132 and Lots 7072 and 7073 DP93778 at 2–6 Jacksons Road, Warriewood
Size	Approximately 5.75 ha
Local government area	Northern Beaches (formerly Pittwater)
Grid reference	342213E 6270482S
Elevation	Approximately 3–5 m AHD
Topography	The study area is almost flat with a slight rise from west to east
Geology and soils	Quaternary silty to peaty quartz sand, silt, and clay. Ferruginous and humic cementation in places. Common shell layers. The soil landscape within the site is mapped as “Disturbed Terrain”.
Catchment and drainage	Narrabeen Creek, which is a second-order stream, flows east to west through the southern portion of the study area then into South Creek and Narrabeen Lagoon.
Vegetation	Floodplain forests, wetlands and Bangalay forests
Existing land use	Residential, sports fields and vacant land. RU2 – Rural Landscape; RE1 – Public Recreation; SP2 Infrastructure.
Clearing	Approximately 75% of 10–12 Boondah Road has been previously cleared. Some parts of 6 Jacksons Road have been cleared or have been used as a shortcut to Warriewood Centro (shopping centre adjacent). 2–2A Jacksons Road is mostly cleared with some remnant vegetation along Narrabeen Creek.

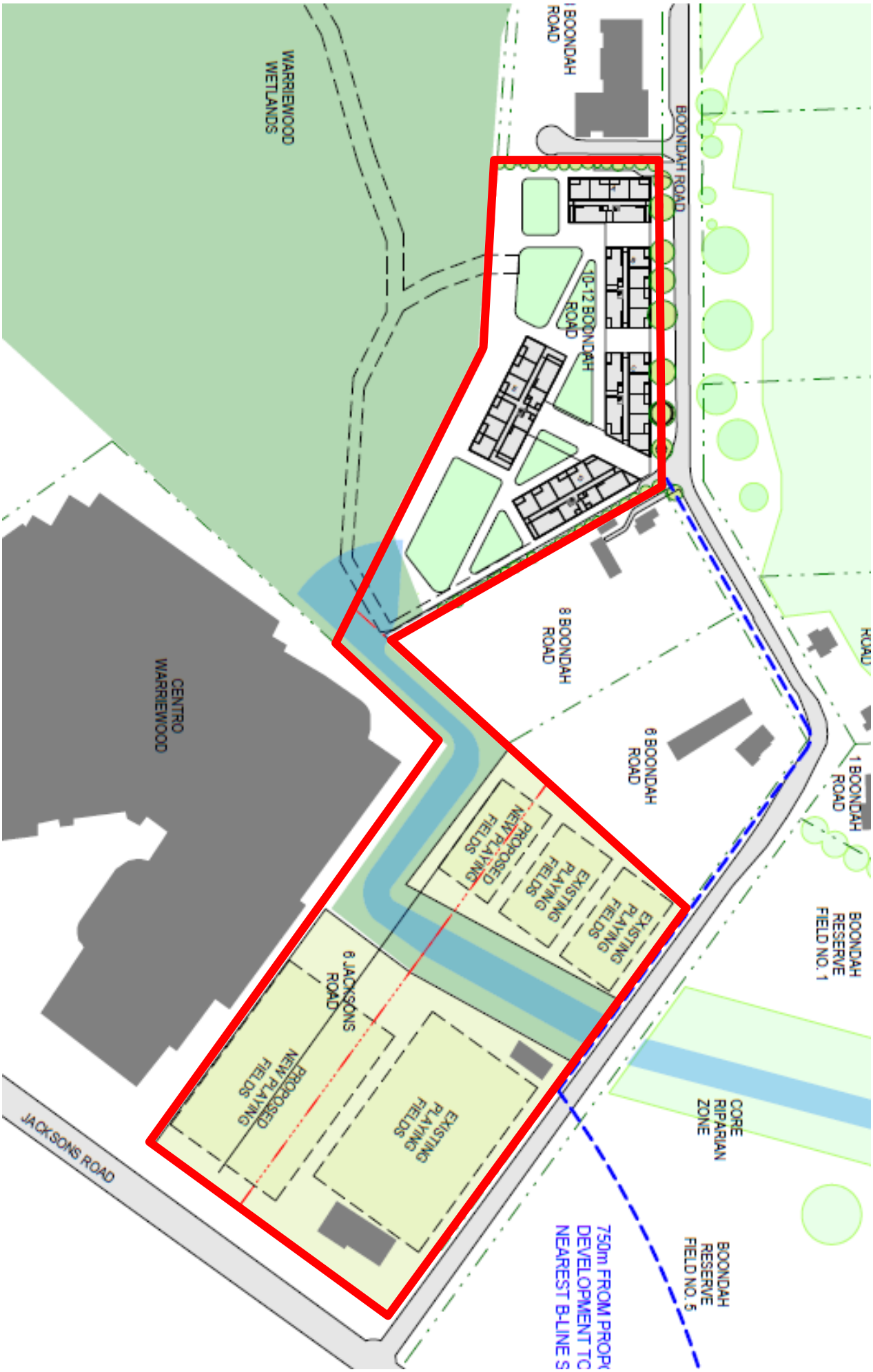
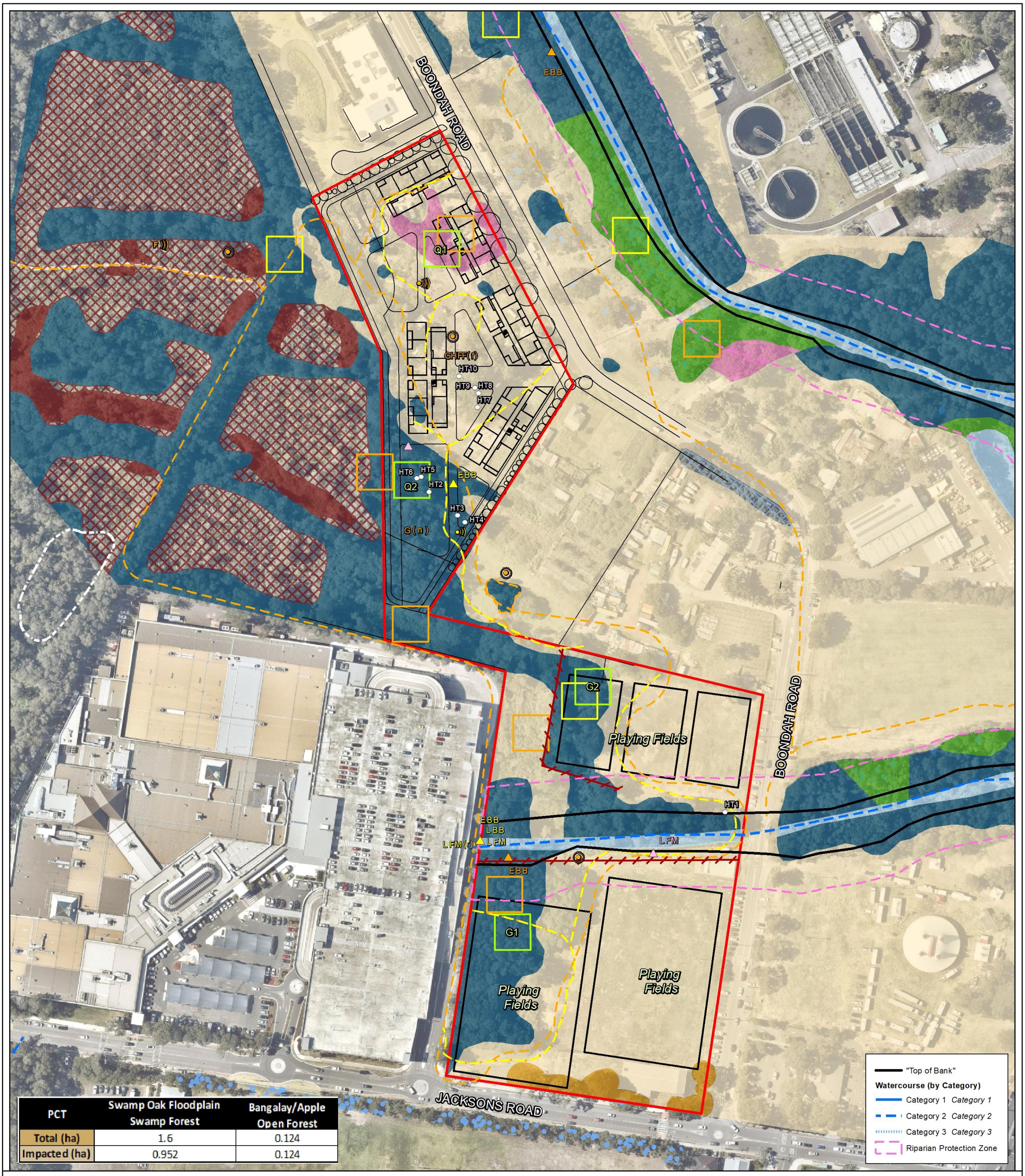


Figure 3 – Concept development plan
(Source: Buchan, drawing number PP-A-0050, dated 12.08.19)



PCT	Swamp Oak Floodplain Swamp Forest	Bangalay/Apple Open Forest
Total (ha)	1.6	0.124
Impacted (ha)	0.952	0.124

Legend

- Development site boundary
- Warriewood Wetlands
- Open water
- Habitat Tree

Flora Survey Effort

- Flora quadrat (20x20m) (2012)
- Flora quadrat (20x20m) (2013)
- Flora quadrat (20x20m) (2019)
- Proposed perimeter fence
- Proposed palying fields
- Asset Protection Zone (APZ)

Fauna Survey Effort 2013

- Anabat Station
- Call Playback
- Green-Golden Bell Frog
- Diurnal Bird Census

Fauna Survey Results 2013

- EBB Eastern Bentwing-bat
- G(n) Goshawk Nest
- CHFF(f) Grey Headed Flying-fox (foraging)
- Grey Headed Flying-fox (roosting camp)

Fauna Survey Effort 2016

- Anabat station

Fauna Survey Results 2016

- LFM Large-footed Myotis (possible)

Fauna Survey Effort (2019)

- Ultrasonic bat recorder
- Call-playback

Fauna Survey Results (2019)

- EBB Eastern Bentwing-bat
- LBB Little Bentwing-bat
- LFM Large-footed Myotis
- LFM(r) Large-footed Myotis (culvert roost)

Vegetation Communities

- Cleared or exotic with occasional remnant trees
- 1793 Smooth-barked Apple - Bangalay / Tuckeroo - Cheese Tree Open Forest
- 1232 Swamp Oak Floodplain Swamp Forest
- 1232 Planted Swamp Oak Floodplain Swamp Forest
- 1795 Swamp Mahogany / Cabbage Tree Palm - Cheese Tree - Swamp Oak Tall Open Forest
- 781 Coastal Freshwater Lagoons
- 1236 Swamp Paperbark - Swamp Oak Tall Shrubland
- Planted native vegetation

Aerial source: Nearmap

Travers bushfire & ecology

PROJECT & MXD REFERENCE
10 & 12 Boondah Road, Warriewood
18HEN03_FF001

DATE & ISSUE NUMBER
21/08/2019
Issue 1
AW

SCALE & COORDINATE SYSTEM
1:2,000 @ A3
GDA 1994 MGA Zone 56

0 25 50 m

TITLE

Flora and Fauna Survey Effort and Results

Disclaimer: The mapping is indicative of available space and location of features which may prove critical in assessing the viability of the proposed works. Mapping has been produced on a map base with an inherent level of inaccuracy, the location of all mapped features are to be confirmed by a registered surveyor.

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Figure 4 – Flora and fauna survey effort and results

2.0 Biodiversity Offsets Scheme (BOS)

The *BC Act* repeals the *Threatened Species Conservation Act 1995*, the *Nature Conservation Trust Act 2001* and the animal and plant provisions of the *National Parks and Wildlife Act 1974*.

Together with the *Biodiversity Conservation Regulation 2017*, the *BC Act* establishes a new regulatory framework for assessing and offsetting biodiversity impacts on proposed developments and clearing. It establishes a framework to avoid, minimise and offset impacts on biodiversity from development through the Biodiversity Offsets Scheme (BOS). Where development consent is granted, the authority may impose as a condition of consent an obligation to retire a number and type of biodiversity credits determined under the new Biodiversity Assessment Method (BAM).

2.1 Threshold assessment

The BOS includes two (2) elements to the threshold test – an area trigger and a sensitive biodiversity values land map trigger. If clearing exceeds either trigger, the BOS applies to the proposed clearing.

2.1.1 Sensitive Biodiversity Land Map

Sensitive biodiversity values land has been mapped in the southern corner of Lot 4 DP26902, across most of Lot 9 DP806132, and in the centre of Lot 7072 DP93778 associated with the riparian area of Narrabeen Creek. Under this trigger, an offset is required for any clearing of native vegetation within the mapped purple areas. Figure 4 shows the study area (blue) in relation to those areas (purple) mapped as having biodiversity values. The mapped areas appear to closely match the existing Swamp Oak Floodplain Forest EEC within the study area (see Section 3.5 of this report).

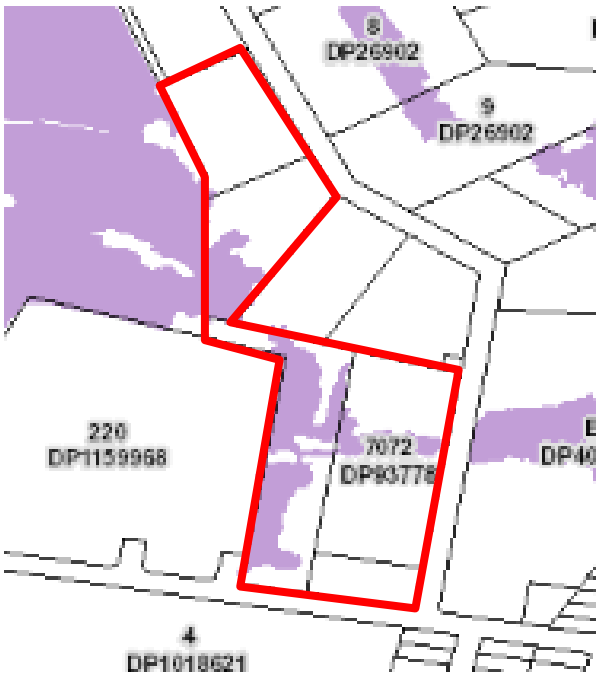


Figure 5 – Biodiversity value land (purple) relative to the study area (red)
(Source: OEH – Biodiversity Values Map – August 2019)

2.1.2 Area clearing threshold

The area threshold varies depending on the minimum lot size (shown in the Lot Size Maps made under the relevant Local Environmental Plan (LEP)), or actual lot size (where there is no minimum lot size provided for the relevant land under the LEP).

Table 2 – BOS entry threshold report

Date of Calculation	07/08/2019 4:10 PM	**BDAR Required***
Total Digitised Area	3.65 ha	
Minimum Lot Size Method	Lot size	
Minimum Lot Size	0.38 ha	
Area Clearing Threshold	0.25 ha	
Area clearing trigger Area of native vegetation cleared	Unknown #	Unknown #
Biodiversity values map trigger Impact on biodiversity values map(not including values added within the last 90 days)?	yes	yes
Date of the 90 day Expiry	N/A	

Table 2 identifies that the BOS entry threshold report has determined the area threshold based on the smallest actual lot size of 0.38 ha, and the area clearing threshold for which the BOS applies is 0.25 ha. Clearing of native vegetation that exceeds 0.25 ha will require a biodiversity offset to be obtained. Note that native vegetation includes planted native species. Based on the preliminary concept plan, future development is likely to impact 1.18 ha of native vegetation, therefore offsetting will likely be required under this trigger.

2.2 Serious and irreversible impacts on biodiversity values

The determination of SAII is to be made in accordance with principles prescribed section 6.7 of the *BC Regulation* (2017). The principles have been designed to capture those impacts which are likely to contribute significantly to the risk of extinction of a threatened species or ecological community in New South Wales.

Candidate SAII entities/species recorded or with potential to occur within the study area include:

- Eastern Bentwing-bat (recorded)
- Little Bentwing-bat (recorded)
- Eastern Cave Bat
- Large-eared Pied Bat
- Regent Honeyeater
- Swift Parrot

The ecological data profiles of each of the above listed candidate species has been reviewed to determine any habitat constraints present for breeding and foraging. There is no presence of these constraints and therefore the proposal is not considered likely to cause serious and irreversible impacts.

Of note, Large-footed Myotis was recorded roosting in the culvert on the edge of the subject lots running under the adjacent shopping center. Often the Bentwing-bats are recorded roosting in similar habitats alongside Large-footed Myotis and therefore could be expected to utilise this same roosting location. Such habitat however is not likely to be utilised for breeding by the two recorded candidate SAII species.

3.0 Flora

3.1 Survey

Botanical survey was undertaken on 19 June and 8 August 2019 over a total time frame of approximately 5 hrs.

Botanical survey included a random meander in accordance with *Cropper* (1993) to gain a full species list of the plants within the site, and then four (4) 20 m x 20 m flora quadrats were undertaken within remnant native vegetation. A review of the *Atlas of NSW Wildlife* (OEH 2019) was undertaken prior to the site visit to determine threatened species previously recorded within 10km of the subject lots, and opportunistic searches were undertaken during the random meander and stratified survey.

Data from previous surveys undertaken by *Travers bushfire & ecology* in 2012 and 2013 were also utilised for this report.

All naturally occurring species were identified to species level where possible, and are listed in Appendix 2.

3.2 Vegetation communities

The following vegetation communities were recorded within the study area:

- PCT 1232 – Swamp Oak floodplain swamp forest
- PCT 1793 – Smooth-barked Apple - Bangalay / Tuckeroo - Cheese Tree open forest
- Planted native vegetation
- Cleared or exotic vegetation with occasional remnant trees

PCT 1232 – Swamp Oak floodplain swamp forest

Canopy:

Canopy consists of *Casuarina glauca* to a height of 15–22 m and a projected foliage cover (PFC) of 20–75%. Naturalised exotic species such as *Erythrina sykesii* and *Cinnamomum camphora* are abundant in some areas and provide up to 25% PFC.

Mid-storey:

The mid-storey is largely devoid of native vegetation, however, occasional small trees, palms and shrubs are present such as *Melaleuca linearifolia, Melaleuca ericifolia, Glochidion ferdinandi, Parsonsia straminea* and *Livistona australis* up to 10% PFC. The mid-storey contains a high abundance of naturalised exotics such as *Lantana camara, Senna pendula, Ipomoea indica, Arundo donax, Anredera cordifolia* and *Loncera japonica*.

Ground layer:

The ground layer contains a number of sedges, herbs and ferns including *Phragmites australis, Machaerina juncea, Machaerina articulata, Persicaria decipiens, Juncus* spp., *Gahnia sieberiana, Hypolepis muelleri, Centella asiatica, Carex appressa, Calochlaena dubia, Oplismenus* spp., *Commelina cyanea, Centella asiatica, Blechnum cartilagineum* and *Viola hederacea.*

Classification:

This vegetation community is commensurate with *Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions* which is listed as an endangered ecological community (EEC) under the NSW *BC Act 2016*. This community is also commensurate with *Coastal Swamp Oak Forest* which is listed under the *EPBC Act* as an EEC.

Photo 1 – Swamp Oak Floodplain Forest in the far south of the study area

Photo 2 – Swamp Oak Floodplain Forest in the centre of the study area

PCT 1793 – Smooth-barked Apple - Bangalay / Tuckeroo - Cheese Tree open forest

Canopy:

Angophora costata and *Eucalyptus botryoides* to a height of 15–20m provide a PFC of 25–35%.

Mid-storey:

The majority of the native mid-storey is absent. Naturalised exotic species such as *Cestrum parqui*, *Lantana camara* and *Senna pendula* are abundant.

Ground layer:

The ground layer contains limited native species but includes *Dichondra repens, Commelina cyanea, Hydrocotyle sibthorpioides, Oplismenus aemulus, Calochlaena dubia* and *Geranium homeanum*.

Classification:

This vegetation community is commensurate with *Bangalay Sand Forest of the Sydney Basin and South East Corner bioregions*, which is listed as an endangered ecological community (EEC) under the NSW *BC Act 2016*. This community is not listed under the *EPBC Act.*

Photo 3 – Disturbed Smooth-barked Apple - Bangalay / Tuckeroo - Cheese Tree open forest near the northern portion of the study area

Planted native vegetation

This vegetation occurs along the southern boundary of the study area and is comprised of mixed native trees that are likely to be planted, including *Eucalyptus tereticornis, Casuarina glauca*, *Melaleuca quinquenervia, Eucalyptus microcorys* and *Eucalyptus robusta.* There are occasional garden beds with native shrubs and groundcovers. The tree species are commensurate PCT 1230 - Swamp Mahogany swamp forest on coastal lowlands of the NSW North Coast Bioregion and northern Sydney Basin Bioregion.

Classification:

PCT 1230 is associated with several EECs, however the vegetation on site does not conform to any of these EECs. Subtropical Coastal Floodplain Forest of the New South Wales North Coast Bioregion is restricted to the North Coast Bioregion. Swamp Sclerophyll Forest on Coastal Floodplains occurs on waterlogged or periodically inundated soils. Swamp Oak Floodplain Forest is dominated by *Casuarina glauca,* and also occurs on waterlogged or periodically inundated soils. These criteria do not apply to this vegetation on site.

Cleared or exotic vegetation with occasional remnant trees

This vegetation occurs as gardens and lawn around existing buildings, disturbed lands occupied by exotic species, and turfed sports fields.

Photo 4 – Eucalyptus tereticornis along the southern boundary of the study area

Photo 5 – Melaleuca quinquenervia with planted garden beds in the south east of the study area

Photo 6 – Managed exotic vegetation surounding the dwelling in the north of the study area.

Photo 7 – Managed pasture and exotic weedy vegetation in the north of the study area

3.3 Threatened flora species

BC Act – A search of the *Atlas of NSW Wildlife* (OEH, 2019) indicated a list of species that have been recorded within a 10 km radius of the subject lots. These species are listed in Appendix 3 Table A2.1 and are considered for potential habitat within the subject lots.

EPBC Act – A review of the schedules of the *EPBC Act* indicated the potential for a list of threatened flora species to occur within a 10km radius of the subject lots. These species have also been listed in Appendix 3 Table A2.1 for consideration of potential to occur.

Based on the habitat assessment within Table A2.1 it is considered that the subject lots provides potential habitat for the following threatened flora species:

Table 2 – Threatened flora species with suitable habitat present

Scientific name	*BC Act*	*EPBC Act*	Potential to occur
Callistemon linearifolius	V	-	Low

Callistemon linearifolius is the only threatened species with any potential to occur. There is potential habitat within 1793 Smooth-barked Apple - Bangalay / Tuckeroo - Cheese Tree open forest and the closest record is 2.4 km away. Flora survey did not locate any individuals of this species within the study area.

All other threatened species in both the Bionet (NSW) and *EPBC Act* coordinate search (National) were considered to have no potential to occur within the study area because of no suitable habitat (due to previous clearing and landscaping works, past and ongoing land

management practices, unsuitable soils / geology, unsuitable previous vegetation type) and / or large distance to species records.

3.4 Endangered flora populations

No endangered flora populations occur within the Northern Beaches or Pittwater LGAs, nor within 10 km of the study area.

3.5 Threatened ecological communities

Two (2) threatened ecological communities (TECs) occur within the study area:

- *Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions* (SOFF)
- *Bangalay Sand Forest of the Sydney Basin and South East Corner bioregions* (BSF)

SOFF:

This TEC occurs in the southern two-thirds of the study area in association with PCT 1232 – Swamp Oak floodplain swamp forest and is listed as an endangered ecological community (EEC) under the NSW *BC Act 2016*. This community is equivalent to *Coastal Swamp Oak Forest* which is listed under the *EPBC Act* as an EEC.

BSF:

This TEC occurs in the north of the study area in association with PCT 1793 Smooth-barked Apple - Bangalay / Tuckeroo - Cheese Tree open forest and is listed as an endangered ecological community (EEC) under the NSW *BC Act 2016*. This community is not listed under the *EPBC Act.*

3.6 State Environmental Planning Policy (Vegetation in Non-Rural Areas) 2017

The *State Environmental Planning Policy (Vegetation in Non-Rural Areas) 2017* (Vegetation SEPP) was one of a suite of Land Management and Biodiversity Conservation (LMBC) reforms that commenced in New South Wales on 25 August 2017. The Vegetation SEPP (the SEPP) works together with the *Biodiversity Conservation Act 2016* and the *Local Land Services Amendment Act 2016* to create a framework for the regulation of clearing of native vegetation in NSW.

The SEPP will ensure the BOS (established under the Land Management and Biodiversity reforms) will apply to all clearing of native vegetation that exceeds the offset thresholds in urban areas and environmental conservation zones that does not require development consent.

Vegetation SEPP applies to the following local government areas:

Bayside, City of Blacktown, Burwood, Camden, City of Campbelltown, Canterbury-Bankstown, Canada Bay, Cumberland, City of Fairfield, Georges River, City of Hawkesbury, Hornsby, Hunter's Hill, Georges River, Inner West, Ku-ring-gai, Lane Cove, City of Liverpool, Mosman, Newcastle, North Sydney, Northern Beaches, City of Parramatta, City of Penrith, City of Randwick, City of Ryde, Strathfield, Sutherland Shire, City of Sydney, The Hills Shire, Waverley, City of Willoughby, Woollahra.

The Vegetation SEPP also applies to land within a variety of zones as set out in the legislation 'Land to which the policy applies'.

3.7 Coastal Management SEPP

The NSW DPE *Coastal Wetlands and Littoral Rainforests Area Map* (http://webmap.environment.nsw.gov.au/PlanningHtml5Viewer/?viewer=SEPP_CoastalManagement) identifies an area within the wetland as "coastal wetlands", and a buffer area surrounding the margin of the wetland as "proximity area for coastal wetlands" (Figure 6).

As stated in the *State Environmental Planning Policy (Coastal Management) 2018*, development consent is required for any development within these areas and must not be given unless the consent authority is satisfied that sufficient measures have been, or will be, taken to protect, and where possible enhance, the biophysical, hydrological and ecological integrity of the coastal wetland. Additionally, within the "proximity area for coastal wetlands" area, development consent must not be given unless the consent authority is satisfied that the proposed development will not significantly impact on the quantity and quality of surface and ground water flows to and from the adjacent coastal wetland.

3.7.1 Wetlands on site or adjacent

Within the study area the interactive mapping tool maps Coastal Wetlands apparently in association with Swamp Oak Floodplain Forest vegetation, which is an Endangered Ecological Community (EEC, see Section 3.5 of this report). A Proximity Area for Coastal Wetlands is mapped across the remainder of the study area. Figure 6 shows the location of the wetland and proximity area.

To the east of the study area there is more SOFF in addition to vegetation that is part of the EEC Freshwater Wetlands on Coastal Floodplains. No quadrats or other stratified survey have been undertaken within this vegetation community by *Travers bushfire & ecology.* Some species observed by random meander are however listed in Appendix 2. Some common species observed include *Melaleuca ericifolia, Persicaria* spp., *Azolla pinnata, Schoenoplectus* sp., *Eleocharis sphacelata, Casuarina glauca, Juncus* spp., and *Phragmites australis.*

Figure 6 – Adjacent wetlands

(Source: Coastal Wetlands and Littoral Rainforest Area Map, NSW Department of Planning & Environment 2018)

4.0 Fauna

4.1 Survey / Habitat assessment

Fauna field survey has been undertaken within the study area in 2013, 2016 and 2019.

Survey on the 8 & 9 April 2013 included:

- *Four (4) diurnal bird census points* undertaken along the western interface within natural habitats. A minimum of 15 minutes of survey was undertaken at each census point in an area radiating out to between 20-40m. Bird census points were selected to give an even spread and representation along the fringes of high quality habitat within the Warriewood Wetlands. Census points were also commenced in locations where bird activity was apparent, as often different small bird species are found foraging together. Opportunistic diurnal bird survey was conducted between census points and whilst undertaking other diurnal surveys.

- *Nocturnal call-playback* for threatened species with suitable habitat present and / or nearby records, including Masked Owl (*Tyto novaehollandiae*), Powerful Owl (*Ninox strenua*), Barking Owl (*Ninox connivens*), Black Bittern (*Ixobrychus flavicollis*), Australian Bittern (*Botaurus poiciloptilus*), Bush Stone-curlew (*Burhinus grallarius*), Koala (Phascolarctos cinereus) and Green and Golden Bell Frog (Litoria aurea).

- *Nocturnal spotlighting* along forest / woodland edges and within the nearby Warriewood wetland area.

- *Passive Anabat monitoring (x3)* which involves leaving a bat recorder in a fixed mounted position to record call sequences of passing bats for the first few hours after dusk. Recording locations are determined in order to represent different available foraging structures for various micro-chiropteran bat species. The Large-footed Myotis was targeted by recording along the Narrabeen Creek including one recorder near to existing culverts where this species is known to roost. One *Anabat* recorder placed along the swamp forest edge did not record due to a faulty flash card and is not included in the effort.

- *Identification of significant habitat trees*. These are defined as trees containing large hollows suitable for use by owls / cockatoos or containing a number of good quality hollows typically consisting of more than one (1) medium (10-30cm) sized hollow. A tree may also be considered significant where evidence of use by select fauna is found, such as Yellow-bellied Glider sap feed tree, raptor nest, or owl roost.

- *Threatened fauna species habitat assessment* with consideration of threatened fauna species previously recorded within 10km of the subject lots area on the *Atlas of NSW Wildlife* (OEH 2013) and species listed as having potential habitat within 10km as considered by the *EPBC Protected Matters Search Tool* (SEWPAC 2013).

Fauna survey undertaken on the 6th December 2016 included:

- *Detailed habitat tree survey of the study area*.
- *Passive overnight Ultrasonic microbat monitoring (x2)*
- *Opportunistic bird survey*

Recent fauna survey undertaken on the 25/7/19. Diurnal fauna survey included:

- *Opportunistic bird call and activity survey,*
- *Mammal activity searches (scats, scratches, diggings, burrows, etc)*
- *Habitat tree survey.*
- *Culvert bat roosting habitat searches.* This involved wading through the first 20m of the two large box culverts that commence on the edge of the subject lots and run under the adjacent shopping centre, looking in the ceiling crevices for microbats at roost.
- *Spotlighting,*
- *Ultrasonic microbat recording (x2 passive recording stations),*
- *Frog call identification,*
- *Owl call-playback (Powerful Owl, Masked Owl, Sooty Owl & Barking Owl),*
- *Bush Stone-curlew, Black Bittern & Australasian Bittern call-playback,*
- *Nocturnal mammal call-playback (Koala & Squirrel Glider)*

The full survey effort table showing timing and weather conditions is provided in Appendix 1. Specific survey effort locations and results are shown on Figure 4. All fauna species recorded during survey within the study area are listed in Table A2.2 in Appendix 2.

A review of the Atlas of NSW Wildlife (OEH 2019) was undertaken prior to the recent site visit to determine threatened species previously recorded within 10km of the subject lots.

The following notable habitat features were observed present:

- Small to medium sized hollows, mostly in exotic trees
- Winter flowering Swamp Mahogany trees potentially utilised by the endangered Swift Parrot during winter migratory foraging.
- Year-round nectar producing tree species, principally *Eucalyptus, Angophora* and *Melaleuca spp*
- Creek
- Dense mid and upper-storey foliage areas
- Surface soils suitable for foraging by bandicoots
- Much artificial refuse

4.2 Hollow-bearing trees

Hollow-bearing trees were surveyed within the subject lots during the recent 2019 fauna survey. Hollow-bearing tree data for the subject lots is provided in Table 3. None of these hollows are considered suitable for threatened large forest owls or cockatoos. No such suitable hollows for nesting will also be indirectly impacted nearby. The majority of hollows recorded present were located within exotic Poplar deciduous trees, one of these HT3 observed to be used by Common Brushtail Possum during survey.

The recorded hollows may be suitable for hollow-dependent threatened species with considered potential to occur including Little Lorikeet, East-coast Freetail Bat, Large-footed Myotis, Eastern Falsistrelle, Greater Broad-nosed Bat and Squirrel Glider. Of these species, the Large-footed Myotis has been recorded during surveys to date, however this species has been recorded utilising the adjacent culverts which are likely preferred over the recorded hollows. The presence of hollows within the proposed development area is considered unlikely to constrain development. The assessment for hollow-dependent species will recommend retention of hollows where possible and otherwise relocation / replacement to adjacent habitat.

Table 3 **– Hollow-bearing tree data**

Tag no.	Common name	DBH (cm)	Height (m)	Spread (m)	Vigour (%)	Hollows recorded
HT1	Swamp Oak	45	13	6	60	1x 5-10cm trunk split
HT2	Poplar sp	34	28	11	75	1x 0-5cm trunk, 1x 5-10cm trunk
HT3	Poplar sp	56	20	11	75	1x 10-15cm broken trunk (Common Brushtail Possum)
HT4	Poplar sp	90	29	17	75	1x 5-10cm trunk, 1x 5-10cm broken trunk
HT5	Poplar sp	40	21	8	75	1x 0-5cm trunk split
HT6	Poplar sp	30	20	8	75	1x 5-10cm trunk
HT7	Poplar sp	41	35	10	75	1x 0-5cm trunk, 1x 0-5cm trunk split
HT8	Poplar sp	40	26	11	75	1x 5-10cm broken trunk
HT9	Poplar sp	37	38	10	75	1x 5-10cm trunk split
HT10	Poplar sp	54	45	20	75	1x 0-5cm trunk

4.3 Threatened fauna species

BC Act – A search of the *Atlas of NSW Wildlife* (OEH, 2019) provided a list of threatened fauna species previously recorded within a 10km radius of the subject lots. These species are listed in Appendix Table A2.2 and are considered for potential habitat within the subject lots.

Fisheries Management Act (FM Act) – No habitats suitable for threatened aquatic species were observed within the subject lots and as such the provisions of this act do not require any further consideration.

EPBC Act – A review of the schedules of the *EPBC Act* identified a list of threatened fauna species or species habitat likely to occur within a 10km radius of the subject lots. These species have also been listed in Appendix Table A2.2.

In accordance with Table A2.2 the following state and nationally listed threatened fauna species are considered to have suitable habitat with varying potential to occur within the subject lots. The state listed species will be considered in the significance of impact test (Appendix 3):

Table 4 **– Threatened fauna species with suitable habitat present**

Common name	*BC Act*	*EPBC Act*	Potential to occur
Grey-headed Flying-fox	V	V	recorded
Little Bentwing-bat	V	-	recorded
Eastern Bentwing-bat	V	-	recorded
Large-footed Myotis	V	-	recorded
Black Bittern	V	-	✓
White-bellied Sea Eagle	V	-	✓
Little Eagle	V	-	✓
Square-tailed Kite	V	-	✓
Little Lorikeet	V	-	✓
Swift Parrot	E	E	✓
Barking Owl	V	-	✓
Powerful Owl	V	-	✓
Varied Sittella	V	-	✓
Squirrel Glider	V	-	✓
East-coast Freetail Bat	V	-	✓
Large-eared Pied Bat	V	V	✓
Eastern Cave Bat	V	-	✓
Regent Honeyeater	E4A	CE	low
Greater Broad-nosed Bat	V	-	low
Australasian Bittern	E	E	unlikely
Yellow-bellied Sheathtail-bat	V	-	unlikely
Eastern Falsistrelle	V	-	unlikely

Four (4) state listed threatened fauna species including Large-footed Myotis (*Myotis macropus*), Eastern Bentwing-bat (*Miniopterus orianae oceanensis*), Little Bentwing-bat (*Miniopterus australis*) and Grey-headed Flying-fox (*Pteropus poliocephalus*) were recorded present during combined surveys.

Grey-headed Flying-fox

An individual Flying-fox was recorded foraging within the subject site during 2013 nocturnal survey. The flowering trees species of foraging use was not recorded at this time however the recorded location is shown on Figure 4. The subject lots therefore provides recorded seasonal foraging habitat for the Grey-headed Flying-fox.

A small roosting camp of approximately 100 individuals was also recorded approximately 150m to the south west during 2013 survey (refer to Figure 4). This roosting location was at the north western edge of the *Centro* shopping complex within the more suitable roosting habitat of Warriewood Wetlands. No flying-foxes were recently observed within the camp or during nocturnal spotlighting of the subject lots. Roosting camps are where diurnal roosting and breeding takes place and thus such camps are critical to this species and their protection is of priority in their conservation efforts. Such camps may also seasonally swell in size with the influx of numerous other individuals as foraging resources in the locality become available.

With this in mind, there is some potential that the area occupied by this camp may utilise habitat closer to the subject lots on occasion. We do not anticipate that such habitat use at these times is likely to include the subject lots or to be indirectly impacted by the current proposal. However, given the height of the proposal (3 storeys), lighting impacts and spill-over into the wetland area may need to be carefully considered. These impacts may not be

comparable to the recently constructed multi-storey apartments on the adjacent property to the north. It should also be noted here that the core area of the camp is located directly behind the *Centro* shopping complex and its associated lighting and rear access. Attempt to reduce any additional lighting spill-over into the wetland area should be made.

The flying-fox camp was not observed to be a large camp at the time of the previous survey however when camps are large, particularly when they receive a seasonal influx in numbers, they can cause noise, smell and notably acid laden droppings on nearby assets. When individuals come to return to the camp after nightly foraging forays they often roost in nearby surrounding trees where they will make noise and droppings before returning to the core roosting area. Such dropping may impact on vehicles, clothes washing and seating below trees but also may scatter on open pedestrian surfaces. The subject lots are at a sufficient distance that this is not expected to be a cause for concern.

In summary, the proposal will remove some seasonally available foraging trees close to the local roosting camp and may cause some indirect impacts on this camp at times when it seasonally swells to accommodate more individuals. The removal of a small amount of foraging habitat and the low potential indirect impacts considered are not likely to cause constraint to the current proposal. Some mitigation measures such as tree planting and considerations to lighting have been proposed to reduce the effect of identified impacts.

The Swamp Mahogany trees present within the subject lots offer unique winter foraging resources for this (and other threatened birds) species within the locality. Swamp Mahogany trees should be retained where possible.

Little Bentwing-bat, Eastern Bentwing-bat and Large-footed Myotis

The Eastern and Little Bentwing-bats both have similar habitat requirements including subterranean roosting behaviour. Both species breed in large cave systems within only a few known locations within the state and then disperse out over large distances. They will roost in structures, under bridges and culverts in the locality but not breed in these.

The Large-footed Myotis alternatively has more diverse roosting habits and forages specifically over open water locations. A single Large-footed Myotis was observed roosting in the ceiling crevice of the large culverts along the western edge of the subject lots. These tunnel culverts continue below the adjacent shopping centre.

These three species are considered here together because all three are known to roost in culverts. The Large-footed Myotis may also roost in hollows however the recorded use of culverts is expected to be preferred. The culverts, the creekline and the riparian vegetation will remain as part of the current proposal. Therefore important habitat for these species is not likely to constrain the proposal. The proposal should however involve the restoration of vegetation lining the creekline to enhance stream health and potential for continued roosting/foraging use.

Other threatened fauna

Other threatened fauna species have been recorded in the nearby locality and in recent years, such as Barking Owl, Black Bittern, Australian Painted Snipe, Little Eagle, Osprey, Powerful Owl, Varied Sittella and East-coast Freetail Bat that potentially use the study area on a seasonal or periodic basis.

Some species recorded nearby to the west during recent years are strictly wetland dependent species (such as Black Bittern, Australian Painted Snipe and also Australasian Bittern) that are not likely to have any utilisation or dependence on the subject lots itself. Indirect impacts on these species such as lighting and noise spill-over into the wetland areas to the west should be considered but are not likely to constrain development.

Interestingly there are also a number of new threatened species records located in the northern study area surrounding the Sydney Water treatment site on the other side of Boondah Road from May 2018. These include Little Lorikeet, Squirrel Gliders, Large-eared Pied Bat and Eastern Cave Bat. The Squirrel Glider records are most significant as they are the only records ever in the immediate area, the only records in the last decade along the northern beaches and whilst not within the recognised area, may represent members of the endangered population know to the old Pittwater LGA.

Furthermore the record of Eastern Cave Bat at the water treatment site is the only one ever known within 10km on *Bionet*. These new threatened fauna records are either dubious or cause for concern on the potential for such species to utilise the subject lots. No trapping has been undertaken for Squirrel Glider and the microbat records may suggest updated survey during warmer months is necessary. This survey would need to include stag-watching of recorded hollows for use by Little Lorikeet and Squirrel Glider.

SEPP 44 – Koala Habitat Protection

Two Koala food tree species – Swamp Mahogany (*Eucalyptus robusta* and Tallowwood (*Eucalyptus microcorys*), as listed on Schedule 2 of SEPP 44, were recorded within the study area. Tallowwood occurs as planted specimens in a patch of approximately ten (10) individual trees within the Cleared or Exotic with Occasional Remnant Trees vegetation community. Although such non-endemic mature planted trees may be available for use by Koalas in locations where Koala populations occur, SEPP only applies to “areas of native vegetation” in consideration to PKH and therefore these trees are not considered here in determining PKH.

Swamp Mahogany trees occur naturally in the study area as a number of mature individuals on the eastern side of Boondah Road. These trees comprised greater than 15% of the total number of trees within the Swamp Sclerophyll Forest community and combined with additional trees immediately adjacent within the Cleared or Exotic with Occasional Remnant Trees Community. Figure 4 shows the location of Swamp Mahogany trees identified during 2013 surveys in the study area. No Swamp Mahogany trees are present within the subject lots making up the current development proposal on the western side of Boondah Road.

Therefore the subject lots are not classified under SEPP 44 as PKH and will not be constrained under this policy. The proposal will not affect existing connective access to the available Koala feed trees on the eastern side of Boondah Road. No Koalas were directly observed at the time of fauna surveys, which included diurnal searches of trees, call-playback techniques and spotlighting.

Potential presence based on local records and remaining local habitat connectivity is discussed below in Section 5.4 given that any remaining local Koalas are part of the endangered Koala population in the Pittwater LGA. Based on these considerations, the study area is also not likely to form CKH under the definitions of SEPP 44.

Additionally protected migratory species listed under the *EPBC Act* are considered for habitat potential in Table A2.3.

It is concluded that there will be no likely serious or irreversible impact any state or nationally listed threatened fauna species with considered potential to occur.

4.4 Protected migratory species (National)

The EPBC Act Protected Matters Report provides additionally listed terrestrial, wetland and marine migratory species of national significance likely to occur, or with habitat for these species likely to occur, within a 10km radius of the subject lots. The habitat potential of migratory species is considered in Table A3.3 (Appendix 3). The habitat potential of threatened migratory species is considered in Table A3.2 (Appendix 3).

No nationally protected migratory bird species were recorded present or are expected to constrain development.

4.5 Endangered fauna populations

Two (2) endangered fauna populations are recorded within 10km of the study area. These include the Koala population in the Pittwater LGA and the Squirrel Glider population on Barrenjoey Peninsula.

The Squirrel Glider population is identified north of Bushrangers Hill which is located more than 3km to the north of the study area. There are however two recent records of Squirrel Glider from 2018 within this distance and therefore the study area is not considered to contribute any habitat of importance to this population.

Koalas forming part of the endangered population have been previously recorded in the locality surrounding the study area. These records are mostly prior to 1950 with the most recent nearby record located north of the study area in 1975. All of these nearby Koala records are to a 1km accuracy, suggesting they were estimated / approximate locations of historical sightings. The study area contains a mature stand of Swamp Mahogany trees located between Boondah Road and Narrabeen Creek, as well as along the fringes of the Warriewood Wetlands.

There is no doubt that the Swamp Mahogany trees present within the study area would have formed important habitat for the local Koala population when this population was previously well represented in the nearby locality. Habitat removal, fragmentation and isolation in the Pittwater LGA over the last hundred years or so has put high pressures on this population which has diminished to what now appears a non-viable population. Stressed Koalas competing with urban landscapes are more susceptible to disease and poor population dynamics.

Based on records alone, it is unlikely that any remaining Koalas that cling onto remaining habitats in the Pittwater LGA still utilise the available habitat present within the study area. Locations of Swamp Mahogany observed during the flora survey within and near to the study area are shown on Figure 4. This tree is not only an important Koala feed tree but is a profuse winter flowering resource to nectar dependent fauna, including the endangered migratory Swift Parrot which has also been recorded in the locality. No Swamp Mahogany trees are present within the three lots making up the current development proposal on the western side of Boondah Road. These Swamp Mahogany trees will also be continually available to free ranging local Koalas which have an ‘unlikely’ potential to occur.

4.6 Connectivity

The subject lots are shown on Figure 7 in orange, with the local habitat connectivity shown in yellow. Connectivity is fragmented in places where roads bisect the free passage for terrestrial species or where the linkages narrow down due to fragmentation.

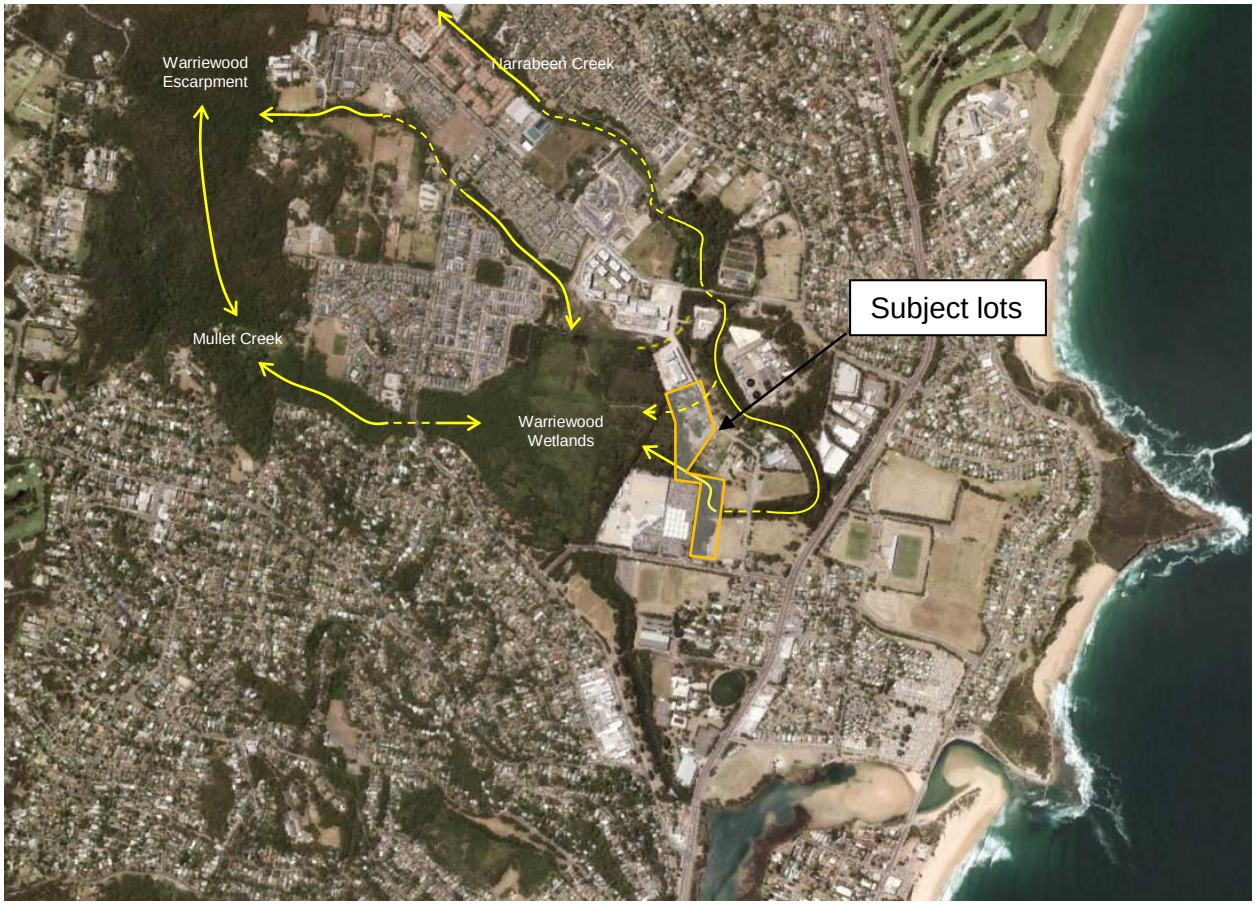


Figure 7 – Local connectivity

The subject lots contributes to local connectivity in two ways but neither of these are of local significance or sufficient to contribute to local or regional 'corridors'. This is particularly given that the creekline connectivity that does extend to the east does not link up with any other major area of natural habitat, but rather loops around to return to the same connective forest areas surrounding Warriewood Wetlands and the Warriewood Escarpment.

One connectivity link through the subject lots occurs along the western boundary and crossing Boondah Road to the south. The second and more direct passage across the northern portions of the site is currently limited to fragmented canopy trees for birds and common arboreal mammals.

The only threatened species records that exist in the immediate area are highly mobile flying species (incl. flying-foxes, diurnal birds, owls and microbats). The removal of the fragmented cross-site connectivity across the northern portions of the subject lots is not likely to affect important habitat or local movements of any of these species. The current proposal maintains the existing southern connectivity along the core riparian zone subsequently reducing further impacts to other locally occurring native biodiversity. Large-footed Myotis has been recorded roosting immediately adjacent and foraging along this channel. Such habitat use will be maintained and may be improved via riparian habitat restoration efforts.

5.0 Watercourses and wetlands

5.1 Endangered wetland communities

A number of wetland communities have been listed as an 'endangered ecological community' under the NSW *BC Act*. We note that ‘wetlands’ are included in the definition of ‘waterfront lands’ in accordance with the *Water Management Act* (*WM Act*) 2000, due to their inclusion in the definition of a ‘lake’ under the same act.

Impacts on wetland communities must be assessed under the *BC Act* and if present the management of wetland communities must be given due consideration in accordance with the objectives and principles of management as contained within the NSW Wetlands Policy (2010), and appropriate management as determined by NSW DPI - Office of Water in their general terms of approval (GTAs). This may include but not limited to the provision of buffers, management of stormwater runoff and maintenance of natural inflows or runoff into those wetland communities.

- Artesian springs ecological community - endangered ecological community listing
- Castlereagh swamp woodland community - endangered ecological community listing
- Coastal saltmarsh in the NSW North Coast, Sydney Basin and South East Corner bioregions - endangered ecological community listing
- Freshwater wetlands on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions - endangered ecological community listing
- Kurri sand swamp woodland in the Sydney Basin Bioregion - endangered ecological community listing
- Lagunaria swamp forest on Lord Howe Island - endangered ecological community listing
- Maroota Sands swamp forest - endangered ecological community listing
- Newnes Plateau Shrub Swamp in the Sydney Basin Bioregion - endangered ecological community listing
- Swamp oak floodplain forest of the NSW North Coast, Sydney Basin and South East Corner bioregions - endangered ecological community listing
- Swamp sclerophyll forest on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions - endangered ecological listing
- Sydney Freshwater Wetlands in the Sydney Basin Bioregion - endangered ecological community listing
- The shorebird community occurring on the relict tidal delta sands at Taren Point - endangered ecological community listing
- Upland wetlands of the drainage divide of the New England Tableland Bioregion - endangered ecological community listing
- Wingecarribee Swamp - endangered ecological community listing

In accordance with the *WM Act*, endangered wetland communities are through the definition of ‘lakes’ potentially classed as waterfront land. Referral to DPI WaterNSW may be required for determination under the *WM Act* as a controlled activity. As well as protection, a buffer may be applied to these communities as specified by DPI WaterNSW.

Swamp Oak Floodplain Forest is present within the study area, and is listed as an EEC within the *BC Act* and *EPBC Act*.

- *Impact on the extent of wetland vegetation*

  Based on preliminary concept plans the extent of SOFF is likely to be reduced by 0.95 ha.

- *Impact on acid sulfate soils*

  The entire study site is mapped by the Pittwater LGA Acid Sulfate Soils Map as containing acid sulfate soil (Figure 7). The majority of the study area is Class 3 acid sulfate soil, and there are very small areas of Lot 9 DP 806132 and Lot 4 DP 26902 identified as Class 2 acid sulfate soil.

- *Indirect impacts of wetlands*

  Indirect impacts may include pedestrian usage and trampling of soils, dumping of rubbish and garden waste, accidental spillages post development.

  A Vegetation Management Plan (VMP) should be prepared to protect, and mitigate impacts on, the SOFF.

- *Impacts due to storm water quality or quantity*

  It is expected that an appropriate storm water management plan will be prepared to avoid these impacts on the SOFF.

- *Impacts on groundwater*

  The proposal is not expected to impact on groundwater resources.

- *Proposed mitigation measures*

  1. Appropriate design of construction of any works e.g. storm water outlets.
  2. Manage access to the area.
  3. Undertake pest animal and weed control.
  4. Preparation of a VMP to improve and maintain sensitive ecological landscapes, sediment and erosion control measures.

- Watercourses and waterfront lands

  See Section 5.3 of this report regarding riparian constraints. Narrabeen Creek, which is a second-order stream, flows east to west through the southern portion of the study area then into South Creek and Narrabeen Lagoon. The area of SOFF is classed as an endangered protected wetland and is a ‘lake’ as defined under the *WM Act* therefore it is deemed as ‘waterfront land’.

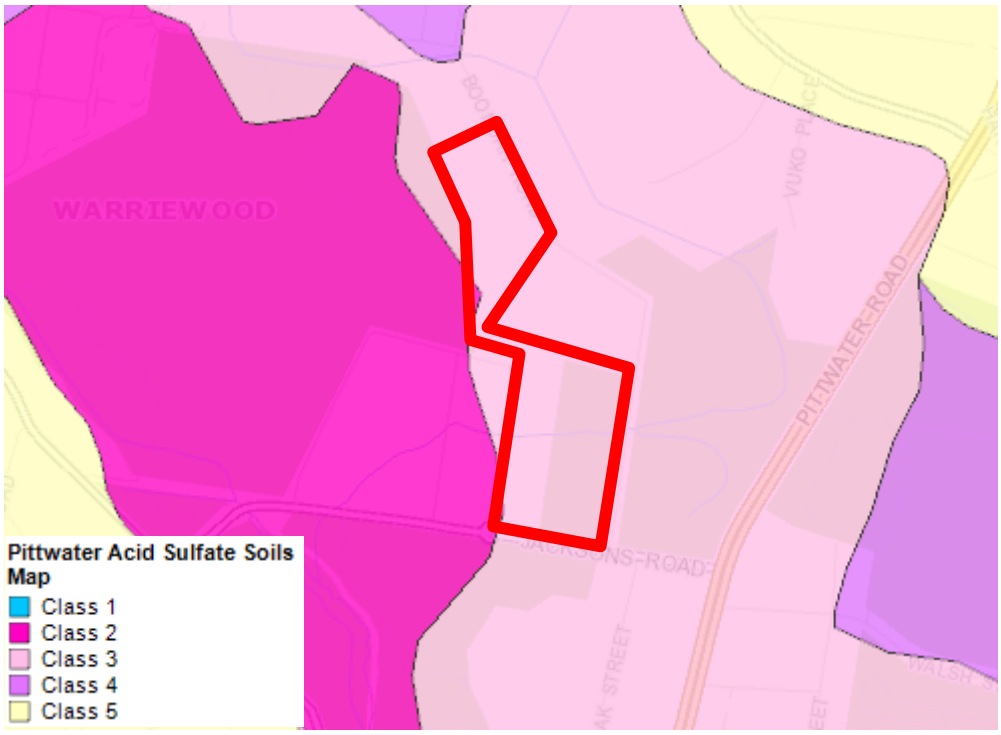
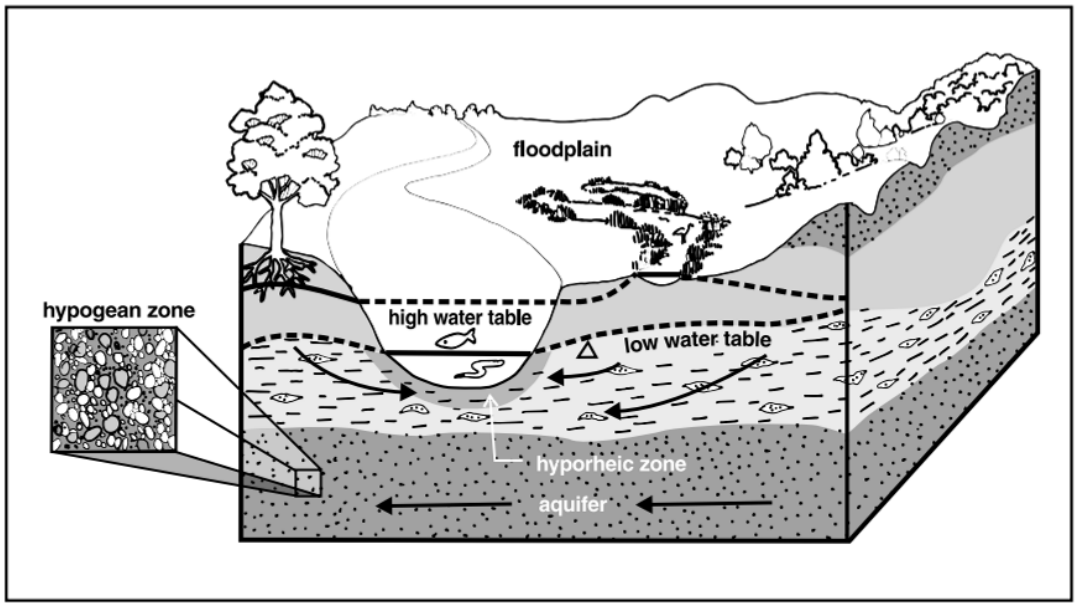


Figure 8 – Pittwater LGA Acid Sulfate Soils Map
(Source: Northern Beaches Interactive Mapping Tool / Pittwater LEP 2014)

5.2 Groundwater dependent ecosystems (GDEs)

Groundwater dependent ecosystems are communities of plants, animals and other organisms whose extent and life processes are dependent on groundwater. Some examples of ecosystems which depend on groundwater are:

- wetlands;
- red gum forests, vegetation on coastal sand dunes and other terrestrial vegetation;
- ecosystems in streams fed by groundwater;
- limestone cave systems;
- springs; and
- hanging valleys and swamps.



Alluvial groundwater system discharging into a river

Groundwater dependent ecosystems are therefore ecosystems which have their species composition and their natural ecological processes determined by groundwater (NSW State Groundwater Dependent Ecosystems Policy April 2002).

Swamp Oak Floodplain Forest is considered to be a wetland community and, in the context of the landscape is likely to be a GDE. To assist in protecting this in the future, this community is recommended to be conserved and managed in accordance with a Vegetation Management Plan (VMP) to protect and mitigate impacts.

5.3 Watercourse assessment

Narrabeen Creek, which is a second-order stream, flows east to west through the southern portion of the study area then into South Creek and Narrabeen Lagoon. In accordance with the *Guidelines for riparian corridors on waterfront land* (NSW DPI Office of Water 2012) controlled activity approval on waterfront land is required under the *WM Act* for works within 20 m of the stream top of bank. A vegetated riparian zone is to be implemented within 20 m of the top of bank on both sides of the stream as part of a VMP (refer to Figure 4). Any revegetation works are to use locally-occurring species commensurate with SOFF.

Photo 7 – Narrabeen Creek in the southern portion of the study area.

6.0 Suitability of Rezoning

The site is currently zoned RU2 – Rural Landscape, RE1 – Public Recreation and SP2 – Infrastructure (refer Figure 3). The proposal seeks a rezoning of the site to R3 – Medium Density Residential and RE1 – Public Recreation (Figure 2). Suitability of the proposed zones are discussed below:

R3 – Medium Density Residential

Proposed development allowed with consent. Ecological impacts associated with development must be approved by consent authorities. This ecological constraints assessment identifies the sites important ecological features and subject to ecological assessment the proposed use of the land is compatible with the site.

RE1 – Public Recreation

Recreational facilities allowed with consent. Existing important ecological features, such as SOFF EEC and riparian areas, can be protected and enhanced. Proposed recreational facilities would require ecological impacts to be assessed appropriately and setbacks provided for riparian corridors.

The site contains the EEC - SOFF, there is a clear opportunity to combine appropriate development and conservation particular within the surrounding riparian corridors and to significantly enhance the natural environment. The proposed use and zoning appears to be compatible with surrounding land uses subject to DA approval. Existing plans for new playing field (Figures 3 & 4) show an encroachment into the 20 m riparian buffer – this needs to be

considered in future versions and any unavoidable impacts offset and compensated for within the study area.

In conclusion, the proposed rezoning is consistent with the ecological constraints on site and allow for appropriate assessment for future ecological impacts.

7.0 Conclusions

Ecological survey and biodiversity constraints assessment has been undertaken for a rezoning proposal within Lots 3 and 4 DP26902 at 10-12 Boondah Road; Lot 9 DP806132 and Lots 7072 and 7073 DP93778 at 2–6 Jacksons Road, Warriewood within the Northern Beaches local government area (LGA). An assessment will need to be undertaken for the finalised development layout in consideration to the *BC Act* through the relevant process outlined by the *EP&A Act*. The schedules and assessment criteria under the *EPBC Act* and the *FM Act* will also require formal consideration.

No threatened flora species have been observed or considered likely to occur in a natural state.

Two (2) threatened ecological communities (TECs) occur within the study area: SOFF, which is listed as an EEC under the *BC Act* and *EPBC Act*; and BSF, which is listed as an EEC under the *BC Act*.

In respect to threatened fauna species, the subject lots provides recorded foraging habitat for Grey-headed Flying-fox, Little Bentwing-bat, Eastern Bentwing-bat and Large-footed Myotis. The Large-footed Myotis was recorded roosting in the culvert under the neighbouring shopping complex which opens at the subject lot boundary. The two Bentwing-bat are likely utilising this same roost. The current proposal will not impact either directly or indirectly on this roosting habitat or the creek line it opens to therefore the roost will not likely constrain development.

The other threatened fauna species which have a high potential to frequent the site seasonally, or on occasion are outlined in Table 4. The subject lots are not expected to provide any breeding habitat or habitat otherwise of importance to threatened fauna species recorded or with varying potential to occur. This should be verified by stag-watching of recorded hollows given potential for hollow-dependent threatened species, particularly those to be removed. Foraging habitat removed as part of the proposal is not considered unique or of local significance to threatened species that persist in the otherwise highly developed locality.

Therefore fauna species are not expected to cause any constraint to development. Having said this, recent and close records of Squirrel Glider occur on the other side of Boondah Road. If these records are true then they are locally significant and this would prompt the need to undertake target trapping within the subject lots as part of the future threatened species assessment.

The habitat to be removed does contribute to cross-site arboreal connectivity however this is not considered of any local significance. Other remaining connectivity further south along Narrabeen Creek will remain and is recommended for restoration.

The current concept layout follows previous advice to:

- Avoid impacting on lots containing the important winter flowering Swamp Mahogany which may play an important function for providing unique foraging resources in the locality, particularly for the endangered Swift Parrot;

- Retain, and where appropriate restore, riparian habitat along Narrabeen Creek that ensures habitat connectivity is maintained in the locality; and
- Ensure that any proposal does not impact directly or indirectly on the high quality habitat available in the adjacent Warriewood Wetlands to the west.

Based on the preliminary concept plan the potential direct impacts are considered to include the following:

- Removal of 0.95 ha of disturbed SOFF (EEC)
- Removal of 0.12 ha of disturbed BSF (EEC)
- Removal of seasonal nectar producing trees for foraging by birds and flying-foxes,
- Removal of small and medium sized hollows mostly within exotic planted trees

The indirect impacts of the proposal are considered to include the following:

- Lighting and noise spill-over effects onto fauna utilising the adjacent wetland habitats.
- Increased soil nutrients from changes to runoff that may provide further opportunities for weed plumes.
- Concentrated stormwater runoff from solid surfaces and subsequent increased flows.
- Edge effects such as weed incursions caused from soil disturbance, repeated clearing and landscaping species becoming a nuisance in the adjacent remnant bushland.

The cumulative impacts of the proposal are considered to include the following:

- Cumulative loss of SOFF (EEC) within the local area
- Cumulative loss of BSF (EEC) within the local area
- Cumulative loss of foraging, denning and shelter habitat for native fauna

Some impacts may be avoided or mitigated as recommended in Section 7.2.

7.1 Constraints for matters listed under the Biodiversity Conservation Act

No threatened flora species have been observed. *Callistemon linearifolius* has a low potential to occur but targeted survey did not locate any individuals of this species within the study area. Further targeted surveys for threatened flora are not likely to be needed.

Native vegetation present within the study area is mostly attributable to *Swamp Oak Floodplain Forest* (SOFF) and *Bangalay Sand Forest* (BSF)*,* which are both listed within the NSW *BC Act* as Endangered Ecological Communities (EECs).

The Biodiversity Offsets Scheme (BOS) and The Regulation (2017) and Biodiversity Assessment Method (2017) came into force under the *BC Act* on the 25th of August, 2017. There are two (2) elements to the threshold test – an area trigger and a Sensitive Biodiversity Values Land Map trigger. If clearing exceeds either trigger, the BOS applies to the proposed clearing.

- The study area contains areas mapped as Sensitive Biodiversity Values Land – an offset is required for any clearing of native vegetation within these mapped areas.

- The threshold for clearing above which the BAM and offsets scheme apply is 0.25 ha or more. Based on the preliminary concept plan, future development is likely to impact 1.18 ha of native vegetation, therefore offsetting will likely be required under this trigger.

Any future development proposal will need to be assessed in accordance with the Significance of Impact Test of the *BC Act* to determine if the proposal constitutes a significant impact upon threatened species, endangered populations or threatened ecological communities. Note that SOFF is also listed under the Commonwealth *EPBC Act* as an EEC.

7.2 Recommendations

To minimise adverse ecological impacts, the following mitigation measures are proposed:

1. Avoidance of impact on native vegetation, particularly within the mapped Biodiversity Values Land, to minimise offsetting requirements.

2. Replacement landscaping should consider the use of locally occurring native species commensurate with SOFF and BSF including trees, shrubs and ground covers to encourage fauna within the locality.

3. A Vegetation Management Plan (VMP) is to be prepared to;

    - Undertake regular low impact weed control to minimise establishment and spread of invasive weeds. Invasive species such as Camphor Laurel, Coral Tree, African Olive, Canary Island Date Palm, Chilean Cestrum, Lantana, Privet, Blackberry, Whisky Grass, Giant Reed, Asparagus Fern, Panic Veldtgrass, Pennywort, Water Primrose and Pampas Grass were observed within the study area.
    - Manage edge effects and enhance connectivity.
    - Manage access to all significant habitat areas
    - Undertake revegetation works to maintain arboreal connectivity across the site and provide a transitional buffer between the proposed development and Warriewood Wetlands
    - Sediment and erosion control measures.
    - Nutrient management and runoff mitigation measures (detention basin, bioswale, etc).
    - Habitat enrichment works including planting of foraging species (particularly for the recorded Grey-headed Flying-fox).
    - It is recommended that nest boxes, as part of habitat replacement and supplementation, are installed in natural habitat areas prior to any future dismantling of buildings within the subject lots. Nest boxes should be constructed from weatherproof material to ensure longevity.

4. A vegetated riparian zone is to be implemented within 20 m of the top of bank of Narrabeen Creek on both sides of the stream as part of the VMP. Revegetation works within the riparian zone are to use locally-occurring species commensurate with SOFF. Riparian offsets are to be provided for encroachments.

5. Target additional threatened species survey is recommended to:

    a. Undertake trapping survey to target presence of Squirrel Glider.
    b. Stag-watch remaining quality hollows within the subject lots to determine any roosting/breeding use by recorded hollow-dependent microbats.
    c. Map locations of Swamp Mahogany not previously identified within the subject lots in order to quantify habitat replacement effort.

6. Establishment of managed ecological zones / asset protection zones as buffers between future building footprints and the existing endangered ecological communities and Warriewood Wetlands.

Appendix 1
Fauna Survey Effort

Table A1.1 – Fauna survey effort

Fauna group	Date	Weather conditions	Survey technique(s)	Survey effort / time (24hr)
Diurnal birds	8/4/13	4/8 cloud, no wind, no rain, 24°C - 18°C	Census points x4 / Diurnal opportunistic	4hr 45min 1315 - 1800
	9/4/13	7-2/8 cloud, no wind, previous rain, 19°C – 22°C	Diurnal opportunistic	2hr 10min 1320 - 1530
	5/12/16	7/8 cloud, light NNE wind, no rain, 33.3°C	Diurnal opportunistic	2hr 45min 1330 - 1615
	13/8/19	0/8 cloud, light W wind, no rain, 15°C - 12°C	Diurnal opportunistic	4hr 45min 1245 - 1730
Nocturnal birds	8/4/13	0/8 cloud, no wind, no rain, 18°C	Spotlighting	2hr 1800 - 2000
			Call playback (MO/PO/BO/BB/AB/BSC)	Commenced @1820
	13/8/19	0/8 cloud, no wind, no rain, 11-8°C	Spotlighting	2hr 15min 1730 - 1945
			Call playback (MO/PO/BO/BB/AB/BSC)	Commenced @1850
Arboreal mammals	8/4/13	0/8 cloud, no wind, no rain, 18°C	Spotlighting	2hr 1800 - 2000
			Call playback (Koala)	Commenced @ 1820
	9/4/13	7-2/8 cloud, no wind, previous rain, 19°C – 22°C	Recording Swamp Mahogany locations	2hr 10min 1320 - 1530
	13/8/19	0/8 cloud, no wind, no rain, 11-8°C	Spotlighting	2hr 15min 1730 - 1945
			Call playback (Koala / Squirrel Glider)	Commenced @1915
Terrestrial mammals	8/4/13	4/8 cloud, no wind, no rain, 24°C – 18°C	Spotlighting	2hr 1800 - 2000
	13/8/19	0/8 cloud, no wind, no rain, 11-8°C	Spotlighting	2hr 15min 1730 - 1945
Bats	8/4/13	0/8 cloud, no wind, no rain, 18°C	Spotlighting	2hr 1800 - 2000
			Anabat x1 (passive monitoring)	2hr 10min 1750 - 2000
	9/4/13	Mostly fine	Anabat x1 (passive monitoring)	2hr 30min 1800 - 2030
	5/12/16	8/8 cloud, moderate wind, mod rain - storms, 24-21°C	SM4Bat x2 (passive monitoring)	1730 - overnight x2
	13/8/19	0/8 cloud, no wind, no rain, 11-8°C	Spotlighting	2hr 15min 1730 - 1945
			Anabat x2 (passive monitoring)	2hr 10min 1735 - 1945
Reptiles	8/4/13	4/8 cloud, no wind, no rain, 24°C – 18°C	Diurnal opportunistic	4hr 45min 1315 - 1800
	9/4/13	7-2/8 cloud, no wind, previous rain, 19°C – 22°C	Diurnal opportunistic	2hr 10min 1320 - 1530
Amphibians	8/4/13	0/8 cloud, no wind, no rain, 18°C	Spotlighting & call identification	2hr 1800 - 2000
			Call playback (Green & Golden Bell Frog)	Commenced @ 1820
	9/4/13	7-2/8 cloud, no wind, previous rain, 19°C – 22°C	Opportunistic call identification	2hr 10min 1320 - 1530
	13/8/19	0/8 cloud, no wind, no rain, 11-8°C	Spotlighting / call identification	2hr 15min 1730 - 1945

Key: Nocturnal birds targeted (call-playback)
MO - Masked Owl (*Tyto novaehollandiae*),
PO - Powerful Owl (*Ninox strenua*),
BO - Barking Owl (*Ninox connivens*),
BB - Black Bittern (*Ixobrychus flavicollis*),
AB - Australian Bittern (*Botaurus poiciloptilus*),
BSC - Bush Stone-curlew (*Burhinus grallarius*)

Appendix 2
Flora & Fauna Species Lists

Table A2.1 – Flora species recorded

Family	Scientific name	Common name
TREES		
Fabaceae	*Acacia parramattensis*	Sydney Green Wattle
Myrtaceae	*Acmena smithii*	Lillypilly
Rhamnaceae	*Alphitonia excelsa*	Red Ash
Myrtaceae	*Angophora costata*	Smooth-barked Apple
Arecaceae	*Archontophoenix alexandrae**	Alexandra Palm
Sterculiaceae	*Brachychiton populneus*	Kurrajong
Casuarinaceae	*Casuarina glauca*	Swamp Oak
Lauraceae	*Cinnamomum camphora**	Camphor Laurel
Myrtaceae	*Corymbia maculata*	Spotted Gum
Sapindaceae	*Cupaniopsis anacardioides*	Tuckeroo
Cyatheaceae	*Cyathea australis*	Rough Tree-fern
Eleocarpaceae	*Elaeocarpus reticulatus*	Blueberry Ash
Fabaceae	*Erythrina sykesii**	Coral Tree
Myrtaceae	*Eucalyptus botryoides*	Bangalay / Southern Mahogany
Myrtaceae	*Eucalyptus microcorys*	Tallowwood
Myrtaceae	*Eucalyptus robusta*	Swamp Mahogany
Myrtaceae	*Eucalyptus tereticornis*	Forest Red Gum
Moraceae	*Ficus coronata*	Sandpaper Fig
Euphorbiaceae	*Glochidion ferdinandi*	Cheese Tree
Bignoniaceae	*Jacaranda mimosifolia**	Jacaranda
Arecaceae	*Livistona australis*	Cabbage Tree Palm
Myrtaceae	*Melaleuca linariifolia*	Snow in Summer
Myrtaceae	*Melaleuca quinquenervia*	Broad-leaved Paperbark
Moraceae	*Morus alba**	Mulberry
Oleaceae	*Olea europaea* subsp. *cuspidata**	African Olive
Arecaceae	*Phoenix canariensis**	Canary Island Date Palm
Pittosporaceae	*Pittosporum undulatum*	Sweet Pittosporum
Salicaceae	*Salix babylonica**	Weeping Willow
Arecaceae	*Syagrus romanzoffiana**	Cocos Palm
Myrtaceae	*Syncarpia glomulifera*	Turpentine
SHRUBS		
Fabaceae	*Acacia elongata*	Swamp Wattle
Fabaceae	*Acacia longifolia* var. *longifolia*	Sydney Golden Wattle
Fabaceae	*Acacia saligna*	Orange Wattle
Euphorbiaceae	*Breynia oblongifolia*	Coffee Bush
Solanaceae	*Cestrum parqui**	Chilean Cestrum
Apocnynaceae	*Gomphocarpus fruiticosus**	Narrow Leaf Cotton Bush
Proteaceae	*Hakea salicifolia*	Willow Hakea
Euphorbiaceae	*Homalanthus populifolius*	Bleeding Heart
Myrtaceae	*Kunzea ambigua*	Tick Bush
Verbenaceae	*Lantana camara**	Lantana
Oleaceae	*Ligustrum lucidum**	Large-leaved Privet
Oleaceae	*Ligustrum sinense**	Small-leaved Privet
Celastraceae	*Maytenus silvestris*	-
Myrtaceae	*Melaleuca armillaris*	Bracelet Honey Myrtle

Family	Scientific name	Common name
Myrtaceae	*Melaleuca ericifolia*	Swamp Paperbark
Araceae	*Monstera deliciosa**	Fruit-salad Plant
Ochnaceae	*Ochna serrulata**	Mickey Mouse Plant
Asteraceae	*Osteospermum fruticosum**	Shrubby Daisy-bush
Pittosporaceae	*Pittosporum revolutum*	Yellow Pittosporum
Araliaceae	*Polyscias sambucifolia*	Elderberry Panax
Euphorbiaceae	*Ricinus communis**	Castor Oil Plant
Rosaceae	*Rubus fruticosus* sp. agg.*	Blackberry Complex
Fabaceae	*Senna pendula* var. *glabrata**	-
Solanaceae	*Solanum mauritianum**	Wild Tobacco
GROUNDCOVERS		
Polygonaceae	*Acetosa sagittata**	Turkey Rhubarb
Adiantaceae	*Adiantum aethiopicum*	Common Maidenhair
Asteraceae	*Ageratina adenophorum**	Crofton Weed
Alismataceae	*Alisma plantago-aquatica*	Water Plantain
Amaranthaceae	*Alternanthera denticulata*	Lesser Joyweed
Myrsinaceae	*Anagallis arvensis**	Scarlet Pimpernel
Poaceae	*Andropogon virginicus**	Whisky Grass
Poaceae	*Arundo donax**	Giant Reed
Asparagaceae	*Asparagus aethiopicus**	Asparagus Fern
Aspleniaceae	*Asplenium australasicum*	Birds Nest Fern
Poaceae	*Axonopus fissifolius**	Narrow-leaf Carpet Grass
Azollaceae	*Azolla pinnata*	Ferny Azolla
Restionaceae	*Baloskion tetraphyllum*	-
Asteraceae	*Bidens pilosa**	Cobbler's Pegs
Blechnaceae	*Blechnum cartilagineum*	Gristle Fern
Cyperaceae	*Bolboschoenus fluviatilis*	Marsh Club-rush
Dicksoniaceae	*Calochlaena dubia*	False Bracken
Brassicaceae	*Capsella bursa-pastoris**	Shepherds purse
Cyperaceae	*Carex appressa*	Tall Sedge
Poaceae	*Cenchrus clandestinum**	Kikuyu
Apiaceae	*Centella asiatica*	Swamp Pennywort
Carophyllaceae	*Cerastium glomeratum**	Mouse-ear Chickweed
Liliaceae	*Chlorophytum comosum**	Spider Plant
Asteraceae	*Cirsium vulgare**	Spear Thistle
Commelinaceae	*Commelina cyanea*	Scurvy Weed
Asteraceae	*Conyza sumatrensis**	Fleabane
Poaceae	*Cortaderia selloana**	Pampas Grass
Apiaceae	*Cyclospermum leptophyllum**	Slender Celery
Poaceae	*Cynodon dactylon*	Common Couch
Cyperaceae	*Cyperus brevifolius**	Mullumbimby Couch
Cyperaceae	*Cyperus gracilis*	-
Cyperaceae	*Cyperus polystachyos*	-
Cyperaceae	*Cyperus rotundatus**	-
Phormiaceae	*Dianella caerulea*	Flax Lily
Convolvulaceae	*Dichondra repens*	Kidney Weed
Iridaceae	*Dietes grandiflora*	Wild Iris
Poaceae	*Ehrharta erecta**	Panic Veldtgrass

Family	Scientific name	Common name
Pontederiaceae	*Eichhornia crassipes**	Water Hyacinth
Cyperaceae	*Eleocharis sphacelata*	Tall Spike-rush
Poaceae	*Entolasia stricta*	Wiry Panic
Asteraceae	*Erechtites valerianifolia**	Brazilian Fireweed
Euphorbiaceae	*Euphorbia peplus**	Spurge
Cyperaceae	*Ficinia nodosa*	-
Apiaceae	*Foeniculum vulgare**	Fennel
Cyperaceae	*Gahnia clarkei*	Tall Saw-sedge
Cyperaceae	*Gahnia sieberiana*	Red-fruited Saw-sedge
Geraniaceae	*Geranium homeanum*	Northern Cranesbill
Iridaceae	*Gladiolus* sp.*	-
Zingiberaceae	*Hedychium gardnerianum**	Ginger Lily
Apiaceae	*Hydrocotyle bonariensis**	Kurnell Curse / Pennywort
Apiaceae	*Hydrocotyle sibthorpioides*	Pennywort
Clusiaceae	*Hypericum perforatum**	St Johns Wort
Asteraceae	*Hypochaeris glabra**	Smooth Catsear
Asteraceae	*Hypochaeris radicata**	Flatweed
Dennstaedtiaceae	*Hypolepis muelleri*	Harsh Ground Fern
Poaceae	*Imperata cylindrica* var. *major*	Blady Grass
Juncaceae	*Juncus usitatus*	Common Rush
Liliaceae	*Lilium formosanum**	Formosan Lily
Lomandraceae	*Lomandra longifolia*	Spiky-headed Mat-rush
Onagraceae	*Ludwigia peruviana**	Water Primrose
Cyperaceae	*Machaerina articulata*	Jointed twig-rush
Cyperaceae	*Machaerina juncea*	Bare Twig-rush
Lamiaceae	*Mentha* sp.*	Mint
Poaceae	*Microlaena stipoides* var. *stipoides*	Weeping Rice Grass
Malvaceae	*Modiola caroliniana**	Red-flowered Mallow
Poaceae	*Oplismenus aemulus*	Basket Grass
Poaceae	*Oplismenus imbecillis*	Basket Grass
Oxalidaceae	*Oxalis corniculata**	Yellow Wood Sorrel
Urticaceae	*Parietaria judaica**	Wall pellitory
Poaceae	*Paspalum dilatatum**	Paspalum
Poaceae	*Paspalum urvillei**	Vasey Grass
Polygonaceae	*Persicaria decipiens*	Slender Knotweed
Polygonaceae	*Persicaria strigosa*	-
Poaceae	*Phragmites australis*	Common Reed
Plantaginaceae	*Plantago lanceolata**	Ribwort
Poaceae	*Poa annua**	Winter Grass
Portulacaceae	*Portulaca oleracea*	Purslane
Lobeliaceae	*Pratia purpurascens*	Whiteroot
Dennstaedtiaceae	*Pteridium esculentum*	Bracken
Ranunculaceae	*Ranunculus repens**	Creeping Buttercup
Polygonaceae	*Rumex crispus**	Curled Dock
Cyperaceae	*Schoenoplectus validus*	River Club-rush
Cyperaceae	*Schoenus brevifolius*	Bog-rush
Asteraceae	*Senecio madagascariensis**	Fireweed
Poaceae	*Setaria parviflora**	-

Family	Scientific name	Common name
Malvaceae	*Sida rhombifolia**	Paddy's Lucerne
Solanaceae	*Solanum nigrum**	Black Nightshade
Asteraceae	*Soliva sessilis**	Jojo
Asteraceae	*Sonchus asper* subsp. *asper**	Prickly Sowthistle
Asteraceae	*Sonchus oleraceus**	Common Sow-thistle
Poaceae	*Sporobolus africanus**	Parramatta Grass
Poaceae	*Sporobolus creber*	Slender Rat's Tail Grass
Poaceae	*Stenotaphrum secundatum**	Buffalo Grass
Strelitzeaceae	*Strelitzea juncea**	Bird of Paradise
Asteraceae	*Tagetes minuta**	Stinking Roger
Asteraceae	*Taraxacum officinale**	Dandelion
Blechnaceae	*Telmatoblechnum indicum*	Swamp Water Fern
Aizoaceae	*Tetragonia tetragonioides*	New Zealand Spinach
Commelinaceae	*Tradescantia albiflora**	Wandering Jew
Fabaceae	*Trifolium repens**	White Clover
Juncaginaceae	*Triglochin microtuberosum*	Water Ribbons
Typhaceae	*Typha orientalis*	Cumbungi
Urticaceae	*Urtica incisa*	Stinging Nettle
Scrophulariaceae	*Verbascum virgatum**	Twiggy Mullein
Verbenaceae	*Verbena bonariensis**	Purpletop
Verbenaceae	*Verbena litoralis**	Coastal Verbena
Violaceae	*Viola hederacea*	Ivy-leaved Violet
Violaceae	*Viola odorata**	Sweet Violet
Iridaceae	*Watsonia meriana**	Wild Watsonia
Araceae	*Zantedeschia aethiopica**	White Arum Lily
VINES		
Basellaceae	*Anredera cordifolia**	Madiera Vine
Apocnyaceae	*Araujia sericifolia**	Mothvine
Sapindaceae	*Cardiospermum grandiflorum**	Balloon Vine, Love in a Puff
Lauraceae	*Cassytha glabella*	
Vitaceae	*Cayratia clematidea*	Slender Grape
Dioscoreaceae	*Dioscorea transversa*	Native Yam
Convolvulaceae	*Ipomoea indica**	Coastal Morning Glory
Caprifoliaceae	*Lonicera japonica**	Japanese Honeysuckle
Apocynaceae	*Parsonsia straminea*	Common Silkpod
Passifloraceae	*Passiflora edulis**	Common Passionfruit
Menispermiaceae	*Stephania japonica* var. *discolor**	Snake Vine
Fabaceae	*Vicia sativa* subsp. *sativa**	Common Vetch
* denotes exotic species TS denotes threatened species		

It should be noted that not all garden, cultivar or landscape species have been identified as part of this assessment.

Table A2.2 – Fauna species recorded

Common name	Scientific name	Method observed	
Birds		**April 2013 / Dec 2016**	**Aug 2019**
Australian Brush-turkey	*Alectura lathami*	O	
Australian Magpie	*Gymnorhina tibicen*	O W	O W
Australian Raven	*Corvus coronoides*	O W	O
Australian White Ibis	*Threskiornis moluccus*		O
Brown Thornbill	*Acanthiza pulsilla*	W	W
Chestnut Teal	*Anas castanea*	O W	
Common Bronzewing	*Phaps chalcoptera*	O	
Common Koel	*Eudynamys scolopacea*	O W	
Common Myna *	*Acridotheres tristis*	W	W
Long-billed Corella	*Cacatua tenuirostris*		O W
Eastern Spinebill	*Acanthorhynchus tenuirostris*	O W	W
Eastern Whipbird	*Psophodes olivaceus*	W	O W
Eastern Yellow Robin	*Eopsaltria australis*		W
Figbird	*Sphecotheres vieilloti*		W
Galah	*Cacatua roseicapilla*	O W	W
Golden Whistler	*Pachycephala pectoralis*	O W	W
Grey Butcherbird	*Cracticus torquatus*	W	W
Grey Fantail	*Rhipidura fuliginosa*	O W	W
Laughing Kookaburra	*Dacelo novaeguineae*	O W	O W
Magpie-lark	*Grallina cyanoleuca*	O	O
Masked Lapwing	*Vanellus miles*	O W	O W
Musk Lorikeet	*Glossopsitta concinna*	O W	W
Noisy Miner	*Manorina melanocephala*	W	O W
Olive-backed Oriole	*Oriolus sagittatus*	O W	
Pacific Black Duck	*Anas superciliosa*	O	
Pied Currawong	*Strepera graculina*	O W	O W
Purple Swamphen	*Porphyrio porphyrio*	O W	O W
Rainbow Lorikeet	*Trichoglossus haematodus*	O W	O W
Red-browed Finch	*Neochmia temporalis*		O W
Red Junglefowl *	*Gallus gallus*	O W	
Red Wattlebird	*Anthochaera carunculata*	W	O W
Red-whiskered Bulbul *	*Pycnonotus jocosus*	O W	W
Rufous Whistler	*Pachycephala rufiventris*		W
Silvereye	*Zosterops lateralis*	O W	
Spotted Pardalote	*Pardalotus punctatus*	W	
Spotted Turtle-Dove *	*Streptopelia chinensis*	O	O W
Sulphur Crested Cockatoo	*Cacatua galerita*	O W	W
Superb Fairy-wren	*Malurus cyaneus*	O W	O W
Tawny Frogmouth	*Podargus strigoides*	O	
Variegated Fairy-wren	*Malurus lamberti*	O W	O W
White-browed Scrubwren	*Sericornis frontalis*	O W	
White-cheeked Honeyeater	*Phylidonyris nigra*	W	W
Willie Wagtail	*Rhipidura leucophrys*	O W	O W
Yellow Thornbill	*Acanthiza nana*	O W	

Common name	Scientific name	Method observed	
Mammals			
Black Rat *	*Rattus rattus*	T	O
Common Brushtail Possum	*Trichosurus vulpecula*	P	O
Common Ringtail Possum	*Pseudocheirus peregrinus*	P	O
Domesticated Dog *	*Canis familiaris*	O	O
Eastern Bentwing-bat TS	*Miniopterus orianae oceansis*	U	U
Eastern Freetail-bat	*Mormopterus ridei*	U PO	
Gould's Wattled Bat	*Chalinolobus gouldii*	U	
Grey-headed Flying-fox TS	*Pteropus poliocephalus*	S	
Horse *	*Equus caballus*	O	O
Large-footed MyotisTS	*Myotis macropus*	U PO	O PR U PO
Little Forest Bat	*Vespadelus vulturnus*	U	
Littlle Bentwing-bat	*Miniopterus australis*		U
Long-nosed Bandicoot	*Perameles nasuta*		O W
Rabbit *	*Oryctolagus cuniculus*	P	O
Swamp Wallaby	*Wallabia bicolor*		O
Reptiles			
Delicate Skink	*Lampropholis delicata*	O	
Eastern Water Dragon	*Intellagama lesueurii*	O	
Eastern Water Skink	*Eulamprus quoyii*	O	
Red-Bellied Black Snake	*Pseudechis porphyriacus*	O	
Amphibians			
Common Eastern Froglet	*Crinia signifera*	W	W
Dwarf Tree Frog	*Litoria fallax*	W	
Peron's Tree Frog	*Litoria peronii*		W
Striped Marsh Frog	*Limnodynastes peronii*	W	

Note:
* indicates introduced species
TS indicates threatened species
MS indicates Migratory species

All species listed are identified to a high level of certainty unless otherwise noted as:

PR indicates species identified to a 'probable' level of certainty – more likely than not
PO indicates species identified to a 'possible' level of certainty – low-moderate level of confidence

E - Nest/roost	H - Hair/feathers/skin	P - Scat	W - Heard call
F - Tracks/scratchings	K - Dead	Q - Camera	X - In scat
FB - Burrow	O - Observed	T - Trapped/netted	Y - Bone/teeth/shell
G - Crushed cones	OW - Obs & heard call	U - Anabat/ultrasound	Z - In raptor/owl pellet

Appendix 3
Threatened Flora and Fauna Species Habitat Assessment

Table A3.1 – Threatened flora species habitat assessment

Scientific name DATABASE SOURCE1	***BC Act***	***EPBC Act***	**Growth form and habitat requirements** ***Distribution limit***	**Recorded on site (✓)**	**If not recorded on site**				**Further assessment required (✓)**
					Suitable habitat present (✓)	**Nearby and / or high number of record(s) (✓)** *Notes 1,2 & 3*	**Record(s) from recent years (✓)** *Notes 1,2 & 3*	**Potential to occur**	
Acacia bynoeana OEH EPBC	E1	V	Erect or spreading shrub to 0.3m high growing in heath and dry sclerophyll open forest on sandy soils. Often associated with disturbed areas such as roadsides. *Distribution limits N-Newcastle S-Berrima.*	x	x	-	-	x	x
Acacia pubescens EPBC	V	V	Spreading shrub 1-4m high open sclerophyll growing in open forest and woodlands on clay soils. *Distribution limits N-Bilpin S-Georges River.*	x	x	-	-	x	x
Acacia terminalis subsp. *terminalis* OEH	E1	E	Erect shrub to 2m tall, flowers from March to July. Occurs in eucalypt woodland or forest, usually in sandy soil on creek banks, hillslopes or in shallow soil in rock crevices and sandstone platforms on cliffs. *Typically restricted to the Port Jackson and eastern suburbs of Sydney.*	x	x	-	-	x	x
Asterolasia elegans OEH EPBC	E1	E	Erect shrub 1-3m high growing in moist sclerophyll forests on Hawkesbury sandstone slopes hillsides. *Distribution limits Maroota region.*	x	x	-	-	x	x
Astrotricha crassifolia EPBC	V	V	Shrub to 2.4m high. Grows in dry sclerophyll woodland on sandstone. *Distribution limits N-Patonga S-Royal NP.*	x	x	-	-	x	x
Baloskion longipes EPBC	V	V	Perennial, grass-like herb with separate male and female plants with a height of 1.5 m. Grows in swamps and depressions. *Recorded mostly in the Southern Tablelands.*	x	x	-	-	x	x
Boronia umbellata OEH	V	V	Orara Boronia is an open shrub, 1 – 2m tall. Geographically restricted to Glenreagh and Lower Bucca, north of Coffs Harbour where it grows around gullies in wet open forest.	x	x	-	-	x	x

Scientific name DATABASE SOURCE1	***BC Act***	***EPBC Act***	**Growth form and habitat requirements** ***Distribution limit***	**Recorded on site (✓)**	**If not recorded on site**				**Further assessment required (✓)**
					Suitable habitat present (✓)	**Nearby and / or high number of record(s) (✓)** *Notes 1,2 & 3*	**Record(s) from recent years (✓)** *Notes 1,2 & 3*	**Potential to occur**	
Caladenia tessellata EPBC	E1	V	Terrestrial orchid. Clay-loam or sandy soils. LHCCREMS guidelines suggest the species grows in Map Unit 34 – Coastal Sand Wallum Woodland - Heath. Flowers in September – November. *Distribution limits N-Swansea S-south of Eden.*	x	marginal	x	-	x	x
Callistemon linearifolius OEH	V	-	Shrub to 4m high. Dry sclerophyll forest on coast and adjacent ranges. *Distribution limits N-Nelson Bay S-Georges River.*	x	✓	2.4 km NW	2016	low	✓
Chamaesyce psammogeton OEH	E1	-	Prostrate herb. Coastal dunes. *Distribution limits N-Tweed Heads S-Jervis Bay.*	x	x	-	-	x	x
Cryptostylis hunteriana OEH EPBC	V	V	Saprophytic orchid. Grows in swamp heath on sandy soils. *Distribution limits N-Gibraltar Range S-south of Eden.*	x	x	-	-	x	x
Cynanchum elegans EPBC	E1	E	Climber or twiner to 1m. Grows in rainforest gullies, scrub & scree slopes. *Distribution limits N-Gloucester S-Wollongong.*	x	x	-	-	x	x
Darwinia biflora EPBC	V	V	Erect or spreading shrub to 0.8m high. Grows in heath or understorey of woodland on or near shale-capped ridges underlain by Hawkesbury sandstone. *Distribution limits N-Gosford S-Cheltenham.*	x	x	-	-	x	x
Epacris purpurascens var. *purpurascens* OEH	V	-	Erect shrub to 1.5m high growing in sclerophyll forest and scrub and near creeks and swamps on sandstone. *Distribution limits N-Gosford S-Blue Mountains.*	x	x	-	-	x	x

Scientific name DATABASE SOURCE1	***BC Act***	***EPBC Act***	**Growth form and habitat requirements** ***Distribution limit***	**Recorded on site (✓)**	**If not recorded on site**				**Further assessment required (✓)**
					Suitable habitat present (✓)	**Nearby and / or high number of record(s) (✓)** *Notes 1,2 & 3*	**Record(s) from recent years (✓)** *Notes 1,2 & 3*	**Potential to occur**	
Eucalyptus camfieldii OEH EPBC	V	V	Stringybark to 10m high. Grows on coastal shrub heath and woodlands on sandy soils derived from alluviums and Hawkesbury sandstone. *Distribution limits N-Norah Head S-Royal NP.*	x	x	-	-	x	x
Eucalyptus nicholii OEH	V	-	This species is widely planted as an urban street tree and in gardens but is quite rare in the wild. *It is confined to the New England Tablelands of NSW, where it occurs from Nundle to north of Tenterfield, largely on private property.*	x	x	-	-	x	x
Eucalyptus scoparia OEH	E1	V	Smooth-barked tree only known from vicinity of Bald Rock.	x	x	-	-	x	x
Genoplesium baueri OEH EPBC	E1	E	A terrestrial orchid that grows in sparse sclerophyll forest and moss gardens over sandstone. Flowers Feb–Mar. *Distribution limits N – Hunter Valley S – Nowra.*	x	x	-	-	x	x
Grammitis stenophylla OEH	E1	-	A small lithophytic fern with fronds generally <5cm. *Occurs in rainforest and wet sclerophyll forest in the coastal divisions of NSW.* Usually grown on rocks.	x	x	-	-	x	x
Grevillea caleyi OEH	E1	E	Shrub mostly 1-3m high. Grows in laterite. *Distribution limits Terrey Hills-Belrose area.*	x	x	-	-	x	x
Grevillea shiressii OEH EPBC	V	V	Shrub 2-5m high. Flowers mainly spring. Grows along creek banks in wet sclerophyll forest. Sandy soil on Hawkesbury Sandstone. *Restricted to the Gosford area. CC.*	x	x	-	-	x	x
Haloragis exalata subsp. *exalata* EPBC	V	V	Shrub to 1.5m high. Grows in damp places near watercourses. *Distribution limits N-Tweed Heads S-south of Eden.*	x	x	-	-	x	x

Scientific name DATABASE SOURCE1	***BC Act***	***EPBC Act***	**Growth form and habitat requirements** ***Distribution limit***	**Recorded on site (✓)**	**If not recorded on site**				**Further assessment required (✓)**
					Suitable habitat present (✓)	**Nearby and / or high number of record(s) (✓)** *Notes 1,2 & 3*	**Record(s) from recent years (✓)** *Notes 1,2 & 3*	**Potential to occur**	
Haloragodendron lucasii OEH	E1	E	Straggling shrub to 1.5m high. Grows in open forest on sheltered slopes near creeks. *Distribution limits Ku-ring-gai Plateau and Mt Wilson.*	x	x	-	-	x	x
Hibbertia puberula OEH	E1	-	Shrublets with branches up to 30cm long. It favours dry sclerophyll woodland or low heath on sandy soils or rarely in clay, with or without rocks underneath. *It extends from Wollemi National Park south to Morton National Park and the south coast near Nowra. Early records are from Hawkesbury River area in Sydney and the Blue Mountains.*	x	x	-	-	x	x
Hibbertia superans OEH	E1	-	Small spreading shrub to 0.3m high. Grows on sandstone, usually in or near SSTF. *Distribution limits N-Glenorie S-Kellyville disjunct Mt Boss.*	x	x	-	-	x	x
Kunzea rupestris OEH	V	V	Shrub to 1.5m high. Grows in cracks and fissures on Hawkesbury Sandstone rock platforms. *Distribution limits N-Maroota S-Glenorie.*	x	x	-	-	x	x
Lasiopetalum joyceae OEH	V	V	Erect shrub to 2m high. Grows in heath and open forest on Hawkesbury sandstone. *Distribution limits Hornsby Plateau.*	x	x	-	-	x	x
Melaleuca biconvexa EPBC	V	V	Tall shrub. Grows in wetlands adjoining perennial streams and on the banks of those streams, generally within the geological series known as the Terrigal Formation. *Distribution limits N-Port Macquarie S-Jervis Bay.*	x	marginal	x	-	x	x
Melaleuca deanei OEH EPBC	V	V	Shrub to 3m high. Grows in heath on sandstone. *Distribution limits N-Gosford S-Nowra.*	x	x	-	-	x	x

Scientific name DATABASE SOURCE1	***BC Act***	***EPBC Act***	**Growth form and habitat requirements** ***Distribution limit***	**Recorded on site (✓)**	**If not recorded on site**				**Further assessment required (✓)**
					Suitable habitat present (✓)	**Nearby and / or high number of record(s) (✓)** *Notes 1,2 & 3*	**Record(s) from recent years (✓)** *Notes 1,2 & 3*	**Potential to occur**	
Micromyrtus blakelyi EPBC	V	V	Low erect shrub. Grows in cracks and fissures on Hawkesbury sandstone rock platforms. *Distribution limits N-Maroota S-Berowra.*	x	x	-	-	x	x
Persicaria elatior EPBC	V	V	Herb to 90cm tall which grows in damp places especially beside streams and lakes. Occasionally in swamp forest or associated with disturbance. *Varied distribution from SE NSW to QLD.*	x	marginal	x	-	x	x
Persoonia hirsuta OEH EPBC	E1	E	Erect to decumbent shrub. Grows in dry sclerophyll forest and woodland on Hawkesbury sandstone with infrequent fire histories. *Distribution limits N-Glen Davis S-Hill Top.*	x	x	-	-	x	x
Persoonia mollis subsp. *maxima* OEH	E1	E	Erect to prostrate shrub. Grows in moist to wet sclerophyll forests on Hawkesbury sandstone. *Distribution limits N-Cowan S-Hornsby.*	x	x	-	-	x	x
Pimelea curviflora var. *curviflora* OEH EPBC	V	V	Woody herb or sub-shrub to 0.2-1.2m high. Grows on Hawkesbury Sandstone near shale outcrops. *Distribution Sydney.*	x	x	-	-	x	x
Prostanthera askania EPBC	E1	E	Erect shrub. Grows in sclerophyll forest on ridges in or adjacent to Rainforest. *Distribution limits Strickland SF region.*	x	x	-	-	x	x
Prostanthera densa OEH	V	V	Erect shrub 0.5-2m. Grows in sclerophyll forest and shrubland. *Distribution limits N-Nelson Bay S-Beecroft Peninsula.*	x	x	-	-	x	x
Prostanthera junonis EPBC	E1	E	Small shrub. Grows in sclerophyll forest and heath in shallow soil on sandstone. *Distribution limits Somersby region.*	x	x	-	-	x	x

Scientific name DATABASE SOURCE1	***BC Act***	***EPBC Act***	**Growth form and habitat requirements** ***Distribution limit***	**Recorded on site (✓)**	**If not recorded on site**				**Further assessment required (✓)**
					Suitable habitat present (✓)	**Nearby and / or high number of record(s) (✓)** *Notes 1,2 & 3*	**Record(s) from recent years (✓)** *Notes 1,2 & 3*	**Potential to occur**	
Prostanthera marifolia OEH	CE	CE	Erect shrub to 0.3m high. Woodland dominated by Eucalyptus sieberi and Corymbia gummifera. In deeply weathered clay soil with ironstone nodules. *Has been recorded previously in the Sydney Harbour region.*	x	x	-	-	x	x
Rhodamnia rubescens *OEH*	E4A	-	Shrub to small tree to 25m tall. Widespread in warmer rainforest and on rainforest margins on range of volcanically derived and sedimentary soils. Mainly coastal areas; north from Batemans Bay. Flowers late winter to spring.	x	x	-	-	x	x
Rhizanthella slateri EPBC	V	E	Underground orchid that is poorly known. Grows in sclerophyll forests. Usually only seen if the soil is disturbed. Flowers in Oct – Nov.	x	x	-	-	x	x
Senecio spathulatus OEH	E1	-	A low growing daisy that prefers primary dunes. *Known to occur at Cape Howe and between Kurnell north to Myall Lakes National Park. Also occurs in coastal locations in eastern Victoria.*	x	x	-	-	x	x
Syzygium paniculatum OEH EPBC	V	V	Small tree. Subtropical and littoral rainforest on sandy soil. *Distribution limits N-Forster S-Jervis Bay.*	x	x	-	-	x	x
Tetratheca glandulosa OEH	V	-	Spreading shrub to 0.2m high. Sandy or rocky heath or scrub. *Distribution limits N-Mangrove Mountain S-Port Jackson.*	x	x	-	-	x	x
Thesium australe EPBC	V	V	Erect herb to 0.4m high. Root parasite. Themeda grassland or woodland often damp. *Distribution limits N-Tweed Heads S-south of Eden.*	x	x	-	-	x	x

OEH	- Denotes species listed within 10km of the subject lots on the *Atlas of NSW Wildlife*
EPBC	- Denotes species listed within 10km of the subject lots in the *EPBC Act* habitat search
V	- Denotes vulnerable listed species under the relevant Act

Scientific name DATABASE SOURCE1	***BC Act***	***EPBC Act***	**Growth form and habitat requirements** ***Distribution limit***	**Recorded on site (✓)**	**If not recorded on site**				**Further assessment required (✓)**
					Suitable habitat present (✓)	**Nearby and / or high number of record(s) (✓)** *Notes 1,2 & 3*	**Record(s) from recent years (✓)** *Notes 1,2 & 3*	**Potential to occur**	
E or E1	- Denotes endangered listed species under the relevant Act								
E4A or CE	- Denotes critically endangered listed species under the relevant Act								
NOTE:	1. This field is not considered if no suitable habitat is present within the subject lots 2. 'records' refer to those provided by the *Atlas of NSW Wildlife* 3. 'nearby' or 'recent' records are species specific accounting for home range, dispersal ability and life cycle								

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Table A3.2 – Threatened fauna species habitat assessment

Common name ***Scientific name*** Database source	***BC Act***	***EPBC Act***	**Preferred habitat** ***Distribution limit***	**Recorded on site (✓)**	**If not recorded on site**				**Further assessment required (✓)**
					Suitable habitat present (✓)	**Nearby and/or high number of record(s) (✓)** *Notes 1,2 & 3*	**Record(s) from recent years (✓)** *Notes 1,2 & 3*	**Potential to occur**	
Giant Burrowing Frog *Heleioporus australiacus* OEH EPBC	V	V	Inhabits open forests and riparian forests along non-perennial streams, digging burrows into sandy creek banks. *Distribution limit: N-Near Singleton S-South of Eden.*	x	x	-	-	x	x
Stuttering Frog *Mixophyes balbus* EPBC	E	V	Terrestrial inhabitant of rainforest and wet sclerophyll forests. *Distribution limit: N-near Tenterfield S-South of Bombala*.	x	x	-	-	x	x
Red-crowned Toadlet *Pseudophryne australis* OEH	V	-	Prefers sandstone areas, breeds in grass and debris beside non-perennial creeks or gutters. Individuals can also be found under logs and rocks in non-breeding periods. *Distribution limit: N-Pokolbin. S-near Wollongong.*	x	x	-	-	x	x
Green and Golden Bell Frog *Litoria aurea* OEH EPBC	E	V	Prefers the edges of permanent water, streams, swamps, creeks, lagoons, farm dams and ornamental ponds. Often found under debris. *Distribution limit: N-Byron Bay S-South of Eden.*	x	✓	x	x	Not likely	x
Littlejohn's Tree Frog *Litoria littlejohnii* EPBC	V	V	Found in wet and dry sclerophyll forest associated with sandstone outcrops at altitudes 280-1,000m on eastern slopes of Great Dividing Range. Prefers flowing rocky streams. *Distribution limit: N-Hunter River S-Eden.*	x	x	-	-	x	x

Common name ***Scientific name*** Database source	***BC Act***	***EPBC Act***	**Preferred habitat** ***Distribution limit***	**Recorded on site (✓)**	**If not recorded on site**				**Further assessment required (✓)**
					Suitable habitat present (✓)	**Nearby and/or high number of record(s) (✓)** *Notes 1,2 & 3*	**Record(s) from recent years (✓)** *Notes 1,2 & 3*	**Potential to occur**	
Rosenberg's Goanna *Varanus rosenbergi* OEH	V	-	Hawkesbury sandstone outcrop specialist. Inhabits woodlands, dry open forests and heathland sheltering in burrows, hollow logs, rock crevices and outcrops. *Distribution limit: N-Nr Broke. S-Nowra Located in scattered patches near Sydney, Nowra and Goulburn.*	x	x	-	-	x	x
Wompoo Fruit-dove *Ptilinopus magnificus* OEH	V	-	Inhabits large undisturbed patches of lowland and adjacent highland rainforest and moist eucalypt forests where it feeds on fruit. *Distribution limit: N-Tweed Heads. S-Sydney.*	x	x	-	-	x	x
Superb Fruit-dove *Ptilinopus superbus* OEH	V	-	Rainforests, adjacent mangroves, eucalypt forests, scrubland with native fruits. *Distribution limit: N-Border Ranges National Park. S-Batemans Bay.*	x	x	-	-	x	x
Australasian Bittern *Botaurus poiciloptilus* OEH EPBC	E	E	Found in or over water of shallow freshwater or brackish wetlands with tall reedbeds, sedges, rushes, cumbungi, lignum and also in ricefields, drains in tussocky paddocks, occasionally saltmarsh, brackish wetlands. *Distribution limit: N-North of Lismore. S- Eden.*	x	marginal	x	✓	unlikely	✓
Black Bittern *Ixobrychus flavicollis* OEH	V	-	Found in shadowy, leafy waterside trees such as callistemons, casuarinas, paperbarks, eucalypts, mangroves and willows along tidal creeks, freshwater and brackish streams and ponds, sheltered mudflats and oyster slats. *Distribution limit: N-Tweed Heads. S-South of Eden.*	x	✓	✓	✓	✓	✓

Common name ***Scientific name*** Database source	***BC Act***	***EPBC Act***	**Preferred habitat** ***Distribution limit***	**Recorded on site (✓)**	**If not recorded on site**				**Further assessment required (✓)**
					Suitable habitat present (✓)	**Nearby and/or high number of record(s) (✓)** *Notes 1,2 & 3*	**Record(s) from recent years (✓)** *Notes 1,2 & 3*	**Potential to occur**	
White-bellied Sea Eagle (*Haliaeetus leucogaster*) OEH	V	-	Occupies coasts, islands, estuaries, inlets, large rivers, inland lakes and reservoirs. *Sedentary; dispersive. N-Tweed Heads. S-South of Eden.*	x	marginal	✓	✓	✓	✓
Little Eagle *Hieraaetus morphnoides* OEH	V	-	Utilises plains, foothills, open forests, woodlands and scrublands; river red gums on watercourses and lakes. *Distribution limit - N-Tweed Heads. S-South of Eden.*	x	marginal	✓	✓	✓	✓
Square-tailed Kite *Lophoictinia isura* OEH	V	-	Utilises mostly coastal and sub-coastal open forest, woodland or lightly timbered habitats and inland habitats along watercourses and mallee that are rich in passerine birds. *Distribution limit: N-Goondiwindi. S-South of Eden.*	x	✓	x	✓	✓	✓
Eastern Osprey *Pandion cristatus* OEH	V	-	Utilises waterbodies including coastal waters, inlets, lakes, estuaries and offshore islands with a dead tree for perching and feeding. *Distribution limit: N-Tweed Heads. S-South of Eden.*	x	x	-	-	x	x
Bush Stone-curlew *Burhinus grallarius* OEH	E	-	Utilises open forests and savannah woodlands, sometimes dune scrub, savannah and mangrove fringes. *Distribution limit: N-Border Ranges National Park. S-Near Nowra.*	x	✓	x	x	Not likly	x
Australian Painted Snipe *Rostratula australis* OEH EPBC	E	E	Most numerous within the Murray-Darling basin and inland Australia within marshes and freshwater wetlands with swampy vegetation. *Distribution limit: N-Tweed Heads. S-South of Eden.*	x	x	-	-	x	x

Common name *Scientific name* Database source	*BC Act*	*EPBC Act*	Preferred habitat *Distribution limit*	Recorded on site (✓)	If not recorded on site				Further assessment required (✓)
					Suitable habitat present (✓)	Nearby and/or high number of record(s) (✓) *Notes 1,2 & 3*	Record(s) from recent years (✓) *Notes 1,2 & 3*	Potential to occur	
Curlew Sandpiper *Callidris ferruginea* OEH EPBC	E	CE	Mainly coastal, but many inland feeding along tidal mudflats, salt marsh, salt fields, fresh, brackish or saline wetlands and sewerage ponds. *Distribution limit: N-Tweed Heads. S-South of Eden.*	x	x	-	-	x	x
Eastern Curlew *Numenius madagascariensis* OEH EPBC	-	CE	Primarily coastal especially estuaries, bays, harbours, inlets and coastal lagoons, with large intertidal mudflats or sandflats, often with beds of seagrass. Occasionally on ocean beaches (often near estuaries), and coral reefs, rock platforms, or rocky islets. Often recorded among saltmarsh and on mudflats fringed by mangroves and also in coastal saltworks and sewage farms. *Distribution limit: N-Tweed Heads. S-South of Eden.*	x	x	-	-	x	x
Gang-gang Cockatoo *Callocephalon fimbriatum* OEH	V	-	Prefers wetter forests and woodlands from sea level to > 2,000m on the Great Dividing Range, timbered foothills and valleys, timbered watercourses, coastal scrubs, farmlands and suburban gardens. *Distribution limit: mid north coast of NSW to western Victoria.*	x	x	-	-	x	x
Glossy Black-Cockatoo *Calyptorhynchus lathami* OEH	V	-	Open forests with *Allocasuarina* species and hollows for nesting. *Distribution limit: N-Tweed Heads. S-South of Eden.*	x	x	-	-	x	x
Little Lorikeet *Glossopsitta pusilla* OEH	V	-	Inhabits forests, woodlands; large trees in open country; timbered watercourses, shelterbeds, and street trees. *Distribution limit: N-Tweed Heads. S-South of Eden*.	x	✓	✓	✓	✓	✓

Common name *Scientific name* Database source	*BC Act*	*EPBC Act*	Preferred habitat *Distribution limit*	Recorded on site (✓)	If not recorded on site				Further assessment required (✓)
					Suitable habitat present (✓)	Nearby and/or high number of record(s) (✓) *Notes 1,2 & 3*	Record(s) from recent years (✓) *Notes 1,2 & 3*	Potential to occur	
Swift Parrot *Lathamus discolour* OEH EPBC	E	E	Inhabits eucalypt forests and woodlands with winter flowering eucalypts. *Distribution limit: N-Border Ranges National Park. S-South of Eden.*	x	✓	✓	✓	✓	✓
Turquoise Parrot *Neophema pulchella* OEH	V	-	Inhabits coastal scrubland, open forest and timbered grassland, especially ecotones between dry hardwood forests and grasslands. *Distribution limit: N-Near Tenterfield. S-South of Eden.*	x	x	-	-	x	x
Barking Owl *Ninox connivens* OEH	V	-	Inhabits principally woodlands but also open forests and partially cleared land and utilises hollows for nesting. *Distribution limit: N-Border Ranges National Park. S-Eden.*	x	✓	✓	✓	✓	✓
Powerful Owl *Ninox strenua* OEH	V	-	Forests containing mature trees for shelter or breeding and densely vegetated gullies for roosting. *Distribution limits: N-Border Ranges National Park. S-Eden.*	x	✓	✓	✓	✓	✓
Masked Owl *Tyto novaehollandiae* OEH	V	-	Open forest and woodlands with cleared areas for hunting and hollow trees or dense vegetation for roosting. *Distribution limit: N-Border Ranges National Park. S-Eden.*	x	marginal	x	x	Not likely	x
Sooty Owl *Tyto tenebricosa* OEH	V	-	Tall, dense, wet forests containing trees with very large hollows. *Distribution limit: N-Border Ranges National Park. S-South of Eden.*	x	x	-	-	x	x

Common name *Scientific name* Database source	*BC Act*	*EPBC Act*	Preferred habitat *Distribution limit*	Recorded on site (✓)	If not recorded on site				Further assessment required (✓)
					Suitable habitat present (✓)	Nearby and/or high number of record(s) (✓) *Notes 1,2 & 3*	Record(s) from recent years (✓) *Notes 1,2 & 3*	Potential to occur	
Eastern Bristlebird *Dasyornis brachypterus* OEH EPBC	E	E	Coastal woodlands, dense scrubs and heathlands, especially where low heathland borders taller woodland or dense tall tea-tree. *Distribution limit: N-Tweed Heads. S-South of Eden.*	x	x	-	-	x	x
Regent Honeyeater *Xanthomyza Phrygia* OEH EPBC	E4A	CE	Found in temperate eucalypt woodland and open forest including forest edges, wooded farmland and urban areas with mature eucalypts. *Distribution limit: N-Urbanville. S-Eden.*	x	✓	x	✓	low	✓
Painted Honeyeater *Grantiella picta* EPBC	V	V	A nomadic bird occurring in low densities within open forest, woodland and scrubland feeding on mistletoe fruits. Inhabits primarily Boree, Brigalow and Box-Gum Woodlands and Box-Ironbark Forests. *Distribution limit: N-Boggabilla. S-Albury with greatest occurrences on the inland slopes of the Great Dividing Range.*	x	x	-	-	x	x
Black-chinned Honeyeater *Melithreptus gularis gularis* OEH	V	-	Found in woodlands containing box-ironbark associations and River Red Gums, also drier coastal woodlands of the Cumberland Plain and Hunter Richmond and Clarence. *Distribution limit: N-Cape York Pen. Qld. S-Victor H. Mt Lofty Ra & Flinders Ra. SA.*	x	x	-	-	x	x
Varied Sittella *Daphoenositta chrysoptera* OEH	V	-	Open eucalypt woodlands / forests (except heavier rainforests); mallee, inland acacia, coastal tea-tree scrubs; golf courses, shelterbelts, orchards, parks, scrubby gardens. *Distribution limit: N-Border Ranges National Park. S-South of Eden.*	x	✓	✓	✓	✓	✓

Common name ***Scientific name*** Database source	***BC Act***	***EPBC Act***	**Preferred habitat** ***Distribution limit***	**Recorded on site (✓)**	**If not recorded on site**				**Further assessment required (✓)**
					Suitable habitat present (✓)	**Nearby and/or high number of record(s) (✓)** *Notes 1,2 & 3*	**Record(s) from recent years (✓)** *Notes 1,2 & 3*	**Potential to occur**	
Dusky Woodswallow *Artamus cyanopterus cyanopterus* OEH	V	-	Found in woodlands and dry open sclerophyll forests, usually dominated by eucalypts, including mallee associations. It has also been recorded in shrublands and heathlands and various modified habitats, including regenerating forests; very occasionally in moist forests or rainforests. Prefers habitat with an open understorey. Often observed in farmland tree patches or roadside remnants. *Widespread in eastern, southern and south-western Australia.*	x	marginal	x	x	Not likely	x
Scarlet Robin *Petroica boodang* OEH	V	-	Found in foothill forests, woodlands, watercourses; in autumn-winter, more open habitats: river red gum woodlands, golf courses, parks, orchards, gardens. *Distribution limit: N-Tweed Heads. S-South of Eden.*	x	marginal	x	✓	Not likely	x
Spotted-tailed Quoll *Dasyurus maculatus* OEH EPBC	V	E	Dry and moist open forests containing rock caves, hollow logs or trees. *Distribution limit: N-Mt Warning National Park. S-South of Eden.*	x	x	-	-	x	x
Southern Brown Bandicoot *Isoodon obesulus* OEH EPBC	E	E	Utilises a range of habitats containing thick ground cover - open forest, woodland, heath, cleared land, urbanised areas and regenerating bushland. *Distribution limit: N-Kempsey. S-South of Eden.*	x	x	-	-	x	x
Koala *Phascolarctos cinereus* OEH EPBC	V	V	Inhabits both wet and dry eucalypt forest on high nutrient soils containing preferred feed trees. *Distribution limit: N-Tweed Heads. S-South of Eden.*	x	x	-	-	x	x

Common name ***Scientific name*** Database source	***BC Act***	***EPBC Act***	**Preferred habitat** ***Distribution limit***	**Recorded on site (✓)**	**If not recorded on site**				**Further assessment required (✓)**
					Suitable habitat present (✓)	**Nearby and/or high number of record(s) (✓)** *Notes 1,2 & 3*	**Record(s) from recent years (✓)** *Notes 1,2 & 3*	**Potential to occur**	
Eastern Pygmy Possum *Cercatetus nanus* OEH	V	-	Found in a variety of habitats from rainforest through open forest to heath. Feeds on insects but also gathers pollen from banksias, eucalypts and bottlebrushes. Nests in banksias and myrtaceous shrubs. *Distribution limit: N-Tweed Heads. S-Eden.*	x	x	-	-	x	x
Squirrel Glider *Petaurus norfolcensis* OEH	V	-	Mixed aged stands of eucalypt forest & woodlands including gum barked & high nectar producing species & hollow bearing trees. *Distribution limit: N-Tweed Heads. S-Albury.*	x	✓	✓	✓	✓	✓
Greater Glider *Petauroides volans* OEH EPBC	-	V	Favours forests with a diversity of eucalypt species, due to seasonal variation in its preferred tree species. Population density is optimal at elevation levels at 845 m above sea level. Prefer overstorey basal areas in old-growth tree stands. Highest abundance typically in taller, montane, moist eucalypt forests, with relatively old trees and abundant hollows *Distribution limit: N-Border Ranges National Park. S- South of Eden.*	x	x	-	-	x	x
Long-nosed Potoroo *Potorous tridactylus* OEH EPBC	V	V	Coastal heath and dry and wet sclerophyll forests with a dense understorey. *Distribution limit: N-Mt Warning National Park. S-South of Eden.*	x	x	-	-	x	x
Brush-tailed Rock-wallaby *Petrogale penicillata* EPBC	E	V	Found in rocky gorges with a vegetation of rainforest or open forests to isolated rocky outcrops in semi-arid woodland country. *Distribution limit: N-North of Tenterfield. S-Bombala.*	x	x	-	-	x	x

Common name ***Scientific name*** Database source	***BC Act***	***EPBC Act***	**Preferred habitat** ***Distribution limit***	**Recorded on site (✓)**	**If not recorded on site**				**Further assessment required (✓)**
					Suitable habitat present (✓)	**Nearby and/or high number of record(s) (✓)** *Notes 1,2 & 3*	**Record(s) from recent years (✓)** *Notes 1,2 & 3*	**Potential to occur**	
Grey-headed Flying-fox *Pteropus poliocephalus* OEH EPBC	V	V	Found in a variety of habitats including rainforest, mangroves, paperbark swamp, wet and dry open forest and cultivated areas. Forms camps commonly found in gullies and in vegetation with a dense canopy. *Distribution limit: N-Tweed Heads. S-Eden.*	✓	-	-	-	-	✓
Yellow-bellied Sheathtail-bat *Saccolaimus flaviventris* OEH	V	-	Rainforests, sclerophyll forests and woodlands. *Distribution limit: N-North of Walgett. S-Sydney.*	x	Sub-optimal	x	x	unlikely	✓
East-coast Freetail Bat *Micronomus norfolkensis* OEH	V	-	Inhabits open forests and woodlands foraging above the canopy and along the edge of forests. Roosts in tree hollows, under bark and buildings. *Distribution limit: N-Woodenbong. S-Pambula.*	x	✓	✓	✓	✓	✓
Large-eared Pied Bat *Chalinolobus dwyeri* OEH EPBC	V	V	Warm-temperate to subtropical dry sclerophyll forest and woodland. Roosts in caves, tunnels and tree hollows in colonies of up to 30 animals. *Distribution limit: N-Border Ranges National Park. S-Wollongong.*	x	✓	✓	✓	✓	✓
Eastern Falsistrelle *Falsistrellus tasmaniensis* OEH	V	-	Recorded roosting in caves, old buildings and tree hollows. *Distribution limit: N-Border Ranges National Park. S-Pambula.*	x	Sub-optimal	x	x	unlikely	✓

Common name ***Scientific name*** Database source	***BC Act***	***EPBC Act***	**Preferred habitat** ***Distribution limit***	**Recorded on site (✓)**	**If not recorded on site**				**Further assessment required (✓)**
					Suitable habitat present (✓)	**Nearby and/or high number of record(s) (✓)** *Notes 1,2 & 3*	**Record(s) from recent years (✓)** *Notes 1,2 & 3*	**Potential to occur**	
Little Bentwing-bat *Miniopterus australis* OEH	V	-	Roosts in caves, old buildings and structures in the higher rainfall forests along the south coast of Australia. *Distribution limit: N-Border Ranges National Park. S-Sydney.*	✓	-	-	-	-	✓
Eastern Bentwing-bat *Miniopterus orianae oceanensis* OEH	V	-	Prefers areas where there are caves, old mines, old buildings, stormwater drains and well-timbered areas. *Distribution limit: N-Border Ranges National Park. S-South of Eden.*	✓	-	-	-	-	✓
Large-footed Myotis *Myotis macropus* OEH	V	-	Roosts in caves, mines, tunnels, buildings, tree hollows and under bridges. Forages over open water. *Distribution limit: N-Border Ranges National Park. S-South of Eden.*	✓	-	-	-	-	✓
Greater Broad-nosed Bat *Scoteanax rueppellii* OEH	V	-	Inhabits areas containing moist river and creek systems, especially tree lined creeks. *Distribution limit: N-Border Ranges National Park. S-Pambula.*	x	✓	x	✓	low	✓
Eastern Cave Bat *Vespadelus troughtoni* OEH	V	-	Inhabits drier open forests and woodlands. Roosts in well-lit parts of caves and mineshafts. *Distribution limit: Along GDR from N-Tweed Heads. S-Kempsey.*	x	✓	✓	✓	✓	✓

Common name ***Scientific name*** Database source	***BC Act***	***EPBC Act***	**Preferred habitat** ***Distribution limit***	**Recorded on site (✓)**	**If not recorded on site**				**Further assessment required (✓)**
					Suitable habitat present (✓)	**Nearby and/or high number of record(s) (✓)** *Notes 1,2 & 3*	**Record(s) from recent years (✓)** *Notes 1,2 & 3*	**Potential to occur**	
New Holland Mouse *Pseudomys novaehollandiae* OEH EPBC	-	V	Occurs in heathlands, woodlands, open forest and paperbark swamps and on sandy, loamy or rocky soils. Coastal populations have a marked preference for sandy substrates, a heathy understorey of leguminous shrubs less than 1m high and sparse ground litter. Recolonise of regenerating burnt areas. *Distribution limit: N-Border Ranges National Park. S-South of Eden.*	x	x	-	-	x	x

OEH	Denotes species listed within 10km of the subject lots on the *Atlas of NSW Wildlife*
EPBC	Denotes species listed within 10km of the subject lots in the *EPBC Act* habitat search
V	Denotes vulnerable listed species under the relevant Act
E or E1	Denotes endangered listed species under the relevant Act
E4A or CE	Denotes critically endangered listed species under the relevant Act
NOTE:	1. This field is not considered if no suitable habitat is present within the subject lots 2. 'records' refer to those provided by the *Atlas of NSW Wildlife* 3. 'nearby' or 'recent' records are species specific accounting for home range, dispersal ability and life cycle
Unlikely	Represents such a low margin but not enough to 100% rule it one. A significance of impact test is required.
Not likely	Means 0% change of occurring, despite there being potential habitat. A significance of impact test is not applied to these species.

A detailed assessment in accordance with Section 1.7 of the *EPA Act* will be completed for these species in Appendix 3 of this report.

Table A2.3 provides an assessment of potential habitat within the subject lots for nationally *protected* migratory fauna species recorded within 10km on the *EPBC Act* Protected Matters Tool. Nationally *threatened* migratory species are considered in Table A2.3.

Table A3.3 – Migratory fauna habitat assessment

Common name ***Scientific name***	**Preferred habitat** ***Migratory breeding***	**Suitable habitat present (✓)**	**recorded (✓)**	**Comments on potential impacts**
Oriental or Horsfield's Cuckoo (*Cuculus optatus*)	It mainly inhabits forests, occurring in coniferous, deciduous and mixed forest. It feeds mainly on insects and their larvae, foraging for them in trees and bushes as well as on the ground.	x		-
White-throated Needletail (*Hirundapus caudacutus*)	Airspace over forests, woodlands, farmlands, plains, lakes, coasts, towns; companies forage often along favoured hilltops and timbered ranges. *Breeds Siberia, Himalayas, east to Japan. Summer migrant to eastern Australia.*	✓	x	No likely impact
Black-faced Monarch (*Monarcha melanopsis*)	Rainforests, eucalypt woodlands; coastal scrubs; damp gullies in rainforest, eucalypt forest; more open woodland when migrating. *Summer breeding migrant to coastal south east Australia, otherwise uncommon*.	x		-
Spectacled Monarch (*Monarcha trivirgatus*)	Understorey of mountain / lowland rainforest, thickly wooded gullies, waterside vegetation, mostly well below canopy. *Summer breeding migrant to south-east Qld and north-east NSW down to Port Stephens from Sept/Oct to May. Uncommon in southern part of range.*	x		-
Yellow Wagtail (*Motacilla flava*)	The yellow wagtail typically forages in damp grassland and on relatively bare open ground at edges of rivers, lakes and wetlands, but also feeds in dry grassland and in fields of cereal crops.	x		-
Satin Flycatcher (*Myiagra cyanoleuca*)	Heavily vegetated gullies in forests, taller woodlands, usually above shrub-layer; during migration, coastal forests, woodlands, mangroves, trees in open country, gardens. *Breeds mostly south east Australia and Tasmania over warmer months, winters in north east Qld.*	x		-
Rufous Fantail (*Rhipidura rufifrons*)	Undergrowth of rainforests / wetter eucalypt forests / gullies; monsoon forests, paperbarks, sub-inland and coastal scrubs; mangroves, watercourses; parks, gardens. On migration, farms, streets buildings. *Breeding migrant to south east Australia over warmer months. Altitudinal migrant in north east NSW in mountain forests during warmer months.*	✓	x	No likely impact
Curlew Sandpiper *Callidris ferruginea*	Mainly coastal, but many inland feeding along tidal mudflats, salt marsh, salt fields, fresh, brackish or saline wetlands and sewerage ponds. *Distribution Limit: N-Tweed Heads. S-South of Eden.*	x		-
Eastern Curlew *Numenius madagascariensis*	Primarily coastal especially estuaries, bays, harbours, inlets and coastal lagoons, with large intertidal mudflats or sandflats, often with beds of seagrass. Occasionally on ocean beaches (often near estuaries), and coral reefs, rock platforms, or rocky islets. Often recorded among saltmarsh and on mudflats fringed by mangroves and also in coastal saltworks and sewage farms. *Distribution Limit: N-Tweed Heads. S-South of Eden.*	x		-

Common name *Scientific name*	Preferred habitat *Migratory breeding*	Suitable habitat present (✓)	recorded (✓)	Comments on potential impacts
Whimbrel (*Numenius phaeopus*)	Found on the intertidal mudflats of sheltered coasts. It is also found in harbours, lagoons, estuaries and river deltas, often those with mangroves, but also open, unvegetated mudflats. It is occasionally found on sandy or rocky beaches, on coral or rocky islets, or on intertidal reefs and platforms. Infrequently recorded using saline or brackish lakes near coastal areas. It also used saltflats with saltmarsh, or saline grasslands with standing water left after high spring-tides, and in similar habitats in sewage farms and saltfields. There are a small number of inland records from saline lakes and canegrass swamps. It has also been recorded in coastal dunes and on a football field.	x		
Little Curlew (*Numenius minutus*)	Feeds in short, dry grassland and sedgeland, including dry floodplains and blacksoil plains, which have scattered, shallow freshwater pools or areas seasonally inundated. Open woodlands with a grassy or burnt understorey, dry saltmarshes, coastal swamps, mudflats or sandflats of estuaries or beaches on sheltered coasts, mown lawns, gardens, recreational areas, ovals, racecourses and verges of roads and airstrips are also used. When resting, congregates around pools, river beds and water-filled tidal channels, and shallow water at edges of billabongs. Prefers pools with bare dry mud and they do not use pools if they are totally dry, flooded or heavily vegetated. *Breeds in Russia.*	x		
Latham's Snipe (*Gallinago hardwickii*)	Soft wet ground or shallow water with tussocks and other green or dead growth; wet parts of paddocks; seepage below dams; irrigated areas; scrub or open woodland from sea-level to alpine bogs over 2,000m; samphire on saltmarshes; mangrove fringes. *Breeds Japan. Regular summer migrant to Australia. Some overwinter.*	x		-
Swinhoe's Snipe (*Gallinago megala*)	During the non-breeding season Swinhoe's Snipe occurs at the edges of wetlands, eg. wet paddy fields, swamps and freshwater streams. Also known in grasslands, drier cultivated areas and market gardens. Habitat specific to Australia includes the dense clumps of grass and rushes around the edges of fresh and brackish wetlands. This includes swamps, billabongs, river pools, small streams and sewage ponds. Also found in drying claypans and inundated plains pitted with crab holes. *Breeds in central Siberia and Mongolia and moving south for the boreal winter.*	x		
Pin-tailed Snipe (*Gallinago stenura*)	During non-breeding period the Pin-tailed Snipe occurs most often in or at the edges of shallow freshwater swamps, ponds and lakes with emergent, sparse to dense cover of grass/sedge or other vegetation. The species is also found in drier, more open wetlands such as claypans in more arid parts of species' range. It is also commonly seen at sewage ponds; not normally in saline or inter-tidal wetlands. *Breeds in Russia. Australian distribution is not well understood. There are confirmed records from NSW, with a single banded bird reported near West Wyalong.*	x		
Fork-tailed Swift (*Apus pacificus*)	Aerial: over open country, from semi-arid deserts to coasts, islands; sometimes over forests, cities. *Breeds Siberia, Himalayas, east to Japan south east Asia. Summer migrant to east Australia. Mass movements associated with late summer low pressure systems into east Australia. Otherwise uncommon.*	✓	x	No likely impact
Bar-tailed Godwit (*Limosa lapponica*)	The Bar-tailed Godwit is 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.	x		

Common name *Scientific name*	Preferred habitat *Migratory breeding*	Suitable habitat present (✓)	recorded (✓)	Comments on potential impacts
Common Greenshank (*Tringa nebularia*)	Found in a wide variety of inland wetlands and sheltered coastal habitats (with large mudflats and saltmarsh, mangroves or seagrass) of varying salinity, Habitats include embayments, harbours, river estuaries, deltas and lagoons. It uses both permanent and ephemeral terrestrial wetlands, including swamps, lakes, dams, rivers, creeks, billabongs, waterholes and inundated floodplains, claypans and saltflats. Also artificial wetlands, including sewage farms and saltworks dams, inundated rice crops and bores. In NSW the Hunter River estuary has been identified as a site of international importance. *Breeds in Eurasia, the northern British Isles, Scandanavia, east Estonia and north-east Belarus, through Russia and east.*	x		