

bushfire & ecology

Biodiversity Assessment Report

120C Old Canterbury Road Summer Hill

> February 2021 (REF: 20ABC02BAR)



Biodiversity Assessment Report

120C Old Canterbury Road, Summer Hill

Report authors:	Lindsay Holmes B. Sc. – Senior Botanist – Accredited Assessor no. BAAS17032 Nathan Stewart B. Env. Sc. Mgmt. – Fauna Ecologist
Flora survey:	Lindsay Holmes B. Sc. – Senior Botanist – Accredited Assessor no. BAAS17032
Fauna survey:	Nathan Stewart B. Env. Sc. Mgmt. – Fauna Ecologist
Plans prepared:	Sandy Cardow B. Sc. Bronte Talbot B. Env. Sc. Mgmt.
Approved by:	Michael Sheather-Reid (Accredited Assessor no. BAAS17085)
Date:	19/02/21
File:	20ABC02BAR

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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.

38A The Avenue Mt Penang Parklands Central Coast Highway Kariong NSW 2250

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
DAWE	Department of Agriculture, Water and the Environment
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DEC	NSW Department of Environment and Conservation (superseded by DECC from April 2007)
DECC	NSW Department of Environment and Climate Change (superseded by DECCW from October 2009)
DECCW	NSW Department of Environment, Climate Change and Water (superseded by OEH from April 2011)
DEWHA	Commonwealth Department of Environment, Water, Heritage & the Arts (superseded by SEWPAC)
DOEE	Commonwealth Department of Environment & Energy (superseded by DAWE February 2020)
DPIE	NSW Department of Planning, Industry and Environment
EEC	endangered ecological community
EPA	Environment Protection Authority
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)
NRAR	Natural Resources Access Regulator (NSW)
NSW DPI	NSW Department of Industry and Investment
OEH	Office of Environment and Heritage (superseded by DPIE from August 2019)
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

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Background



Travers bushfire & ecology has been engaged to undertake a biodiversity assessment within Lot 1 DP 817359 and Lot 100 DP 875660 at 120C Old Canterbury Road, Summer Hill within the Inner West local government area (LGA).

The extent of these lots is shown in Figure 1. This lot is subject to a proposed mixed use high-rise development that includes commercial premises on the ground floor and residential premises above. Adjoining vegetation immediately east and west has been included as part of the survey and will hereafter be referred to as the 'study area'.

The proposal shall be assessed under the Biodiversity Conservation Act (BC Act), 2016.



Figure 1 - Study area (yellow) and subject site (red)

1.1 Proposed development

The proposed development includes the construction of an 8-storey mixed-use development comprising ground level retail, fifty-seven (57) residential units, three (3) levels of basement car parking and a pocket park.



Figure 2 – Proposed development (Source: McGregor Coxall – Sheet No. LD-SK-01 Revision E)

It is also understood that the residential flat building is proposed with the following landscaping, as also demonstrated in the Landscape Plans:

- 21.68% (424 m²) of the site to be deep soil zone, which accommodates an extensive landscaped setting, perimeter plantings within the pocket park, common open space areas on Levels 1, 3, 4, 6, and for the Level 7 green roof garden.
- Landscaping includes the pocket park at the northern end of the perimeter planting, and landscaped common areas on Levels 1, 3, 4, 6, plus the landscaped Level 7 green roof area site, with a total of 482.5 m² (24.66%) of soft landscaping provided. This consists of a mixture of shrubs, ferns, grasses, and groundcovers.

1.2 Site description

Table 1 provides a summary of the planning, cadastral, topographical, and disturbance details of the development footprint.

Table 1 – Site features

Location	Lot 1 DP 817359 and Lot 100 DP 875660
Area	1,957 m ²
Local government area	Inner West Council
Zoning	B4 – Mixed use
Grid reference	328280E 6247940S MGA-56
Elevation	Approximately 8-17m AHD
Topography	The majority of the site is level with a moderately steep rise in the south to Old Canterbury Rd, and embankments to Hawthorne Canal along the eastern boundary.
Geology and soils	The geological boundary is approximate has been mapped as passing through the site. The southern and eastern portion of the site is mapped as Ashfield Shale. The northern and western portion is mapped as man-made fill (dredged estuarine sand and mud, demolition rubble, industrial and household waste) overlying silty to peaty quartz sand, silt and clay with ferruginous & humic cementation in places and common shell layer Soils: Birrong – alluvial.
Catchment, drainage and steam order	Hawthorne Canal adjoins the eastern boundary of the site. There is an existing road carriage that passes over the canal into the subject site. There are no proposed changes to the canal from the development. The mapped 'blue line' for a watercourse doesn't exist adjoining the site, it finishes 80m to the north of the subject site.
Existing land use	Vacant – used for general building storage. / industrial equipment.
Connectivity features	There is very poor arboreal connectivity along the light rail corridor heading south, which is broken up by many overhead busy roads.



2.1 Survey

Botanical survey was undertaken on 16 February over a time frame of approximately 1.5 hrs.

Botanical survey included a random meander in accordance with *Cropper* (1993) to gain a full species list of the plants within the site. Given the size of the site being around 0.2 ha, the random meander lines being less than 10 m apart is considered adequate to cover any threatened species survey. There is no remnant native vegetation within the subject site and adjoining vegetation within the light rail corridor is planted. No BAM plots have been undertaken.

All observed species within the study area (includes the vegetation immediately east and west of the subject site) were identified to species level where possible, and are listed in Appendix 1.

2.2 Vegetation communities

Previous vegetation mapping

The Native Vegetation of the Sydney Metropolitan Area OEH (2016) maps the vegetation within the site as Urban_E/N (exotic/native).

Native Vegetation of the Cumberland Plain (2003) does not cover this part of Sydney.

The Sydney Natural Vegetation mapping by Benson in 1994 does not map any native vegetation on site.

Current vegetation mapping

There are no native vegetation communities present within the subject site.

The vegetation in the light rail corridor is very weedy and any mature native trees are likely to have been planted. There is a small percentage of regrowth cover throughout the light rail corridor in the study area adjoining the site's western boundary. *Melaleuca quinquenervia* has been planted in the light rail corridor and accounts for approximately 15% of the canopy cover. The understorey contains only a handful of native species that would not exceed 10% coverage. Other dominant plant species in the light rail corridor include *Cinnamonum camphora, Phoenix canariensis, Olea europaea* subsp. *cuspidata, Ligustrum lucidum, Lantana camara, Cardiospermum grandiflorum, Anredera cordifolia* and *Toxicodendron succedaneum*.

Within the subject site there are no native trees or shrubs. The native ground layer has been replaced by hard surfaces with weedy annuals emerging or persisting across the site. Much of the embankment to Old Canterbury Road has been recently slashed. Some common species include *Verbena bonariensis, Conyza* spp., *Ehrharta erecta, Paspalum dilatatum, Parietaria Judaica, Bidens pilosa, Ageratina Adenophora, Araujia sericifera* and *Andredera cordifolia. Commelina cyanea* was the only native species of note on the embankment, however it only covers 1-2 m².

Within the narrow strip of vegetation along the canal immediate east of the site, much of the same weed species are present that occur within the subject site, along with *Ricinus communis*. The native species *Hibbertia scandens* was prominent and there were a few *Leptospermum* shrubs, however their full identity was not checked due to difficult access.



Photo 1 – Looking north from the Old Canterbury Road southern boundary



Photo 2 – Close up weedy embankment to Old Canterbury Road



Photo 3 – Trees along the light rail corridor. Overhanging branches have been recently trimmed back



Photo 4 – Site overview looking south from the northern boundary



Photo 5 – Weed-lined canal adjacent to eastern site boundary



Figure 3 - Tree locations as adapted from arborist report

2.3 Threatened flora species

BC Act – A search of the *Atlas of NSW Wildlife* (DPIE, 2021) indicated a list of species that have been recorded within a 10 km radius of the development footprint. These species, their habitat requirements and distribution are listed in Table 7 (Appendix 2) and are considered

for potential habitat within the development footprint. Table 2 below provides a brief summary of those species.

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 10 km radius of the development footprint. These species have also been listed in Table 7 for consideration of potential to occur.

Given there is no likely suitable habitat, and no known habitat present for any locally occurring threatened flora species, no significance of assessment is required.

Scientific name	NSW status	Comm. status	Comment
Acacia bynoeana	E1	V	No suitable habitat present
Acacia prominens	E2		The endangered population is not relevant to this local government area
Acacia pubescens	V	V	Habitat is too degraded
Acacia terminalis subsp. terminalis	E1	E	Outside of natural distribution
Amperea xiphoclada var. pedicellata	E4	Х	No suitable habitat present
Caladenia tessellata	E1,P,2	V	No suitable habitat present
Callistemon linearifolius	V,3		No suitable habitat present
Darwinia biflora	V	V	No suitable habitat present
Dichanthium setosum	V	V	Outside of natural distribution
Dillwynia tenuifolia	V		No suitable habitat present
Doryanthes palmeri	V,P		Outside of natural distribution
Epacris purpurascens var. purpurascens	V		No suitable habitat present
Eucalyptus camfieldii	V	V	No suitable habitat present
Eucalyptus nicholii	V	V	Outside of natural distribution
Eucalyptus pulverulenta	V	V	Outside of natural distribution
Eucalyptus scoparia	E1	V	Outside of natural distribution
Genoplesium baueri	E1,P,2	E	No suitable habitat present
Grevillea beadleana	E1,3	E	Outside of natural distribution
Grevillea caleyi	E4A,3	CE	Outside of natural distribution
Hibbertia puberula	E1		No suitable habitat present
Hibbertia spanantha	E4A,2	CE	No suitable habitat present
Isotoma fluviatilis subsp. fluviatilis		Х	No suitable habitat present
Lasiopetalum joyceae	V	V	No suitable habitat present
Leptospermum deanei	V	V	No suitable habitat present
Leucopogon exolasius	V	V	No suitable habitat present
Macadamia tetraphylla	V	V	Outside of natural distribution
Maundia triglochinoides	V		No suitable habitat present
Melaleuca deanei	V	V	No suitable habitat present
Persoonia hirsuta	E1,P,3	E	No suitable habitat present
Pimelea curviflora var. curviflora	V	V	No suitable habitat present
Pomaderris prunifolia	E2		The endangered population is not relevant to this local government area
Prostanthera marifolia	E4A,3	CE	No suitable habitat present
Rhodamnia rubescens	E4A		No suitable habitat present
Sarcochilus hartmannii	V,P,2	V	No suitable habitat present
Senecio spathulatus	E1		No suitable habitat present

Table 2 – State listed threatened flora species summary

Scientific name	NSW status	Comm. status	Comment
Syzygium paniculatum	E1	V	No suitable habitat present
Tetratheca glandulosa	V		No suitable habitat present
Tetratheca juncea	V	V	No suitable habitat present
Wahlenbergia multicaulis	E2		The endangered population is not relevant to this local government area
Wilsonia backhousei	V		No suitable habitat present
Zannichellia palustris	E1		Outside of natural distribution

Additional species from the EPBC coordinate search not previously surveyed within 10 km are included in Table 3.

Scientific name	NSW status	Comm. status	Comment
Allocasuarina glareicola	E1	Е	No suitable habitat present
Asterolasia elegans	E1	E	No suitable habitat present
Cryptostylis hunteriana	E1	E	No suitable habitat present
Deyeuxia appressa	E1	E	No suitable habitat present
Haloragodendron lucasii	E1	E	No suitable habitat present
Melaleuca biconvexa	V	V	No suitable habitat present
Persicaria elatior	V	V	No suitable habitat present
Pterostylis saxicola	E1	Е	No suitable habitat present
Rhizanthella slateri	V	E	No suitable habitat present
Thesium australe	V	V	No suitable habitat present

Table 3 – Additional EPBC coordinate search species for consideration

The native vegetation on site has been fully cleared with much of it covered in hard surfaces. The only native species noted during the inspection within the subject site was *Commelina cyanea*.

Many of the listed species in Table 2 occur in sandstone-based communities and can be ruled out as having no suitable habitat. Some species prefer wet sclerophyll, rainforest or wetland environments and may be ruled out. It was considered that the only likely threatened species that could occur would be *Acacia pubescens*. In the older urban suburbs of Sydney, *Syzygium paniculatum, Eucalytpus nicholii* and *Eucalyptus scoparia* are commonly planted species. None of these are present within the study area.

There are no threatened flora species present on site or considered likely to occur due to previous clearing and ongoing management of the land. As such, no test of significance is required. References against the *EPBC Act* criteria are also not required.

2.4 Endangered flora populations

No endangered flora populations occur within The Inner West Council LGA. Before amalgamation with other Council's, the site was formerly in the Ashfield LGA. There are no threatened flora populations listed for this LGA.

Whilst there are endangered populations of *Acacia prominens, Pomaderris prunifolia* and *Wahlenbergia multicaulis* that have been observed within a 10 km radius of the site, if they were to occur, they would not form part of the endangered population listing.

2.5 Threatened ecological communities

There is no native vegetation within the subject site. Some trees adjoining the western boundary within the light rail corridor will need to be removed as their tree protection zone will be impeded by future works, largely due to the basement construction.

The four (4) observed native species within the corridor were entered into Bionet vegetation classification tool. The plant community type (PCT) that had a best fit was PCT 1793 - Smooth-barked Apple - Bangalay / Tuckeroo - Cheese Tree open forest on coastal sands of the Sydney basin. This PCT has an affiliation with the threatened ecological community Bangalay Sand Forest of the Sydney Basin and South East Corner bioregions (under the *BC Act*). Given that the Melaleuca's are likely to have been planted and the soils / geology of the area are more of the alluvial type than sand type, it considered that the vegetation is not commensurate with the threatened community listing.

EPBC Act threatened ecological communities that may occur in the locality based on the EPBC coordinate search include:

- Castlereagh Scribbly Gum and Agnes Banks Woodlands of the Sydney Basin Bioregion
- Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community
- Coastal Upland Swamps in the Sydney Basin Bioregion
- Cooks River/Castlereagh Ironbark Forest of the Sydney Basin Bioregion
- Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest
- Eastern Suburbs Banksia Scrub of the Sydney Region
- River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria
- Shale Sandstone Transition Forest of the Sydney Basin Bioregion
- Subtropical and Temperate Coastal Saltmarsh
- Turpentine-Ironbark Forest of the Sydney Basin Bioregion
- Upland Basalt Eucalypt Forests of the Sydney Basin Bioregion
- Western Sydney Dry Rainforest and Moist Woodland on Shale

The Bangalay Sand Forest is not part of any nationally listed threatened communities at present. Based on the topography and distance to the coast, prior to urbanisation of the area, the site may have once contained River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria. This is a newly listed critically endangered community as of December 2020. The characteristics of the vegetation within the light rail corridor do not match closely to the description of this community due to the years of degradation and man-made soils / geology and therefore it is considered that the vegetation present does not conform to this community.

2.6 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.

As 'development consent' is required for the proposed works the Vegetation SEPP does not apply.



Fauna

3.1 Survey

Fauna survey including afternoon/morning diurnal survey, nocturnal survey and threatened species habitat assessment was undertaken within the subject site and nearby surrounds on 15th, 16th & 19th February 2020.

Diurnal fauna survey included:

- Frog and reptile habitat searches,
- 3x bird census points (out to a radius of 30-50m for 15 minutes),
- Opportunistic bird call and activity survey between census points,
- Mammal activity searches (scats, scratches, diggings, burrows, etc.).

Weather conditions at the time of diurnal surveys were:

- 15/2/21 8/8 cloud, 32km S wind, showers, 20°C between 18:00 19:50.
- 16/2/21 6/8 cloud, no wind, showers, 21°C between 08:30 09:05.
- 19/2/21 7/8 cloud, no wind, overnight showers, 20 °C between 07:30 08:05.

Nocturnal fauna survey included:

- Spotlighting,
- Ultrasonic microbat recording (x2 overnight passive recording stations),
- Owl call-playback (Powerful Owl),
- Burrow observing on dusk.
- 4x surveillance cameras at baited stations targeting Long-nosed Bandicoot (5 recording nights).
- Weather conditions at the time of nocturnal survey were 15/2/21 8/8 cloud, 32km S wind, Showers, 20-21°C between 19:50 21:00

Specific survey effort locations and results are shown on Figure 5. All fauna species recorded during survey within the development footprint and nearby surrounds are listed in Table 8 (Appendix 2).

A review of the Atlas of NSW Wildlife (DPIE 2021) was undertaken prior to the site visit to determine threatened species previously recorded within 10 km of the development footprint.

3.2 Habitat features

The following notable habitat features were observed present:

- A single burrow
- Seasonal fruits from exotic tree species within the light rail corridor adjacent to the site
- Summer flowering melaleuca species
- Surface soils suitable for foraging by bandicoots

• Commercial equipment providing terrestrial hides

3.3 Threatened fauna species

BC Act – A search of the *Atlas of NSW Wildlife* (DPIE, 2021) provided a list of threatened fauna species previously recorded within a 10 km radius of the development footprint. These species are listed in Table 8 (Appendix 2) and are considered for potential habitat within the study area.

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 10 km radius of the development footprint. These species have also been listed in Table 8.

In accordance with Table 8 (Appendix 2) the following state and nationally listed threatened fauna species are considered to have suitable habitat with varying potential to occur within the study area. The state listed species will be considered in the test of significance (Appendix 3):

Common name	BC Act	EPBC Act	Potential to occur
Grey-headed Flying-fox	V	V	Recorded
Yellow-bellied Sheathtail-bat	V	-	Unlikely
Large-eared Pied Bat	V	V	Unlikely
Little Bent-winged Bat	V	-	Unlikely
Large Bent-winged Bat	V	-	Unlikely

Table 4 – Threatened fauna species with suitable habitat present

The state test of significance assessment (Appendix 3) and a review of EPBC impact criteria (Appendix 4) has concluded that the proposed development will not have a significant impact on threatened fauna species. Therefore, (a) a Species Impact Statement is not required in respect to fauna for the proposal and (b) biodiversity offsetting is not required.

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

3.4 **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 10 km radius of the development footprint. The habitat potential of migratory species is considered in Table 9 (Appendix 2). The habitat potential of threatened migratory species is considered with other threatened species in Table 8 (Appendix 2).

No nationally protected migratory bird species were recorded present within the study area during survey. Each of these migratory species protected under the *EPBC Act* do not likely contain any breeding habitat or habitat otherwise of importance within the study area. Therefore, these species will not likely offer constraint to the proposal

3.5 Endangered fauna populations

There are two (2) endangered fauna populations that occur within The Inner West LGA, the White-fronted Chat population in the Sydney Metropolitan Catchment Management Area and the Long-nosed Bandicoot population in inner western Sydney.

White-fronted Chat population in the Sydney Metropolitan Catchment Management Area

The subject site falls Sydney Metropolitan Catchment Management Authority area. An endangered population of White-fronted Chat (*Epthianura albifrons*) is identified to this area however this is made up of two known isolated sub-populations; one at Newington Nature Reserve on the Parramatta River, approximately 7.5 kilometres to the north west and one at Towra Point Nature Reserve at Kurnell, approximately 14.5 kilometres to the south east.

The closest record occurs approximately 7.5 kilometres to the north west from 1991 and is within Newington Nature Reserve. This species was not recorded during survey and the study area contains no suitable habitat for foraging or breeding.

Long-nosed Bandicoot population in inner western Sydney

An endangered population of Long-nosed Bandicoot (*Parameles nasuta*) is identified to the inner Western Sydney. Since 2003 this population has become evident within the surrounding areas to the subject site. Twenty (20) Atlas of NSW Wildlife database records from this population occur within 1km of the subject site with the closest record 360m to the south east. Records are from all directions excluding north west suggesting the subject site is well within the activity areas.

Approximately ³/₄ of the study area has been historically surfaced with bitumen depleting most of the foraging opportunities. There are remaining areas on the northern, western and southern borders which provide marginal foraging habitat. The species appears to be utilising the local urban landscapes for foraging areas and, uncharacteristically, using cement structures for shelters. No cement structures providing breeding habitat were recorded during survey but one (1) burrow was located and was surveyed for an hour starting prior to sunset. No animals were observed utilising this burrow. Burrows are not typical of this species but they have been known to utilise abandoned burrows of other species. This has been depicted on Figure 5.



Figure 4 - Nearby records of Long-nosed Bandicoot within a 1 km radius (Source: BioNet 2021)

3.6 Long-nosed Bandicoot habitat assessment

Since 2003 this population has become evident within the surrounding areas to the subject site with individuals reported from Lewisham, Dulwich Hill and Petersham. Twenty (20) confirmed records from this population occur within 1 km to the north, north-east, east, southeast, south and south-west. This population is utilising foraging habitat similar to that provided by the unsealed portions within the subject site.

It is considered there is only marginal foraging habitat for the Long-nosed Bandicoot (*Parameles nasuta*) within the subject site. Cement foundations and other structures to support likely shelters and nesting behaviour were not recorded within the subject site. The limited foraging areas which occur within the northern, western and southern limits of the site are quite sparse of suitable vegetation. Such areas may support some invertebrate, fungi and other feeding opportunities; however, these areas provided no evidence of foraging such as characteristic diggings during field assessments.

Whilst the records are located around the rail corridors and drainage lines there is no evidence as yet to confirm use of such infrastructure by Long-nosed Bandicoots for movement (DECC, Leary et al 2008). Tracking of one individual suggests that the individuals move throughout the urban landscape and over roads to access suitable foraging gardens. A light rail corridor runs along the western boundary of the subject site adjacent to the unmanaged areas of native vegetation. There is no suitable habitat within the light rail corridor.

The chain mesh fencing observed between the site and the light rail corridor is intact no opportunities for possible underpass on the western boundary. The wooden fence on the southern boundary comprises of a number of entrances into the site but requires passage across Old Canterbury Road. Large buildings make up the entirety of the eastern property boundary. There is limited foraging habitat either side of the light rail corridor next to the site. There is no evidence of diggings along this fence or other fencing nearer to the more appropriate northern and southern foraging areas.

No evidence of diggings around structures likely to support shelters were observed. Surveillance cameras provided no recordings of terrestrial mammal activity in locations within the site grounds. Exotic Black Rats (*Rattus rattus*) and House Mouse (*Mus musculus*) were recorded previously by GIS Environmental Consultants in 2010 through hair samples. Black Rats (*Rattus rattus*) and Domestic Cats (*Felis catus*) were detected on all surveillance cameras during survey from the 16-19/2/21.



Photo 6 – Observed burrow



Figure 5 – Flora and fauna survey effort and results

3.7 Connectivity

There is very poor connectivity as the vegetation within the development footprint is severed from surrounding areas in all directions due to suburban infrastructures, roads and railways. The nearest partially native vegetation occurs immediately to the west along the light rail line however, this does not extend far beyond the extent of the subject site. The vegetation to the south is fragmented by the overhead Old Canterbury Road and only provides connectivity for birds and flying mammals to pass to and from the site. Terrestrial connectivity for small mammals such as the Long-nosed Bandicoot is limited and the site can only be accessed by travelling over roads and the light rail tracks, or through the canal system.



Figure 6 - Local connectivity

The Marrickville DCP 2011 Biodiversity Map identifies the complete site as both a wildlife corridor and as part of the Long-nosed Bandicoot endangered population of the Inner West Protection Area, hence further surveys for this species have been conducted. Nocturnal survey conducted on the 15/2/21 and surveillance cameras did not pick up any individuals or activity within the site.



Watercourses & Wetlands

4.1 Endangered wetland communities

A number of wetland communities have been listed as an 'endangered ecological community' under the NSW *BC 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 DPIE - Office of Water in their general terms of approval. 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
- Castlereagh Swamp Woodland Community
- Coastal Saltmarsh in the NSW North Coast, Sydney Basin and South East Corner bioregions
- Coastal Upland Swamp in the Sydney Basin bioregion
- Coolibah–Black Box woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain and Mulga Lands bioregions
- Freshwater Wetlands on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions
- Kurri sand swamp woodland in the Sydney Basin Bioregion
- Lagunaria swamp forest on Lord Howe Island
- Maroota Sands swamp forest
- Newnes Plateau Shrub Swamp in the Sydney Basin Bioregion
- Swamp oak floodplain forest of the NSW North Coast, Sydney Basin and South East Corner bioregions
- Swamp sclerophyll forest on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions
- The shorebird community occurring on the relict tidal delta sands at Taren Point
- Upland wetlands of the drainage divide of the New England Tableland Bioregion
- Wingecarribee Swamp

No endangered wetland communities were present within the study area and therefore a referral to NRAR is not required for impacts on waterfront land.

4.2 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.



Figure 7 - 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).

Groundwater Dependent Ecosystems (GDEs) were not observed within the study area and therefore the policy does not require any further consideration. A referral to NRAR is not required for impacts on waterfront land.

4.3 Watercourse assessment

There was possibly a true watercourse that ran through the site or adjacent to it in the past, however with urbanisation and filling of the area, the former watercourse has been realigned and runs through the urban area as a canal, sometimes exposed and sometimes underground. The canal adjoins the eastern site boundary, however this is not identified as a stream using current 1:25,000 topographic maps therefore a controlled activity approval on waterfront land is not required under the *WM Act*.

4.4 Coastal Management SEPP

As shown in Figure 8, there are no coastal wetlands or proximity to coastal wetland areas in close proximity to the site. No further action is required.



Figure 8 - Coastal wetlands area map (solid blue - coastal wetlands; hatched blue - proximity area for coastal wetlands).



Biodiversity Impact Assessment

5.1 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).

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).

The Biodiversity Offsets Scheme applies to:

- local development (assessed under Part 4 of the *Environmental Planning and Assessment Act 1979*) that triggers the Biodiversity Offsets Scheme Threshold or is likely to significantly affect threatened species based on the test of significance in section 7.3 of the *Biodiversity Conservation Act 2016*
- state significant development and state significant infrastructure projects, unless the Secretary of the Department of Planning, Industry and Environment and the environment agency head determine that the project is not likely to have a significant impact
- biodiversity certification proposals
- clearing of native vegetation in urban areas and areas zoned for environmental conservation that exceeds the Biodiversity Offsets Scheme threshold and does not require development consent
- clearing of native vegetation that requires approval by the Native Vegetation Panel under the *Local Land Services Act 2013*
- activities assessed and determined under Part 5 of the *Environmental Planning and Assessment Act 1979* (generally, proposals by government entities) if proponents choose to 'opt in' to the Scheme.

Proponents will need to supply evidence relating to the triggers for the Biodiversity Offsets Scheme Threshold and the test of significance (where relevant) when submitting their application to the consent authority.

5.2 Threshold assessment

The BOS includes two (2) elements to the threshold test – an area trigger and a Biodiversity Values Land Map trigger. If clearing exceeds either trigger, the BOS applies to the proposed clearing.

5.2.1 Biodiversity Values Land Map

Biodiversity Values Land has not been mapped within the study area – an offset is not required under this trigger. Figure 9 shows the site (red) in relation to those areas (coloured mauve) as having biodiversity values. There are no biodiversity values mapped within the extent of the view.



Figure 9 - Biodiversity Values (light purple) and Biodiversity Values added in the last 90 days (dark purple) relative to the study lots (red)



5.2.2 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).

There is no minimum lot size for the site, therefore it goes off the actual lot size. Being around 0.2 ha, the clearing threshold is 0.25 ha. The clearing or impact on adjoining native vegetation in the light rail corridor will be below this threshold, therefore not triggering the BOS under this criteria.

5.3 Serious and irreversible impacts on biodiversity values

No candidate SAII entities were recorded during survey nor considered to be affected.

5.4 Potential ecological impacts

The direct, indirect and cumulative ecological impacts have been considered in respect to recorded biodiversity, threatening processes and extent of impact as a result of the proposed works:

5.4.1 BC Reg Prescribed impacts

The following potential impacts on biodiversity values as a result of the proposal are prescribed (subject to subclause (2) of the *BC Reg.*) as biodiversity impacts to be assessed under the biodiversity offsets scheme:

- Karst, caves, crevices, cliffs and other geological features of significance
 Not applicable.
- Rocks
 - Not applicable.
- Human made structures
 - The proposal will not remove man-made structure that provide habitat for threatened fauna.
- Non-native vegetation
 - The proposal will remove of modify a narrow band of planted and weedy vegetation along the light rail corridor adjacent to the western boundary. Certain trees will need to be removed as their tree protection zones cannot be supported due to the proposed excavation for the basement levels, including species such as Camphor Laurel.
 - Vegetation within the subject site is all exotic to 1m tall. The removal shall have little bearing on fauna as it provides little to no protection from predators.
- Connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range
 - Connectivity is described and mapped in Section 3.7.
 - No threatened species likely to benefit from the connectivity provided by the study area.
 - The proposed development has no potential to indirectly impact on connectivity.
 - The connectivity within the study area is not identified as important within any local literature sourced.
 - The consequences of these prescribed impacts are minor, particularly given that each of them may be ameliorated through appropriate management measures. These will be recommended in Section 5.4 but fundamentally include restoration of the remaining natural remnant, preventing stormwater, soil and nutrient overflow, lighting baffles and sound and light screening with low native hedge plantings outside of APZs.
- Movement of threatened species that maintains their lifecycle
 - The proposal will not provide a barrier for fauna movement through the landscape that would ultimately disrupt their lifecycle.
- Water quality, water bodies and hydrological processes that sustain threatened species and threatened ecological communities (including from subsidence or upsidence resulting from underground mining or other development)
 - No impacts are considered likely upon the adjoining canal and associated hydrological environment for flora or fauna.
- Wind turbine strikes on protected animals
 - Not applicable.
- Vehicle strikes on threatened species of animals or on animals that are part of a threatened ecological community
 - o Not applicable.

5.4.2 Direct impacts

The direct impacts of the proposal within the development footprint are considered as:

- Removal of planted and exotic trees within the light rail corridor adjoining the western boundary as the basement levels will likely impede tree protection zones.
- Removal of mostly summer flowering trees including *Melaleuca quinquenervia*.

5.4.3 Indirect impacts

The potential indirect impacts of the proposal are considered as:

- Increased morning to noon shading on part of the retained vegetation in the light rail corridor.
- Minor changes to local hydrology from hard surfaces that are likely to drain to the adjoining canal system.
- Increased spill-over from noise, activity and lighting effects into the adjacent planted and exotic vegetation in the light rail corridor.
- Potential for increased dumping of rubbish and garden waste.

5.4.4 Cumulative impacts

The potential cumulative impacts (combined results of past, current and future activities) of the proposal are considered as:

- Cumulative loss of native vegetation within the local area (although planted).
- Increased risk fungal mobilisation or infections.
- Cumulative loss of foraging habitat for native fauna.
- Increased varied human presence and activity upon adjoining planted and exotic vegetation.

5.5 Avoid actions

Given the small-scale development and absence of TECs, threatened plants or any notable habitat features, no development design avoid actions are considered necessary.

5.6 Mitigation measures

The following <u>mitigation measures</u> are recommended to avoid, minimise or ameliorate the above potential ecological impacts, address threatening processes and to guide a more positive ecological outcome for threatened species and their associated habitats.

- (a) Trees proposed for removal in the light rail corridor are to be replanted with species suitable for the area and its attributes. Given the corridor is narrow, and the distance to the proposed building and basement is small, only small trees or tall shrubs should be planted. For potential screening and habitat value, consider utilising Lilly Pilly species. Other native species that may be suitable – Melaleuca's (like those being removed or smaller varieties), Callistemon's, Water Gum or Cabbage Tree Palms. Many of these will grown in partly shaded environments or alongside waterways.
- (b) Landscaping within the subject site is to utilise native species as a priority.
- (c) Eradicate noxious and environmental weeds which are required to be controlled in accordance with the NSW *Biosecurity Act* (2015).
- (d) Standard *Phytophthora cinnamomi* protocol applies to the cleaning of all plant, equipment, hand tools and work boots prior to delivery onsite to ensure that there is no loose soil or vegetation material caught under or on the equipment and within the tread of vehicle tyres. Any equipment onsite found to contain soil or vegetation material is to be cleaned in a quarantined work area or wash station and treated with fungicides.

(e) Specific measures for the protection and/or enhancement of Little Bent-winged Bat habitat are outlined in the letter titled "Fauna Ecologist Review on habitat creation measures Large Bent-winged Bat at 120C Old Canterbury Road, Summer Hill" dated 11 February 2021 (draft). This is attached in Appendix 5.

Travers bushfire & ecology



Conclusions

Ecological survey and assessment have been undertaken in accordance with relevant legislation including the *Environmental Planning and Assessment Act 1979*, the *Biodiversity Conservation Act 2016*, the commonwealth *Environment Protection and Biodiversity Conservation Act 1999* and the *Fisheries Management Act 1994*.

In respect of matters required to be considered under the *Environmental Planning and Assessment Act 1979* and relating to the species / provisions of the *Biodiversity Conservation Act 2016*, no threatened fauna species, no threatened flora species, no endangered populations and no TECs were recorded within the study area.

The state assessment of significance (Appendix 3) has concluded that the proposed development will not have a significant impact on any threatened species, populations or TECs. Therefore, (a) a Species Impact Statement is not required for the proposal and (b) biodiversity offsetting is not required.

Offsetting under the Biodiversity Offsets Scheme (BOS) is not required for the proposal as:

- The study area is not located on lands mapped as Biodiversity Values Land.
- The proposed impacts on native vegetation within the light rail corridor do not exceed the clearing threshold that triggers the BOS.
- The test of significance concludes a not-significant impact on the relative entities being tested.

The proposal will also not cause any Serious or Irreversible Impacts (SAII) on threatened biodiversity most at risk of extinction. There are no areas of outstanding biodiversity value mapped for the site.

In respect of matters required to be considered under the *Environment Protection and Biodiversity Conservation Act 1999*, no threatened fauna species, no migratory bird species, no threatened flora species, and no TECs were recorded within the study area.

The proposal was not considered to have a significant impact on matters of national environmental significance. As such a referral to Department of Agriculture, Water and the Environment is not required.

In respect of matters relative to the *Fisheries Management Act 1994*, no suitable habitat for threatened marine or aquatic species was observed within the development footprint and there are no matters requiring further consideration under this Act.

Appendix 1 Flora & Fauna Species Lists

Family	Scientific name	Common name		
TREES				
Ulmaceae	Celtis sinensis*	Chinese Hackberry		
Lauraceae	Cinnamomum camphora*	Camphor Laurel		
Sapindaceae	Cupaniopsis anacardioides	Tuckeroo		
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		
Anacardiaceae	Toxicodendron succedaneum*	Rhus Tree		
SHRUBS				
Solanaceae	Cestrum parqui*	Chilean Cestrum		
Verbenaceae	Lantana camara*	Lantana		
Myrtaceae	Leptospermum spp.	Tea-tree		
Oleaceae	Ligustrum lucidum*	Large-leaved Privet		
Oleaceae	Ligustrum sinense*	Small-leaved Privet		
Ochnaceae	Ochna serrulata*	Mickey Mouse Plant		
Phytolaccaceae	Phytolacca octandra*	Inkweed		
Euphorbiaceae	Ricinus communis*	Castor Oil Plant		
Solanaceae	Solanum lycopersicum	Tomato Bush		
Solanaceae	Solanum sisymbriifolium*	Sticky Nightshade		
GROUNDCOVERS	,	, ,		
Asteraceae	Ageratina adenophora*	Crofton Weed		
Amaranthaceae	Amaranthus viridis*	Green Amaranth		
Asteraceae	Bidens pilosa*	Cobbler's Pegs		
Brassicaceae	Brassica fruticulosa*	Twiggy Turnip		
Poaceae	Bromus cartharticus*	Prairie Grass		
Chenopodiaceae	Chenopodium album*	Fat Hen		
Asteraceae	Cirsium vulgare*	Spear Thistle		
Commelinaceae	Commelina cvanea	Scurvy Weed, Native Wandering		
Asteraceae	Convza bonariensis*	Flax-leaf Fleabane		
Asteraceae	Convza sumatrensis*	Tall Fleabane		
Apiaceae	Cyclospermum leptophyllum*	Slender Celery		
Cyperaceae	Cyperus eragrostis*	Umbrella Sedge		
Phormiaceae	Dianella caerulea	Blue Flax-lily		
Poaceae	Digitaria sanguinalis*	Crab Grass		
Poaceae	Echinochloa crus-galli*	Barnvard Grass		
Poaceae	Ehrharta erecta*	Panic Veldtgrass		
Fuphorbiaceae	Funhorbia peplus*	Spurge		
Apiaceae	Foeniculum vulgare*	Fennel		
Asteraceae	Galinsoga parviflora*	Potato Weed		
/1010100000	Gamochaeta coarctata* was G			
Asteraceae	spicata	Cudweed		
Asteraceae	Hypochaeris radicata*	Flatweed		
Asteraceae	Lactuca saligna*	Willow-leaved Lettuce		
Asteraceae	Lactuca serriola*	Prickly Lettuce		
Brassicaceae	Lepidium africanum*	Common Peppercress		

Family	Scientific name	Common name	
Urticaceae	Parietaria judaica*	Pellitory	
Poaceae	Paspalum dilatatum*	Paspalum	
Poaceae	Poa annua*	Winter Grass	
Asteraceae	Senecio madagascariensis*	Fireweed	
Poaceae	Setaria parviflora*	-	
Malvaceae	Sida rhombifolia*	Paddy's Lucerne	
Solanaceae	Solanum nigrum*	Black Nightshade, Black-berry Nightshade	
Asteraceae	Sonchus oleraceus*	Common Sow-thistle	
Strelitzeaceae	Strelitzia juncea* (Cultivar)	Bird of Paradise	
Asteraceae	Taraxacum officinale*	Dandelion	
Commelinaceae	Tradescantia fluminensis*	Wandering Jew	
Scrophulariaceae	Verbascum virgatum*	Twiggy Mullein	
Verbenaceae	Verbena bonariensis*	Purpletop	
Verbenaceae	Verbena rigida var. rigida*	Veined Verbena	
VINES			
Basellaceae	Anredera cordifolia*	Madiera Vine	
Asclepiadaceae	Araujia sericifera*	Mothvine	
Asparagaceae	Asparagus asparagoides*	Bridal Creeper	
Sapindaceae	Cardiospermum grandiflorum*	Balloon Vine, Love in a Puff	
Fabaceae (Faboideae)	Dipogon lignosus*	Dolichos Pea	
Dilleniaceae	Hibbertia scandens	Climbing Guinea Flower	
Convolvulaceae	Ipomoea indica*	Morning Glory	
* denotes exotic species			

Common name	Scientific name	Method observed		
Birds		GIS Environmental Consultants 2010	Feb 2020	
Australian Magpie	Cracticus tibicen	\checkmark		
Common Myna *	Sturnus tristis		OW	
House Sparrow *	Passer domesticus		WO	
Laughing Kookaburra	Dacelo novaeguineae	\checkmark		
Long-billed Corella	Cacatua tenuirostris		W	
Noisy Miner	Manorina melanocephala	\checkmark		
Rainbow Lorikeet	Trichoglossus haematodus	\checkmark	WO	
Red-browed Finch	Neochmia temporalis		WO	
Red Wattlebird	Anthochaera carunculata	\checkmark		
Spotted Dove	Spilopelia chinensis		OWQ	
Sulphur Crested Cockatoo	Cacatua galerita	\checkmark		
Superb Fairy-wren	Malurus cyaneus		OWQ	
Variegated Fairy-wren	Malurus lamberti	\checkmark		
Mammals				
Black Rat *	Rattus rattus	Н	Q	
Domestic Cat *	Felis catus		OQ	
Domesticated Dog *	Canis lupus familiaris	Н		
Gould's Wattled Bat	Chalinolobus gouldii		U	
House Mouse *	Mus musculus	Н		
Large Forest Bat	Vespadelus darlingtoni		U	
Reptiles				
Delicate Skink	Lampropholis delicata		0	
Eastern Blue Tongue Lizard	Tiliqua scincoides		0	
Grass Skink	Lampropholis guichenoti	0		
Note: * indicates introduced species ^{TS} indicates threatened species ^{MS} indicates Migratory species All species listed are identified to a high l	evel of certainty unless otherwise noted as:			

Table 6 – Fauna species recorded (Appendix 1)

^{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

F	- Nest/roost	H - Hair/feathers/skin	Р	- Scat	W	- Heard call
-	Tracke/scratchings	K Dood		Comoro	Ŷ	In scat
	- Hacks/sciaterings	R - Deau	Q T		$\hat{\mathbf{v}}$	
FB	- Burrow	O - Observed	I	- Trapped/netted	Y	- Bone/teetn/snell
G	 Crushed cones 	OW - Obs & heard call	U	 Anabat/ultrasound 	Z	 In raptor/owl pellet
Appendix 2 Threatened Flora & Fauna Habitat Assessment

Table 7 – Threatened flora species habitat assessment (Appendix 2)

					If not recorded on site				Considered in
Scientific name	BC Act	EPBC Act	Growth form and habitat requirements Distribution limit	Recorded on site (✓)	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	assessment of significance test (√) Refer to Appendix 3
Acacia bynoeana	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. <i>Distribution limits N-Newcastle S-</i> <i>Berrima.</i>	x	x	-	-	x	x
Acacia pubescens	V	V	Spreading shrub 1-4m high open sclerophyll growing in open forest and woodlands on clay soils. <i>Distribution limits N-Bilpin S-Georges River.</i>	x	x	-	-	х	x
Acacia terminalis subsp. terminalis DPIE EPBC	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. <i>Typically restricted to the Port Jackson and</i> <i>eastern suburbs of Sydney.</i>	x	Outside of natural distribution	-	-	x	x
Allocasuarina glareicola EPBC	E1	E	Small shrub 1-2m high growing in open sclerophyll forest on lateritic soils derived from tertiary alluviums. <i>Distribution limits Castlereagh NR region.</i>	x	Outside of natural distribution	-	-	x	x
Amperea xiphoclada var. pedicellata ^{DPIE}	E4	Ext.	An erect shrub growing up to 60cm high, was previously widespread in heath, woodland and forest on low fertility and sandy soils and is now presumed extinct.	x	х	-	-	x	x
Asterolasia elegans ^{EPBC}	E1	E	Erect shrub 1-3m high growing in moist sclerophyll forests on Hawkesbury sandstone slopes hillsides. <i>Distribution limits Maroota region.</i>	x	Outside of natural distribution	-	-	x	x
Caladenia tessellata DPIE EPBC	E1	V	Terrestrial orchid. Clay-loam or sandy soils. Flowers in September – November. <i>Distribution limits N-</i> <i>Swansea S-south of Eden.</i>	x	x	-	-	x	x

						If not record	ded on site		Considered in
Scientific name	BC Act	EPBC Act	Growth form and habitat requirements Distribution limit	Recorded on site (✓)	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	assessment of significance test (√) Refer to Appendix 3
Callistemon linearifolius ^{DPIE}	V	-	Shrub to 4m high. Dry sclerophyll forest on coast and adjacent ranges. <i>Distribution limits N-Nelson Bay S-Georges River.</i>	x	x	-	-	x	x
Cryptostylis hunteriana ^{EPBC}	V	V	Saprophytic orchid. Grows in swamp heath on sandy soils. <i>Distribution limits N-Gibraltar Range S-south of Eden.</i>	x	x	-	-	x	x
Darwinia biflora DPIE 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. <i>Distribution limits N-Gosford S-Cheltenham.</i>	x	x	-	-	x	x
Deyeuxia appressa EPBC	E1	E	Erect grass to 0.9m high. Grows on wet ground. Distribution limits N-Hornsby S-Bankstown.	x	x	-	-	х	x
Dichanthium setosum DPIE	V	V	An erect perennial grass to <1m high. Flowers in summer. Grows in woodland and is associated with heavy basaltic black soils and stony red-brown hard-setting loam with clay subsoil. <i>Known chiefly</i> on the northern tablelands in the Saumarez area, west of Armidale, and 18-30 km east of Guyra. It is more rarely found on the north-western slopes, central western slopes and north-western plains of NSW.	x	Outside of natural distribution	-	-	x	x
<i>Dillwynia tenuifolia</i> ^{DPIE}	V	-	Erect shrub 0.6-1m high. Grows in woodlands and open forest on sandstone shale or laterite. <i>Distribution limits N-Howes Valley S-Cumberland</i> <i>Plain.</i>	x	x	-	-	х	x
<i>Doryanthes palmeri</i> DPIE	V	-	A large succulent herb which grows as a rosette, producing a flowering stalk to 5m tall. Occurs on exposed rocky outcrops on infertile soils or on bare rock in montane heath next to subtropical rainforest, warm temperate rainforest or wet eucalypt forest. Occurs in NE NSW and SE QLD north from Mount Billen.	x	Outside of natural distribution	-	-	x	x

						If not record	ded on site		Considered in
Scientific name	BC Act	EPBC Act	C Growth form and habitat requirements Distribution limit	Recorded on site (✓)	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	assessment of significance test (√) Refer to Appendix 3
Epacris purpurascens var. purpurascens DPIE	V	-	Erect shrub to 1.5m high growing in sclerophyll forest and scrub and near creeks and swamps on sandstone. <i>Distribution limits N-Gosford S-Blue Mountains</i> .	x	х	-	-	x	x
Eucalyptus camfieldii DPIE EPBC	V	V	Stringybark to 10m high. Grows on coastal shrub heath and woodlands on sandy soils derived from alluviums and Hawkesbury sandstone. <i>Distribution</i> <i>limits N-Norah Head S-Royal NP</i> .	x	x	-	-	x	x
<i>Eucalyptus nicholii</i> ^{DPIE}	V	V	This species is widely planted as an urban street tree and in gardens but is quite rare in the wild. <i>It</i> <i>is</i> confined to the New England Tablelands of NSW, where it occurs from Nundle to north of Tenterfield, largely on private property.	x	Outside of natural distribution	-	-	x	x
Eucalyptus pulverulenta ^{DPIE}			A small tree, typically mallee-like on shallow soils in open forest, typically dominated by Brittle Gum (<i>Eucalyptus mannifera</i>), Red Stringybary (<i>E.</i> <i>macrorhynca</i>), Broad-leafed Peppermint (<i>E.</i> <i>dives</i>), Silvertop Ash (<i>E. sieberi</i>) and Apple Box (<i>E. bridgesiana</i>). There are two main areas of occurrence including Lithgow to Bathurst, and Bredbo to Bombala.	x	Outside of natural distribution	-	-	x	x
Eucalyptus scoparia ^{DPIE}	E1	V	Smooth-barked tree only known naturally from vicinity of Bald Rock in Northern NSW. Commonly planted as a street tree in the Sydney region.	x	Outside of natural distribution	-	-	x	x
Genoplesium baueri DPIE EPBC	E1	E	A terrestrial orchid that grows in sparse sclerophyll forest and moss gardens over sandstone. Flowers Feb–Mar. <i>Distribution limits N – Hunter Valley S – Nowra.</i>	х	x	-	-	х	х
Grevillea beadleana ^{DPIE}	E1	E	A spreading shrub to 2.5m tall and wide. Grows in open eucalypt forest with a shrubby understorey usually on steep granite slopes at high altitudes with the exception of specimens at Shannon Creek at lower elevation and on sandstone. <i>NE NSW</i> .	x	Outside of natural distribution	-	-	x	x

			Growth form and habitat requirements Distribution limit	Recorded on site (✓)	If not recorded on site				Considered in
Scientific name DATABASE SOURCE	BC Act	EPBC Act			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	assessment of significance test (✓) Refer to Appendix 3
Grevillea caleyi	E1	E	Shrub mostly 1-3m high. Grows in laterite. Distribution limits Terrey Hills-Belrose area.	x	Outside of natural distribution	-	-	x	x
Haloragodendron lucasii ^{EPBC}	E1	E	Straggling shrub to 1.5m high. Grows in open forest on sheltered slopes near creeks. <i>Distribution limits</i> <i>Ku-ring-gai Plateau and Mt Wilson.</i>	x	x	-	-	x	x
<i>Hibbertia puberula</i> DPIE	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 spanantha DPIE	E4A	CE	Grows in forest with canopy species including <i>E. pilularis, E. resinifera, C. gummifera</i> and <i>A. costata.</i> The understorey is open with species of Poaceae, Orchidaceae, Fabaceae and Liliaceae. Flowers Oct- Nov with odd flowers throughout the year. Substrate is identified as a light clay occurring on a shale sandstone soil transition.	x	x	-	-	x	x
lsotoma fluviatilis subsp. fluviatilis	-	x	A small herb known to grow in damp places, on the Cumberland Plain, including freshwater wetland, grassland/alluvial woodland and an alluvial woodland/shale plains woodland (Cumberland Plain Woodland) ecotone. <i>Currently only known from</i> <i>Erskine Park but there are previous sightings</i> <i>around the Sydney area.</i>	x	x	-	-	x	x
Lasiopetalum joyceae DPIE EPBC	V	V	Erect shrub to 2m high. Grows in heath and open forest on Hawkesbury sandstone. <i>Distribution limits Hornsby Plateau.</i>	x	x	-	-	x	x
Leptospermum deanei DPIE EPBC	V	V	Shrub to 5m high. Grows on forested slopes. Distribution limits near watershed of Lane Cove River.	x	x	-	-	x	x

			Growth form and habitat requirements Distribution limit	Recorded on site (∕∕)	If not recorded on site				Considered in
Scientific name	BC Act	EPBC Act			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	assessment of significance test (√) Refer to Appendix 3
Leucopogon exolasius DPIE	V	V	Erect shrub to 2m high. Rocky hillsides and creek banks in Sydney Sandstone Gully Forest. Confined to Woronora and Georges Rivers and Stokes Creek.	x	x	-	-	х	x
Macadamia tetraphylla ^{DPIE}	V	V	Small-medium tree with toothed or prickly leaf margins. North from Richmond River in NE NSW.	х	Outside of natural distribution	-	-	x	x
Maundia triglochinoides ^{DPIE}	V	-	A reed-like herb which grows in swamps and shallow fresh water on clay. <i>Distribution Limits N-Qld border S-Wyong.</i>	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. <i>Distribution limits N-Port Macquarie S-Jervis Bay.</i>	x	x	-	-	x	x
Melaleuca deanei DPIE EPBC	V	V	Shrub to 3m high. Grows in heath on sandstone. Distribution limits N-Gosford S-Nowra.	x	x	-	-	х	x
Persicaria elatior	V	V	Herb to 90cm tall which grows in damp places especially beside streams and lakes. Occasionally in swamp forest or associated with disturbance. <i>Varied distribution from SE NSW to QLD.</i>	x	x	-	-	х	x
Persoonia hirsuta	E1	E	Erect to decumbent shrub. Grows in dry sclerophyll forest and woodland on Hawkesbury sandstone with infrequent fire histories. <i>Distribution limits N-Glen Davis S-Hill Top.</i>	x	x	-	-	х	x
Pimelea curviflora var. curviflora ^{DPIE EPBC}	V	V	Woody herb or sub-shrub to 0.2-1.2m high. Grows on Hawkesbury Sandstone near shale outcrops. <i>Distribution Sydney.</i>	x	x	-	-	x	x
<i>Pimelea spicata</i>	E1	E	Decumbent or erect shrub to 0.5m high. Occurs principally in woodland on soils derived from Wianamatta Shales. <i>Distribution limits N-</i> <i>Lansdowne S-Shellharbour.</i>	x	x	-	-	x	x

			Growth form and habitat requirements Distribution limit	Recorded on site (✓)	If not recorded on site				Considered in
Scientific name	BC Act	EPBC Act			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	assessment of significance test (✓) Refer to Appendix 3
Prostanthera marifolia DPIE	E4A	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
Pterostylis saxicola EPBC	E1	E	Terrestrial orchid. Grows in shallow sandy soil above rock shelves, usually near Wianamatta / Hawkesbury transition. <i>Distribution limits N-</i> <i>Hawkesbury River S-Campbelltown.</i>	x	x	-	-	х	x
Rhodamnia rubescens DPIE EPBC	E4A	-	Shrub or small tree to 25 m high found in rainforest and riparian vegetation along the coast and up to 600m ASL. Flowers in late winter through to spring, with a peak in October, and fruits typically begin to appear in December in the Sydney region. Distribution limits N-Tweed Heads S- Batemans Bay.	x	x	-	-	x	x
Rhodomyrtus psidioides ^{EPBC}	E4A	-	Pioneer species found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest often near creeks and drainage lines. Populations are typically restricted to coastal and sub-coastal areas of low elevation however the species does occur up to c. 120 km inland in the Hunter and Clarence River catchments and along the Border Ranges in NSW. Distribution N – Maryborough Qld, S – Broken Bay NSW.	x	x	-	-	x	x
Rhizanthella slateri EPBC	V	E	A cryptical orchid that is largely underground. Flowers September to November. Links to habitat requirements are poorly understood. <i>Bulahdelah,</i> <i>Watagan Mountains, Blue Mountains, Wiseman's</i> <i>Ferry, Agnes Banks and Nowra.</i>	x	x	-	-	x	x
Sarcochilus hartmannii ^{DPIE}	V	V	An orchid which grows on volcanic rocks, often in shallow soil in sclerophyll forest or exposed sites usually at an elevation above 500m. <i>Distribution – north from the Richmond River in the far north of NSW.</i>	x	x	-	-	x	x

			BC Growth form and habitat requirements Distribution limit	Recorded on site (✓)		Considered in			
Scientific name	BC Act	EPBC Act			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	assessment of significance test (✓) Refer to Appendix 3
Senecio spathulatus DPIE	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 DPIE EPBC	V	V	Small tree. Subtropical and littoral rainforest on sandy soil. <i>Distribution limits N-Forster S-Jervis Bay.</i>	x	x	-	-	x	x
Tetratheca glandulosa ^{DPIE}	V	-	Spreading shrub to 0.2m high. Sandy or rocky heath or scrub. <i>Distribution limits N-Mangrove Mountain S-Port Jackson.</i>	x	х	-	-	x	x
<i>Tetratheca juncea</i>	V	V	Prostrate shrub to 1m high. Dry sclerophyll forest and heath. <i>Distribution limits N-Bulahdelah S-Port</i> <i>Jackson.</i>	x	х	-	-	x	x
Thesium australe	V	V	Erect herb to 0.4m high. Root parasite. Themeda grassland or woodland often damp. <i>Distribution limits N-Tweed Heads S-south of Eden.</i>	x	x	-	-	х	x
Wilsonia backhousei DPIE	V	-	Perennial subshrub with procumbent branches. Grows in coastal saltmarshes. <i>Wilsonia</i> <i>backhousei</i> is salt tolerant and is found in intertidal saltmarshes and, more rarely, on seacliffs. In New South Wales <i>Wilsonia</i> <i>backhousei</i> is scattered along the coast, reaching a northern limit at Wamberal Lagoon. In the Sydney region there has been a considerable decline in the abundance of the species over the last 100yrs, largely as a result of loss of habitat. <i>Distribution limits N-Sydney S-South of Eden.</i>	X	x	-	-	X	x
Zannichellia palustris ^{DPIE}	E1	-	Submerged herb. Fresh or slightly saline stationary or slow-flowing water. <i>Distribution limits N-Tweed Heads S-Newcastle.</i>	x	Outside of natural distribution	-	-	x	x
DPIE - Denc	otes spe	ecies liste	ed within 10km of the development footprint o	n the <i>Atlas of N</i>	SW Wildlife				
 EPBC Denotes species listed within 10km of the development footprint in the EPBC Act habitat search 									

						Considered in				
Scientific DATABASE SOL	name JRCE	BC Act	EPBC Act	Growth form and habitat requirements <i>Distribution limit</i>	Recorded on site (√)	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	assessment of significance test (✓) Refer to Appendix 3
V	- Den	otes vul	nerable l	isted species under the relevant Act						
E or E1	- Den	otes en	dangered	l listed species under the relevant Act						
E4a or CE	- Den	otes crit	tically en	dangered listed species under the relevant Ad	ct					
NOTE:	1. This 2. 'rec 3. 'nea	s field is ords' re arby' or	not cons fer to tho 'recent' r	sidered if no suitable habitat is present within se provided by the <i>Atlas of NSW Wildlife</i> ecords are species specific accounting for ho	the developmen me range, dispe	nt footprint ersal ability a	and life cycle	I.		

Table 8 – Threatened fauna species habitat assessment (Appendix 2)

Common name Scientific name Database source	BC Act	EPBC Act	Preferred habitat Distribution limit	Recorded on site (√)	Suitable habitat present (✓)	Nearby and/or high number of record(s) (✓) Notes 1,2 & 3	Record(s) from recent years (1) Notes 1,2 & 3	Potential to occur	Considered in test of significance (✓) Refer to Appendix 3
Wallum Froglet <i>Crinia tinnula</i> DPIE	V	-	Found in acidic paperbark swamps and wallum country with dense groundcover. Breeds in temporary and permanent pools and ponds of high acidity. <i>Distribution limit: N-Tweed Heads S-Kurnell.</i>	x	x	-	-	x	x
Giant Burrowing Frog <i>Heleioporus</i> <i>australiacus</i> DPIE EPBC	V	V	Inhabits open forests and riparian forests along non- perennial streams, digging burrows into sandy creek banks. <i>Distribution limit: N-Near Singleton S-South of</i> <i>Eden.</i>	x	x	-	-	x	x
Stuttering Frog <i>Mixophyes balbus</i> DPIE EPBC	E1	V	Terrestrial inhabitant of rainforest and wet sclerophyll forests. <i>Distribution limit: N-near Tenterfield S-South of Bombala</i> .	x	x	-	-	х	x
Red-crowned Toadlet <i>Pseudophryne</i> <i>australis</i>	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. <i>Distribution limit: N-Pokolbin. S-near</i> <i>Wollongong.</i>	x	x	-	-	x	x
Green and Golden Bell Frog <i>Litoria aurea</i> DPIE EPBC	E1	V	Prefers the edges of permanent water, streams, swamps, creeks, lagoons, farm dams and ornamental ponds. Often found under debris. <i>Distribution limit: N- Byron Bay S-South of Eden.</i>	x	x	-	-	x	x
Southern Bell Frog Litoria raniformis DPIE EPBC	E1	V	Prefers the edges of permanent water, streams, swamps, creeks, lagoons, farm dams and ornamental ponds. Often found under debris. <i>Distribution limit: N-ACT Bay. S-Albury.</i>	x	х	-	-	х	x

Common name Scientific name Database source	BC Act	EPBC Act	Preferred habitat Distribution limit	Recorded on site (√)	Suitable habitat present (✓)	Nearby and/or high number of record(s) (*) Notes 1,2 & 3	Record(s) from recent years (1) Notes 1,2 & 3	Potential to occur	Considered in test of significance (✓) Refer to Appendix 3
Broad-headed Snake Hoplocephalus bungaroides DPIE EPBC	E1	V	Sandstone outcrops, exfoliated rock slabs and tree hollows in coastal and near coastal areas. <i>Distribution limit: N-Mudgee Park. S-Nowra.</i>	x	x	-	-	x	x
Magpie Goose Anseranas semipalmata DPIE	V	-	A strongly nomadic species found in tropical through to sub-tropical wetlands, flood plains, large swamps, dams and wet grasslands with dense growths of rushes and sedges. <i>Distribution limit: N-Tweed Heads. S-Mulwala.</i>	x	x	-	-	x	x
Cotton Pygmy- goose <i>Nettapus</i> coromandelianus DPIE	E1	-	An aquatic species found in tropical to subtropical coastal lagoons, swamps and large bodies of calm fresh water with abundant vegetation. <i>Distribution limit: N-Tweed Heads. S-Pambula.</i>	x	x	-	-	x	x
Freckled Duck Stictonetta naevosa DPIE	V	-	Occurs mainly within the Murray-Darling basin and the channel country within large cool temperate to sub-tropical swamps, lakes and floodwaters with cumbungi, lignum or melaleucas. <i>Distribution limit: N- Tenterfield. S-Albury.</i>	x	x	-	-	x	x
Superb Fruit-dove Ptilinopus superbus DPIE	V	-	Rainforests, adjacent mangroves, eucalypt forests, scrubland with native fruits. <i>Distribution limit: N-Border</i> <i>Ranges National Park. S-Batemans Bay.</i>	x	x	-	-	x	x
Black-necked Stork Ephippiorhynchus asiaticus DPIE	E1	-	Occurs in tropical to warm temperate terrestrial wetlands, estuarine and littoral habitats such as mangroves, tidal mudflats, floodplains, open woodlands, irrigated lands, bore drains, sub-artesian pools, farm dams and sewerage ponds. <i>Distribution</i> <i>limit: N-Tweed Heads. S-Nowra.</i>	x	x	-	-	x	x

Common name Scientific name Database source	BC Act	EPBC Act	Preferred habitat Distribution limit	Recorded on site (✓)	Suitable habitat present (✓)	Nearby and/or high number of record(s) (✓) Notes 1,2 & 3	Record(s) from recent years (1) Notes 1,2 & 3	Potential to occur	Considered in test of significance (√) Refer to Appendix 3
Australasian Bittern Botaurus poiciloptilus EPBC	E1	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. <i>Distribution limit: N-North of Lismore. S-</i> <i>Eden.</i>	x	x	-	-	x	x
Black Bittern Ixobrychus flavicollis DPIE	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. <i>Distribution limit: N-Tweed Heads. S-South of Eden.</i>	x	x	-	-	x	x
Spotted Harrier <i>Circus assimilis</i>	V	-	Utilises grassy plains, crops and stubblefields; saltbush, spinifex associations; scrublands, mallee, heathlands; open grassy woodlands. <i>Distribution limit:</i> <i>N-Tweed Heads. S-South of Eden.</i>	x	x	-	-	x	x
White-bellied Sea Eagle (<i>Haliaeetus</i> <i>leucogaster</i>) DPIE	V	-	Occupies coasts, islands, estuaries, inlets, large rivers, inland lakes and reservoirs. <i>Sedentary; dispersive. N-Tweed Heads. S-South of Eden.</i>	x	x	-	-	x	x
Little Eagle Hieraaetus morphnoides DPIE	V	-	Utilises plains, foothills, open forests, woodlands and scrublands; river red gums on watercourses and lakes. <i>Distribution limit - N-Tweed Heads. S-South of Eden.</i>	x	x	-	-	x	x
Square-tailed Kite <i>Lophoictinia isura</i> DPIE	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. <i>Distribution limit: N-Goondiwindi. S-</i> <i>South of Eden.</i>	x	x	-	-	x	x

Common name Scientific name Database source	BC Act	EPBC Act	Preferred habitat Distribution limit	Recorded on site (✓)	Suitable habitat present (✓)	Nearby and/or high number of record(s) (✓) Notes 1,2 & 3	Record(s) from recent years (1) Notes 1,2 & 3	Potential to occur	Considered in test of significance (√) Refer to Appendix 3
Eastern Osprey Pandion cristatus DPIE	V	-	Utilises waterbodies including coastal waters, inlets, lakes, estuaries and offshore islands with a dead tree for perching and feeding. <i>Distribution limit: N-Tweed Heads. S-South of Eden.</i>	x	x	-	-	x	x
Grey Falcon <i>Falco hypoleucos</i> ^{DPIE}	V	-	Occurs over mainly inland drainage systems of open plains and lightly timbered country including the acacia scrub, spinifex and tussock grasslands. <i>Distribution</i> <i>limit: N-Mullumbimby. S-Bega.</i>	x	x	-	-	x	x
Black Falcon <i>Falco subniger</i> ^{DPIE}	V	-	Inhabits plains, grasslands, foothills, timbered watercourses, wetland environs, crops; occasionally over towns and cities. <i>N-Tweed Heads. S-South of Eden</i>	x	x	-	-	x	x
Bush Stone-curlew Burhinus grallarius DPIE	E1	-	Utilises open forests and savannah woodlands, sometimes dune scrub, savannah and mangrove fringes. <i>Distribution limit: N-Border Ranges National</i> <i>Park. S-Near Nowra.</i>	x	x	-	-	x	x
Major Mitchell's Cockatoo <i>Cacatua</i> <i>leadbeateri</i> DPIE	V	-	Commonly found within the arid interior of Australia within desert scrubs, open woodland, mallee, mulga, and callitris woodlands. <i>Distribution limit: N-Goodooga. S-Albury.</i>	x	x	-	-	x	x
Gang-gang Cockatoo <i>Callocephalon</i> <i>fimbriatum</i> DPIE	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. <i>Distribution</i> <i>limit: mid north coast of NSW to western Victoria.</i>	x	x	-	-	x	x

			Preferred habitat Distribution limit	Recorded on site (✓)					
Common name Scientific name Database source	BC Act	EPBC Act			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	test of significance (✓) Refer to Appendix 3
Glossy Black- Cockatoo <i>Calyptorhynchus</i> <i>lathami</i> DPIE	V	-	Open forests with <i>Allocasuarina</i> species and hollows for nesting. <i>Distribution limit: N</i> -Tweed Heads. <i>S</i> -South of Eden.	Х	x	-	-	x	x
Little Lorikeet Glossopsitta pusilla DPIE	V	-	Inhabits forests, woodlands; large trees in open country; timbered watercourses, shelterbeds, and street trees. <i>Distribution limit: N-Tweed Heads. S-South of Eden.</i>	x	x	-	-	x	x
Swift Parrot Lathamus discolour DPIE EPBC	E1	E	Inhabits eucalypt forests and woodlands with winter flowering eucalypts. <i>Distribution limit: N-Border Ranges</i> <i>National Park. S-South of Eden.</i>	x	x	-	-	х	x
Turquoise Parrot Neophema pulchella _{DPIE}	V	-	Inhabits coastal scrubland, open forest and timbered grassland, especially ecotones between dry hardwood forests and grasslands. <i>Distribution limit: N-Near Tenterfield. S-South of Eden.</i>	x	x	-	-	x	x
Orange-bellied Parrot Neophema chrysogaster DPIE EPBC	E1	E	Favours small islands, peninsulas in coastal areas; with saltmarsh plants; coastal pastures, golf courses; crops of millet and sunflowers; dunes, beaches. <i>Distribution limit: N-Southern Sydney coast. S-South of Eden.</i>	x	x	-	-	x	x
Barking Owl Ninox connivens	V	-	Inhabits principally woodlands but also open forests and partially cleared land and utilises hollows for nesting. <i>Distribution limit: N-Border Ranges National</i> <i>Park. S-Eden.</i>	x	x	-	-	x	x

Common name Scientific name Database source	BC Act	EPBC Act	EPBCPreferred habitatActDistribution limit		Suitable habitat present (✓)	Nearby and/or high number of record(s) (✓) Notes 1,2 & 3	Record(s) from recent years (1) Notes 1,2 & 3	Potential to occur	Considered in test of significance (√) Refer to Appendix 3
Powerful Owl <i>Ninox strenua</i> ^{DPIE}	V	-	Forests containing mature trees for shelter or breeding and densely vegetated gullies for roosting. <i>Distribution</i> <i>limits: N-Border Ranges National Park. S-Eden.</i>	x	x	-	-	x	x
Grass Owl Tyto longimembris DPIE	V	-	Inhabits grassland, coastal heath and lignum swamps, sheltering in dense grass tussocks by day. <i>Distribution limit: N-Tweed Heads. S-Lithgow.</i>	x	x	-	-	х	x
Masked Owl <i>Tyto</i> novaehollandiae ^{DPIE}	V	-	Open forest and woodlands with cleared areas for hunting and hollow trees or dense vegetation for roosting. <i>Distribution limit: N-Border Ranges National</i> <i>Park. S-Eden.</i>	x	x	-	-	x	x
Sooty Owl <i>Tyto tenebricosa</i> ^{DPIE}	V	-	Tall, dense, wet forests containing trees with very large hollows. <i>Distribution limit: N-Border Ranges National Park. S-South of Eden.</i>	x	x	-	-	х	x
White-throated Needletail ^{MS} <i>Hirundapus</i> <i>caudacutus</i> <i>DPIE EPBC</i>	-	V	Airspace over forests, woodlands, farmlands, plains, lakes, coasts, towns; companies often forage along favoured hilltops and timbered ranges. Breeds Siberia, Himalayas, east to Japan. Summer migrant to eastern Australia. <i>Distribution limit: N-Tweed Heads. S-South of</i> <i>Eden.</i>	x	x	-	-	x	x
Regent Honeyeater Xanthomyza Phrygia DPIE EPBC	E4A	CE	Found in temperate eucalypt woodland and open forest including forest edges, wooded farmland and urban areas with mature eucalypts. <i>Distribution limit: N-Urbanville. S-Eden.</i>	x	x	-	-	х	x
White-fronted Chat Epithianura albifrons	V	-	Found in open damp ground, grass clumps, fencelines, heath, samphire saltmarshes, mangroves, dunes, saltbush plains. <i>Distribution limit: N-Tweed Heads. S-South of Eden.</i>	x	x	-	-	x	x

		EPBC Act	Preferred habitat Distribution limit	Recorded on site (✓)					
Common name Scientific name Database source	BC Act				Suitable habitat present (✓)	Nearby and/or high number of record(s) (✓) Notes 1,2 & 3	Record(s) from recent years (1) Notes 1,2 & 3	Potential to occur	test of significance (✓) Refer to Appendix 3
Varied Sittella Daphoenositta chrysoptera DPIE	V	-	Open eucalypt woodlands / forests (except heavier rainforests); mallee, inland acacia, coastal tea-tree scrubs; golf courses, shelterbelts, orchards, parks, scrubby gardens. <i>Distribution limit: N-Border Ranges National Park. S-South of Eden.</i>	x	x	-	-	x	x
Dusky Woodswallow <i>Artamus</i> <i>cyanopterus</i> <i>cyanopterus</i> DPIE	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. <i>Widespread in eastern, southern</i> <i>and south-western Australia.</i>	x	x	-	-	x	x
Scarlet Robin Petroica boodang DPIE	V	-	Found in foothill forests, woodlands, watercourses; in autumn-winter, more open habitats: river red gum woodlands, golf courses, parks, orchards, gardens. <i>Distribution limit: N-Tweed Heads. S-South of Eden.</i>	x	x	-	-	x	x
Flame Robin Petroica phoenicea DPIE	V	-	Summer: forests, woodlands, scrubs, from sea-level to <i>c</i> . 1800 m. Autumn-winter: open woodlands, plains, paddocks, golf courses, parks, orchards. <i>Distribution</i> <i>limit: N northern NSW tablelands. S-South of Eden.</i>	x	x	-	-	x	x
Diamond Firetail Stagonopleura guttata DPIE	V	-	Found in eucalypt woodlands, forests and mallee where there is grassy understorey west of the Great Div. also drier coastal woodlands of the Cumberland Plain and Hunter Richmond and Clarence River Valleys. <i>Distribution limit: N-Rockhampton Q. S-Eyre</i> <i>Pen Kangaroo Is. SA.</i>	x	x	-	-	x	x

Common name Scientific name Database source	on name fic name BC EPBC Prefer fic name Act Act Distri		Preferred habitat Distribution limit	Recorded on site (✓)	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	Considered in test of significance (√) Refer to Appendix 3
Spotted-tailed Quoll Dasyurus maculatus DPIE EPBC	V	E	Dry and moist open forests containing rock caves, hollow logs or trees. <i>Distribution limit: N-Mt Warning</i> <i>National Park. S-South of Eden.</i>	x	x	-	-	x	x
Koala Phascolarctos cinereus DPIE EPBC	V	V	Inhabits both wet and dry eucalypt forest on high nutrient soils containing preferred feed trees. <i>Distribution limit: N-Tweed Heads. S-South of Eden.</i>	x	x	-	-	x	x
Eastern Pygmy Possum <i>Cercatetus</i> nanus _{DPIE}	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. <i>Distribution</i> <i>limit: N-Tweed Heads. S-Eden.</i>	x	x	-	-	x	x
Yellow-bellied Glider <i>Petaurus</i> <i>australis</i> DPIE	V	-	Tall mature eucalypt forests with high nectar producing species and hollow bearing trees. <i>Distribution limit: N-Border Ranges National Park. S-South of Eden.</i>	x	x	-	-	x	x
Greater Glider Petauroides volans 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 <i>Distribution limit: N- Border Ranges National Park. S- South of Eden.</i>	x	x	-	-	x	x

Common name Scientific name Database source	n name <i>BC EPBC Preferred</i> <i>ic name Act Act Distribut</i>		Preferred habitat Distribution limit	red habitat Recorded on site	Suitable habitat present (✓)	Nearby and/or high number of record(s) (✓) Notes 1,2 & 3	Record(s) from recent years (1) Notes 1,2 & 3	Potential to occur	Considered in test of significance (√) Refer to Appendix 3
Brush-tailed Rock- wallaby Petrogale penicillata EPBC	E1	V	Found in rocky gorges with a vegetation of rainforest or open forests to isolated rocky outcrops in semi-arid woodland country. <i>Distribution limit: N-North of</i> <i>Tenterfield. S-Bombala.</i>	x	x	-	-	x	x
Grey-headed Flying-fox Pteropus poliocephalus DPIE 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. <i>Distribution limit: N-Tweed Heads. S-Eden.</i>	~	-	-	-	Recorded	V
Yellow-bellied Sheathtail-bat Saccolaimus flaviventris	V	-	Rainforests, sclerophyll forests and woodlands. Distribution limit: N-North of Walgett. S-Sydney.	x	x	-	-	x	x
Eastern Coastal Free-tailed Bat <i>Micronomus</i> <i>norfolkensis</i> DPIE	V	-	Inhabits open forests and woodlands foraging above the canopy and along the edge of forests. Roosts in tree hollows, under bark and buildings. <i>Distribution</i> <i>limit:</i> N-Woodenbong. S-Pambula.	x	x	-	-	x	x
Large-eared Pied Bat <i>Chalinolobus</i> <i>dwyeri</i> DPIE 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. <i>Distribution</i> <i>limit: N-Border Ranges National Park. S-Wollongong.</i>	x	x	-	-	x	x

	BC Act	EPBC Act	Preferred habitat Distribution limit	Recorded on site (✓)					
Common name Scientific name Database source					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	test of significance (✓) Refer to Appendix 3
Eastern False Pipistrelle <i>Falsistrellus</i> <i>tasmaniensis</i>	V	-	Recorded roosting in caves, old buildings and tree hollows. <i>Distribution limit: N-Border Ranges National Park. S-Pambula.</i>	х	x	-	-	x	x
Little Bent-winged Bat <i>Miniopterus</i> <i>australis</i> DPIE	V	-	Roosts in caves, old buildings and structures in the higher rainfall forests along the south coast of Australia. <i>Distribution limit: N-Border Ranges National Park. S-</i> <i>Sydney.</i>	x	Marginal	V	~	Unlikely	1
Large Bent-winged Bat <i>Miniopterus</i> <i>orianae</i> <i>oceanensis</i> DPIE	V	-	Prefers areas where there are caves, old mines, old buildings, stormwater drains and well-timbered areas. <i>Distribution limit: N-Border Ranges National Park. S-</i> <i>South of Eden.</i>	x	Marginal	V	✓	✓	V
Southern Myotis <i>Myotis macropus</i> DPIE	V	-	Roosts in caves, mines, tunnels, buildings, tree hollows and under bridges. Forages over open water. <i>Distribution limit: N-Border Ranges National Park. S-</i> <i>South of Eden.</i>	x	x	-	-	x	x
Eastern Chestnut Mouse Pseudomys gracilicaudatus DPIE	V	-	Inhabits heathland including dense wet heath and swampy areas, occasionally in woodland with grassy understorey. <i>Distribution limit: N-Border Ranges</i> <i>National Park. S-Brisbane Water National Park.</i>	x	x	-	-	x	x

							If not recor	ded on site		
Common name Scientific name Database source		ne BC EH ne Act A		Preferred habitat Distribution limit	Recorded on site (✓)	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	Considered in test of significance (✓) Refer to Appendix 3
New Hollan Mouse Pseudomys novaehollar EPBC	d S ndiae	-	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. <i>Distribution</i> <i>limit: N-Border Ranges National Park. S-South of Eden.</i>	x	x	-	-	x	x
Giant Drago Petalura gig ^{DPIE}	onfly gantean	E1	-	Inhabits large relatively deep permanent swamps and bogs with high water quality and moss or other soft vegetation along the edge for egg laying. <i>It occurs in</i> <i>the far NE NSW, south to Kempsey, & in a patch</i> <i>between Gosford & Nowra.</i>	x	x	-	-	x	x
Dural Land Pommerhel duralensis EPBC	Snail lix	E1	E	Occurs on shale-sandstone transitional forest landscapes within the Blue Mountains, Penrith, The Hills, Wollondilly, Hornsby and Parramatta LGA's. Occurs in low abundance and shelters under rocks or inside curled-up bark, beneath leaves and light woody debris. <i>Distribution limit: St Albans to Mulgoa with most</i> <i>records from The Hills LGA.</i>	x	x	-	-	x	X
EPBC	Denotes	species l	isted with	nin 10km of the development footprint in the EPE	BC Act habitat	search				
TBE	Denotes	additiona	al species	s considered by <i>Travers bushfire</i> & ecology to ha	ive potential ha	abitat based	on regional	knowledge	and other red	cords
V	Denotes	vulnerab	le listed s	species under the relevant Act						
E or E1	Denotes	endange	red listed	species under the relevant Act						
E4a or CE	Denotes	critically	endange	red listed species under the relevant Act						
NOTE:	 This f 'recor 'neart 	ield is not ds' refer t by' or 'reco	consider o those p ent' recor	red if no suitable habitat is present within the dev provided by the <i>Atlas of NSW Wildlife</i> rds are species specific accounting for home ran	elopment foot _l ge, dispersal a	orint Ibility and lif	e cycle			
Unlikely	Represe	ents such	a low ma	rgin but not enough to 100% rule it one. A test o	f significance is	s required.				
Not likely	Means 0)% chang	e of occu	rring, despite there being potential habitat. A tes	t of significanc	e is not app	lied 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 9 provides an assessment of potential habitat within the study area for nationally *protected* migratory fauna species recorded within 10 km on the *EPBC Act* Protected Matters Tool. Nationally *threatened* migratory species are instead considered above in Table 8.

Common name Scientific name	Preferred habitat Migratory breeding	Suitable habitat present (√)	Recorded on site (✓)	Comments
Oriental Cuckoo (Cuculus optatus)	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.	х	х	-
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	х	-
Black-faced Monarch (<i>Monarcha melanopsis</i>)	Rainforests, eucalypt woodlands; coastal scrubs; damp gullies in rainforest, eucalypt forest; more open woodland when migrating. <i>Summer breeding migrant to coastal south east Australia, otherwise uncommon.</i>	x	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	x	-
Satin Flycatcher (<i>Myiagra cyanoleuca</i>)	Heavily vegetated gullies in forests, taller woodlands, usually above shrub-layer; during migration, coastal forests, woodlands, mangroves, trees in open country, gardens. <i>Breeds mostly south-east Australia and Tasmania over warmer months, winters in north east Qld.</i>	x	x	-
Rufous Fantail (<i>Rhipidura rufifrons</i>)	Undergrowth of rainforests / wetter eucalypt forests / gullies; monsoon forests, paperbarks, sub-inland and coastal scrubs; mangroves, watercourses; parks, gardens. On migration, farms, streets buildings. <i>Breeding migrant to south-east Australia over warmer months. Altitudinal migrant in north-east NSW in mountain forests during warmer months.</i>	x	x	-
Yellow Wagtail (<i>Motacilla flava</i>)	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	х	-

Table 9 – Protected migratory bird habitat assessment (Appendix 2)

Appendix 3 Test of Significance Flora and fauna survey and habitat assessments of the study area have resulted in the identification of suitable habitat for the following threatened biodiversity that was recorded present or considered otherwise with varying potential to occur. The potential for any direct or indirect impacts on species has been considered and noted.

Given the extensive site disturbance, it was considered that there was unlikely to be any natural habitat suitable for threatened flora species. No planted threatened flora specimens were observed within the subject site.

Common name	BC Act	Potential to occur	Potential habitat impact
Grey-headed Flying-fox	V	Recorded	Direct – on potential foraging
Large Bent-winged Bat	V	\checkmark	Indirect – on potential foraging
Little Bent-winged Bat	V	Unlikely	Indirect – on potential foraging

Endangered populations

- Seringia denticulata in the Hawkesbury local government area.
- White-fronted Chat population in the Sydney Metropolitan Catchment Management Area.
- Long-nosed Bandicoot population in inner western Sydney local government area.

Locally recorded threatened flora populations including *Acacia prominens, Pomaderris prunifolia* and *Wahlenbergia multicaulis* do not include the Inner West LGA (or formerly Ashfield) as part of their population distribution.

Threatened ecological communities

None

BC ACT 2016 - SECTION 7.3 TEST OF SIGNIFICANCE

As outlined in Section 7.2 of the *BC* Act development or an activity is *likely to significantly affect threatened species* if:

- (a) It is likely to significantly affect threatened species or ecological communities, or their habitats, according to the test in Section 7.3, or
- (b) The development exceeds the threshold if the BOS applies to the impacts of the development on biodiversity values, or
- (c) It is carried out in a declared area of outstanding biodiversity value.

With respect to (a) above, and outlined in Section 7.3 of the *BC Act*, the following *test of significance* is a set of five main considerations, with sub-considerations for determining whether proposed development or activity likely to significantly affect threatened species or ecological communities, or their habitats.

a) In the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species

such that a viable local population of the species is likely to be placed at risk of extinction,

The direct and indirect impacts of the proposal are considered within Section 5.4.

With consideration to the relative direct and indirect impacts on all threatened species with varying potential to occur, it is considered that the proposal is unlikely to disrupt the life cycle for any of these listed species such that a viable local population would be placed at risk of extinction. Species recorded present during survey, previously recorded nearby or with high potential to occur and requiring further discussion given potential impacts are further discussed in detail below.

Summary of threatened species recorded

Grey-headed Flying-fox

Grey-Headed Flying-foxes are canopy feeding frugivores and nectarivores, inhabiting a wide range of habitats including rainforest, mangroves, paperbark forests, wet and dry sclerophyll forests and cultivated areas. This species roosts in camps, which may contain tens of thousands of individuals.

Camps are commonly formed in gullies, typically not far from water and usually in vegetation with a dense canopy (Tidemann 1998). Camps can be found in riparian rainforest patches, Melaleuca stands, mangroves, riparian woodland or modified vegetation in urban areas. Loyalty to a site is high and some camps in NSW have been used for over a century (NSW NPWS 2001). Some camps are used at the same time every year by hundreds of thousands of flying-foxes while others are used sporadically by a few hundred individuals (Strahan 1995). Generally foraging is within 20km of camps but individuals are known to commute up to 50km to a productive food source.

A Grey-headed Flying-fox was recorded during survey flying over the study area during nocturnal survey on the 15th February 2021. The development footprint provides only seasonal foraging habitat for the Grey-headed Flying-fox as no suitable roosting or subsequent breeding habitat is present. Foraging habitat is otherwise well represented in the surrounding locality such that removal of habitat will not significantly impact on a local population. It is recommended that foraging habitat is replaced by locally native flowering eucalypts within landscaping areas.

Little Bent-winged Bat & Large Bent-winged Bat

These two species are considered here together because of their similar roosting/breeding habitat requirements and subsequent assessment outcome.

The Little Bent-winged Bat forages below the canopy within open forests and woodlands, feeding on small insects (Dwyer 1995b). This species roosts in caves, tunnels, tree hollows and occasionally old buildings (Dwyer 1995b). Caves are an important resource for this species, particularly for breeding where maternity caves must have suitable temperature, humidity and physical dimensions to permit breeding (Dwyer 1995b). One record exists of this species utilising a tree hollow however hollows are not currently considered as preferred habitat for this species (pers. com. Brad Law).

The Large Bent-winged Bat forages above and below the canopy within open forests and woodlands, feeding on small flying insects, predominantly moths (Dwyer 1995). The Large Bent-winged Bat is known to roost in a range of habitats including stormwater channels,

under bridges, occasionally in buildings, old mines and, in particular, caves (Dwyer 1995). Caves are an important resource for this species, particularly for breeding where maternity caves must have suitable temperature, humidity and physical dimensions to permit breeding (Dwyer 1995). Roost sites in tree hollows have not been reported within the literature reviewed. This species has not been identified as utilising culverts for maternity roosts. Maternity roosts rather are occupied by up to 100,000 females with only 12 maternity roosts known throughout the complete range (Hoy & Hall 2008).

It is considered that the development footprint provides suitable foraging only habitat for the Little Bent-winged Bat and Large Bent-winged Bat. The Little Bent-winged Bat would forage more predominantly below the canopy where an open structure below the shrub layer permits. The Large Bent-winged Bat would forage more predominantly above the canopy and down in more open areas. Concentrated activity is likely in some locations such as along the creek, forest fringes and trails, particularly for the Large Bent-winged Bat.

Whilst foraging by both species may be more concentrated in some habitats (most based on structure and insect activity) no specific valued habitat features within the study area are identified. No important roosting or breeding habitat is likely present within the study area. Roosting locations are expected to occur throughout the locality and many of these are likely within man-made structures.

Given the highly mobile nature of both of these species, the absence of any important habitat, their known ability to move across and utilise some urban landscapes and that the proposed development will not inhibit local movements and dispersal, neither species will be likely significantly impacted by the proposed habitat clearance.

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

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

There will be no impacts on TECs.

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

N/A.

c) In relation to the habitat of threatened species or ecological community:

It is considered that the habitat attributes of the development footprint provide known or potential habitat for Grey-headed Flying-fox, Little Bent-winged Bat and Large Bent-winged Bat.

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

The subject site is approximately 2,000 m^2 and contains only low growing exotic and weed species with occasional exotic vines. The proposal will impact some vegetation within the adjoining light rail corridor that comprises a few *Melaleuca quinquenervia* trees amongst other exotic species over a maximum area of 500 m².

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

Connectivity is described in section 3.7 of the report. The subject site is not part of an extensive or important connected habitat. The proposal will not result in habitat fragmentation nor isolation.

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

In respect to threatened fauna species recorded or with potential to occur the proposed area of impact is not likely of high quality, of any breeding importance or central to the home range requirements of any species such that behaviour or ecology of these species will be significantly altered in any way

The habitat being removed or impacted within the subject site is all weeds. A few planted *Melaleuca quinquenervia* will be removed in the adjoining light rail corridor because the basement plans impede on tree protection zones. Less than 5% of the mid-storey and ground layer in the light rail corridor comprises native species.

The subject site is not part of a significant habitat corridor, and the proposal will not cause further fragmentation or isolation of species habitat.

No vegetation is listed as a TEC.

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

The development footprint is not within any declared area of outstanding biodiversity value. Therefore, the proposal will not have any adverse effects on any declared area of outstanding biodiversity value (either directly or indirectly).

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

A key threatening process is defined as a process that threatens, or could threaten, the survival or evolutionary development of species, populations or ecological communities.

The current list of key threatening processes, and whether the proposed activity is recognised as a threatening process, is shown below.

Listed key threatening process	Develop	oment a thr process?	eatening
	Likely	Possible	Unlikely
Aggressive exclusion of birds by Noisy Miners (<i>Manorina melanocephala</i>)			√

Table 11 – Key threatening processes (Appendix 3)

Listed key threatening process	Development a threatening process?				
	Likely	Possible	Unlikely		
Alteration of habitat following subsidence due to longwall mining	Linoly		√		
Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands			\checkmark		
Anthropogenic Climate Change			\checkmark		
Bushrock removal			\checkmark		
Clearing of native vegetation	\checkmark				
Competition and habitat degradation by feral goats			\checkmark		
Competition and grazing by the feral European Rabbit (Oryctolagus cuniculus)			√		
Competition from feral honeybees			\checkmark		
Death or injury to marine species following capture in shark control programs on ocean beaches			\checkmark		
Entanglement in, or ingestion of anthropogenic debris in marine and estuarine environments			√		
Forest Eucalypt dieback associated with over-abundant psyllids and bell miners			✓		
High frequency fire resulting in the disruption of life-cycle processes in plants and animals and loss of vegetation structure and composition			√		
Herbivory and environmental degradation caused by feral deer			\checkmark		
Importation of red imported fire ants into NSW			\checkmark		
Infection by <i>Psittacine circoviral</i> (beak and feather) disease affecting endangered psittacine species and populations			\checkmark		
Infection of frogs by amphibian chytrid causing the disease chytridiomycosis			√		
Introduction and establishment of Exotic Rust Fungi of the order Pucciniales pathogenic on plants of the family Myrtaceae		\checkmark			
Infection of native plants by Phytophthora cinnamomi		\checkmark			
Introduction of the large earth bumblebee (Bombus terrestris)			✓		
Invasion and establishment of exotic vines and scramblers			\checkmark		
Invasion and establishment of Scotch Broom (<i>Cytisus</i> scoparius)			\checkmark		
Invasion and establishment of the Cane Toad (Bufo marinus)			\checkmark		
Invasion, establishment and spread of Lantana camara			\checkmark		
Invasion of native plant communities by bitou bush & boneseed Chrysanthemoides monilifera			✓		
Invasion of native plant communities by exotic perennial grasses			√		
Invasion of native plant communities by African Olive (Olea europaea subsp. cuspidata)			√		
Invasion of the Yellow Crazy Ant (Anoplolepis gracilipes)			\checkmark		
Loss of Hollow-bearing trees			\checkmark		

Listed key threatening process	Development a threatening process?		
	Likely	Possible	Unlikely
Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants			√
Loss and/or degradation of sites used for hill-topping by butterflies			√
Predation and hybridisation by feral dogs (<i>Canis lupus familiaris</i>)			√
Predation by the European Red Fox (Vulpes vulpes)			\checkmark
Predation by the Feral Cat (Felis catus)			\checkmark
Predation by Gambusia holbrooki Girard, 1859 (plague minnow or mosquito fish)			√
Predation by the Ship Rat (<i>Rattus rattus</i>) on Lord Howe Island			√
Predation, habitat degradation, competition & disease transmission from Feral pigs (<i>Sus scofa</i>)			√
Removal of dead wood and dead trees			\checkmark

The above key threatening processes have been considered in reference to the proposal. It was considered that the proposal may contribute to a small degree to a number these processes as described below. It was not considered that the proposal will have a large or significant impact on any of the following key threatening processes. Some mitigation measures have been listed under each process to minimise or reduce such impacts upon those processes.

Summary of "likely" or "possible" Key Threatening Processes

This section identifies what mitigation measures can be implemented to address threatening processes.

Clearing of native vegetation

The proposal is of a class of development recognised as a threatening process. There are ten (10) *Melaleuca quinquenervia* trees within the adjoining light rail corridor, some of which are required to be removed as the tree protection zones are compromised. A handful of native specimens are also likely to be removed in the process, eg. juvenile *Pittosporum undulatum* and *Cupaniopsis anacardioides*.

The proposal seeks to create a small pocket park area in the northern section of the site. There are also narrow green areas for landscaping that can be utilised for planting of native trees and shrubs that will provide a no net loss of native vegetation.

Infection of native plants by Phytophthora cinnamomi

The proposal may temporarily increase the risk of fungal infection on site as it may be spread via vehicular movement and relocation of soil and vegetation. Consequently, standard *Phytophthora cinnamomi* protocol applies to the cleaning of all plant, equipment, hand tools and work boots prior to delivery onsite to ensure that there is no loose soil or vegetation material caught under or on the equipment and within the tread of vehicle tyres or tracks. Any equipment found to contain soil or vegetation material from offsite is to be cleaned in a quarantined work area or wash station and treated with fungicides prior to commencing work.

Introduction and establishment of Exotic Rust Fungi of the order Pucciniales pathogenic on plants of the family Myrtaceae

'Myrtle Rust' may be spread via machinery, animals and humans as well as by environmental factors such as wind. The presence of machinery and construction works is likely to slightly increase the potential for spread of this key threatening process. Similar protocols as to *Phytophthora cinnamomi* should be applied.

Appendix 4 EPBC significance assessment criteria

EPBC Act Significance Assessment Criteria

Under the *EPBC Act* an action will require approval from the Australian Government Environment Minister if the action has, will have, or is likely to have, a significant impact on a matter of national environmental significance. The following significant impact criteria were sourced from the *EPBC Act* Policy Statement 1.1 (May 2006):

CRITICALLY ENDANGERED AND ENDANGERED SPECIES

Significant impact criteria

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

- Lead to a long-term decrease in the size of a population;
- Reduce the area of occupancy of the species;
- Fragment an existing population into two or more populations;
- Adversely affect habitat critical to the survival of a species;
- Disrupt the breeding cycle of a population;
- Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline;
- Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat;
- Introduce disease that may cause the species to decline; or
- Interfere with the recovery of the species.

>> What is a population of a species?

A 'population of a species' is defined under the *EPBC Act* as an occurrence of the species in a particular area. In relation to critically endangered, endangered or vulnerable threatened species, occurrences include but are not limited to:

• a geographically distinct regional population, or collection of local populations; or

• a population, or collection of local populations, that occurs within a particular bioregion.

>> What is habitat critical to the survival of a species or ecological community?

'Habitat critical to the survival of a species or ecological community' refers to areas that are necessary:

• For activities such as foraging, breeding, roosting, or dispersal;

• For the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators);

• To maintain genetic diversity and long-term evolutionary development; or

• For the reintroduction of populations or recovery of the species or ecological community.

Such habitat may be, but is not limited to: habitat identified in a recovery plan for the species or ecological community as habitat critical for that species or ecological community; and/or habitat listed on the Register of Critical Habitat maintained by the Minister under the *EPBC Act.*

VULNERABLE SPECIES

Significant impact criteria

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

- lead to a long-term decrease in the size of an important population of a species;
- reduce the area of occupancy of an important population;
- fragment an existing important population into two or more populations;
- adversely affect habitat critical to the survival of a species;
- disrupt the breeding cycle of an important population;
- modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline;
- result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat;
- introduce disease that may cause the species to decline; or
- interfere substantially with the recovery of the species.

>> What is an important population of a species?

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

- Key source populations either for breeding or dispersal;
- Populations that are necessary for maintaining genetic diversity; and/or
- Populations that are near the limit of the species range.

CRITICALLY ENDANGERED AND ENDANGERED ECOLOGICAL COMMUNITIES

Significant impact criteria

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

- Reduce the extent of an ecological community;
- Fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines;
- Adversely affect habitat critical to the survival of an ecological community;
- Modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns;
- Cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting;
- Cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to:
 - assisting invasive species, that are harmful to the listed ecological community, to become established; or
 - causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community; or
- Interfere with the recovery of an ecological community.

MIGRATORY SPECIES

Significant impact criteria

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

- Substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species;
- Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species; or
- Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.

>> What is important habitat for a migratory species?

An area of 'important habitat' for a migratory species is:

- a) Habitat utilised by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species; and/or
- b) Habitat that is of critical importance to the species at particular life-cycle stages; and/or
- c) Habitat utilised by a migratory species which is at the limit of the species range; and/or
- d) Habitat within an area where the species is declining.

>> What is an ecologically significant proportion?

Listed migratory species cover a broad range of species with different life cycles and population sizes. Therefore, what is an 'ecologically significant proportion' of the population varies with the species (each circumstance will need to be evaluated). Some factors that should be considered include the species' population status, genetic distinctiveness and species-specific behavioural patterns (for example, site fidelity and dispersal rates).

>> What is the population of a migratory species?

'Population', in relation to migratory species, means the entire population or any geographically separate part of the population of any species or lower taxon of wild animals, a significant proportion of whose members cyclically and predictably cross one or more national jurisdictional boundaries including Australia.

Appendix 5 – Large Bent-winged Bat habitat assessment for landscape design



Our Ref: 20ABC02

11 February 2021

ABC Planning P/L Shop 4 500 Elizabeth Street SURRY HILLS NSW 2010

Attention: K Richards

Dear Kite

Re: Fauna Ecologist Review on habitat creation measures Large Bent-winged Bat at 120C Old Canterbury Road, Summer Hill

Travers bushfire & *ecology* has been engaged to provide ecological review and advice regarding habitat creation measures for Large Bent-winged Bat proposed for a multi-level residential unit block at the above address in response to pre-DA comments from Inner West Council. The subject site is shown on Figure 1.



Figure 1 – Subject site

Comments provided from Council are as follows:

The proposal is located within a significant/ strategic Biodiversity corridor with the Inner West LGA. As such amended documentation addressing and responding to the requirements of the biodiversity Act 2016 are recommended to be submitted. In particular this documentation should address and respond to the potential impact of the development on the flight path of the threatened eastern bent-wing bat.

Response: The Biodiversity Conservation Act 2016 guides an assessment on threatened biodiversity and the potential impacts from development. This legal framework will determine if a development will cause a significant impact on biodiversity and outlines subsequent measures of avoidance, minimization and then offsetting of impacts under the Biodiversity Offsetting Scheme.

Travers bushfire & *ecology* were not engaged to prepare a Biodiversity Assessment Report as part of this submission which I limited to review and advice. It is understood that an ecological assessment has been previously undertaken for the proposal. The development is not expected to trigger offsetting due to triggering the clearance of native vegetation exceeding the threshold nor is the site mapped as contain biodiversity values.

As the development proposal does not impact on any important maternal roosting habitat or any known other structural roost, then a test of significance assessment, if undertaken, would likely conclude a not significant impact on this species on Large Bent-winged Bat. It is likely that comments relating to the flight path of this species have potentially arisen out of recordings during the initial site ecological surveys. Only a wind farm close to a breeding or high use roost may potentially impact on flight paths for this species. This development is static non-moving structure and consequently Microbats will avoid it through sonar echolocation.

Council's comments go on to state:

In order to ensure minimal impact on the flight path of the eastern bentwing bat it is recommended that the topmost roof of the building (roof of level 8) be amended to incorporate a green roof. Such an amendment will ensure resting and bio-diversity opportunities for this and other species and assist to off-set any habitation loss experienced by the re-development of the existing land parcel.

Response: *Travers bushfire & ecology* has reviewed the following documentation:

- Existing Tree Plan (*Fox Johston* 2020)
- Survey Plan (Stone Mason & Artist 2019)
- Arborist Report (Rain Tree Consulting 2020)
- Landscape Plan (*McGregor Coxall* 2020)

Following this a site visit was undertaken by Corey Mead (Fauna Ecologist) with Joppe Veul (*McGregor Coxall*) and Jamie Howeson (*The Yard 120c* Project Manager) on Friday the 5th February.

It is also understood that the residential flat building is proposed with the following landscaping, as also demonstrated in the Landscape Plans:
- 21.68% (424m²) of the site to be deep soil zone, which accommodates an extensive landscaped setting, perimeter plantings within the pocket park, common open space areas on Levels 1, 3, 4, 6, and for the Level 7 green roof garden.
- Landscaping includes the pocket park at the northern end of the perimeter planting, and landscaped common areas on Levels 1, 3, 4, 6, plus the landscaped Level 7 green roof area site, with a total of 482.5m² (24.66%) of soft landscaping provided. This consists of a mixture of shrubs, ferns, grasses, and groundcovers.

The Landscape Plans also provide a preliminary review of sourced hides for insects to encourage potential microbat prey species habitat as well as an example of microbat and bird roosting/nesting designs incorporated into building structures.

The preliminary effort in consideration to the Large Bent-winged Bat is likely to fall short of council expectations based on their request for the top most roof to incorporate a 'green roof'. Fringing gardens are instead provided on the second top floor surrounding a living/social space and the upper roof with no plantings.

Records of the Large Bent-winged Bat within the Sydney and inner suburbs shows activity concentrated along riparian and associated vegetated areas. This may have prompted council's requests for the site to provide supplementary habitat to the adjacent GreenWay. The GreenWay is a 5.8 km environmental and active travel corridor linking the Cooks River at Earlwood with the Parramatta River at Iron Cove. It mostly follows the route of the Inner West Light Rail and Hawthorne Canal. State and local government funding has now been secured to complete the southern section of the GreenWay from Parramatta Road through Lewisham West and Dulwich Hill to the Cooks River.

Further to this the Marrickville DCP 2011 Biodiversity Map identifies the complete site as both a wildlife corridor and as part of the Long-nosed Bandicoot endangered population of the Inner West Protection Area.

Council's argument to facilitate a green roof space for 'resting' opportunities for the species is unfounded given that the species does not utilise such habitat for roosting or resting and there is no demonstrated evidence that roosting locations are set proximate to any particular vegetated gardens. This is also particularly given that this species is well known to occupy urbanised and city landscapes and forage along streetlights more than other microbats, particularly threatened species. Such gardens may alternatively provide prey species habitat and thus provide foraging benefits if designed correctly.

Therefore, *Travers bushfire & ecology* can support the current extent of the proposed vegetated landscaping as outlined in the Landscape Plan provided the following additional elements can be incorporated further into the design:

i. The insect housings investigated and provided in landscape plans thus far are European and likely accommodate mostly diurnal flying insects. It should be emphasised here that the Large Bent-winged Bat is alternatively a specialist hunter of flying nocturnal insects, predominantly moths. Therefore, further investigations are required to support the selected vegetation and soil base that support moths in all its lifecycle stages.

McGregor Coxall Senior Landscape Architect Joppe Veul has commenced this further research based on our site discussions with beneficial findings that moths need nectar-producing flowing plants to eat, as well as food plants for their larvae (caterpillars). A diverse garden is critical and local indigenous plants are best. The ABC Gardening Australia episode on moths suggested:

- Bottlebrushes (*Melaleuca* spp., syn *Callistemon* spp.)
- Melaleucas (*Melaleuca* spp.)
- Blue hibiscus (Alyogyne hueglii)
- Grevilleas (*Grevillea* cv.)
- Grasses

These plant species may be further incorporated into the planting schedule. Mulch is also noted of importance as some moth species can lay their eggs in it for later larvae feeding. Therefore, untreated mulch is recommended as the soil substrate cover for much of the landscaping areas. Mulch has other values in maintaining moisture within the soil and preventing colonisation by competing weeds.

ii. The residential block design provides a steep western aspect frontage to the GreenWay corridor, whilst the remaining public interfaces are tiered. This steep western aspect is ideal to incorporate roosting options for subterranean microbats into the structure itself at various levels.

It is recommended that a 2m² vertical microbat apartment housing block is designed to be attached to the face of the building. The material used, whilst being durable, should allow for good internal insulation and protection from varying external temperatures. This bat housing block is to provide various entry types between 15-25mm slits or 30mm hole entries into a range of internal housing dimensions. Vertical faces below and around entries are to be rough surfaces to allow landing on the exposed face, climbing inside as well as into the deeper dark crevices within. The internal dimensions should vary in width between 60-400mm but allow no more than 6mm between internal faces.

The concept is to basically permit a range of different options for the bats to select the housings most preferred. These bat apartment blocks are to be replicated for each level of the building along the western aspect so that they are available at various levels. Such an aspect is ideal for obtaining late day heating before the bats emerge at night.

The bat apartment blocks are to be placed on the external vertical face of the building and be unobstructed and undisturbed. They may be any external colour and architectural design that may be either discrete or a bold feature to the building, as long as they permit the right climbing, entry and internal features described.

The effort to incorporate these bat roosting opportunities into the building design does not guarantee that they will be taken up. The design does however demonstrate to council a clear intent to provide more than foraging benefits to the species. Successful microbat roosting habitats within building structures has been previously investigated and some successful designs should be sourced and incorporated into the design.

iii. The building provides a sub-floor area (basement) as well as site entry bridges that also provide opportunities to mount similar microbat roosting houses in the underside areas. Large Bent-winged Bats show a high preference to roosting in crevices in the underside of structures such as under bridges and in the ceiling joins of stormwater culverts. Again, these could be prefabricated housings with the same surface and size specifications that could be mounted at variable locations away from any public access spaces. Such designs likely exist and could be modelled. The intent to again supplement habitat with roosting opportunities in addition to the garden areas.

- iv. Lighting that attracts moths should also be investigated and accommodated where possible in the public spaces requiring light. Whilst the sub-floor areas and the underside of bridges should remain dark with little lighting spill-over where possible.
- v. Ground level entry into the sub-floor areas of the building along the western side should permit for available surface shelter habitat for Long-nosed Bandicoot accessed to and from the adjacent GreenWay corridor. These should also be variable in dimensions but generally permit small hole and crevice entries of approximately 200mm high and internal shelter areas with internal linings such as waterproof carpet.
- vi. The microbat housings and subfloor spaces should be monitored for use by microbats and bandicoots in separate seasons at least for 2 years following the installation.
- vii. The design of the abovementioned structures should be reviewed by an experienced fauna ecologist before finalisation and installation locations also verified.

If you require any further information please do not hesitate to contact the undersigned on (02) 4340 5331 or at <u>info@traversecology.com.au</u>

Yours faithfully

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Michael Sheather-Reid | Managing Director BAM Accredited (BAAS17085) (B. Nat. Res. Hons)

- **P**: 1300 896 998
- E: servicedesk@traversecology.com.au
- W: traversecology.com.au