



**FLORA AND FAUNA SURVEYS
AND
AND BIODIVERSITY IMPACT ASSESSMENT
FOR
PROPOSED DEVELOPMENT
AT
521 BARRENJOEY ROAD,
BILGOLA, NSW, 2107**

PREPARED FOR:

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EXECUTIVE SUMMARY

In April 2021, ACS Environmental was commissioned by Mr Peter Downes of Peter Downes Designs C/o Mr Peter Madew of 521 Barrenjoey Road, Bilgola, NSW, to survey for flora and fauna and undertake a biodiversity impact assessment for the development of a residential dwelling house on an allotment at Lot 129 in DP 16902, 521 Barrenjoey Road, Bilgola.

The total area of the subject land proposed for development is estimated at about 689m², about 500m² of which will be subject to development.

The proposal is to build a new residence within the allotment, the house location footprint located on a south-facing hillslope.

Architectural plans submitted with this application should be consulted for detail (Peter Downes Designs 2021).

Ground-truthing confirms that the vegetation of the subject land has been maintained in relatively good condition, the vegetation comprised of a low forest canopy of Sydney Red Gum with Broad-leaved White Mahogany occurring less frequently. Other tree species include emergent individuals of low to medium height trees of Coast Mahogany, Coast Banksia, Black Sheoak and Forest Oak.

The principal weed species occurring at the site is Ground Asparagus with a suite of other exotic herbaceous weed species occurring at lower frequency.

The vegetation occurring on the subject land has been mapped and confirmed as Coastal Sandstone Foreshores Forest (OEH 2016), a community that usually occurs on Sydney's coastal escarpments.

A total of 30 individual trees, mainly Sydney Red Gum, occur on the subject site (Figures 6 & 7). Of these, a total of 19 trees are proposed for removal for the building footprint (mainly individuals of Sydney Red Gum from the western section of the subject land) and 11 would be retained (Figure 2).

As the NSW Rural Fire Service legislation has a requirement that the building be built to Flame Zone construction, it is likely that these 10 individual trees would be retained in the eastern section of the development property (Figure 2).

Another 6 individuals of low trees would be removed from the Road Reserve to allow for construction of the driveway and garages off Barrenjoey Road (Figure 2).

Where landscaping is undertaken it is recommended to utilise up to 80% of plant species that are representative of Coastal Sandstone Foreshores Forest assemblages sourced from local nurseries to maintain floristic contiguity across the hillslope.

Coastal Sandstone Foreshores Forest has a maritime influence due to its exposure to prevailing sea breezes (OEH 2016). Localised patches of Sydney Red Gum (*Angophora costata*) and Broad-leaved White Mahogany (*Eucalyptus umbra*) occur close to the coast on substrates derived from Narrabeen Sandstone sediments.

A resilient layer of small mesic tree species occur in the understorey of this community, typified at the subject site by species such as Sweet Pittosporum, Scentless Rosewood, Blueberry Ash, Cheese Tree and Mock Olive.

Bionet Atlas of NSW Wildlife data records for an area of 5km radius around the subject site indicate that 8 flora species of conservation significance have been recorded within the last 20 years (Bionet Atlas 2021).

Habitat at the subject site does not appear to be suitable for most of these species. Of particular interest, however, is the single record for *Asterolasia elegans* that occurs about 220m to the south-west of the subject site. This individual occurs in very steep dense littoral rainforest vegetation above the Bilgola Bends to the north of Bilgola Creek at Hewitt Park Reserve, Bilgola Beach (sighted in 2014, DPIE 2021) (Figure 11).

This species is Endangered and is known more commonly from the Hawkesbury, Hills (Maroota) and Hornsby LGA's (PlantNet 2021).

According to PlantNet (2021) this species occurs on Hawkesbury sandstone and is found in sheltered forests on mid - to lower slopes and valleys (e.g. in or adjacent to gullies which support sheltered forest). The canopy at known sites includes Turpentine (*Syncarpia glomulifera* subsp. *glomulifera*), Smooth-barked Apple (*Angophora costata*), Sydney Peppermint (*Eucalyptus piperita*), Forest Oak (*Allocasuarina torulosa*) and Christmas Bush (*Ceratopetalum gummiferum*).

The species is considered to be fire sensitive and reliant on seed germination after disturbance to maintain populations. A soil seedbank appears to be established by this species, so for a number of years following fire or other disturbance the species may not be apparent, but be present only as seed in the soil.

This species, as well as the other threatened species where habitat may be suitable for their occurrence, were targeted in searches throughout the subject land, but none were located. The lower canopy was relatively open (Figures 6 & 7) and targeted searches were not limited by dense vegetation. The species when mature is very distinctive to 3m tall with

leaves having a rusty red tomentum. The absence of distinct large life-form individuals in the canopy indicates the non-occurrence of *Asterolasia elegans* in the assemblage.

The OEH Atlas of NSW Wildlife database 2021 recorded thirty three (33) species of terrestrial and avifauna listed as threatened under the BC Act within a 5 km radius of the site. None of these threatened fauna species have been recorded at the subject site but threatened species such as the Grey-headed Flying Fox, Large Bentwing Bat, Powerful Owl and possibly Bush Stone-curlew are considered to have potential to occasionally forage at the site. All of these mobile species have very large foraging ranges and the proposal to clear a small area of mainly low trees of Sydney Red Gum from the hillslope of the subject land would not be considered to compromise these species' life cycles or viability in relation to foraging, roosting and breeding behaviours.

In regard to threatened species legislation, the proposed development is considered to comply with the desired criteria in relation to The Pittwater Council LEP (2014) and Pittwater 21 Council DCP (2014).

It is considered that the development would be highly unlikely to have an adverse effect on the life cycle of any individual threatened flora or fauna species or their respective habitat. It is considered that for potential impacts to any threatened ecological communities or threatened flora or fauna, concurrence from the Director General of the Department of Planning, Industry and Environment is not required, nor is a Species Impact Statement necessary for the proposed development.

Environmental criteria in relation to requirement for biodiversity offsets is assessed as follows:

- The area of property and area proposed for development is less than 1ha and less than 0.25ha respectively, areas too small to trigger offsets;
- The subject land is not marked on the Biodiversity Values Map as containing any significant biodiversity value (Figure 13) and so not triggering biodiversity offsets; and
- It is assessed and considered that no threatened species (of both flora and fauna) would be significantly impacted by the small area of the proposed development at the subject land.
- The scale of potential loss of habitat is small (estimated at about 400m²), and as such, this development based on threatened species occurrence and potential impacts of development, would not be considered to trigger the biodiversity offsets scheme.

As such, it is considered that biodiversity offsets in relation to the development are not required.

GLOSSARY AND ACRONYMS

APZ - Asset Protection Zone

BAM - Biodiversity Assessment Method (2017) - supports the BC Act (2016).

BC Act - *Biodiversity Conservation Act (2016)* - legislation enacted in August 2017

CEEC - Critically Endangered Ecological Community

DAWE - Commonwealth Department of Agriculture, Water and Environment

DPIE - Department of Planning, Industry and Environment

E (threatened species status) - Endangered species

EEC - Endangered Ecological Community as listed by the BC Act and EPBC Act

EPBC Act - Environmental Protection & Biodiversity Conservation Act (1999). Enacted to protect and manage nationally and internationally (migratory) flora, fauna and ecological communities, defined in the Act as matters of national environmental significance (NES)

Habitat - areas occupied, either territorially, periodically or occasionally, by a species, population or ecological community

IPA - Inner Protection Area

KTP - Key threatening process, a process that threatens the survival, life cycle, abundance or potential evolutionary development of native species, populations or ecological communities (Dept of Environment and Conservation 2004). KTP's are listed under the BC Act and the EPBC Act.

Migratory species - listed under the EPBC Act and relating to international agreements to which Australia is a signatory. Includes the Japan-Australia Migratory Bird Agreement (JAMBA), Chine-Australia Migratory Bird Agreement (CAMBA) Republic of Korea Migratory Bird Agreement (ROKAMBA)

OEH - State Office of Environment and Heritage

PCT - Plant Community Type identified as such using the Bionet Vegetation Classification system (OEH 2018)

PSGF - Pittwater Spotted Gum Forest

RoTAP - Rare or Threatened Australian Plants

SMCMA - Sydney Metropolitan Catchment Management Authority

Threatened species, populations or ecological communities - Entities listed by the BC Act and EPBC Act as 'Vulnerable to decreasing population growth in time', Endangered as population growth decreasing rapidly leading to eventual extinction' or 'Critically Endangered, a more extreme rate of population decrease than the former'.

V (threatened species status) - Vulnerable

INTRODUCTION

1.1 Proposed development

In April 2021, ACS Environmental was commissioned by Mr Peter Downes of Peter Downes Designs C/o Mr Peter Madew of 521 Barrenjoey Road, Bilgola, NSW, to survey for flora and fauna and undertake a biodiversity impact assessment for the development of a residential dwelling house on an allotment at Lot 129 in DP 16902, 521 Barrenjoey Road, Bilgola.

The total area of the subject land proposed for development is estimated at about 689m².

The land occurs on a steeply south facing hillslope and currently appears to be in good condition with few exotic species, with Ground Asparagus appearing to be the main incursive weed. The shrub stratum canopy appears to have been recently reduced in cover for ease of access, whereas the ground stratum canopy appears relatively intact. The canopy stratum is comprised mainly of Sydney Red Gum to about 10m tall with less cover of Broad-leaved White Mahogany and with some smaller tree species such as Black Sheoak present in the lower tree canopy.

The proposal is to build a new residence within the allotment, the house location footprint taking up to about 60% of the property (Figure 1).

Figure 1 is an aerial image showing the subject land indicating adjoining properties and extensive vegetated bushland.

Figure 2 is a schematic site plan of Level 5 of the proposed building overlain by an arboricultural tree plan depiction showing the location of canopy trees located on the subject land with TPZ and SRZ areas indicated for trees to be retained including Sydney Red Gum and Broad-leaved White Mahogany, and also indicating individuals proposed for removal.

Figures 3A, 3B & 3C are schematic images of the overall Site Plan, Level 3 and Level 5 site plans of the proposed residence in relation to the property layout.

Figure 4 is a schematic side view of seven levels of the proposed residence viewed from east to west across the hill-slope.

Figure 5 is an aerial depiction of the subject area showing the land in relation to established development in the local area.



Figure 1 - Aerial image of subject land at 152 Barrenjoey Road, Bilgola (red outline) including canopy distribution in local area and residential development in surrounding allotments (from SIXmaps 2021)

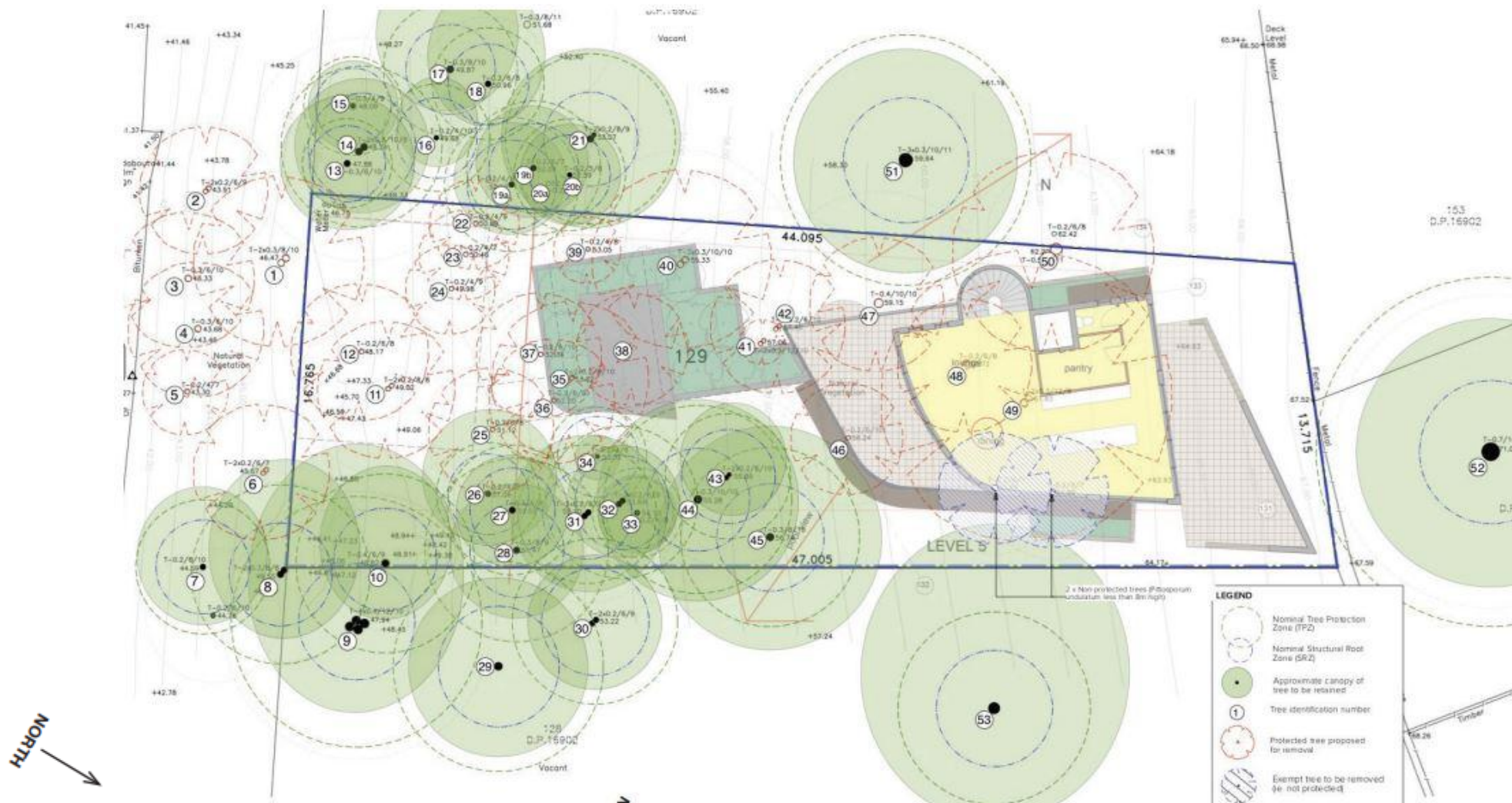


Figure 2 - Schematic plan of subject land showing location of canopy trees in relation to subject property boundaries and canopy tree distribution overlying Level 5 site plan of the proposed development (Tree locations from Willis 2021 overlain over Level 5 site plan by Peter Downes Designs 2021)

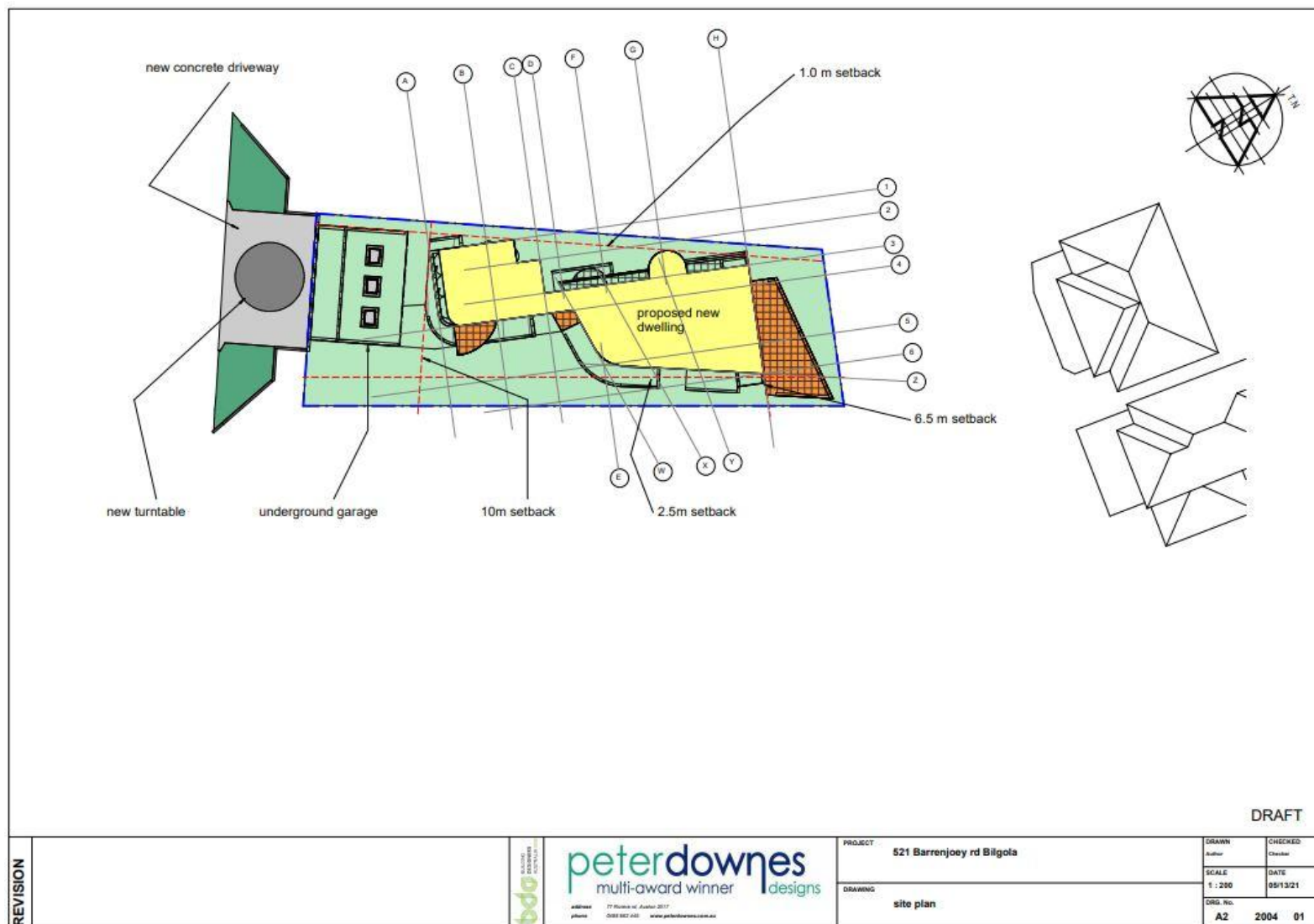


Figure 3A - Schematic Site Plan in relation to boundary perimeters of subject land at 521 Barrenjoey Road, Bilgola (Final Revised Design - Peter Downes Designs 2021)

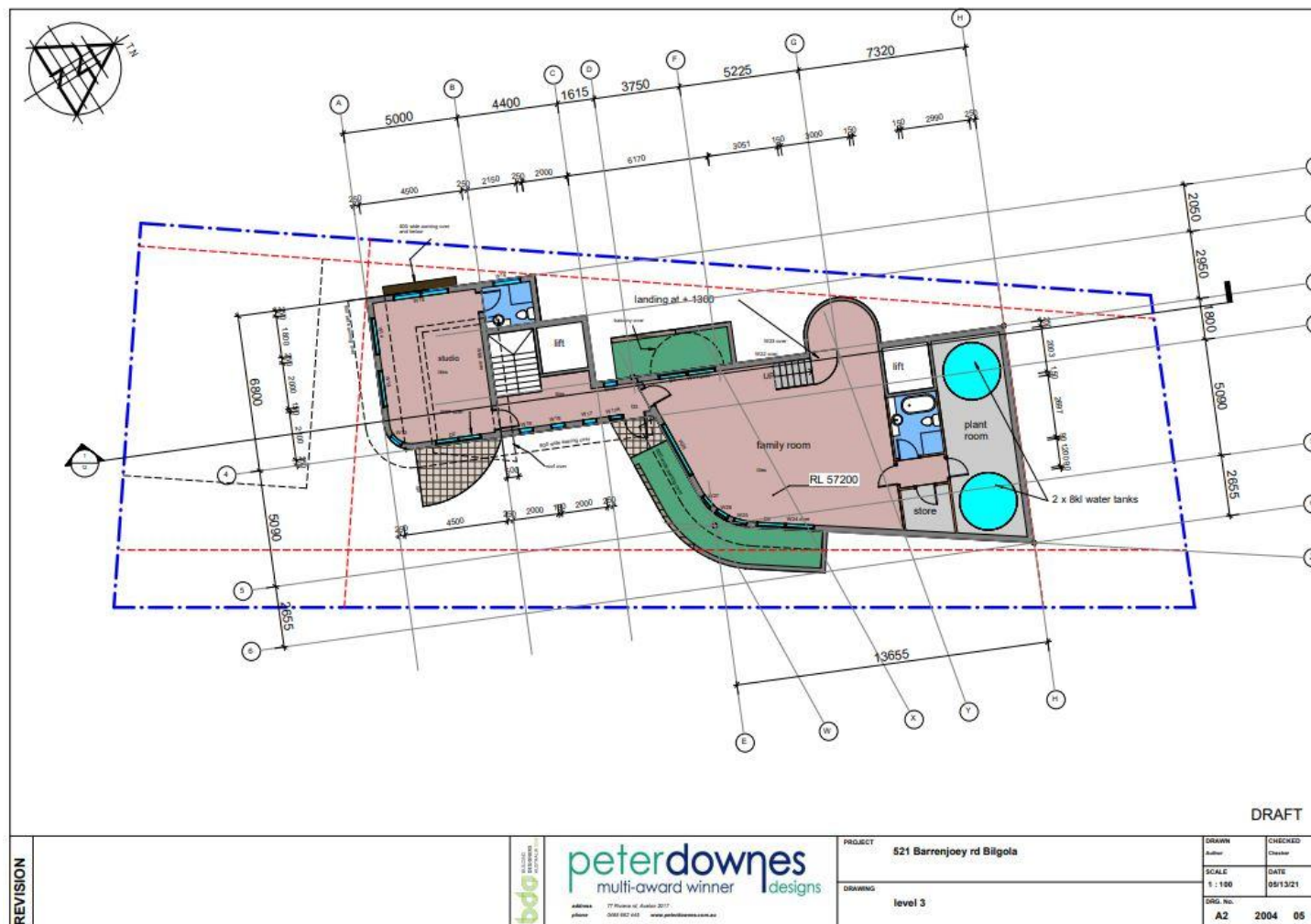


Figure 3B - Schematic plan showing site plan of Level 3 of proposed development in relation to boundary perimeters of subject land (Peter Downes Designs 2021)



Figure 4 - Schematic plan of subject land showing vertical plan of proposed development viewed from east to west along the slope (Peter Downes Designs 2021)

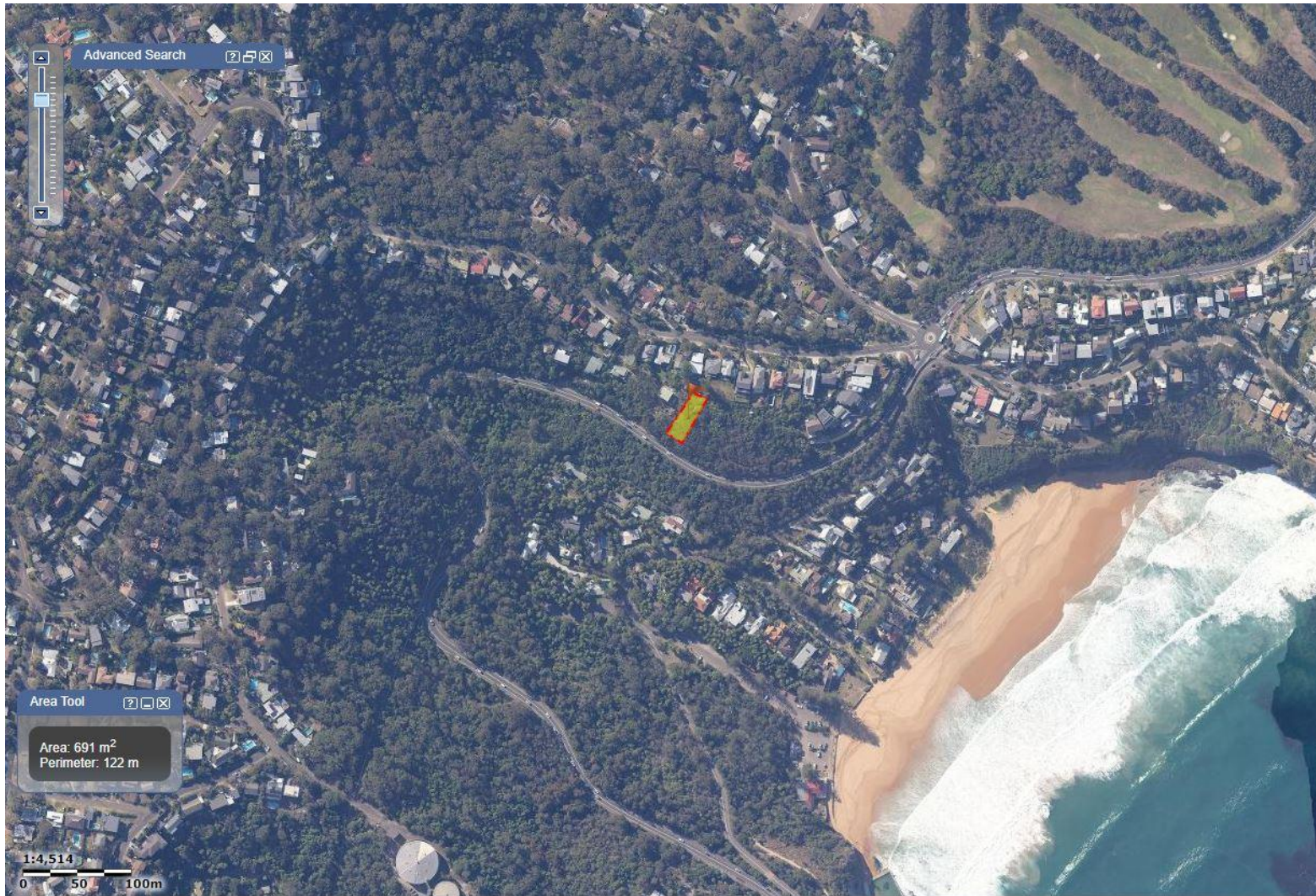


Figure 5 - Aerial view of the subject land (bordered in red outline) in relation to development in locality including roads, residential development and waterways (SixMaps 2021)

1.2 Purpose of biodiversity impact assessment report

The purpose of the flora and fauna surveys and ecological impact assessment is to document existing and expected biota and to ensure all necessary safeguards are described and complied with in relation to the proposal as required by Northern Beaches Council.

1.3 Statutory and legislative requirements

Planning controls provided by State and Commonwealth Legislation include the following:

- ◆ Environmental Planning and Assessment Act (EP & A Act) (1979),
- ◆ Commonwealth Environment Protection and Biodiversity Conservation Act (EPBC Act) (1999),
- ◆ Biodiversity Conservation Act (BC Act) (2016). The BC Act (2016) includes Preliminary Determinations of the NSW Scientific Committee (to May 2021) as well as Provisional Listings of Endangered Species on an emergency basis (to May 2021),

The objectives of this Act are:

- to provide for the conservation of threatened species, populations and ecological communities of animals and plants. The Act sets out a number of specific objects relating to the conservation of biological diversity and the promotion of ecologically sustainable development.

- ◆ Planning for Bushfire Protection (2018).
- ◆ Biosecurity Weeds Act 2015 (NSW)

The objectives of this Act are:

- to reduce the negative impact of weeds on the economy, community and environment of this State by establishing control mechanisms to:
- prevent the establishment in this State of significant new weeds, and
- restrict the spread in this State of existing significant weeds, and
- reduce the area in this State of existing significant weeds,
- to provide for the monitoring of and reporting on the effectiveness of the management of weeds in this State

Local Council planning controls include the:

- ◆ Pittwater Local Environment Plan (2014) and Pittwater 21 Development Control Plan (2014)

This flora and fauna assessment report includes an account of:

- ◆ Threatened flora and fauna species, populations, endangered ecological communities and their habitats, as listed under the Biodiversity Conservation Act (BC Act), 2016;
- ◆ Nationally significant flora species, as listed under the Environment Protection and Biodiversity Conservation Act (EPBC Act), 1999;

- ◆ Rare or threatened Australian plants (RoTAP) as listed in Briggs and Leigh (1996); and
- ◆ Any regionally or locally significant species in the Northern Beaches Council LGA.

1.4 Documents provided

- ◆ Richards and Loftus (2021) Base Survey Plan of 521 Barrenjoey Road, Bilgola Beach
- ◆ R Coffey (2011) Bushfire Risk Assessment for 521 Barrenjoey Road, Bilgola Beach
- ◆ Peter Downes Designs (2021) Sketch Designs of proposed residence at 521 Barrenjoey Road, Bilgola Beach
- ◆ Willis, J (2021) Arboricultural Impact Assessment Report for 521 Barrenjoey Road, Bilgola Beach

1.5 Objectives of the study

- ◆ To carry out detailed flora and fauna surveys on the subject land;
- ◆ To prepare a comprehensive report qualifying potential impacts and describing mitigation measures in relation to the above assessments.

1.6 Scope of the study

The survey work was undertaken to provide Peter Downes (Peter Downes Designs) with current and detailed information on the following:

- ◆ Identification of the flora and fauna that occur at the subject sites including documentation of species lists and mapping of identifiable plant communities;
- ◆ Identification of Threatened (Endangered and Vulnerable) species, populations, communities and habitats as listed in Schedules 1 & 2 of the Biodiversity Conservation Act 2016 (BC Act) including Preliminary Determinations of the NSW Scientific Committee, and the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act), ROTAP species (Briggs & Leigh 1996) and regionally and locally significant species that could potentially be impacted upon by the proposed development;
- ◆ Identify listed migratory species (as listed in international treaties referred to in the EPBC Act);
- ◆ Identification of fauna species, including species of amphibians, reptiles, birds or mammals, not directly recorded during surveys but that could potentially occur in the study area as indicated by the presence of associated habitat;
- ◆ Preparation of a report describing vegetation communities on the subject land indicating their current condition and level of degradation;
- ◆ Recording of the area and extent of Biosecurity (and other significant High Threat Exotic) weed species in the study area;
- ◆ Assessment of potential impacts of the proposal on existing flora and fauna within the study area;

- ◆ Submission of draft report;
- ◆ Incorporation of relevant review comments and amendment of draft report; and
- ◆ Submission of a final report within 1 week of receiving review comments.

2 EXISTING ENVIRONMENT

2.1 Topography, geology and soils

The site is a rectangular narrow block of land about 17m wide and 47m in length (Figure 1).

The site has a southerly aspect with gradients to 25° - 35° (Figure 1).

The local substrate geology of the hillslope at the subject area at 521 Barrenjoey Road, Bilgola, is Narrabeen Sandstone. Narrabeen Sandstone is compromised of interbedded laminite, shale and quartz, to lithic quartz sandstone (Herbert 1983).

The soil landscape series of the Narrabeen Sandstone sediments is the colluvial Watagan Soil Landscape Series (Chapman & Murphy 1989).

2.2 Existing vegetation

The subject land appears in good condition with minor patches of weed infestation, mostly Ground Asparagus, the low forest structure dominated by low to medium tall trees of Sydney Red Gum, and to lesser extent, Broad-leaved White Mahogany (*Eucalyptus umbra*) (Figures 6 & 7).

The shrub layer appears to have been recently reduced in density and cover, possibly to allow ease of access for personnel to investigate various aspects of the landscape and tree population (Figures 6 & 7) but species diversity is relatively high in both the shrub and ground layers.

2.3 Current and surrounding land use

The aerial view of the subject land at No. 521 Barrenjoey Road, Bilgola, indicates that much of the surrounding landscape has been long established as residential development on moderate to steep hillslopes, though with extensive areas of forest canopy retained in the locality, particularly along south-east-facing slopes of the landform (Figure 5; from SIXmaps DPIE 2021).



Figure 6 - Image of forested vegetation cover on subject site dominated by low trees of Sydney Red Gum with open-structured shrub cover and intact ground cover with high litter cover



Figure 7 - Image of lower section of subject property indicating wind sheared tree canopies, steeply sloped landscape and open structured lower canopies

3 FLORA AND FAUNA SURVEY AND ASSESSMENT

3.1 Methods

3.1.1 Literature review

Existing information on 'Threatened Flora of the Locality', defined as an area of 5km radius around the site, was accessed from the DPIE Atlas of NSW Wildlife (online BioNet), Commonwealth DAWE Environmental Reporting Tool (May 2021) and RoTAP (Briggs and Leigh 1996) databases. Other literature detailing regionally and locally threatened and significant flora and fauna, as well as plant communities of the study area, included NSW Scientific Committee Final Determinations (1996-2021), Benson and Howell (1994), OEH (2016) 'The Native Vegetation of the Sydney Metropolitan Catchment Management Authority Area' and DPIE Mapping (2021).

3.1.2 Site survey

The subject site was surveyed on 21st April 2021.

3.1.3 Flora survey

Currently existing information on 'Threatened Flora of the Locality', defined as a 10km x 10km area centred around the site, was accessed from the DPIE Atlas of NSW Wildlife (April 2021), the Department of Agriculture, Water and Environment (DAWE) Environmental Reporting Tool (April 2021), and RoTAP (Briggs & Leigh, 1996) databases.

Other literature detailing regionally and locally threatened and significant flora, as well as endangered populations and plant communities of the study area, including NSW Scientific Committee Final Determinations (1996 - 2021) were accessed and reviewed.

Comprehensive surveys were undertaken on foot (Diversity Search method of Cropper 1993, and Threatened Biodiversity Surveys and Assessment - Guidelines for Developments and Activities - DEC 2004) to identify the existence of extant flora populations present on the subject area.

As the subject land was in large part, relatively uniform in vegetation structure and floristics, a quadrat-based (20 x 20m) methodology was undertaken for assessment of cover and species assemblage, though the entire area including the RMS road reserve on Barrenjoey Road, was inspected.

The survey included a complete floristic inventory of indigenous and exotic species and an assessment of the presence, or likelihood of occurrence, of any threatened, rare, regionally or locally significant species or plant community occurring at the surveyed site.

The extent of noxious and other weed incursions on the subject area of the land were assessed.

3.1.4 Fauna Survey

The survey effort complies with the survey effort recommended by the Draft Guidelines for Threatened Species Assessment under Part 3A (DEC and DPI, 2004) for the study area size, habitat types available on the site and seasonal factors.

A dedicated ground search was undertaken as was a census of extant birds. The survey involved different search strategies and protocols and all extant fauna or evidence of fauna was recorded. Threatened fauna species not recorded in the surveys but with the potential to be present as indicated by habitat are considered in the final assessment.

Strategies employed for the field investigation of the Study Area:

Assessment of the value of habitat suitable for native fauna species and specific habitat structures/resources considered important in life cycles. These structures or resources include:

- Mature trees with hollows for breeding, roosting and/or nesting;
- Particular foraging resources such as certain tree or shrub species;
- Dispersal, migratory or foraging corridors for fauna;
- Leaf litter and ground search for reptiles, frogs and threatened invertebrates;
- Identification of scats and other indirect evidence to suggest fauna utilisation such as tracks, scratch marks or diggings;

3.1.5 Limitations of the study

Limitations of the study may arise where certain cryptic species of plants may occur as soil-stored seed or as subterranean vegetative structures. Some species are identifiable above-ground only after particular environmental circumstances related to factors such as periodic fire frequency, intensity or seasonality, soil moisture regime, grazing pressure, biological life-cycle patterns as in the case of small geophytic taxa such as species of orchids etc.

Diurnal surveys at one time of the year cannot be expected to detect the presence of all species occurring, or likely to occur, in the study area. This is because some species may (a) occur seasonally, (b) utilise different areas periodically (as a component of a more extensive home range), or (c) become dormant during specific periods of the year. Rather, the survey provides the opportunity to sample the area, search specifically for species likely to be encountered within the available time frame, and assess the suitability of habitat for particular species.

The criteria used to assess the likelihood of threatened species occurring in the Study Area included the specificity of habitat features such as tree canopy cover, relative soil moisture

regime, relative soil nutrient regimes, extent of historical disturbance and degradation of vegetation and known occurrences of threatened species in the immediate locality.

If all or most of these collective criteria deemed optimal for the occurrence of a particular threatened species occur in relation to the habitat of the Study Area, then the likelihood of its potential occurrence in the habitat of the Study Area could be assessed as being relatively high. If only some of these collective criteria deemed suitable for the occurrence of a particular threatened species occur in the habitat of the Study Area, then its potential occurrence in the area of study may be deemed moderate at best. If few of these collective criteria deemed suitable for the occurrence of a particular threatened species occur in the habitat of the Study Area, then the likelihood of its occurrence would be assessed as being low to very unlikely.

These criteria are qualified in respect of threatened flora species in Appendix 2 of this report and in relation to threatened species of fauna in Appendix 4 of this report.

3.2 Results - Flora

3.2.1 Landscape features

The subject site occurs within the Pittwater IBRA subregion of the Sydney Basin IBRA Region.

The Mitchell Soil Landscape appears to be defined as the Belrose Coastal Slopes of the Pittwater Meso Group of landforms.

3.2.2 Indigenous and exotic plant species

Appendix 1 lists the various plant species found to occur within each discrete ecological community that occurs the subject site.

Species nomenclature follows that of Harden (1990 – 2002; 2021online).

A total of 35 native species were recorded across the subject site, with 17 being diagnostically positive for the coastal forest community 'Coastal Sandstone Foreshores Forest' PCT 1778 (OEH 2016)

The subject site contains a relatively uniform assemblage of species on steep south-facing slopes (Figures 6 & 7).

Dominant tree species to 75% cover include Sydney Red Gum (*Angophora costata*) and Broad-leaved White Mahogany (*Eucalyptus umbra*), with a sparse small tree layer including Black Sheoak (*Allocasuarina littoralis*) and Coast Banksia (*Banksia integrifolia*) (Appendix 1; Figures 6 & 7).

Common shrub species to 10% cover include Cheese Tree (*Glochidion ferdinandi*), Blueberry Ash (*Elaeocarpus reticulatus*), Sweet Pittosporum (*Pittosporum undulatum*), Mock Olive (*Notelaea longifolia*) and Scentless Rosewood (*Synoum glandulosum*) (Appendix 1).

The ground and twiner cover to 75% includes common species such as Bracken (*Pteridium esculentum*), Common Maiden Hair Fern (*Adiantum aethiopicum*), Rough Saw-sedge (*Gahnia aspera*), Burrawang (*Macrozamia communis*), Giant Water Vine (*Cissus hypoglauca*), Running Postman (*Kennedia rubicunda*), Wiry Panic (*Entolasia stricta*), Blady Grass (*Imperata cylindrica*) and Spiny-headed Mat-rush (*Lomandra longifolia*) (Appendix 1).

A total of 5 exotic weed species were recorded over this section of the subject land, only Ground Asparagus (*Asparagus aethiopicum*), occurring at high cover values. Other exotic weed species with low cover values occurring at low frequency included Camphor Laurel, Lantana, Crofton Weed and Common Cassia (*Senna pendula*) (Appendix 1).

3.2.3 Plant community

Previous mapping

The local ecological plant community that occurs at the Study Area has been mapped by DPIE (2021) compiling data from API and environmental attributes of geology, average annual rainfall, topography, elevation, Soil Landscape Series type and extent of disturbance (condition), and including some ground-truthing (Figure 8) (DPIE 2021).

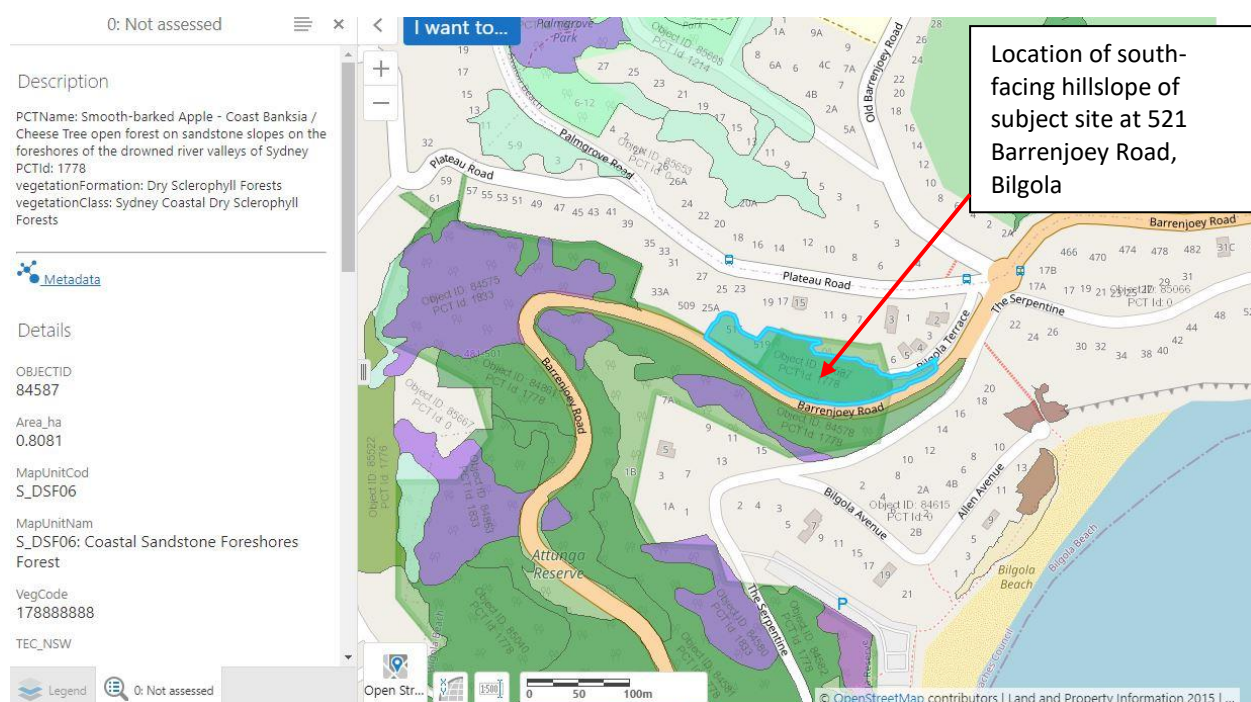


Figure 8 - DPIE (2021) mapping of ecological community occurring at the south-facing hillslope of the subject site (S_DSF06; PCT 1778: Coastal Sandstone Foreshores Forest area bounded in aqua blue outline).

3.2.4 Description and conservation status of Coastal Sandstone Foreshores Forest

Description of ecological community

Coastal Sandstone Foreshores Forest occurs on sheltered sandstone slopes along the foreshores of Sydney's major waterways and coastal escarpments. It is a low forest with moist shrub layer and ground cover of ferns, sedges and grasses. The flora has a maritime influence due to its exposure to prevailing sea breezes (OEH 2016). Localised patches of Sydney Red Gum (*Angophora costata*) often dominate this community, though more regularly occur in association with other tree species, such as, in this case, Broad-leaved White Mahogany (*Eucalyptus umbra*). The community is restricted to closeness to the coast with the substrate derived from Narrabeen Sandstone sediments in this case.

A resilient layer of small mesic tree species occur in this community, typified at the subject site by species such as Black Sheoak, Blueberry Ash, Coast Banksia, Sweet Pittosporum, Cheese Tree and Mock Olive (Appendix 1).

Trees of Sydney Red Gum, Broad-leaved White Mahogany and other canopy species occurring at the subject site

A total of 53 trees have been located on the Preliminary Site Plan including 23 individuals that occur either on adjacent properties or on the road reserve of Barrenjoey Road (Willis 2021) (Figure 2).

As such, a total of 30 individual trees occur on the subject site. Of these, a total of 19 trees are proposed for removal for the building footprint (mainly from the western section of the subject land) and 10 would be retained (Willis 2021) (Figure 2).

As the building has a requirement of an APZ to Flame Zone and the building built to Flame Zone construction, it is likely that these 10 individuals trees would be retained in this eastern section of the development property.

Another 6 individuals would be removed from the Road Reserve to allow for construction of the driveway and garages off Barrenjoey Road (Willis 2021) (Figure 2).

Status of ecological community occurring at subject site and mitigation measures

Coastal Sandstone Foreshores Forest is well represented in the protected area network and is common in reserves such as Royal National Park, Lane Cove National Park, Sydney Harbour National Park and Garigal National Park (OEH 2016), the community not listed on registers of the NSW BC Act or Commonwealth EPBC Act.

The potential impacts to the Coastal Sandstone Foreshore Forest vegetation as a result of the proposal to construct a new dwelling house at 521 Barrenjoey Road, Bilgola, over a relatively small area of about 500m² with about 190m² of natural vegetation remaining, would not be considered to significantly impact on the biodiversity of the local ecological community.

It would, however, be recommended to utilise up to 80% of components of the Coastal Sandstone Foreshores Forest assemblage in landscaping plans for the development.

3.2.5 Impacts to Coastal Sandstone Foreshore Forest vegetation resulting from proposed development and mitigation measures

Trees proposed for removal and mitigation measures to offset loss of trees

For the proposed development, 25 individual trees inclusive of the subject land and Road Reserve, are proposed to be removed for the proposed new dwelling, driveway, garages and the requisite APZ. These individuals include 16 Sydney Red Gum, 4 Broad-leaved White Mahogany, 2 individuals of Coast Banksia and one individual each of Cheese Tree, Bangalay and Forest Oak (Willis 2021). Figure 2 indicates the location of these individuals in the subject area and Table 1 summarises the attributes and condition of these trees.

All weed infestations (particularly Ground Asparagus) (Appendix 1) on the land should be removed and disposed of offsite in a licensed disposal facility.

Tree Number	Species	Height (m)	Canopy Spread (m)	DBH (mm)	Foliage (defects/ comment)
Individuals occurring within road reserve					
1	Sydney Red Gum	10	8	200	Fair-good
2	Sydney Red Gum	9	6	150	Fair
3	Coast Banksia	10	6	300	Good
4	Sydney Red Gum	10	6	300	Fair
5	Coast Banksia	7	4	150	Fair
6	Sydney Red Gum	7	8	100	Fair
Tree Number	Species	Height (m)	Canopy Spread (m)	DBH (mm)	Foliage (defects/ comment)
Individuals occurring within subject land					
11	Broad-leaved White Mahogany	8	8	250	Good
12	Sydney Red Gum	7	6	220	Poor
22	Sydney Red Gum	6	4	160	Fair
23	Broad-leaved White Mahogany	5	2	130	Fair
24	Sydney Red Gum	5	3	160	Fair
25	Sydney Red Gum	7	6	250	Fair
35	Broad-leaved White Mahogany	8	7	250	Fair
36	Sydney Red Gum	7	6	230	Fair
37	Sydney Red Gum	8	5	180	Fair
38	Forest Oak	9	3	200	Poor
39	Sydney Red Gum	8	4	170	Fair
40	Sydney Red Gum	9	8	330	Good
41	Sydney Red Gum	7	2	140	Fair

Tree Number	Species	Height (m)	Canopy Spread (m)	DBH (mm)	Foliage (defects/ comment)
42	Sydney Red Gum	7	6	240	Fair
46	Sydney Red Gum	7	5	230	Fair
47	Broad-leaved White Mahogany	8	7	350	Fair
48	Cheese Tree	5	6	220	Fair
49	Sydney Red Gum	7	20	390	Fair
50	Bangalay	7	10	480	Fair

Table 1 - Attributes of 25 individuals of trees from a total of 36 that occur within the subject site and road reserve, proposed for removal for construction of the new dwelling, driveway and garages and to maintain a required APZ for Flame Zone Bushfire Attack Level ((Willis 2021; Coffey 2011).

Table 2 lists the plant species that may be indicative for use in post-construction landscaping. The recommendation for the plan is that a minimum of 80% of plants utilised are derived from assemblages characterising Coastal Sandstone Foreshores Forest (OEH 2016), preferably using local provenance (Northern Beaches Council 2021) as follows:

Stratum	Species name	Common name
Large trees	<i>Angophora costata</i>	Sydney Red Gum
	<i>Eucalyptus botryoides</i>	Coast Mahogany
	<i>Eucalyptus resinifera</i>	Broad-leaved Red Mahogany
Small trees	<i>Pittosporum undulatum</i>	Sweet Pittosporum
	<i>Notelaea longifolia</i>	Mock Olive
	<i>Acacia longifolia</i>	Sydney Golden Wattle
	<i>Acacia implexa</i>	Hickory Wattle
	<i>Elaeocarpus reticulatus</i>	Blueberry ash
	<i>Allocasuarina littoralis</i>	Black Sheoak
	<i>Allocasuarina torulosa</i>	Forest Oak
Shrubs and sub-shrubs	<i>Polyscias sambucifolius</i>	Elderberry Panax
	<i>Dodonaea triquetra</i>	Common Hop Bush
	<i>Zieria smithii</i>	Sandfly Zieria
	<i>Breynia oblongifolia</i>	Coffee Bush
Ground covers	<i>Lomandra longifolia</i>	Spiny-headed Mat-rush
	<i>Oplismenus imbecillus</i>	Basket Grass
	<i>Dianella caerulea</i>	Blue Flax Lily
	<i>Pteridium esculentum</i>	Bracken
	<i>Entolasia marginata</i>	Bordered Panic
	<i>Calochlaena dubia</i>	Soft Bracken
	<i>Entolasia marginata</i>	Bordered Panic
	<i>Commelina cyanea</i>	Scurvy Weed
Twiners	<i>Hardenbergia violacea</i>	False Sarsaparilla
	<i>Billardiera scandens</i>	Apple Berry
	<i>Pandorea pandorana</i>	Wonga Wonga Vine
	<i>Kennedia rubicunda</i>	Runniung Postman
	<i>Eustrephus latifolius</i>	Wombat Berry
	<i>Geitonoplesium clandestinum</i>	Scrambling Lily

Table 2 - List of representative plant species that occur in various structural layers for Coastal Sandstone Foreshores Forest (OEH 2016)

Mitigation measures to offset loss of potential fauna habitat

It was noted that some spouts and hollows were located on branches of some individuals of Sydney Red Gum (Tree numbers 39 & 40) (Figure 9) which are proposed to be removed.



Figure 9 - Individual of Sydney Red Gum (Tree Number 40) containing well formed hollow, the individual located within the western section of the property within the footprint of the proposed building envelope (Figure 2)

To compensate for potential loss of sheltering and breeding habitat for small birds or microchiropterans, it is recommended that at least 2 nest boxes suitable for medium sized birds and two bat boxes be installed at a height of at least 5 - 10m on trunks of retained trees in suitable locations

3.2.6 Flora species of conservation significance

Threatened species

The OEH Atlas of NSW Wildlife (2021) records for an area of 5km radius around the subject site indicate that 8 species of conservation significance have been recorded within a radius of 5km of the site within the last 20 years (Table 3).

Seven (7) of these species are listed as Endangered on the BC Act with one listed as Vulnerable, with 4 species listed as Endangered and one Vulnerable on the Commonwealth EPBC Act.

Appendix 2 lists these species with an account of their threatened status, geographical range, physiognomic attributes, habitat features and likelihood of occurrence.

Family	Common name	Scientific name	NSW status	Comm. status	No. of records
Euphorbiaceae	Sand Spurge	<i>Chamaesyce psammogeton</i>	E1		5
Myrtaceae	Netted Bottle Brush	<i>Callistemon linearifolius</i>	V		1
	Scrub Turpentine	<i>Rhodamnia rubescens</i>	E4A		27
	Magenta Lilly Pilly	<i>Syzygium paniculatum</i>	E1	V	15
Orchidaceae	Bauer's Midge Orchid	<i>Genoplesium baueri</i>	E1	E	1
	Angus's Onion Orchid	<i>Microtis angusii</i>	E1	E	3
Proteaceae	Hairy Geebung	<i>Persoonia hirsuta</i>	E1	E	3
Rutaceae		<i>Asterolasia elegans</i>	E1	E	1

Table 3 - Eight (8) species of threatened flora that have been recorded within a 10km area centred around the subject site within the last 20 years (DPIE 2021)

For most of these species, the Coastal Sandstone Foreshores Forest habitat of the subject site appears unsuitable for their occurrence (Appendix 2).

Figure 10 indicates the recorded sightings of five flora species of conservation significance, where recordings in the locality have mostly been numerous.

Most recordings of Magenta Lilly Pilly (*Syzygium paniculata*) are planted individuals obtained from nurseries. The relatively dry habitat does not appear suitable for natural occurrences of this species.

Of particular interest is the single record for *Asterolasia elegans* that occurs about 220m to the south-west of the subject site in very steep dense littoral rainforest vegetation, above the

Bilgola Bends to the north of Bilgola Creek at Hewitt Park Reserve, Bilgola Beach (sighted in 2014, DPIE 2021) (Figure 11).

This species is Endangered and is known more commonly from the Hawkesbury, Hills (Maroota) and Hornsby LGA's (PlantNet 2021).

According to PlantNet (2021) this species occurs on Hawkesbury sandstone and is found in sheltered forests on mid- to lower slopes and valleys, (e.g. in or adjacent to gullies which support sheltered forest). The canopy at known sites includes Turpentine (*Syncarpia glomulifera* subsp. *glomulifera*), Smooth-barked Apple (*Angophora costata*), Sydney Peppermint (*Eucalyptus piperita*), Forest Oak (*Allocasuarina torulosa*) and Christmas Bush (*Ceratopetalum gummiferum*).

The species is considered to be fire sensitive and reliant on seed germination after disturbance to maintain populations. A soil seedbank appears to be established by this species, so for a number of years following fire or other disturbance the species may not be apparent, but be present only as seed in the soil.

This species, as well as the other threatened species where habitat may be suitable for its occurrence, were targeted in searches throughout the subject land, but none were located. The lower canopy was relatively open (Figures 6 & 7) and targeted searches were not limited by dense vegetation. The species, when mature is very distinctive to 3m tall with leaves having a rusty red tomentum. The absence of distinct large life-form individuals in the canopy indicates its non-occurrence in the assemblage.

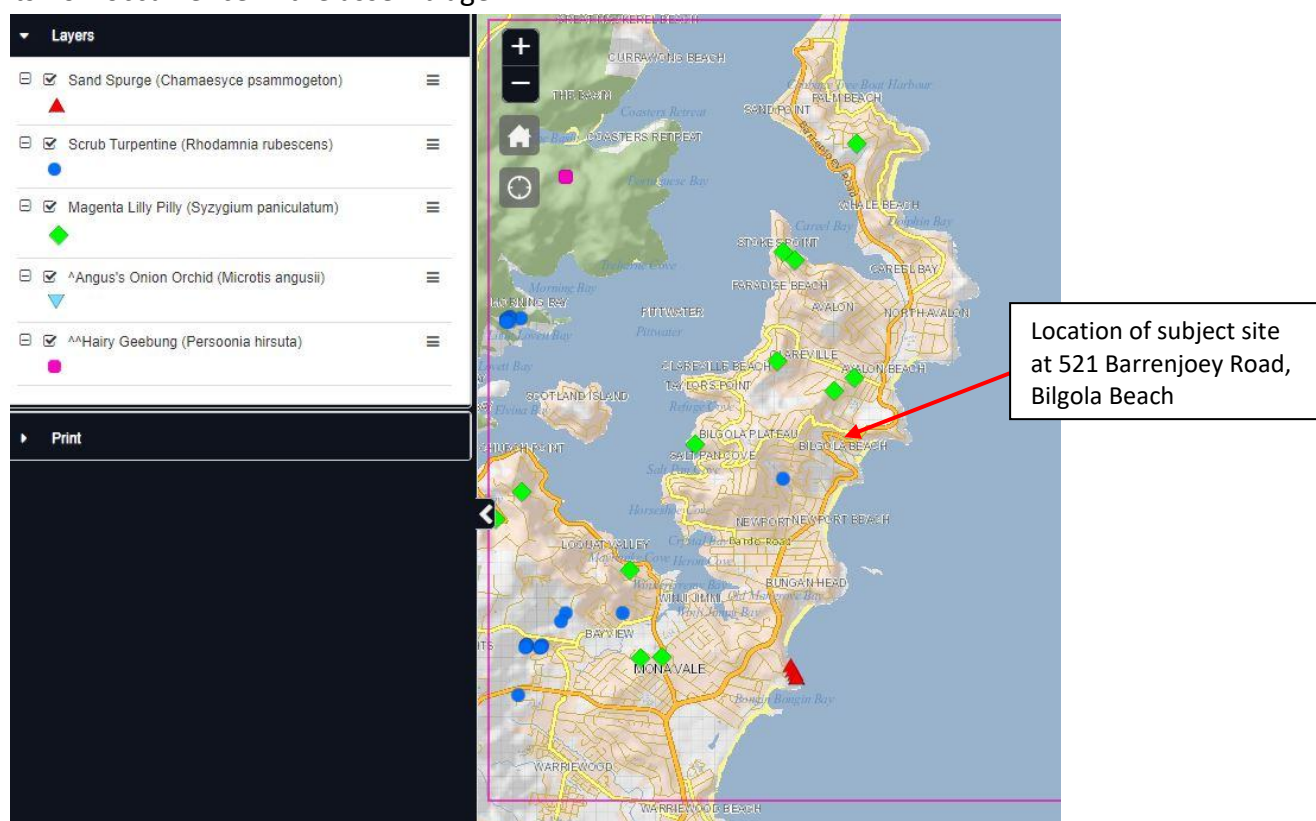


Figure 10 - Records for 5 threatened flora species within 5km radius of the subject site (DPIE 2021)



Figure 11 - Recorded sighting of *Asterolasia elegans* in dense littoral rainforest (red flag pin) about 220m to the south-west of the subject site at 521 Barrenjoey Road, Bilgola Beach (DPIE 2021)

Targeted searches for all threatened species listed in Table 3 located none of these threatened flora species within the small area of the subject site (Figures 1, 10 & 11)

3.3 Results - Fauna and habitat potential assessment

The following fauna assessment has been prepared with particular regard to the BC Act, Section 5A of the current EP&A Act and the EPBC Act.

3.3.1 Location and weather conditions of subject surveyed site

Grid co-ordinates of centre of subject land;

latitude: -33.64329243°;

longitude: 151.3255881°

Weather conditions

Warm and relatively humid weather conditions with light winds, no rain

21 st April 2021	9am	3pm
Temp	14.5 ⁰	18.4 ⁰
Wind	SW 17km/hr	S 6km/hr

A dedicated ground search was undertaken as well as a census of extant birds. The survey involved different search strategies and protocols and all extant fauna or evidence of fauna was recorded.

3.3.2 Habitats present

The habitat is a uniform unmanaged patch of Coastal Sandstone Foreshore Forest occurring on a steep south-facing hillslope vegetated by a relatively natural low forest dominated by low trees from 5 - 10m tall of Sydney Red Gum. The understorey appears to have been recently trimmed to about 10% cover with native ground covers and vines to 70% (Figures 6 & 7). Litter to about 40% cover.

Canopy trees may provide sheltering and seasonal food resources for avifauna, arboreal species and the Grey-headed Flying Fox. A few relatively mature trees contained hollows suitable for nesting by small birds or microbat species (Figure 9). Large hollows for owl species were not recorded within the study area. No arboreal nests were recorded during this survey.

3.3.3 Wildlife corridor potential

The presence of similar contiguous unmanaged forest vegetation along the slope and surrounds of Bilgola Beach, including low canopy trees wind-sheared from the influence of strong southerly winds and a continuous low scrub understorey stratum, affords effective connectivity for avian, reptilian, microbats and arboreal species in the locality (Figure 4).

3.3.4 Fauna recorded

The conditions of a cool temperatures and light cool winds, together with a lack of flowering trees, shrubs and ground covers, were not ideal for fauna. The proximity to the busy Barrenjoey Road subtended by the property also provides a deterrent for midday activity of fauna.

Table 4 indicates the fauna recorded or expected to occur on occasion when flowering resources are available within the relatively small area of survey at 521 Barrenjoey Road, Bilgola.

Class/Family	Common name	Scientific name	Low forest vegetation on south facing hillslope
REPTILIA Scincidae	Dark-flecked Garden Sunskink	<i>Lampropholis delicata</i>	x
AVES Alcedinidae	Laughing Kookaburra	<i>Dacelo novaeguineae</i>	e
Cacatuidae	Sulphur-crested Cockatoo	<i>Cacatua galerita</i>	x
Psittacidae	Crimson Rosella	<i>Platycercus elegans</i>	e
	Rainbow Lorikeet	<i>Trichoglossus haematodus</i>	x
Maluridae	Superb Fairy-wren	<i>Malurus cyaneus</i>	e
Meliphagidae	Eastern Spinebill	<i>Acanthorhynchus tenuirostris</i>	e
	Noisy Miner	<i>Manorina flavigula</i>	x
	Lewin's Honeyeater	<i>Meliphaga lewinii</i>	e
Megapodiidae	Australian Brush Turkey	<i>Alectra lathamii</i>	e
Corvidae	Australian Raven	<i>Corvus coronoides</i>	e
Hirundinidae	Welcome Swallow	<i>Hirundo neoxena</i>	x
MAMMALIA Pseudocheiridae	Common Ringtail possum	<i>Pseudocheirus peregrinus</i>	e
Phalangeridae	Common Brushtail Possum	<i>Trichosurus vulpecula</i>	e
Pteropodidae	Grey-headed Flying-fox	<i>Pteropus poliocephalus</i>	e
Vespertilionidae	Gould's Wattled Bat	<i>Chalinolobus gouldii</i>	e
Muridae	Black Rat*	<i>Rattus rattus</i>	e

Legend:

x - observed either onsite or overhead or heard in vicinity; e - expected to occur onsite and in vicinity on occasion

The weather conditions at the time of survey included warm and relatively humid weather conditions with light winds, ideal conditions for bird activity, however, not many plant species, including exotic plants, were in flower at the time.

The Powerful Owl (*Ninox strenua*) may occasionally forage within the area if prey species are in abundance. However during the survey, prey for this large owl did not appear sufficient in number to attract it to the area at the present time.

The Common Brushtail Possum (*Trichosurus vulpecula*) and Ringtail Possum (*Pseudocheirus peregrinus*) are expected to occur within the low forest habitat.

A few trees within the surveyed area contained small hollows and spouts that could accommodate small mammals (microbats) or small birds (Figure 9).

The common Little Forest Bat (*Vespadelus vulturnus*), and Gould's Wattled Bat (*Chalinolobus gouldii*) may be expected to occur occasionally for foraging. The Little Forest Bat roosts in hollows in old trees, buildings and timber stacks. These bat species have been recorded in a location near to the subject site in 2014 and are common insectivorous microbat species in the region.

The larger megabat, Grey-headed Flying Fox (*Pteropus poliocephalus*) was not sighted during the survey, which occurred during mid-morning when the bats would be roosting in camps, but may be attracted to flowering Eucalyptus trees on occasion during the warmer months.

Reptilian habitat within the leaf litter was rated good for foraging and sheltering. The Dark-flecked skink (*Lampropholis delicata*) was recorded at this location.

Habitat for amphibian species was rated as poor as no drainage lines or ponds occur at the developed subject site

The pest species Black Rat and House Mouse may be expected to occur occasionally at and in the vicinity of the subject site as residential development and weed incursion occurred closer to established residence upslope (Table 4).

3.3.5 Fauna species of conservation significance

3.3.5.1 Threatened species

The criteria used to assess the likelihood of threatened species occurring in the Study Area include the specificity of habitat features such as tree canopy cover, relative soil moisture regime, relative soil nutrient regimes, historical disturbance and degradation of vegetation and known occurrences of threatened species in the immediate locality.

If all or most of these collective criteria deemed optimal for the occurrence of a particular threatened species occur in relation to the habitat of the Study Area, then the likelihood of its potential occurrence in the habitat of the Study Area could be assessed as being relatively high. If only some of these collective criteria deemed suitable for the occurrence of a particular

threatened species occur in the habitat of the Study Area, then its potential occurrence in the area of study may be deemed moderate at best. If few of these collective criteria deemed suitable for the occurrence of a particular threatened species occur in the habitat of the Study Area, then the likelihood of its occurrence would be assessed as being low to very unlikely.

The DPIE Atlas of NSW Wildlife database 2021 (Dept Planning, Industry and Environment) listed thirty three (33) species of terrestrial and avifauna considered threatened under the BC Act within a 5 km radius of the site (Table 4). Four of these species are designated as endangered by the NSW Scientific Committee with the remainder designated as vulnerable. Under the EPBC Act 1999, three are listed as endangered and five species are listed as vulnerable.

Family	Common name	Scientific name	NSW status	Comm. status	No. of records
Amphibia Myobatrachidae	Red-crowned Toadlet	<i>Pseudophryne australis</i>	V		25
Limnodynastidae	Giant Burrowing Frog	<i>Heleioporus australiacus</i>	V	V	5
Reptilia Varanidae	Rosenberg's Goanna	<i>Varanus rosenbergi</i>	V		4
Aves Columbidae	Rose-crowned Fruit-Dove	<i>Ptilinopus regina</i>	V		3
	Superb Fruit-Dove	<i>Ptilinopus superbus</i>	V		1
Apodidae	White-throated Needletail	<i>Hirundapus caudacutus</i>		V,C,J,K	3
Ardeidae	Black Bittern	<i>Ixobrychus flavicollis</i>	V		1
Accipitridae	White-bellied Sea-Eagle	<i>Haliaeetus leucogaster</i>	V		32
	Little Eagle	<i>Hieraaetus morphnoides</i>	V		2
	Square-tailed Kite	<i>Lophoictinia isura</i>	V		2
Burhinidae	Bush Stone-curlew	<i>Burhinus grallarius</i>	E1		43
Cacatuidae	Gang-gang Cockatoo	<i>Callocephalon fimbriatum</i>	V		1
	Glossy Black-Cockatoo	<i>Calyptorhynchus lathami</i>	V		30
Psittacidae	Little Lorikeet	<i>Glossopsitta pusilla</i>	V		2
	Swift Parrot	<i>Lathamus discolor</i>	E1	CE	5
	Turquoise Parrot	<i>Neophema pulchella</i>	V		1
Strigidae	Barking Owl	<i>Ninox connivens</i>	V		12
	Powerful Owl	<i>Ninox strenua</i>	V		416
Tytonidae	Masked Owl	<i>Tyto novaehollandiae</i>	V		1
Dasyornithidae	Eastern Bristlebird	<i>Dasyornis brachypterus</i>	E1	E	1
Petroicidae	Scarlet Robin	<i>Petroica boodang</i>	V		1
Mammalia Peramelidae	Southern Brown Bandicoot (eastern)	<i>Isodon obesulus obesulus</i>	E1	E	1
Phascolarctidae	Koala	<i>Phascolarctos cinereus</i>	V	V	1
Burramyidae	Eastern Pygmy-possum	<i>Cercartetus nanus</i>	V		36
Petauridae	Squirrel Glider	<i>Petaurus norfolcensis</i>	V		3
	Squirrel Glider on Barrenjoey Peninsula, north of Bushrangers Hill	<i>Petaurus norfolcensis</i>	E2,V		1
Pteropodidae	Grey-headed Flying-fox	<i>Pteropus poliocephalus</i>	V	V	101
Molossidae	Eastern Coastal Free-tailed Bat	<i>Micronomus norfolkensis</i>	V,P		6

Family	Common name	Scientific name	NSW status	Comm. status	No. of records
Vespertilionidae	Large-eared Pied Bat	<i>Chalinolobus dwyeri</i>	V,P	V	6
	Southern Myotis	<i>Myotis macropus</i>	V,P		9
	Greater Broad-nosed Bat	<i>Scoteanax rueppellii</i>	V,P		4
	Eastern Cave Bat	<i>Vespadelus troughtoni</i>	V,P		1
Miniopteridae	Little Bent-winged Bat	<i>Miniopterus australis</i>	V,P		34
	Large Bent-winged Bat	<i>Miniopterus orianae oceanensis</i>	V,P		47

Legend to Table 5 - BC Act, EPBC Act, Migratory Bird Agreements

Key	
Environmental Protection and Biodiversity Conservation Act (EPBC Act) 1999	Biodiversity Conservation Act (BC Act) 2016
CE - Critically Endangered	E1 - Endangered
E - Endangered	E4 - critically endangered
V - Vulnerable	V - Vulnerable
	C CAMBA Migratory bird agreement between Australia and China

Table 5 - 33 species of threatened fauna recorded within 5km radius of the subject site within the previous 20 years (DPIE Bionet Atlas 2021).

3.3.5.2 Threatened species with potential to occur at the subject land

All threatened species listed require specific habitat for foraging, nesting or roosting. The subject land was assessed for these habitat requirements (refer to Appendix 3).

Due to the uniform habitat of the subject site with no rock outcrops or mature tall trees, few threatened fauna species are considered likely to regularly occur as indicated by the recorded sightings of threatened fauna species in the locality. Figures 12A, 12B and 12C indicate the most recorded threatened fauna species.

Most of the threatened species listed in Table 5 occur in habitats differing from that indicated for the subject site. Figure 12A indicates the distribution of the Bush Stone-curlew, which mostly inhabits open forests and woodlands with a sparse grassy groundlayer and fallen timber, unlike the habitat of the subject site with relatively dense ground cover, small trees and shrubs. This species is largely nocturnal, being especially active on moonlit nights where it feeds on insects and small vertebrates, such as frogs, lizards and snakes.

Figure 12B indicates the locations of sightings and calls of the Powerful Owl across all areas of the locality, its widespread range documented as records on a 1km grid pattern.

Most terrestrial and arboreal mammals occur north of Avalon, west of Mona Vale or in Ku-ring-gai Chase National Park.

Figure 12C indicates that on occasion, when food resources are available from fruit and flowering eucalypts and other Myrtaceous species, the Grey-headed Flying Fox has a wide range across the locality.

The Pied-eared Bat has also been recorded along Barrenjoey Road, Bilgola Beach. However its preferred habitat includes proximity to roost caves, crevices in cliffs, old mine workings, frequenting low to mid-elevation dry open forest and woodland close to these features. The species usually occurs in well-timbered areas containing gullies, dissimilar to that of the subject land (Figure 12C).

Figure 12D indicates the proximity of records for both the Little Bentwing Bat and the Large Bentwing Bat along the Bilgola Bends area of Bilgola Beach.

These species differ in that the habitat of the Little Bentwing Bat occurs mainly in moist eucalypt forest, rainforest, vine thicket, wet and dry sclerophyll forest, Melaleuca swamps, dense coastal forests and banksia scrub. The species is generally found in well-timbered areas. Little Bentwing Bats roost in caves, tunnels, tree hollows, abandoned mines, stormwater drains, culverts, bridges and sometimes buildings during the day, and at night forage for small insects beneath the canopy of densely vegetated habitats. In NSW the largest maternity colony is in close association with a large maternity colony of Large Bentwing Bats (*Miniopterus orianae oceanensis*).

The Large Bentwing Bat mainly roosts in caves but also use derelict mines, storm-water tunnels, buildings and other man-made structures. The species hunts in forested areas, catching moths and other flying insects above the tree tops.

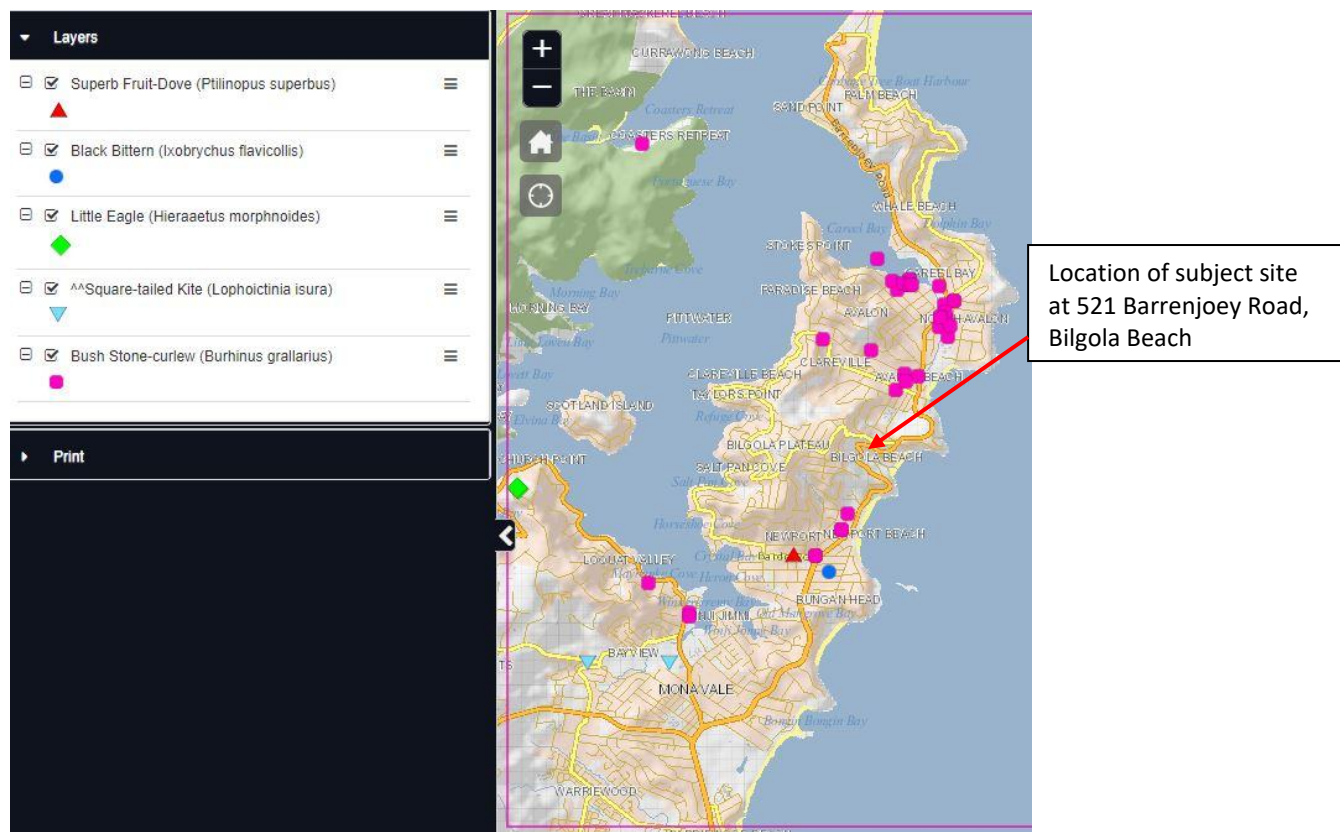


Figure 12A - Indicates recorded sightings of 5 threatened fauna species in the locality of the subject site, including for the Bush Stone-curlew along the northern peninsula to Careel Bay

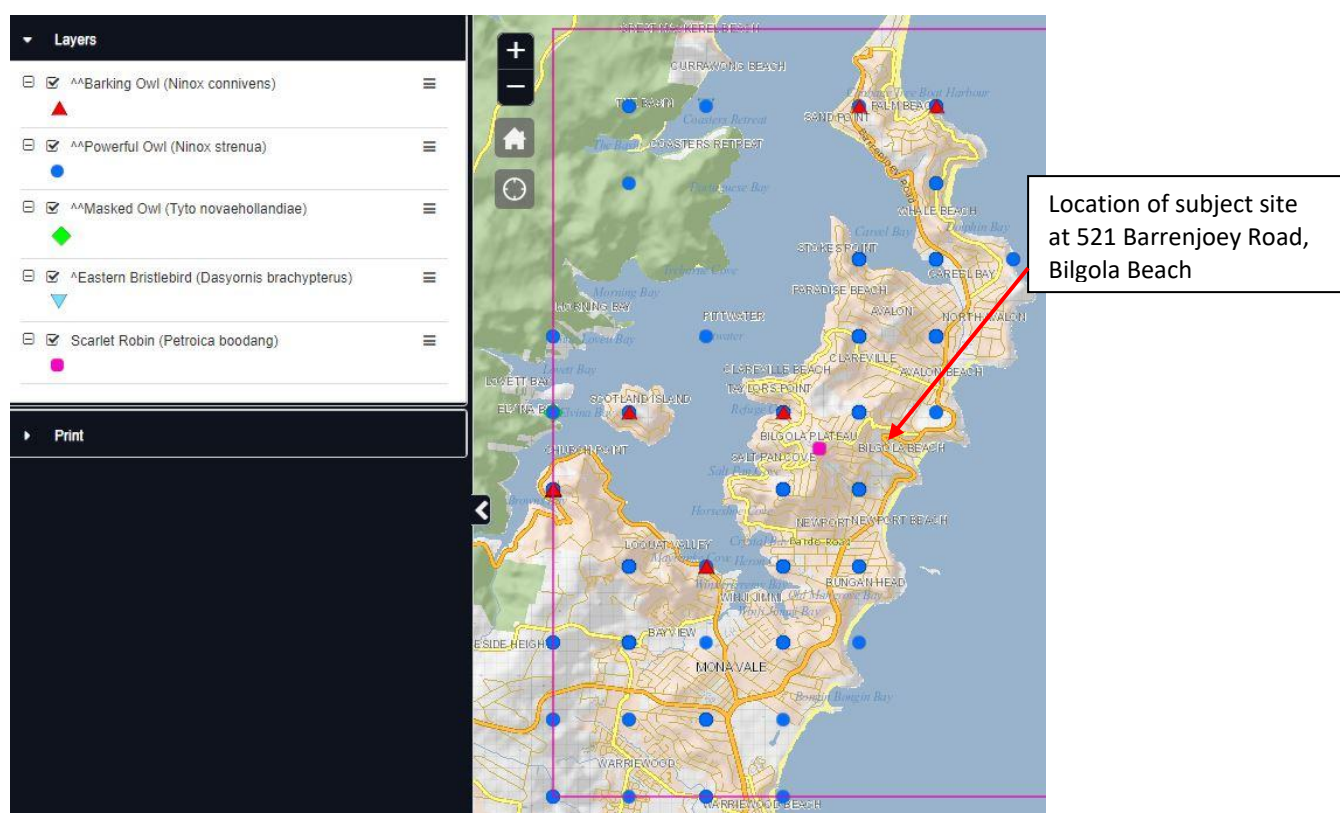


Figure 12B - Indicates recorded sightings of 5 threatened fauna species in the locality of the subject site, including for the Bush Powerful Owl in a 1km grid pattern across the landscape

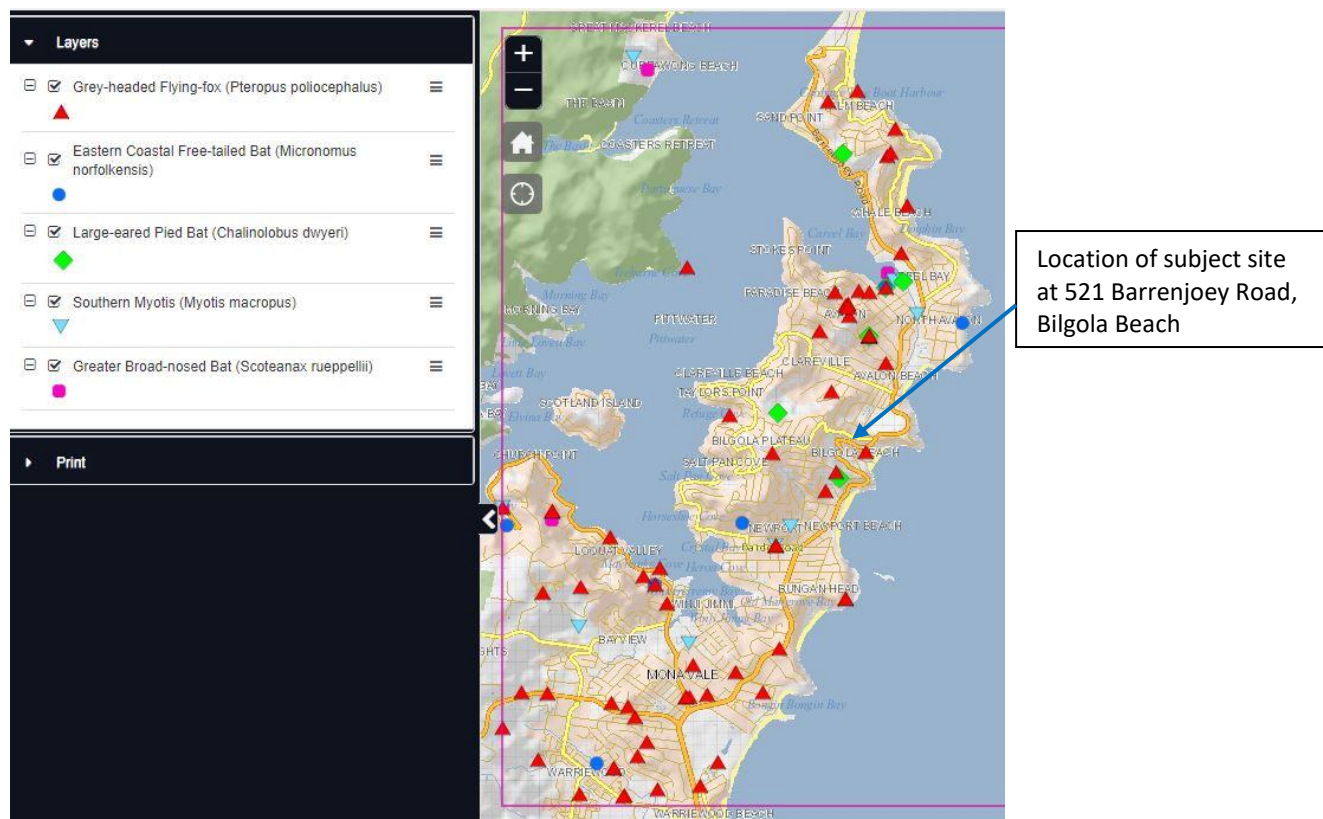


Figure 12C - Indicates recorded sightings over time of 5 threatened Bat species in the locality of the subject site, including widespread recorded sightings of the Grey-headed Flying Fox

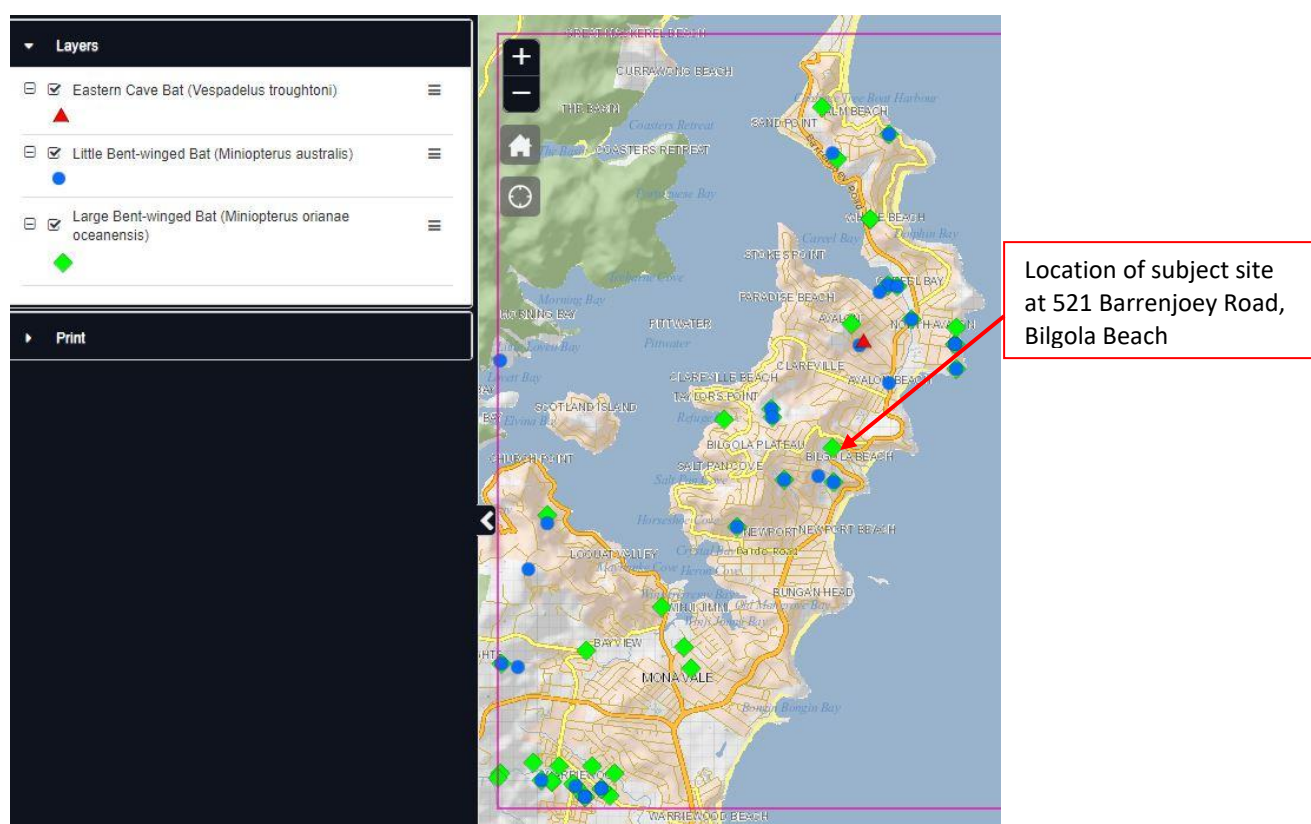


Figure 12D - Indicates recorded sightings of both the Little Bentwing Bat and the Large Bentwing Bat in close proximity to the subject site

Four threatened species occurring closest to, or in the vicinity of the site, include the following (See Appendix 3 for habitat assessment):

1. Bush Stone-curlew (*Burhinus grallarius*) The Bush Stone-curlew is found throughout Australia except for the central southern coast and inland, the far south-east corner, and Tasmania. Only in northern Australia is it still common however and in the south-east it is either rare or extinct throughout its former range.

The species inhabits open forests and woodlands with a sparse grassy groundlayer and fallen timber.

The Bush Stone-curlew is largely nocturnal, being especially active on moonlit nights. It feeds on insects and small vertebrates, such as frogs, lizards and snakes and forms a nest on the ground in a scrape or small bare patch.

The habitat of the subject site is considered unsuitable for this species and the proposed development is not expected to affect the life-cycles or viability of populations of this species.

2. Powerful Owl (*Ninox strenua*) The Powerful Owl inhabits a range of vegetation types, from woodland and open sclerophyll forest to tall open wet forest and rainforest.

The Powerful Owl requires large tracts of forest or woodland habitat but can occur in fragmented landscapes as well. The species breeds and hunts in open or closed sclerophyll forest or woodlands and occasionally hunts in open habitats. It roosts by day in dense vegetation comprising species such as Turpentine *Syncarpia glomulifera*, Black She-oak *Allocasuarina littoralis*, Blackwood *Acacia melanoxylon*, Rough-barked Apple *Angophora floribunda*, Cherry Ballart *Exocarpus cupressiformis* and a number of eucalypt species (DPIE 2020).

The main prey items are medium-sized arboreal marsupials, particularly the Greater Glider, Common Ringtail Possum and Sugar Glider. Flying foxes are important prey in some areas; birds comprise about 10-50% of the diet depending on the availability of preferred mammals. As most prey species require hollows and a shrub layer, these are important habitat components for the owl (DPIE 2020).

Pairs of Powerful Owls demonstrate high fidelity to a large territory, the size of which varies with habitat quality and thus prey densities. In good habitats a mere 400ha can support a pair; where hollow trees and prey have been depleted the owls need up to 4000 ha (DPIE 2020).

The Powerful Owl may forage in the area of the subject land from time to time and be an infrequent visitor to the subject area. However, much of the surrounding forest will

be retained and occurs in reserve areas, and as such, it is considered that the proposal is not expected to affect the life-cycle or viability of populations of the Powerful Owl in the locality.

3. Grey-headed Flying Fox (*Pteropus poliocephalus*). This species congregates in large camps and is found in a variety of habitats including rainforest, mangroves, Melaleuca swamps, wet and dry sclerophyll forests and also cultivated areas. The species feeds on the blossoms of more than 80 plant species, especially eucalyptus blossom and the fruits of a number of palm species. Flowering species of eucalypts such as Swamp Mahogany (*Eucalyptus robusta*) and Forest Red Gum (*Eucalyptus tereticornis*) and Paperbarks (*Melaleuca quinquenervia*), are particularly important. Distances of up to 30km from the camp are often travelled, with 60-70km sometimes covered per night to reach a particular food source.

The Grey-headed Flying Fox (*Pteropus poliocephalus*) was not sighted during the survey, which occurred during mid-morning when the bats would be roosting in camps, but individuals may be attracted to flowering Eucalyptus and Turpentine trees on occasion during the warmer months.

The habitat for this species may occur at the subject site as it occasionally forages for nectar within the forest or scrub canopy. It is considered that as the area on the south-facing hillslope that is proposed to be impacted is very small compared to its large foraging range in the locality, this species will not be compromised by the proposed development proposed for the subject site (DPIE 2021).

4. Large Bentwing Bat (*Miniopterus orianae oceanensis*)

Roosting habitat for this species includes caves, mines near or above water, discarded buildings and tunnels. No suitable structures described are present on the subject land. Suitable roosting habitat for this threatened microchiropteran bat species is likely to be found within moister valleys of the locality rather than the exposed hillslope area of the subject land.

This bat forages in well timbered valleys above the tree canopy on small flying insects (Strahan 1995). Potential occasional foraging habitat is present over the land and within the immediate vicinity. Core likely foraging habitat for the Large Bentwing Bat is likely concentrated in the larger areas of mature vegetation such as the tall open forest Pittwater Spotted Gum Forest vegetation that occurs along the western slopes of Whale Beach and surrounding suburbs (Figure 4). The relatively small area of vegetation that will be impacted by the proposal is not considered to result in a significant adverse impact on the life-cycle or population dynamics of the Large Bentwing Bat (DPIE 2021).

4 POTENTIAL IMPACTS AND COMPLIANCE WITH DEVELOPMENT IN PITTWATER COUNCIL LGA

4.1 Introduction

Residential development must comply with Pittwater Council LEP (2014) and Pittwater Council 21 DCP (2014). This plan applies to all land within the former Pittwater Council LGA to which LEP 2014 applies.

4.2 Pittwater Council LEP (2014)

Clause 7.6 refers to the following:

(1) The objective of this clause is to maintain terrestrial, riparian and aquatic biodiversity by: (a) protecting native fauna and flora, and (b) protecting the ecological processes necessary for their continued existence, and (c) encouraging the conservation and recovery of native fauna and flora and their habitats.

(2) This clause applies to land identified as “Biodiversity” on the Biodiversity Map. The land at 16521 Barrenjoey Road, Bilgola Beach, is included in the overall marking of Biodiversity on the Council Biodiversity Map (current at 2021)

(3) The consent authority must consider: (a) whether the development is likely to have: (i) any adverse impact on the condition, ecological value and significance of the fauna and flora on the land,

Comment: The proposal is to remove 25 individuals of common tree species such as Sydney Red Gum and Broad-leaved White Mahogany from a small section of Coastal Sandstone Foreshores Forest that is part of a more extensive distribution of this plant community in the immediate locality established along a section of south-facing hillslope (Figures 1 & 4). The individuals mostly occur in only fair condition, and this removal would be offset by replacement planting of species landscaped to 80% of representative species for Coastal Sandstone Foreshore Forest. This offset could be considered adequate to maintain the condition, ecological value and habitat for flora and fauna at this small section of the subject land.

(ii) any adverse impact on the importance of the vegetation on the land to the habitat and survival of native fauna,

Comment: The proposal is to remove 25 individuals of common tree species such as Sydney Red Gum and Broad-leaved White Mahogany from a small section of Coastal

Sandstone Foreshores Forest that is part of a more extensive distribution of this plant community in the immediate locality established along a section of south-facing hillslope (Figures 1 & 4).

Two of the low growing individuals of Sydney Red Gum (Tree numbers 39 & 40 per Willis 2021) contain small hollows at the ends of branches about 2m above ground level (Figure 9). To compensate for potential loss of sheltering and breeding habitat for small birds or microchiropterans, it is recommended that at least 2 nest boxes suitable for small to medium sized birds and two bat boxes be installed at a height of at least 5 - 10m on trunks of retained trees in suitable locations

(iii) any potential to fragment, disturb or diminish the biodiversity structure, function and composition of the land,

Comment: The proposal is to remove 25 individuals of common tree species such as Sydney Red Gum and Broad-leaved White Mahogany from a small section of Coastal Sandstone Foreshores Forest that is part of a more extensive distribution of this plant community in the immediate locality established along a section of south-facing hillslope (Figures 1 & 4). The individuals mostly occur in only fair condition, and this removal would be offset by replacement planting of species landscaped to 80% of representative species for Coastal Sandstone Foreshore Forest. This offset could be considered adequate to resemble the condition, ecological value and habitat for flora and fauna and to not diminish the biodiversity structure and function at this small section of the subject land.

(iv) any adverse impact on the habitat elements providing connectivity on the land,

Comment: The proposal is to remove 25 individuals of common tree species such as Sydney Red Gum and Broad-leaved White Mahogany from a small section of Coastal Sandstone Foreshores Forest that is part of a more extensive distribution of this plant community in the immediate locality established along a section of south-facing hillslope (Figures 1 & 4). The individuals mostly occur in only fair condition, and this removal would be offset by replacement planting of species landscaped to 80% of representative species for Coastal Sandstone Foreshore Forest. To compensate for potential loss of sheltering and breeding habitat for small birds or microchiropterans by the loss of two potential roosting and breeding hollows (Figure 9), it is recommended that at least 2 nest boxes suitable for small to medium sized birds and two bat boxes be installed at a height of at least 5 - 10m on trunks of retained trees in suitable locations. These offsets could be considered adequate to maintain much of the habitat elements that provide connectivity on the land.

(3) The consent authority must consider whether (b) there any appropriate measures proposed to avoid, minimise or mitigate the impacts of the development.

Comment: The land is relatively small in area and to accommodate the dwelling, the removal of structural and functional elements of the habitat would be offset by replacement planting of species landscaped to 80% of representative species for Coastal Sandstone Foreshore Forest. To compensate for potential loss of sheltering and breeding habitat for small birds or microchiropterans by the loss of two potential roosting and breeding hollows (Figure 9), it is recommended that at least 2 nest boxes suitable for small to medium sized birds and two bat boxes be installed at a height of at least 5 - 10m on trunks of retained trees in suitable locations. These offsets could be considered adequate mitigation measures to maintain much of the condition, ecological value and habitat elements that occur on the land.

The provision of Flame Zone building construction for the hazard sides of the proposed dwelling structure would limit the requirement for excessive clearing of bushland vegetation that occurs on the southern hillslope of the subject land. Discretionary clearing of weed-infested vegetation and bush regeneration of patches of weed-covered scrub occurring within this vegetation would also act to enhance the condition, ecological value and habitat for flora and fauna at this hillslope section of the subject land.

(4) Development consent must not be granted to development on land to which this clause applies unless the consent authority is satisfied that:

(a) the development is designed, sited and will be managed to avoid any significant adverse environmental impact, or (b) if that impact cannot be reasonably avoided by adopting feasible alternatives—the development is designed, sited and will be managed to minimise that impact, or (c) if that impact cannot be minimised—the development will be managed to mitigate that impact.

Comment: The development is designed, sited and will be managed to minimise and mitigate biodiversity impact.

The provision of Flame Zone building construction for the hazard sides of the proposed dwelling structure would limit the requirement for excessive clearing of bushland vegetation that occurs on the southern hillslope of the subject land. Discretionary clearing of weed-infested vegetation and bush regeneration of patches of weed-covered scrub occurring within this vegetation would also act to enhance the condition, ecological value and habitat for flora and fauna at this hillslope section of the subject land.

4.3 Pittwater Council 21 DCP (2014)

One of the aims of this DCP is to ensure that controls relating to biodiversity conservation and vegetation and wildlife management are undertaken when any development is proposed in areas containing natural bushland. The objective to maintain terrestrial biodiversity aims to ensure the following (Pittwater 21 DCP):

- protection of native fauna and flora,
- protection of ecological processes necessary to maintain their continued existence, and
- the encouragement of the conservation and recovery of native fauna and flora and their habitats.

This aim serves to protect and conserve the biodiversity of the local area through the retention of natural vegetation where applicable and to maintain, enhance and/or establish wildlife corridors that enable existing plant and animal communities to survive and potentially expand their range where possible (Pittwater Council 21 DCP 2014).

In regard to the proposed development, the location or positioning of the proposed dwelling house takes account of the environmental constraints of the subject area and the building envelope is located such that there is a relatively limited clearing and modification of natural bushland (Figures 2 & 6). The retention of elements of natural bushland is encouraged wherever possible. The building layout also occurs in relation to effluent and water run-off disposal etc.

4.4 Proposed impacts to floristic biodiversity

4.4.1 Potential impacts of development

The arboricultural impact assessment report by Willis (2021) lists a total of 53 individuals of low trees occurring within the subject property, road reserve and adjacent allotments. These tree species include mainly Sydney Red Gum with fewer Broad-leaved White Mahogany and other small tree species located in a low forest stratum, 25 of which are proposed to be removed for the building footprint and requisite APZ.

The floristic diversity at the subject site is relatively high (35 native species/400m²) and this diversity is expected to be maintained as the natural bushland surrounding the building envelope is recommended to be retained and any cleared areas enhanced with landscaped plantings of up to 80% components of Coastal Sandstone Foreshores Forest assemblages (PCT 1778) (OEH 2016).

As such, the removal of 25 individuals of trees and some associated shrub, ground cover and twiner species in an area where these species are common in the immediate and extended locality, would not be considered to substantially alter the floristics, structure or functionality of the local ecological community of Coastal Sandstone Foreshore Forest. This is particularly as it is recommended to replace these species to be planted in suitable sections of the subject land.

4.4.2 Recommended mitigation measures

1. The habitat of the Coastal Sandstone Foreshore Forest is expected to be maintained by the incorporation of a landscape plan for cleared areas of the property. The area

will be planted with 80% of species that are representative of Coastal Sandstone Foreshore Forest (Table 2).

2. Potential habitat for avifauna and microbats in relation to hollows occurring on Tree Numbers 39 & 40 (Willis 2021) would be enhanced by the installation of several small nesting boxes and bat boxes on suitable individuals existing at the subject site.

4.5 Compliance with Threatened Species Legislation

4.5.1 Threatened species

No individuals of threatened flora or fauna were recorded at, or expected to occur, at the subject site.

Occasional visitors to the site where food resources become available may include the Powerful Owl, Grey-headed Flying Fox, Bush Stone-curlew and large Bent-wing Bat. These are highly mobile species and the limited development on the southern flank of the hill is not considered to have any significant impact on these species behavior or life-cycles.

Any hollow logs and dead trees should be left intact as these provide safe refuge and shelter for many fauna species.

4.5.2 Threatened Ecological Community

A typical component of Coastal Sandstone Foreshores Forest occurs along the southern flanks of the landscape above Barrenjoey Road, Bilgola, including at the subject land (Figures 1, 5, 6 & 7). The dwelling house is to be constructed to Flame Zone specifications on the 3 sides of the house that are exposed to bushfire hazard.

This ecological community is not listed as an EEC on either registers of the BC Act (2016) or the EPBC Act (1999) with a total of 567ha of this community located in conservation reserves and a further 245ha occurring in the non-reserved catchment (OEH 2016).

No elements of Littoral Rainforest were recorded within the subject land (Figures 6 & 7).

4.6 Compliance with Effluent and Stormwater Disposal

The site would be serviced by sewage and storm water infrastructure.

4.7 Conclusions

With appropriate management of potential environmental constraints and the undertaking of effective mitigation measures as outlined in this report, the proposed development is considered to comply with the desired criteria in relation to Pittwater Council 21 DCP (2014).

5 ADDRESSING THE PROPOSED DEVELOPMENT IN RELATION TO THE BAM (BIODIVERSITY ASSESSMENT METHOD) AS REQUIRED BY THE BC ACT (2016)

5.1 Offset Scheme Thresholds

5.1.1 Area criteria

The threshold for clearing above which the BAM and offsets apply is 1ha (BAM 2016). Of this 1ha area, if the area to be developed is >0.25ha then offsets apply (BAM 2016). If the area of the property is >1ha, then up to 0.5ha of vegetation can be cleared before offsets apply (BC Act 2016).

The property described as 531 Barrenjoey Road, Bilgola, comprises an area of about 689m² (Figure 1) (Richards and Loftus 2021).

The maximum area of potential natural bushland occurring at the subject site that is proposed to be impacted is estimated at about 460m² (Willis 2021).

The development does not meet the offset criteria in relation to potential area to be impacted.

5.1.2 Biodiversity Values Map

The Biodiversity Values Map (BV Map) identifies land with high biodiversity value, as defined by the *Biodiversity Conservation Regulation 2017*. The Biodiversity Offsets Scheme applies to all local developments, major projects or the clearing of native vegetation where the State Environmental Planning Policy (Vegetation in Non-Rural Areas) 2017 applies. Any of these will require entry into the Biodiversity Offsets Scheme if they occur on land mapped on the Biodiversity Values Map (DPIE 2021).

The location of the subject property on the Biodiversity Values Map is indicated in Figure 13.

The subject property is not indicated as containing any significant Biodiversity Value that may be impacted either directly or indirectly by the proposed development (Figure 13).

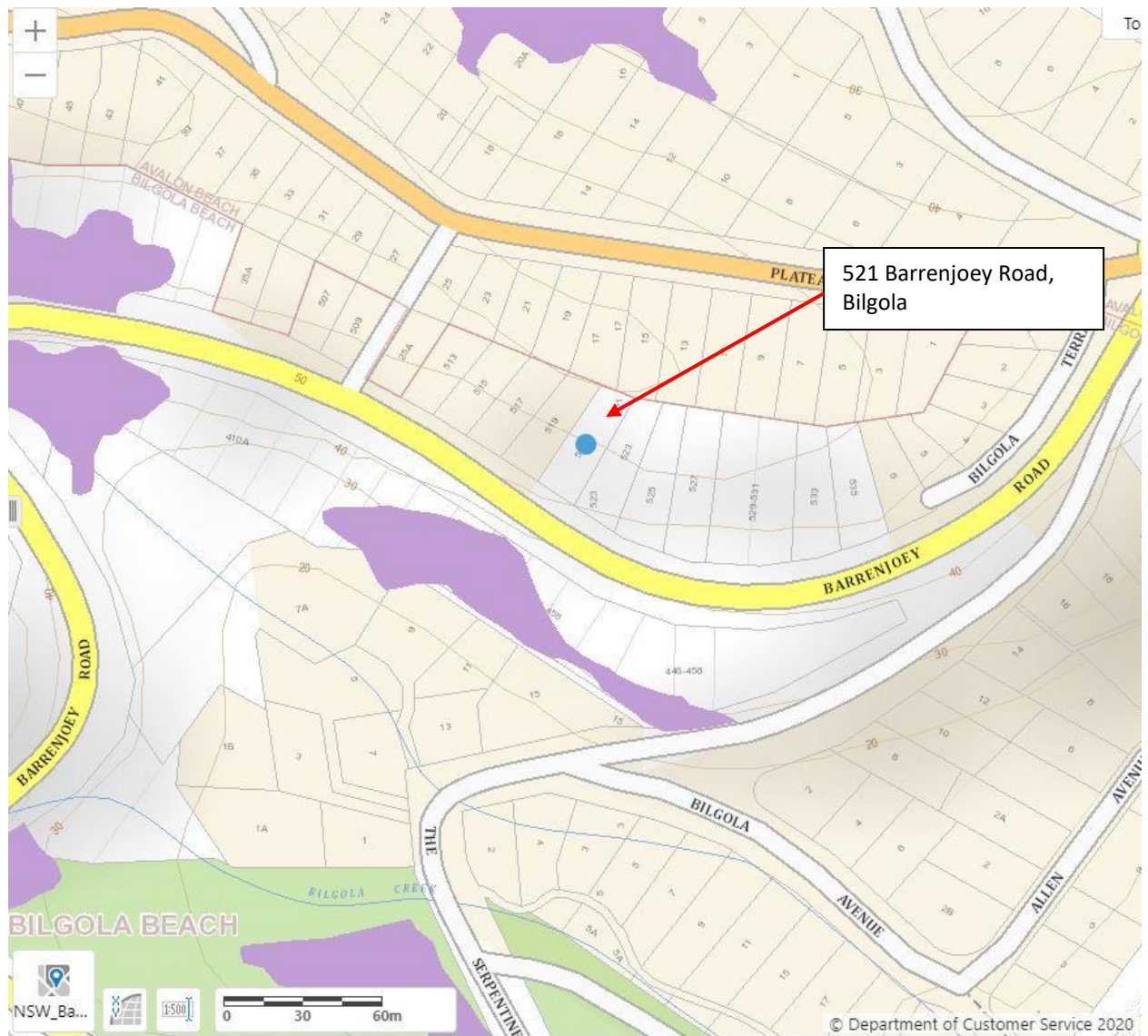


Figure 13 - Biodiversity Values Mapping of subject site at 521 Barrenjoey Road, Bilgola Beach (blue solid circle on map), showing biodiversity values mapped below the subject site, below Barrenjoey Road, in Littoral Rainforest (an EEC shaded in purple shading) (DPIE 2021).

5.1.3 Threatened species, populations and/or ecological communities.

No threatened species of flora or fauna or ecological community will be impacted by the development proposal.

As such, it is considered that no significant impacts would occur to the extent of or viability of any threatened species or ecological community in the locality and as such, no biodiversity offsets are required.

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Appendix 1: Floristic species assemblage recorded at 521 Barrenjoey Road, Bilgola

KEY
Status
* Exotic species
HTW - High Threat Weeds (DPIE 2021)
Biosecurity Weeds (Prohibition on dealing or Regional Recommended Measures) (DPI Priority Weeds for Greater Sydney 2021)
Vegetation
Assemblage of Coastal Foreshores Sandstone Forest occurring on south-facing hillslope
Relative cover value (% cover)

STATUS	SCIENTIFIC NAME	COMMON NAME	SUBJECT SITE
	FILICOPSIDA		
	Dennstaedtiaceae		
	<i>Pteridium esculentum</i>	Bracken	15
	Pteridaceae		
	<i>Adiantum aethiopicum</i>	Common Maidenhair	5
	GYMNOSPERMAE:		
	CONIFERALES		
	Zamiaceae		
	<i>Macrozamia communis</i>	Burrawang	5
	MAGNOLIOPSIDA:		
	MAGNOLIDAE		
	Asteraceae		
*	<i>Ageratina adenophora</i>	Crofton Weed	0.1
	Bignoniaceae		
	<i>Pandorea pandorana</i>	Wonga Wonga Vine	1
	Caesalpinaceae		
*	<i>Senna pendula</i> var. <i>glabrata</i>	Common Cassia	0.1
	Casuarinaceae		
	<i>Allocasuarina littoralis</i>	Black Sheoak	5
	<i>Allocasuarina torulosa</i>	Forest Oak	1

STATUS	SCIENTIFIC NAME	COMMON NAME	SUBJECT SITE
*	Dilleniaceae		
	<i>Hibbertia aspera</i>		0.1
	<i>Hibbertia scandens</i>	Climbing Guinea Flower	0.1
	Elaeocarpaceae		
	<i>Elaeocarpus reticulatus</i>	Blueberry Ash	0.1
	Fabaceae: Faboideae		
	<i>Kennedia rubicunda</i>	Red Kennedy Pea	4
	<i>Podolobium ilicifolium</i>		1
	Lauraceae		
	<i>Cinnamomum camphora</i>	Camphor Laurel	0.1
	Meliaceae		
	<i>Synoum glandulosum</i> subsp. <i>glandulosum</i>	Bastard Rosewood	0.5
	Mimosaceae		
	<i>Acacia longifolia</i> subsp. <i>longifolia</i>	Sydney Golden Wattle	1
	Myrtaceae		
	<i>Angophora costata</i>	Sydney Red Gum	40
	<i>Eucalyptus botryoides</i>	Coast Mahogany	1
	<i>Eucalyptus umbra</i> subsp. <i>umbra</i>	Bastard Mahogany	10
	Oleaceae		
	<i>Notelaea longifolia</i> f. <i>longifolia</i>	Mock Olive	1
	<i>Notelaea ovata</i>		
	Phyllanthaceae		
	<i>Glochidion ferdinandi</i>	Cheese Tree	0.5
	Pittosporaceae		
	<i>Billardiera scandens</i>	Appleberry	0.1
	<i>Pittosporum undulatum</i>	Sweet Pittosporum	2
	Proteaceae		
	<i>Banksia integrifolia</i>	Coast Banksia	0.1
	<i>Banksia spinulosa</i>	Hairpin Banksia	0.2
	Rubiaceae		
	<i>Opercularia diphylla</i>		0.1

STATUS	SCIENTIFIC NAME	COMMON NAME	SUBJECT SITE
Biosecurity Weed	Rutaceae <i>Zieria smithii</i>	Sandfly Zieria	0.1
	Verbenaceae <i>Lantana camara</i>	Lantana	0.5
	Vitaceae <i>Cissus antarctica</i> <i>Cissus hypoglauca</i>	Giant Water Vine	0.1 5
	MAGNOLOPSIDA: LILIDAE		
	Arecaceae <i>Archontophoenix cunninghamiana</i> <i>Livistona australis</i>	Bangalow Palm Cabbage Tree Palm	1 1
	Asparagaceae <i>Asparagus aethiopicus</i>	Asparagus Fern	3
	Cyperaceae <i>Gahnia aspera</i> <i>Gahnia clarkei</i>		5 2
	Lomandraceae <i>Lomandra longifolia</i>	Spiky-headed Mat-rush	1
	Luzuriagaceae <i>Eustrephus latifolius</i>	Wombat Berry	0.1
	Poaceae <i>Entolasia stricta</i> <i>Imperata cylindrica</i> <i>Oplismenus aemulus</i>	Wiry Panic Blady Grass Basket Grass	1 1 0.5
nat	Smilacaceae <i>Smilax glycyphylla</i>	Sweet Sarsaparilla	0.1
	Strelitzaceae <i>Strelitzia nicolai</i>	Wild Banana	1
	Xanthorrhoeaceae <i>Xanthorrhoea media</i>	Forest Grass-tree	0.1

LEGEND TO APPENDIX 1 - BIOSECURITY WEEDS IN NORTHERN BEACHES COUNCIL LGA
(Department of Primary Industries 2021)

SPECIES	BIOSECURITY STATUS
<u>Ground Asparagus</u> <i>Asparagus aethiopicus</i>	Prohibition on dealings <i>Must not be imported into the State or sold</i>
<u>Lantana</u> <i>Lantana camara</i>	Prohibition on dealings <i>Must not be imported into the State or sold</i>

Appendix 2: Plant species of conservation significance recorded within a 5km radius of the surveyed area since 2001 where potential habitat may occur (DPIE Bionet Atlas of NSW Wildlife 2021^α) or where potential habitat is deemed to potentially occur (Commonwealth Environmental Reporting Tool 2021^β)

Scientific Name	Status (EPBC Act 1999)	Status (BC Act 2016)	RoTAP	Habit/potential habitat/general geographic location	Likelihood of occurrence in surveyed areas	Reference material derived from 'Final Determinations' (Scientific Committee) and others listed below:
<i>Asterolasia elegans</i> ^{α,β}	E*	E1	2ECa	Leafy shrub to 3m tall, occurring in moist gully habitat such as occurs north of Maroota.	Unlikely - habitat appears unsuitable. Record in littoral rainforest about 220m to the west at Bilgola Beach. Absence of relatively distinct life-form individuals in defined area of study deemed to indicate non-occurrence. No further assessment required	Robinson (1991); DPIE Atlas of NSW Wildlife (2021); Fairley (2004)
<i>Callistemon linearifolius</i> ^α		V	2RCi	Erect shrub to 2.5m tall. Occurs in damp situations in woodland or scrub on sandstone substrates	Unlikely - Habitat unsuitable. Nearest record about 2km to the north-east at North Avalon headland. Absence of conspicuous large-life form individuals indicate non-occurrence. No further assessment required.	DPIE Atlas of NSW Wildlife (2021); Robinson (2000), James <i>et al</i> (1999)
<i>Genoplesium baueri</i> ^α	E*	E1		Inconspicuous ground orchid with a single flat leaf occurring in heathland on very shallow soils.	Highly unlikely – Habitat unsuitable, records from Tallong, Woronora Dam Road and south-east of Wingello. No further assessment required.	Bionet Atlas of NSW Wildlife (2021)
<i>Microtis angusii</i> ^α	E*	E1	2E	Terrestrial orchid to 60cm tall, flowering between May and October. Natural habitat unknown but may have been introduced from nearby Duffys Forest Ecological Community	Highly unlikely - Habitat unsuitable. Records from a single population of 336 plants in the Pittwater/Warringah locality within the Mona Vale Road road reserve at the junction of the Pittwater and Warringah LGAs No further assessment required.	Bionet Atlas of NSW Wildlife (2021)

Scientific Name	Status (EPBC Act 1999)	Status (BC Act 2016)	RoTAP	Habit/potential habitat/general geographic location	Likelihood of occurrence in surveyed areas	Reference material derived from 'Final Determinations' (Scientific Committee) and others listed below:
<i>Persoonia hirsuta</i> subsp <i>hirsuta</i> ^{α β}	E*	E1	3KCi	Spreading to decumbent shrub found in sandy soils in dry sclerophyll open forest, woodland and heath on sandstone.	Unlikely – Habitat suitable. Nearest record about 4.7km to the north-west associated with Hawkesbury Sandstone landscapes. The absence of relatively distinct large life-form individuals in area of study indicates non-occurrence. No further assessment required	DPIE Atlas Of NSW Wildlife (2021); James et al (1999); Fairley & Moore (2000); Fairley (2004).
<i>Rhodamnia rubescens</i> ^α		E4A		Shrub or small tree to 25 m high with reddish/brown, fissured bark (OEH 2019). Occurs in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest usually on volcanic and sedimentary soils (OEH 2019).	Unlikely – Habitat unsuitable. Nearest records occur to the south-west about 1km of the subject site at Newport (DPIE 2021). The habitat of the subject site is open but floristically diverse, however, the survey targeted this species of conservation significance but no individuals were found to occur in the surveyed area. No further assessment required.	DPIE Bionet Atlas of NSW Wildlife (2021)
<i>Syzygium paniculatum</i> ^{α β}	V*	V	3VCi	Shrub or small tree to 8m tall, occurs in or near rainforest from littoral sands to sheltered gullies, especially near watercourses on sandy soils	Unlikely – Habitat not suitable. Record likely indicates landscaped individuals evident at about 500m to the north of the subject site. However, the absence of conspicuous large-life form individuals of this species indicates non-occurrence. No further assessment required.	DPIE Atlas of NSW Wildlife (2021); Robinson (1991), Fairley & Moore (2000)

Key to Conservation Status:

Commonwealth legislation

Environmental Protection and Biodiversity Conservation Act, 1999

EX – Presumed extinct

E* - Endangered

V* - Vulnerable

NSW legislation

Biodiversity Conservation Act, 2016

E4A – Schedule 1 Part 1 – Presumed extinct, recently recorded

E1 Schedule 1 Part 1 – Endangered

V Schedule 2 - Vulnerable

RoTAP

Conservation code

2 - geographic range <100km

3 - geographic range >100km

Conservation status

E - endangered to point of extinction if current land use and other threats continue to operate

V - vulnerable, at risk of depletion over 20-50- years if land use that threatens survival is maintained

C - at least one population conserved in a national park or proclaimed conservation area

Size class of reserved populations

a - >1000 plants in conservation reserve

i - < 1000 plants in conservation reserve

- reserved population size not accurately known

Appendix 3 - Likelihood of occurrence of some fauna species of conservation significance recorded within a 5km radius of the Study Area at 521 Barrenjoey Road, Bilgola Beach (DPIE Bionet Atlas of NSW Wildlife 2021) or where potential habitat is deemed to potentially occur (DAWE 2021).

<i>Amphibians</i>	BC Act	EPBC Act	Habitat	Record (source)	Likelihood of Occurrence	Assessment of Significance required
Red-crowned Toadlet <i>Pseudophryne australis</i>	V		Occurs in open forests, mostly on Hawkesbury and Narrabeen Sandstones at the sandstone-shale interface. Inhabits periodically wet drainage lines below sandstone ridges that often have shale lenses. Shelters under rocks and amongst masses of dense vegetation or thick piles of leaf litter.	25 DPIE Bionet Atlas (2021)	Highly unlikely - habitat unsuitable; all records either at Warriewood wetlands or north-west at Kuring-gai Chase National Park	No
Giant Burrowing Frog <i>Heleioporus australiacus</i>	V	V	Distribution; The Giant Burrowing Frog occurs from the NSW Central Coast to eastern Victoria, but is most common on the Sydney sandstone. It has been found from the coast to the Great Dividing Range. Habitat; Found in heath, woodland and open forest with sandy soils. Generally lives in the heath or forest and will travel several hundred metres to creeks to breed. Burrows into deep litter or loose soil, emerging to feed or breed after rain. Breeding; Breeds from August to March and the eggs are laid in a white foam-mass under vegetation in creeks or in yabby holes. Feeding; Diet includes ground-dwelling invertebrates such as ants, beetles and spiders.	5 DPIE Bionet Atlas (2021)	Highly unlikely - habitat highly modified; no suitable habitat on the subject land.	No
<i>Birds</i>	BC Act	EPBC Act	Habitat	No sighted (source)	Likelihood of Occurrence	Assessment of Significance required
Rose-crowned Fruit Dove <i>Ptilinopus regina</i>	V		Occurs mainly in sub-tropical and dry rainforest and occasionally in moist eucalypt forest and swamp forest, where fruit is plentiful. They are shy pigeons, not easy to see amongst the foliage, and are more often heard than seen. They feed entirely on fruit from vines, shrubs, large trees and palms, and are thought to be locally nomadic as they follow the ripening of fruits.	3 DPIE Bionet Atlas (2021)	Highly unlikely - no suitable habitat on the subject land	No

Birds	BC Act	EPBC Act	Habitat	No sighted (source)	Likelihood of Occurrence	Assessment of Significance required
Superb Fruit Dove <i>Ptilinopus superbus</i>	V		<p>Distribution; The Superb Fruit-Dove is found along the coast and nearby ranges of Queensland and New South Wales south to Moruya.</p> <p>Habitat; Inhabits rainforest, wet sclerophyll forest. Open forest and sometimes mangroves of eastern Australia. Uncommon to rare south of Keppel Bay, Queensland (Pizzey & Knight 1997).</p> <p>Breeding; Rarely breeds (if ever) in New South Wales or Victoria. Nests in October to January on a small frail platform of twigs, on a horizontal fork in a tree, between 5-1- metres from the ground (Beruldsen 2003).</p> <p>Feeding; eats the fruits of many tree species such as figs and palms. It may also forage in eucalypt or acacia woodland where there are fruit-bearing trees.</p>	1 DPIE Bionet Atlas (2021)	Highly unlikely - no suitable habitat on the subject land.	No
Black Bittern <i>Ixobrychus flavicollis</i>	V	C	Black Bitterns roost and nest in trees, and are found in tree-lined wetlands and in mangroves. They forage in both daylight and darkness, mainly from shady trees over water, but may be seen during the day in open areas of short marshy vegetation and along creeks.	1 DPIE Bionet Atlas (2021)	Unlikely - habitat unsuitable	No
White-bellied Sea-Eagle <i>Haliaeetus leucogaster</i>	V	C	Low potential for habitat to occur at site. Occurs in wooded areas near the sea or sea-shore, such as around bays and inlets, beaches, reefs, lagoons, estuaries and mangroves. Terrestrial habitats include coastal dunes, tidal flats, grassland, heathland, woodland, and forest. May overfly site on occasion.	32 DPIE Bionet Atlas (2021)	Low - May overfly the area as part of a wider foraging range. May perch on low trees in study area.	No
Little Eagle <i>Hieraetus morphnoides</i>	V		<p>The Little Eagle is seen over woodland and forested lands and open country, extending into the arid zone. It tends to avoid rainforest and heavy forest. The Little Eagle searches for prey on the wing or from a high exposed perch, taking prey from the ground, the shrub layer or the canopy. Prey includes rabbits, other live mammals and insects.</p> <p><i>May overfly the area as part of a wider foraging range but will not be affected by the development.</i></p>	2 OEH Bionet Atlas (2021)	Low - Moderate - May overfly the area as part of a wider foraging range	No

Birds	BC Act	EPBC Act	Habitat	No sighted (source)	Likelihood of Occurrence	Assessment of Significance required
Square-tailed Kite <i>Lophoictinia isura</i>	V		In NSW the Square-tailed Kite is often associated with ridge and Gully forests dominated by Woollybutt <i>Eucalyptus longifolia</i> , Spotted Gum <i>Eucalyptus maculata</i> , or Peppermint Gum <i>Eucalyptus elata</i> . It has also been sighted in forests containing <i>Angophora spp.</i> and <i>Callitris spp.</i> with a shrubby understorey and Box-Ironbark woodland. It feeds on honeyeating birds and insects in the tree canopy. They have a large foraging range and hunt prey early morning and evening. Nesting sites are along or close to watercourses in a fork or large horizontal limb of a <i>Eucalyptus</i> or <i>Angophora</i> species (Pizzey and Knight 2003).	2 DPIE Bionet Atlas (2021)	Low -No impact, habitat unsuitable, Sighted at Mona Vale and Bayview to the south-west	No
Bush Stone-curlew <i>Burhinus grallarius</i>	V		The Bush Stone Curlew is found throughout Australia except for the central southern coast and inland, the far south-east corner, and Tasmania. Only in northern Australia is it still common however and in the south-east it is either rare or extinct throughout its former range. Inhabits open forests and woodlands with a sparse grassy groundlayer and fallen timber. Largely nocturnal, being especially active on moonlit nights. Feed on insects and small vertebrates, such as frogs, lizards and snakes. Nest on the ground in a scrape or small bare patch.	43 DPIE Bionet Atlas (2021)	Low -Sightings centred around Careel Bay, Avalon and Newport (Figure 12A). Habitat of Coastal Foreshores Sandstone Forest considered suboptimal for this species.	No
Glossy Black Cockatoo <i>Calyptorhynchus lathami</i>	V		Inhabits open forest and woodlands of the coast and the Great Dividing Range up to 1000 m in which stands of she-oak species, particularly Black She-oak (<i>Allocasuarina littoralis</i>), Forest She-oak (<i>A. torulosa</i>) occur. Forest She-oak is the preferred foraging resource. Roosts in the canopy of tall trees, occasionally in tree hollows. <i>A few individuals of Allocasuarina torulosa occur at the subject site but most will be retained. As no Glossy Black-cockatoos were recorded and no chewed cones or evidence of feeding was noted, the likelihood of this species being impacted by the development is unlikely</i>	30 DPIE Bionet Atlas (2021)	Low -Few individuals of Black Sheoak onsite.	No

<i>Birds</i>	BC Act	EPBC Act	Habitat	No sighted (source)	Likelihood of Occurrence	Assessment of Significance required
Little Lorikeet <i>Glossopsitta pusilla</i>	V		<p>Little Lorikeets mostly occur in dry, open eucalypt forests and woodlands. They have been recorded from both old-growth and logged forests in the eastern part of their range, and in remnant woodland patches and roadside vegetation on the western slopes.</p> <p>Little lorikeets are considered to be nomadic, likely in a response to food availability. These lorikeets usually forage in small flocks, feeding mainly on nectar and pollen, but also fruit of eucalypts, melaleucas and mistletoes. The little lorikeet breeds from May to September, nesting in tree hollows, with small diameter entrance holes. Most breeding records are located on the western slopes.</p> <p><i>May forage in the subject site with other species of lorikeets during peak flowering events.</i></p>	<p>2</p> <p>DPIE Atlas of NSW Wildlife (2021)</p>	<p>Low - Coastal Foreshores Sandstone Forest considered not ideal habitat of this species.</p>	No
Turquoise Parrot <i>Neophema pulchella</i>	V		<p>Range extends from southern Queensland through to northern Victoria, from the coastal plains to the western slopes of the Great Dividing Range.</p> <p>Lives on the edges of eucalypt woodland adjoining clearings, timbered ridges and creeks in farmland.</p> <p>Usually seen in pairs or small, possibly family, groups and have also been reported in flocks of up to thirty individuals.</p> <p>Prefers to feed in the shade of a tree and spends most of the day on the ground searching for the seeds or grasses and herbaceous plants, or browsing on vegetable matter.</p> <p>Forages quietly and may be quite tolerant of disturbance. However, if flushed it will fly to a nearby tree and then return to the ground to browse as soon as the danger has passed.</p> <p>Nests in tree hollows, logs or posts, from August to December. It lays four or five white, rounded eggs on a nest of decayed wood dust.</p>	<p>1</p> <p>DPIE Atlas of NSW Wildlife (2021)</p>	<p>Low - Coastal Foreshores Sandstone Forest considered not ideal habitat of this species.</p>	No

<i>Birds</i>	BC Act	EPBC Act	Habitat	No sighted (source)	Likelihood of Occurrence	Assessment of Significance required
Barking Owl <i>Ninox connivens</i>	V		Inhabits eucalypt woodland, open forest, swamp woodlands and, especially in inland areas, timber along watercourses. Dense vegetation is used occasionally for roosting. During the day they roost along creek lines, usually in tall understorey trees with dense foliage such as <i>Acacia</i> and <i>Casuarina</i> species, or the dense clumps of canopy leaves in large <i>Eucalypts</i> . Live alone or in pairs. Territories range from 30 to 200 hectares and birds are present all year (Debus 1997).	12 DPIE Bionet Atlas (2021)	Low - Habitat unsuitable, recorded to north, west and south of subject site. Even if occurs occasionally in bushland at property, then little impact on habitat of this species	No
Powerful Owl <i>Ninox strenua</i>	V		Inhabits a range of vegetation types, from woodland and open sclerophyll forest to tall open wet forest and rainforest. The Powerful Owl requires large tracts of forest or woodland habitat but can occur in fragmented landscapes as well. It roosts by day in dense vegetation comprising species such as Turpentine <i>Syncarpia glomulifera</i> , Black She-oak <i>Allocasuarina littoralis</i> , Blackwood <i>Acacia melanoxylon</i> , Rough-barked Apple <i>Angophora floribunda</i> , Cherry Ballart <i>Exocarpus cupressiformis</i> and a number of other eucalypt species. <i>No evidence (presence of pellets or droppings at base of trees or on tree trunks) of this species using the subject site for roosting. The subject site is not regarded as core habitat for Powerful Owl.</i>	416 DPIE Bionet Atlas (2021)	Low - Habitat unsuitable, even if occurs occasionally in bushland at property, then no impact on habitat of this species	No
Masked Owl <i>Tyto novahollandiae</i>	V		Extends from the coast where it is most abundant to the western plains. Overall records for this species fall within approximately 90% of NSW, excluding the most arid north-western corner. There is no seasonal variation in its distribution. Lives in dry eucalypt forests and woodlands from sea level to 1100 m. A forest owl, but often hunts along the edges of forests, including roadsides. The typical diet consists of tree-dwelling and ground mammals, especially rats. Pairs have a large home-range of 500 to 1000 hectares. Roosts and breeds in moist eucalypt forested gullies, using large tree hollows or sometimes caves for nesting.	1 DPIE Bionet Atlas (2021)	Low - Nearest record is north at Barrenjoey Head. Habitat unsuitable.	No

Birds	BC Act	EPBC Act	Habitat	No sighted (source)	Likelihood of Occurrence	Assessment of Significance required
Eastern Bristlebird <i>Dasyornis brachypterus</i>	E1	E	<p>Distribution of this species has contracted to three disjunct areas of south-eastern Australia. There are three main populations: Northern - southern Queensland/northern NSW, Central - Barren Ground NR, Budderoo NR, Woronora Plateau, Jervis Bay NP, Booderee NP and Beecroft Peninsula and Southern - Nadgee NR and Croajingalong NP in the vicinity of the NSW/Victorian border. The estimated population size is less than 2000 individuals occupying a total area of about 120 sq km. The central population comprises an estimated 1600 birds, mainly from Barren Grounds Nature Reserve, Budderoo National Park and the Jervis Bay area. The southern population in Nadgee Nature Reserve and Howe's Flat is around 200 birds. Further surveys are required in parts of Ben Boyd National Park and Sydney Catchment Authority lands to determine whether further populations of the Eastern Bristlebird occur in these areas.</p> <p>Habitat for central and southern populations is characterised by dense, low vegetation including heath and open woodland with a heathy understorey.</p> <p>Age of habitat since fires (fire-age) is of paramount importance to this species. The Illawarra and southern populations reach maximum densities in habitat that has not been burnt for at least 15 years; however, habitat in northern NSW requires frequent fires to maintain habitat condition and suitability. The northern fire regimes is between 3-6 years and of variable intensity depending on the habitat condition.</p> <p>Shy and cryptic and rarely flies, although can be seen scampering over the ground; when approached, may move to a lookout perch 1 m or more above the ground, then retreat into dense vegetation.</p> <p>Feeds on a variety of insects, particularly ants.</p>	1 DPIE Bionet Atlas (2021)	Low - more likely to occur within tracts of dense undisturbed bushland.	No

<i>Birds</i>	BC Act	EPBC Act	Habitat	No sighted (source)	Likelihood of Occurrence	Assessment of Significance required
Scarlet Robin <i>Petroica boodang</i>	V		<p>The species inhabits dry eucalypt forests and woodlands. The understorey is usually open and grassy with few scattered shrubs. Prefers abundant logs and fallen timber which do not occur at the subject site.</p> <p><i>Not optimal habitat for the Scarlet Robin. The proposed development should not impact on the foraging activity of this species.</i></p>	<p>1 DPIE Atlas of NSW Wildlife (2021)</p>	<p>Low - more likely to occur where there are large areas of open, grassy forest and woodland. Small area of impact on Coastal Foreshores Sandstone Forest not considered significant to affect potential habitat in locality for this species. No record for this species at Bilgola Plateau.</p>	No
<i>Mammals</i>	BC Act	EPBC Act	Habitat	No sighted (source)	Likelihood of Occurrence	Assessment of Significance required
Southern Brown Bandicoot <i>Isodon obesulus obesulus</i>	E1	E	<p>The Southern Brown Bandicoot has a patchy distribution. In south-eastern NSW, found east of the Great Dividing Range south from the Hawkesbury River. Southern Brown Bandicoots are largely crepuscular (active mainly after dusk and/or before dawn). They are generally only found in heath or open forest with an understorey on sandy or friable soils.</p>	<p>1 Bionet Atlas of NSW Wildlife (2021)</p>	<p>Unlikely - Small area of impact on Coastal Foreshores Sandstone Forest not considered significant to affect potential habitat in locality for this species. Nearest record some 1.3km to the north at Avalon Beach. Most records occur in Kuring-gai National Park to the north-west of the subject site.</p>	No

<i>Mammals</i>	BC Act	EPBC Act	Habitat	No sighted (source)	Likelihood of Occurrence	Assessment of Significance required
Koala <i>Phascolarctus cinereus</i>	V	V	<p>Occurs in natural eucalypt forests and woodlands. Koala feed trees listed under Schedule 2 of SEPP 44 legislation include: Forest red gum <i>Eucalyptus tereticornis</i>; Tallowwood, <i>Eucalyptus microcorys</i>; Grey Gum, <i>Eucalyptus punctata</i>; Manna Gum, <i>Eucalyptus viminalis</i>; River Red Gum, <i>Eucalyptus camaldulensis</i>; Broad leaved scribbly gum, <i>Eucalyptus haemastoma</i>; Scribbly gum, <i>Eucalyptus signata</i>; White box, <i>Eucalyptus albens</i>; Bimble box, <i>Eucalyptus populnea</i> and Swamp mahogany, <i>Eucalyptus robusta</i>.</p> <p><i>On the subject land there are no primary food trees, so the land does not represent optimal Koala habitat.</i></p>	1 DPIE Atlas of NSW Wildlife (2021)	Highly unlikely - no suitable habitat on the subject land. Single record at Clareville	No
Eastern Pygmy Possum <i>Cercartetus nanus</i>	V		<p>In most areas woodlands and heath appear to be preferred, except in north-eastern NSW where they are most frequently encountered in rainforest. Feeds largely on nectar and pollen collected from banksias, eucalypts and bottlebrushes; an important pollinator of heathland plants such as banksias; soft fruits are eaten when flowers are unavailable.</p>	36 DPIE Atlas of NSW Wildlife (2021)	Highly unlikely - no suitable habitat on the subject land. Most records some 3.6km to the south-west at Ingleside, Mona Vale and Ku-ring-gai Chase National Park	No
Squirrel Glider <i>Petaurus norfolcensis</i>	V		<p>Distribution; The species is widely though sparsely distributed in eastern Australia, from northern Queensland to western Victoria. Within Sydney the species is only known on the Barrenjoey Peninsula and in the Kurrajong-Wilberforce area</p> <p>Habitat; Inhabits dry sclerophyll forests and woodlands but is generally absent from rainforests and closed forests (Menkhorst and Collier 1988). Their coastal habitats range from low, scrubby eucalypt woodlands and banksia thickets to tall, wet eucalypt forests bordering on rainforest (Lindenmayer 2002). In coastal New South Wales they typically inhabit areas with a diversity of tree and shrub species, including high nectar-producing species and winter-flowering Species.</p> <p>Breeding; Births may occur throughout the year, usually with peak in winter. Most females exhibit the capacity to raise two</p>	3 DPIE Bionet Atlas (2021)	Low - No foraging activity recorded. Nearest record about 2km to the north-west at Avalon.	No

			<p>litters per year. Young gliders disperse at a mean age of 12.5 months.</p> <p>Feeding; Diet consists of sap from wattle and eucalypt trees, invertebrates, nectar and pollen. (Lindenmayer 2002). During winter when other food sources are scarce the Squirrel Glider may obtain its energy from winter flowers of a number of plant species. Favoured within the Pittwater area is Coastal Banksia, Old Man Banksia, Grey Ironbark, Red bloodwood, Spotted Gum and Sydney Red Gum.</p>			
<p>Grey-headed Flying-fox <i>Pteropus poliocephalus</i></p>	V	V	<p>Grey-headed Flying Fox (<i>Pteropus poliocephalus</i>). This species congregates in large camps and is found in a variety of habitats including rainforest, mangroves, Melaleuca swamps, wet and dry sclerophyll forests and also cultivated areas. The species feeds on the blossoms of more than 80 plant species, especially eucalyptus blossom and the fruits of a number of palm species. Flowering species of eucalypts such as Swamp Mahogany (<i>Eucalyptus robusta</i>) and Forest Red Gum (<i>Eucalyptus tereticornis</i>) and Paperbarks (<i>Melaleuca quinquenervia</i>), are particularly important. Distances of up to 30km from the camp are often travelled, with 60-70km sometimes covered per night to reach a particular food source. The Grey-headed Flying Fox (<i>Pteropus poliocephalus</i>) was not sighted during the survey, which occurred during mid-morning when the bats would be roosting in camps, but may be attracted to flowering Eucalyptus trees on occasion.</p>	<p>101 DPIE Bionet Atlas (2021)</p>	<p>Low - Moderate- May on occasion forage in the area as part of a wider foraging range in the locality. The proposed development will not impact on populations of the Grey-headed Flying Fox.</p>	<p>No</p>
<p>Eastern Freetail Bat <i>Micronomus norfolkensis</i></p>	V		<p>Occur in dry sclerophyll forest and woodland east of the Great Dividing Range. Roost mainly in tree hollows but will also roost under bark or in man-made structures. Insectivorous.</p>	<p>6 DPIE Bionet Atlas (2021)</p>	<p>Low - Nearest record some 1.7km to the south-west at Careel Bay. May on occasion forage above the tree canopy for insects. Development will not impact on this species</p>	<p>No</p>

<i>Mammals</i>	BC Act	EPBC Act	Habitat	No sighted (source)	Likelihood of Occurrence	Assessment of Significance required
Large-eared Pied Bat <i>Chalinobus dwyeri</i>	V	V	These bats roost in shallow caves in escarpments, particularly in sandstone and forage in remnant native dry and wet open forests, woodlands and rainforests.	6 DPIE Bionet Atlas (2021)	Low - May on occasion forage in the area as part of a wider foraging range. It is considered that species will not be compromised by the proposed development at the subject site (DPIE 2021).	No
Southern Myotis <i>Myotis macropus</i>	V		Prefers permanent and/or flowing water. The Southern Myotis is commonly a cave dwelling microchiropteran, but will utilise tree hollows, mines, stormwater drains, bridges and dense vegetation (Churchill 1998). Roosting sites can be located within a wide variety of habitats, usually located in close proximity to permanent, slow flowing water. Breeding occurs between November and December, with young being weaned after three to four weeks (Churchill 1998). The Southern Myotis commonly forages over water bodies for insects and small fish (Churchill 1998).	9 DPIE Bionet Atlas (2021)	Low -no foraging habitat on the subject land	No
Greater Broadnose Bat <i>Scoteanax ruepellii</i>	V		The preferred foraging habitat of this species appears to be tree-lined creeks and the interface between forested land and cleared areas. This species usually roosts in tree hollows, with large live or dead emergent hollow bearing trees preferred. The roof spaces of old buildings are also used as roost sites. The Greater Broad-nosed Bat has been observed to travel from a forested foraging area, several kilometres to a roost tree hollow adjacent to the edge of a town. A colony of up to 80 individuals was using the roost. Large, individual paddock trees have also been found to be used by this species. This indicates that an individual tree may be extremely important, at least on a seasonal basis.	4 DPIE Atlas of NSW Wildlife (2021)	Low -- Habitat of site unsuitable. May on occasion forage at the subject site as part of a wider foraging range. It is not expected that the Greater Broadnose Bat will be impacted upon by the proposed development.	No

<i>Mammals</i>	BC Act	EPBC Act	Habitat	No sighted (source)	Likelihood of Occurrence	Assessment of Significance required
Eastern Cave Bat <i>Vespadelus troughtoni</i>	V		<p>This bat species is found in a broad band on both sides of the Great Dividing Range from Cape York to Kempsey, with records from the New England Tablelands and the upper north coast of NSW. The western limit appears to be the Warrumbungle Range, and there is a single record from southern NSW, east of the ACT.</p> <p>Very little is known about the biology of this uncommon species.</p> <p>A cave-roosting species that is usually found in dry open forest and woodland, near cliffs or rocky overhangs; has been recorded roosting in disused mine workings, occasionally in colonies of up to 500 individuals.</p> <p>Occasionally found along cliff-lines in wet eucalypt forest and rainforest.</p> <p>Little is understood of its feeding or breeding requirements or behaviour</p>	1 DPIE Bionet Atlas (2021)	Low -Appears to occur mainly in upper North Coast of NSW, proposed development will not impact on this species.	No
Little Bentwing Bat <i>Miniopterus australis</i>	V		<p>Habitat in moist eucalypt forest, rainforest, vine thicket, wet and dry sclerophyll forest, Melaleuca swamps, dense coastal forests and banksia scrub. Generally found in well-timbered areas. Little Bentwing-bats roost in caves, tunnels, tree hollows, abandoned mines, stormwater drains, culverts, bridges and at night forage for small insects beneath the canopy of densely vegetated habitats.</p>	34 DPIE Bionet Atlas (2021)	Low-Moderate Scattered records occur throughout locality. May forage along hillslope of subject site but as extensive areas of this vegetation occur in surrounding areas, there would be no impact to this species by the proposed development.	No

<i>Mammals</i>	BC Act	EPBC Act	Habitat	No sighted (source)	Likelihood of Occurrence	Assessment of Significance required
Large Bentwing Bat <i>Miniopterus orianae oceanensis</i>	V		<p>This sub species of Bentwing Bat occurs from Cape York to central Vic. Occurs in wet and dry sclerophyll forests and rainforests. Roost within man-made structures. Known roost sites include caves, disused mines, storm-water drains, culverts and buildings. However maternity roosts occur in sandstone or limestone cave systems. Will form scattered smaller colonies, mostly within 300km of the larger maternity cave (Churchill 1998).</p> <p>Active all year round, foraging mostly on moths above the tree canopy. Feeds over large areas of land and has been reported to travel up to 70 km in one night (Dwyer 1995)</p> <p><i>The Large Bentwing Bat will not be impacted upon by the proposed development.</i></p>	47 DPIE Bionet Atlas (2021)	Moderate- foraging habitat occurs on the hillslopes of the subject land and surrounding properties. Proposed development will not impact on this species as the foraging area in the locality is extensive.	No
<i>Reptiles</i>	BC Act	EPBC Act	Habitat	No sighted (source)	Likelihood of Occurrence	Assessment of Significance required
Rosenberg's Goanna <i>Varanus rosenbergi</i>	V		Found in heath, open forest and woodland. Shelters in hollow logs, rock crevices and in burrows, which they may dig for themselves, or they may use other species' burrows, such as rabbit warrens. Runs along the ground when pursued (as opposed to the Lace Monitor, which climbs trees (Cogger 2000).	4 DPIE Bionet Atlas (2021)	Highly unlikely - no suitable habitat on the subject land. Nearest records some 3.7km to the south-west at Bayview.	No

