# Flora and Fauna Impact Assessment

**4 Forest Rd, Warriewood NSW 2102**

*By Ecological Consultants Australia Pty Ltd TA*

*Kingfisher Urban Ecology and Wetlands*

**December 2022**

# About this document

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## Statement of Authorship

*This study and report were undertaken by Ecological Consultants Australia at Studio 1/33 Avalon Parade, Avalon. The author of the report is Geraldene Dalby-Ball with qualifications BSc. majoring in Ecology and Botany with over 20 years' experience in this field.*

## Limitations Statement

Information presented in this report is based on an objective study undertaken in response to the brief provided by the client. Any opinions expressed in this report are the professional, objective opinions of the authors and are not intended to advocate any proposal or pre-determined position.

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Signed: Geraldene Dalby-Ball – Director of Ecological Consultants Australia 

# Executive Summary

**Introduction**

- This Flora and Fauna Impact Assessment was prepared for BMN Properties Pty Ltd for the proposed development at 4 Forest Rd, Warriewood, NSW 2102 (Lot B in DP 370222), in the Northern Beaches Council LGA.
- The proposed development is to demolish the existing dwelling and replace it with a new subdivision.
- Recommendations have been provided to reduce the likelihood of impact and mitigate impacts if the proposal is approved.

**Methods**

- On-ground survey took place on March 2022 by Senior Ecologist Geraldene Dalby-Ball.
- Flora and fauna observations were recorded on-site using binoculars. Notes, photos and samples of flora species were taken to assess ecological health and value of the site.
- BioNet searches were performed for flora, fauna and endangered populations to identify if there were previous records of threatened species occurring within the local area using a 10km radius around the site.
- Review of proposed development was evaluated for potential environmental impacts.

**Results**

- No threatened flora or fauna species were recorded on- site during survey or previously recorded via BioNet.
- Trees on site are a mix of *Eucalyptus*, *Corymbia, Angophora, Syncarpia* and *Allocasuarina* species.
- No significant habitat features will be impacted by the proposed development. The land at the rear of the site is part of the escarpment wide landscape corridor.
- The proposal does not trigger entry into the BOS (not on BV map, below area clearing threshold and no significant impact likely on threatened species).
- Tree protection will be consistent with the Arboricultural Impact Appraisal and Method Statement (Naturally Trees 14/12/22).
- Test of significance has been conducted for microbats, Grey Headed flying Fox and Large Forest Owls. – while these resulted in a 'not significant' impact for this community recommendations have been made to assists the long-term sustainability of species.

**Mitigation Measures**

If the development is approved mitigation works will be required. Refer to VMP for specifications.

Before works:

- Tree Protection
- Removal of weeds to prevent spread of seed
- Effective site management to minimise sediment runoff

- Translocation of some Kangaroo Grass to off-site locations

During works:

- Tree Protection and seed collection from any trees approved to be removed.
- Effective site management to minimise sediment runoff.
- Bush hygiene protocols are to be followed to prevent the spread of pathogens including *Phytophthora*.
- Retention of top-soil moved as part of earth works for re-spreading on 'new' top surfaces that are to be vegetated.

After completion of works:

- Vegetation Management Plan implemented to maximise the restoration of habitat and to replace native species removed as part of the development. The ecosystem can be in better condition due to the revegetation and on-going maintenance than it currently is.
- Tree and vegetation maintenance and on-going native vegetation and habitat renewal (planting).
- Native species landscaping.

Legislation: Various pieces of legislation apply to this location and the proposed works are in keeping with the objective of the Acts. Key acts are listed below.

- *Cwlth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act).*
- *Environmental Planning and Assessment Act 1979 (EP&A Act).*
- *Biodiversity Conservation Act 2016 (BC Act).*
- *National Parks & Wildlife Act 1974 (NP&W Act).*
- *Biosecurity Act 2015 (superseding the Noxious Weed Act 1993) (NW Act).*

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# 1 Introduction

## 1.1 Scope of works

Ecological Consultants Australia (ECA) trading as Kingfisher Urban Ecology & Wetlands has been contracted by BMN Properties Pty Ltd to provide a "Flora and Fauna Assessment" to assess potential direct and indirect impacts on any threatened species, populations and communities as per section 5A of the Environmental Planning & Assessment Act 1979. The 'test of significance' has been undertaken in accordance with the NSW Department of Planning, Industry and Environment (DPIE) 'threatened species test of significance'. The test of significance is set out in s. 7.3 of the Biodiversity Conservation Act 2016 (BC Act).

## 1.1 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 environmental circumstances related to factors such as periodic fire frequency, intensity or seasonality, soil moisture regime, biological life-cycle patterns as in the case of small plants such as species of orchids etc. No specific invertebrate surveys were conducted.

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.

Considering the site and habitat availability Kingfisher are confident that this survey is representative of the likely species and vegetation community and that future studies at other times would not change the conclusions in this report.

## 1.2 Site information and general description

The Subject Site (the "Site") is the area of direct and likely indirect impacts and is defined as the whole of the property. The Study Area includes the Subject Site, as well as any additional surrounding land traversed during the field survey. The Subject Site (the "Site") is identified as Lot B in DP 370222, in the local government area of Northern Beaches Council.

The site has an area of 9,728m$^2$ and contains cleared areas, an existing drive, house and sheds and an edge of native bushland on the south and west of the site.

Table 1.1. Site administrative information.

| Category | Details |
|---|---|
| Title Reference (Lot/DP) | B/DP370222 |
| Area ($m^2$) | 9,728$m^2$ |
| Street Address | 4 Forest Rd, Warriewood NSW 2102 |
| LGA | Northern Beaches Council |
| Land Zoning | R3 – Medium Density Residential |


Figure 1.1. Site location. Source: SixMaps 2022.

## 1.3 The Proposal

The proposed development relates to the subdivision of Lot B in DP 370222.

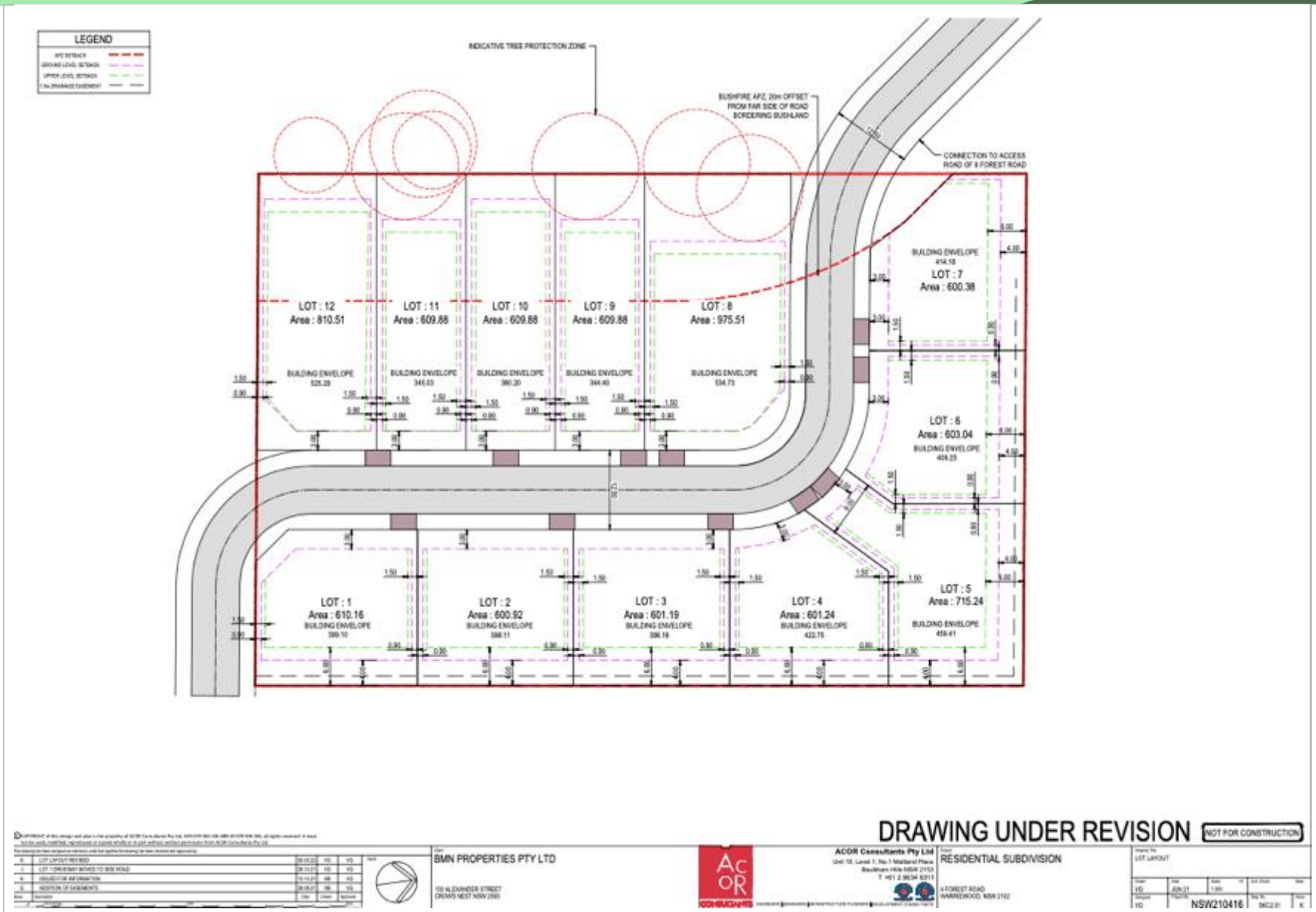



Figure 1.2. Lot Layout. Source: ACOR Consultants Pty Ltd, 30.03.22 Rev. K.

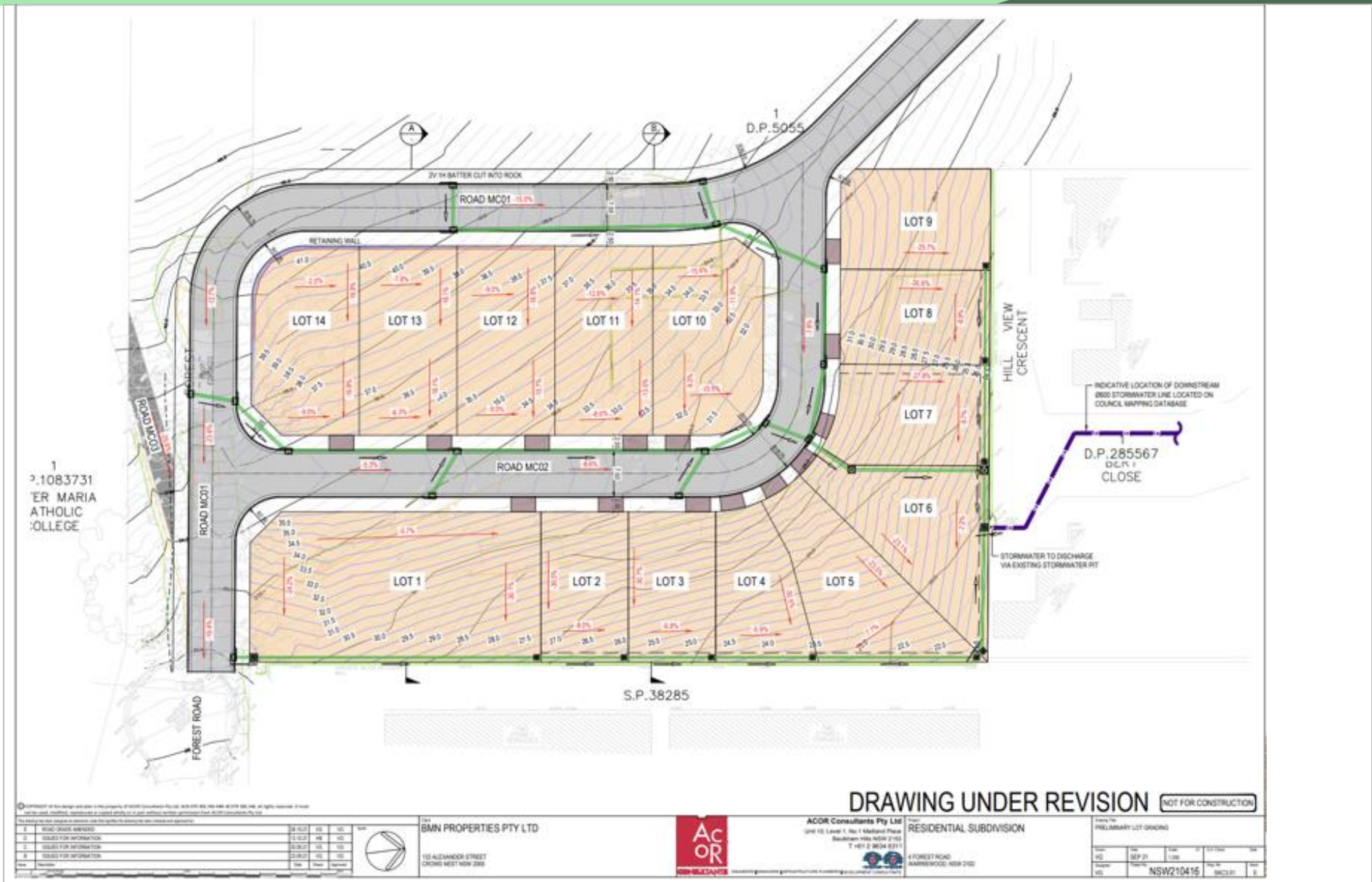



Figure 1.3. Preliminary Lot Grading. Source: ACOR Consultants Pty Ltd, 28.10.21 Rev. E.

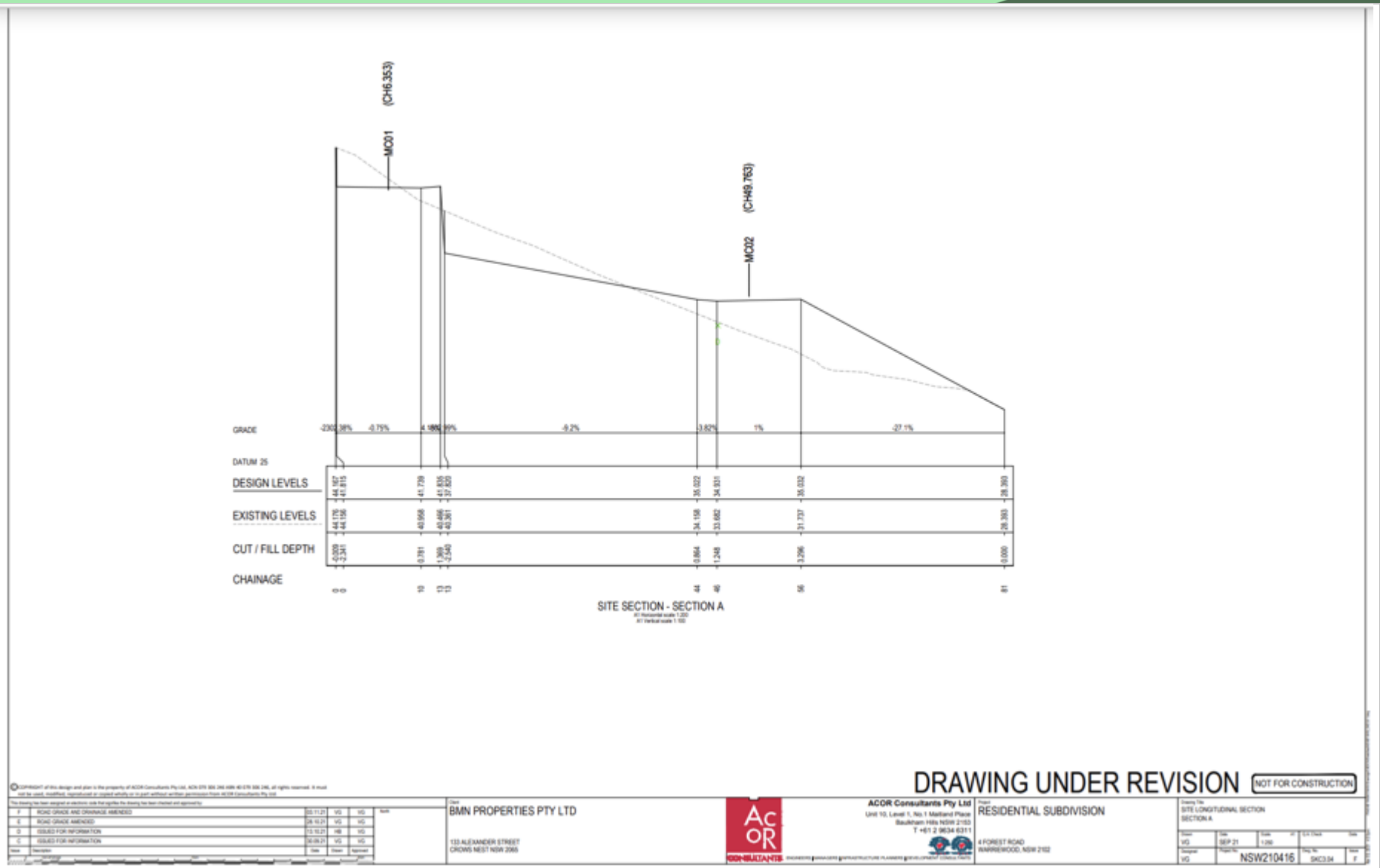



Figure 1.4. Site Longitudinal Section A. Source: ACOR Consultants Pty Ltd, 03.11.21 Rev. F.

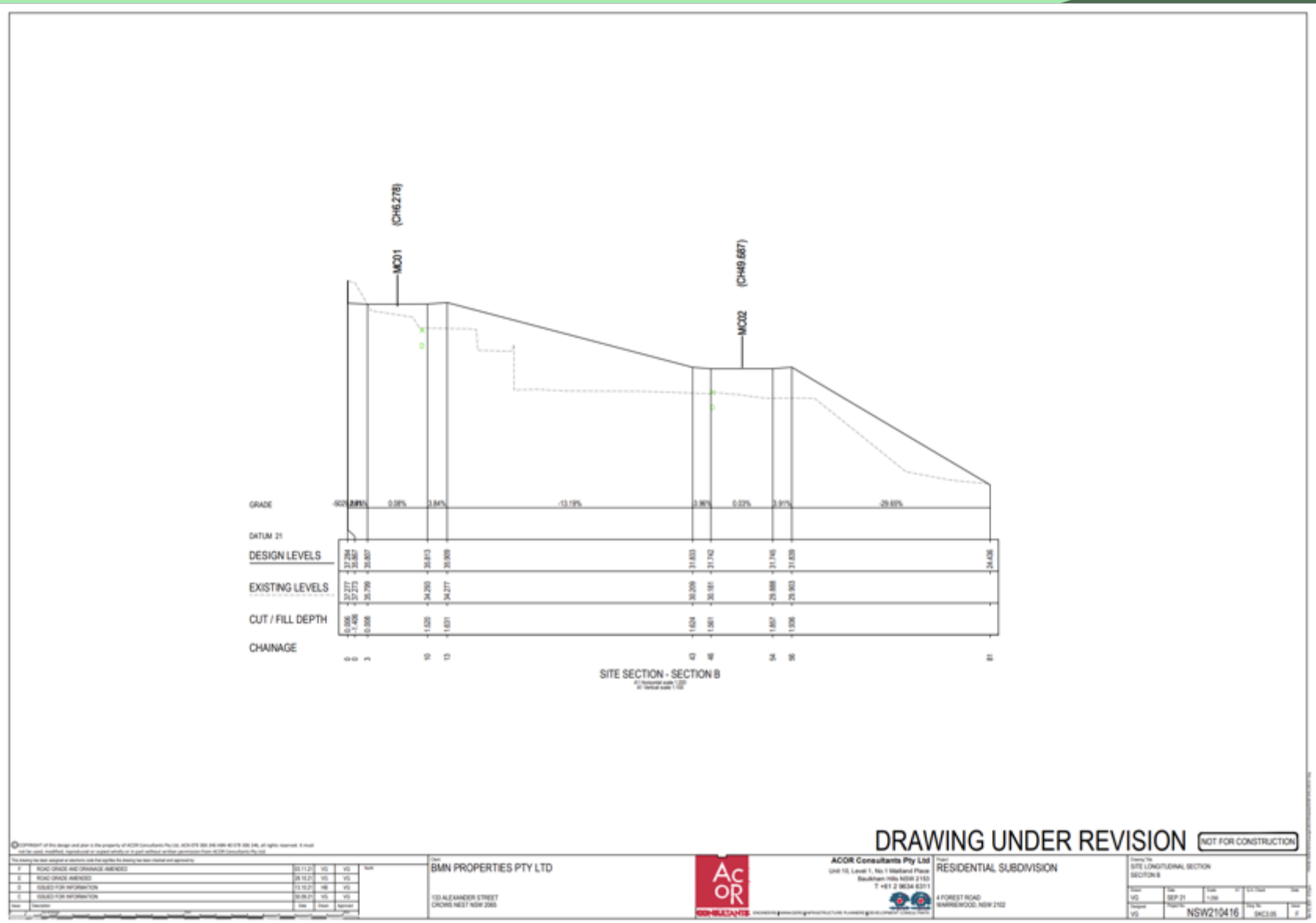



Figure 1.5. Site Longitudinal Section A. Source: ACOR Consultants Pty Ltd, 03.11.21 Rev. F.

## 1.4 Sources of information used in the assessment

The following sources of information were used for this assessment:

Bionet, previous studies and the author's knowledge of the local area, were used to determine the possible occurrence of endangered ecological communities and threatened plant species on-site. The Bionet records accessed cover a 10km$^2$ area extending from the site and include recordings from 1993 to the present day.

Records from the following databases were collated and reviewed:

- Atlas of NSW Wildlife (Bionet). New South Wales, Office of Environment and Heritage (OEH).
- NSW Threatened Species Information (DPIE).
- The Native Vegetation of the Sydney Metropolitan Area - Version 3.1 (OEH, 2016) VIS_ID 4489.
- PlantNET (The Royal Botanic Gardens and Domain Trust 2014).
- Protected Matters Search Tool of the Australian Government Department of the Environment (DoE) for matters protected by the Cwlth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act).

Plans and drawings specific to this development:

- Arboricultural Impact Appraisal and Method Statement. Naturally Trees, 6 Nov 2021.
- Pre-DA Set Plans. ACOR Consultants Pty Ltd 28/10/21 Rev J.
- Revised Lot Layout. ACIR Consultants Pty Ltd 30.3.ww Rev K.

## 1.5 Legislative context and statutory requirements

The implications for the proposal were assessed in relation to key biodiversity legislation and policy including:

- *Cwlth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act).*

The Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) provides a legal framework to protect and manage national and international important flora, fauna, ecological communities and heritage places (defined by the EPBC Act as matters of national environmental significance). The EPBC Act is applicable to the proposal if it was considered that an impact on a 'matter of national environmental significance' were likely, thus providing a trigger for referral of the proposal to the Department of Environment and Heritage.

Matters of national environmental significance identified in the Act are:

- world heritage properties;
- national heritage places;
- Ramsar wetlands;
- nationally threatened species and communities;
- migratory species protected under international agreements;
- the Commonwealth marine environment; and

- nuclear actions.

The Commonwealth Government has published 'Significant Impact Guidelines' to assist in the determination of whether an action is likely to have a significant impact on a matter of national environmental significance. **The proposal does not impact on a matter of national environmental significance and therefore is compliant with the EPBC Act.**

- *Environmental Planning and Assessment Act 1979 (EP&A Act).*

The Environmental Planning and Assessment Act 1979 (EP&A Act) requires that the assessing body, in the case of this proposal the local government, consider the impact of the development, with respect to this Flora and Fauna Impact Assessment, on the environment. **The proposal indicates no significant impact on threatened species or ecological communities, or their habitats.**

- *Biodiversity Conservation Act 2016 (BC Act).*

The Biodiversity Conservation Act 2016 (NSW) (BC Act) and Biodiversity Conservation Regulation 2017 provide greater protection for biodiversity, particularly threatened species and threatened ecological communities. The 'test of significance' is set out in s. 7.3 of the BC Act and is used to determine if a development or activity is likely to affect threatened species or ecological communities, or their habitats. The test of significance was conducted for threatened species and ecological communities likely to occur in the area of the proposed development and the proposal was found to not significantly impact listed threatened species and ecological communities. **The proposal is therefore compliant with the BC Act.**

- *National Parks & Wildlife Act 1974 (NP&W Act).*

The proposed development is complaint with the NP&W Act.

- *Biosecurity Act (superseding the Noxious Weed Act 1993) (NW Act).*

The Biosecurity Act 2015 (NSW) repeals and replaces the Noxious Weeds Act 1993. Under the Biosecurity Act all landowners have a 'General Biosecurity Duty' to control invasive weeds on their property and prevent them from spreading to other properties or native bushland. The objectives of the Act are to manage and eradicate weeds that cause a high level of environmental, economic or social harm. With the removal of and management of weeds the proposal is compliant with the objectives of the Act.

- Northern Beach Council DCP and LEP

The proposal satisfies provisions outlined in both the Pittwater Local Environmental Plan 2014 - 7.6 (Biodiversity protection) and Pittwater Development Control Plan 21 - DCP - B4.7 (Pittwater Spotted Gum Forest). Impacts on native vegetation and the environment are expected to be negligible. Offset plantings and other mitigation measures are expected to maintain and improve upon the condition of the site.

### 2.1.1 Biodiversity Offsets Scheme Threshold

The Biodiversity Offsets Scheme (BOS) is a test used to determine when it is necessary to engage an accredited assessor to apply the Biodiversity Assessment Method (the BAM) and thus evaluate the impacts of a proposal.

It has been concluded that the development does not trigger the BOS area clearing threshold nor is the site located on the BV map. The area clearing threshold trigger is based on the minimum or actual lot size associated with the property (Less than 1 ha) and the thresholds for clearing which triggers BOS (0.25 ha or

more). The building footprint is expected to replace the existing dwelling and will not remove more than 0.5Ha of native vegetation therefore the development does not trigger the BOS.

**Area clearing threshold**

| Minimum lot size associated with the property | Threshold for clearing, above which the BAM and offsets scheme apply |
|---|---|
| Less than 1 ha | 0.25 ha or more |
| 1 ha to less than 40 ha | 0.5 ha or more |
| 40 ha to less than 1000 ha | 1 ha or more |
| 1000 ha or more | 2 ha or more |

The development will not clear >0.25 ha of vegetation.

Thus, the BOS area clearing threshold does not apply.

**Biodiversity Values Map threshold**

The Biodiversity Values (BV) Map identifies land of high biodiversity value, as defined by clause 7.3(3) of the Biodiversity Conservation Regulation 2017. The Biodiversity Offsets Scheme applies to clearing of native vegetation and other biodiversity impacts prescribed by clause 6.1 of the Biodiversity Regulation 2017 on land identified on the map.

Figure 1.5. The site (red mark) located on the BV map.

The site (red mark) is not located on land mapped as biodiversity value as identified on the Biodiversity Values Map.

Therefore, the development does not trigger the BOS as per the Biodiversity Values Map threshold.

# 2 Methods

## 2.1 Site Inspections

Senior Ecologist Geraldene Dalby-Ball assessed the site in March 2022. Weather was fine and sunny during survey.

During site visits, notes and photos were taken of the vegetation types, flora and fauna present. Due to the small area of proposed impacts, detailed or systematic surveys were not performed. Surveys were general and opportunistic in nature and were performed by traversing the site. Surveys included one diurnal bird and fauna survey, a single vegetation survey and a general habitat survey in which fauna habitat resources were identified.

## 2.2 Site photos

Plate 1. Two Red Bloodwood trees proposed to be removed. Both are mature neither have of his holidays. Glider chair marks were looked for however are absent.

Plate 2. View from the rear of the property looking northeast location of proposed retaining wall.

Plate 3. Southern boundary with a narrow span of native vegetation before joining Forest Road curling up into the school.

# 3 Results

## 3.1 Desktop results – Plant Community Types (PCTs) and Vegetation Zones

A review of the most up-to-date vegetation mapping, Sydney Metropolitan Area Vegetation Mapping - Version 3.1 (OEH, 2016) VIS_ID 4489), identified 3 plant community types (PCT) within site. The PCTs identified are, PCT 1250 - *Sydney Peppermint - Smooth-barked Apple - Red Bloodwood shrubby open forest on slopes of moist sandstone gullies, eastern Sydney Basin Bioregion*; PCT 1776 - *Smooth-barked Apple - Red Bloodwood open forest on enriched sandstone slopes around Sydney and the Central Coast*; and PCT 1841 - *Smooth-barked Apple - Turpentine - Blackbutt tall open forest on enriched sandstone slopes and gullies of the Sydney region.*

Table 3.1 – Table of vegetation community synonyms as per NSW and Commonwealth legislation.

| NSW PCT Code | PCT Name | BC Act 2016 | EPBC Act 1999 |
|---|---|---|---|
| 1250 | Sydney Peppermint - Smooth-barked Apple - Red Bloodwood shrubby open forest on slopes of moist sandstone gullies, eastern Sydney Basin Bioregion | No associated TEC | No associated TEC |
| 1776 | Smooth-barked Apple - Red Bloodwood open forest on enriched sandstone slopes around Sydney and the Central Coast | No associated TEC | No associated TEC |
| 1841 | Smooth-barked Apple - Turpentine - Blackbutt tall open forest on enriched sandstone slopes and gullies of the Sydney region | No associated TEC | No associated TEC |

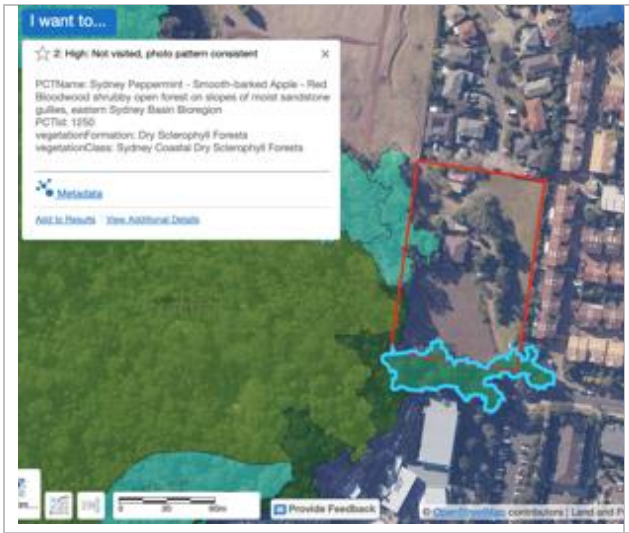



Figure 3.1a. PCT 1250 Sydney Peppermint - Smooth-barked Apple - Red Bloodwood shrubby open forest on slopes of moist sandstone gullies, eastern Sydney Basin Bioregion. SEED 2022.


Figure 3.1b. PCT 1776 - Smooth-barked Apple - Red Bloodwood open forest on enriched sandstone slopes around Sydney and the Central Coast. SEED 2022.

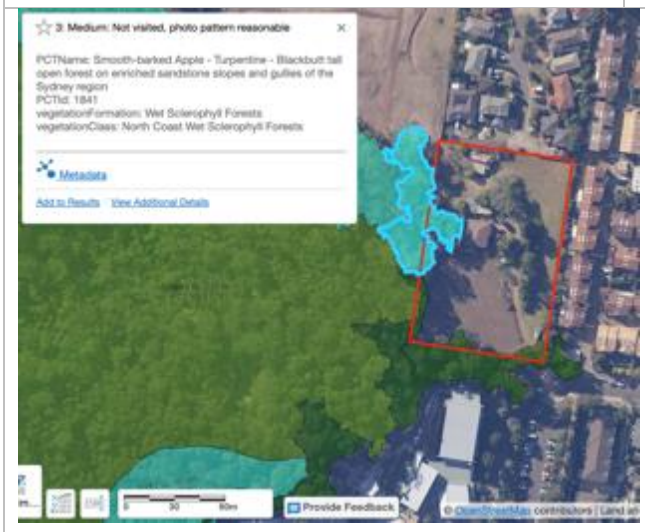



Figure 3.1c. PCT 1841 - Smooth-barked Apple - Turpentine - Blackbutt tall open forest on enriched sandstone slopes and gullies of the Sydney region. SEED 2022.

## 3.2 Threatened flora

Bionet results were compared with the list from the BAM calculator to ensure all possible species were considered.

BioNet records within 10km of the study site had 22 species currently listed as vulnerable or endangered under state and/or commonwealth legislation, out of a total of 2,013 species. The vulnerable and endangered species to focus on-site searches for can be seen in **Table 3.2** below. This is based on likelihood of occurrence.

Table 3.2. **Threatened flora recorded within a 10km radius since 1993. NSW OEH Bionet 2022.**

| Family | Scientific Name | Common Name | NSW status | Cwealth status | Records |
|---|---|---|---|---|---|
| Fabaceae | *Acacia terminalis* subsp. *Eastern Sydney* | Sunshine wattle | E1 | E | 2 |
| Rutaceae | *Boronia umbellata* | Orara Boronia | V,P | V | 1 |
| Myrtaceae | ***Callistemon linearifolius*** | **Netted Bottle Brush** | V,3 | | 10 |
| Euphorbiaceae | *Chamaesyce psammogeton* | Sand Spurge | E1 | | 14 |
| Orchidaceae | *Cryptostylis hunteriana* | Leafless Tongue Orchid | V,P,2 | V | 1 |
| Ericaceae | *Epacris purpurascens* var. *purpurascens* | | V | | 3 |
| Myrtaceae | *Eucalyptus camfieldii* | Camfield's Stringybark | V | V | 64 |
| Myrtaceae | ***Eucalyptus nicholii*** | **Narrow-leaved Black Peppermint** | V | V | 5 |
| Orchidaceae | *Genoplesium baueri* | Bauer's Midge Orchid | E1,P,2 | E | 3 |
| Grammitidaceae | *Grammitis stenophylla* | Narrow-leaf Finger Fern | E1,3 | | 2 |
| Proteaceae | *Grevillea caleyi* | Caley's Grevillea | E4A,3 | CE | 462 |
| Myrtaceae | *Kunzea rupestris* | | V | V | 1 |
| Malvaceae | *Lasiopetalum joyceae* | | V | V | 2 |
| Proteaceae | *Macadamia integrifolia* | Macadamia Nut | | V | 8 |
| Orchidaceae | *Microtis angusii* | Angus's Onion Orchid | E1,P,2 | E | 165 |
| Proteaceae | *Persoonia hirsuta* | Hairy Geebung | E1,P,3 | E | 27 |
| Thymelaeaceae | *Pimelea curviflora var. curviflora* | | V | V | 28 |
| Lamiaceae | *Prostanthera densa* | Villous Mint-bush | V | V | 1 |
| Lamiaceae | *Prostanthera marifolia* | Seaforth Mintbush | E4A,3 | CE | 1 |
| Myrtaceae | ***Rhodamnia rubescens*** | **Scrub Turpentine** | E4A | CE | 34 |
| Myrtaceae | *Syzygium paniculatum* | Magenta Lilly Pilly | E1 | V | 26 |
| Elaeocarpaceae | *Tetratheca glandulosa* | | V | | 155 |

**Note:** E = Endangered, V = Vulnerable, P = Protected.

## 3.3 Threatened fauna

A total of 553 fauna species have been recorded within 10km of the study site according to BioNet records since 1993. Of these, 70 species are currently listed as vulnerable or endangered under state and/or commonwealth legislation. The vulnerable and endangered species to focus on-site searches for can be seen in **Table 3.3** below, this is based on likelihood of occurrence.

NB: species whose habitat doesn't occur on site have been omitted from this list – those with marginal habitat have been retained on the list.

Table 3.3 **Threatened fauna recorded within a 10km radius since 1993. NSW OEH Bionet 2022.**

| Class | Scientific Name | Common Name | NSW status | Cwealth status | Records |
|---|---|---|---|---|---|
| Amphibia | ***Heleioporus australiacus*** | **Giant Burrowing Frog** | V,P | V | 89 |
| Amphibia | ***Litoria aurea*** | **Green and Golden Bell Frog** | E1,P | V | 5 |
| Amphibia | ***Pseudophryne australis*** | **Red-crowned Toadlet** | V,P | | 142 |
| Aves | ***Anthochaera phrygia*** | **Regent Honeyeater** | E4A,P | CE | 39 |
| Aves | *Ardenna carneipes* | Flesh-footed Shearwater | V,P | J,K | 3 |
| Aves | *Artamus cyanopterus cyanopterus* | Dusky Woodswallow | V,P | | 8 |
| Aves | *Botaurus poiciloptilus* | Australasian Bittern | E1,P | E | 3 |
| Aves | ***Burhinus grallarius*** | **Bush Stone-curlew** | E1,P | | 54 |
| Aves | *Calidris alba* | Sanderling | V,P | C,J,K | 8 |
| Aves | *Calidris canutus* | Red Knot | P | E,C,J,K | 2 |
| Aves | *Calidris ferruginea* | Curlew Sandpiper | E1,P | CE,C,J,K | 3 |
| Aves | *Calidris tenuirostris* | Great Knot | V,P | CE,C,J,K | 4 |
| Aves | *Callocephalon fimbriatum* | Gang-gang Cockatoo | V,P,3 | | 3 |
| Aves | *Calyptorhynchus lathami* | Glossy Black-Cockatoo | V,P,2 | | 145 |
| Aves | *Charadrius leschenaultii* | Greater Sand-plover | V,P | V,C,J,K | 3 |
| Aves | *Charadrius mongolus* | Lesser Sand-plover | V,P | E,C,J,K | 2 |
| Aves | *Daphoenositta chrysoptera* | Varied Sittella | V,P | | 5 |
| Aves | *Diomedea exulans* | Wandering Albatross | E1,P | E | 5 |
| Aves | *Esacus magnirostris* | Beach Stone-curlew | E4A,P | | 2 |
| Aves | ***Glossopsitta pusilla*** | **Little Lorikeet** | V,P | | 15 |
| Aves | *Gygis alba* | White Tern | V,P | | 1 |
| Aves | *Haematopus fuliginosus* | Sooty Oystercatcher | V,P | | 27 |
| Aves | *Haematopus longirostris* | Pied Oystercatcher | E1,P | | 7 |
| Aves | ***Haliaeetus leucogaster*** | **White-bellied Sea-Eagle** | V,P | | 54 |
| Aves | ***Hieraaetus morphnoides*** | **Little Eagle** | V,P | | 9 |
| Aves | ***Hirundapus caudacutus*** | **White-throated Needletail** | P | V,C,J,K | 19 |

| Class | Scientific Name | Common Name | NSW status | Cwealth status | Records |
|---|---|---|---|---|---|
| Aves | *Ixobrychus flavicollis* | Black Bittern | V,P | | 26 |
| Aves | ***Lathamus discolor*** | **Swift Parrot** | E1,P,3 | CE | 33 |
| Aves | *Lophoictinia isura* | Square-tailed Kite | V,P,3 | | 6 |
| Aves | *Macronectes giganteus* | Southern Giant Petrel | E1,P | E | 2 |
| Aves | *Macronectes halli* | Northern Giant-Petrel | V,P | V | 1 |
| Aves | *Melithreptus gularis gularis* | Black-chinned Honeyeater (eastern subspecies) | V,P | | 1 |
| Aves | *Neophema pulchella* | Turquoise Parrot | V,P,3 | | 3 |
| Aves | *Ninox connivens* | Barking Owl | V,P,3 | | 39 |
| Aves | ***Ninox strenua*** | **Powerful Owl** | V,P,3 | | 650 |
| Aves | *Numenius madagascariensis* | Eastern Curlew | P | CE,C,J,K | 10 |
| Aves | *Onychoprion fuscata* | Sooty Tern | V,P | | 3 |
| Aves | ***Pandion cristatus*** | **Eastern Osprey** | V,P,3 | | 31 |
| Aves | *Petroica boodang* | Scarlet Robin | V,P | | 3 |
| Aves | *Ptilinopus magnificus* | Wompoo Fruit-Dove | V,P | | 2 |
| Aves | *Ptilinopus regina* | Rose-crowned Fruit-Dove | V,P | | 3 |
| Aves | *Ptilinopus superbus* | Superb Fruit-Dove | V,P | | 5 |
| Aves | *Puffinus assimilis* | Little Shearwater | V,P | | 2 |
| Aves | *Rostratula australis* | Australian Painted Snipe | E1,P | E | 3 |
| Aves | *Sternula albifrons* | Little Tern | E1,P | C,J,K | 2 |
| Aves | *Thalassarche cauta* | Shy Albatross | V,P | V | 4 |
| Aves | *Thalassarche chrysostoma* | Grey-headed Albatross | P | E | 1 |
| Aves | *Thalassarche melanophris* | Black-browed Albatross | V,P | V | 5 |
| Aves | ***Tyto novaehollandiae*** | **Masked Owl** | V,P,3 | | 8 |
| Aves | *Tyto tenebricosa* | Sooty Owl | V,P,3 | | 2 |
| Aves | *Xenus cinereus* | Terek Sandpiper | V,P | C,J,K | 2 |
| Mammalia | ***Cercartetus nanus*** | **Eastern Pygmy-possum** | V,P | | 534 |
| Mammalia | *Chalinolobus dwyeri* | Large-eared Pied Bat | V,P | V | 23 |
| Mammalia | ***Dasyurus maculatus*** | **Spotted-tailed Quoll** | V,P | E | 18 |
| Mammalia | ***Falsistrellus tasmaniensis*** | **Eastern False Pipistrelle** | V,P | | 3 |

| Class | Scientific Name | Common Name | NSW status | Cwealth status | Records |
|---|---|---|---|---|---|
| Mammalia | ***Isoodon obesulus obesulus*** | **Southern Brown Bandicoot (eastern)** | E1,P | E | 63 |
| Mammalia | ***Micronomus norfolkensis*** | **Eastern Coastal Free-tailed Bat** | V,P | | 28 |
| Mammalia | ***Miniopterus australis*** | **Little Bent-winged Bat** | V,P | | 82 |
| Mammalia | ***Miniopterus orianae oceanensis*** | **Large Bent-winged Bat** | V,P | | 191 |
| Mammalia | ***Myotis macropus*** | **Southern Myotis** | V,P | | 62 |
| Mammalia | ***Petaurus norfolcensis*** | **Squirrel Glider** | V,P | | 8 |
| Mammalia | ***Phascolarctos cinereus*** | **Koala** | V,P | V | 75 |
| Mammalia | *Pseudomys novaehollandiae* | New Holland Mouse | P | V | 5 |
| Mammalia | ***Pteropus poliocephalus*** | **Grey-headed Flying-fox** | V,P | V | 246 |
| Mammalia | *Saccolaimus flaviventris* | Yellow-bellied Sheathtail-bat | V,P | | 3 |
| Mammalia | *Scoteanax rueppellii* | Greater Broad-nosed Bat | V,P | | 11 |
| Mammalia | *Vespadelus troughtoni* | Eastern Cave Bat | V,P | | 2 |
| Reptilia | *Caretta caretta* | Loggerhead Turtle | E1,P | E | 6 |
| Reptilia | *Chelonia mydas* | Green Turtle | V,P | V | 14 |
| Reptilia | **Varanus rosenbergi** | **Rosenberg's Goanna** | V,P | | 115 |

## 3.4 Endangered Populations

Two (2) **endangered populations** have been recorded to occur within 10km of the site. Table 3.4 identifies the populations.

The endangered populations are unlikely to be within the study site or a corridor linking populations to those communities. No further assessment is required for these communities.

**Table 3.4. Endangered Populations within 10km of site.**

| Family | Scientific Name | Common Name | NSW status | Cwealth status | Records |
|---|---|---|---|---|---|
| Mammalia | *Petaurus norfolcensis* | Squirrel Glider on Barrenjoey Peninsula, north of Bushrangers Hill | E2,V,P | | 1 |
| Mammalia | *Phascolarctos cinereus* | Koala in the Pittwater Local Government Area | E2,V,P | V | 70 |

***Likelihood of occurrence***

*The likelihood of occurrence is a broad categorisation used by Kingfisher to indicate the potential for a species to occur within the study area. It is based on expert opinion and implies the relative value of a study area for a species. See Appendix III for rationale of likelihood of occurrence.*

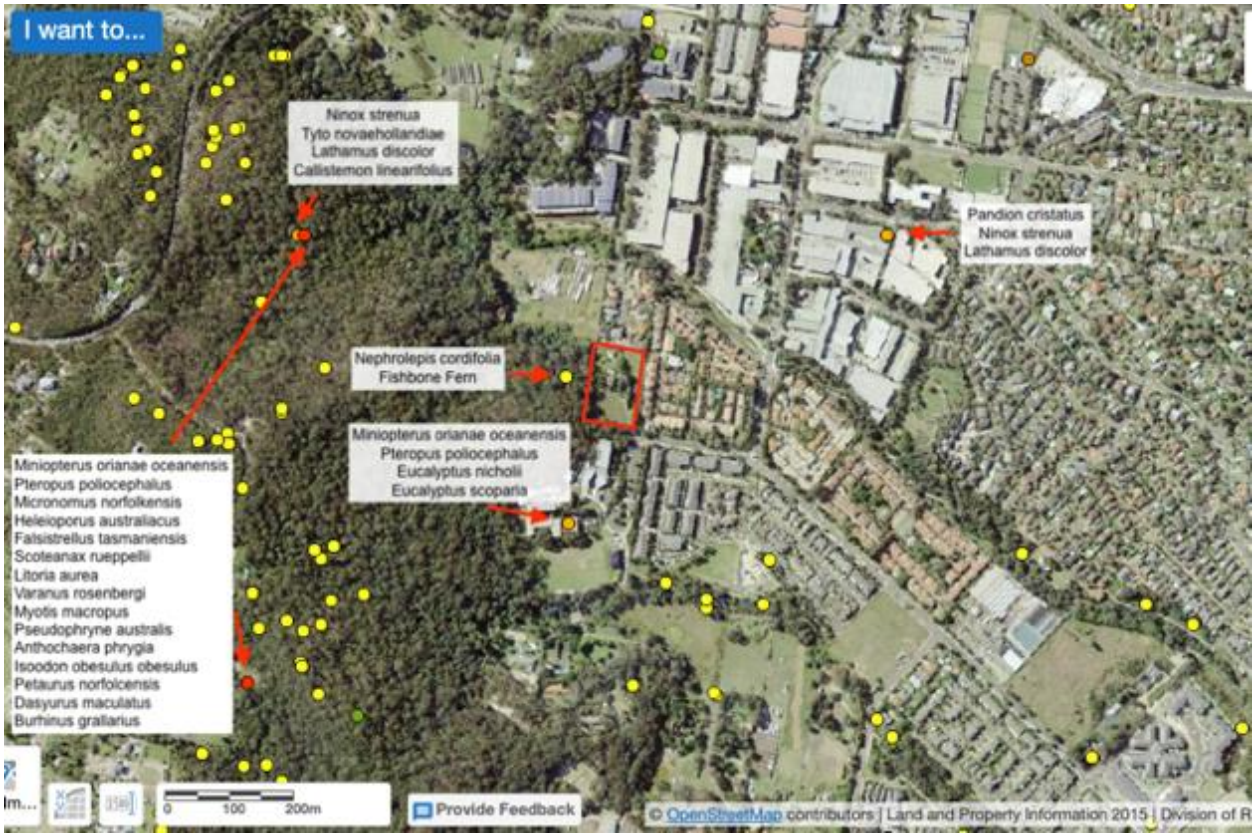



Figure 3.2. Threatened species sighted. Source: SEED 2022.

# 4 Impacts

## 4.1 Direct Impacts

### 4.1.1 Tree and Vegetation removal

Trees proposed for removal, according to arborist assessment, include 11 native tree species and two Cheese Trees (Glochidion ferdinandi). Native ground and midstory will be removed for the rear cut/fill perimeter road / APZ. This has been moved further east (downslope to retain trees 21, 23 and 24 (*A. costata*).

- T11, 20, 22 and 25 – *Angophora costata* (x4)
- T30, 33 – *Eucalyptus robusta* (Swamp Mahogany) (x2)
- T17,18,19 – *Corymbia gummifera* (Red Bloodwoods) (x3)
- T34, 39 – *Eucalyptus botryoides* (x2)
- T2, 27 – *Glochidion ferdinandi* (x2)

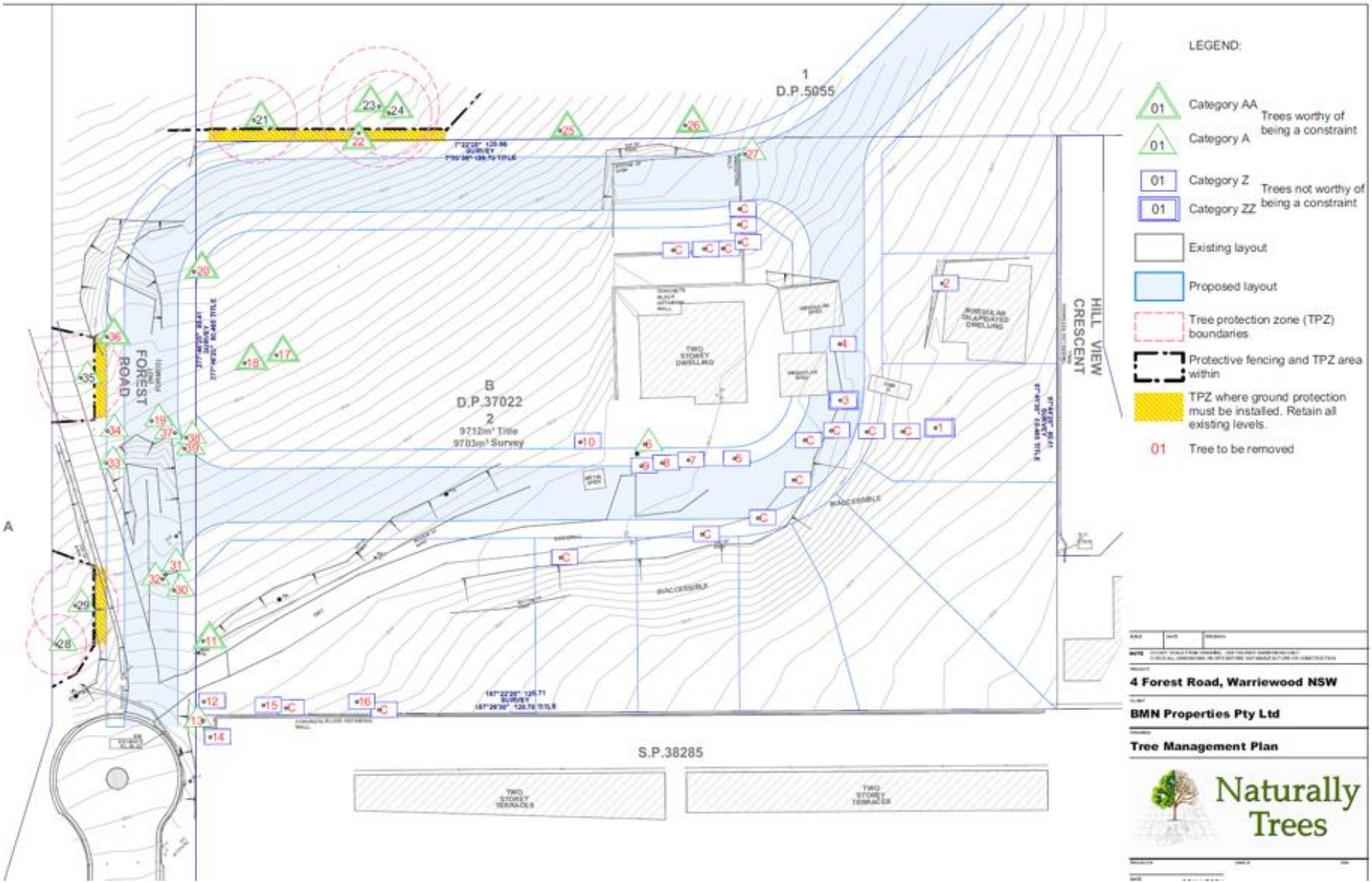



Figure 4.1. Tree Management Plan. Source: Naturally Trees 06/11/2021

**Table 1: Summary of existing trees and trees that may be affected by development**

| Impact | Reason | Important trees | | Unimportant trees | |
|---|---|---|---|---|---|
| | | AA | A | Z | ZZ |
| Retained trees that may be affected through disturbance to TPZs | Removal of existing surfacing/structures/ landscaping and/or installation of new surfacing/structures/ landscaping | 21, 23, 24 | 28, 29, 35 | | |
| Trees to be removed | Civil and road construction and/or level variations within TPZ | 11, 17, 18, 20, 25, 26, 36 | 6, 13, 19, 22, 27, 30, 31, 32, 33, 34, 37, 38, 39 | 2, 4, 5, 7, 8, 9, 10, 12, 14, 15, 16, C | 1, 3 |

Many of the trees to removed are exotics as can be seen in the tables extracted from the Arborist report

3.2 **Detailed impact appraisal**

3.2.1 **Category AA and A trees to be lost:** The proposed development will necessitate the removal of twenty high category trees (Trees 6, 11, 13, 17, 18, 19, 20, 22, 25, 26, 27, 30, 31, 32, 33, 34, 36, 37, 38 and 39). These trees are considered moderate to high significance and display good health and condition. In order to compensate for loss of amenity, consideration should be given to replacement planting within the site.

3.2.2 **Category AA and A trees that could potentially be adversely affected through TPZ disturbance:** Six category A and AA trees (Trees 21, 23, 24, 28, 29 and 35) could potentially be adversely affected through disturbance to their TPZs as follows:

- Trees 21, 23, 24, 28 and 35: These are important trees with a high potential to contribute to amenity so any adverse impacts on them should be minimised. The proposed road construction will impede within the TPZ of these trees by 18%, 16%, 13% and 14% respectively and is expected to have a moderate level of impact.

## APPENDIX 2
### Tree schedule

NOTE: Colour annotation is AA & A trees with green background; Z & ZZ trees with blue background; trees to be removed in red text.

| No. | Genus species | Height | Spread | DBH | TPZ | Foliage % | Age class | Defects/Comment | Location | Services | Significance | Tree AZ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | *Morus sp.* | 9 | 12 | 500 | **6.0** | 60% | O | Borer, Lopped, Epicormic growth | Grass | Nil | M | **ZZ5** |
| 2 | *Glochidion ferdinandi* | 5 | 5 | 150 | **2.0** | 90% | S | Nil | Grass | Adj. building | L | **Z1** |
| 3 | *Morus sp.* | 7 | 9 | 300 | **3.6** | 70% | O | Failures, Decayed trunk base | Grass | Nil | M | **ZZ5** |
| 4 | *Eriobotrya japonica* | 7 | 5 | 250 | **3.0** | 80% | M | Nil | Grass | Nil | L | **Z3** |
| 5 | *Bauhinia galpinii* | 10 | 8 | 300 | **3.6** | 80% | M | Epicormic growth throughout canopy | Grass | Nil | M | **Z9** |
| 6 | *Araucaria heterophylla* | 16 | 5 | 400 | **4.8** | 80% | M | Nil | Grass | Nil | M | **A1** |
| 7 | *Cupressus sp.* | 8 | 5 | 250 | **3.0** | 70% | M | Poor form | Grass | Nil | M | **Z10** |
| 8 | *Cupressus sp.* | 8 | 5 | 250 | **3.0** | 70% | M | Poor form | Grass | Nil | M | **Z10** |
| 9 | *Cupressus sp.* | 8 | 5 | 250 | **3.0** | 70% | M | Poor form | Grass | Nil | M | **Z10** |
| 10 | *Syagrus romanzoffiana* | 10 | 5 | 300 | **3.6** | 90% | M | Nil | Grass | Nil | M | **Z3** |
| 11 | *Angophora costata* | 18 | 18 | 600 | **7.2** | 90% | M | Nil | Grass | Adj. structure | H | **AA1** |
| 12 | *Syagrus romanzoffiana* | 10 | 5 | 300 | **3.6** | 90% | M | Nil | Grass | Nil | M | **Z3** |
| 13 | *Araucaria heterophylla* | 14 | 6 | 300 | **3.6** | 80% | M | Nil | Garden bed | Adj. structure | M | **A1** |
| 14 | *Cupressus sp.* | 9 | 4 | 200 | **2.4** | 80% | S | Nil | Garden bed | Nil | M | **Z3** |
| 15 | *Schefflera actinophylla* | 9 | 7 | 200 | **2.4** | 80% | M | Co-dominant | Grass | Nil | M | **Z3** |
| 16 | *Schefflera actinophylla* | 9 | 7 | 200 | **2.4** | 80% | M | Co-dominant | Grass | Nil | M | **Z3** |
| 17 | *Corymbia gummifera* | 24 | 14 | 450 | **5.4** | 80% | M | Nil | Grass | Nil | H | **AA1** |
| 18 | *Corymbia gummifera* | 26 | 20 | 500 | **6.0** | 80% | M | Nil | Grass | Nil | H | **AA1** |
| 19 | *Corymbia gummifera* | 18 | 15 | 600 | **7.2** | 80% | M | Nil | Natural ground | Nil | H | **A1** |
| 20 | *Angophora costata* | 22 | 16 | 500 | **6.0** | 90% | M | Nil | Natural ground | Nil | H | **AA1** |
| 21 | *Angophora costata* | 22 | 16 | 500 | **6.0** | 90% | M | Nil | Natural ground | Nil | H | **AA1** |

| No. | Genus species | Height | Spread | DBH | TPZ | Foliage % | Age class | Defects/Comment | Location | Services | Significance | Tree AZ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22 | *Angophora costata* | 28 | 22 | 700 | **8.4** | 90% | M | Nil | Natural ground | Nil | H | **AA1** |
| 23 | *Angophora costata* | 28 | 22 | 700 | **8.4** | 90% | M | Nil | Natural ground | Nil | H | **AA1** |
| 24 | *Angophora costata* | 20 | 16 | 500 | **6.0** | 90% | M | Nil | Natural ground | Nil | H | **AA1** |
| 25 | *Angophora costata* | 20 | 16 | 500 | **6.0** | 90% | M | Nil | Natural ground | Nil | H | **AA1** |
| 26 | *Angophora costata* | 20 | 16 | 500 | **6.0** | 90% | M | Nil | Natural ground | Nil | H | **AA1** |
| 27 | *Glochidion ferdinandi* | 8 | 9 | 250 | **3.0** | 80% | M | Nil | Garden | Nil | M | **A1** |
| 28 | *Angophora costata* | 14 | 10 | 350 | **4.2** | 80% | M | Nil | Grass | Nil | M | **A1** |
| 29 | *Eucalyptus robusta* | 18 | 16 | 500 | **6.0** | 90% | M | Nil | Garden | Nil | H | **A1** |
| 30 | *Eucalyptus robusta* | 9 | 6 | 300 | **3.6** | 80% | S | Nil | Natural ground | Nil | M | **A1** |
| 31 | *Corymbia gummifera* | 9 | 6 | 250 | **3.0** | 80% | M | Nil | Natural ground | Nil | M | **A1** |
| 32 | *Angophora costata* | 10 | 8 | 300 | **3.6** | 80% | M | Nil | Natural ground | Nil | M | **A1** |
| 33 | *Eucalyptus robusta* | 8 | 4 | 250 | **3.0** | 80% | S | Nil | Natural ground | Adj. driveway | M | **A1** |
| 34 | *Eucalyptus botryoides* | 14 | 14 | 600 | **7.2** | 80% | M | Nil | Natural ground | Adj. driveway | H | **A1** |
| 35 | *Angophora costata* | 10 | 8 | 300 | **3.6** | 80% | M | Nil | Natural ground | Adj. driveway | M | **A1** |
| 36 | *Angophora costata* | 20 | 16 | 500 | **6.0** | 80% | M | Nil | Natural ground | Nil | H | **AA1** |
| 37 | *Eucalyptus robusta* | 8 | 4 | 150 | **2.0** | 80% | S | Nil | Natural ground | Nil | L | **A1** |
| 38 | *Angophora costata* | 10 | 6 | 300 | **3.6** | 80% | M | Co-dominant | Natural ground | Nil | M | **A1** |
| 39 | *Eucalyptus botryoides* | 7 | 8 | 300 | **3.6** | 80% | M | Leaning | Natural ground | Nil | M | **A1** |
| C | *Syagrus romanzoffiana* | 10 | 5 | 300 | **3.6** | 90% | M | Represents similar exempt palms | Grass | Nil | M | **Z3** |

It is recommended that offset planting occur on site. Plantings should aim to replace the canopy in alignment with requirements of Bushfire.

Trees 17 and 19 – *Corymbia gummifera* (Red Bloodwoods) proposed for removal with Sheoaks juveniles among these and ground cover of Bracken, Lomandra and Kangaroo Grass.

## 4.2 Indirect Impacts

The proposed actions may result in a range of indirect impacts affecting species or communities.

### 4.2.1 Loss of Breeding Opportunities

Works in the site may result in temporary-reduced breeding opportunities for locally occurring native species including amphibians, reptiles, birds, mammals and invertebrates through the production of construction noise and vegetation removal.

### 4.2.2 Weed growth and invasion

Weed species may arise within the direct works zone and surrounding landscaped areas through soil disturbance or by being brought in as seed on work machinery, tools, equipment and worker clothes (e.g. boots). Soil disturbance combined with the elevated nutrients and increased light exposure may result in increased weed growth, aggravated by the high abundance of weeds present pre-works.

### 4.2.3 Introduction of pathogens

The introduction of pathogens may occur into the site, , via machinery, tools, equipment and worker clothing (e.g. boots). Diseases to watch out for include Phytophthora (also known as Root Rot – type of water mould) and Myrtle Rust (*Puccinia psidii* – type of fungus). See Appendix for methods to control selected pathogens.

#### 4.2.4 Noise

The proposed actions may result in noise which may result in minor disturbance to sensitive fauna in the local canopy.

#### 4.2.5 Runoff

The proposed actions may result in transport of sediment from the work zones as a result of increased storm water runoff.

# 5 Recommendations

## 5.1 Mitigation Measures

The following mitigation measures have been suggested with approval of the subdivision.

#### 5.1.1 Tree Protection

Tree protection will be installed. See final arborist report for details of works and tree numbers.

#### 5.1.2 Delineation of Work areas

During construction of any infrastructure associated with the subdivision the delineation of works zones, adjacent vegetation is required to minimise impact.

Flagging tape to be placed along the maximum disturbance area. Works are to be from the cleared area of land and reaching in towards the bushland area.

Access will be restricted to already disturbed open areas.

#### 5.1.3 Seed collection and Transplanting

Seed collection is to occur from any native trees and grasses that are removed. Seed to be collected form each species and saved in material or paper bags and provided to the site ecologist or Northern Beaches Council.

Transplanting of patches of Kangaroo Grass from areas that will be impacted by subdivision works (road and APZ) can occur. People doing restoration works elsewhere may take the grasses and plant elsewhere.

#### 5.1.4 Care of Bushland Areas Long-term

Bushland regeneration is to occur on the bushland edge and bushland that is retained within the community land/assets. The bushland on site displaying signs of high resilience. A Vegetation Mgt Plan can be provided prior to sub-division certification. The VMP can had a section for subdivision and one for post site development of individual lots.

Plantings of tube stock across the site from locally native ground and shrub species is recommended and this is to be in accordance with Asset Protection Zone requirements.

### 5.1.5 Erosion and runoff

Where required, sediment controls will be put in place. These will include, but not be limited to sediment fences, jute matting and crushed sandstone. Sediment controls will be reviewed during site inspections and/or after significant rainfall (more than 10mm in 24hrs resulting in site runoff).

### 5.1.6 Weed management

Weed species are present and must be appropriately managed so they do not spread. There must be continuous maintenance of the native vegetation onsite otherwise it may result in increased weed growth, exacerbated by the high abundance of weeds present pre-works.

Weeds will colonize and pioneer on any cleared grounds so must be managed throughout the duration of the project as well as on-going post woks.

### 5.1.7 Weed Removal Techniques

Weed removal proposed for the site will consist of hand removal techniques, manual/mechanical removal using bush regenerator tools and winter thermal (flame) weeding. This approach will reduce the amount of herbicide used and reduce the amount of off-target damage through spot on application.

Woody perennial weeds less than 2 metres in height will require cut and paint or scrape and paint bush regenerator techniques based on the germinating/epicormic behaviour of the plant (especially plants that tend to coppice or sucker).

It is recommended that seed heads are removed prior to commencement of primary works. This would be best performed carefully by hand with secateurs with the aim of avoiding the spread flowers or seeds into planting zones. See Appendix for further details.

### 5.1.8 Nest boxes

Although it is not critical, installation of a single nest box designed for microbats should be added to the site to replace potential loss of roosting habitat.

Image from: nestboxes.com.au

### 5.1.9 Pathogen prevention

To prevent the introduction of pathogens, Bushland Hygiene Protocols outlined in Appendix II should be followed. The site is considered to be an area which may promote the spread of Phytophthora (a group of fungus-like diseases affecting plants) due to its moist soil and proximity to water. It is recommended that Bushland Hygiene Protocols be followed closely.

Phytophthora infected vegetation. (Image by Rasbak, licensed under the Creative Commons Attribution-Share Alike 3.0 Unported, 2.5 Generic, 2.0 Generic and 1.0 Generic license.)

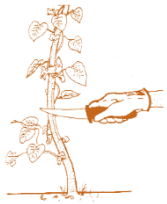
Myrtle Rust generally infects new leaf growth. (Image by John Tann, licensed under the Creative Commons Attribution 2.0 Generic license.)

# 6 Appendices

## 6.1 Appendix I– Key Weed Removal Methods

**Physical removal**

| Technique | Method | Equipment |
|---|---|---|
| Hand Removal  | Seedlings and smaller weed species where appropriate will be pulled out by hand, without risk of injury to workers. The size that this can occur varies throughout the treatment area. Generally, it ranges from post seed to approximately 300mm in height.<br><br>Rolling and raking is suitable for larger infestations of Wandering Jew. The weed can be raked and stems and plants parts rolled. The clump of weed material can then be bagged and removed from site. | Tools: Gloves, Rakes, Knife and<br><br>Weed Bags |
| Crowning  | Plants that possess rhizomes or bulbs might not respond to various removal techniques and may need to be treated with crowning.<br><br>A knife, mattock or trowel is to be driven into the soil surrounding the bulb or rhizome at an angle of approximately 45 degrees with surrounding soil, so as to cut any roots that may be running off. This is to occur in 360 degrees around the bulb/rhizome. The rhizome or bulb is to be bagged and removed from the site and disposed of at an appropriate waste recycling facility<br><br>Soil disturbance is to be kept to a minimum when using this technique. | Tools: Knife, mattock, trowel, impervious gloves, and all other required P.P.E. |

| Technique | Method | Equipment |
|---|---|---|
| Cut and Paint Stems  | Weed species deemed unsuitable for hand removal shall be cut. Those that have persistent of vigorous growth will be cut and painted with Roundup® Biactive Herbicide or equivalent.<br><br>Juvenile and smaller weed species will be cut with secateurs at base of plant, and herbicide applied via applicator bottle. Stem to be cut horizontally as close to the ground as possible, using secateurs, loppers or a pruning saw. Horizontal cuts to be made on top of stem to prevent the herbicide running off the stump.<br><br>Apply herbicide to the cut stem immediately, within 10-20 seconds, before the plant cells close and the translocation of the herbicide is limited. Herbicide is not to reach sediment or surrounding non-targeting plants. | Tools: loppers, secateurs, pruning saw, herbicide applicator/sprayer, impervious gloves, Roundup® Biactive Herbicide and all other required P.P.E. |
| Scrape and Painting  | More resilient weed species, where other techniques are less reliable are to be scraped with a knife or chisel and painted with undiluted Roundup® Biactive Herbicide. Works to be carried out by a contractor with a current herbicide license.<br><br>Weed species will be scraped with a knife or chisel up the length of the trunk, and herbicide applied via applicator bottle. Scrape the trunk from as close to the ground as possible to approximately ¾ of the plants height. Where trunk diameters exceed approximately 5 cm a second scrape shall be made on the other side of the trunk.<br><br>Apply undiluted herbicide to the cut trunk immediately, within 10-20 seconds, before the plant cells close and the translocation of the herbicide is limited. All care must be taken by the contractor not to spill herbicide onto sediment or surrounding non-targeting plants.<br><br>Follow up treatment may be required. If plants resprout, scrape and paint the shoots using the same method after sufficient regrowth has occurred. | Tools: knife, chisel, protective clothing, safety glasses herbicide applicator/sprayer, impervious gloves, Roundup® Biactive Herbicide, and all other required P.P.E. |

| Technique | Method | Equipment |
|---|---|---|
| Cut with a Chainsaw and Paint  | Larger size weed species, too large for cutting with hand tools, shall be cut with a chainsaw and painted with undiluted Roundup® Biactive Herbicide. Works to be carried out by a contractor with a current chainsaw and herbicide license.<br><br>Larger weed species will be cut with a chainsaw at base of plant, and herbicide applied via applicator bottle. Cut the stem horizontally as close to the ground as possible, using the chainsaw. Remove upper branches to reduce bulk of plant.<br><br>If cutting at the base is impractical, cut higher to get rid of the bulk of the weed, then cut again at the base and apply herbicide. Make cuts horizontal to prevent the herbicide running off the stump. Apply undiluted herbicide to the cut trunk immediately, within 10-20 seconds, before the plant cells close and the translocation of the herbicide is limited. Ensure there is no runoff of poison. All care must be taken by the contractor not to spill herbicide into water, onto sediment, or surrounding non-targeting plants.<br><br>Follow up treatment will be required. If plants resprout, cut and paint the shoots using the same method. | Tools: chainsaw, ear muffs, protective clothing, safety glasses herbicide applicator/sprayer, impervious gloves, Roundup® Biactive Herbicide, and all other required P.P.E. |
| Spot Spraying | Spot spraying involves spraying non-seeding annuals and grasses, and for regrowth of weeds once an area has been cleared or brushcut. Works to be carried out by a contractor with a current herbicide license.<br><br>Herbicide will be mixed up according to the manufacturer's directions for the particular weed species being targeted. Mixed herbicide shall be applied to the targeted weed species with a backpack sprayer. All care must be taken by the contractor not to spill herbicide onto sediment or surrounding non-targeting plants. | Tools: protective clothing, safety glasses, herbicide sprayer, impervious gloves, Herbicide, and all other required P.P.E. |

## 6.2 Appendix II– Bushland Hygiene Protocols for Phytophthora

- Always assume that the area you are about to work in is free of the disease and therefore needs to be protected against infection.
- And, always assume that the activity you are about to undertake has the potential to introduce the disease.
- Arrive at site with clean shoes, i.e.: no dirt encrusted on them.
- If you arrive with shoes that are encrusted with dirt, they will have to be completely soaked in metho or disinfectant and allow a few minutes to completely soak in. NEVER scrape untreated dirt off your shoes onto the ground.
- Before you move onto the site spray the bottom of your shoes with 70 % metho. Bleach solution (1% strength) or household/commercial disinfectant (as per label) are also suitable.
- Check all tools and equipment that comes in contact with soil are clean before entering the area (they should have been cleaned on site at the end of the previous work session). If there is any dirt on them, spray them with 70% metho.
- Clean all tools at the end of each work session while still on site ensuring this is done away from drainage lines and adjacent work areas. Knock or brush off encrusted dirt and completely spray with 70 % metho. Replace in storage/transport containers.
- Preferably compost all weed material on site.
- Never drag vegetation with exposed roots and soil through bushland.
- When removing weeds from site, remove as much soil as possible from them in the immediate work area and carefully place vegetative material into plastic bags.
- Try not to get the bag itself dirty; don't put it on/in a muddy area.
- Always work from the lower part of a slope to the upper part.
- Always work in areas known to be free of the pathogen before working in infected areas.
- Minimise activities wherever possible when the soil is very wet.
- Vehicles should not be driven off track or into reserves (unless vehicle decontamination is carried out before and after entering a single work site)
- Only accredited supplies of plants/mulch to be used.

**Kit should contain:** 1 bucket, 1 scrubbing brush, 1 spray bottle (metho 70% solution), 1 bottle tap water, 1 bottle methylated spirits.

## Facts about Phytophthora

*Phytophthora cinnamomi* (Phytophthora) is a microscopic, soil borne, water-mould that has been implicated in the death of remnant trees and other plants in Australian bushland. Phytophthora is not native to Australia. It is believed to have been introduced sometime after European settlement. Phytophthora is a national problem and is listed as a key threatening process under the Commonwealth's Environmental Protection and Biodiversity Conservation Act 1999.

"Dieback" simply means dying or dead plants. There are many causes of dieback; Phytophthora is just one of them. Often dieback is the result of a combination of factors such as; changed drainage patterns and nutrient loads (e.g.: increased stormwater run-off) or changed soil conditions (e.g.: dumped fill or excavation of/near root zone). Plants that are stressed are more vulnerable to Phytophthora.

## 6.3 Appendix III – Threatened species likelihood of occurrence

Appendix III is based on BioNet records within 10km of the study site. The following flora and fauna species are currently listed as vulnerable or endangered under state and/or commonwealth legislation. The likelihood of occurrence for the flora and fauna species is listed below.

Table 7.1 – Threatened flora species likelihood of occurrence ***please see species with no "Site Suitability"***

| Family | Scientific Name | Common Name | Habitat Requirements | Site Suitability |
|---|---|---|---|---|
| Fabaceae | *Acacia terminalis* subsp. *Eastern Sydney* | Sunshine wattle | Coastal scrub and dry sclerophyll woodland on sandy soils. Habitat is generally sparse and scattered. Most areas of habitat or potential habitat are small and isolated. Most sites are highly modified or disturbed due to surrounding urban development. Flowers in autumn but may be through to early winter. Small birds and bees are natural pollinators. Seeds mature in November and are dispersed by ants. Seed viability is high and recruitment occurs mainly after fire. A fire temperature of 60 degrees is required for optimum germination. Although plants are killed by fire, they have been recorded sprouting from the base. | Surveyed for and not present |
| Rutaceae | *Boronia umbellata* | Orara Boronia | This Boronia grows as an understorey shrub in and around gullies in wet open forest. It appears to regenerate well after disturbance, but it is not known whether prolonged or repeated disturbance affects long-term persistence. | Surveyed for and not present |
| Myrtaceae | *Callistemon linearifolius* | Netted Bottle Brush | For the Sydney area, recent records are limited to the Hornsby Plateau area near the Hawkesbury River. The species was more widespread in the past, and there are currently only 5-6 populations remaining from the 22 populations historically recorded in the Sydney area. Three of the remaining populations are reserved in Ku-ring-gai Chase National Park, Lion Island Nature Reserve and Spectacle Island Nature Reserve. The species has also been recorded from Yengo National Park. Grows in dry sclerophyll forest on the coast and adjacent ranges. Flowers in spring to summer. | Surveyed for and not present. |

| Family | Scientific Name | Common Name | Habitat Requirements | Site Suitability |
|---|---|---|---|---|
| Euphorbiaceae | *Chamaesyce psammogeton* | Sand Spurge | Grows on fore-dunes, pebbly strandlines and exposed headlands, often with Spinifex (*Spinifex sericeus*) and Prickly Couch (*Zoysia macrantha*). Flowering recorded in spring and summer. Sand Spurge seeds float, so some dispersal between beaches may occur. Longevity of the species is approximately 5–30 years with a primary juvenile period of less than 1 year. Plant growth occurs in spring and summer. | No habitat |
| Orchidaceae | *Cryptostylis hunteriana* | Leafless Tongue Orchid | Does not appear to have well defined habitat preferences and is known from a range of communities, including swamp-heath and woodland. It appears to prefer open areas in the understorey and is often found in association with the Large Tongue Orchid and the Tartan Tongue Orchid. | Surveyed for and not present |
| Ericaceae | *Epacris purpurascens* var. *purpurascens* | | Found in a range of habitat types, most of which have a strong shale soil influence. These include ridgetop drainage depressions supporting wet heath within or adjoining shale cap communities e.g. Stringybark and Ironbark woodlands, various shale/sandstone transition forest associations including Turpentine Ironbark Margin Forest, Stringybark/ Scribbly Gum Woodland and Scribbly Gum/ Grey Gum/ Red Bloodwood Woodland. The species also occurs in riparian zones draining into Sydney Sandstone Gully Forest, shale lenses within sandstone habitats and colluvial areas overlying or adjoining sandstone or tertiary alluvium. | No habitat |
| Myrtaceae | *Eucalyptus camfieldii* | Camfield's Stringybark | Restricted distribution at Norah Head, Peats Ridge, Mt Colah, Elvina Bay Trail (West Head), Terrey Hills, Killara, North Head, Menai, Wattamolla and a few other sites in Royal National Park. Recorded in poor coastal country in shallow sandy soils overlying Hawkesbury sandstone. Coastal heath mostly on exposed sandy ridges. Occurs mostly in small scattered stands near the boundary of tall coastal heaths and low open woodland of the slightly more fertile inland areas. Associated species frequently include stunted species | Not habitat and surveyed for and not present |

| Family | Scientific Name | Common Name | Habitat Requirements | Site Suitability |
|---|---|---|---|---|
| | | | of *E. oblonga* Narrow-leaved Stringybark, *E. capitellata* Brown Stringybark and *E. haemastoma* Scribbly Gum. | |
| Myrtaceae | *Eucalyptus nicholii* | Narrow-leaved Black Peppermint | It occurs in grassy or sclerophyll woodland in association with many other eucalypts that grow in the area, including *E. andrewsii* and many of the stringybarks, such as *E. caliginosa*. Grows on shallow relatively infertile soils on shales and slates; Niangala to Glen Innes. The distribution of this species overlaps with the following EPBC Act-listed threatened ecological communities: White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland, and Upland Wetlands of the New England Tablelands and the Monaro Plateau. | Surveyed for and not present |
| Orchidaceae | *Genoplesium baueri* | Bauer's Midge Orchid | Grows in dry sclerophyll forest and moss gardens over sandstone. | No habitat in possibly impact areas |
| Grammitidaceae | *Grammitis stenophylla* | Narrow-leaf Finger Fern | Moist places, usually near streams, on rocks or in trees, in rainforest and moist eucalypt forest. | No habitat in possibly impact areas |
| Proteaceae | *Grevillea caleyi* | Caley's Grevillea | Restricted to an 8 km square area around Terrey Hills, approximately 20 km north of Sydney. Occurs in three major areas of suitable habitat, namely Belrose, Ingleside and Terrey Hills/Duffys Forest within the Ku-ring-gai, Pittwater and Warringah Local Government Areas. Recorded existing on the ridgetop between elevations of 170 to 240m asl, in association with laterite soils and a vegetation community of open forest, generally dominated by *Eucalyptus sieberi* and *E. gummifera*. | Surveyed for and not present. No habitat in possibly impact areas |
| Myrtaceae | *Kunzea rupestris* | | Grows in shallow depressions on large flat sandstone rock outcrops. Characteristically found in short to tall shrubland or heathland. Flowering occurs in spring. It has indehiscent fruits which resist soil entrapment and so may disperse many metres per week. Resprouts | No habitat in possibly impact areas |

| Family | Scientific Name | Common Name | Habitat Requirements | Site Suitability |
|---|---|---|---|---|
| | | | from the base after fire or mechanical damage. Seedlings have also been observed after fire. | |
| Malvaceae | *Lasiopetalum joyceae* | | Grows in heath on sandstone. Flowers in spring. The distribution of this species overlaps with the following EPBC Act-listed threatened ecological communities: Shale/ Sandstone Transition Forest, White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland, and Turpentine-Ironbark Forest in the Sydney Basin Bioregion. | No habitat in possibly impact areas |
| Proteaceae | *Macadamia integrifolia* | Macadamia Nut | | Not suitable |
| Orchidaceae | *Microtis angusii* | Angus's Onion Orchid | Currently known from only one site at Ingleside, north of Sydney. The Ingleside population occurs on soils that have been modified but were originally those of the restricted ridgetop lateritic soils in the Duffys Forest - Terrey Hills - Ingleside and Belrose areas. | Surveyed for and not present. No habitat in possibly impact areas |
| Proteaceae | *Persoonia hirsuta* | Hairy Geebung | Usually found in sandy soils in dry sclerophyll open forest, woodland and heath on sandstone. Usually present as isolated individuals or very small populations. Habitat Preferences: It also favours disturbed heath, shrubby thickets and sandstone scrubs. | Surveyed for and not present. No habitat in possibly impact areas |
| Thymelaeaceae | *Pimelea curviflora* var. *curviflora* | | Occurs on shaley/lateritic soils over sandstone and shale/ sandstone transition soils on ridgetops and upper slopes amongst woodlands. Also recorded in Illawarra Lowalnd Grassy Woodland habitat at Albion Park on the Illawaraa coastal plain. Flowers October to May. Has an inconspicuous cryptic habit as it is fine and scraggly and often grows amongst dense grasses and sedges. It may not always be visible at a site as it appears to survive for some time without any foliage after fire or grazing, relying on energy reserves in its tuberous roots. | Surveyed for and not present. May come up after disturbance. |

| Family | Scientific Name | Common Name | Habitat Requirements | Site Suitability |
|---|---|---|---|---|
| Lamiaceae | *Prostanthera densa* | Villous Mint-bush | *Prostanthera densa* generally grows in sclerophyll forest and shrubland on coastal headlands and near coastal ranges, chiefly on sandstone, and rocky slopes near the sea. Plants regenerate from rootstock after fire and flower within the first year or two. | Surveyed for and not present. |
| Lamiaceae | *Prostanthera marifolia* | Seaforth Mintbush | Occurs in localized patches in or in close proximity to the endangered Duffys Forest ecological community. Located on deeply weathered clay-loam soils associated with ironstone and scattered shale lenses, a soil type which only occurs on ridge tops and has been extensively urbanised. | Surveyed for and not present. No habitat in possibly impact areas |
| Myrtaceae | *Rhodamnia rubescens* | Scrub Turpentine | Found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest usually on volcanic and sedimentary soils. This species is characterised as highly to extremely susceptible to infection by Myrtle Rust. Myrtle Rust affects all plant parts. | No habitat in possibly impact areas |
| Myrtaceae | *Syzygium paniculatum* | Magenta Lilly Pilly | Found in rainforest on sandy soils or stabilised Quaternary sand dunes at low altitudes in coastal areas. Rainforests are often remnant stands of littoral or gallery rainforest. Is thought to tolerate wet and dry conditions on sands. | No habitat in possibly impact areas |
| Elaeocarpaceae | *Tetratheca glandulosa* | | Occurs on shale/sandstone transition geology particularly in areas where shale caps occur over sandstone. Associated with Lucas heights, Gymea, Lambert and Faulconbridge soil landscapes. Generally occurs on ridgetops, upper slopes and occasionally mid-slope benches. Prefers shallow soils consisting of yellow clayey/sandy loams. | Habitat not ideal Surveyed for and not present. May come up after disturbance. |

Table 7.2 – **Threatened fauna species likelihood of occurrence** ***please see species with no "Site Suitability"***

Please note – Marine species including Turtles (*Cheloniidae*), Marine Birds *(Diomedeidae, Procellariidae) and Whales (Otariidae, Balaenidae, Balaenopteridae, Physeteridae) have been omitted from this list.*

| Class | Scientific Name | Common Name | Habitat Requirements | Site Suitability |
|---|---|---|---|---|
| Amphibia | *Heleioporus australiacus* | Giant Burrowing Frog | Sites must have native vegetation. The species has not been found on cleared land. Occurs in hanging swamps on sandstone shelves and along perennial creeks. The species is not restricted to watercourses. | In other areas of the Escarpment – no suitable breeding habitat on-site. GBF could move through the site. |
| Amphibia | *Litoria aurea* | Green and Golden Bell Frog | Optimum habitat includes water-bodies that are unshaded, free of predatory fish such as Plague Minnow *(Gambusia holbrooki)*, have a grassy area nearby and diurnal sheltering sites available. Some sites, particularly in the Greater Sydney region occur in highly disturbed areas. The species is active by day and usually breeds in summer when conditions are warm and wet. | GGBF – no habitat |
| Amphibia | *Pseudophryne australis* | Red-crowned Toadlet | Occurs in open forests, mostly on Hawkesbury and Narrabeen Sandstones. Inhabits periodically wet drainage lines below sandstone ridges that often have shale lenses or cappings. Shelters under rocks and amongst masses of dense vegetation or thick piles of leaf litter. Breeding congregations occur in dense vegetation and debris beside ephemeral creeks and gutters. Eggs are laid in moist leaf litter, from where they are washed by heavy rain; a large proportion of the development of the tadpoles takes place in the egg. Disperses outside the breeding period, when they are found under rocks and logs on sandstone ridges and forage amongst leaf-litter. | In other areas of the Escarpment – no suitable breeding habitat on-site. GBF could move through the site. |

| Class | Scientific Name | Common Name | Habitat Requirements | Site Suitability |
|---|---|---|---|---|
| Aves | *Anthochaera phrygia* | Regent Honeyeater | The species inhabits dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests of River Sheoak. Regent Honeyeaters inhabit woodlands that support a significantly high abundance and species richness of bird species. These woodlands have significantly large numbers of mature trees, high canopy cover and abundance of mistletoes. This species has been seen foraging in flowering coastal Swamp Mahogany and Spotted Gum forests. | |
| Aves | *Ardenna carneipes* | Flesh-footed Shearwater | Nest on Lord Howe Island in forests on sandy soils from Ned's Beach to Clear Place, with smaller colonies below Transit Hill and at Old Settlement Beach. Eggs are laid at the end of a burrow 1 - 2 metres in length. | No habitat |
| Aves | *Artamus cyanopterus cyanopterus* | Dusky Woodswallow | Woodlands and dry open forests with preference for those dominated by eucalypts with mallee associations. May also be found in shrublands, heaths and occasionally in modified habitats and wet forests. | No habitat |
| Aves | *Botaurus poiciloptilus* | Australasian Bittern | Freshwater wetlands and occasionally estuarine reedbeds. Prefers permanent shallow wetlands or the pools of creeks and rivers with tall and thick vegetation. | No habitat |
| Aves | *Burhinus grallarius* | Bush Stone-curlew | 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 | Habitat is not suitable |

| Class | Scientific Name | Common Name | Habitat Requirements | Site Suitability |
|---|---|---|---|---|
| | | | 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. Two eggs are laid in spring and early summer. | |
| Aves | *Calidris alba* | Sanderling | A regular summer migrant from Siberia and other Arctic breeding grounds to most of the Australian coastline. It is uncommon to locally common, arriving from September and leaving by May (some may overwinter in Australia). Sanderlings occur along the NSW coast, with occasional inland sightings. Often found in coastal areas on low beaches of firm sand, near reefs and inlets, along tidal mudflats and bare open coastal lagoons; individuals are rarely recorded in near-coastal wetlands. | No habitat |
| Aves | *Calidris canutus* | Red Knot | Breeding in the Arctic Circle between August and April, it visits Australian shores in large numbers and frequents coastal sand flats and the margins of estuaries and rivers. It feeds in close-packed flocks that move in unison. | No habitat |
| Aves | *Calidris ferruginea* | Curlew Sandpiper | Curlew Sandpipers mainly occur on intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons, and also around non-tidal swamps, lakes and lagoons near the coast, and ponds in saltworks and sewage farms. They are also recorded inland, though less often, including around ephemeral and permanent lakes, dams, waterholes and bore drains, usually with bare edges of mud or sand. They occur in both fresh and brackish waters. | No habitat |

| Class | Scientific Name | Common Name | Habitat Requirements | Site Suitability |
|---|---|---|---|---|
| Aves | *Calidris tenuirostris* | Great Knot | Occurs within sheltered, coastal habitats containing large, intertidal mudflats or sandflats, including inlets, bays, harbours, estuaries and lagoons. Often recorded on sandy beaches with mudflats nearby, sandy spits and islets and sometimes on exposed reefs or rock platforms. Migrates to Australia from late August to early September, although juveniles may not arrive until October-November. Most birds return north in March and April, however some individuals may stay over winter in Australia. Forages for food by methodically thrusting its bill deep into the mud to search for invertebrates, such as bivalve molluscs, gastropods, polychaete worms and crustaceans. | No habitat |
| Aves | *Callocephalon fimbriatum* | Gang-gang Cockatoo | In spring and summer, generally found in tall mountain forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. In autumn and winter, the species often moves to lower altitudes in drier more open eucalypt forests and woodlands, particularly box-gum and box-ironbark assemblages, or in dry forest in coastal areas and often found in urban areas. Favours old growth forest and woodland attributes for nesting and roosting. Nests are located in hollows that are 10 cm in diameter or larger and at least 9 m above the ground in eucalypts. | No habitat |
| **Aves** | ***Calyptorhynchus lathami*** | **Glossy Black-Cockatoo** | **Lives in coastal woodlands and drier forest areas, open inland woodlands or timbered watercourses where casuarinas (or sheoaks), its main food trees, are common. Glossy black-cockatoos occasionally eat seeds from eucalypts, angophoras, acacias and hakeas, as well as** | **Food trees for Glossy Black Cockatoos are being removed. 5-part test conducted. Glossy Black Cockatoos are recorded in the Escarpment a** |

| Class | Scientific Name | Common Name | Habitat Requirements | Site Suitability |
|---|---|---|---|---|
| | | | **eating insect larvae. Prefers to nest in the hollows of large, old eucalypt trees, alive or dead. The typical nest site will be around 3 to 30 metres above the ground.** | |
| Aves | *Charadrius leschenaultii* | Greater Sand-plover | Almost entirely restricted to coastal areas in NSW, occurring mainly on sheltered sandy, shelly or muddy beaches or estuaries with large intertidal mudflats or sandbanks. Roosts during high tide on sandy beaches and rocky shores; begin foraging activity on wet ground at low tide, usually away from the edge of the water; individuals may forage and roost with other waders. Diet includes insects, crustaceans, polychaete worms and molluscs. Prey is detected visually by running a short distance, stopping to look, then running to collect the prey. | No habitat |
| Aves | *Charadrius mongolus* | Lesser Sand-plover | In non-breeding grounds in Australia, this species usually occurs in coastal littoral and estuarine environments. It inhabits large intertidal sandflats or mudflats in sheltered bays, harbours and estuaries, and occasionally sandy ocean beaches, coral reefs, wave-cut rock platforms and rocky outcrops. It also sometime occurs in short saltmarsh or among mangroves. The species also inhabits saltworks and near-coastal saltpans, brackish swamps and sandy or silt islands in river beds. | No habitat |
| Aves | *Daphoenositta chrysoptera* | Varied Sittella | Inhabits eucalypt forests and woodlands, especially those containing rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland. Feeds on arthropods gleaned from crevices in | No habitat |

| Class | Scientific Name | Common Name | Habitat Requirements | Site Suitability |
|---|---|---|---|---|
| | | | rough or decorticating bark, dead branches, standing dead trees and small branches and twigs in the tree canopy. | |
| Aves | *Esacus magnirostris* | Beach Stone-curlew | The Beach Stone-curlew has been recorded around the north coast of Australia, mainly between mid-north Western Australia and north-east NSW. The species has largely disappeared from the south-east of its former range and is now rarely recorded on ocean beaches in NSW. Occurs on open, undisturbed beaches, islands, reefs, and estuarine intertidal sandflats and mudflats; beaches with estuaries or mangroves nearby are preferred; may also frequent river mouths, offshore sandbars and rock platforms. | No habitat |
| Aves | *Glossopsitta pusilla* | Little Lorikeet | Prefers open Eucalypt forest and woodlands. Primarily feeds within the canopy of Eucalyptus, Angophora and Melaleuca trees. Prefers riparian areas but may visit isolated trees in open or cleared land. | No habitat |
| Aves | *Gygis alba* | White Tern | Occurs widely in tropical and subtropical seas and islands. The subspecies on Lord Howe Island is rarely seen on the mainland but occurs on Norfolk and Kermadec Islands. Most breeding sites on Lord Howe Island are close to the lagoon in the settlement area. Marine habitat. A recent arrival to Lord Howe Island, only breeding there since the 1960s. This species nests in the high branches of trees. On Lord Howe Island it nests in the introduced Norfolk Island Pine as well as native Sallywood, Blackbutt, Greybark, Banyan and Pandanus. White Terns do not build a nest but select a | No habitat |

| Class | Scientific Name | Common Name | Habitat Requirements | Site Suitability |
|---|---|---|---|---|
| | | | depression or damaged area on the branch of a tree on which to balance their egg. Breeding and non-breeding birds roost in the trees during the night. Vagrant birds occur in coastal NSW waters, particularly after storm events. | |
| Aves | *Haematopus fuliginosus* | Sooty Oystercatcher | Inhabits rocky headlands, rocky shelves, exposed reefs with rock pools, beaches and muddy estuaries. Forages on exposed rock or coral at low tide for foods such as limpets and mussels. Breeds in spring and summer, almost exclusively on offshore islands, and occasionally on isolated promontories. | No habitat |
| Aves | *Haematopus longirostris* | Pied Oystercatcher | Favours intertidal flats of inlets and bays, open beaches and sandbanks. Forages on exposed sand, mud and rock at low tide, for molluscs, worms, crabs and small fish. The chisel-like bill is used to pry open or break into shells of oysters and other shellfish. Nests mostly on coastal or estuarine beaches although occasionally they use saltmarsh or grassy areas. Nests are shallow scrapes in sand above the high tide mark, often amongst seaweed, shells and small stones. Two to three eggs are laid between August and January. The female is the primary incubator and the young leave the nest within several days. | No habitat |
| Aves | *Haliaeetus leucogaster* | White-bellied Sea-Eagle | Habitats are characterised by the presence of large areas of open water including larger rivers, swamps, lakes, and the sea. Occurs at sites near the sea or sea-shore, such as around bays and inlets, beaches, reefs, lagoons, estuaries and mangroves; and at, or in the vicinity of freshwater | No habitat |

| Class | Scientific Name | Common Name | Habitat Requirements | Site Suitability |
|---|---|---|---|---|
| | | | swamps, lakes, reservoirs, billabongs and saltmarsh. Terrestrial habitats include coastal dunes, tidal flats, grassland, heathland, woodland, and forest (including rainforest). Breeding habitat consists of mature tall open forest, open forest, tall woodland, and swamp sclerophyll forest close to foraging habitat. Nest trees are typically large emergent eucalypts and often have emergent dead branches or large dead trees nearby which are used as 'guard roosts'. | |
| Aves | *Hieraaetus morphnoides* | Little Eagle | Occupies open eucalypt forest, woodland or open woodland. Sheoak or Acacia woodlands and riparian woodlands of interior NSW are also used. Nests in tall living trees within a remnant patch, where pairs build a large stick nest in winter. Lays two or three eggs during spring, and young fledge in early summer. Preys on birds, reptiles and mammals, occasionally adding large insects and carrion. | No habitat |
| Aves | *Hirundapus caudacutus* | White-throated Needletail | White-throated Needletails often occur in large numbers over eastern and northern Australia. They arrive in Australia from their breeding grounds in the northern hemisphere in about October each year and leave somewhere between May and August. They are aerial birds and for a time it was commonly believed that they did not land while in Australia. It has now been observed that birds will roost in trees, and radio-tracking has since confirmed that this is a regular activity. The White-throated Needletail feeds on flying insects, such as termites, ants, beetles and flies. They catch the insects in flight in their wide gaping beaks. Birds usually | No habitat |

| Class | Scientific Name | Common Name | Habitat Requirements | Site Suitability |
|---|---|---|---|---|
| | | | feed in rising thermal currents associated with storm fronts and bushfires and they are commonly seen moving with wind fronts. White-throated Needletails are non-breeding migrants in Australia. | |
| Aves | *Ixobrychus flavicollis* | Black Bittern | Inhabits both terrestrial and estuarine wetlands, generally in areas of permanent water and dense vegetation. Where permanent water is present, the species may occur in flooded grassland, forest, woodland, rainforest and mangroves. Feeds on frogs, reptiles, fish and invertebrates, including snails, dragonflies, shrimps and crayfish, with most feeding done at dusk and at night. During the day, roosts in trees or on the ground amongst dense reeds. | No habitat |
| Aves | *Lathamus discolor* | Swift Parrot | On the mainland they occur in areas where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations. Favoured feed trees include winter flowering species such as Swamp Mahogany *Eucalyptus robusta*, Spotted Gum *Corymbia maculata*, Red Bloodwood *C. gummifera*, Mugga Ironbark *E. sideroxylon*, and White Box *E. albens*. Commonly used lerp infested trees include Grey Box *E. microcarpa*, Grey Box *E. moluccana* and Blackbutt *E. pilularis*. Return to home foraging sites on a cyclic basis depending on food availability. | No habitat |
| Aves | *Lophoictinia isura* | Square-tailed Kite | Found in a variety of timbered habitats including dry woodlands and open forests. Shows a particular preference for timbered watercourses. In arid north-western NSW, has been observed in stony country with a ground cover of | No habitat |

| Class | Scientific Name | Common Name | Habitat Requirements | Site Suitability |
|---|---|---|---|---|
| | | | chenopods and grasses, open acacia scrub and patches of low open eucalypt woodland. Is a specialist hunter of passerines, especially honeyeaters, and most particularly nestlings, and insects in the tree canopy, picking most prey items from the outer foliage. | |
| Aves | *Macronectes giganteus* | Southern Giant Petrel | The Southern Giant Petrel has a circumpolar pelagic range from Antarctica to approximately 20° S and is a common visitor off the coast of NSW. Over summer, the species nests in small colonies amongst open vegetation on Antarctic and subantarctic islands, including Macquarie and Heard Islands and in Australian Antarctic territory. A single chick is raised and although breeding occurs annually, approximately 30% of the potential breeding population does not nest. It is an opportunistic scavenger and predator, and scavenges from fishing vessels and animal carcasses on land. It is also an active predator of cephalopods and euphausiids, as well as smaller birds (particularly penguins) both at land and at sea. Birds will desert their nests if disturbed at the breeding colony. | No habitat |
| Aves | *Macronectes halli* | Northern Giant-Petrel | The Northern Giant-petrel has a circumpolar pelagic distribution, usually between 40-64ºS in open oceans. Their range extends into subtropical waters (to 28ºS) in winter and early spring, and they are a common visitor in NSW waters, predominantly along the south-east coast during winter and autumn. Breeding in Australian territory is limited to Macquarie Island and occurs during spring and summer. Adults usually remain near the breeding colonies | No habitat |

| Class | Scientific Name | Common Name | Habitat Requirements | Site Suitability |
|---|---|---|---|---|
| | | | throughout the year (though some do travel widely) while immature birds make long and poorly known circumpolar and trans-oceanic movements. Hence most birds recorded in NSW coastal waters are immature birds. Northern Giant-Petrels seldom breed in colonies but rather as dispersed pairs, often amidst tussocks in dense vegetation and areas of broken terrain. A single chick is raised and although breeding occurs annually, approximately 30% of the potential breeding population do not nest. | |
| Aves | *Melithreptus gularis gularis* | Black-chinned Honeyeater (eastern subspecies) | Primarily found in the upper levels of dry open forests and woodlands. Prefers vegetation dominated by box and ironbark Eucalypts but may be found in areas of smooth-barked gums, stringybarks, river sheoaks (nesting) and tea-trees. | No habitat |
| Aves | *Neophema pulchella* | Turquoise Parrot | Occurs on edges of eucalypt woodlands, ridges through forests and creeks. Prefers shading for ground foraging. | No habitat |
| Aves | *Ninox connivens* | Barking Owl | Inhabits eucalypt woodland, open forest, swamp woodlands and, especially in inland areas, timber along watercourses. Denser vegetation is used occasionally for roosting. During the day they roost along creek lines, usually in tall understorey trees with dense foliage such as Acacia and Casuarina species, or the dense clumps of canopy leaves in large Eucalypts. Feeds on a variety of prey, with invertebrates predominant for most of the year, and birds and mammals such as smaller gliders, possums, rodents and rabbits becoming important during breeding. Live alone or in pairs. | No habitat |

| Class | Scientific Name | Common Name | Habitat Requirements | Site Suitability |
|---|---|---|---|---|
| | | | Territories range from 30 to 200 hectares and birds are present all year. Three eggs are laid in nests in hollows of large, old eucalypts including River Red Gum (*Eucalyptus camaldulensis*), White Box (*Eucalyptus albens*), (Red Box) *Eucalyptus polyanthemos* and Blakely's Red Gum (*Eucalyptus blakelyi*). Breeding occurs during late winter and early spring. | |
| Aves | *Ninox strenua* | Powerful Owl | The species requires large tracts of forest or woodland, however fragmented landscapes can contribute to their range. Breeds in forests and woodlands but may forage in open areas. Mainly preys upon medium sized arboreal mammals. Requires tree hollows for breeding. | No habitat |
| Aves | *Numenius madagascariensis* | Eastern Curlew | The Eastern Curlew is most commonly associated with sheltered coasts, especially estuaries, bays, harbours, inlets and coastal lagoons, with large intertidal mudflats or sandflats, often with beds of seagrass. The Eastern Curlew mainly forages on soft sheltered intertidal sandflats or mudflats, open and without vegetation or covered with seagrass, often near mangroves, on saltflats and in saltmarsh, rockpools and among rubble on coral reefs, and on ocean beaches near the tideline. The Eastern Curlew roosts on sandy spits and islets, especially on dry beach sand near the high-water mark, and among coastal vegetation including low saltmarsh or mangroves. It occasionally roosts on reef-flats, in the shallow water of lagoons and other near-coastal wetlands. | No habitat |

| Class | Scientific Name | Common Name | Habitat Requirements | Site Suitability |
|---|---|---|---|---|
| Aves | *Onychoprion fuscata* | Sooty Tern | The Sooty Tern is found over tropical and sub-tropical seas and on associated islands and cays around Northern Australia. Occasionally seen along coastal NSW, especially after cyclones. Large flocks can be seen soaring, skimming and dipping but seldom plunging in off shore waters. Breeds in large colonies in sand or coral scrapes on offshore islands and cays including Lord Howe and Norfolk Islands. | No habitat |
| Aves | *Pandion cristatus* | Eastern Osprey | Inhabits coastal areas, especially the mouths of large rivers, lagoons and lakes. Feeds on fish over clear, open water. Breed from July to September in NSW. Nests are made high up in dead trees or in dead crowns of live trees, usually within one kilometre of the sea. | No habitat |
| Aves | *Petroica boodang* | Scarlet Robin | Ideal habitat includes eucalypt forests and woodlands with an open and grassy understorey with few shrubs. Can occur in mature or regrowth vegetation. Sometimes seen in mallee, wet forests, wetlands and tea-tree swamps. Habitat generally contains many logs and fallen timber. | No habitat |
| Aves | *Ptilinopus magnificus* | Wompoo Fruit-Dove | Occurs along the coast and coastal ranges from the Hunter River in NSW to Cape York Peninsula. It is rare south of Coffs Harbour. Three subspecies are recognised, with the most southerly in NSW and south-eastern Queensland. It used to occur in the Illawarra, though there are no recent records. Occurs in, or near rainforest, low elevation moist eucalypt forest and brush box forests. Feeds on a diverse range of tree and vine fruits and is locally nomadic - following ripening fruit; some of its feed trees rely on | No habitat |

| Class | Scientific Name | Common Name | Habitat Requirements | Site Suitability |
|---|---|---|---|---|
| | | | species such as the this to distribute their seeds. Feeds alone, or in loose flocks at any height in the canopy. The nest is a typical pigeon nest - a flimsy platform of sticks on a thin branch or a palm frond, often over water, usually 3 - 10 m above the ground. Breeds in spring and early summer; a single white egg is laid. Most often seen in mature forests, but also found in remnant and regenerating rainforest. | |
| Aves | *Ptilinopus regina* | Rose-crowned Fruit-Dove | Coast and ranges of eastern NSW and Queensland, from Newcastle to Cape York. Vagrants are occasionally found further south to Victoria. Rose-crowned Fruit-doves occur 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. Some populations are migratory in response to food availability - numbers in north-east NSW increase during spring and summer then decline in April or May. | No habitat |
| Aves | *Ptilinopus superbus* | Superb Fruit-Dove | The species is found in rainforests, rainforest margins, mangroves, wooded stream-margins, and even isolated figs, lilly pilies and pittosporums. The Superb Fruit-Dove may migrate to New Guinea in winter, but little is known of its movements, or the reasons for its sometimes-southerly flights as far as Tasmania. Feeds almost exclusively on fruit, mainly in large trees. | No habitat |

| Class | Scientific Name | Common Name | Habitat Requirements | Site Suitability |
|---|---|---|---|---|
| Aves | *Puffinus assimilis* | Little Shearwater | A widespread species in the subtropical Atlantic, Pacific and Indian Oceans. Lord Howe Island has one of the larger breeding colonies in the Australian region. Marine. Breeding sites at Lord Howe Island include Roach Island, Muttonbird Island, Blackburn Island and on the main Island at Muttonbird Point and Transit Hill. The species is known to feed in continental shelf waters and breed on the subtropical and sub- Antarctic islands, where the soil is soft and suitable for burrowing. Burrows are located in tussock grassland, shrubland, woodland and under mats of succulents (e.g. *Carpobrotus, Nitraria, Rhagodia, Atriplex, Tetragonia, Melaleuca*), or among loose rocks. | No habitat |
| Aves | *Rostratula australis* | Australian Painted Snipe | Inhabits fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber. Nests on the ground amongst tall vegetation, such as grasses, tussocks or reeds. Forages nocturnally on mud-flats and in shallow water. Feeds on worms, molluscs, insects and some plant-matter. | No habitat |
| Aves | *Sternula albifrons* | Little Tern | Almost exclusively coastal, preferring sheltered environments; however may occur several kilometres from the sea in harbours, inlets and rivers (with occasional offshore islands or coral cay records). Nests in small, scattered colonies in low dunes or on sandy beaches just above high tide mark near estuary mouths or adjacent to coastal lakes and islands. The nest is a scrape in the sand, which may be lined with shell grit, seaweed or small pebbles. Both parents incubate up to three well-camouflaged eggs for | No habitat |

| Class | Scientific Name | Common Name | Habitat Requirements | Site Suitability |
|---|---|---|---|---|
| | | | up to 22 days, aggressively defending the nest against intruders until the young fledge at 17 - 19 days. Often seen feeding in flocks, foraging for small fish, crustaceans, insects, annelids and molluscs by plunging in the shallow water of channels and estuaries, and in the surf on beaches, or skipping over the water surface with a swallow-like flight. | |
| Aves | *Tyto novaehollandiae* | Masked Owl | The species prefers dry eucalypt forests and woodlands and hunts along the edges and forests and roadsides. Mainly preys upon arboreal and ground mammals, primarily rats. Requires tree hollows in moist gullies for breeding. | No habitat |
| Aves | *Tyto tenebricosa* | Sooty Owl | Habitat is limited mainly to the moist eucalypt forests and rainforests of the coastal, escarpment and eastern tablelands regions of NSW. Sooty Owls occur in both steep and undulating country but are strongly associated with sheltered gullies, particularly those with a tall, rainforest understorey. Hollows in live or occasionally dead trees, eucalypt or rainforest species, in moist forest; among dense foliage in rainforest gullies; caves, recesses or ledges in cliffs or banks. Roost sites are in the darkest and most secluded or sheltered positions. | No habitat |
| Aves | *Xenus cinereus* | Terek Sandpiper | A rare migrant to the eastern and southern Australian coasts, being most common in northern Australia, and extending its distribution south to the NSW coast in the east. The two main sites for the species in NSW are the Richmond River estuary and the Hunter River estuary. The latter has been identified as nationally and internationally | No habitat |

| Class | Scientific Name | Common Name | Habitat Requirements | Site Suitability |
|---|---|---|---|---|
| | | | important for the species. Favours mudbanks and sandbanks located near mangroves but may also be observed on rocky pools and reefs, and occasionally up to 10 km inland around brackish pools. Generally roosts communally amongst mangroves of dead trees, often with related wader species. Breaks up into smaller flocks or even solitary birds when feeding in open intertidal mudflats. | |
| Mammalia | *Cercartetus nanus* | Eastern Pygmy-possum | Found in rainforests communities to sclerophyll (including Box-Ironbark) forests, woodland and heath. Feeds largely on nectar and pollen collected from banksias, eucalypts and bottlebrushes, soft fruits are eaten when flowers are unavailable and insects. | No habitat |
| Mammalia | *Chalinolobus dwyeri* | Large-eared Pied Bat | Large-eared Pied Bat roosts in caves (near their entrances), crevices in cliffs, old mine workings and in the disused, bottle-shaped mud nests of the Fairy Martin (*Petrochelidon ariel*), frequenting low to mid-elevation dry open forest and woodland close to these features. | No habitat |
| Mammalia | *Dasyurus maculatus* | Spotted-tailed Quoll | Recorded across a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline. Individual animals use hollow-bearing trees, fallen logs, small caves, rock outcrops and rocky-cliff faces as den sites. Mostly nocturnal animal feeding on medium-sized (500g-5kg) mammals. | No habitat |
| Mammalia | *Falsistrellus tasmaniensis* | Eastern False Pipistrelle | The Eastern False Pipistrelle is found on the south-east coast and ranges of Australia, from southern Queensland to | No habitat |

| Class | Scientific Name | Common Name | Habitat Requirements | Site Suitability |
|---|---|---|---|---|
| | | | Victoria and Tasmania. Prefers moist habitats, with trees taller than 20 m. Generally roosts in eucalypt hollows, but has also been found under loose bark on trees or in buildings. Hunts beetles, moths, weevils and other flying insects above or just below the tree canopy. Hibernates in winter. Females are pregnant in late spring to early summer. | |
| Mammalia | *Isoodon obesulus obesulus* | Southern Brown Bandicoot (eastern) | Species found in heath or open forest with a heathy understorey on sandy or friable soils. They feed on a variety of ground-dwelling invertebrates and the fruit-bodies of hypogenous (underground-fruiting) fungi. | No habitat |
| Mammalia | *Micronomus norfolkensis* | Eastern Coastal Free-tailed Bat | Occur in dry sclerophyll forest, woodland, swamp forests and mangrove forests east of the Great Dividing Range. Roost mainly in tree hollows but will also roost under bark or in man-made structures. Usually solitary but also recorded roosting communally, probably insectivorous. | No habitat |
| Mammalia | *Miniopterus australis* | Little Bent-winged Bat | Moist eucalypt forest, rainforest or dense coastal banksia scrub. Little Bentwing-bats roost in caves, tunnels and sometimes tree hollows during the day, and at night forage for small insects beneath the canopy of densely vegetated habitats. They often share roosting sites with the Common Bentwing-bat and, in winter, the two species may form mixed clusters. In NSW the largest maternity colony is in close association with a large maternity colony of Common Bentwing-bats (*M. schreibersii*) and appears to depend on | No habitat |

| Class | Scientific Name | Common Name | Habitat Requirements | Site Suitability |
|---|---|---|---|---|
| | | | the large colony to provide the high temperatures needed to rear its young. | |
| Mammalia | *Miniopterus orianae oceanensis* | Large Bent-winged Bat | Primarily roosts in caves but will utilise mine shafts, storm-water tunnels, buildings and other man-made structures. Forms colonies within a maternity cave and disperse within a 300km range. Forage in forested areas in the tree canopy. | No habitat |
| Mammalia | *Myotis macropus* | Southern Myotis | Roosts in groups of 10-15 in areas close to water. Will utilise caves, mine shafts, tree hollows, storm water drains, buildings, bridges and dense foliage. Forages over water bodies catching insects and small fish. | No habitat |
| Mammalia | *Petaurus norfolcensis* | Squirrel Glider | Inhabits mature or old growth Blackbutt-Bloodwood forests with heath understorey in coastal areas. Prefers mixed species stands with a shrub or Acacia mid-storey. Requires abundant tree hollows for refuge and nest sites. Diet varies seasonally and consists of Acacia gum, eucalypt sap, nectar, honeydew and manna, with invertebrates and pollen providing protein. | No habitat |
| Mammalia | *Phascolarctos cinereus* | Koala | Inhabit eucalypt woodlands and forests. Feeds on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred browse species. | No habitat |
| Mammalia | *Pseudomys novaehollandiae* | New Holland Mouse | The New Holland Mouse has a fragmented distribution across Tasmania, Victoria, New South Wales and Queensland. Known to inhabit open heathlands, open woodlands with a heathland understorey and vegetated sand dunes. Lives predominantly in burrows shared with other individuals. | No habitat |

| Class | Scientific Name | Common Name | Habitat Requirements | Site Suitability |
|---|---|---|---|---|
| Mammalia | *Pteropus poliocephalus* | Grey-headed Flying-fox | Occurs within tall sclerophyll forests and woodlands, heath, swamp subtropical and temperate rainforests, and urban areas. Occurs within 20km of a significant food source. May be found close to gullies and water within vegetation with a dense canopy. | No habitat |
| Mammalia | *Saccolaimus flaviventris* | Yellow-bellied Sheathtail-bat | Roosts singly or in groups of up to six, in tree hollows and buildings; in treeless areas they are known to utilize mammal burrows. When foraging for insects, flies high and fast over the forest canopy, but lower in more open country. Forages in most habitats across its very wide range, with and without trees; appears to defend an aerial territory | No habitat |
| Mammalia | *Scoteanax rueppellii* | Greater Broad-nosed Bat | Roosts in tree hollows but may be found in buildings. Primarily found in gullies and river systems that drain the Great Dividing Range. Occurs in a range of habitats including woodlands to moist or dry eucalypt forest, rainforest with greatest preference for tall wet forests. Forages along creeks and river corridors. | No habitat |
| Mammalia | *Vespadelus troughtoni* | Eastern Cave Bat | Roosts in caves, mine shafts. Generally found in dry open forest and woodlands. Prefers areas near cliffs and rocky overhangs. | No habitat |
| Reptilia | *Varanus rosenbergi* | Rosenberg's Goanna | Found in heath, open forest and woodland. Associated with termites, the mounds of which this species nests in; termite mounds are a critical habitat component. Individuals require large areas of habitat. Feeds on carrion, birds, eggs, reptiles and small mammals. Shelters in hollow logs, rock crevices | No habitat |

| Class | Scientific Name | Common Name | Habitat Requirements | Site Suitability |
|---|---|---|---|---|
| | | | and in burrows, which they may dig for themselves, or they may use other species' burrows, such as rabbit warrens. | |

## 6.4 Appendix IV – Species listed on-site.

Species recorded on-site (most on periphery)

| | |
|---|---|
| *Acacia floribunda* | *Eucalyptus umbra* |
| *Acacia longifolia* | *Eustrephus latifolius* |
| *Adiantum aethiopicum* | *Geitonoplesium cymosum* |
| *Allocasuarina torulosa* | *Glochidion ferdinandi* |
| *Angophora costata* | *Gymnostachys anceps* |
| *Angophora floribunda* | *Hibberia* sp. |
| *Billardiera scandens* | *Hydrocotyle peduncularis* |
| *Breynia oblongifolia* | *Livistona australis* |
| *Cassytha paniculata* | *Lomandra longifolia* |
| *Cayratia clematidea* | *Macrozamia communis* |
| *Cissus hypoglauca* | *Notelaea longifolia* |
| *Corymbia gummifera* | *Oplismenus* |
| *Corymbia maculata* | *Pittosporum undulatum* |
| *Dianella caerulea* | *Platylobium formosum* |
| *Dodonaea triquetra* | *Pteridium esculentum* |
| *Doodia caudata* | *Pultenaea flexilis* |
| *Eleocarpus reticulatis* | *Syncarpia glomulifera* |
| *Entolasia stricta* | *Themeda triandra* |
| *Eucalyptus botryoides* | *Xanthorrhoea* sp (possibly) *macronema* |
| *Eucalyptus paniculata* | |
| *Eucalytpus punctata* | |
| *Eucalytpus robusta* | |

## 6.1 Appendix V – Test of Significance (5 Part Test).

### 6.1.1 Large Forest Owls Populations Barking, Powerful, Eastern Grass and Sooty, (*Ninox connivens, Ninox strenua, Tyto longimembris, Tyto tenebricosa*).

*(a) in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,*

The tree removals would not however, alone, be expected to adversely affect the life cycle of Large Forest Owls such that a local population would become extinct. Potential impacts from the removal of trees and thus prey species. Tree proposed for removal do not host suitable breeding habitat features for Large Forest Owls. The proposal is unlikely to affect the life cycle of a local population of Large Forest Owls.

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

*Not EEC*

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

*Not EEC*

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

*Not EEC*

*(c) in relation to the habitat of a threatened species or ecological community:*

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

Habitat for Large Forest Owls will not be removed because of this development. Marginal foraging habitat for owl prey species may be removed (in the form of four trees) however this is not expected to cause a significant impact for Large Forest Owls.

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

The removal of trees from the site will include four trees and thus the prey species that use these trees preferentially. This is not expected to fragment or isolate the general habitat of Large Forest Owls.

No core habitat will be removed or modified as a result of the proposed development. No areas of habitat will become fragmented or isolated from other areas of habitat as a result of the proposed action.

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

No essential habitat being removed. Habitat to be removed is not known breeding or roosting habitat.

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

No areas of outstanding biodiversity value yet listed for this area.

*(e) whether the proposed development or activity is, or is part of, a key threatening process or is likely to increase the impact of a key threatening process.*

Yes, tree removal is part of the KTP of habitat loss – direct and indirect through loss of prey habitat.

**Conclusion:**

This proposal is not likely to significantly affect Populations of Large Forest Owls (*Ninox connivens, Ninox strenua, Tyto longimembris, Tyto tenebricosa*) and will not be likely to put the local population at risk of extinction.

### 6.1.2 Microbats

Six species of microbat were assessed as having the potential to occur within the study area based on bionet. Though the likelihood of them being on-site very low. Abandoned buildings may be used however an assessment of this site indicated no use of the existing buildings by microbats. The following species would have lived in the area prior to extensive clearing of the surrounding bushland:

- Eastern Freetail-bat (*Mormopterus norfolkensis)*
- Large Bentwing-bat (*Miniopterus schreibersii oceanensis)*
- Little Bentwing-bat (*Miniopterus australis)*
- Large-eared Pied Bat (*Chalinolobus dwyeri)*
- Greater Broad-nosed Bat (*Scoteanax rueppellii)*
- Yellow-bellied sheath-tail bat *(Saccolaimus flaviventris)*

All of the recorded species are considered to be highly mobile and would be likely to be accessing the site occasionally or opportunistically as foraging habitat across a landscape of fragmented habitat. Although these species have differing habitat requirements, they have been assessed together as the trees to be removed would be considered marginal habitat (mostly for foraging on insects that visit flowers) for all seven species.

*(a) in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,*

The proposed work includes tree removal (possible foraging habitat) however not considered optimal or significant foraging/breeding habitat for the species. Marginal foraging habitat for microbat species may be removed (trees) however this is not expected to place any microbat species at risk of extinction.

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

Not an EEC

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

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

*(c) in relation to the habitat of a threatened species or ecological community:*

Microbat species are highly mobile and would only be accessing the site occasionally or opportunistically as foraging habitat. It is unlikely that individuals would be exclusively reliant upon the trees being removed for foraging purposes.

*(i) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and*

No core habitat will be removed or modified as a result of the proposed development. No areas of habitat will become fragmented or isolated from other areas of habitat as a result of the proposed action.

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

No areas of outstanding biodiversity value yet listed for this area.

*(e) whether the proposed development or activity is, or is part of, a key threatening process or is likely to increase the impact of a key threatening process.*

Yes, tree removal is part of the KTP of habitat loss – direct and indirect through loss of prey habitat.

Recommendations: Micro-bat boxes should be installed on-site x 2. Boxes to be marine ply or equivalent and installed so that there is no nailing into the tree (see best practice – hanging of boxes and using coil-springs to keep in place). Boxes to be at least 4m above the ground.

### 6.1.3 Grey Headed Flying Foxes

Grey-headed Flying-foxes are generally found within 200 km of the eastern coast of Australia, from Rockhampton in Queensland to Adelaide in South Australia. In times of natural resource shortages, they may be found in unusual locations. Occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Annual mating commences in January and conception occurs in April or May; a single young is born in October or November. Can travel up to 50 km to forage; commuting distances are more often <20 km. Feed on the nectar and pollen of native trees, in particular Eucalyptus, Melaleuca and Banksia, and fruits of rainforest trees and vines.

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

The proposed work includes tree removal (possible foraging habitat) however not considered optimal or significant foraging/breeding habitat for the species. Marginal foraging habitat for microbat species may be removed (trees) however this is not expected to place any microbat species at risk of extinction.

GHFF are likely to occasionally or opportunistically visit the site to forage in flowering canopy vegetation. While it is unlikely that the trees proposed for removal significantly contribute to the lifecycle of the GHFF removal of canopy in urban areas contributes to incremental loss.

The removal of the trees at this site is not expected to place the GHFF at risk of extinction.

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

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

Not an EEC

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

Not an EEC

*b) In relation to the habitat of a threatened species or ecological community:*

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

The GHFF is highly mobile and would be likely to be accessing the site occasionally or opportunistically as foraging habitat. It is unlikely that the trees proposed for removal are significantly contributing the lifecycle of the GHFF.

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

Habitat is already fragmented within the landscape. The proposed works are occurring within an insignificant area of the GHFF home range. It is unlikely that the trees proposed for removal are significantly contributing towards habitat connectivity for the GHFF when considered in isolation form other development.

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

Trees (particularly the *Eucalyptus* spp*)* are all foraging habitat for the GHFF. Importance is unknown but likely to be of low significance on its own.

This proposal, in isolation, will not be place GHFF at an increased risk of extinction.

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

No

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

Clearing is a KTP, although the trees being removed are not expected to be significantly contributing to the species survival in the locality.

Conclusion:

This proposal is not likely to significantly affect the GHFF and will not be likely to put the local population of at risk of extinction.

### 6.1.4 Gang Gang Cockatoo (*Callocephalon fimbriatum*) and Glossy Black Cockatoo (*Calyptorhynchus lathami*)

*(a) in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,*

The proposal will not impact on breeding habitat of either Cockatoo species. The site displays foraging habitat for the species in the form of flowing eucalypt species and pine trees within the site. 14 trees are proposed for removal, these trees are not considered critical habitat for the survival of the local population.

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

Not an EEC

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

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

(c) in relation to the habitat of a threatened species or ecological community:
(i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and

11 native trees are proposed for removal, these trees form foraging habitat of Cockatoos. No Pinnus species are proposed for removal.

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

The development will not contribute to the fragmentation of species habitat. The species is highly mobile, and the impact area is relatively small.

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

The habitat on site to be removed does not form breeding habitat for the species due to the lack of hollows. While the trees proposed for removal do form foraging habitat for the species, it is unlikely the site contributes significantly to the long-term survival of the species.

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

No areas of outstanding biodiversity value yet listed for this area.

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

Habitat removal is part of the KTP of habitat loss. Direct and indirect through loss of foraging habitat.

**Conclusion:**

The proposal in not likely to significantly effect populations of Gang Gang Cockatoo or Glossy Black Cockatoo and will not be likely to put the local population at risk of extinction.

# 7 Expertise of authors

With over 25 years wetland and urban ecology experience, a great passion for what she does and extensive technical and on-ground knowledge make Geraldene a valuable contribution to any project.

Geraldene has over 8 years local government experience as manager of environment and education for Pittwater Council. Geraldene presented papers on the topic at the NSW Coastal Conference, Sydney CMA and Hawkesbury Nepean forums. Geraldene is a Technical Advisor Sydney Olympic Park Wetland Education and Training (WET) panel.

Geraldene has up to date knowledge of environmental policies and frequently provides input to such works. Geraldene was a key contributor to the recent set of Guidelines commissioned by South East Queensland Healthy Waterways Water Sensitive Urban Design Guidelines. Geraldene's role included significant contributions and review of the Guideline for Maintaining WSUD Assets and the Guideline for Rectifying WSUD Assets.

Geraldene is a frequent contributor to many community and professional workshops on ecological matters particularly relating to environmental management. She is an excellent Project Manager.

Geraldene is a joint author on the popular book Burnum Burnum's Wildthings published by Sainty and Associates. Author of the Saltmarsh Restoration Chapter Estuary Plants of East Coast Australia published by Sainty and Associates (2013). Geraldene's early work included 5 years with Wetland Expert Geoff Sainty of Sainty and Associates. Geraldene is an expert in creating and enhancing urban biodiversity habitat and linking People with Place.

## Geraldene Dalby-Ball
## DIRECTOR

### SPECIALISATIONS

- Urban Ecology – and habitat rehabilitation and re-creation.
- Urban waterway management – assessing, designing and supervising rehabilitation works
- Saltmarsh and Wetland re-creation and restoration – assessment, design and monitoring
- Engaging others in the area of environmental care and connection
- Technical Advisor – environmental design, guidelines and policies
- Sound knowledge and practical application of experimental design and statistics
- Project management and supervision
- Grant writing and grant assessment
- Budget estimates and tender selection
- Expert witness in the Land and Environment Court

### CAREER SUMMARY

- **Director and Ecologist**, Ecological Consultants Australia. 2014-present
- **Director and Ecologist**, Dragonfly Environmental. 1998
- **Manager** Natural Resources and Education, Pittwater Council 2002-2010
- **Wetland Ecologist** Sainty and Associates 1995-2002

### QUALIFICATIONS AND MEMBERSHIPS

- **Bachelor of Science with 1st Class Honors**, Sydney University
- **WorkCover** WHS General Induction of Construction Industry NSW White Card.
- **Senior First Aid Certificate.**
- **Practicing member and vice president** Ecological Consultants Association