Flora and Fauna Report

113 Orchard Street, Warriewood

By Ecological Consultants Australia Pty Ltd TA

Kingfisher Urban Ecology and Wetlands

September 2020 updated March 2023

Commented [KW1]: Flora and Fauna Report

March 2023

About this document

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Statement of Authorship

This study and report was 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 and Gabriel James with qualifications B EnvSc.

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 particular proposal or pre-determined position.

Document Control Sheet	
Title:	Flora and Fauna Report 113 Orchard Street, Warriewood
Version:	Draft
Author:	Gabriel James and Geraldene Dalby-Ball
Date:	March 2023
File location:	C:\Users\Geraldene\Dropbox\ECA 4 Projects\2 Projects\2022-2023\Flora Fauna BAM BDAR\BDARs\ 113 Orchard St, Warriewood
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Executive Summary

Introduction

Ecological Consultants Australia (ECA) has been contracted by Mr Tony McLain of Tony McLain Architects to provide a **Flora and Fauna Report** for a proposal at 113 Orchard Street, Warriewood NSW 2102 (Lot 6, DP 749791) within the Northern Beaches Council Local Government Area (LGA).

Trigger for a formal BDAR under the BC Act 2016:

The proposal does not trigger the Biodiversity Values or the area clearing threshold as per the BOS entry requirements.

Stage 1: Biodiversity Assessment

- On-ground survey took place in February 2023 by Ecologist Gabriel James.
- Data was gathered across two BAM plots located in each vegetation condition at the site.
- Flora and fauna observations were recorded on-site using binoculars and physical examination. 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.

Results

Stage 2: Impact Assessment

- The impact calculations were made based on there being direct impacts to vegetation from the proposed development. The impact area and/or areas of modification has been calculated as 0.4210ha within the 1.0ha site.
- Species plots were recorded across two different vegetation communities including Coastal Sandstone Gully Forest (PCT 1250) and Coastal Enriched Sandstone Moist Forest (PCT 1841). There are no Threatened Ecological Communities (TEC's) associated with either of these PCT's.
- Vegetation onsite is mixed between natural bushland present within the western half of the property on the upper side of the existing dwelling and disturbed vegetation within the properties eastern half which has been significantly altered and does not reflect the natural attributes of its original plant community (PCT 1841).
- Vegetation within the eastern half of the sites structurally and functionally poor due to previous clearing onsite. Tree removal would be the greatest impact from this development. See Arborist report (LaurenceCo 2022) for details. 44 trees are proposed for removal as they are currently in proposed development areas including horse arenas. The trees that would be removed were not observed to be bearing hollows suitable for tree roosting microbat species or large forest owls. This indicates a low potential for the life cycles of local populations to be put at risk from a breeding perspective however the site may be used primarily for foraging resources.
- Test of significance has been conducted for Glossy Black Cockatoo's, Large Forest Owls, Microbats Grey-headed Flying Foxes. While these resulted in a 'not significant' impact for this community recommendations have been made to assists the long-term sustainability of species.

- No threatened species were recorded during the site surveys.

Stage 3: Improving Biodiversity values

- Fauna refuge zone
- Delineation of work areas
- Vegetation clearing control measures
- Weed Management and removal
- Native seed collection
- Preservation of habitat
- Nest boxes
- Native species landscaping

See recommendations section for a detailed explanation as to how these recommendations improve biodiversity values.

Conclusions and Recommendations

- The proposed development will have an approximate impact area of 0.4210ha on Coastal Enriched Sandstone Moist Forest (PCT1841). A significant proportion of this vegetation has been significantly altered and degraded from its natural state.
- The site has been managed for residential purposes. The site and much of the surrounding area has previous history of vegetation clearing, habitat fragmentation and on-going disturbance, via agricultural and residential practices. Much of the vegetation within the proposed development design includes cleared exotic grass as well as some native canopy cover with cleared understory.
- No significant habitat features, values or landscape corridors will be impacted by the proposed development.
- Measures including but not limited to; nest boxes, native species landscaping, delineation of works zones, weed removal, tree protection and fauna refuge zones should all be used to mitigate any impacts associated with the proposal and increase habitat opportunities in the area.

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Stage 1: Biodiversity Assessment

1 Introduction

Ecological Consultants Australia (ECA) has been contracted by Mr Tony McLain of Tony McLain Architects to provide a **Biodiversity Development Assessment Report** for a proposal at 113 Orchard Street, Warriewood NSW 2102 (Lot 6 DP 749791) within the Northern Beaches Council Local Government Area (LGA).

1.1 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.

Table 1.1 Site Administrative Information

Category	Details
Title Reference (Lot/DP)	6/-/DP749791
Area (m^2)	9813m^2
Street Address	113 Orchard Street, Warriewood NSW 2102
LGA	Northern Beaches Council
Land Zoning	RU2: Rural Landscape

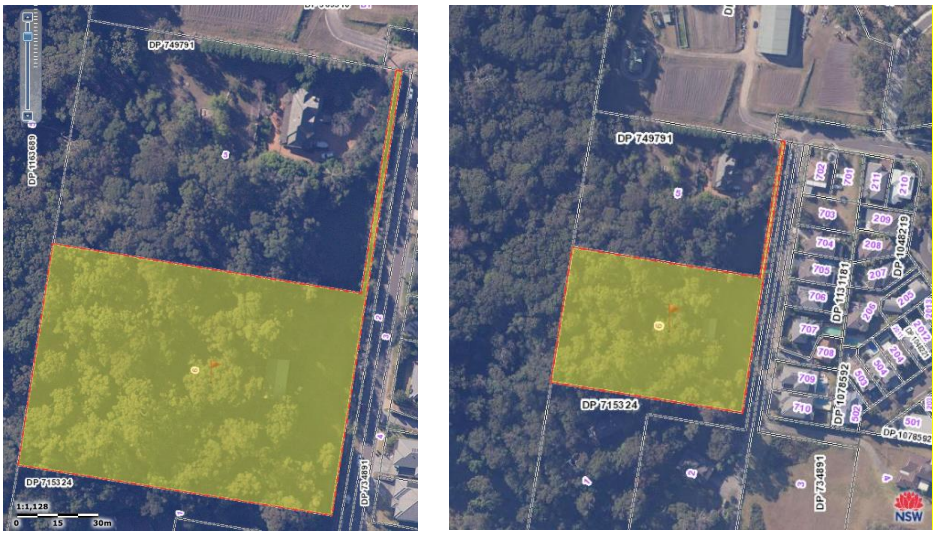


Figure 1.1. Site of the proposed development. Source: SixMaps 2020.

1.2 Site history

The site and much of the surrounding area has been managed for agricultural and horticultural purposes. Native vegetation would have once covered the area although due to modification and disturbance, the site has lost many natural attributes on its eastern side which is situated downslope from the remaining property. This half of the site has been significantly altered and degraded from its natural state due to a long history of vegetation clearing, habitat fragmentation and on-going disturbance, via agricultural practices.

A majority of vegetation within this eastern half is regrowth or has been planted by the property owner. It includes cleared land with exotic grasses. The vegetation just behind the dwelling including native tree species which provided good canopy cover mixed with cleared understory. The western side of the property includes good natural bushland however this is being excluded from the proposed development.

1.3 Proposed actions

The proposed actions involve horse arena, day yards, paddocks, access drive, turning and parking as well as additions to the existing dwelling. The works also involve associated earth and landscape works including gabion walls. Figure 1.2 is a plan diagram (see DA submission for higher resolution copy).

It is anticipated that no further tree removal or pruning will be required post development for the site to satisfy APZ standards as per PBP requirements. Rather than removing or severely pruning trees in the APZ, building modifications (gutter guards) will be installed to safeguard the house. It is expected that the tree removal and protection plan (Arborist Report, V. Beecher and O. Tebbutt) will allow the site to achieve APZ requirements. It is acknowledged that the ground and shrub vegetation layers will be continually managed in perpetuity. These factors were considered in the BAM-C when determining the future vegetation integrity score for the site.

Figure 1.2. Proposed layout. Source: Tony McLain Architect July 2022.

1.4 Sources of information used in the assessment

The following sources of information were used for this assessment:

- SeedMaps 2023
- SydneyMetroArea_v3.1_2016_E-VIS_4489
- BioNet DPIE (2023)
- Flora and Fauna Assessment for 113 Orchard Street, Warriewood by ECA Pty Ltd TA (updated 2020)
- Plan Showing Detail & Levels Over LOT 6 in DP749791, prepared by Axiom Surveying, dated 22.02.18.
- Proposed Horse Arena and Facilities – Site Plan, prepared by Tony McLain Architect, Drawing number DA01, rev H, dated November 2022.
- Proposed Horse Arena and Facilities – Site Plan, prepared by Tony McLain Architect, Drawing number DA01, rev H, dated November 2022.
- Proposed Horse Arena and Facilities – Site Sections, prepared by Tony McLain Architect, Drawing number DA02, rev H, dated November 2022.
- Proposed Horse Arena and Facilities – Addition to House, prepared by Tony McLain Architect, Drawing number DA03, rev H, dated November 2022.
- Arborist Report (Sep 2022) by V. Beecher and O. Tebbutt prepared for Tony McLain Architect.
- Bushfire Risk Assessment prepared by Matthew Willis (April 2022)

1.5 Legislative context and statutory requirements

1.5.1 NSW Environmental Planning and Assessment Act 1979

The NSW *Environmental Planning and Assessment Act 1979* and the *Environmental Planning and Assessment Regulation 2000* institutes and sets out a system for environmental planning and assessment in NSW, and includes Part 4 which deals with development applications on private land.

This proposal falls under a Part 4 development and requires development consent, and associated environmental assessment.

1.5.2 NSW Biodiversity Conservation Act 2016 and associated documents

The *Biodiversity Conservation Act 2016* (BC Act 2016) is the key legislation that enables the conservation of biodiversity within the state of New South Wales. The BC Act 2016 facilitates the assessment and on-going protection of flora and fauna, including threatened species and ecological communities. The BC Act 2016 outlines assessment and offsetting requirements for activities with the potential to impact on threatened species and ecological communities in NSW, and the clearing of native vegetation which exceeds the threshold.

The BC Act also:

- Outlines the licences required under the BC Act to harm protected flora and fauna;
- Lists Threatened species and ecological communities in Schedules 1 and 2;

- Sets out monetary and imprisonment penalties for offences relating to the harming of protected flora and fauna;
- Under Part 7 (s7.4), introduces a list of activities/proposal that exceeds the biodiversity offsets scheme threshold.

The NSW *Biodiversity Conservation Regulation 2017* sets out the Biodiversity Offsets Scheme entry threshold for Part 4 developments under the EP&A Act 1979. If the development triggers as least one (1) entry threshold, the development must be assessment under The BC Act using the Biodiversity Assessment Method (BAM) (OEH 2017). See also https://www.environment.nsw.gov.au/biodiversity/entryrequirements.htm

1.5.3 NSW State Environmental Planning Policy Koala Habitat Protection 2019.

The State Environmental Planning Policy (SEPP) (Koala Habitat Protection) 2019 applies to the proposed development as there is no approved Koala Plan of Management which applies. The subject land is greater than one hectare and the land is identified on the Koala Development Application Map (DPIE, 2020). A Koala Assessment Report has been prepared and will accompany the DA.

The report should assist the consent authority in determining any potential impacts on the species. This KAR directly addresses criteria outlined in the Koala Habitat Protection Guideline (DPIE, 2020) as detailed by the State Environmental Planning Policy (SEPP) (Koala Habitat Protection) 2019.

1.5.4 Commonwealth Environmental Protection and Biodiversity Conservation Act 1999

The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is applicable if it was considered that an impact on a 'matter of National Environmental Significance (NES)' 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 (DE 2013) to assist in the determination of whether an action is likely to have a significant impact on a matter of NES. The proposal is not expected to significantly impact any MNES.

1.5.5 Pittwater Local Environmental Plan 2014

The site is identified as “Significant vegetation” and “Connectivity between significant vegetation” on the Terrestrial Biodiversity Map as published by Northern Beaches Council. (Map Identification Number: 6370_COM_BIO_012_010_20140217).

As identified in LEP (2012) the aim of part 6, clause 6.4 is to maintain terrestrial biodiversity by—

(a) protecting native fauna and flora, and

(b) protecting the ecological processes necessary for their continued existence, and

(c) encouraging the conservation and recovery of native fauna and flora and their habitats.

The proposal will include revegetation areas and biodiversity strategies which will satisfy and contribute to the objectives of part 6, clause 6.4 in the LEP. Mitigation measures are outlined in section 10 of this report.

Figure 1.3. The site is situated on "Significant vegetation" and "Connectivity between significant vegetation" on the Terrestrial Biodiversity Map. Source: PlanningPortal 2020.

1.6 Biodiversity Offsets Scheme threshold

The Biodiversity Offsets Scheme applies to:

local development (assessed under Part 4 of the Environmental Planning and Assessment Act 1979) that triggers the Biodiversity Offsets Scheme threshold (see section 1.6) or is likely to significantly affect threatened species based on the test of significance in section 7.3 of the Biodiversity Conservation Act 2016.

1.6.1 BOS Area Clearing Threshold

The proposal does not trigger the area clearing threshold as per the BOS entry requirements as the impact area does not exceed the clearing area threshold. Area clearing thresholds are determined by minimum lot size and guidelines outlined in BAM (OEH 2017) (figure 1.4). The proposed development is expected to

impact an area of 0.4210ha in size. This includes both the construction zone and the proposed APZ requirements as stated in the bushfire report (Bushfire Planning Services, 2022). The proposed construction boundary and impact area are illustrated in Figures 1.5 and 1.6.

Table 1.2. Minimum lot size and threshold which the development exceeds.

Minimum lot size	**1.0Ha**
Threshold for clearing, above which the BAM and offsets scheme apply	**0.5ha**
Impact area	**0.4210ha**

Area clearing threshold

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

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

Figure 1.4 The area clearing threshold as per the BOS entry requirements.

Figure 1.5. The proposed construction boundary based on architecture designs (Tony McLain Architecture 2022). Source: Google Satellite 2023.

Figure 1.6. Impacted Vegetation based on the development proposal and APZ requirements (Tony McLain Architecture 2022 & Bushfire Planning Solutions 2022). Source: Google Satellite 2023.

1.6.2 Biodiversity Values Map

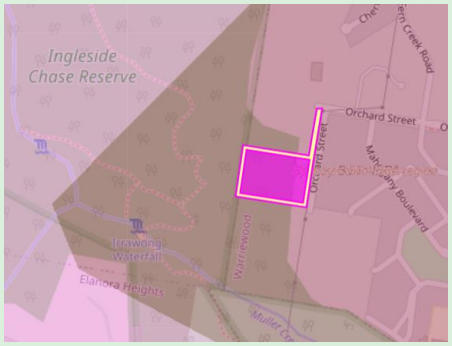
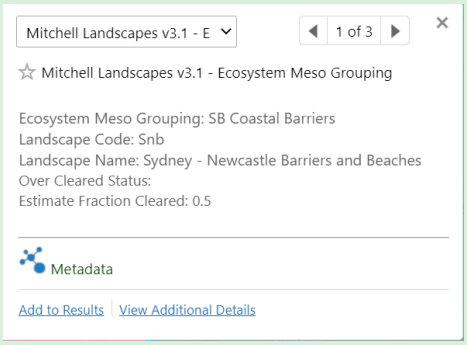
The proposed development area does not impact areas identified by the Biodiversity Values map published by the Chief Executive of the NSW Office of Environment and Heritage.

Figure 1.7 Biodiversity Map – Site in yellow. Source: https://www.lmbc.nsw.gov.au/Maps/index.html?viewer=BOSETMap

2 Landscape features and site context

The site is located within agricultural/rural/light industrial setting. The surrounding properties are made up of agricultural (Cropping) rural (grazing and pasture paddocks) and patches of native bushland.

Table 2.1 Site Biodiversity Information

Category	Details
Interim Biogeographic Regionalisation for Australia (IBRA)	Sydney Basin
IBRA Sub Region	Pittwater
NSW Landscape 	Newcastle Barriers and Beaches - Below 
% Native vegetation cover	41% in the 1500m radius circle See Figure 1.6
Landscape features	
Rivers and streams	Mullet creek is the closest waterway to the site and exists to the south of the site 180 meters away. The waterway is not expected to be impacted or altered in any way from the proposed development.
Wetlands	N/A
Connectivity features	Vegetation on site is connected to adjoining bushland via the native trees which are present on site behind the existing dwelling.
Areas of geological significance and soil hazard features	No
Areas of Outstanding Biodiversity Value identified under the BC Act	No

Category	Details
Geology and Soil	"Warriewood" is the identified soil landscape for the site as per eSpade2.0 (DPIE, 2023). Warriewood is characterised by level to gently undulating swales, depressions and infilled lagoons on Quaternary sands. Mostly cleared of native vegetation. Localised flooding and run-on, high watertables, highly permeable soil.

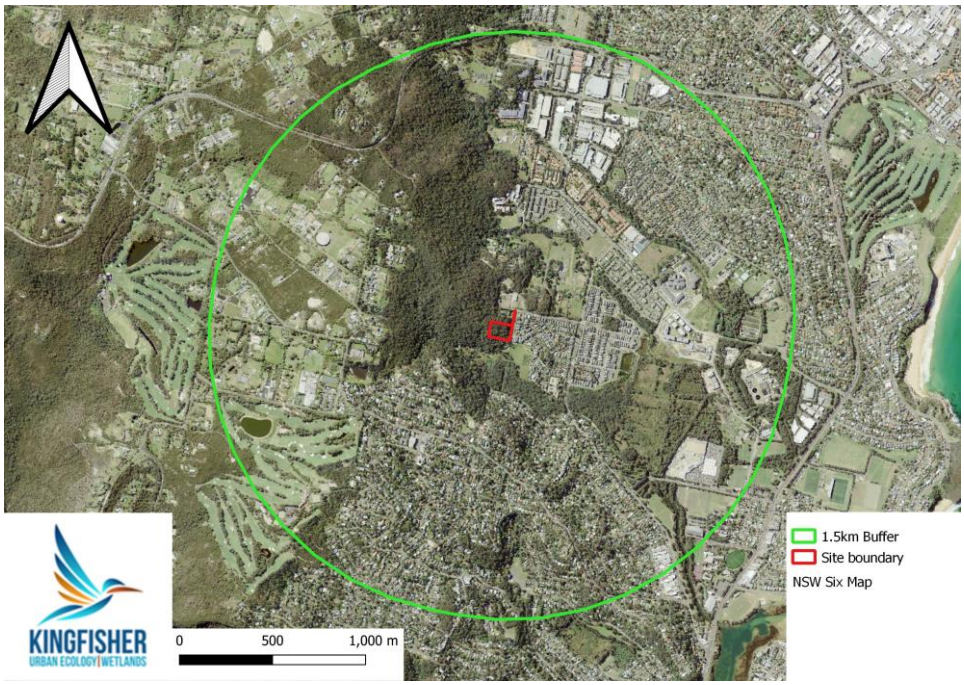


Figure 2.1. 1500m buffer around the site. Source; SixMaps 2023.

3 Native vegetation

3.1 Desktop and Survey results – Plant Community Types (PCTs)

A review of the most up-to-date vegetation mapping, SydneyMetroArea_v3.1_2016_E-VIS-4489 DPIE (2020), identified two plant community types (PCT) within site. The PCT is identified as; *Sydney Peppermint - Smooth-barked Apple - Red Bloodwood shrubby open forest on slopes of moist sandstone gullies, eastern Sydney Basin Bioregion* (PCT1250) and *Smooth-barked Apple - Turpentine - Blackbutt tall open forest on enriched sandstone slopes and gullies of the Sydney region* (PCT1841).

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

NSW PCT Code	NSW 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	Coastal sandstone gully forest No associated TEC	Coastal sandstone gully forest No associated TEC
1841	Smooth-barked Apple - Turpentine - Blackbutt tall open forest on enriched sandstone slopes and gullies of the Sydney region	Coastal enriched sandstone moist forest No associated TEC	Coastal enriched sandstone moist forest No associated TEC

3.1.1 Field Survey

The field survey assisted in verifying the distribution and quality of vegetation at the site. Approximately 60% of the vegetation onsite has been previously disturbed. 15% of the site has been highly disturbed and as such, the current condition does not represent the original natural vegetative community. This area contains cleared land which is now dominated by exotic species including pasture grasses.

The other 45% of the disturbed site is adjacent to this cleared area and includes native tree species with cleared understory. Moderate disturbances have occurred in this area and as a result, shrub and ground species are minimal. Exotic weed species are also present within this area. 40% of the site on the western side includes natural bushland which includes native tree species as well as a mix of shrubs and ground cover species. The proposed construction is to exclude this bushland and impacts to this area are not expect to significantly impact this region (Figure 3.1).

Figure 3.1. The vegetation types currently present on site. Source; Google Satellite 2023.

Stratification and plot dimensions

Plots were as per the BAM Method with 20x20 plots (400m^2) for assessing structure and composition with a center line extending 50m to great a 20 x 50 plot (1000m^2) to assess function. See Biodiversity Assessment Method Operational Manual – Stage 1 (OEH 2018) page 26-28 for methods used.

https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Animals-and-plants/Biodiversity/biodiversity-assessment-method-operational-manual-stage-1-180276.pdf

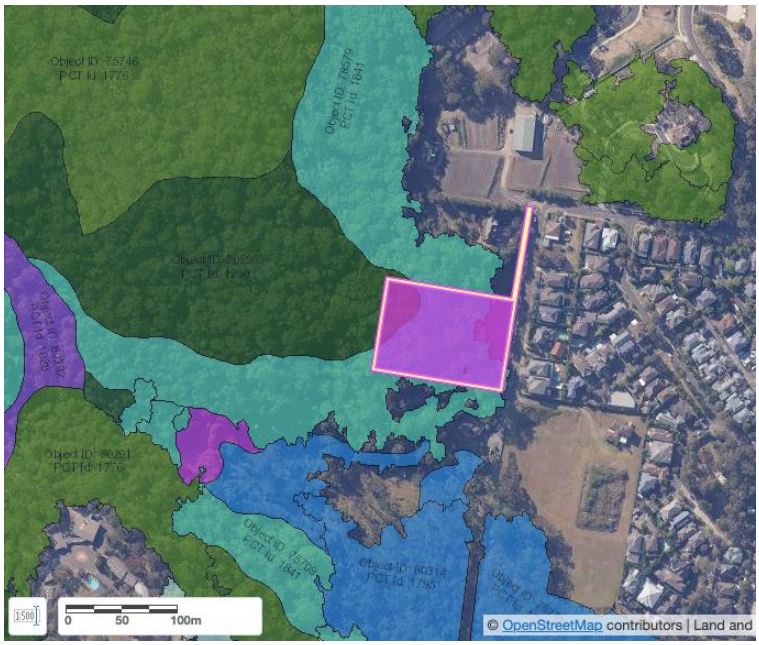


Figure 3.2. Subject site within mapped vegetation surrounding the property SydneyMetroArea_v3.1_2016_E-VIS-4489 DPIE (2020). Source: SEEDMaps 2023.

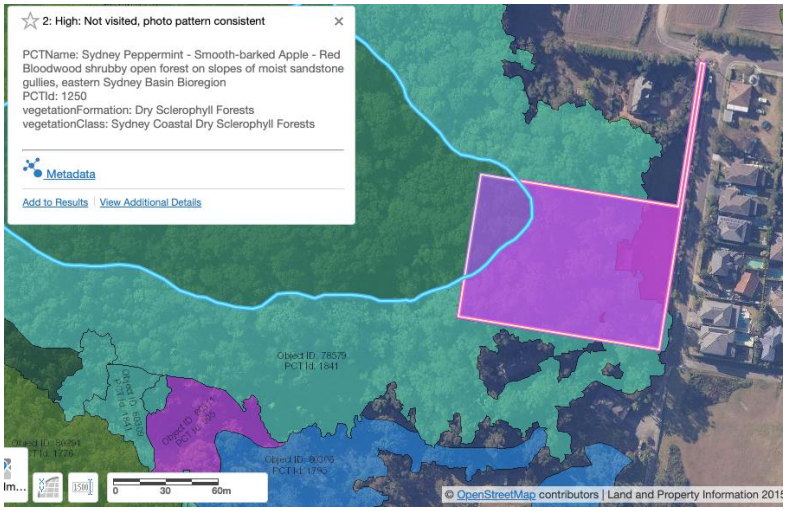


Figure 3.3. Subject site within PCT1250 Sydney Peppermint - Smooth-barked Apple - Red Bloodwood shrubby open forest on slopes of moist sandstone gullies, eastern Sydney Basin Bioregion. Source: SEEDMaps 2023.

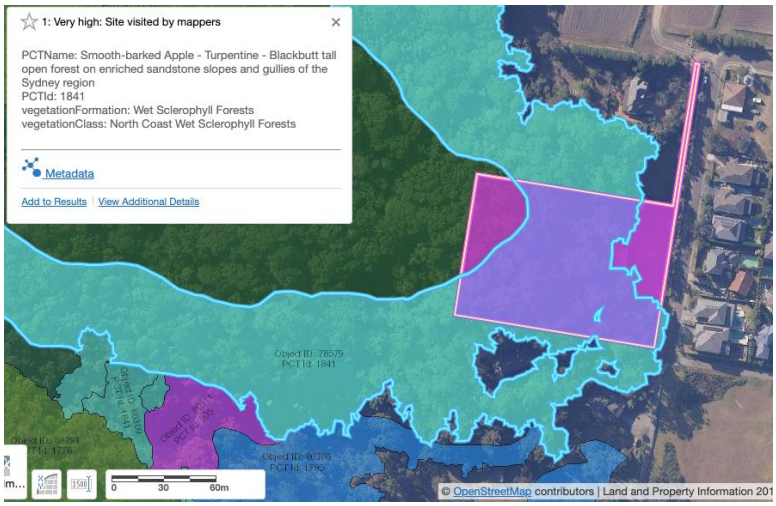


Figure 3.4. Subject site within PCT1841 Smooth-barked Apple - Turpentine - Blackbutt tall open forest on enriched sandstone slopes and gullies of the Sydney region. Source: SEEDMaps 2023.

3.1.2 Site Photos

Plate 1. The current driveway and entrance onto the site.

Plate 2. The existing dwelling located on site. Looking from east to west.

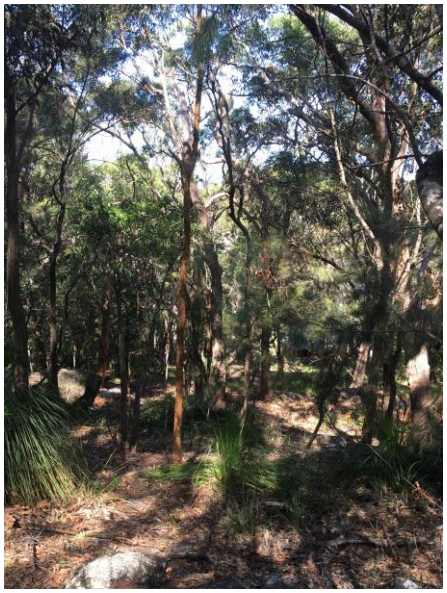
Plate 3. This photo illustrates the native canopy cover with cleared understory located adjacent to the cleared land with exotic grass.

Plate 4. Location of Plot 1 which includes the vegetative condition of native canopy cover with cleared understory.

Plate 5. Evidence of disturbance within this first condition is evident due to the low density of shrubs and ground cover species.

Plate 6. The presence of weeds species between the cleared exotic grass and native canopy with cleared understory was high across some areas on site.

Plates 7 and 8. In the western half of the site looking eastwards towards the dwelling. These photos indicate the transition between native canopy with cleared understory and natural bushland.



Plates 9 and 10. Photos taken in the western side of the property showing the natural bushland which is present on site. This area contains vegetation across all strata and is in good condition. The proposed development does not expect to impact this area.

4 Threatened Species

4.1 Flora and Flora Field Survey

No threatened flora or fauna species were identified during Kingfisher 2023 field surveys.

4.1.1 Opportunistic Flora and Fauna survey methods

During opportunistic surveys, notes and photos were taken of the vegetation types and flora and fauna present onsite were recorded. Surveys were general and opportunistic in nature and were performed by traversing the site.

4.1.2 Diurnal Bird Surveys

Diurnal bird surveys occurred during mid-afternoon. Opportunistic observations of birds were made during vegetation surveys. Several species which are known to nest in hollows were predicted at the site and a dedicated effort was made to traverse the impact area to understand if hollows are present and if they are suitable for predicted bird species.

The site survey for birds primarily focused on their breeding habitat requirements such as hollows, waterways onsite, nests that are present and other features which bird species may use for breeding purposes. It was concluded that the impact area hosts potential foraging habitat for all birds species listed in the BAM calculator. Therefore, all bird species identified in the BAM calculator were retained in the assessment for foraging purposes.

However, it is unlikely that threatened avifauna would use the impact area for breeding purposes, due to lack of optimal breeding habitat (suitable hollows, suitable waterways). Justification for species exclusion in the BAM-C can be found in appendix I. Searches and call playback was conducted for forest owls however no individuals were recorded on site.

4.1.3 Microbats

The impact area hosts potential foraging habitat for threatened microbat species which are identified in the BAM calculator for the site. The site survey for microbats primarily focused on their breeding habitat requirements such as caves, outcrops, hollows and other features which microbat species may use for breeding purposes.

It has been concluded that while microbat species may use the site for foraging purposes, they are unlikely to use the site for breeding purposes due to lack of optimal breeding opportunities within the impact area. Therefore, impact assessment on microbat breeding habitat has been excluded from the BAM assessment.

4.1.4 Mammal Surveys

Mammal surveys occurred during the mid-afternoon. The proposed development is not expected to significantly impact upon breeding or foraging purposes for any mammal species identified in the BAM Calculator as there are no optional habitat features within the development area.

4.1.5 Amphibian Surveys

Amphibian surveys occurred during the mid-afternoon. Opportunistic observations of amphibians were made during vegetation surveys. Any potential habitat features were investigated however no threatened

amphibian species identified in the BAM calculator were identified onsite. Habitat requirements for all threatened amphibian species identified in the BAM calculator are marginal within the impact area.

4.1.6 Reptile and Snail surveys

Reptile and Snail surveys were undertaken by thorough investigation of potential habitat including:

- Leaf litter
- Bark litter
- Stick piles
- Native ground cover vegetation
- Rocks
- Rubbish

No threatened Reptile or Snail species were identified during site investigations.

4.1.7 Koala assessment summary

The proposal is unlikely to have a significant impact on the Koala or areas of critical habitat for the species. The *Koala habitat assessment tool* (DotE; 2014) was used to determine the importance of habitat on site for the Koala. The site is unlikely to support a population of Koalas. It is unlikely that the species would occur on site due to the degraded nature of vegetation and habitat, as such, there is a low likelihood of occurrence for the species.

Desktop (Bionet, ALA) and on-ground surveys were conducted to determine the presence / absence of the species. The on-ground survey also contributed to information regarding habitat availability within the site. Direct observation surveys for the species were generally opportunistic in nature, however no individuals were observed on site. Indirect survey methods including; scat and scratching's searches (outlined in DotE; 2014) were conducted. No evidence of the species was found on site.

See appendix V for the Koala assessment which is in accordance the *Significant impact guidelines 1.1- Matters of National Environmental Significance – page 11.* The assessment also references *Table 4: Koala habitat assessment tool* within the document; *EPBC Act Referral Guidelines for the vulnerable koala* published by Commonwealth Department of Environment (DotE; 2014).

4.2 Threatened Flora - Desktop

A total of 19 threatened flora species have been recorded within 10km of the study site according to BioNet records. These species are currently listed as vulnerable or endangered under state and/or commonwealth legislation (see Table 4). The vulnerable and endangered species to focus on-site searches for can be seen in Table 4 below highlighted in bold. This is based on likelihood of occurrence.

Table 4.1 Threatened flora observed in previous ecological surveys within a 10km radius of the study site. NSW DPIE Bionet 2020.

Family	Scientific Name	Common Name	NSW status	Comm. status	Records
Rutaceae	*Asterolasia elegans*		E1	E	1
Myrtaceae	*Callistemon linearifolius*	Netted Bottle Brush	V,3		5
Euphorbiaceae	*Chamaesyce psammogeton*	Sand Spurge	E1		13
Ericaceae	*Epacris purpurascens* var. *purpurascens*		V		3
Myrtaceae	*Eucalyptus camfieldii*	Camfield's Stringybark	V	V	22
Myrtaceae	*Eucalyptus nicholii*	Narrow-leaved Black Peppermint	V	V	4
Orchidaceae	*Genoplesium baueri*	Bauer's Midge Orchid	E1,P,2	E	2
Grammitidaceae	*Grammitis stenophylla*	Narrow-leaf Finger Fern	E1,3		2
Proteaceae	*Grevillea caleyi*	Caley's Grevillea	E4A,3	CE	457
Myrtaceae	*Kunzea rupestris*		V	V	1
Malvaceae	*Lasiopetalum joyceae*		V	V	1
Orchidaceae	*Microtis angusii*	Angus's Onion Orchid	E1,P,2	E	82
Proteaceae	*Persoonia hirsuta*	Hairy Geebung	E1,P,3	E	6
Thymelaeaceae	*Pimelea curviflora* var. *curviflora*		V	V	11
Lamiaceae	*Prostanthera densa*	Villous Mint-bush	V	V	1
Lamiaceae	*Prostanthera marifolia*	Seaforth Mintbush	E4A,3	CE	1
Myrtaceae	*Rhodamnia rubescens*	Scrub Turpentine	E4A		22
Myrtaceae	*Syzygium paniculatum*	Magenta Lilly Pilly	E1	V	18
Elaeocarpaceae	*Tetratheca glandulosa*		V		91

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

4.3 Threatened Fauna - Desktop

A total of 55 threatened fauna species have been recorded within 10km of the study site according to BioNet records. These species are currently listed as vulnerable or endangered under state and/or commonwealth legislation (see Table 4.2). The vulnerable and endangered species to focus on-site searches for can be seen in Table 4.2 below highlighted in bold. This is based on likelihood of occurrence.

Table 4.2. Threatened fauna observed in previous ecological surveys within a 10km radius of the study site. NSW DPIE Bionet 2020.

Class	Scientific Name	Common Name	NSW Status	Comth. Status	No. of records
Amphibia	Heleioporus australiacus	Giant Burrowing Frog	V,P	V	50
Amphibia	Litoria aurea	Green and Golden Bell Frog	E1,P	V	4
Amphibia	Pseudophryne australis	Red-crowned Toadlet	V,P		81
Aves	Anthochaera phrygia	Regent Honeyeater	E4A,P	CE	39
Aves	Ardenna carneipes	Flesh-footed Shearwater	V,P	J,K	1
Aves	Artamus cyanopterus cyanopterus	Dusky Woodswallow	V,P		2
Aves	Botaurus poiciloptilus	Australasian Bittern	E1,P	E	3
Aves	Burhinus grallarius	Bush Stone-curlew	E1,P		10
Aves	Callocephalon fimbriatum	Gang-gang Cockatoo	V,P,3		3
Aves	Calyptorhynchus lathami	Glossy Black-Cockatoo	V,P,2		109
Aves	Daphoenositta chrysoptera	Varied Sittella	V,P		4
Aves	Diomedea exulans	Wandering Albatross	E1,P	E	2
Aves	Glossopsitta pusilla	Little Lorikeet	V,P		14
Aves	Haematopus fuliginosus	Sooty Oystercatcher	V,P		7
Aves	Haliaeetus leucogaster	White-bellied Sea-Eagle	V,P		44
Aves	Hieraaetus morphnoides	Little Eagle	V,P		9

Class	Scientific Name	Common Name	NSW Status	Comth. Status	No. of records
Aves	Hirundapus caudacutus	White-throated Needletail	P	V,C,J,K	13
Aves	Ixobrychus flavicollis	Black Bittern	V,P		25
Aves	Lathamus discolor	Swift Parrot	E1,P,3	CE	17
Aves	Lophoictinia isura	Square-tailed Kite	V,P,3		3
Aves	Melithreptus gularis gularis	Black-chinned Honeyeater (eastern subspecies)	V,P		1
Aves	Ninox connivens	Barking Owl	V,P,3		36
Aves	Ninox strenua	Powerful Owl	V,P,3		294
Aves	Pandion cristatus	Eastern Osprey	V,P,3		29
Aves	Petroica boodang	Scarlet Robin	V,P		2
Aves	Ptilinopus magnificus	Wompoo Fruit-Dove	V,P		2
Aves	Ptilinopus regina	Rose-crowned Fruit-Dove	V,P		2
Aves	Ptilinopus superbus	Superb Fruit-Dove	V,P		4
Aves	Rostratula australis	Australian Painted Snipe	E1,P	E	3
Aves	Thalassarche cauta	Shy Albatross	V,P	V	3
Aves	Thalassarche chrysostoma	Grey-headed Albatross	P	E	1
Aves	Thalassarche melanophris	Black-browed Albatross	V,P	V	2
Aves	Tyto novaehollandiae	Masked Owl	V,P,3		6
Aves	Tyto tenebricosa	Sooty Owl	V,P,3		2
Aves	Xenus cinereus	Terek Sandpiper	V,P	C,J,K	2

Class	Scientific Name	Common Name	NSW Status	Comth. Status	No. of records
Mammalia	Cercartetus nanus	Eastern Pygmy-possum	V,P		376
Mammalia	Chalinolobus dwyeri	Large-eared Pied Bat	V,P	V	17
Mammalia	Dasyurus maculatus	Spotted-tailed Quoll	V,P	E	17
Mammalia	Falsistrellus tasmaniensis	Eastern False Pipistrelle	V,P		3
Mammalia	Isoodon obesulus obesulus	Southern Brown Bandicoot (eastern)	E1,P	E	32
Mammalia	Micronomus norfolkensis	Eastern Coastal Free-tailed Bat	V,P		22
Mammalia	Miniopterus australis	Little Bent-winged Bat	V,P		57
Mammalia	Miniopterus orianae oceanensis	Large Bent-winged Bat	V,P		132
Mammalia	Myotis macropus	Southern Myotis	V,P		58
Mammalia	Petaurus norfolcensis	Squirrel Glider	V,P		7
Mammalia	Phascolarctos cinereus	Koala	V,P	V	37
Mammalia	Phascolarctos cinereus	Koala in the Pittwater Local Government Area	E2,V,P	V	33
Mammalia	Pseudomys novaehollandiae	New Holland Mouse	P	V	1
Mammalia	Pteropus poliocephalus	Grey-headed Flying-fox	V,P	V	151
Mammalia	Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	V,P		1
Mammalia	Scoteanax rueppellii	Greater Broad-nosed Bat	V,P		8
Mammalia	Vespadelus troughtoni	Eastern Cave Bat	V,P		1
Reptilia	Caretta caretta	Loggerhead Turtle	E1,P	E	4
Reptilia	Chelonia mydas	Green Turtle	V,P	V	5

Class	Scientific Name	Common Name	NSW Status	Comth. Status	No. of records
Reptilia	Varanus rosenbergi	Rosenberg's Goanna	V,P		97

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

Likelihood of occurrence

See Appendix I for a 'Rationale for Likelihood of Occurrence', which outlines why species have been retained or omitted from BAM calculations. Reasons for inclusion or removal are based on species habitat preferences, site investigations, species survey, Bionet records and expert opinion. During the survey, none of the above threatened species were observed on-site. Marginal foraging habitat for several species is present onsite. Thus, all predicted species were retained in the BAM-C and several candidate species generated species credit species due to the impact on foraging habitat.

5 Direct Impacts

5.1.1 Vegetation disturbance and Loss

Tree removal as per the Arborist report is up to forty-three (43) trees within the development footprint, to be removed or impacted by the proposed activities, see figure 5. The flowering Eucalypts (and invertebrates attracted) are foraging resources for the threatened Grey Headed Flying Fox, threated species of microbats and nectivorous birds. Breeding habitat is not expected to be impacted although foraging habitat will be modified.

1.6	The proposed works are also within the SRZs of Trees 1, 14, 15, 17, 63, 65, 71, 72, 88 & 143 and represent a *Major Encroachment* (as defined by AS4970). However, these trees will need to be removed as the TPZ encroachment is too large for their long-term viability, based on a consideration of their health, structure and the size of the encroachment. These trees were all assigned Low to Moderate Landscape Significance Values except for Trees 65 & 71, which were assigned High Landscape Significance Values.
1.7	Trees 5, 6, 8, 11, 18, 29, 30, 31, 32, 33, 35, 64, 66, 67, 68, 69, 70, 79, 84, 85, 86, 87, 89, 122, 123, 134, 138, 146, 147, 148, 156, 157 & 158 are within the proposed development footprint and will need to be removed. These trees were mostly assigned Low to Moderate Landscape Significance Values except for Trees 35, 69 & 79, which were assigned High Landscape Significance Values.

Figure 5.1. Trees for removal from Arborist report. Source; L&O Consultancy Arboriculture Plant Pathology, 26 Sept 2022 v1 Draft.

Native trees proposed for removal include:

- *Macadamia integrifolia* (Macadamia) - Tree #5;
- *Callistemon viminalis* (Weeping Bottlebrush) - Tree #6;
- *Glochidion fernandi* (Cheese Tree) - Tree #8, 147, 157;
- *Angophora floribunda* (Rough-barked Apple) - Tree #11, 64, 67, 70, 72, 79, 138, 146, 156;
- *Syncarpia glomulifera* (Turpentine) - Tree #14, 15, 18, 30, 31, 32, 33, 66, 85, 86, 88;
- *Allocasaurina littoralis* (Black She Oak) - Tree #17, 68, 84, 89, 122;
- *Allocasaurina torulosa* (Forest Oak) - Tree #29;
- *Eucalyptus piperita* (Sydney Peppermint) - Tree #35;
- *Banksia serrata* (Old Man Banksia) - Tree #63;
- *Eucalyptus umbra* (Broad-leaved White Mahogany) - Tree #65, 71;
- *Eucalyptus robusta* (Swamp Mahogany) - Tree #69, 148;
- *Angophora costata* (Sydney Red Gum) - Tree #87, 143;
- *Melicope elleryana* (Doughwood) - Tree #134; and
- *Syzygium australe* (Brush Cherry Lilly Pilly) - Tree #158.

The proposed development also includes the removal of one (1) non-native tree including a *Jacaranda mimosifolia* (Jacaranda) (Tree # 1).

6 Indirect Impacts

6.1.1 Weed growth and invasion

Weed species are present and must be properly managed so they do not spread.

At the direct works zone weeds are to be managed by stopping seed spread on machinery, tools, equipment and worker clothes (e.g. boots). Additionally, after weed removal around the perimeter area of the construction, there must be continuous maintenance of the site 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

6.1.2 Introduction of pathogens

The introduction of pathogens may occur into the site, and surrounding remnant bushland, 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 mold) and Myrtle Rust (*Puccinia psidii* – type of fungus). See Appendix for Bushland Hygiene Protocols for Phytophora.

6.1.3 Soil disturbance and erosion

The removal of vegetation and trees can result in soil disturbance. The soil appears to be sodic thus erosion can occur at a faster rate. Soil compaction could occur from machinery use. It is recommended that soil compaction in non-built upon areas is to be avoided and not to occur within the trees to be retained Replacement of woody debris and a covering of organic matter over the cleared site will prevent erosion and thus is highly recommended.

6.1.4 Water Quality

There are no streams present onsite however the proposed actions may result in transport of sediment from the work zones because of increased storm water runoff to areas downstream. Which may impact water quality, riparian vegetation and aquatic fauna. Recommendations to maintain and improve water quality on site have been listed in section 10 below.

6.1.4.1.1 Livestock

Hard-hoofed animals, such as cattle, horses and sheep can accelerate habitat degradation, trample native vegetation and compact the soil, which prevents seedling growth and encourages soil erosion. These factors have been considered as indirect impacts associated with the proposal. Keeping of livestock may not significantly affect the native vegetation on site although it may increase the likelihood of other indirect impacts (soil erosion, weed invasion, decrease in water quality).

7 Recommendations

7.1.1.1.1 Native species landscaping

All landscaped areas should be planted with locally native species. This will provide greater foraging and nesting habitat for native species and will deliver greater biodiversity gain outcomes. These species should be selected in consultation with an ecologist for the greatest ecological outcome.

7.1.1 Weed management

Low impact bushland regeneration methods should be utilised to meet weed control performance criteria in all areas of remnant native vegetation, to prevent unnecessary impacts to native vegetation and disturbance to soil. Low impact bush regeneration methods include the manual removal of herbaceous weeds and their propagules by hand and with hand tools. All bush regeneration activities requiring the use of chemicals must be performed in accordance with the NSW *Pesticides Act 1999.* Herbicides must not be applied whilst exotic plants are setting seeds.

7.1.2 Delineation of work areas

During construction, impacts to the site and adjacent vegetation should be minimised by the delineation of works zones. Access to the site would be best restricted to the development footprint only. An environmental exclusion zone is proposed for vegetation outside work areas.

7.1.3 Vegetation clearing control measures

An ecologist should be present onsite during vegetation clearing to ensure no fauna are harmed as a result of clearing.

7.1.4 Tree Protection

Tree protection will be consistent with the Arborist report. Main trees to be managed are trees within close proximity to building works NB: see final tree survey for details and tree numbers.

7.1.5 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 III for further details. For key weed photo guide see Appendix VIII.

7.1.6 Native Seed Collection

Any native trees or shrubs being removed for the construction works should be checked for seeds during removal works. If seeds are present, they should be collected and used off-site, location to be determined with council.

7.1.7 Nest boxes

Installation of a 4 nest boxes designed for microbats should be added to the site to increase roosting opportunities in the area.

Image from: nestboxes.com.au

7.1.8 Pathogen prevention

To prevent the introduction of pathogens, Bushland Hygiene Protocols outlined in Appendix V 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.

8 Conclusions

The proposed development will have an approximate impact area of 0.4210ha on PCT 1841 (Coastal Enriched Sandstone Moist Forest). A large proportion of the site includes areas of previous modification and disturbance. Impacts will be made to areas of exotic vegetation including pasture grass as well as native tree species with cleared understory. The greatest impact of the proposal will be the removal of native tree species which may provide potential foraging habitat for some threatened species. The natural bushland on the western side of the property is not expected to be impacted by the proposed development.

9 Appendices

9.1 Appendix I – Rationale for Likelihood of Occurrence

Appendix I 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 9.1. Threatened flora species likelihood of occurrence.

Scientific Name	Common Name	Habitat/ Geographic Constraints	Reason for Inclusion or Removal
Acacia terminalis subsp. *Eastern Sydney*	Sunshine Wattle	*A.t.terminalis* usually occupies sandy soil on creek banks, hillslopes or in shallow soil in rock crevices and sandstone platforms on cliffs.	No flora bearing the key identifying features of this species was identified during surveys. No potential habitat within the site boundaries. **No further assessment required.**
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.	No flora bearing the key identifying features of this species was identified during surveys. No potential habitat within the site boundaries. **No further assessment required.**
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	No flora bearing the key identifying features of this species was identified during

Scientific Name	Common Name	Habitat/ Geographic Constraints	Reason for Inclusion or Removal
		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.	surveys. No potential habitat within the site boundaries. **No further assessment required.**
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 flora bearing the key identifying features of this species was identified during surveys. No potential habitat within the site boundaries. **No further assessment required.**
Cryptostylis hunteriana	Leafless Tongue Orchid	The larger populations typically occur in woodland dominated by Scribbly Gum (*Eucalyptus sclerophylla*), Silvertop Ash (*E. sieberi*), Red Bloodwood (*Corymbia gummifera*) and Black Sheoak (*Allocasuarina littoralis*); appears to prefer open areas in the understorey of this community and is often found in association with the Large Tongue Orchid (*C. subulata*) and the Tartan Tongue Orchid (*C. erecta*).	No flora bearing the key identifying features of this species was identified during surveys. No potential habitat within the site boundaries. **No further assessment required.**
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	No flora bearing the key identifying features of this species was identified during surveys. No potential habitat within the site boundaries.

Scientific Name	Common Name	Habitat/ Geographic Constraints	Reason for Inclusion or Removal
		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 further assessment required.**
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 of *E. oblonga* Narrow-leaved Stringybark, *E. capitellata* Brown Stringybark and *E. haemastoma* Scribbly Gum.	No flora bearing the key identifying features of this species was identified during surveys. No potential habitat within the site boundaries. **No further assessment required.**
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.	No flora bearing the key identifying features of this species was identified during surveys. No potential habitat within the site boundaries. **No further assessment required.**
Genoplesium baueri	Bauers Midge Orchid	Grows in dry sclerophyll forest and moss gardens over sandstone.	No flora bearing the key identifying features of this species was identified during

Scientific Name	Common Name	Habitat/ Geographic Constraints	Reason for Inclusion or Removal
			surveys. No potential habitat within the site boundaries. **No further assessment required.**
Grammitis stenophylla	Narrow Leaf FInger Fern	Moist places, usually near streams, on rocks or in trees, in rainforest and moist eucalypt forest.	No flora bearing the key identifying features of this species was identified during surveys. No potential habitat within the site boundaries. **No further assessment required.**
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*.	No flora bearing the key identifying features of this species was identified during surveys. No potential habitat within the site boundaries. **No further assessment required.**
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 from the	No flora bearing the key identifying features of this species was identified during surveys. No potential habitat within the site boundaries.

Scientific Name	Common Name	Habitat/ Geographic Constraints	Reason for Inclusion or Removal
		base after fire or mechanical damage. Seedlings have also been observed after fire.	**No further assessment required.**
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 flora bearing the key identifying features of this species was identified during surveys. No potential habitat within the site boundaries. **No further assessment required.**
Macadamia integrifolia	Macadamia	In drier types of subtropical rainforest north from Currumbin in Qld. It is not known to occur naturally in the wild in N.S.W.; however, it has been recorded from Camden Haven but it is not known if the tree was cultivated or growing naturally. This species is frequently cultivated for its fruit.	No flora bearing the key identifying features of this species was identified during surveys. No potential habitat within the site boundaries. **No further assessment required.**
Microtis angusii	Angus' Onion Orchid	Currently known from sites at Ingleside. The Ingleside population occurs on both natural and moditfied soils in restricted ridgetop lateritic soils in the Duffys Forest - Terrey Hills - Ingleside and Belrose areas.	No flora bearing the key identifying features of this species was identified during surveys. No potential habitat within the site boundaries. **No further assessment required.**

Scientific Name	Common Name	Habitat/ Geographic Constraints	Reason for Inclusion or Removal
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.	No flora bearing the key identifying features of this species was identified during surveys. No potential habitat within the site boundaries. **No further assessment required.**
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.	No flora bearing the key identifying features of this species was identified during surveys. No potential habitat within the site boundaries. **No further assessment required.**
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.	No flora bearing the key identifying features of this species was identified during surveys. No potential habitat within the site boundaries. **No further assessment required.**

Scientific Name	Common Name	Habitat/ Geographic Constraints	Reason for Inclusion or Removal
Prostanthera marifolia	Seaforth Mint Bush	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.	No flora bearing the key identifying features of this species was identified during surveys. No potential habitat within the site boundaries. **No further assessment required.**
Rhodamnia rubescens	Scrub Turpentine	Found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest usually on volcanic and sedimentary soils.	No flora bearing the key identifying features of this species was identified during surveys. No potential habitat within the site boundaries. **No further assessment required.**
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 flora bearing the key identifying features of this species was identified during surveys. No potential habitat within the site boundaries. **No further assessment required.**
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,	No flora bearing the key identifying features of this species was identified during

Scientific Name	Common Name	Habitat/ Geographic Constraints	Reason for Inclusion or Removal
		upper slopes and occasionally mid-slope benches. Prefers shallow soils consisting of yellow clayey/sandy loams.	surveys. No potential habitat within the site boundaries. **No further assessment required.**

Table 7.2 – **Threatened fauna species likelihood of occurrence**

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

Fauna

Scientific Name	Common Name	Habitat Requirements	Site Suitability
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.	No habitat present within construction footprint.
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.	No habitat present within construction footprint.
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	No habitat present within

Scientific Name	Common Name	Habitat Requirements	Site Suitability
		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.	construction footprint.
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.	No habitat present within construction footprint.
Ardenna carneipes	Fresh-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.	Species restricted to coastal and marine areas. No nesting or foraging habitat present on site.
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 present within construction footprint.
Botaurus poiciloptilus	Australisian Bittern	Favours permanent freshwater wetlands with tall, dense vegetation, particularly bullrushes (*Typha* spp.) and spikerushes (*Eleocharis* spp.).	Species restricted to coastal and marine areas. No nesting or

Scientific Name	Common Name	Habitat Requirements	Site Suitability
		Breeding occurs in summer from October to January; nests are built in secluded places in densely-vegetated wetlands on a platform of reeds; there are usually six olive-brown eggs to a clutch.	foraging habitat present on site.
Burhinus grallarius	Bush Stone-curlew	Inhabits open forests and woodlands with a sparse grassy groundlayer and fallen timber. Nest on the ground in a scrape or small bare patch.	Species restricted to coastal and marine areas. No nesting or foraging habitat present on site.
Calidris alba	Sanderling	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.	Species restricted to coastal and marine areas. No nesting or foraging habitat present on site.
Calidris canutus	Red Knot	In NSW the Red Knot mainly occurs in small numbers on intertidal mudflats, estuaries, bays, inlets, lagoons, harbours and sandflats and sandy beaches of sheltered coasts. It is occasionally found on sandy ocean beaches or shallow pools on exposed wave-cut rock platforms and is a rare visitor to terrestrial saline wetlands and freshwater swamps. The birds roost on sandy beaches, spits, islets and mudflats close to feeding grounds, usually in open areas.	Species restricted to coastal and marine areas. No nesting or foraging habitat present on site.
Calidris ferruginea	Curlew Sandpiper	It generally occupies littoral and estuarine habitats, and in New South Wales is mainly found in intertidal mudflats of sheltered coasts.	Species restricted to coastal and marine areas. No nesting or

Scientific Name	Common Name	Habitat Requirements	Site Suitability
		It roosts on shingle, shell or sand beaches; spits or islets on the coast or in wetlands; or sometimes in salt marsh, among beach-cast seaweed, or on rocky shores.	foraging habitat present on site.
Calidris tenuirostris	Great Knot	Occurs within sheltered, coastal habitats containing large, intertidal mudflats or sandflats, including inlets, bays, harbours, estuaries and lagoons.	Species restricted to coastal and marine areas. No nesting or foraging habitat present on site.
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 present within construction footprint.
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 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.**	**Food trees for Glossy Black Cockatoos are being removed. 5-part test conducted. Glossy Black Cockatoos are recorded in the Escarpment.**

Scientific Name	Common Name	Habitat Requirements	Site Suitability
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.	Species restricted to coastal and marine areas. No nesting or foraging habitat present on site.
Charadrius mongolus	Lesser Sand-plover	Almost entirely coastal in NSW, favouring the beaches of sheltered bays, harbours and estuaries with large intertidal sandflats or mudflats; occasionally occurs on sandy beaches, coral reefs and rock platforms.Roosts during high tide on sandy beaches, spits and rocky shores; forage individually or in scattered flocks on wet ground at low tide, usually away from the water's edge.	Species restricted to coastal and marine areas. No nesting or foraging habitat present on site.
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. Builds a cup-shaped nest of plant fibres and cobwebs in an upright tree fork high in the living tree canopy, and often re-uses the same fork or tree in successive years.	No habitat present within construction footprint.
Esacus magnirostris	Beach Stone-curlew	Beach Stone-curlews are found exclusively along the coast, on a wide range of beaches, islands, reefs and in estuaries, and may often be seen at the edges of or near mangroves. They forage in the intertidal zone of beaches and estuaries, on islands, flats, banks and spits of sand, mud, gravel or rock, and among mangroves. Beach Stone-curlews breed above the littoral zone, at the backs of beaches, or on sandbanks and islands, among low vegetation of grass, scattered shrubs or low trees; also among open mangroves.	Species restricted to coastal and marine areas. No nesting or foraging habitat present on site.

Scientific Name	Common Name	Habitat Requirements	Site Suitability
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 present within construction footprint.
Gygis alba	White tern	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.	Species restricted to coastal and marine areas. No nesting or foraging habitat present on site.
Haematopus fuliginosus	Sooty Oystercatcher	Favours rocky headlands, rocky shelves, exposed reefs with rock pools, beaches and muddy estuaries. Breeds in spring and summer, almost exclusively on offshore islands, and occasionally on isolated promontories. The nest is a shallow scrape on the ground, or small mounds of pebbles, shells or seaweed when nesting among rocks.	Species restricted to coastal and marine areas. No nesting or foraging habitat present on site.
Haematopus longirostris	Pied Oystercatcher	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.	Species restricted to coastal and marine areas. No nesting or foraging habitat present on site.
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	No habitat present within

Scientific Name	Common Name	Habitat Requirements	Site Suitability
		the vicinity of freshwater 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'. Nests are large structures built from sticks and lined with leaves or grass. Feed mainly on fish and freshwater turtles, but also waterbirds, reptiles, mammals and carrion. White-bellied Sea-Eagles build a large stick nest, which is used for many seasons in succession. The nest can be located in a tree up to 30m above the ground, but may also be placed on the ground or on rocks, where there are no suitable trees. At the start of the breeding season, the nest is lined with fresh green leaves and twigs.	construction footprint.
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 present within construction footprint.
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	No habitat present within construction footprint.

Scientific Name	Common Name	Habitat Requirements	Site Suitability
		flight in their wide gaping beaks. Birds usually 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.	
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 present within construction footprint.
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 present within construction footprint.
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 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.	No habitat present within construction footprint.

Scientific Name	Common Name	Habitat Requirements	Site Suitability
Melithreptus gularis gularis	Black-chinned Honeyeater (eastern subspecies)	Occupies mostly upper levels of drier open forests or woodlands dominated by box and ironbark eucalypts, especially Mugga Ironbark (*Eucalyptus sideroxylon*), White Box (*E. albens*), Inland Grey Box (*E. microcarpa*), Yellow Box (*E. melliodora*), Blakely's Red Gum (*E. blakelyi*) and Forest Red Gum (*E. tereticornis*).	No habitat present within construction footprint.
Neophema pulchella	Turquoise Parrot	Lives on the edges of eucalypt woodland adjoining clearings, timbered ridges and creeks in farmland.Prefers to feed in the shade of a tree and spends most of the day on the ground searching for the seeds or grasses and herbaceous plants, or browsing on vegetable matter. Forages quietly and may be quite tolerant of disturbance. However, if flushed it will fly to a nearby tree and then return to the ground to browse as soon as the danger has passed.Nests in tree hollows, logs or posts, from August to December. It lays four or five white, rounded eggs on a nest of decayed wood dust.	No habitat present within construction footprint.
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 understory 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. 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 (*E. albens*), (Red Box) *E. polyanthemos* and Blakely's Red Gum (*E. blakelyi*). Breeding occurs during late winter and early spring.**	**Potential habitat for prey items. 5-part test conducted.**

Scientific Name	Common Name	Habitat Requirements	Site Suitability
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. Closest in Attungah Reserve and Palmgove Reserve.**	**Potential habitat for prey items. 5-part test conducted.**
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 salt flats 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 present within construction footprint.
Onychoprion fuscata	Sooty Tern	Breeds in large colonies in sand or coral scrapes on offshore islands and cays including Lord Howe and Norfolk Islands	Species restricted to coastal and marine areas. No nesting or foraging habitat present on site.
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. Closest frequent records are from Narrabeen Lagoon and sometimes at Mona Vale pool	No habitat present within construction footprint.

Scientific Name	Common Name	Habitat Requirements	Site Suitability
Petroica boodang	Scarlett Robin	The Scarlet Robin lives in dry eucalypt forests and woodlands. The understorey is usually open and grassy with few scattered shrubs. Scarlet Robin habitat usually contains abundant logs and fallen timber: these are important components of its habitat. The Scarlet Robin breeds on ridges, hills and foothills of the western slopes, the Great Dividing Range and eastern coastal regions; this species is occasionally found up to 1000 metres in altitude. Birds forage from low perches, fence-posts or on the ground, from where they pounce on small insects and other invertebrates which are taken from the ground, or off tree trunks and logs; they sometimes forage in the shrub or canopy layer.	No habitat present within construction footprint.
Ptilinopus magnificus	Wompoo Fruit Dove	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. Thought to be an effective medium to long-distance vector for seed dispersal. 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.	No habitat present within construction footprint.
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 present within construction footprint.
Ptilinopus superbus	Superb Fruit Dove	Inhabits rainforest and similar closed forests where it forages high in the canopy, eating the fruits of many tree species such as figs and palms. It may also forage in eucalypt or acacia woodland where there are fruit-bearing trees. reeding takes place from	No habitat present within

Scientific Name	Common Name	Habitat Requirements	Site Suitability
		September to January. The nest is a structure of fine interlocked forked twigs, giving a stronger structure than its flimsy appearance would suggest, and is usually 5-30 metres up in rainforest and rainforest edge tree and shrub species.	construction footprint.
Puffinus assimilis	Little Shearwater	Breeding sites at Lord Howe Island include Roach Island, Muttonbird Island, Blackburn Island and on the main Island at Muttonbird Point and Transit Hill.	Species restricted to coastal and marine areas. No nesting or foraging habitat present on site.
Rostratula australis	Australian Painted Snipe	Prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber. Nests on the ground amongst tall vegetation, such as grasses, tussocks or reeds.	Species restricted to coastal and marine areas. No nesting or foraging habitat present on site.
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.	Species restricted to coastal and marine areas. No nesting or foraging habitat present on site.
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 present within construction footprint.

Scientific Name	Common Name	Habitat Requirements	Site Suitability
Tyto tenebricosa	Sooty Owl	Occurs in rainforest, including dry rainforest, subtropical and warm temperate rainforest, as well as moist eucalypt forests. Roosts by day in the hollow of a tall forest tree or in heavy vegetation; hunts by night for small ground mammals or tree-dwelling mammals such as the Common Ringtail Possum (*Pseudocheirus peregrinus*) or Sugar Glider (*Petaurus breviceps*).	No habitat present within construction footprint.
Xenus cinereus	Terek Sandpiper	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 or dead trees, often with related wader species.	Species restricted to coastal and marine areas. No nesting or foraging habitat present on site.
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 present within construction footprint.
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.**	**Potential foraging area being removed. 5-part test conducted.**
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 present within construction footprint.

Scientific Name	Common Name	Habitat Requirements	Site Suitability
Falsistrellus tasmaniensis	**Eastern False Pipestelle**	**The Eastern False Pipistrelle is found on the south-east coast and ranges of Australia, from southern Queensland to Victoria and Tasmania. Prefers moist habitats, with trees taller than 20 m. Generally roosts in eucalypt hollows, but has also been found under loose bark on trees or in buildings. 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.**	**Potential foraging area being removed. 5-part test conducted.**
Isoodon obesulus obesulus	Southern Brown Bandicoot (eastern)	Species found in heath or open forest with a heathy understory 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 present within construction footprint.
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 maily in tree hollows but will also roost under bark or in man-made structures. Usually solitary but also recorded roosting communally, probably insectivorous**	**Potential foraging area being removed. 5-part test conducted.**
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 the large colony to provide the high temperatures needed to rear its young.**	**Potential foraging area being removed. 5-part test conducted.**

Scientific Name	Common Name	Habitat Requirements	Site Suitability
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.**	**Potential foraging area being removed. 5-part test conducted.**
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 present within construction footprint.
Petauroides volans	Greater Glider	Inhabit eucalypt woodlands and forests. Feed on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred browse species. Inactive for most of the day, feeding and moving mostly at night. Spend most of their time in trees, but will descend and traverse open ground to move between trees. Home range size varies with quality of habitat, ranging from less than two ha to several hundred hectares in size.	No habitat present within construction footprint.
Petaurus norfolcensis	Squirrel Glider	Inhabits mature or old growth Blackbutt-Bloodwood forests with heath understory in coastal areas. Prefers mixed species stands with a shrub or Acacia mid-story. 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 present within construction footprint.
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 present within construction footprint.

Scientific Name	Common Name	Habitat Requirements	Site Suitability
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 understory and vegetated sand dunes. Lives predominantly in burrows shared with other individuals	No habitat present within construction footprint.
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.**	**Potential foraging area being removed. 5-part test conducted.**
Saccolaimus flaviventris	**Yellow-bellied Sheathtailed-bat**	**Roosts singly or in groups of up to six, in tree hollows and buildings; in treeless areas they are known to utilise 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. Breeding has been recorded from December to mid-March, when a single young is born. Seasonal movements are unknown; there is speculation about a migration to southern Australia in late summer and autumn.**	**Potential foraging area being removed. 5-part test conducted.**
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 present within construction footprint.
Vespadelus troughtoni	Eastern Cave Bat	A cave-roosting species that is usually found in dry open forest and woodland, near cliffs or rocky overhangs; has been recorded roosting in disused mine workings, occasionally in colonies of up to 500 individuals. Occasionally found along cliff-lines in wet eucalypt forest and rainforest.	No habitat present within construction footprint.

9.2 Appendix II– 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. 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 Weed Bags
Crowning 	Plants that possess rhizomes or bulbs might not respond to various removal techniques and may need to be treated with crowning. 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 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.
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. 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. 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.

Technique	Method	Equipment
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. 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. 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. 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.
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. 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. 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. 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.

Technique	Method	Equipment
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. 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.

Flame Weeding

Thermal (flame) weeding is a method where high temperatures are applied to weeds, causing the plant to die. Thermal weeding is particularly useful in situations where conservation or health considerations are high and weed density is low such as waterways where herbicide use is not permitted.
While flame weeding is not suited to most streetscapes due to the fire hazard nor can it be used on materials such as soft fall and similar playground equipment it is noted that 'flame' weeding in waterways allows weed management in areas where herbicides are not permitted.
Also for native vegetation areas thermal weeding, with a flame weeder, has been shown to stimulate germination of native plants while killing the seeds of annual weeds such as Devils Pitchfork, *Bidens pilosa*. Flame weeding is also effective in killing persistent weeds like
Mother of Millions.
Best results are obtained when follow up weed control is undertaken 4-6 weeks after treatment. In addition, weed control should be conducted periodically after that for example to control weeds over a period of a year it is likely that between 3-5 applications will be necessary, depending on rainfall and the extent of the weed seed bank. This method is most effective on young annual weeds and least effective on older perennial weeds. In some cases, control of perennial weeds will be ineffective however this depends on the species present and its age.

Images provided by Dragonfly Environmental

Flame weeding should be undertaken outside of the fire seasons. Flame weeding allows for the mimicking of a burn in areas where a control burn could not be undertaken. See native plants regenerating after flame weeding.

9.3 Appendix III– Bushland Hygiene Protocols for Phytophthora (Hornsby Council Recommendations)

- 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.

Contact Hornsby Bushcare if you require any refills or replacements of your Phytophthora Kits on 9484 3677 or bushcare@hornsby.nsw.gov.au

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.

Symptoms including Dieback

"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.

Initial symptoms of Phytophthora include; wilting, yellowing and retention of dried foliage, loss of canopy and dieback. Infected roots blacken and rot and are therefore unable to take-up water and nutrients. Severely infected plants will eventually die. Symptoms can be more obvious in summer when plants may be stressed by drought. If you suspect that Phytophthora is on your site, please contact the Bushcare team to collect a soil sample to be lab tested. This is usually done in the warmer months where conditions are optimum for the disease.

Infection

There is no way of visually telling if Phytophthora is present in the soil as its structures and spores are microscopic (invisible to the naked eye). Phytophthora requires moist soil conditions and warm temperatures for infection, growth and reproduction. Spores travel through moist soil and attach to plant roots. Once Phytophthora has infected a host plant it can grow inside plant root tissue independent of external soil moisture conditions. After infection, Phytophthora grows through the root destroying the tissue which is then unable to absorb water and nutrients.

Appendix IV– PCT 1250 & 1841 Species List

PCT 1250	
Scientific name	Common name
Upper stratum	
Banksia serrata	Old-man's Banksia
Angophora costata	Smooth-barked Apple
Eucalyptus piperita	Sydney Peppermint
Corymbia gummifera	Red Bloodwood
Ceratopetalum gummiferum	Christmas Bush
Middle stratum	
Acacia terminalis	Sunshine Wattle
Acacia suaveolons	Sweet Wattle
Banksia ericifolia	Heath-leaved Banksia
Banksia spinulosa	Hairpin Banksia
Leptospermum trinervium	Slender Tea-Tree
Leptospermum polygalifolium	Tantoon
Lomatia silaifolia	Crinkle Bush

Persoonia pinifolia	Pine-leaved Geebung
Platysace linearifolia	Giant Water Vine
Ground stratum	
Caustis flexuosa	Curly Wig
Dianella caerulea	Blue Flax-lily
Doryanthes excelsa	Gymea Lily
Entolasia stricta	Wiry Panic
Gonocarpus tuecrioides	Germander Raspwort
Lepidosperma laterale	Variable Sword-sedge
Lomandra longifolia	Spiny-headed Mat-rush
Pteridium esculentum	Bracken Fern

PCT 1841	
Scientific name	Common name
Upper stratum	
Angophora costata	Sydney Red Gum
Syncarpia glomulifera	Turpentine

Eucalyptus piperita	Sydney Peppermint
Eucalyptus pilularis	Blackbutt
Eucalyptus saligna	Sydney Blue Gum
Eucalyptus botryoides	Bangalay Gum
Middle stratum	
Allocasuarina torulosa	Forest Oak
Breynia oblongifolia	Coffee Bush
Ceratopetalum apetalum	Coachwood
Dodonaea triquetra	Large-leaf Hop-bush
Elaeocarpus reticularis	Blueberry Ash
Glochidion ferdinandi	Cheese Tree
Leucopogon lanceolatus var. lanceolatus	
Myrsine variabilis	
Notelaea longifolia	Mock Olive
Pittosporum revolutum	Rough Fruit Pittosporum
Pittosporum undulatum	Sweet Pittosporum
Polyscias sambucifolia	Elderberry Panax
Ground stratum	

Calochlaena dubia	Rainbow Fern
Dianella caerulea	Blue Flax-lily
Entolasia marginata	Bordered Panic Grass
Entolasia stricta	Wiry Panic Grass
Gonocarpus teucrioides	Germander Raspwort
Lepidosperma laterale	Variable Sword-sedge
Lomandra longifolia	Spiny-headed Mat-rush
Microlaena stipoides var. stipoides	Weeping Grass
Poa affinis	
Pseuderanthemum variable	Pastel Flower
Pteridium esculentum	Bracken Fern

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

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 the Glossy Black Cockatoo. The site displays foraging habitat for the species in the form of *Allocasuarina* species within the site. Six trees are proposed for removal which could provide potential foraging habitat for the species. 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:

(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

(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

Six native trees are proposed for removal which form foraging habitat for the Glossy Black Cockatoo. This parcel of foraging habitat is minimal and the trees being removed are young to mature trees and therefore unlikely to make a significant impact to the foraging behaviors of the species.

(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 is not likely to significantly affect populations Glossy Black Cockatoo and will not be likely to put the local population at risk of extinction.

Large Forest Owls Populations Barking, Powerful, (*Ninox connivens, Ninox strenua*).

(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 native trees from which prey species feeds. Trees 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:*

(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 (Eucalyptus spp. And Cheese Tree) 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 impact 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.

(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 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*). Indirect impacts may be made through the removal of prey foraging trees however this will not likely put the local population at a direct risk of extinction.

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:

- Large-eared Pied Bat (*Chalinolobus dwyerii)*
- Eastern False Pipistrelle (*Falsistrellus tasmaniensis)*
- Eastern Coastal Free-tailed Bat (*Micronomus norfolkensis)*
- Little Bent-winged Bat (Miniopterus australis)

- Large Bent-winged Bat (*Miniopterus orianae oceanensis)*
- Yellow-bellied Sheathtailed Bat (*Saccolaimus flaviventris)*

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. This species has been assessed due to the presence of some foraging habitat on site.

(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 native tree removal, however not considered optimal or significant foraging/breeding habitat for the species. Minimal foraging habitat for microbat species may be removed (native 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:*

(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

(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*

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.

(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*

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 4. 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.

 **Grey-headed Flying Fox**

The proposal will not impact on breeding habitat of the Grey-headed Flying Fox. The site displays foraging habitat for the species in the form of *Eucalyptus* and *Glochidion* species within the site. Over nineteen (19) trees are proposed for removal which could provide potential foraging habitat for the species. These trees are not considered critical habitat for the survival of the local population.

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. This species has been assessed due to the presence of some foraging habitat on site.

(f) *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 native tree removal, however not considered optimal or significant foraging/breeding habitat for the species. Minimal foraging habitat for flying fox species may be removed (native trees) however this is not expected to place the species at risk of extinction.

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

(iii) *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

(iv) *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

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

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

Grey-headed Flying Foxes 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.

(iv) *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.

(i) *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.

(j) *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:

The proposal is not likely to significantly affect populations of Grey-headed Flying Foxes 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

• 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

Gabriel James

ECOLOGIST

Finishing his environmental degree at Macquarie University, Gabriel's passion for nature is evident through his pursuit as an ecologist, working on a range of projects across all sectors. Gabriel has contributed to a number of government projects where he conducted ecological surveys to identify the presence of any threatened species and habitat features. These have been for the development of sustainable energy alternatives as well as the construction of a feral predator-free fence with aims to introduce endangered native species and re-establish their populations.

Within these projects, Gabriel has developed his skills in fauna handling and species identification for both flora and fauna across multiple regions within NSW. Additionally, Gabriel has been required to liaise with clients to achieve both efficiency for the client as well as a positive outcome for the environment.

SPECIALISATIONS

- Urban and landscape ecology
- Flora and Fauna Assessments
- Habitat tree assessment, marking and mapping
- GIS mapping

CAREER SUMMARY

- **Trainee Ecologist**, Ecological Consultants Australia. *2022-pres*
- **Project Ecologist,** Narla Environmental. *2021- present*
- **Bush Regenerator,** Dragonfly Environmental. *2021*
- **Landscaping labourer,** Oxygenhort Horticultural Services. *2 2020*

QUALIFICATIONS AND MEMBERSHIPS

- **Bachelor of Environmental Science Major in Biology, Macqu University.**
- **WHS General Induction of Construction Industry NSW W Card.**
- **First Aid Certificate**