Flora and Fauna Report 23 Fisher Rd, Dee Why

To: Wendy Aitken Business Manager

By Ecological Consultants Australia Pty Ltd TA

Kingfisher Urban Ecology and Wetlands

April 2018

About this document

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Statement of Authorship

This study and report was undertaken by Ecological Consultants Australia at Fisher R,d Dee Why. 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, Vicki Beecher with qualifications BSc. Majoring in Geology and Climate Science.

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.

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Distribution:	Wendy Aitken **Business Manager** Forest Tree Service **Phone** (02) 9451 9057 **Mobile** 0412 363 336 **Address** PO Box 274 Forestville NSW 2087 **Web** www.foresttreeservice.com.au

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

Executive Summary

Introduction

- The development will consist of the construction of apartments and associated buildings on the block of land located on the corner of Fisher Rd and St David Avenue Dee Why.
- Due to the ecological values of the site, a Flora and Fauna Impact Assessment has been utilised to assess any damage from proposed works and off-target damage. Recommendations will be provided to reduce the likelihood of impact and mitigate loss.

Methods

- On-ground survey took place on the 18th April, 2018 by Senior Ecologist Geraldene Dalby-Ball and Vicki Beecher.
- 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

- No threatened flora or fauna species were found on-site during on site searches;
- Environmental weeds are present on-site listed as Weeds of National Significance (WoNS); Weeds to remove as a priority are: Asparagus Fern and Privet.
- The site may be providing habitat for threatened fauna species. Foraging habitat is available for the Powerful Owl, Microbats, Grey-headed Flying-fox thus requiring a Test of Significance (also known as 7-Part Test);
- Habitat is not suitable for Squirrel Glider population.

Mitigation Measures

- Tree Protection as per Arborist report by qualified Arborist.
- Removal of Weeds to prevent spread of seed.
- Seeds to be collected from any native vegetation removed and to be used off-site, location determined with council, and/or given to native plant nurseries (see Appendix 7.6).
- Installation of 5 microbat box and 6 small mammal box of marine ply or equivalent to be placed more than 3 meters above ground.

During works:

- Vegetated areas outside of approved disturbance zone to be protected from any impact of development.

- Dead wood including upright dead trees and fallen logs on the ground should be retained or relocated onsite and protected during works as they provide high quality habitat for threatened fauna species.
- Bush hygiene protocols should be followed to prevent the spread of pathogens including *Phytophthora*.

After completion of works:

- Revegetation works will be conducted using native species. See Landscape Plan for flora species.
- Retained dead wood (over 10cm diameter) to be reintroduced to the site to offset any loss of habitat.
- Continued weed removal.

Conclusions and Recommendations

- The proposed actions are likely to remove habitat by way of crevices/hollows/loosebark in trees and this may have an adverse effect on the life cycles of individual microbats however this site alone is not expected to result in the loss of local populations. Due to the number of trees to be removed that could be potentially used by microbats, a minimum of nine (9) microbat roosting boxes are to be installed. Boxes to be of marine ply or equivalent and are to be placed more than 3 meters above ground and hung not nailed.
- Continued weed removal
- Implement recommendations of Arborists Report
- Retain or relocate water and pools as a habitat feature onsite
- Off-site planting of 200 tubestock native trees

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1 Introduction

Ecological Consultants Australia (ECA) has been contracted by the to provide an "Assessment of Significance" to assess potential direct and indirect impacts on any threatened species, populations and communities as per section 5A of the Environmental Planning & Assessment Act 1979. The 'Assessment of Significance' has been undertaken in accordance with the NSW Department of Environment & Climate Change 'Threatened species assessment guidelines'. It Is noted that the Threatened Species Act has been superseded by the Biodiversity Conservation Act (BC) and that the author of this report is fully trained in the new legislation and associated biobanking.

It is understood that this report is to form part of a Development Application for the proposed construction of an apartment complex with associated car parking facilities.

1.1 Legislation and policy

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

- *Cwlth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act).*
- *Environmental Planning and Assessment Act 1979 (EP&A Act).*
- *Biodiversity Conservation Act 2016 (BC Act).*
- *Fisheries Management Act 1994 (FM Act).*
- *National Parks & Wildlife Act 1974 (NP&W Act).*
- *Biosecurity Act (superseding the Noxious Weed Act 1993 (NW Act).*

1.2 Scope of works

To provide a flora and fauna assessment for assessing the potential direct and indirect impacts of any threatened species, populations and communities on the site. The assessment will also include assessing other ecological impacts and providing recommendations for mitigating these. Including the following:

Flora and Fauna Impact Assessment – with test of significance for threatened species.

The objectives of this Flora and Fauna Impact Assessment are to:

- Identify any native vegetation communities, significant species or significant habitat features present within the study area.
- Identify any known or potential habitat for threatened species.
- Review the implications of relevant biodiversity legislation and policy.
- Identify potential impacts on significant ecological communities, species or habitats from the proposed development and provide recommendations to assist with the mitigation of those potential impacts during the construction and operation stages.
- Targeted searches for significant species are based on the authors knowledge of the site.
- The client has opted for the basic level of Flora and Fauna assessment given the disturbed and urban nature of the site.

Works included a site survey/assessment, review of project design and any additional reports and review of available literature to produce site specific ecological and environmental effects report.

1.1 Limitations of the Study

Limitations of the study may arise where certain cryptic species of plants may occur as soil-stored seed or as subterranean vegetative structures. Some species are identifiable above-ground only after particular environmental circumstances related to factors such as periodic fire frequency, intensity or seasonality, soil moisture regime, biological life-cycle patterns as in the case of small plants such as species of orchids etc. No specific invertebrate surveys were conducted.

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

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

1.2 Site Location

The proposed study area is situated at 15 Fisher Rd, Dee Why (Lot 11 in DP 577062,), located 19.3 kilometres north-east of the Sydney central business district in the local government area of Northern Council (see Figure 1). The study area is zoned as B4 – Mixed Use under the provisions of Warringah Local Environment Plan (WLEP 2014).

Figure 1a. Site location with approximate property boundaries. Source: SixMaps, April 2018.

The site covers a total area of 1.062 hectares wit approximate boundaries of 130 meters by 80 meters. Approximately 70% of the area is cleared and developed. Buildings previously used for seniors living with associated amenities such as laundry and kitchen facilities are currently on-site. The cleared and developed areas are moderately landscaped with gardens consisting primarily of exotic species and lawn areas.

1.3 Ecology of the site

The site consists of Urban Exotic/Native vegetation and was most likely Coastal Enriched Sandstone Dry Forest. This site has the potential for developing tree hollows if trees were left to grow to maturity.

2 Proposed Actions

The proposed actions involve the redevelopment of the site and the construction of a block of apartments with associated car parking. Architectural plans have been provided and have been assessed with reference to the Flora and Fauna present on the site (see Figure 2a and b below). The development application is the action triggering the need for a Flora and Fauna Impact Assessment so be assessed under Part 4 by Council.

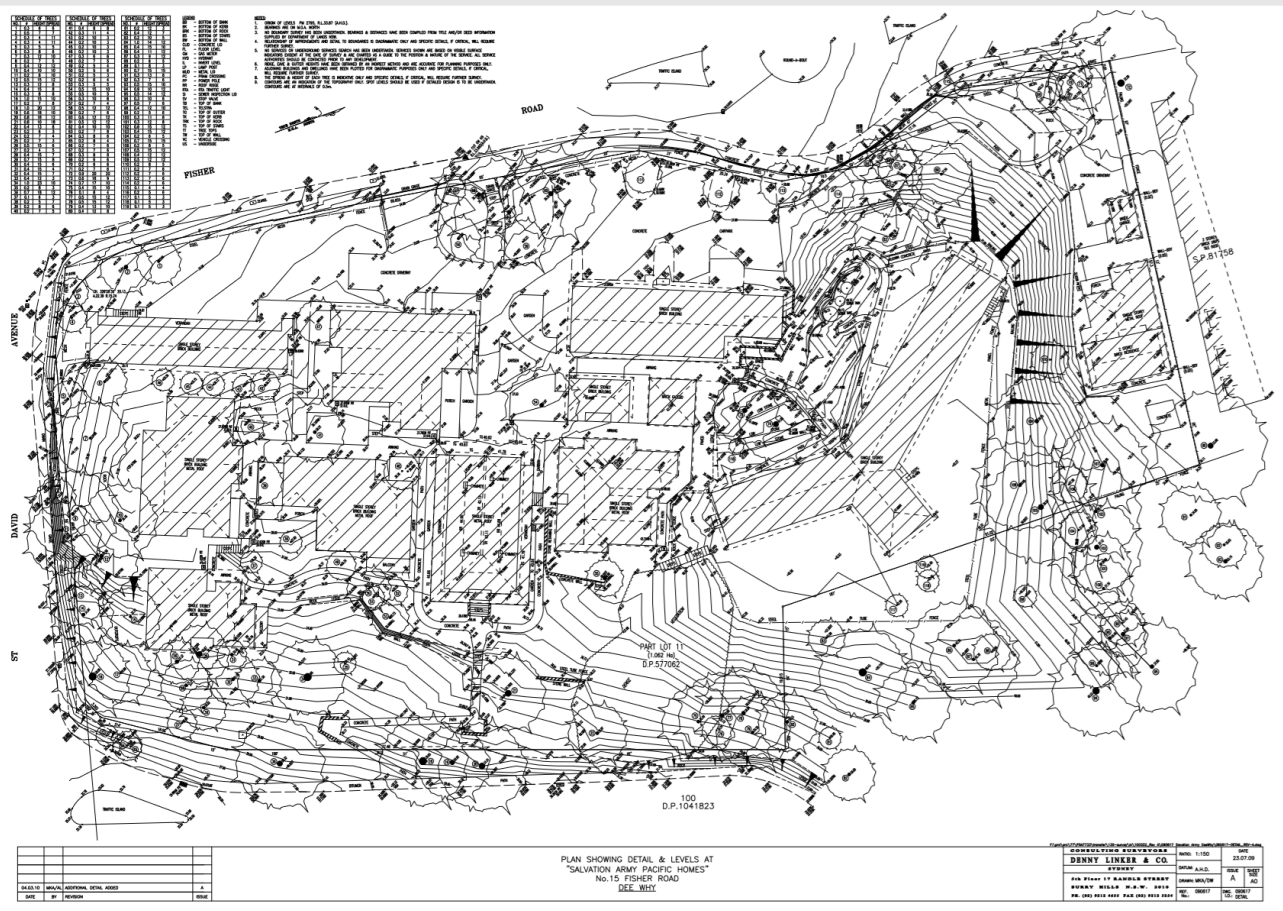


Figure 2a. Site Survey. Source: Denny Lenker and Co 2009

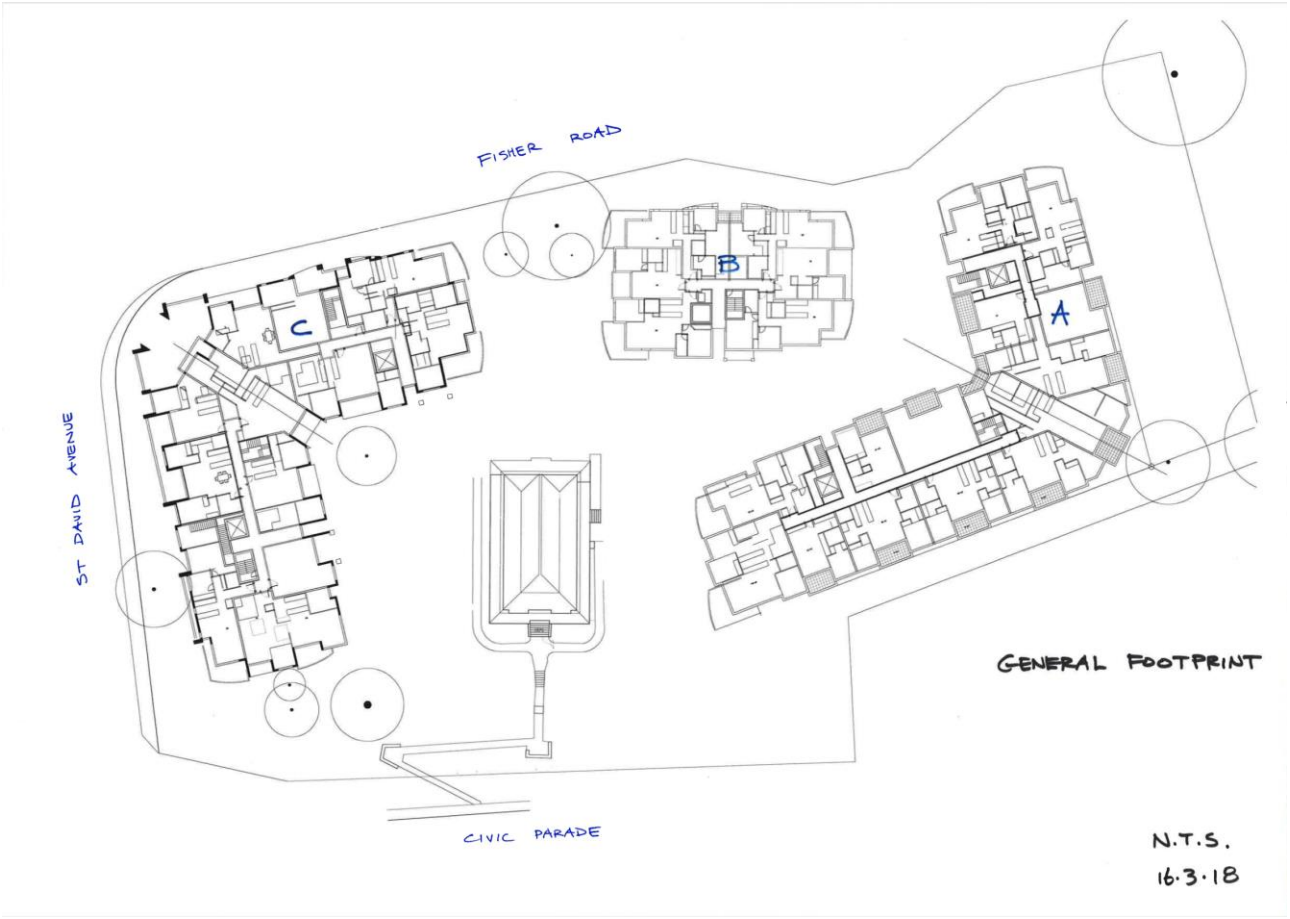


Figure 2b. Dee Why General Footprint Source: Applicant 2018

3 Methods

3.1 Site Inspections

Senior Ecologist Geraldene Dalby-Ball and Vicki Beecher assessed the site on April 17, 2018 between 10:00 and 12:00 hours. Geraldene inspected again August 11st 2018. Both times weather was fine and sunny during time of visit. During site visits, notes and photos were taken of the important vegetation types, flora and fauna present. As a vast majority of the site has been previously developed the area likely to be affected by the proposed redevelopment is relatively small. Due to the afore mentioned small area impacted, detailed or systematic surveys were not performed. Surveys were general and opportunistic in nature and were performed by traversing the site. Surveys included one diurnal bird and fauna survey, a single vegetation survey and a general habitat survey in which fauna habitat resources were identified. Whilst undertaking the survey every effort was made to document and record the diversity, value and structure of the habitats present within the area surveyed. The significance for native species, in particular any of national or state conservation concern was noted. Habitat assessment included identification of active and/or dormant nesting hollows, connectivity of fauna corridors, aquatic environments of any threatened species either known to or likely to occur within the area.

3.2 Previous studies

Bionet, previous studies and the author's knowledge of the local area, were used to determine the possible occurrence of endangered ecological communities and threatened plant species on-site. The Bionet records accessed cover a 10km^2 area extending from the site and include recordings from 1980 to the present day.

Records from the following databases were collated and reviewed:

- Atlas of NSW Wildlife (Bionet). New South Wales, Office of Environment and Heritage (OEH).
- NSW Threatened Species Information (OEH).
- PlantNET (VIS).
- Protected Matters Search Tool of the Australian Government Department of the Environment (DoE) for matters protected by the Cwlth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act).

Other sources of biodiversity information:

- Relevant vegetation mapping, including:
    - Vegetation Information System, VIS Mapping (OEH).
    - Native Vegetation of the Sydney Metropolitan CMA Area, Sydney Metropolitan (CMA, 2009).

The following reports were also reviewed:

- Aboricultural Impact Assessment Statement, Bluegum Tree care and Consultancy 2018
- Northern Beaches Council, website and records.
- Flora and Fauna Report, LesryK Environmental Consultants. 2011.

4 Flora

The purpose of the flora investigation was to determine the flora composition of the site, particularly vulnerable and endangered species. In addition it included an assessment of the flora as habitat. Either current or potential. Furthermore, an assessment of potential impact of the development with a determination of native ground and shrub was conducted.

4.1 Threatened flora

BioNet records within 10km of the study site had 15 species currently listed as vulnerable or endangered under state and/or commonwealth legislation (see Table 2). The vulnerable and endangered species to focus on-site searches for can be seen in **Table 2** below. This is based on likelihood of occurrence.

Table 2. Threatened flora recorded within a 10km radius since 1993. Source: NSW OEH Bionet 2018.

Family	Scientific Name	Common Name	NSW status	Comm. status	Records
Asteracea	*Senecio spathulatus*	Coast groundsel	V,P		1
Dilleniaceae	*Hibertia superans*		V,P		1
Ericacea	*Epicaris purpurascens var.purpurascens*		V,P		1
Euphorbiacea	*Chamaesyce psammogeton*	Sand spurge	V,P		3
Lamiaceae	*Prostanthera manifolia*	Seaforth mintbush	V,P	V	3
Myrtaceae	*^^Callistemon linearifolius*	Netted Bottle Brush	V,P,3		3
Myrtaceae	*Eucalyptus camfieldii*	Camfield's Stringybark	V,P	V	6
Myrtaceae	*Eucalyptus nicholii*	Narrow-leaved Black Peppermint	V,P	V	2
Myrtaceae	*Darwinia biflora*		V,P	V	1
Myrtaceae	*Syzygium paniculatum*	Magenta Lilly Pilly	E1,P	V	2
Proteaceae	*^^Grevillea caleyi*	Caley's Grevillea	E4A,P,3	E	1
Proteaceae	*^^Persoonia hirsuta*	Hairy Geebung	E1,P,3	E	3
Tremandraceae	*Tethratheca glandulosa*		V,P	V	28
Thymelaeaceae	*Pimelea curvifolia var. curvifolia*		V, P		19

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

4.2 Flora Findings from Site Investigations

4.2.1 Threatened plant species findings

No threatened plant species were found during site assessments.

4.2.2 Observed Flora

A list of flora was compiled for flora in the proposed development area and surrounding remnant bushland
* is an exotic species

Table 3. Flora observed during the ecological assessment.

Scientific Name	Common Name	Habit (native speces)
Acacia floribunda	White Sallow Wattle	Tree
Acacia suaveolens	Sweet-scented Wattle	Shrub
*Agapanthus praecox**	African Lily	
Angophora costata	Smooth–barked Apple.	Tree
*Araucaria heterophylla**	Norfolk Island Pine	
Banksia marginata	Silver Banksia	Shrub
Callistemon sp.	Bottlebrush	Shrub
Casuarina cunninghamiana	River She-Oak	Tree
Casuarina glauca	Swamp She-Oak	Tree
*Cinnamomum camphora **	Camphor Laurel	
*Citrus limonium**	Lemon Tree	
Commelina cyanea	Trad	
Cynodon dactylon	Couch	Ground plant
Dianella caerulea var. producta	Blue Flax Lily	Ground plant
Dietes sp.*		
Doryanthes excelsa	Gymea Lily	
*Ehrharta erecta **	Panic Veldt Grass	
Elaeocarpus reticulatus	Blueberry Ash	Large Shrub / Small Tree

Scientific Name	Common Name	Habit (native speces)
Eucalyptus haemastoma	Broad-leaved Scribbly Gum	Tree
Eucalyptus saligna x Eucalyptus botryoides	Hybrid	Tree
Eucalyptus sp.		Tree
Grevillea sp.		Shrub
Hakea salicifolia subsp. salicifolia	Willow-leaved Hakea	Shrub
Hypochaeris radicata *	Catsear	
Jacarandas mimosifolia *	Jacaranda	
Jasminum sp*	Jasmine	
Kunzea ambigua	Tick Bush	Shrub
*Lantana camara**	Lantana	
Liquidambar styraciflua *	Liquid Ambar	
Lomandra longifolia	Mat Rush	Ground
Mangifera indica *	Mango Tree	
Melaleuca quinquenervia	Broad-leaved Paperbark	
Monotoca eliptica	Monotoca	
*Nephrolepis cordifolia**	Fishbone Fern	
*Ochna serrulata**	Ochna	
*Olea europaea subsp. Cuspidate**	African Olive	
Oxalis sp.	Oxalis	
Paspalum dilatatum	Paspalum	
*Pennisetum clandestinum**	Kikuyu Grass	
*Pinus radiate**	Radiata Pine	
Pittosporum undulatum	Sweet Pittosporum	

Scientific Name	Common Name	Habit (native speces)
*Plantago lanceolate**	Lamb's Tongue	
Plumeria sp. *	Frangipani	
*Protasparagus aethiopicus**	Asparagus Fern	
Pteridium esculentum	Bracken Fern	
*Senna pendula var. glabrata **	Cassia	
*Strelitzia reginae**	Bird of Paradise	
*Trifolium repens **	White Clover	

N/A: None of these are listed at a State or Federal level as endangered species.

*Exotic species

4.2.1 Disturbances to Flora

Remnant Bushland zone
The vegetation doesn't classify as bushland – if the tree canopy was to be considered bushland then this remnant bushland zone is considered to be in very-poor condition due to the high ratio of exotic species to native species and the relatively low native species richness (restricted to canopy species and a sparse scattering of shrubs).

Notable weeds
Weeds of Environmental Significance observed include Asparagus Fern

5 Fauna

5.1 Threatened fauna

A total of 514 fauna species have been recorded within 10km of the study site according to BioNet records. Of these, 54 species are currently listed as vulnerable or endangered under state and/or commonwealth legislation (see Table 4). This includes whales, turtles and migratory birds. 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.

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

Table 4. Threatened fauna observed in previous ecological surveys within a 10km radius since 1993. Source: NSW OEH Bionet 2018.

Class	Scientific Name	Common Name	NSW Status	Comth. Status	No. of records
Amphibia	*Heleioporus australiacus*	Giant Burrowing Frog	V,P	V	10
Amphibia	*Pseudophryne australis*	Red-crowned Toadlet	V,P		65
Amphibia	*Litoria aurea*	Green and Golden Bell Frog	E1,P	V	2
Reptilia	*Varanus rosenbergi*	Rosenberg's Goanna	V,P		59
Aves	*Ptilinopus magnificus*	Wompoo Fruit - Dove	V,P		2
Aves	*Ptilinopus superbus*	Superb Fruit-Dove	V,P		1
Aves	*Tyto tenebricosa*	^Sooty Owl	V,P	V	1
Aves	*Daphoenositta chrysoptera*	Varied Sittella	E1,P	E	2
Aves	Artamus cyanopterus cyanopterus	Dusky Woodswallow	V,P		1
Aves	*Petroica boodang*	Scarlet Robin	V,P		2
Aves	*Hieraaetus morphnoides*	Little Eagle	V,P		2
Aves	*Glossopsitta pusilla*	Little Lorikeet	V,P,3		4
Aves	*Lathamus discolo*	Swift Parrot	E1, P, 3	C,E	3
Aves	*Burhinus grallarius*	Bush Stone-curlew	E1,P		4
Aves	*Esacus magnirostris*	Beach Stone - curlew	V,P		1
Aves	*Calidris alba*	Sandering	V,P,3		3
Aves	*Callocephalon fimbriatum*	^^Gang-gang Cockatoo	V,P		1
Aves	*Callocephalon lathami*	^Glossy Black-Cockatoo	V,P		3
Aves	*Cailris ferruginea*	Curlew sandpiper	V,P,2		1
Aves	*Cailris tenuirostris*	*Great knot*			2
Aves	*Numenius madagascariensis*	Eastern curlew	E1,P,3		2
Aves	*^^Lathamus isura*	Square tailed kite	E1,P,3		1
Aves	*^^Ninox connivens*	Barking Owl	V,P,3		5
Aves	*^^Ninox strenua*	Powerful Owl	V,P,3		50
Aves	*^^Tyto novaehollandiae*	Masked Owl	V,P,3		2

Class	Scientific Name	Common Name	NSW Status	Comth. Status	No. of records
Mammalia	*Pteropus poliocephalus*	Grey-headed Flying-fox	**V,P**	**V**	**40**
Mammalia	*Mormopterus norfolkensis*	Eastern Freetail-bat	V,P		1
Mammalia	*Dasyurus maculatus*	Spotted-tailed Quoll	V,P		6
Mammalia	*Isoodon obesulus obesulus*	Southern Brown Bandicoo	V,P		2
Mammalia	*Phascolarctos cinereus*	Koala	V,P		3
Mammalia	*Cercartetus nanus*	Eastern Pygmy-possum	V,P		38
Mammalia	*Chalinolobus dwyeri*	Large-eared Pied Bat	**V,P**	**V**	**2**
Mammalia	*Miniopterus australis*	Little Bentwing-bat	**V,P**		**9**
Mammalia	*Miniopterus schreibersii oceanensis*	Eastern Bentwing-bat	**V,P**		**62**
Mammalia	*Myotis macropus*	Southern Myotis	**V,P**		**9**
Mammalia	*Scoteanax rueppellii*	Greater Broad-nosed Bat	**V,P**		**2**

Note: E = Endangered, V = Vulnerable, P = Protected. Species in bold have been identified as having appropriate habitat present on-site.

Likelihood of occurrence

The habitat suitability is a broad categorisation used by Kingfisher to indicate the potential for a species to occur within the study area. It is based on expert opinion and implies the relative value of a study area for a particular species. See Appendix II for rational lists of what threatened fauna species may occur on site due to habitat preferences and whether the site offers these habitat features.

During the survey, none of the above threatened species were observed on-site. However, marginal foraging habitat and refugee habitat for the Grey-headed Flying-fox and Powerful Owl were recorded within the study area. Other marginal habitats identified for various Microbat species (see Figure 11, 12 and 13) were also recorded. Therefore, a Test of Significance (7-Part Test) will be used to assess the impacts of works on these species.

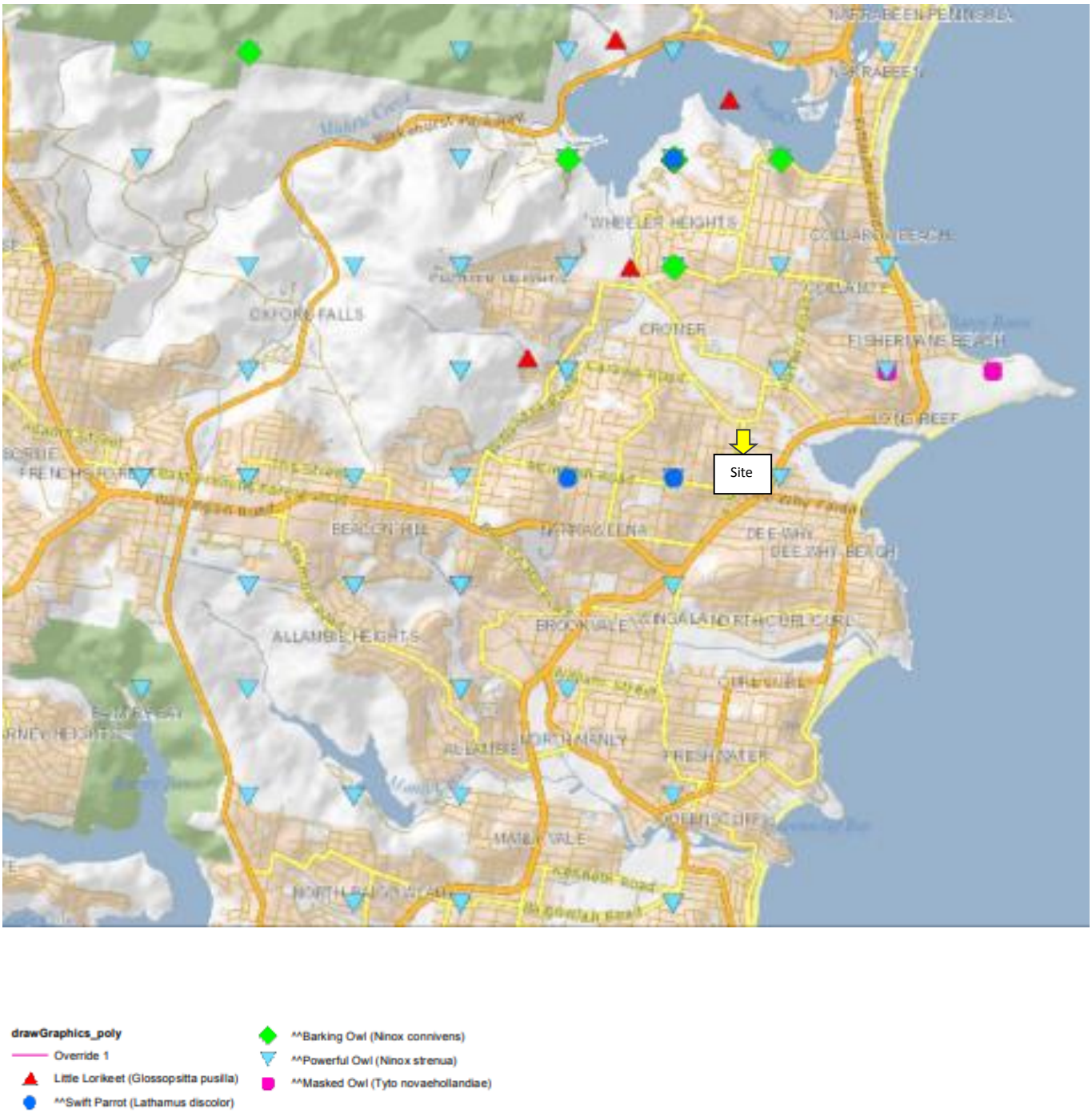


Figure 3a. Powerful Owl, Barking Owl, Masked Owl, Little Lorikeet and Swift Parrot sightings on Bionet.

Source OEH 2018.

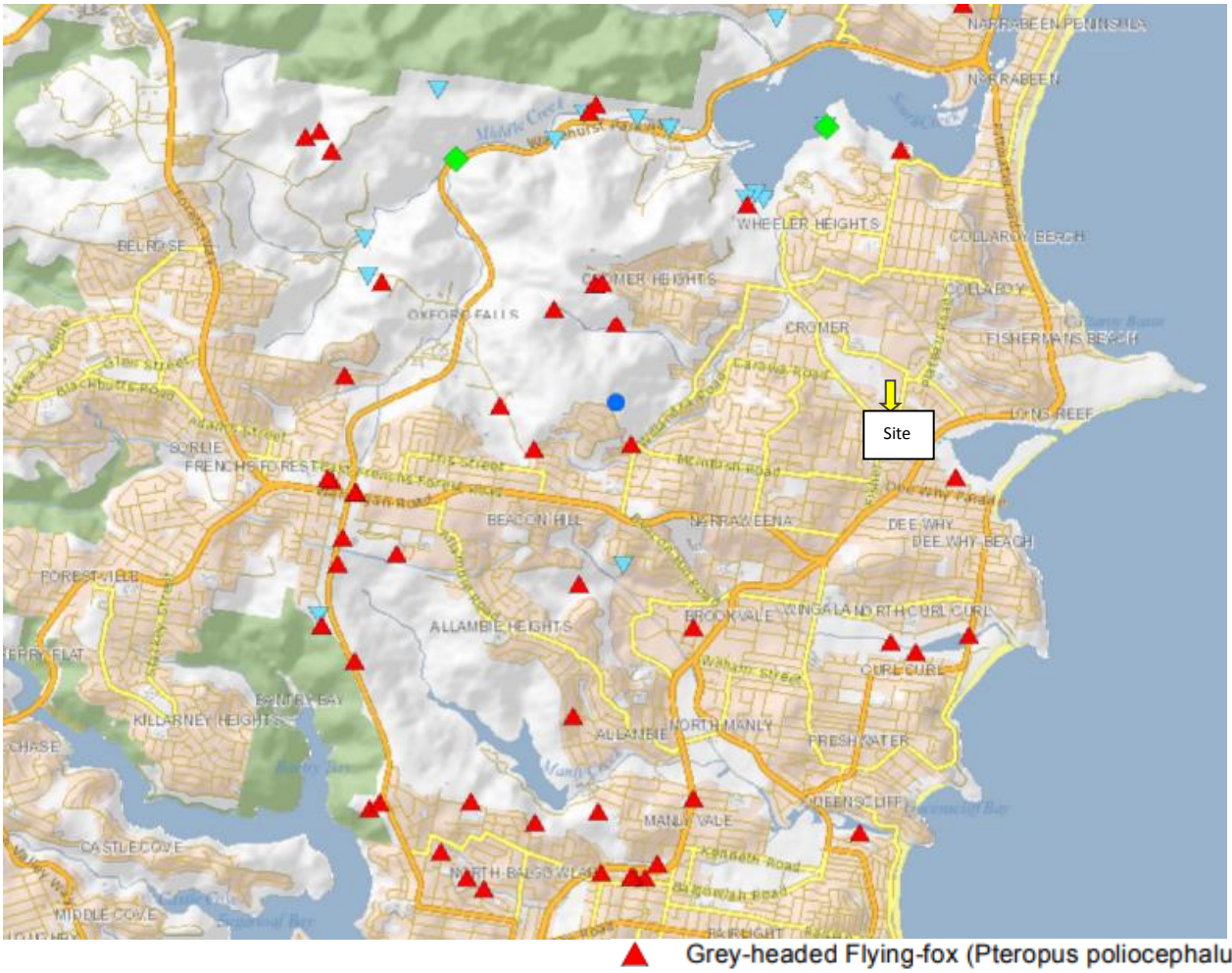


Figure 3b. Microbat Sightings on Bionet. Source: OEH 2018.

5.2 Fauna findings from site assessment

Table 6 provides a list of vertebrate fauna recorded during the site visit.

Table 6. Fauna recorded on the site.

Class	Scientific Name	Common Name	NSW Status	Comth. Status
Reptilia	*Lampropholis delicata*	Garden skink	N/A	N/A
Reptilia	*Intellagama lesueurii*	Eastern Water Dragon		
Reptilia	*Lampropholis delicata*	Dark-flecked Garden Sunskink		
Aves	*Eulamprus quoyii*	Eastern Water-skink		
Aves	*Trichoglossus haematodus*	Rainbow Lorikeet		
Aves	*Dacelo novaeguineae*	Laughing Kookaburra		
Aves	*Anthochaera carunculata*	Red Wattlebird		
Aves	*Manorina melanocephala*	Noisy Miner		
Aves	*Cracticus nigrogularis*	Pied Butcherbird		
Aves	*Strepera graculina*	Pied Currawong		
Mammalia	*Trichosurus vulpecula*	Common Brushtail Possum		

N/A: None of these are listed at a State or Federal level as endangered species.

5.2.1 Fauna habitat

A number of potential habitat features were identified on site during the site assessment.

Flowering Eucalypts

The site contains canopy trees potentially providing foraging resources for the threatened Grey Headed Flying Fox.

Sandstone outcrops and floater rocks

The site has sandstone outliers and rocks providing habitat for a number of invertebrates and reptiles.

Native canopy trees with planted *Doryanthus excelsior* in understory

Potential marsupial scratches – possums are on-site.

Bottlebrush in understory

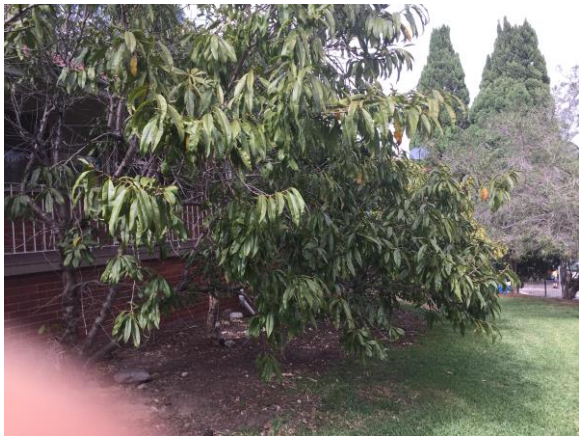
Sandstone in exotic understory

Exotic under and mid-story

Other tree hollows were identified in the surroundings of the proposed development not included in the Arborist report, which could be potentially inhabited by a number of organisms. See photos below, big Eucalyptus (tree number 17) on the western side of the location, and others.

Angophora Trees

Angophora close to existing buildings



Exotic trees and lawn

Canopy and mid-story

Exotic Trees provide – habitat for Cockatoos

Upright Stags

A number of upright dead trees were observed onsite providing habitat for invertebrates, birds and possibly microbats. No obvious hollows were observed.

Tree Hollows

Minor tree hollows were identified on-site. None were observed to be large enough for Owls.

Nest boxes are to be installed on trees at least 3m above the ground. Boxes are to be of marine ply with all-weather fixtures. Boxes to be hung, not nailed, to the trees.

5.3 Habitat Corridors

Whilst the site is not directly connected to the core habitat of Dee Why Lagoon, Stony Range Reserve and Garrigal National Park it does form a habitat stepping stone.

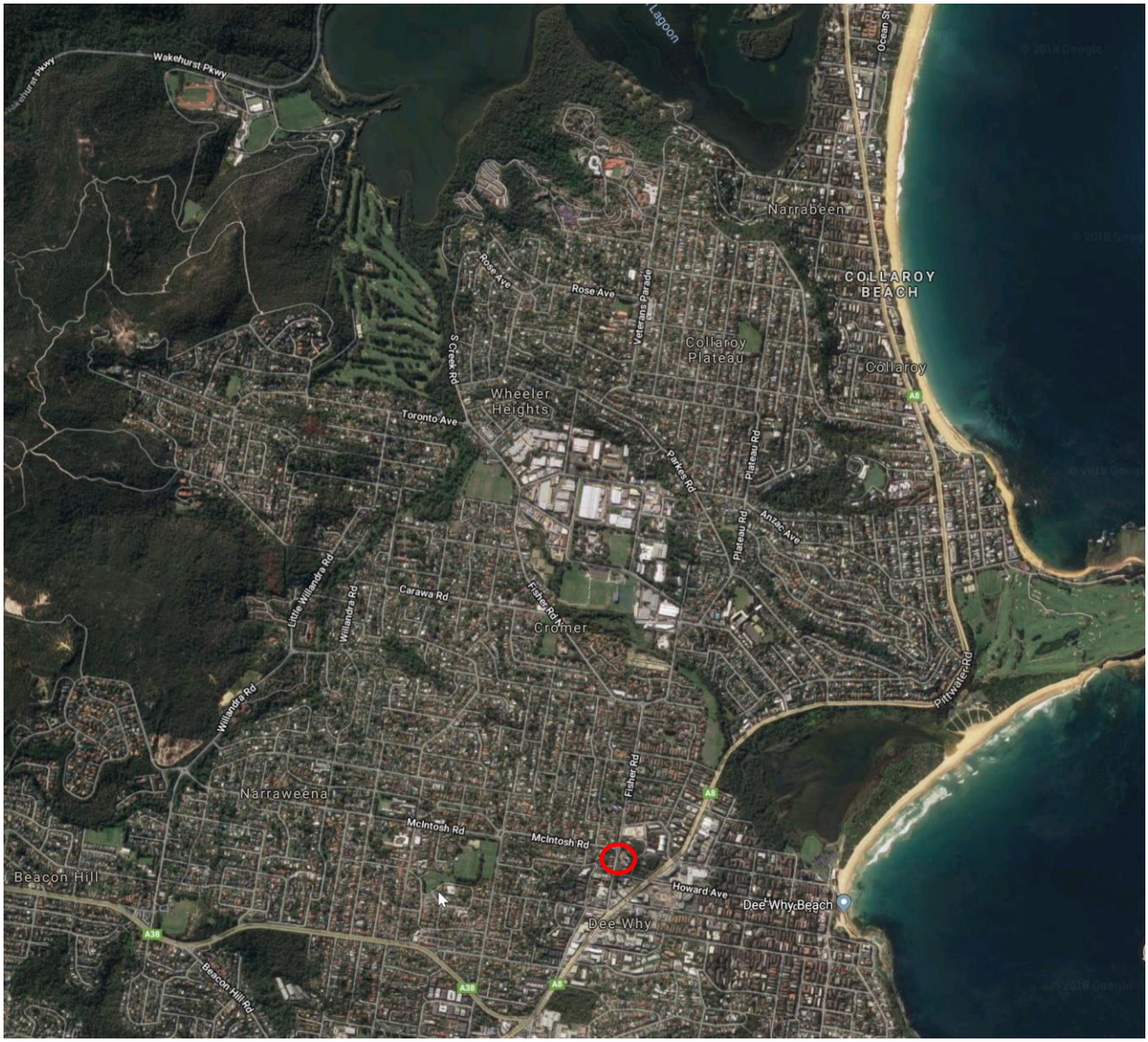


Figure 5. Green Corridor Connectivity in the wider area. Source: Google Maps 2018.

6 Impacts

6.1 Direct Impacts

6.1.1 Vegetation disturbance and loss

Direct impacts will be from the removal of trees. The Arborist Report by BlueGum – Tree Care and Consulting (final report received August 31st 2018). Fifty seven trees are proposed for removal and this includes exotic species. Following is an extract from the report.

Table A: Retention Values of the Subject Trees.

	High Retention Value (Tree Number)	Medium Retention Value (Tree Number)	Low Retention Value (Tree Number)
To be Retained	7, 9, 13, 16A, 21, 21A, 22, 23, 24, 25, 54, 56, 72, 75, 77, 78, 79, 80, 81, 82, 83, 85, 86, 87, 88, 89, 90, 94, 95, 95, 97, 98, 100, 101, 102, 103, 107	2, 3, 4, 12, 14, 16, 17, 18, 19, 20, 35, 36, 51, 53, 55A, 57, 58, 61A, 76, 91, 99, 118, 119, 119B, 119C, 119D, 119E	52, 58A, 84, 104, 104, 106
To be Removed	6A, 10, 38, 40, 41, 62, 64, 65, 69, 70, 71, 105, 109, 110, 111, 112, 113	1 (row of 9), 26, 27, 28, 29, 30, 31, 32, 37, 40A, 42, 43, 44, 45, 47, 47A, 48, 63, 67, 68, 73, 74, 108, 119A	15, 33, 34, 37A, 66, 114, 115, 116

Fifty seven (57) trees are proposed to be removed as part of this project. This includes seventeen (17) High Retention Value trees, thirty two (32) Medium Retention Value trees and eight (8) Low Retention Value trees.

All site trees that have a reasonable prospect of survival are proposed to be retained and protected. All trees located on the adjoining council land are able to be protected with no notable impact.

There are works proposed within the Tree Protection Zones (TPZ) of Trees 2, 7, 12, 16, 17, 18, 36, 41, 54, 56, 57, 64, 65, 72, 90, 105, 107. Recommendations have been made regarding tree protection measures and tree sensitive construction methods to limit the impact on retained trees.

Native Trees Proposed for Removal

Nineteen native trees are proposed for removal – these are listed below. Data is extracted from the Arborist report – Attachment A (BlueGum 2018). Most are of high retention value with Expected Life (ELE) over 30 years.

Actions including replacement planting, nest box installation and management is required and assisted regeneration in the neighbouring bushland is recommended (pending fire mgt considerations).

Tree 6A Smooth-barked Apple, *Angophora costata,* ELE - High

Tree 37 Blueberry Ash, *Elaepcarpus reticulatis,* ELE – Medium

Tree 38 Smooth-barked Apple, *Angophora costata,* ELE - High

Tree 40 Smooth-barked Apple, *Angophora costata,* ELE - High

Tree 40A Smooth-barked Apple, *Angophora costata,* ELE - High

Tree 41 Smooth-barked Apple, *Angophora costata,* ELE - High

Tree 42 Swamp She Oak, *Casuarina glauca,* ELE - High

Tree 43 Swamp She Oak, *Casuarina glauca,* ELE - High

Tree 44 Swamp She Oak, *Casuarina glauca,* ELE - High

Tree 45 Swamp She Oak, *Casuarina glauca,* ELE - High

Tree 62 Swamp She Oak, *Casuarina glauca,* ELE – Medium

Tree 65 Red Cedar *Toona australis,* ELE - High

Tree 69 Smooth-barked Apple, *Angophora costata,* ELE - High

Tree 70 Smooth-barked Apple, *Angophora costata,* ELE - High

Tree 71 Scribbly Gum, *Eucalyptus haemastoma,* ELE – Medium

Tree 105 Smooth-barked Apple, *Angophora costata,* ELE - High

Tree 109 Smooth-barked Apple, *Angophora costata,* ELE - High

Tree 110 Broad-leaved White Mahogany, *Eucalyptus umbra,* ELE - High

Tree 119A Swamp Mahogany, *Eucalyptus robusta,* ELE - High

Trees that are major fauna habitat

All the above species provide fauna habitat. Noteable species for Cockatoo food include the She Oaks and the introduced Monterey Pine, *Pine radiata*. The stand of Monterey Pine are proposed for removal – while they are exotic trees they are food trees and have been consisted in the test of significance (5-part test).

Tree Protection

The Plan in Attachment A of the Arborist Report, and other tree care recommendations, must be implemented to ensure protection of the trees proposed for retention.

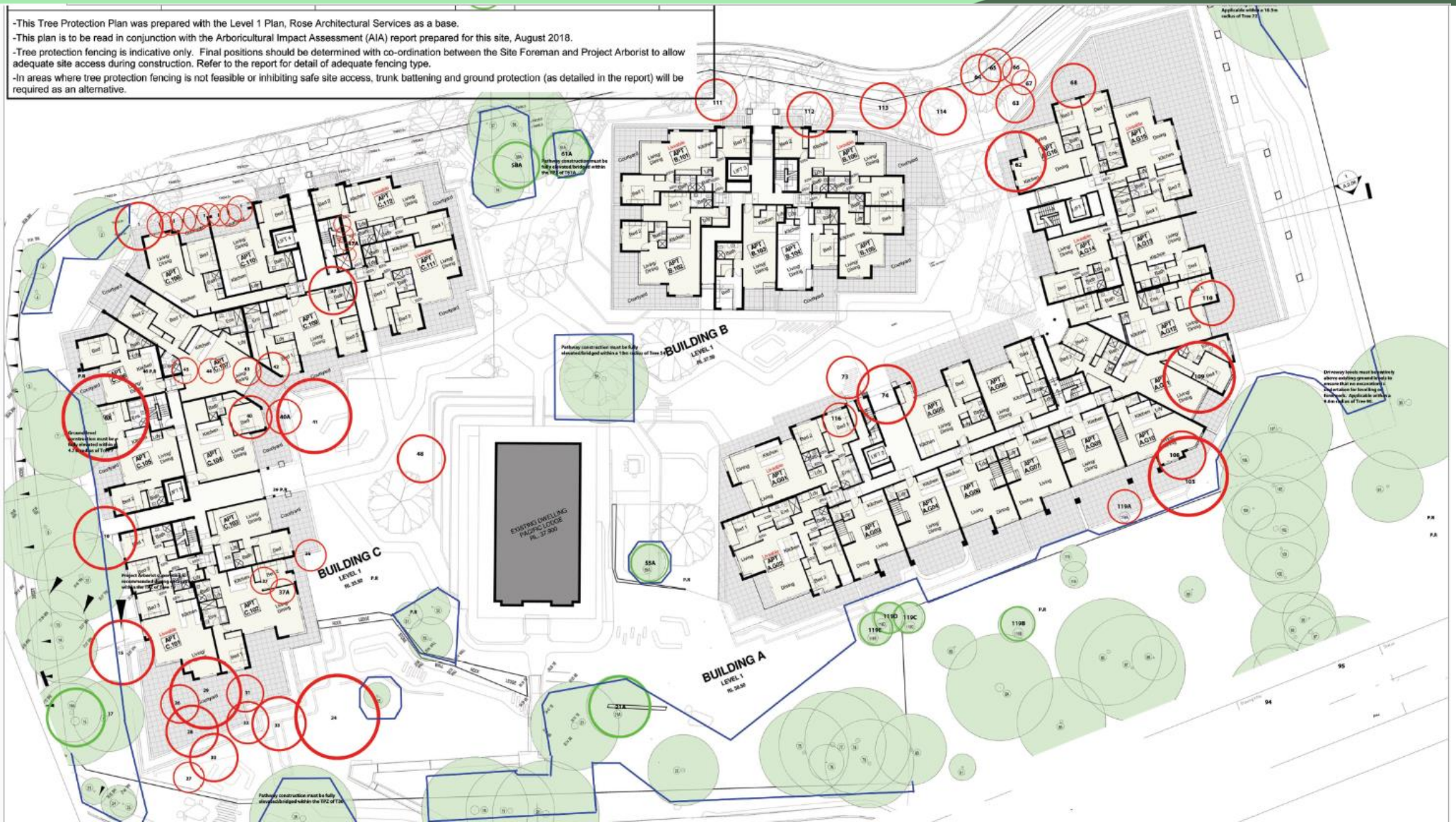


Figure 6. Trees proposed for removal, proposed for retention and for tree protection (blue-line) Source: BlueGum August 2018.

NB: See Arborist report for future detail.

6.1.2 Weed growth and invasion

Weed and exotic species are present (see Flora list) – these are to be removed (except desirable exotic canopy species). Weed management is required throughout the development stages to ensure no weed spread into the neighbouring bushland. Weeds may grow within the direct works zone and surrounding remnant bushland through soil disturbance or by being brought in as seed on work machinery, tools, equipment and worker clothes (e.g. boots). Soil disturbance combined with the elevated nutrients and increased light exposure may result in increased weed abundance.

6.1.3 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 mould) and Myrtle Rust (*Puccinia psidii* – type of fungus). See Appendix for methods to control selected pathogens.

6.2 Assessment of Significance (5-part tests) Summary

See Appendix VI for full 5-Part Tests.

Powerful Owl

The threatened Powerful Owl (*Ninox strenua*) was identified as having potential foraging habitat within the site. The site offers habitat for arboreal prey species particularly Eucalyptus trees. This habitat may be disturbed during proposed works. Loss of these trees would have little effect on arboreal prey species which would have little effect on food availability for the Powerful Owl.

Mircobats

Threatened Microbat species have been recorded within 5km of the site (see Bionet and personal data). Potential foraging habitat occurs within the site. Trees proposed to be removed do not contain obvious hollows, some have flaking bark, the dead tree has no obvious roosting habitat for microbat species – however they could still be present. Trees may contain marginal foraging habitat for species which feed on insects in or above the canopy. This habitat may be disturbed during proposed works.

Grey-headed Flying-Fox

The threatened Grey-headed Flying-Fox (*Pteropus poliocephalus*) has potential foraging habitat within the site. There are two populations of Grey-headed Flying-foxes existing at Capua Place, Avalon (within 10 km) and Warriewood Wetlands (within 10 km) – animals from either site could easily include Dee Why within their primarily foraging habitat.

7 Recommendations

7.1 Mitigation Measures

7.1.1 Delineation of work areas

During construction, impacts on the site and adjacent vegetation should be minimized by the delineation of works zones. Access to the site would be best restricted to small passageways avoiding native vegetation to prevent soil disturbance in general and in particular, damage to native vegetation. Access will be restricted to disturbed open areas and in accordance to Arborist report in a line with tree protection measures.

7.1.2 Vegetation clearing control measures

Most of the vegetation planned for clearing (areas within the footprints of driveways and building envelopes) are trees, turf and weeds. In this case, no vegetation clearing control measures are necessary other than tree removal. Refer to Arborist report.

7.1.3 Tree Protection

Tree protection will be consistent with the Arborist report by William Dunlop completed in June 2017. Main trees to be managed are trees within close proximity to building works.
NB: see final arborist report for details of works and tree numbers.

7.1.4 Weed management, bush regeneration and planting

Weed management, landscaping and bush regeneration will occur within the designated areas shown below. Planting works include planting native species of the local vegetation community (see Figure 18 below).

Figure 18. Proposed weed management, bush regeneration and landscaping zones. Source Google Maps 2018.

Note: See Landscaping Plan for accurate locations for planting.

Below is a Performance Criteria which bush regenerators should follow as a guide that will form part of a vegetation management plan (VMP) (see Table 7).

Table 7. Performance Criteria.

Tasks	Performance Criteria
Weed Management Zone	Removal of exotic vegetation within the zone for planting. Techniques proposed for this area are physical removal and thermal weeding.
Landscaping and Bush Regeneration Zone	Landscaping and bush regeneration within the zone. Techniques proposed for this area are thermal weeding, physical removal and habitat enhancement and alteration. As per landscape plan. Planting of native species included in landscape plan.

Tasks	Performance Criteria
Monitor for weeds and natural regeneration	6 months, 12 months and 24 months after initial bush regeneration and planting, monitor weed species richness and density and natural regeneration.

Table 8. Gannt chart work schedule for actions relevant to vegetation management.

Task	Time Frame									
	Initial	Ongoing	3 months	6 months	9 months	12 months	15 months	18 months	21 months	24 months
Upper weed management zone										
Weed removal										
Maintenance										
Landscape Zone										
Weed removal										
Planting										
Bush regeneration and maintenance										
Monitor										

NB: after 24 months works is on-going but on a reduced basis.

Above is a draft schedule of works (in the form of a Gantt Chart) to commence pre-, during and post-construction phase. The following Gantt chart was prepared to assist in bush regeneration works addressing timing and staging of all tasks in the project.

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. See Appendix X for a list of closest nurseries from the site.

7.1.7 Landscaping

Landscaping will follow the Landscape Plan. The front area will be managed for native regeneration, in keeping with this Flora and Fauna report recommendations.

The 'On-site Wastewater Management Report' completed by Envirotech has proposed the facility to be located where Tree 15 is found, therefore alternative locations are proposed in the Landscape Plan.

Preservation of Habitat:

- Retention of logs and tree stumps should be kept to maintain refugee habitat values.
- Retention of Eucalyptus species should be kept to maintain foraging resources for threatened Grey Headed Flying Fox

7.1.8 Nest boxes

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


Image from: nestboxes.com.au

7.1.9 Pathogen prevention

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

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

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.

7.1.10 Vertebrate Pests

Vertebrate pests (cats, dogs, foxes) would not be considered a significant problem at the site and no actions are suggested for their control.

Fauna

Scientific Name	Common Name	Habitat Preferences	Site Suitability
Lathamus discolor	Swift Parrot	Migratory species occurring in south-eastern Australian from March to October. Occurs in areas of flowering Eucalyptus or abundant lerp invertebrates. Preferred tree species include Swamp Mahogany, Spotted Gums, Red Bloodwoods, Mugga Ironbarks and White Box.	There is moderate potential for the species to feed on flowering Eucalypts.
Anthochaera phrygia	Regent Honeyeater	The species inhabits dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests of River She oak. 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.	Records of this species were recorded in Ingleside Heights (> 5 km away). No potential habitat within the site or in the immediate vicinity. Low potential for the species to occur within the site. No further assessment or consideration is required.
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 potential habitat within the site or in the immediate vicinity. Low potential for the species to occur within the site. No further assessment or consideration is required.
Pseudophryne australis	Red-crowned Toadlet	Occurs in open forests on Hawkesbury and Narrabeen Sandstones. Inhabits ephemeral drainage lines below sandstone ridges. Requires shelter in the form of rocks, dense vegetation and thick leaf litter.	No potential for the species to occur within the site due to the site of water courses. No further assessment or consideration is required.
Varanus rosenbergi	Rosenberg's Goanna	Found in heath, open forest and woodland. Associated with termites, the mounds of which this species nests in; termite mounds are a critical habitat component. Individuals require large areas of habitat. Feeds on carrion,	Records of this species were recorded in north Warriewood (> 5 km away). No potential habitat within the site or in the

Scientific Name	Common Name	Habitat Preferences	Site Suitability
		birds, eggs, reptiles and small mammals. Shelters in hollow logs, rock crevices and in burrows, which they may dig for themselves, or they may use other species' burrows, such as rabbit warrens.	immediate vicinity. Low potential for the species to occur within the site. No further assessment or consideration is required.
Ptilinopus superbus	Superb Fruit-Dove	The species is found in rainforests, rainforest margins, mangroves, wooded stream-margins, and even isolated figs, lilly pillies and pittosporums. The Superb Fruit-Dove may migrate to New Guinea in winter, but little is known of its movements, or the reasons for its sometimes southerly flights as far as Tasmania. Feeds almost exclusively on fruit, mainly in large trees.	There is very low potential for the species to occur within the site. No further assessment is required.
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.	Records of this species were recorded in Ingleside Heights (> 5 km away). No potential habitat within the site or in the immediate vicinity. Low potential for the species to occur within the site. No further assessment or consideration is required.
Haliaeetus leucogaster	White-bellied Sea-Eagle	Occurs along the coastline and occasionally larger waterways.	No potential habitat within the site or in the immediate vicinity. Low potential for the species to occur within the site. No further assessment or consideration is required.
Hieraaetus morphnoides	Little Eagle	Occupies open eucalypt forest, woodland or open woodland. She Oak 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	Records of this species were recorded in Ku-ring-gai Chase NP and north Ingleside Heights (> 5 km away). Moderate potential for the species to forage over the site. No

Scientific Name	Common Name	Habitat Preferences	Site Suitability
		in early summer. Preys on birds, reptiles and mammals, occasionally adding large insects and carrion.	further assessment or consideration is required.
Haematopus fuliginosus	Sooty Oystercatcher	Inhabits rocky headlands, rocky shelves, exposed reefs with rock pools, beaches and muddy estuaries. Forages on exposed rock or coral at low tide for foods such as limpets and mussels. Breeds in spring and summer, almost exclusively on offshore islands, and occasionally on isolated promontories.	Records of this species were recorded south of Loquat Valley (> 2 km away. No potential habitat within the site or in the immediate vicinity. Low potential for the species to occur within the site. No further assessment or consideration is required.
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.	Low potential for the species to occur within the site – may feed on flowering Eucalypts. No further assessment required.
Melithreptus gularis gularis	Black-chinned Honeyeater (eastern subspecies)	Occupies upper canopies of dry 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). Also inhabits open forests of smooth-barked gums, stringybarks, ironbarks, river sheoaks (nesting habitat) and tea-trees. Feeds on insects, nectar and honeydew.	Records of this species were recorded in Ku-ring-gai Chase NP (> 5 km away). No potential habitat within the site or in the immediate vicinity. Low potential for the species to occur within the site. No further assessment or consideration is required.
Daphoenositta chrysoptera	Varied Sittella	Inhabits eucalypt forests and woodlands, especially those containing rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland. Feeds on arthropods gleaned from crevices in rough or decorticating bark, dead branches, standing dead trees and small branches and twigs in the tree canopy.	Records of this species were recorded in Ingleside Heights (> 5 km away). No potential habitat within the site due to the sparse vegetation. No further assessment or consideration is required.

Scientific Name	Common Name	Habitat Preferences	Site Suitability
Artamus cyanopterus cyanopterus	Dusky Woodswallow	Migratory bird primarily inhabit dry, open eucalypt forests and woodlands, including mallee associations, with an open or sparse understorey of eucalypt saplings, acacias and other shrubs, and ground-cover of grasses or sedges and fallen woody debris. Feeds on invertebrates, mainly insects.	Records of this species were recorded in Loquat Valley (> 2 km away). No potential habitat within the site or in the immediate vicinity. Low potential for the species to occur within the site. No further assessment or consideration is required.
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.	Records of this species were recorded north-west from Ingleside Heights (> 5 km away). No potential habitat within the site or in the immediate vicinity. Low potential for the species to occur within the site. No further assessment or consideration is required.
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.	Records of this species were recorded in Ku-ring-gai Chase NP (> 5 km away). No potential habitat within the site or in the immediate vicinity. Low potential for the species to occur within the site. No further assessment or consideration is required.
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.	Records of this species were recorded in Ku-ring-gai Chase NP (> 5 km away). No potential habitat within the site or in the immediate vicinity. Low potential for the species to occur within the site. No further assessment or consideration is required.

Scientific Name	Common Name	Habitat Preferences	Site Suitability
Petaurus norfolcensis	Squirrel Glider	Inhabits mature or old growth Blackbutt-Bloodwood forests with heath understorey in coastal areas. Prefers mixed species stands with a shrub or Acacia midstorey. 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.	Records of this species were recorded in Ku-ring-gai Chase NP (> 5 km away). No potential habitat within the site or in the immediate vicinity. Low potential for the species to occur within the site. No further assessment or consideration is required.
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 habitat occurs within the site and in the surrounding areas. The species would be expected to utilize the remnant vegetation within the site as foraging habitat. Specifically, the species would be expected to utilise the vegetation canopy for invertebrate foraging resources.**
Mormopterus norfolkensis	**Eastern Freetail-bat**	**Prefers to roost in tree hollows buy may roost under flaking bark or in man-made structures. Occurs east of the Great Dividing Range throughout dry sclerophyll forest, woodlands, swamp forest and mangrove forests.**	**Potential habitat within the site and in the immediate vicinity. Moderate potential for the species to occur within the site. No further assessment or consideration is required.**
Chalinolobus dwyeri	**Large-eared Pied Bat**	**Roosts in caves, cliff crevices, mine shafts and in old nests of the Fairy Martin. Typically inhabits low to mid elevation well-timbered dry open forests and woodlands in close proximity to suitable nesting. Prefers areas containing gullies.**	**Potential habitat occurs within the site and in the surrounding areas. The species would be expected to utilize the remnant vegetation within the site as foraging habitat. Specifically the species would be expected to utilize the vegetation canopy for invertebrate foraging resources.**

Scientific Name	Common Name	Habitat Preferences	Site Suitability
Miniopterus australis	**Little Bentwing-bat**	**Roosts in tree hollows, caves, tunnels, mine shafts, stormwater drains, culverts, bridges and buildings. Forages for insects in the tree canopy in densely vegetated areas. Prefers moist eucalyptus forests, rainforests, vine thickets, wet and dry sclerophyll forests, Melaleuca swamps, dense coastal forests and banksia scrub. Prefers well timbered areas.**	**Potential habitat occurs within the site and in the surrounding areas. The species would be expected to utilize the remnant vegetation within the site as foraging habitat. Specifically the species would be expected to utilize the vegetation canopy for invertebrate foraging resources.**
Miniopterus schreibersii oceanensis	**Eastern Bentwing-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 habitat occurs within the site and in the surrounding areas. The species would be expected to utilize the remnant vegetation within the site as foraging habitat. Specifically, the species would be expected to utilize the vegetation canopy for invertebrate foraging resources.**
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.**	**Potential habitat occurs within the site and in the surrounding areas. The species would be expected to utilize the remnant vegetation within the site as foraging habitat. Specifically, the species would be expected to utilize the vegetation canopy for invertebrate foraging resources.**
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,**	**Potential habitat occurs within the site and in the surrounding areas. The species would be expected to utilize the remnant vegetation within the site as foraging**

Scientific Name	Common Name	Habitat Preferences	Site Suitability
		rainforest with greatest preference for tall wet forests. Forages along creeks and river corridors.	**habitat. Specifically, the species would be expected to utilize the vegetation canopy for invertebrate foraging resources.**
Calyptorhynchus lathami	**Glossy Black-Cockatoo**	Lives in coastal woodlands and drier forest areas, open inland woodlands or timbered watercourses where casuarinas (or she oaks), its main food trees, are common. Glossy black-cockatoos occasionally eat seeds from eucalypts, angophoras, acacias and hakeas, as well as eating insect larvae.	Records of this species were recorded east Ingleside (> 5 km away). Potential habitat within the site or in the immediate vicinity. Low potential for the species to occur within the site – low priority feed trees (She Oaks and Pines) 5-part test conducted. NB: Glossy Blacks Prefer Forest Oaks than either species on-site.
Lophoictinia isura	Square-tailed Kite	Inhabits dry woodlands and open forests, particularly along timbered watercourses. Specialist hunter of passerines, especially honeyeaters, and most particularly nestlings, and insects in the tree canopy, picking most prey items from the outer foliage.	One record of this species was recorded in Ku-ring-gai Chase NP (> 5 km away). No potential habitat within the site or in the immediate vicinity. Low potential for the species to occur within the site. No further assessment or consideration is required.
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.	Records of this species was recorded in Ku-ring-gai Chase NP and as far south as Ingleside (> 5 km away). No potential habitat within the site or in the immediate vicinity. Low potential for the species to occur within the site. No further assessment or consideration is required.

Scientific Name	Common Name	Habitat Preferences	Site Suitability
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.	One record of this species was recorded in Ku-ring-gai Chase NP (> 5 km away). No potential habitat within the site or in the immediate vicinity. Low potential for the species to occur within the site. No further assessment or consideration is required.
Ninox connivens	Barking Owl	Inhabits woodland and open forest, including fragmented remnants and partly cleared farmland. It is flexible in its habitat use, and hunting can extend in to closed forest and more open areas. Sometimes able to successfully breed along timbered watercourses in heavily cleared habitats due to the higher density of prey on these fertile soils. Roost in shaded portions of tree canopies, including tall midstorey trees with dense foliage such as Acacia and Casuarina species. Preferentially hunts small mammals such as Squirrel Gliders and Ringtail Possums, but when loss of tree hollows decreases these prey populations the owl becomes more reliant on birds, invertebrates and terrestrial mammals such as rodents and rabbits.	Records of this species was recorded in Ku-ring-gai Chase NP, around Narrabeen Lagoon (In Jamieson Park – pers obs) and Ingleside Heights (> 5 km away). No potential habitat within the site or in the immediate vicinity. Low potential for the species to occur within the site. No further assessment or consideration is required.
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.**	**Potential foraging habitat occurs within the site and in the surrounding areas. Powerful Owls hunt small mammals from the outer canopy. The site may form part of a larger territory.** **No roosting or breeding habitat.**

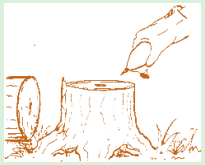
Scientific Name	Common Name	Habitat Preferences	Site Suitability
Tyto novaehollandiae	Masked Owl	The species prefers dry eucalypt forests and woodlands and hunts along the edges and forests and roadsides. Mainly preys upon arboreal and ground mammals, primarily rats. Requires tree hollows in moist gullies for breeding.	No potential habitat within the site or in the immediate vicinity. Low potential for the species to occur within the site. No further assessment or consideration is required.

Note: Species in **bold** have been assumed as having appropriate habitat present on-site.

7.2 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 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 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 t e 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.

7.3 Appendix III– Bushland Hygiene Protocols for Phytophthora

- Always assume that the area you are about to work in is free of the disease and therefore needs to be protected against infection.

- And, always assume that the activity you are about to undertake has the potential to introduce the disease.

- Arrive at site with clean shoes, i.e.: no dirt encrusted on them.

- If you arrive with shoes that are encrusted with dirt, they will have to be completely soaked in metho or disinfectant and allow a few minutes to completely soak in. NEVER scrape untreated dirt off your shoes onto the ground.

- Before you move onto the site spray the bottom of your shoes with 70 % metho. Bleach solution (1% strength) or household/commercial disinfectant (as per label) are also suitable.

- Check all tools and equipment that comes in contact with soil are clean before entering the area (they should have been cleaned on site at the end of the previous work session). If there is any dirt on them, spray them with 70% metho.

- Clean all tools at the end of each work session while still on site ensuring this is done away from drainage lines and adjacent work areas. Knock or brush off encrusted dirt and completely spray with 70 % metho. Replace in storage/transport containers.

- Preferably compost all weed material on site.
- Never drag vegetation with exposed roots and soil through bushland.
- When removing weeds from site, remove as much soil as possible from them in the immediate work area and carefully place vegetative material into plastic bags.
- Try not to get the bag itself dirty; don't put it on/in a muddy area.
- Always work from the lower part of a slope to the upper part.
- Always work in areas known to be free of the pathogen before working in infected areas.
- Minimise activities wherever possible when the soil is very wet.
- Vehicles should not be driven off track or into reserves (unless vehicle decontamination is carried out before and after entering a single work site)
- Only accredited supplies of plants/mulch to be used.

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

Facts about Phytophthora

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

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.

7.4 Appendix IV– Tests of Significance

7.4.1 Powerful Owl (*Ninox strenua*)

5-Part Test

The following is to be taken into account for the purposes of determining whether a proposed development or activity is likely to significantly affect threatened species or ecological communities, or their habitats:

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

The works are not expected to adversely affect the life cycle of Large Forest Owls such that a local population would become extinct. Impacts are potentially from the removal of trees, which could have hollows for prey species, and the increased use of the site which could result in a decrease in habitat quality for ground-prey species.

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

(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,

The Powerful Owl species in the area are not part of an endangered population.

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

(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

(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 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. Sightings of Powerful Owls have been recorded nearby the site. The proposed vegetation removal will take out prey habitat but is not expected, on its own, to significantly influence the long-term survival of PO in the locality.

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),

Declared areas of outstanding biodiversity value have not yet been declared in 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.

Land clearing is a key threatening process for the Powerful Owls. The proposed development will not result in clearing of Large Forest Owl species breeding or roosting habitat. IT will reduce habitat that can be used by prey species.

Conclusion:

This proposal is not likely to significantly affect Populations of Powerful Owls (*Ninox strenua*). A local population for Powerful Owls would include 1 breeding pair. No breeding habitat was observed, or previously recorded, on-site. While foraging habitat and prey species would be reduced no known breeding habitat would be lost so the proposal is not likely to put the local population at risk of extinction. Revegetation is required (will need to include off-site planting) so that there is habitat for prey species and no-nett loss of habitat long-term.

7.4.2 Microbats

Species of microbat were assessed as having the potential to occur within the study area based on Bionet records. The following species have the potential to occur in the site or surrounding bushland:

- Eastern Freetail-bat (*Mormopterus norfolkensis)*
- Yellow-bellied Sheathtail-bat (*Saccolaimus flaviventris)*
- Eastern False Pipistrelle (*Falsistrellus tasmaniensis)*
- Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis)*
- Little Bentwing-bat (*Miniopterus australis)*
- Large-eared Pied Bat (*Chalinolobus dwyeri)*
- Greater Broad-nosed Bat (*Scoteanax rueppellii)*
- Southern Myotis (*Myotis macropus)*

Microbats are mobile but do tend to use and re-use suitable areas and roost trees. Although these species have differing habitat requirements, they have been assessed together as the trees to be removed are habitat either directly for roosting (cracks, crevices, hollows) or indirectly for food (flying insects) for all eight species.

5-Part Test

The following is to be taken into account for the purposes of determining whether a proposed development or activity is likely to significantly affect threatened species or ecological communities, or their habitats:

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

The trees that may need to be removed were not observed to be bearing hollows suitable for tree roosting micro-bat species including the Eastern Free-tail-bat. The low number of recorded sightings tree roosting species suggest that the area is not currently being used as primary breeding habitat (Bionet, 2018). This indicates a low potential for the life cycles of local populations to be put at risk as the site may be used primarily for foraging resources. The proposed actions would be expected to have a lesser impact upon cave

dwelling species including the Eastern Bentwing-bat and the Southern Myotis. Trees do not comprise breeding habitat for these species and would not impact their life cycles. The Eastern Freetail Bat, the Eastern Bentwing Bat and the Southern Myotis have relatively higher recorded sightings within a 10km are surrounding the site (Bionet, 2018). This indicates that the site may be used frequently for foraging resources by these species and that the proposed actions would not impact the life-cycles of cave dwelling species.

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

(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,

Microbats are not an EEC but they do live within EECs and re key pollinators of some species so to that extent they are part of the 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

(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

(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 proposed actions involve the removal of 19 native mature trees. Hollows are expected though none were observed directly, there are areas of flaking bark and other roosting habitat for microbat species. These trees may contain marginal foraging habitat for species which feed on insects in or above the canopy. Due to the number of trees to be removed that could be potentially used by microbats, nine (9) micro-bat roosting boxes are to be installed.

Removal of habitat by way of crevices/hollows/loosebark in trees and this may have an adverse effect on the life cycles of individual microbats however this site alone is not expected to result in the loss of local populations.

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),

Declared areas of outstanding biodiversity value have not yet been declared in 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.

Vegetation removal is part of a key threatening process as it results in the loss of habitat for microbats.

<u>Conclusion</u>

The proposed actions are likely to remove habitat by way of crevices/hollows/loosebark in trees and this may have an adverse effect on the life cycles of individual microbats however this site alone is not expected to result in the loss of local populations. Due to the number of trees to be removed that could be potentially used by microbats, a minimum of nine (9) microbat roosting boxes are to be installed.

7.4.3 Grey-headed Flying-Fox (*Pteropus poliocephalus*)

Species Description

TSC-V

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

5-Part Test

The following is to be taken into account for the purposes of determining whether a proposed development or activity is likely to significantly affect threatened species or ecological communities, or their habitats:

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

The proposed development is unlikely to have an adverse effect on the life cycle of this threatened species' viable population or bring it at risk of extinction. Grey-headed Flying-foxes to feast on a traditional diet such as nectar and pollen, and fruits from native trees/shrubs (e.g. Pittosporums) and vines (e.g. Wombat berry) not found on site.

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

(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

The proposed action is expected to have a low immediate impact on Flying Foxes (FF) as the trees, flowering, would be use used as an occasionally or opportunistic food source. There are no FF roosts in the trees proposed for removal. Tree loss on a landscape scale does remove food sources for FF and this loss would contribute to cumulative loss and hence tree replanting is required at a 10 to 1 ratio – minimum (570 tube stock locally native trees).

(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 proposal will not result in the creation of any barriers to the movement of these highly mobile, aerial species. The available habitat on site will be not become fragmented or isolated from other areas of habitat as a result of the proposed developments.

(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 being removed or modified is not significant towards the long-term survival of the species as it is considered to be marginal habitat, only to be used occasionally or opportunistically.

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),

Declared areas of outstanding biodiversity value have not yet been declared in 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.

The proposed action includes tree removal which contributes to habitat loss which is a KTP. There are no FF roosts in the trees proposed for removal. Tree loss on a landscape scale does remove food sources for FF and this loss would contribute to cumulative loss and hence tree replanting is required at a 10 to 1 ratio – minimum (200 tube stock locally native trees).