Biodiversity Development Assessment Report

12A John Street, Avalon Beach NSW 2107

By Ecological Consultants Australia Pty Ltd TA

Kingfisher Urban Ecology and Wetlands

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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 Jack Hastings 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.

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

Executive Summary

Introduction

- The proposal is for the subdivision of the land into 2 lots which includes the construction of a driveway and an additional two Development Applications (DA2019/1333 and DA2019/1334) have been submitted for the construction a new dwelling, garage and secondary dwelling on each of the proposed lots. Proposed Lot 12A with a 4-bedroom dwelling and 2-bedroom secondary dwelling and proposed Lot 12B with a 5-bedroom dwelling and 2-bedroom secondary dwelling.
- The property directly adjoins Careel Creek to the east which contains estuarine habitat including mangroves. Saltmarsh is present upstream from this location.
- The native canopy trees clustered within the north-eastern portion of the site are mapped as PCT 1234 Swamp Oak Swamp Forest NSW BC Act 2016 and Commonwealth Environment Protection and Biodiversity Conservation Act 1999
- Fringing Estuaries which is a component of Swamp Oak Floodplain Forest an EEC listed within the
- The land currently has no buildings and contains, some planted exotic / non-local native trees and mown lawn / exotic garden and native canopy trees mostly Swamp Mahogany and She-Oaks.

Methods

- On-ground survey took place in February 2019, May 2019, December 2019, March 2020, October 2020 and Jan 2021 by Senior Ecologist Geraldene Dalby-Ball and Ecologist Tina Feodoroff (2019 inspections).
- 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.
- BAM was applied and one quadrat was placed in the rear of the property in an area that had native canopy. It is noted that the land is not bushland and the gardens are landscaped and the quadrat could not fulfill the BAM guidelines of being in a relatively 'undisturbed' area.

Results

- The footprint of the proposed dwelling covers approximately two thirds of the site with the easterly end of the site adjacent to the creek being left as garden.
- The site is adjacent to the Threatened Ecological Community PCT1234 Swamp Oak *swamp forest fringing estuaries, Sydney Basin Bioregion and South East Corner Bioregion*
- The site may be providing habitat for threatened fauna species. Foraging habitat is available for the Large Forest Owls, Microbats, Grey-headed Flying-fox and Bush Stone-curlew and Tests of Significance (also known as 5-Part Test) have been conducted;
- The ratio of tree replacement recommended is in excess of 10:1.Trees can be planted on and off-site.
- Installation of 3 nest boxes to encourage native wildlife is required (2 bat boxes and one rosella box).
- Using the BDAR calculator the total cost to offset both ecosystem credits and species credits generated by this development is $13,805.90 (including GST), assuming payment will be made into the Biodiversity Conservation Fund. A credit is a unit used to measure the impact of a development. Credits have a price and are traded by the Biodiversity Conservation Trust (BCT) under the

Biodiversity. Conservation Scheme (BOS). A credit may be created due to a number of factors including but not limited to, amount of vegetation removed, critical habitat removed and alteration of the landscape.

- It is recommended that rather than requiring payment to the Trust that a condition be placed to revegetate the riparian zone along Careel Creek both within the property and between the property boundary and the top of the Careel Creek Bank. A separate coastal and riparian plan has been completed that details the recommended works. Flora species from PCT1234 have been prioritised for planting within the riparian zone. The works would be in excess of the $13,805.90 and would see the local Careel Creek environment improved.

Mitigation Measures

Before works:

- Tree Protection as per Arborist report by Naturally trees (2nd February 2021).
- Mark the riparian zone with bunting and signage to ensure only riparian creation works are conducted in this area.
- Order all plants for riparian planting (as soon as DA is approved).
- Effective site management to ensure sediment doesn't enter the waterway
- Installation of the 3 nest boxes in trees to be retained.

During works:

- Protect all trees to be retained as per Arborist report by Naturally trees (2nd February 2021).
- Bush hygiene protocols to be followed to prevent the spread of pathogens including *Phytophthora*.
- Implement Riparian Zone rehabilitation and creation as per the Riparian Land Plan by ECA (20th Feb 2021).
- Implement the Landscape Plan as this applies to land outside the Riparian Zone.
- Implement recommendations of the Coastal Mgt Plan (Cardno 2020) and ensure the existing retaining wall is established with native vegetation to assist ecological integrity.

After completion of works:

- Maintain the Riparian Land rehabilitation and continue to plant species from PCT1234.
- Management of the sites interface with Careel Creek to reduce sediment build-up and improve bank stability and water quality.

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

- *Cwlth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act).*
- *Environmental Planning and Assessment Act 1979 (EP&A Act).*
- *Coastal Management Act 2016*
- *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).*

Conclusions and Recommendations

- Riparian Zone to be revegetated with Swamp Oak Forest and dedicated as an offset to the removal of Casuarina on the site.
- Exotic species are to be replaced with native species from PCT1234 and other locally native species as per the Riparian Land Plan.
- Arborist report recommendations to be applied.
- The installation of a living retainer wall established with native vegetation to stabilize the creek/edge environment/ development site interface will assist ecological integrity.

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Stage 1: Biodiversity Assessment

1 Introduction

Ecological Consultants Australia (ECA) has been contracted by Tim West to provide a Biodiversity Development Assessment Report 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'.

This report was updated in January, July 2020 and March 2021 to take into account Council comments (provided below).

NSW Biodiversity Conservation Act 2016
The vegetation within the north-eastern portion of the site is mapped as "Biodiversity Value" within the Biodiversity Values Map published by DPIE within the Biodiversity Offsets Scheme (BOS). Clause 7.1 (3) of the Biodiversity Conservation Regulation 2017 requires consideration of the likely vegetation clearing resulting from the subdivision, which are presented in the two dwelling DAs. The proposal is removing native trees within the mapped extent which triggers automatic entry into the BOS. As a result impacts to biodiversity must be assessed within a Biodiversity Development Assessment Report (BDAR) prepared by an Accredited Assessor. Alternatively, the proposal could be amended to avoid removing native vegetation within the mapped "Biodiversity Value" extent, which will demonstrate some avoidance of biodiversity impacts.

The Arborist Report identified *Syzygium paniculatum* (T22) which is a threatened species listed in Schedule 1 of the NSW *Biodiversity Conservation Act 2016*. This species was not identified or assessed with a 5-part test within the Flora and Fauna Report (Ecological Consultants Australia, October 2019).

Recommendation
Council's Natural Environment - Biodiversity section cannot support the application due to non-compliances with relevant Pittwater LEP / DCP controls and the provisions of the NSW BC Act 2016 and Coastal Management SEPP 2018. The applicant is encouraged to consider a design which avoids and minimises impacts to the biodiversity values on the site, i.e. retention of prescribed high quality trees and a wider set-back from Careel Creek.

This BDAR addresses council comments above by assessing impacts (minimal) on the area mapped as "Biodiversity Value" within the site. It is noted the mapping has included Casuarina trees however there are no other species of the EEC in this area. Replacement plantings in the riparian zone will offset residual impacts on the "Biodiversity Value" area.

With respect to the *Syzigium paniculatum* the author has been provided with anecdotal evidence that the tree was planted. Given that *S. paniculatum* is a commonly sold and planted Lilly Pilly and its placement is in mown lawn along with similar exotics. Further I personally of planting 2 of these at number 8 John street ~ 30 yrs ago. For this reason, it has not been assessed as the Threatened species.

It will however be carefully transplanted on-site and the author has seen this done successfully in the past.

The home owner will also pay for *S. paniculatum* that can be certified as being from local stock (like from the one at Bangalley Headland) and plant these (at least 3) on the property.

The proposed development is now set back and average of 20m from top of bank with one section (2m wide) encroaching 2m into the outer 50% of the riparian zone. As per the Water Mgt Act Guidelines this has been compensated for by having a wider (than 20m) riparian zone in other areas. See Riparian Plan (ECA Feb 2021) for details.

The proposal is compliant with BC Regulation 2017.

1.1 Site Location

The study area is 12 John St, Avalon Beach NSW 2107, Australia (see Figure 1).

Figure 1. Location of the site at 12A John Street, Avalon Beach NSW 2107. Source: Six Maps 2020.

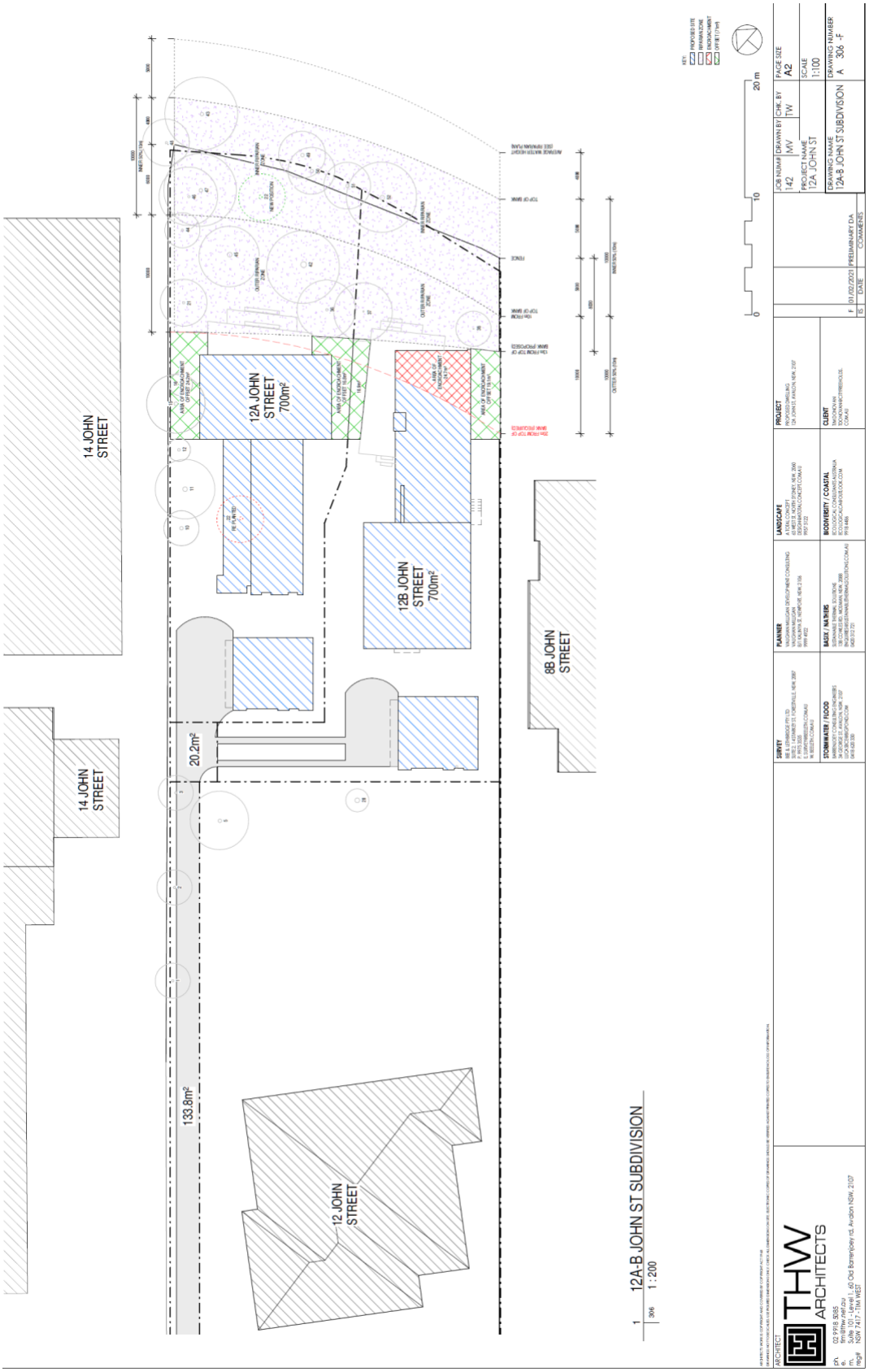


Figure 1.1. Site Plan for the proposal at 12A John Street, Avalon Beach NSW. Source – THW Architects, 1st Feb 2021.

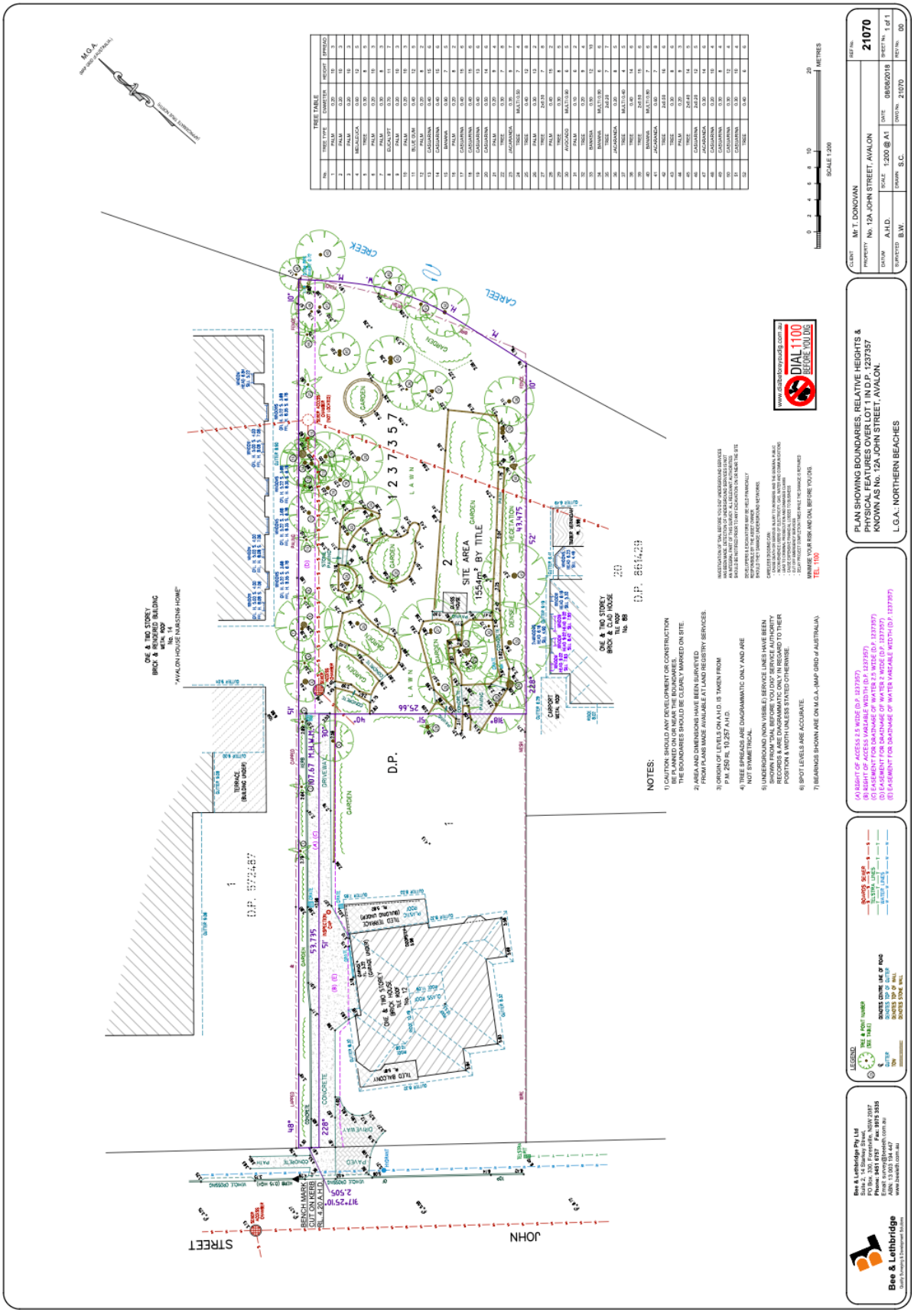


Figure 1.3. Plan showing boundaries, relative heights & physical features of existing things over Lot 1 DP 1237357. Source: Bee Lethbridge Pty Ltd, 2018 (still relevant Feb 2021).

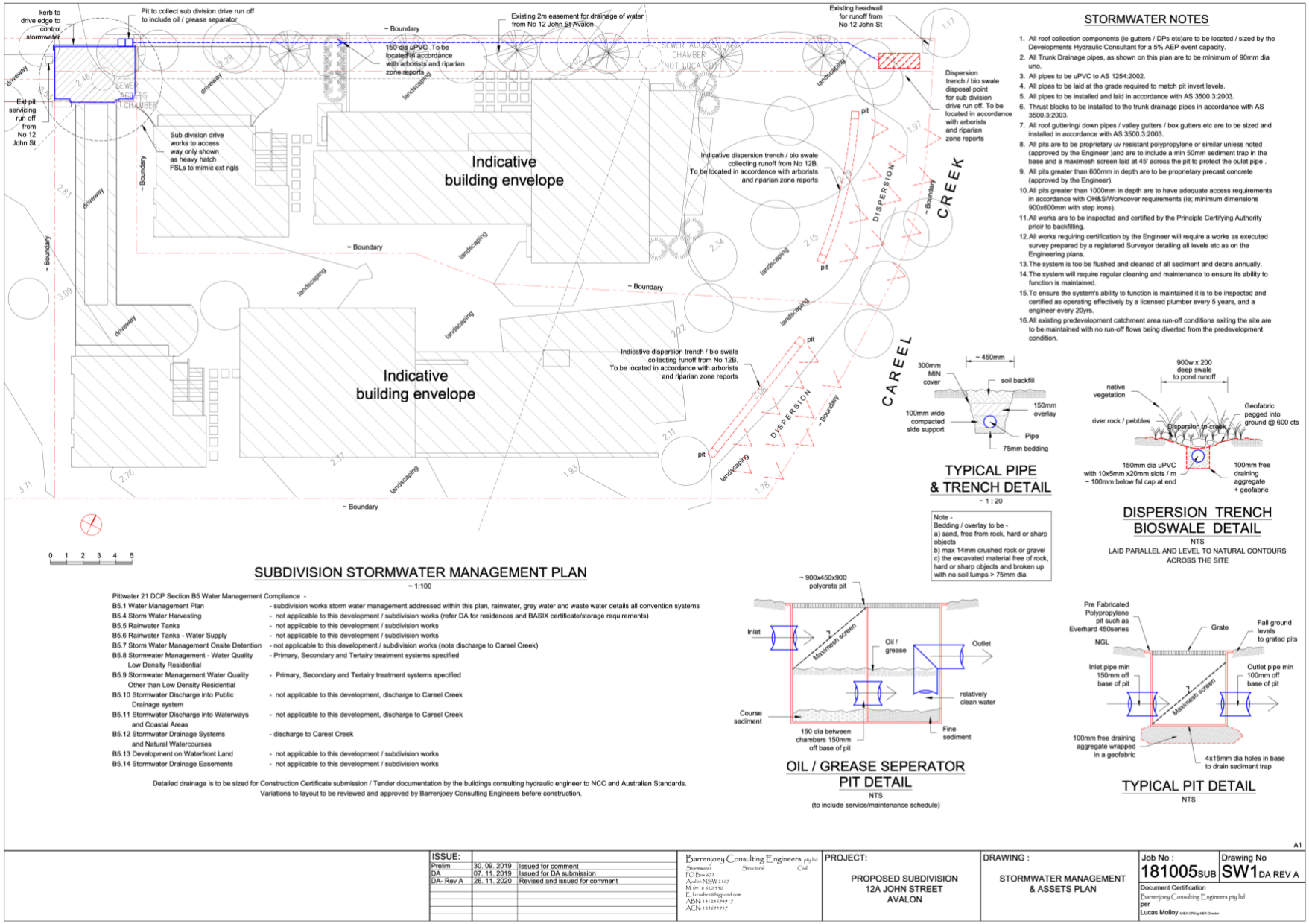


Figure 1.4. Stormwater Management and Assets Plan. Source: Barrenjoey Consulting Engineers Pty Ltd, 26.11.2020.

1.2 Sources of information used in the assessment

The following sources of information were used for this assessment:

- SeedMaps 2021
- SydneyMetroArea_v3.1_2016_E-VIS_4489
- BioNet DPIE (2020 and 2021)

1.3 Legislative context and statutory requirements

1.3.1 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.

1.3.2 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 2020). See also https://www.environment.nsw.gov.au/biodiversity/entryrequirements.htm

Areas of Biodiversity Value occur within the north-eastern portion of the site. As such, the development triggers the Biodiversity Offsets Scheme entry threshold. The assessment type used in the BAM-C is Part 4 Developments (Small Area).

Figure 1.4a. Site identified on the BV Map (March 2021)

1.3.3 Commonwealth Environmental Protection and Biodiversity Conservation Act 1999

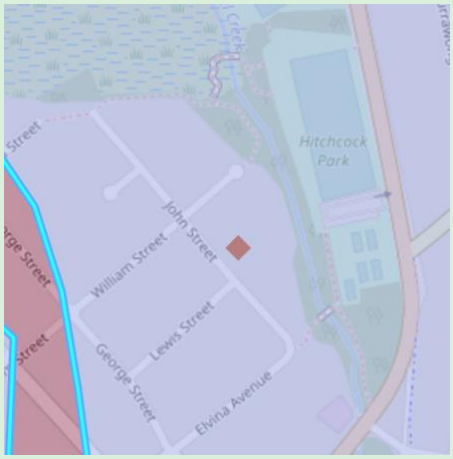
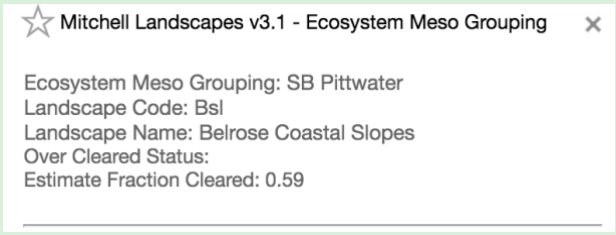
The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is applicable if it was considered that an impact on a 'matter of National Environmental Significance (NES)' were likely, thus providing a trigger for referral of the proposal to the Department of Environment 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.

2 Landscape features

Category	Details
Interim Biogeographic Regionalisation for Australia (IBRA)	Sydney Basin
IBRA Sub Region	Pittwater
NSW Landscape 	Belrose Coastal Slopes 
% Native vegetation cover	5% in the 1500m radius circle.
Landscape features	
Rivers and streams	The property directly adjoins Careel Creek to the east which contains estuarine habitat including mangroves.
Wetlands	Saltmarsh and Mangroves are within the 1500m radius but not on the property.
Connectivity features	Limited to the Careel Creek corridor. Mobile species could access the area.
Areas of geological significance and soil hazard features	None of geological significance. The Creek bank off-site has the potential to erode but is not considered a hazard.
Areas of Outstanding Biodiversity Value identified under the BC Act	No

3 Methods

3.1 Site Inspections

Senior Ecologist Geraldene Dalby-Ball assessed the site with ecologist Tina Feodoroff.

A total of nine site inspections were undertaken. Inspections included a range of tidal heights from full moon high tide in a rain fall event to a full moon low-tide as well as average tidal flows.

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

The recommended requirements for placement of a BDAR plot were not able to be fulfilled on-site due to the small size of the site. Being an urban planted landscape with significant areas of disturbance and abundance of exotic/planted species the only plants indicative of the community are the canopy trees. Plot data from the flora survey, the accredited assessor's knowledge of the site and the arborist report were collated to form the BAM-C data that had to be used. A standard BDAR plot is not designed to capture data from a site such as this.

Site photos

Careel Creek adjoining the site (high-tide)

Native Swamp Mahogany tree and Melaleuca. Exotic species dominate the ground and shrub layer

The Site open areas are domianted by exotic grass and planted extoics.

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 1993 to the present day.

Records from the following databases were collated and reviewed:

- Atlas of NSW Wildlife (Bionet). New South Wales, Office of Environment and Heritage (OEH).
- NSW Threatened Species Information (OEH).
- VIS – Vegetation Mapping information NSW.
- PlantNET (The Royal Botanic Gardens and Domain Trust 2014).
- Protected Matters Search Tool of the Australian Government Department of the Environment (DoE) for matters protected by the Cwlth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act).

Other sources of biodiversity information:

- Relevant vegetation mapping, including:
    - Vegetation Information System, VIS Mapping (OEH).

The following reports were also reviewed:

- Arboricultural Impact Assessment Naturally Trees by Andrew Scales Feb 2021
- THW Architect plans 31/07/2019 and Feb 2021
- Cardno Coastal Mgt Plan 2020

3.2.1 Arborist report findings

Fifty four (54) trees were individually assessed onsite, 49 located within the subject site and 5 adjacent to it, on public and private property. Around half the exotic trees will be removed (19 exotic trees) to be removed.

Eleven native trees are proposed for removal. It is noted that 6 of these are *Casuarina glauca* and possibly suckers of a fewer number of trees. No native trees for removal have hollows.

- Tree 4 *Melaluca quinquenervia*
- Tree 8 *Eucalyptus robusta* (recommended to be removed due to co-dominance)
- Trees 13, 14, 17-20 *Casuarina glauca* (6 trees)
- Tree 22 *Syzygium paniculatum* (recommend for removal has dieback) NB: this tree is 80% likely to be a planted specimen. It will be transplanted as part of works. A five part test has been done for this species even though it is considered planted.
- Tree 29 *Glochidion ferdinandi* - Cheese tree and
- Tree 33 *Banksia integrifolia* – Coastal Banksia

All species listed here will be planted in the riparian rehabilitation works.

Nine *Casuarina glauca* are being retained and others planted.

The main *Eucalyptus robusta* (trees 42 and 45) are being retained.

Fifty five native trees being planted as part of the riparian rehabilitation works.

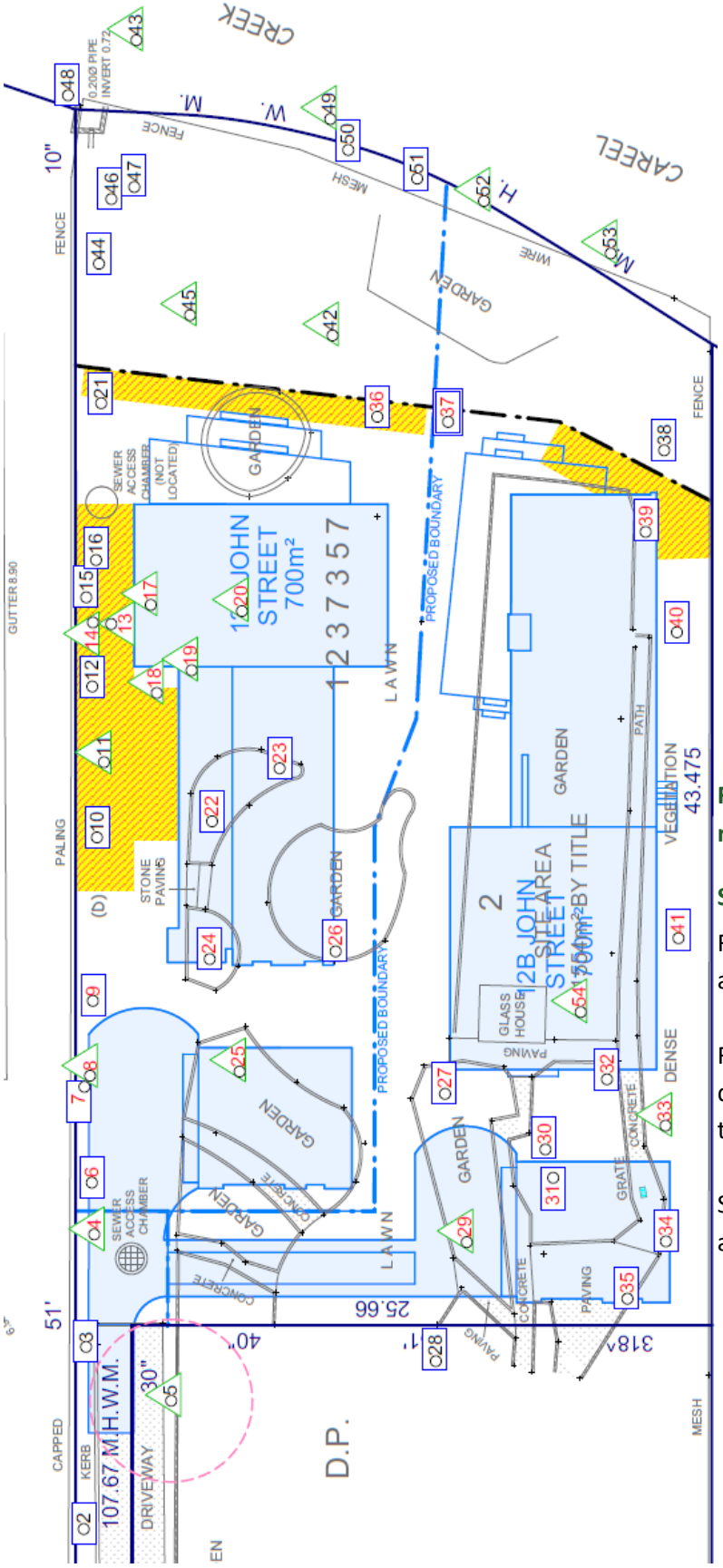


Figure 2. Trees marked for retention / removal.

Source Naturally Trees Feb 2021

Red numbers are for removal and black are for retention.

Retained trees will require protection during works and construction to protect the roots.

See Arborist report for details. Table 1 is an extract from that report.

Table 1 – List of trees marked for removal (red)

APPENDIX 2
Tree schedule

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

No.	Genus species	Height	Spread	DBH	TPZ	Foliage %	Age class	Defects/Comment	Location	Services	Significance	Tree AZ
1	*Archontophoenix alexandrae*	10	3	250	**2.0**	90%	M	Nil	Garden	Adjacent driveway	M	**Z3**
2	*Archontophoenix alexandrae*	10	3	250	**2.0**	90%	M	Nil	Garden	Adjacent driveway	M	**Z3**
3	*Archontophoenix alexandrae*	10	3	250	**2.0**	90%	M	Nil	Garden	Adjacent driveway	M	**Z3**
4	*Melaleuca quinquenervia*	10	6	350	**4.2**	80%	M	Nil	Garden	Nil	M	**A1**
5	*Glochidion ferdinandi*	8	5	300	**3.6**	80%	S	Nil	Garden	Adjacent driveway	M	**A1**
6	*Archontophoenix alexandrae*	10	3	250	**2.0**	90%	M	Nil	Garden	Adjacent driveway	M	**Z3**
7	*Syagrus romanzoffiana*	7	3	300	**2.0**	80%	M	Nil	Garden	Nil	M	**Z3**
8	*Eucalyptus robusta*	14	10	400	**4.8**	80%	M	Co-dominant	Garden	Nil	M	**A1**
9	*Archontophoenix alexandrae*	10	3	250	**2.0**	90%	M	Nil	Garden	Nil	M	**Z3**
10	*Archontophoenix alexandrae*	10	3	250	**2.0**	90%	M	Nil	Garden	Nil	M	**Z3**
11	*Casuarina glauca*	18	7	300	**3.6**	80%	M	Nil	Grass	Nil	M	**A1**
12	*Archontophoenix alexandrae*	10	3	250	**2.0**	90%	M	Nil	Garden	Nil	M	**Z3**
13	*Casuarina glauca*	18	8	400	**4.8**	80%	M	Nil	Grass	Nil	M	**A1**
14	*Casuarina glauca*	18	8	400	**4.8**	80%	M	Nil	Grass	Nil	M	**A1**
15	*Strelitzia nicolai*	5	3	100	**2.0**	80%	M	Nil	Grass	Nil	L	**Z3**
16	*Archontophoenix alexandrae*	10	3	250	**2.0**	90%	M	Nil	Garden	Nil	M	**Z3**
17	*Casuarina glauca*	18	8	450	**5.4**	80%	M	Nil	Grass	Nil	M	**A1**
18	*Casuarina glauca*	18	9	400	**4.8**	80%	M	Nil	Grass	Nil	M	**A1**
19	*Casuarina glauca*	18	8	350	**4.2**	80%	M	Nil	Grass	Nil	M	**A1**
20	*Casuarina glauca*	18	8	400	**4.8**	80%	M	Nil	Grass	Nil	M	**A1**
21	*Archontophoenix alexandrae*	10	3	250	**2.0**	90%	M	Nil	Garden	Nil	M	**Z3**
22	*Syzygium paniculatum*	8	6	250	**2.0**	60%	O	Dieback	Garden	Nil	M	**Z4**
23	*Jacaranda mimosifolia*	10	7	350	**4.2**	80%	M	Nil	Garden	Nil	M	**Z3**
24	*Jacaranda mimosifolia*	9	6	200	**2.4**	90%	M	Co-dominant	Garden	Nil	L	**Z3**
25	*Liriodendron tulipifera*	18	12	450	**5.4**	80%	M	Nil	Garden	Nil	M	**A1**
26	*Archontophoenix alexandrae*	10	3	250	**2.0**	90%	M	Nil	Garden	Nil	M	**Z3**
27	*Magnolia × soulangeana*	6	7	200	**2.4**	80%	M	Nil	Garden	Nil	L	**Z1**
28	*Washingtonia robusta*	22	4	450	**5.4**	80%	M	Nil	Garden	Nil	M	**Z3**
29	*Glochidion ferdinandi*	8	5	300	**3.6**	80%	S	Nil	Garden	Adjacent driveway	M	**A1**
30	*Strelitzia nicolai*	5	3	100	**2.0**	80%	M	Nil	Garden	Nil	L	**Z3**
31	*Trachycarpus fortunei*	4	2	150	**2.0**	90%	M	Nil	Garden	Nil	L	**Z3**
32	*Hymenosporum flavum*	9	4	250	**3.0**	70%	M	Nil	Garden	Nil	L	**Z12**
33	*Banksia integrifolia*	12	9	500	**6.0**	80%	M	Nil	Garden	Nil	M	**A1**
34	*Strelitzia nicolai*	5	3	100	**2.0**	80%	M	Nil	Garden	Nil	L	**Z3**
35	*Macadamia indica*	6	4	200	**2.4**	80%	S	Nil	Garden	Nil	L	**Z1**
36	*Jacaranda mimosifolia*	6	5	250	**3.0**	70%	S	Nil	Grass	Nil	L	**Z3**
37	*Ficus carica*	3	3	40	**2.0**	70%	S	Nil	Grass	Nil	L	**ZZ1**
38	*Grevillea robusta*	18	10	400	**4.8**	80%	M	Failures	Garden	Nil	M	**Z3**
39	*Brachychiton acerifolius*	16	9	450	**5.4**	80%	M	Nil	Garden	Nil	M	**Z3**
40	*Strelitzia nicolai*	5	3	100	**2.0**	80%	M	Nil	Garden	Nil	L	**Z3**
41	*Schinus areira*	8	6	300	**3.6**	60%	M	Co-dominant	Garden	Nil	L	**Z12**
42	*Eucalyptus robusta*	16	10	450	**5.4**	70%	M	Co-dominant	Grass	Nil	M	**A1**
43	*Avicennia marina*	9	9	300	**3.6**	80%	M	Nil	Natural ground	Nil	M	**A1**
44	*Archontophoenix alexandrae*	10	3	250	**2.0**	90%	M	Nil	Garden	Nil	M	**Z3**
45	*Eucalyptus robusta*	16	10	450	**5.4**	70%	M	Co-dominant	Grass	Nil	M	**A1**
46	*Casuarina glauca*	14	5	250	**3.0**	60%	S	Slender habit	Grass	Nil	L	**Z9**
47	*Grevillea robusta*	18	10	400	**4.8**	80%	M	Nil	Grass	Nil	M	**Z3**
48	*Casuarina glauca*	9	5	200	**2.4**	60%	S	Nil	Natural ground	Nil	L	**Z1**

No.	Genus species	Height	Spread	DBH	TPZ	Foliage %	Age class	Defects/Comment	Location	Services	Significance	Tree AZ
49	*Casuarina glauca*	12	6	350	**4.2**	80%	M	Nil	Natural ground	Nil	M	**A1**
50	*Casuarina glauca*	12	6	350	**4.2**	80%	M	Cavity in base	Natural ground	Nil	M	**Z9**
51	*Casuarina glauca*	9	5	200	**2.4**	60%	S	Nil	Natural ground	Nil	L	**Z1**
52	*Casuarina glauca*	12	6	350	**4.2**	80%	M	Nil	Natural ground	Nil	M	**A1**
53	*Casuarina glauca*	12	6	350	**4.2**	80%	M	Nil	Natural ground	Nil	M	**A1**
54	*Carya illinoinensis*	18	14	600	**7.2**	80%	M	Co-dominant	Garden	Nil	H	**A1**

Explanatory Notes

- **Measurements/estimates:** All dimensions are estimates unless otherwise indicated. Measurements taken with a tape or clinometer are indicated with a '*'. Less reliable estimated dimensions are indicated with a '?'.
- **Species:** The species identification is based on visual observations and the botanical name. In some instances, it may be difficult to quickly and accurately identify a particular tree without further detailed investigations. Where there is some doubt of the precise species of tree, it is indicated with a '?' after the name in order to avoid delay in the production of the report. The botanical name is followed by the abbreviation sp if only the genus is known. The species listed for groups and hedges represent the main component and there may be other minor species not listed.
- **Tree number:** relates to the reference number used on site diagram/report.
- **Height:** Height is estimated to the nearest metre.
- **Spread:** The average crown spread is visually estimated to the nearest metre from the outermost tips of the live lateral branches.
- **DBH:** These figures relate to 1.4m above ground level and are recorded in millimetres. If appropriate, diameter is measured with a diameter tape. 'M' indicates trees or shrubs with multiple stems.
- **Foliage Cover:** Percent of estimated live foliage cover for particular species range.
- **Age class:**
  - Y Young = recently planted
  - S Semi-mature (<20% of life expectancy)
  - M Mature (20-80% of life expectancy)
  - O Over-mature (>80% of life expectancy)
- **TPZ:** The Tree Protection Zone (TPZ) is the radial offset distance of twelve times the trunk diameter in meters.
- **Tree AZ:** See reference for Tree AZ categories in Appendix 3.
- **Significance:** A tree's significance/value in the landscape takes into account its prominence from a wide range of perspectives. This includes, but is not limited to neighbour hood perspective, local perspective and site perspective. The significance of the subject trees has been categorized into three groups, such as: High, Moderate or Low significance.

Source: Naturally Trees Feb 2021

4 Flora

The purpose of the flora work was an investigation to determine the flora composition of the site, particularly vulnerable and endangered species. It also included an assessment of the flora as habitat. Furthermore, an assessment of potential impact of the development with a determination of native ground and shrub was conducted.

4.1 Site Vegetation – mapping

The site itself is comprised of primarily exotic species however canopy species associated with *PCT1234 Swamp Oak swamp forest fringing estuaries, Sydney Basin Bioregion and South East Corner Bioregion* are on-site indicating the plant community before disturbance was PCT1234. Furthermore, the eastern end of the site runs adjacent to the remnant PCT1234 along Careel Creek.

Background on PCT 1234.

Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions is a Threatened Ecological Community (TEC). This community is found on the coastal floodplains of NSW. It has a dense to sparse tree layer in which Casuarina glauca (swamp oak) is the dominant species northwards from Bermagui. Other trees including Acmena smithii (lilly pilly), Glochidion spp. (cheese trees) and Melaleuca spp. (paperbarks) may be present as subordinate species, and are found most frequently in stands of the community northwards from Gosford. Tree diversity decreases with latitude, and Melaleuca ericifolia is the only abundant tree in this community south of Bermagui.

The understorey is characterised by frequent occurrences of vines, Parsonsia straminea, Geitonoplesium cymosum and Stephania japonica var. discolor, a sparse cover of shrubs, and a continuous groundcover of forbs, sedges, grasses and leaf litter. The composition of the ground stratum varies depending on levels of salinity in the groundwater. Under less saline conditions prominent ground layer plants include forbs such Centella asiatica, Commelina cyanea, Persicaria decipiens and Viola banksii; graminoids such as Carex appressa, Gahnia clarkei, Lomandra longifolia, Oplismenus imbecillis; and the fern Hypolepis muelleri. On the fringes of coastal estuaries, where soils are more saline, the ground layer may include the threatened grass species, Alexfloydia repens as well as Baumea juncea, Juncus kraussii, Phragmites australis, Selliera radicans and other saltmarsh species.

Figure 3. Site within landscape context. Source: Seed 2020

Figure 3.1 PCT1234: Swamp Oak swamp forest fringing estuaries, Sydney Basin Bioregion and South East Corner Bioregion in relation to the development sight (purple dot). Source: SEED 2020.

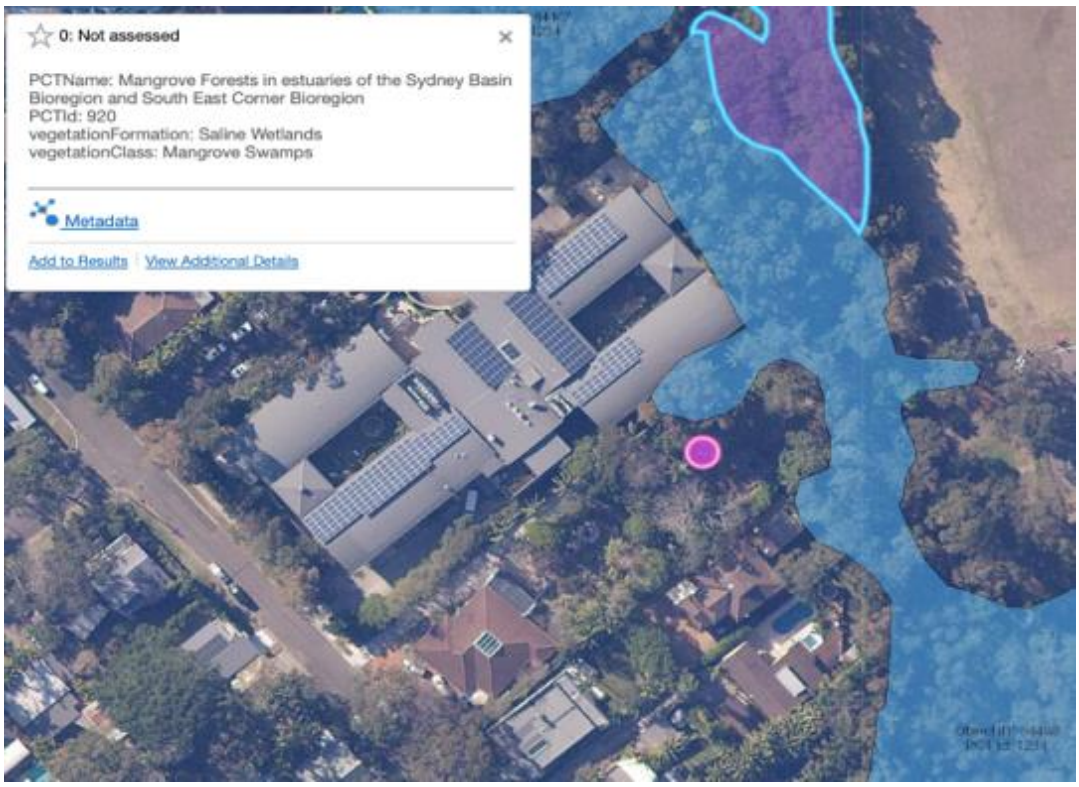


Figure 3.2 PCT920: Mangrove Forests in estuaries of the Sydney Basin Bioregion and South East Corner Bioregion in relation to the development sight (purple dot) Source: SEED 2020.

4.2 Threatened flora

Bionet flora sightings recorded within 10km of the study site according to BioNet records since 1993. Nine species are currently listed as vulnerable or endangered under state and/or commonwealth legislation. The vulnerable and endangered species to focus on-site searches for can be seen in Table 2 below, this is based on likelihood of occurrence.

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

Table 2. Threatened flora recorded within a 10km radius since 1993. Source: NSW OEH Bionet 2021.

Family	Scientific Name	Common Name	NSW status	Cwealth status	Records
Rutaceae	*Asterolasia elegans*		E1	E	1
Rutaceae	*Boronia umbellata*	Orara Boronia	V,P	V	1
Myrtaceae	*Callistemon linearifolius*	Netted Bottle Brush	V,3		3
Euphorbiaceae	*Chamaesyce psammogeton*	Sand Spurge	E1		7
Myrtaceae	*Eucalyptus nicholii*	Narrow-leaved Black Peppermint	V	V	3
Orchidaceae	*Genoplesium baueri*	Bauer's Midge Orchid	E1,P,2	E	3
Proteaceae	*Persoonia hirsuta*	Hairy Geebung	E1,P,3	E	3
Myrtaceae	*Rhodamnia rubescens*	Scrub Turpentine	E4A		26
Myrtaceae	*Syzygium paniculatum*	Magenta Lilly Pilly	E1	V	16

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

4.3 Flora Findings from Site Investigations

4.3.1 Threatened plant species findings

No threatened plant species were found during site assessments.

4.3.2 Observed Flora

During the site visit a variety of native and exotic flora was observed. A species list has been provided and used for developing the *Riparian Land Plan* (ECA Feb 2021)

5 Fauna

Bionet fauna sightings recorded within 10km of the study site according to BioNet records since 1993. 50 species are currently listed as vulnerable or endangered under state and/or commonwealth legislation. The vulnerable and endangered species to focus on-site searches for can be seen in Table 3 below, this is based on likelihood of occurrence.

NB: species with no habitat on site (eg whales) have been omitted from this list – those with marginal habitat have been retained on the list.

Table 3. Threatened fauna observed in previous ecological surveys within a 10km radius since 1993. Source: NSW OEH Bionet 2021.

Class	Scientific Name	Common Name	NSW status	Cwealth status	Records
Amphibia	*Heleioporus australiacus*	Giant Burrowing Frog	V,P	V	2
Amphibia	*Pseudophryne australis*	Red-crowned Toadlet	V,P		18
Aves	*Anthochaera phrygia*	Regent Honeyeater	E4A,P	CE	3
Aves	*Ardenna carneipes*	Flesh-footed Shearwater	V,P	J,K	1
Aves	*Artamus cyanopterus cyanopterus*	Dusky Woodswallow	V,P		1
Aves	***Burhinus grallarius***	**Bush Stone-curlew**	**E1,P**		**52**
Aves	*Callocephalon fimbriatum*	Gang-gang Cockatoo	V,P,3		1
Aves	***Calyptorhynchus lathami***	**Glossy Black-Cockatoo**	**V,P,2**		**41**
Aves	*Dasyornis brachypterus*	Eastern Bristlebird	E1,P,2	E	1
Aves	*Diomedea exulans*	Wandering Albatross	E1,P	E	4
Aves	*Diomedea gibsoni*	Gibson's Albatross	V,P	V	1
Aves	*Esacus magnirostris*	Beach Stone-curlew	E4A,P		1
Aves	***Glossopsitta pusilla***	**Little Lorikeet**	**V,P**		**3**
Aves	*Haematopus fuliginosus*	Sooty Oystercatcher	V,P		4

Aves	*Haliaeetus leucogaster*	White-bellied Sea-Eagle	V,P		36
Aves	*Hieraaetus morphnoides*	Little Eagle	V,P		3
Aves	*Hirundapus caudacutus*	White-throated Needletail	P	V,C,J,K	4
Aves	*Ixobrychus flavicollis*	Black Bittern	V,P		1
Aves	*Lathamus discolor*	Swift Parrot	E1,P,3	CE	2
Aves	*Lophoictinia isura*	Square-tailed Kite	V,P,3		2
Aves	*Macronectes giganteus*	Southern Giant Petrel	E1,P	E	1
Aves	*Neophema pulchella*	Turquoise Parrot	V,P,3		1
Aves	*Ninox connivens*	Barking Owl	V,P,3		18
Aves	***Ninox strenua***	**Powerful Owl**	**V,P,3**		**222**
Aves	*Numenius madagascariensis*	Eastern Curlew	P	CE,C,J,K	8
Aves	*Pandion cristatus*	Eastern Osprey	V,P,3		5
Aves	*Petroica boodang*	Scarlet Robin	V,P		1
Aves	*Ptilinopus regina*	Rose-crowned Fruit-Dove	V,P		3
Aves	*Ptilinopus superbus*	Superb Fruit-Dove	V,P		2
Aves	*Thalassarche cauta*	Shy Albatross	V,P	V	3
Aves	*Thalassarche melanophris*	Black-browed Albatross	V,P	V	1
Aves	*Tyto novaehollandiae*	Masked Owl	V,P,3		2
Mammalia	*Cercartetus nanus*	Eastern Pygmy-possum	V,P		29
Mammalia	***Chalinolobus dwyeri***	**Large-eared Pied Bat**	**V,P**	**V**	**6**
Mammalia	*Dasyurus maculatus*	Spotted-tailed Quoll	V,P	E	3

Mammalia	*Isoodon obesulus obesulus*	Southern Brown Bandicoot (eastern)	E1,P	E	19
Mammalia	***Micronomus norfolkensis***	**Eastern Coastal Free-tailed Bat**	**V,P**		**5**
Mammalia	***Miniopterus australis***	**Little Bent-winged Bat**	**V,P**		**27**
Mammalia	***Miniopterus orianae oceanensis***	**Large Bent-winged Bat**	**V,P**		**35**
Mammalia	***Myotis macropus***	**Southern Myotis**	**V,P**		**9**
Mammalia	*Petauroides volans*	Greater Glider	P	V	1
Mammalia	*Petaurus norfolcensis*	Squirrel Glider	V,P		3
Mammalia	*Phascolarctos cinereus*	Koala	V,P	V	74
Mammalia	*Pteropus poliocephalus*	Grey-headed Flying-fox	V,P	V	113
Mammalia	***Scoteanax rueppellii***	**Greater Broad-nosed Bat**	**V,P**		**4**
Mammalia	*Vespadelus troughtoni*	Eastern Cave Bat	V,P		1
Reptilia	*Varanus rosenbergi*	Rosenberg's Goanna	V,P		4

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 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.

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, Little Eagle and Large Forest Owls were recorded within the study area. Microbats are expect within the vicinity of the site despite not roosting habitat on-site. A pair of Bush-stone Curlews live within the 1500m circumference of the site. A Test of Significance (5-Part Test) was used to assess the impacts of works on these species.

5.1 Endangered population

Two (2) endangered populations have been recorded to occur within 10km of the site through Bionet. Table 4 outlines these populations. The two populations mentioned have not been sighted within the development proposal site nor is the vegetation for these species adequate or available for these populations to use as nesting or foraging habitat.

Table 4. Endangered Populations in the LGA. Source: NSW OEH Bionet 2020.

Class	Family	Scientific Name	Common Name	NSW status	Comm. status	Records
Mammalia	Petauridae	*Petaurus norfolcensis*	Squirrel Glider on Barrenjoey Peninsula, north of Bushrangers Hill	E2,V,P		1
Mammalia	Phascolarctidae	*Phascolarctos cinereus*	Koala in the Pittwater Local Government Area	E2,V,P	V	74

5.2 Fauna findings from site assessment

- Semaphore Crabs, *Heloecius cordiformis*, were observed in the creek mudflats on the property north of the site.

Birds present on-site were:

- Magpie-lark/Pee-wee *Grallina cyanoleuca*
- Australian Magpie *Gymnorhina tibicen*
- Laughing Kookaburra *Dacelo novaeguineae*

5.2.1 Fauna habitat

No nests or hollows rock features, woody debris on the ground layer or burrows were sighted that would indicate primary habitat for species.

5.3 Habitat Corridors

Careel Creek crates a corridor of vegetation from the Mangroves and saltmarsh past the playing fields. It then meets discontinuous canopy trees. This corridor is used by fauna as a habitat corridor by highly mobile and aerial species. The vegetation surrounding the site is urbanised (discontinuous canopy and exotic understory). See Figure 5 for local canopy cover.

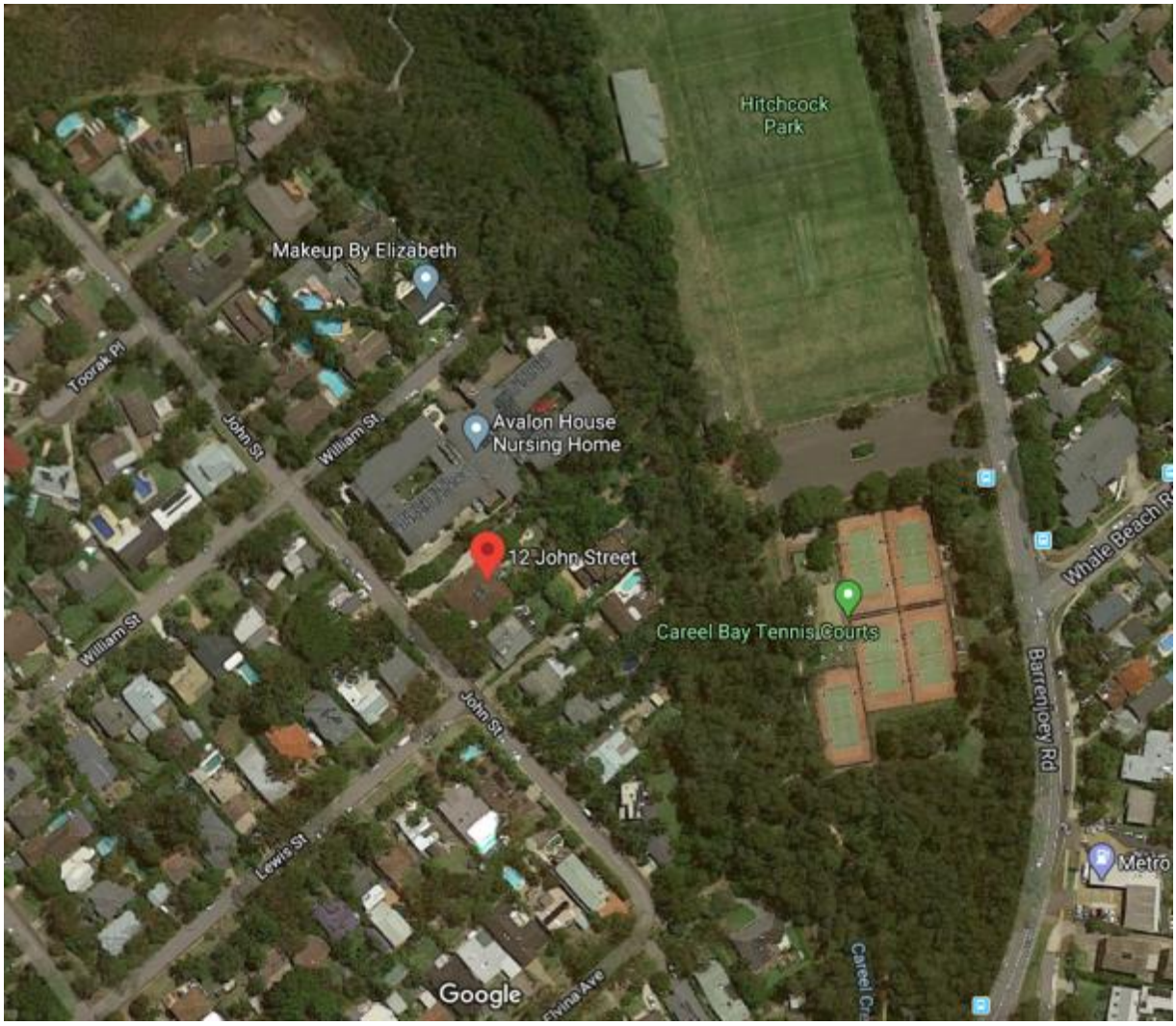


Figure 5. Habitat Corridor Connectivity in the wider area. Source: Google Maps 2020.

5.4 Assessment of Significance (5-part tests) Summary

See Appendix IV for full 5-Part Tests.

Large Forest Owls

The threatened species populations Large Forest Owls (Powerful owl, Barking owl) were identified as having potential foraging habitat within the site. The site offers habitat for arboreal prey species particularly the 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 Large Forest Owls.

Mircobats

Threatened Microbat species (Eastern Freetail-bat, Yellow-bellied Sheathtail Bat, Eastern False Pipistrelle, Eastern Bentwing-bat and Southern Myotis) were identified as having potential foraging habitat within the site. Proposed trees to be removed do not contain hollows, flaking bark or other roosting habitat for microbat species. These trees may contain marginal foraging habitat for species which feed on insects in or above the canopy. Fishing bats (Myotis) may fish over the open water of Careel Creek when it is still (mid-tides).

Grey-headed Flying-Fox

The threatened Grey-headed Flying-Fox (*Pteropus poliocephalus*) was identified as having potential foraging habitat within the site. There are no endangered populations of Grey-headed Flying-foxes existing at near the site

Bush Stone-curlew.

Bush Stone-curlew (a pair and some years a chick) are known from the Careel Bay saltmarsh and on the playing fields (at night) this is within the 1500m circumference of the site. The site is unlikely habitat due to the fencing from the creek and lack of ground habitat (logs etc). Being insectivorous these birds will be benefited by works that increase the diversity and abundance of ground-based invertebrates. The proposed replacement of turn with a structured riparian zone and habitat features including logs will be beneficial. Gaps can be created in the fencing to enable easy access to the riparian zone. No companion animals are to be present in the riparian zone.

Magenta Lilly Pilly (*Syzygium paniculatum*)

The works are not expected to adversely affect the life cycle of the Magenta Lilly Pilly (*Syzygium paniculatum*). It is proposed that the tree ("#22 - Magenta Lilly Pilly") will be transplanted as part of works. The tree (#22) is likely planted vegetation and unlikely that it would be remnant. The tree is experiencing die-back.

It is unlikely that the areas proposed for modification (landscaping and building areas) would be considered critical habitat for the Magenta Lilly Pilly (*Syzygium paniculatum*). At present, the site contains planted exotic / non-local native trees and mown lawn / exotic garden and native canopy trees mostly Swamp Mahogany and She-Oaks. If vegetation were left to remain in its current state, the site would continue to lose native species diversity as the abundance of exotic species increases, thus decreasing habitat value for Magenta Lilly Pilly (*Syzygium paniculatum*).

It is unlikely that the Magenta Lilly Pilly (*Syzygium paniculatum*) would flourish on site, if the site were to remain undeveloped and remain in its current state. The proposal can achieve a balance between development and conservation via effective mitigation measures. The habitat on site will not become fragmented. The area of potential habitat on site will be supported by the *Riparian Land Plan (ECA Feb 2021).* This plan outlines the requirements for the riparian land on site and how it can be managed to support biodiversity and threatened species. There is expected to be net increase in available habitat on site post construction.

Swamp Oak Swamp Forest - PCT 1234 (SOFF)

Listed as an EEC on the NSW BC Act 2016 and Commonwealth Environment Protection and Biodiversity Conservation Act 1999

The proposal is unlikely to have an adverse effect on the extent of the SOFF community such that its local occurrence is likely to be placed at risk of extinction. Additionally, the proposal is unlikely to substantially and adversely modify the composition of the ecological community.

At present, the site contains planted exotic / non-local native trees and mown lawn / exotic garden and native canopy trees mostly Swamp Mahogany and She-Oaks. Vegetation on site is does not represent SOFF at benchmark condition, most structural layers are significantly modified from a natural state. The canopy on site is indicative of SOFF, with a scattered abundance of Swamp Mahogany and She-Oaks. The riparian

land on site will remain primarily unaffected by the proposal and habitat in this area will be supported through a *Riparian Land Plan (ECA Feb 2021).*

The existing canopy will be supported by landscape plantings with the aim to restore SOFF in the riparian zone. This will also increase the viability of the riparian corridor to act as a habitat corridor in an otherwise urbanized landscape. No areas of habitat will become fragmented or isolated from other areas of habitat as a result of the proposed development. Rehabilitation of the riparian zone will increase habitat for SOFF or other threatened species which may use the habitat corridor.

Stage 2: Impact Assessment

6 BAM Calculator

6.1 Vegetation Zones and Integrity Scores

A single vegetation zone has been identified on site. The vegetation zone covers an area in which native vegetation including *Swamp Oak (Casuarina glauca),* is proposed for removal and/or modification. A majority of the site is currently landscaped with exotic vegetation. Only a small portion, approximately 0.01Ha is indicative of PCT1234, as identified by the accredited assessor.

Regardless, the entire impact area (0.1Ha – figure 6) was used in the BAM-C as the vegetation zone to account for all impacts and thus providing a worst-case scenario.

Table 6 – Table of the current vegetation integrity score.

PCT	Vegetation Zone	Area (Ha)	Vegetation Integrity Score
1234	One	0.1	19.6

Figure 6. Vegetation zone 1 “impact area”, impacts on vegetation has been verified on-ground.

6.2 Species and Ecosystem Credits

6.2.1 Ecosystem Credit Species derived from BAM

The development and associated works generated 1 ecosystem credit for the site. In total the cost to offset the species credits generated will be $12,733.74 (including GST), assuming payment will be made into the Biodiversity Conservation Fund. See below, figure 7.1 for the ecosystem credit summary.

Ecosystem credits for plant communities types (PCT), ecological communities & threatened species habitat

IBRA sub region	PCT common name	Threat status	Offset trading group	Risk premium	Administrative cost	Methodology adjustment factor	Price per credit	No. of ecosystem credits	Final credits price
Pittwater	**1234 -** Estuarine Swamp Oak forest	Yes	Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	18.83%	$376.98	3.6333	$11,576.13	1	$11,576.13
							Subtotal (excl. GST)		**$11,576.13**
								GST	**$1,157.61**
							Total ecosystem credits (incl. GST)		**$12,733.74**
Calculated as on: **02/03/2021 10:30:49**							**Grand total**		**$12,733.74**

Figure 7.1. Ecosystem credit summary from the BAM calculator.

6.2.2 Species Credit Species derived from BAM

The development and associated works generated species credits for one (1) species; Large-eared Pied Bat (*Chalinolobus dwyeri*). In total the cost to offset the species credits generated will be $1,072.16 (including GST), assuming payment will be made into the Biodiversity Conservation Fund. The individual credit price for species credits species can be seen below in figure 7.2.

Species credits for threatened species

Species profile ID	Species	Threat status	Price per credit	Risk premium	Administrative cost	No. of species credits	Final credits price
10157	***Chalinolobus dwyeri*** (Large-eared Pied Bat)	Vulnerable	$741.31	20.6900%	$80.00	1	$974.69
						Subtotal (excl. GST)	**$974.69**
						GST	**$97.47**
						Total species credits (incl. GST)	**$1,072.16**

Figure 7.2. Species credit summary from the BAM calculator.

It has been concluded that not all land within the impact area holds suitable habitat for threatened species. Thus, some species have been excluded due to severe habitat degradation. References used for the rationale table are species records from Bionet and information from the relevant DPIE species profile for each species and from the Threatened Biodiversity Data Collection.

Appendix I lists the species credit species predicted by the BAM Calculator and details whether the species have been further assessed based on site suitability (I.e. Habitat constraints and/or habitat degradation within the development site). Under Section 6.4.1.13 of the BAM, further species credit species can be excluded from further assessment if an assessment of habitat constraints and microhabitats determines that the habitat within the development site is substantially degraded such that the species credit species is unlikely to occur. See section "6.1.2 BAM Candidate Species for Further Assessment".

7 Impacts

7.1 Direct Impacts

7.1.1 Vegetation disturbance and loss

Tree removal as per the Arborist report 11 native trees. The flowering species provide foraging resources for the threatened Grey Headed Flying Fox, microbats and nectivorous birds. The flowers attract insects fed on by microbats. Tree and native plant replacement will be implemented (see Riparian land plan and landscape plan).

7.2 Indirect Impacts

The proposed action may result in a indirect impacts as discussed below:

7.2.1 Weed growth and invasion

The rehabilitated riparian zone will need to be maintained and this is discussed in the Riparian Land Plan (ECA Feb 2021).

7.2.2 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 methods to control selected pathogens.

7.2.3 Construction Noise

Construction will result in noise temporarily. Construction disturbance may result in decreased fauna species frequenting the site for the duration of works.

Stage 3: Improving Biodiversity Values

8 Avoid and minimise impacts

The development will not significantly impact features outlined in table 8 below. The proposed actions will not affect water quality as there will be erosion and silt management controls onsite to prevent runoff. Below is a table showing the potential impact the development would have on features that threatened species or communities can be dependent on.

Table 8. Expected impact on potential habitat onsite.

Feature	Present	Description of feature characteristics and location	Potential Impact	Threatened species or community using or dependent on feature	Section of the BAR where prescribed impact is addressed.
Karst, caves, crevices, cliffs or other geologically significant feature	No	N/A	N/A	N/A	N/A
Rocks	No	N/A	N/A	N/A	N/A
Human made structure	Yes	House within the development site	Negligible	N/A	N/A
Non-native vegetation	Yes	Scattered throughout	Negligible	N/A	N/A

9 Recommendations

9.1 Mitigation Measures

9.1.1 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.

9.1.2 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.

No vegetation clearing control measures are necessary other than those for tree removal (refer to Arborist report).

Large woody debris (over 25cm diameter) from native species is to be retained on-site for use in the riparian zone.

9.1.3 Tree and Riparian Zone Protection

Tree protection will be consistent with the Arborist report (Feb 2021). See arborist report for details of works and tree numbers.
Riparian Zone to be marked and protected such that works in this area are solely for the purpose of riparian rehabilitation.

9.1.4 Weed management, bush regeneration and planting

Weed management, landscaping and bush regeneration will occur as per Landscaping and Riparian Land Plans.

Weed management will have to be on-going for the life of the development.

9.1.5 Weed Removal Techniques prior to planting the riparian zone

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.

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

9.1.6 Native Seed Collection

Native trees being removed are to be checked for seeds during removal works. If seeds are present, they are to be collected and for on and off-site planting. Excess seed can go to NB Council.

9.1.7 Landscaping and Riparian Zone

Landscaping will follow the Landscaping Plan and the Riparian Plan 2021.

9.1.8 Nest boxes

Three nest boxes (hard-wood or marine-ply with stainless steel fixtures) are required. Boxes are to eb secured by hanging and not rely on nailing into trees. Two for Microbats and one for parrots. Boxes to be installed in trees to be retained and at least 3m above ground. Image from: nestboxes.com.au

9.1.9 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. Bushland Hygiene Protocols are to be followed closely.

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

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

9.1.1 Vertebrate Pests including 'Companion' Animals.

Vertebrate pests (cats, dogs, foxes) are a significant problem at the site. If domestic animals are permitted they should eb inside most of the time and never out at night off-lead. Cats should never be allowed out on this site or surrounds. Careel aby Wetlands is a designated Wildlife Protection Area and domestic animals are prohibited.

9.2 Appendix I – Rationale for Likelihood of Occurrence

Rationale for Likelihood of Occurrence all Species Credit Species (candidate species) predicted by the BAM Calculator (BAM-C) and details whether the species have been retained or omitted from the calculator.

Where a species has a specific habitat constraint, which is not present within the subject land, or if the species is a vagrant within the IBRA subregion, the species is considered unlikely to occur and no further assessment is required. Additionally. in accordance with section 6.4.1.17 of the BAM, a candidate species credit species can be considered unlikely to occur within the subject land (or specific vegetation zones) where habitat is substantially degraded such that the species is unlikely to utilise area. As discussed in Sections 2 and 3, much of the vegetation within the subject land and 1,500 m buffer has been previously cleared, fragmented and is subject to ongoing disturbance.

A predicted candidate species credit species that is not considered to have suitable habitat on the subject land (or specific vegetation zones) in accordance with section 6.4.1.17 of the BAM does not require further assessment on the subject land (or specific vegetation zones). The reasons for determining that a predicted species credit species is unlikely to have suitable habitat on the subject land (or specific vegetation zones) has been included below for each Candidate Species for the BDAR.

Table 9. Potential Species Credit Species generated by the BAM-C, all the following species were candidate threatened species for the site. All BAM-C predicated species were retained.

Scientific Name	Common Name	Habitat/ Geographic Constraints	Retained in BAM Calculator	Reason for Inclusion or Removal
Fauna				
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	Foraging = Yes *(BAM Predicated Species)* Breeding = No	There is a moderate likelihood of occurrence. It is expected that the species may use the site for foraging and thus the species was retained as a Predicted threatened species (Ecosystem credits) in the BAM-C. The site presents marginal

		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.	*(BAM Candidate Species)*	foraging habitat for the species in the form of canopy vegetation. The development site does not contain areas of important breeding habitat for the species, as per the DPIE BV map. Habitat constraints in BAM-C are based on this BV map and as such, Habitat constraints are N/A. Species not recorded during site survey. No further assessment or consideration is required.
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.	Foraging = Yes *(BAM Predicated Species)* Breeding = No *(BAM Candidate Species)*	There is a moderate likelihood of occurrence. It is expected that the species may use the site for foraging and thus the species was retained as a Predicted threatened species (Ecosystem credits) in the BAM-C. The site presents marginal foraging habitat for the species in the form of canopy vegetation. The development site does not contain areas of important breeding habitat for the species, as per the DPIE BV map. Habitat constraints in BAM-C are based on this BV map and as such, Habitat constraints are N/A. Species not recorded during site survey. No further assessment or consideration is required.

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.	Yes - Assumed present.	The site presents foraging habitat for the species, considered to be marginal habitat, only to be used occasionally or opportunistically. The development site would not be considered breeding habitat for the species. The impact area lacks key Habitat constraints. However, the site may be located within two kilometres of rocky areas containing caves, overhangs, escarpments, outcrops, or crevices, or within two kilometres of old mines or tunnels, as such the species is assumed present.
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.	Foraging = Yes *(BAM Predicated Species)* Breeding = No *(BAM Candidate Species)*	There is a moderate likelihood of occurrence. It is expected that the species may use the site for foraging and thus the species was retained as a Predicted threatened species (Ecosystem credits) in the BAM-C. The site presents marginal foraging habitat for the species in the form of canopy vegetation. The development site does not contain areas of important breeding habitat for the species. Breeding habitat constraints in BAM-C are; *Cave, tunnel, mine, culvert or other structure known or suspected to be used for breeding*

				including species records in BioNet with microhabitat code 'IC – in cave' observation type code 'E nest-roost' with numbers of individuals >500 or from the scientific literature. As such, habitat constraints are N/A. No further assessment or consideration is required.
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.	Foraging = Yes *(BAM Predicated Species)* Breeding = No *(BAM Candidate Species)*	There is a moderate likelihood of occurrence. It is expected that the species may use the site for foraging and thus the species was retained as a Predicted threatened species (Ecosystem credits) in the BAM-C. The site presents marginal foraging habitat for the species in the form of canopy vegetation. The development site does not contain areas of important breeding habitat for the species. Breeding habitat constraints in BAM-C are; *Cave, tunnel, mine, culvert or other structure known or suspected to be used for breeding including species records in BioNet with microhabitat code 'IC – in cave' observation type code 'E nest-roost' with numbers of individuals >500 or from the scientific literature.*

				As such, habitat constraints are N/A. No further assessment or consideration is required.

9.3 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.

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.

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.

This technique is suitable for use along the riparian zone and would assist in killing seed of exotic grass and other weeds prior to planting.

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

9.4 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.

9.5 Appendix IV – Test of Significance

9.5.1 Bush Stone Curlew

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 Bush Stone-Curlew such that a local population would become extinct. The site is not a breeding site and the foraging area for this pair is generally not within the fenced gardens but is on nearby playing fields.

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 or CEEC

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 BSC 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. Rehabilitation of the riparian zone within and outside the fenced area will increase habitat for BSC and their prey 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),

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 Bush Stone-curlew however the proposed development will not result in clearing of Bush Stone-curlew species breeding, foraging or roosting habitat. Removal of

large woody debris is a known impact for these birds and this proposal intends to increase the LWD in the riparian zone.

Conclusion:

This proposal is not likely to significantly affect the Population of Bush Stone-curlew.

9.5.2 Large forest owls (Powerful and Barking Owl)

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:

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 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 (prey habitat). No trees on-site have hollows suitable for owls to breed in. Trees are foraging habitat for Owl prey species (Flying Foxes and small Brushtails). Favored food (Ring-tail Possums) currently have no habitat on-site. Riparian restoration will see increased habitat for these possums / prey species.

g) 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 a EEC or CEEC

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

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

(v) 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

(vi) 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. 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.

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),

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

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. Tree removals will reduce habitat availability for Powerful Owl prey species.

Conclusion:

This proposal is not likely to significantly affect Populations of Large forest Owls. 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 at a ratio of 10:1 (will need to include off-site planting) so that there is habitat for prey species and no-net loss of habitat long-term.

9.5.3 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. The open water foraging area would remain unchanged.

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,

Trees may contain marginal foraging habitat for species which feed on insects in or above the canopy.

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.

Conclusion

The trees proposed to be removed do not have obvious habitat for microbats. Tree removal is foraging (insect) reduction. This alone will not have an adverse effect on the life cycles of individual microbats. Proposed riparian planting will increase habitat for micro-bat prey.

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

Species Description

Vulnerable NSW

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 eat nectar and pollen, and fruits from native trees/shrubs. Native trees on site (including Melaleuca and Swamp Mahogany) are feed trees when in blossom. The closest Flying fox Roost is within 1km. No Flying foxes roost on this 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. Grey-headed Flying-foxes eat nectar and pollen, and fruits from native trees/shrubs. Native trees on site (including Melaleuca and Swamp Mahogany) are feed trees when in blossom. While 11 native trees (6 Swamp Oaks – non-food) are coming out others are being retained and more will be planted. 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 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.

9.5.5 Magenta Lilly Pilly *Syzygium paniculatum*

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:

k) 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 the Magenta Lilly Pilly (*Syzygium paniculatum*). It is proposed that the tree (#22) will be transplanted as part of works. The tree is likely planted vegetation and unlikely that it would be remnant. The tree is experiencing die-back. The proposed transplant of Tree 22 and landscaping on site (which will include Magenta Lilly Pilly) is expected to support the local population. Due to these mitigation measures, it is unlikely that the species or local population will be placed at risk of extinction.

l) 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 or CEEC

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

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

(viii) 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

(ix) 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,

It is unlikely that the areas proposed for modification (landscaping and building areas) would be considered critical habitat for the Magenta Lilly Pilly (*Syzygium paniculatum*). At present, the site contains planted exotic / non-local native trees and mown lawn / exotic garden and native canopy trees mostly Swamp Mahogany and She-Oaks. The habitat on site will not become fragmented. The area of potential habitat on site will be supported by the *Riparian Land Plan (ECA Feb 2021).* This plan outlines the requirements for the riparian land on site and how it can be managed to support biodiversity and threatened species. There is expected to be net increase in available habitat on site post construction.

It is unlikely that the Magenta Lilly Pilly (*Syzygium paniculatum*) would flourish on site, if the site were to remain undeveloped and remain in its current state. The proposal can achieve a balance between development and conservation via effective mitigation measures. No areas of habitat will become fragmented or isolated from other areas of habitat as a result of the proposed development.

n) 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.

o) 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 Magenta Lilly Pilly (*Syzygium paniculatum*) however the proposed development is unlikely to result in a significant impact for the species. The proposed mitigation measures are expected to support and enhance the ecological value of habitat on site.

Conclusion:

This proposal is not likely to significantly Magenta Lilly Pilly (*Syzygium paniculatum*).

9.5.6 Swamp Oak Swamp Forest - PCT 1234 (SOFF)

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:

p) 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,

Not a threatened species

q) 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 proposal is unlikely to have an adverse effect on the extent of the SOFF community such that its local occurrence is likely to be placed at risk of extinction. Additionally, the proposal is unlikely to substantially and adversely modify the composition of the ecological community.

At present, the site contains planted exotic / non-local native trees and mown lawn / exotic garden and native canopy trees mostly Swamp Mahogany and She-Oaks. Vegetation on site is does not represent SOFF at benchmark condition, most structural layers are significantly modified from a natural state.

The inclusion of canopy tree planting and planting of locally native mid and understory species will be a benefit to the community. The area of potential habitat on site will be supported by the *Riparian Land Plan (ECA Feb 2021).*

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

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

(xi) 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

(xii) 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 site does support habitat area for SOFF. However, the existing vegetation does not accurately represent SOFF in a near natural state. The canopy on site is indicative of SOFF, with a scattered abundance of Swamp Mahogany and She-Oaks. The riparian land on site will remain primarily unaffected by the proposal and habitat in this area will be supported through a *Riparian Land Plan (ECA Feb 2021).*

If vegetation were left to remain in its current state, the site would continue to lose native species diversity as the abundance of exotic species increases. The existing canopy will be supported by landscape plantings with the aim to restore SOFF in the riparian zone. This will also increase the viability of the riparian corridor to act as a habitat corridor in an otherwise urbanized landscape. No areas of habitat will become fragmented

or isolated from other areas of habitat as a result of the proposed development. Rehabilitation of the riparian zone will increase habitat for SOFF or other threatened species which may use the habitat corridor.

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.

s) *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 SOFF however the proposed development will not result in a significant and irreversible impact likely to increase the risk of extinction on site. The proposed mitigation measures will support the ongoing viability of the SOFF on site.

Conclusion:
This proposal is not likely to significantly affect the Swamp Oak Swamp Forest - PCT 1234 (SOFF)

9.6 Appendix V Species attributed to PCT 1234

Scientific Name	Common Name (Range)
Tree Canopy Species (>6m)	
Alphitonia excelsa	Red Ash (N-Sho)
Casuarina glauca	Swamp Oak +
Cupaniopsis anacardioides	Tuckeroo (N-Sho)
Lophostemon suaveolens	Swamp Turpentine (N-Coffs)
Melaleuca ericifolia	Swamp Paperbark + (S-P-Mac)
Melaleuca quinquenervia	Broad leaved Paperbark (N-Syd)
Melaleuca styphelioides	Prickly-leaved Tea Tree (N-Sho)
Small Trees / Shrub Species (1.5-6m)	
Acmena smithii	Lilly Pilly
Callistemon salignus	Sweet Willow Bottlebrush
Glochidion ferdinandi	Cheese Tree +
Glochidion sumatranum	Umbrella Cheese Tree (N-Coffs)
Homalanthus populifolius	Bleeding Heart
Melaleuca alternifolia	Narrow-leaved paperbark (N-Gra)
Myoporum acuminatum	Boobialla
Groundcover Species (0-1.5m) & Vines/Scramblers	
Herbs / Ferns	
Alternanthera denticulata	Lesser Joyweed
Blechnum indicum	Swamp Water-fern (N-J-Bay)
Centella asiatica	Indian Pennywort + N-Illa)
Commelina cyanea	Commelina + (N-Nar)
Enydra fluctuans	An Enydra (N-Syd)
Hypolepis muelleri	Harsh Ground Fern
Lobelia anceps (formerly L. alata)	Angled Lobelia
Persicaria decipiens	Slender Knotweed
Persicaria strigosa	Prickly Smartweed
Selliera radicans	Swamp Weed (S-Gos)
Viola banksii	A Violet

Scientific Name	Common Name (Range)
Rushes / Grasses	
Baumea juncea	Bare Twig Rush
Carex appressa	Tall Sedge +
Cynodon dactylon	Sand Couch +
Crinum pedunculatum	Swamp Lily (N-J-Bay)
Dianella caerulea	Blue Flax Lily
Entolasia marginata	Bordered Panic
Gahnia clarkei	Tall Saw-sedge
Imperata cylindrica var. major	Blady Grass
Isolepis inundata	Swamp Club-sedge
Juncus kraussii subsp. australiensis	Sea Rush +
Juncus planifolius	A Rush
Juncus usitatus	Common Rush
Lomandra longifolia	Ribbon Grass
Maundia triglochinoides	Water Ribbons (N-Gos)
Oplismenus imbecillis	Basket Grass
Phragmites australis	Common Reed +
Vines	
Parsonsia straminea	Common Silkpod + (N-Sho)
Stephania japonica var. discolor	Snake Vine
Flagellaria indica	Whip Vine (N-Illa)

+ =Key indicator species; N = North of; S = South of; Coffs = Coffs Harbour; Gos = Gosford; Gra = Grafton; Illa = Illawarra; J-Bay = Jervis Bay; Nar = Narooma; P-Mac = Port Macquarie; Sho = Shoalhaven; Syd = Sydney.

For further help with plant identification see: plantNET.rbgsyd.nsw.gov.au/search/simple.htm

9.7 Appendix VI– BAM –C; Reports and Data

9.7.1 Payment Repot.

Biodiversity payment summary report

Assessment Id	Payment data version	Assessment Revision	Report created
00021287/BAAS19008/20/00021288		0	02/03/2021

Assessor Name	Assessor Number	Proposal Name	BAM Case Status
Geraldene Susan Dalby-Ball	BAAS19008	12a John St Avalon	Finalised

Assessment Type	Date Finalised	BOS entry trigger
Part 4 Developments (Small Area)	02/03/2021	BOS Threshold: Biodiversity Values Map

PCT list

Price calculated	PCT common name	Credits
Yes	**1234** - Estuarine Swamp Oak forest	1

Species list

Price calculated	Species	Credits
Yes	***Chalinolobus dwyeri*** (Large-eared Pied Bat)	1

Ecosystem credits for plant communities types (PCT), ecological communities & threatened species habitat

NSW GOVERNMENT

Biodiversity payment summary report

IBRA sub region	PCT common name	Threat status	Offset trading group	Risk premium	Administrative cost	Methodology adjustment factor	Price per credit	No. of ecosystem credits	Final credits price
Pittwater	**1234** - Estuarine Swamp Oak forest	Yes	Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	18.83%	$376.98	3.6333	$ 11,576.13	1	$11,576.13

Subtotal (excl. GST)	**$11,576.13**
GST	**$1,157.61**
Total ecosystem credits (incl. GST)	**$12,733.74**

Species credits for threatened species

Species profile ID	Species	Threat status	Price per credit	Risk premium	Administrative cost	No. of species credits	Final credits price
10157	***Chalinolobus dwyeri*** (Large-eared Pied Bat)	Vulnerable	$741.31	20.6900%	$80.00	1	$974.69

Assessment Id
00021287/BAAS19008/20/00021288

Proposal Name
12a John St Avalon

NSW GOVERNMENT

Biodiversity payment summary report

	Subtotal (excl. GST)	$974.69
	GST	$97.47
Total species credits (incl. GST)		$1,072.16
	Grand total	$13,805.90

Assessment Id	Proposal Name	Page 3 of 3
00021287/BAAS19008/20/00021288	12a John St Avalon	

9.7.2 Credit Summary Repot.

BAM Credit Summary Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00021287/BAAS19008/20/00021288	12a John St Avalon	22/02/2021
Assessor Name	Report Created	BAM Data version *
Geraldene Susan Dalby-Ball	02/03/2021	37
Assessor Number	BAM Case Status	Date Finalised
BAAS19008	Finalised	02/03/2021
Assessment Revision	Assessment Type	BOS entry trigger
0	Part 4 Developments (Small Area)	BOS Threshold: Biodiversity Values Map

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Ecosystem credits for plant communities types (PCT), ecological communities & threatened species habitat

Zone	Vegetation zone name	TEC name	Current Vegetation integrity score	Change in Vegetation integrity (loss / gain)	Area (ha)	BC Act Listing status	EPBC Act listing status	Species sensitivity to gain class (for BRW)	Biodiversity risk weighting	Potential SAII	Ecosystem credits

NSW GOVERNMENT

BAM Credit Summary Report

Estuarine Swamp Oak forest											
1	1234_John_St	Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	19.6	19.6	0.1	Endangered Ecological Community	Endangered	High Sensitivity to Potential Gain	2.00		1
										Subtotal	**1**
										Total	**1**

Species credits for threatened species

Vegetation zone name	Habitat condition (Vegetation Integrity)	Change in habitat condition	Area (ha)/Count (no. individuals)	BC Act Listing status	EPBC Act listing status	Biodiversity risk weighting	Potential SAII	Species credits
Chalinolobus dwyeri / Large-eared Pied Bat (Fauna)								
1234_John_St	19.6	19.6	0.1	Vulnerable	Vulnerable	3	True	1
							Subtotal	**1**

9.7.3 Predicted species repot.

BAM Predicted Species Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00021287/BAAS19008/20/00021288	12a John St Avalon	22/02/2021
Assessor Name	Report Created	BAM Data version *
Geraldene Susan Dalby-Ball	02/03/2021	37
Assessor Number	Assessment Type	BAM Case Status
BAAS19008	Part 4 Developments (Small Area)	Finalised
Assessment Revision	BOS entry trigger	Date Finalised
0	BOS Threshold: Biodiversity Values Map	02/03/2021

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Threatened species reliably predicted to utilise the site. No surveys are required for these species. Ecosystem credits apply to these species.

Common Name	Scientific Name	Vegetation Types(s)
Australasian Bittern	Botaurus poiciloptilus	1234-Estuarine Swamp Oak forest
Australian Painted Snipe	Rostratula australis	1234-Estuarine Swamp Oak forest
Black Bittern	Ixobrychus flavicollis	1234-Estuarine Swamp Oak forest
Brown Treecreeper (eastern subspecies)	Climacteris picumnus victoriae	1234-Estuarine Swamp Oak forest
Dusky Woodswallow	Artamus cyanopterus cyanopterus	1234-Estuarine Swamp Oak forest
Eastern Coastal Free-tailed Bat	Micronomus norfolkensis	1234-Estuarine Swamp Oak forest
Eastern Osprey	Pandion cristatus	1234-Estuarine Swamp Oak forest
Flame Robin	Petroica phoenicea	1234-Estuarine Swamp Oak forest
Gang-gang Cockatoo	Callocephalon fimbriatum	1234-Estuarine Swamp Oak forest
Grey-headed Flying-fox	Pteropus poliocephalus	1234-Estuarine Swamp Oak forest

NSW GOVERNMENT

BAM Predicted Species Report

Koala	Phascolarctos cinereus	1234-Estuarine Swamp Oak forest
Large Bent-winged Bat	Miniopterus orianae oceanensis	1234-Estuarine Swamp Oak forest
Little Bent-winged Bat	Miniopterus australis	1234-Estuarine Swamp Oak forest
Little Eagle	Hieraaetus morphnoides	1234-Estuarine Swamp Oak forest
Little Lorikeet	Glossopsitta pusilla	1234-Estuarine Swamp Oak forest
Masked Owl	Tyto novaehollandiae	1234-Estuarine Swamp Oak forest
Powerful Owl	Ninox strenua	1234-Estuarine Swamp Oak forest
Regent Honeyeater	Anthochaera phrygia	1234-Estuarine Swamp Oak forest
Spotted Harrier	Circus assimilis	1234-Estuarine Swamp Oak forest
Spotted-tailed Quoll	Dasyurus maculatus	1234-Estuarine Swamp Oak forest
Square-tailed Kite	Lophoictinia isura	1234-Estuarine Swamp Oak forest
Superb Fruit-Dove	Ptilinopus superbus	1234-Estuarine Swamp Oak forest
Swift Parrot	Lathamus discolor	1234-Estuarine Swamp Oak forest
Turquoise Parrot	Neophema pulchella	1234-Estuarine Swamp Oak forest
Varied Sittella	Daphoenositta chrysoptera	1234-Estuarine Swamp Oak forest
White-bellied Sea-Eagle	Haliaeetus leucogaster	1234-Estuarine Swamp Oak forest
Yellow-bellied Sheathtail-bat	Saccolaimus flaviventris	1234-Estuarine Swamp Oak forest

Threatened species assessed as not within the vegetation zone(s) for the PCT(s)

Refer to BAR for detailed justification

Common Name	Scientific Name	Justification in the BAM-C

9.7.4 Candidate species repot.

BAM Candidate Species Report

Proposal Details

Assessment Id 00021287/BAAS19008/20/00021288	Proposal Name 12a John St Avalon	BAM data last updated * 22/02/2021
Assessor Name Geraldene Susan Dalby-Ball	Report Created 02/03/2021	BAM Data version * 37
Assessor Number BAAS19008	Assessment Type Part 4 Developments (Small Area)	BAM Case Status Finalised
Assessment Revision 0	Date Finalised 02/03/2021	BOS entry trigger BOS Threshold: Biodiversity Values Map

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

List of Species Requiring Survey

Name	Presence	Survey Months
Chalinolobus dwyeri Large-eared Pied Bat	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?

Threatened species assessed as not on site

Refer to BAR for detailed justification

Common name	Scientific name	Justification in the BAM-C
Large Bent-winged Bat	Miniopterus orianae oceanensis	Habitat constraints
Little Bent-winged Bat	Miniopterus australis	Habitat constraints
Regent Honeyeater	Anthochaera phrygia	Habitat constraints
Swift Parrot	Lathamus discolor	Habitat constraints

9.7.5 Biodiversity Credit Report (Like for Like).

BAM Biodiversity Credit Report (Like for like)

Proposal Details

Assessment Id 00021287/BAAS19008/20/00021288	Proposal Name 12a John St Avalon	BAM data last updated * 22/02/2021
Assessor Name Geraldene Susan Dalby-Ball	Assessor Number BAAS19008	BAM Data version * 37
Proponent Names Tim Donovan	Report Created 02/03/2021	BAM Case Status Finalised
Assessment Revision 0	Assessment Type Part 4 Developments (Small Area)	Date Finalised 02/03/2021
BOS entry trigger BOS Threshold: Biodiversity Values Map	* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.	

Potential Serious and Irreversible Impacts

Name of threatened ecological community	Listing status	Name of Plant Community Type/ID
Nil		
Species		
Chalinolobus dwyeri / Large-eared Pied Bat		

Additional Information for Approval

BAM Biodiversity Credit Report (Like for like)

PCTs With Customized Benchmarks

PCT
No Changes

Predicted Threatened Species Not On Site

Name
No Changes

Ecosystem Credit Summary (Number and class of biodiversity credits to be retired)

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	HBT Cr	No HBT Cr	Total credits to be retired
1234-Estuarine Swamp Oak forest	Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	0.1	0	1	1

BAM Biodiversity Credit Report (Like for like)

1234-Estuarine Swamp Oak forest

Like-for-like credit retirement options

Name of offset trading group	Trading group	Zone	HBT	Credits	IBRA region
Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions This includes PCT's: 915, 916, 917, 918, 919, 1125, 1230, 1232, 1234, 1235, 1236, 1726, 1727, 1728, 1729, 1731, 1800, 1808	-	1234_John_St	No	1	Pittwater, Cumberland, Sydney Cataract, Wyong and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Species Credit Summary

Species	Vegetation Zone/s	Area / Count	Credits
Chalinolobus dwyeri / Large-eared Pied Bat	**1234_John_St**	0.1	1.00

Credit Retirement Options

Like-for-like credit retirement options

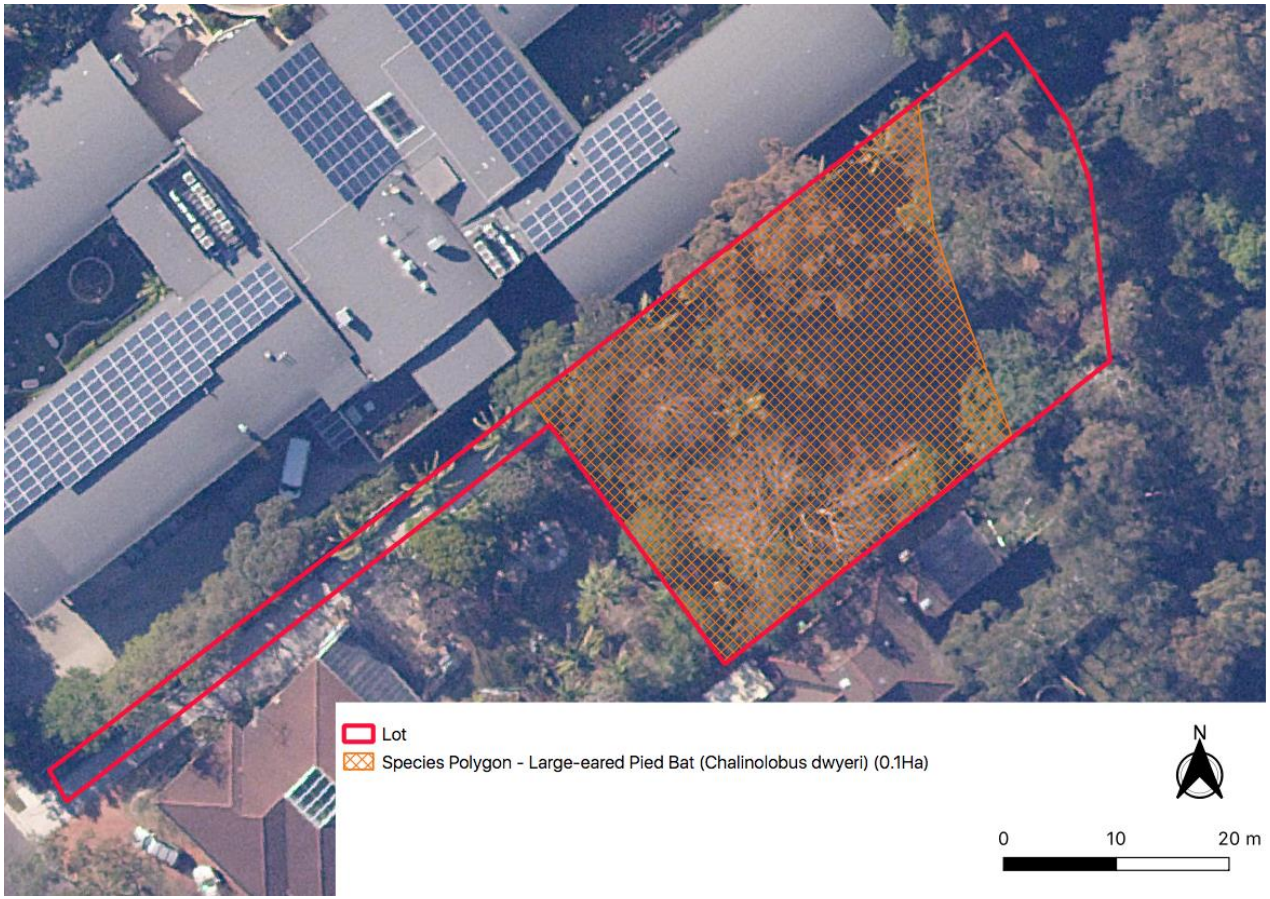
NSW GOVERNMENT

BAM Biodiversity Credit Report (Like for like)

Chalinolobus dwyeri / Large-eared Pied Bat	Spp	IBRA subregion
	Chalinolobus dwyeri / Large-eared Pied Bat	Any in NSW

9.7.6 Species polygon

The development generated 1 species credit for the Large-eared Pied Bat (*Chalinolobus dwyeri*). The site presents foraging habitat for the species, considered to be marginal habitat, only to be used occasionally or opportunistically. The development site would not be considered breeding habitat for the species. The impact area lacks key Habitat constraints. However, the site may be located within two kilometres of rocky areas containing caves, overhangs, escarpments, outcrops, or crevices, or within two kilometres of old mines or tunnels, as such the species is assumed present. The impact area is generated based on the removal of canopy vegetation which the species may use occasionally or opportunistically. The species polygon covers the "suitable habitat area" which will be impacted and includes all of vegetation zone one.



9.8 Appendix VIII– SEED Map Bionet Species Sightings

Below are a series of figures (Figures 8-16) showing listed species sightings recorded around the development site via SEED. They include the Grey-headed flying fox, Bush Stone-curlew, Large Bent-winged bat, Eastern coastal free-tailed bat, Little Bent-winged bat and the large eared pied bat. Bionet listings include these species (Table 3)

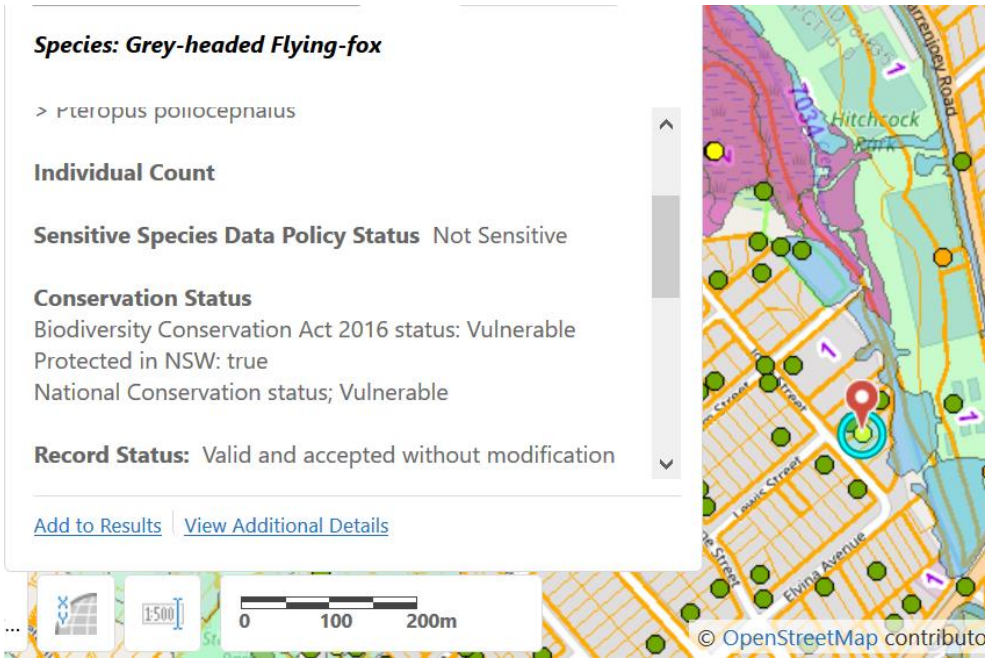


Figure 8 Bionet recorded sighting of Grey-headed flying fox Event date 2016-11-06 Source SEED 2019

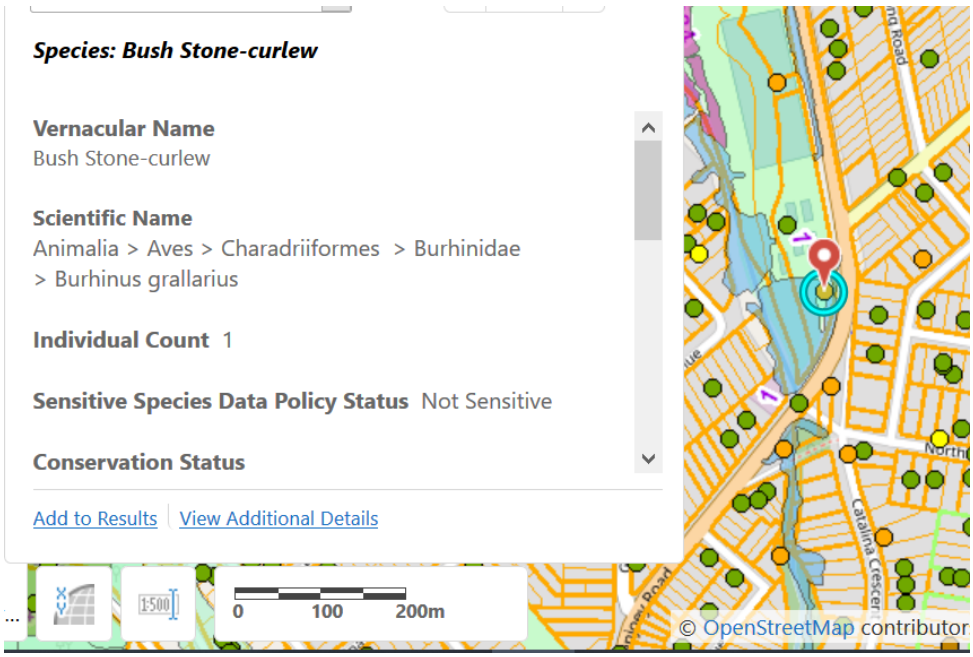


Figure 9 Bionet recorded sighting of Bush Stone-curlew Event date 2012-10-26 Source: SEED 2019

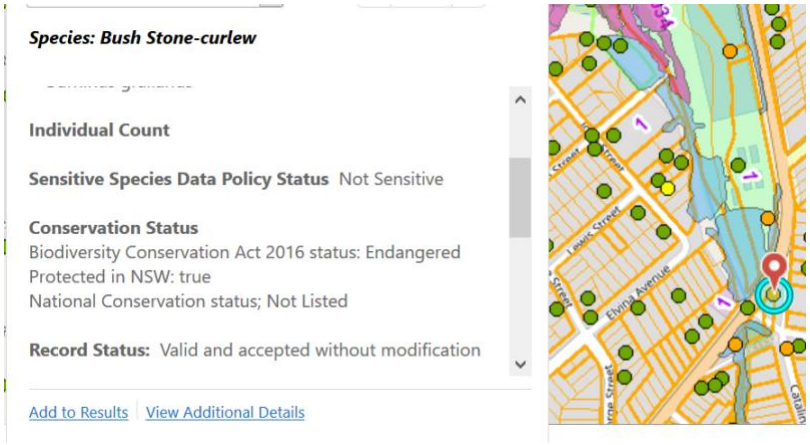


Figure 10 Bionet recorded sighting of Bush Stone-curlew Event date 2012-10-18 Source: SEED 2019

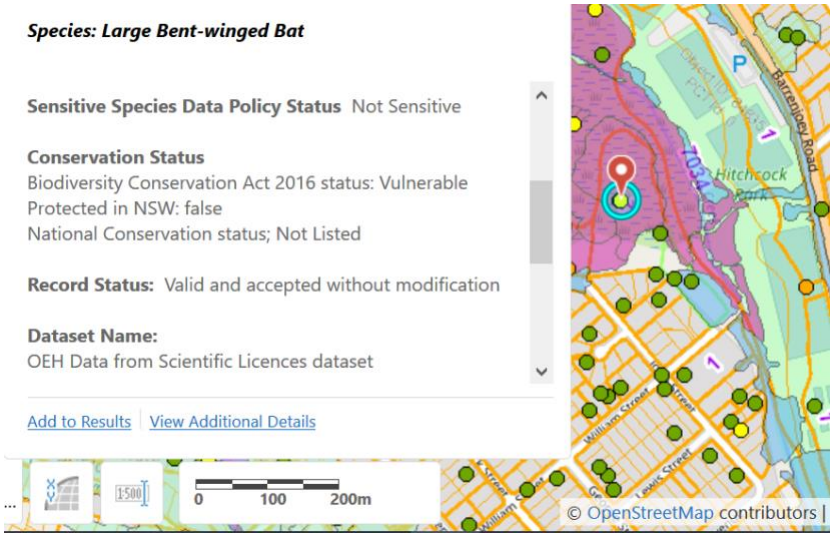


Figure 11 Bionet recorded sighting of Large Bent-wing Bat Event date 2014-06-14 Source: SEED 2019

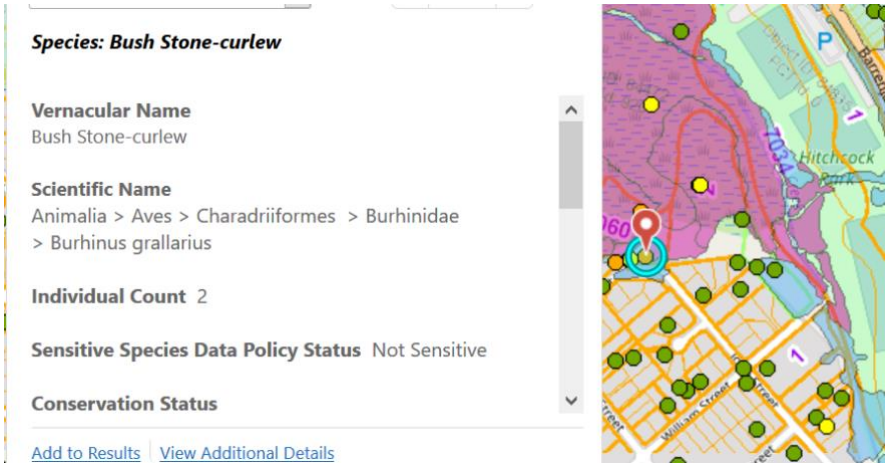


Figure 12 Bionet recorded sighting of Bush Stone-curlew Event date 2018-03-16 Source: SEED 2019

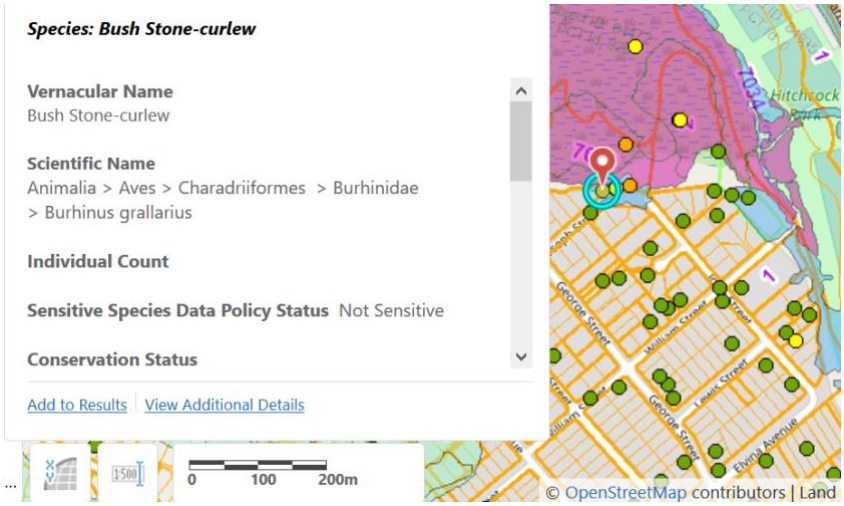


Figure 13 Bionet recorded sighting of Bush Stone-curlew Event date 2008-11-17 Source: SEED 2019

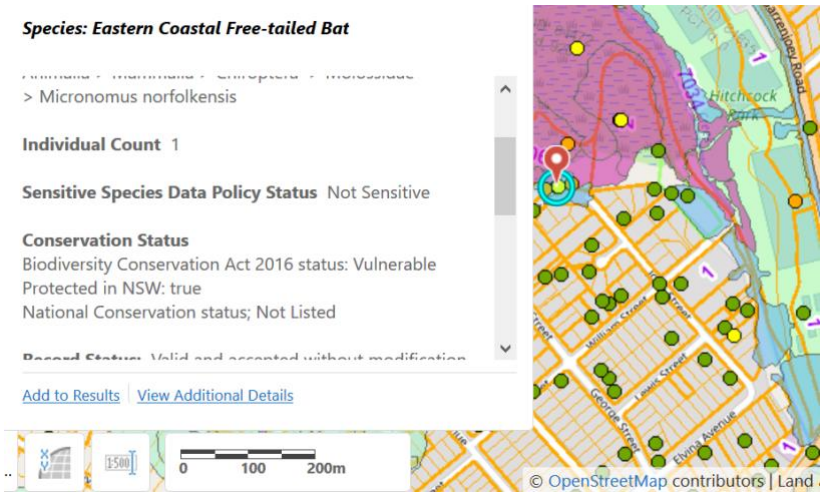


Figure 14 Bionet recorded sighting of Eastern Coastal Free-tailed Bat Event date 2018-03-11 Source: SEED 2019

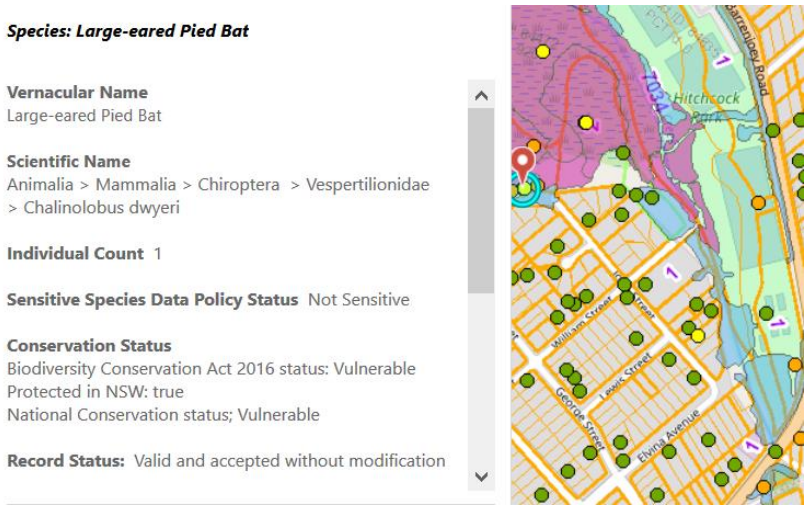


Figure 15 Bionet recorded sighting of Large-eared Pied Bat Event date 2018-03-11 Source: SEED 2019

Figure 16 Bionet recorded sighting of Little Bent-winged Bat Event date 2018-03-11 Source: SEED 2019

10 Expertise of authors

Geraldene Dalby-Ball
DIRECTOR

With over 20 years wetland and urban ecology experience, a great passion for what she does, and extensive technical and on-ground knowledge make Geraldene a valuable contribution to any project.

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

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

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

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

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-*present*
- **Manager** Natural Resources and Education, Pittwater Council 2002-2010
- **Wetland Ecologist** Sainty and Associates 1995-2002

QUALIFICATIONS AND MEMBERSHIPS

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

Jack Hastings

ECOLOGIST

Jack is a passionate ecologist who has worked with various stakeholders across both the public and private sectors to deliver sustainable environmental outcomes. He has worked on projects with major construction contractors and has been able to deliver tailored environmental solutions on time and within budget.

As an undergraduate student, he published a study that examined the cost of revegetation across the Richmond River Catchment in NSW. This study provided Jack with a deep understanding of urban and landscape ecology and the environmental factors associated with habitat restoration.

He has advanced communication skills and can deliver professional ecological assessments. He has a thorough understanding of current NSW and Commonwealth environmental legislation. He is also competent in the practical application of flora and fauna surveying and monitoring techniques.

Jack would be a valuable addition to any ecology project as he is committed to achieving the best possible outcome for both the client and the environment.

Key Projects Include:

- Monitoring of Endangered Species, various locations
- Environmental consultant for many civil developments throughout the Sydney region
- Researching the On-farm costs of revegetation in the Richmond River Catchment
- Sustainable business transformation proposal for a retail store.

SPECIALISATIONS

- Urban and landscape ecology – design and re-creation
- Environmental Impact Assessments (EIA)
- Review of Environmental Factors for development applications
- Flora and Fauna management plans
- Habitat tree assessment, marking and mapping
- GIS mapping
- Sound understanding and practical application of experimental design
- Grant writing and grant assessment

CAREER SUMMARY

- **Ecologist**, Ecological Consultants Australia. *2019-present*
- **Environmental Consultant,** BBN Consulting. *2018-2019*

QUALIFICATIONS AND MEMBERSHIPS

- **Bachelor of Environmental Science, Southern Cross University.**
- **Certificate II Agriculture.**
- **WHS General Induction of Construction Industry NSW White Card.**