Ecological Assessment and Biodiversity Management Plan

Station Beach Boat House Wharf

1191 Barrenjoey Rd Palm Beach

By Ecological Consultants Australia Pty Ltd TA

Kingfisher Urban Ecology and Wetlands

March 2020 updated February 2021

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, Jack Hastings with qualifications BSc. Majoring in Ecology.

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

- This Ecological Assessment and Biodiversity Management Plan was prepared for London Lakes Pty Ltd for the proposed development at Station Beach Boat House Wharf, 1191 Barrenjoey Rd Palm Beach.
- Proposed actions at the site include; the demolition of the existing "Boathouse" and associated structures and construction of a replacement 2 storey structure and ancillary structure for use as a café, boar hire and seaplane office.
- Recommendations have been provided to enhance the habitat for native flora and fauna, reduce the likelihood of impact on areas of native flora and fauna, increase opportunities for the public awareness and appreciation of the coastal estuary / dunal setting and fauna habitat.
- Information has been provided for the restoration of a small area of foreshore associated with the existing parking north of the site.
- This report focuses on the terrestrial area and cross-references with the Aquatic report (Cardno 2020) for intertidal and sub-tidal ecological matters.
- Palm Beach is an official 'Night Sky' area and lightening has been assessed for the usual impacts on fauna and has been designed to minimise upward escaping light leaving the sky as dark as practical.

Methods

- Multiple site investigations have been conducted by ECA staff between 2018 – 2021, most by senior ecologist Geraldene Dalby-Ball.
- A desktop study was undertaken using government databases and previous ecological studies to ensure site assessments included target searches for threatened species or their habitats.
- Bionet searches were performed for flora, fauna and endangered populations to identify if there were previous records of threatened species occurring within the local area using a 10km radius around the site.
- Review of proposed development were assessed for potential environmental impacts.
- Cross-discipline workshops were participated in to ensure consistency between disciplines and maximise beneficial outcomes where there were competing needs. Key representatives were Arboriculture, engineering, landscape, risk, ecology, traffic/parking and planning.

Results

- No significant habitat features, values or landscape corridors will be impacted by the proposed development.
- Changing exotic species for native coastal dune and foreshore species. Including native food plants to recognise First People's knowledge and increase connection to the natural area.
- Landscaping will have positive ecological outcomes with increased native plant species and increased porous surfaces and natural water flow. Appendix III summarises locally native species recommended for planting at Palm Beach Boat House and foreshore.

- The proposal does not trigger entry requirements for the Biodiversity Offset Scheme (BOS).
- Negligible impact on the aquatic environment, beds of seagrass will remain primarily unaffected by the proposal. Appropriate mitigation measures and recommendations are detailed in the Aquatic Ecology report by Cardno and within this report.
- The upgraded sewer system will be connected to a pump-out line, which runs toward Beach road (approved by Pittwater Council 1995).
- The fuel/chemical storage facility will be bunded sufficiently to avoid any spills into the marine environment. It has been designed in accordance to AS1940 (separate supporting report).
- Lighting is available that will result in the required 'safe-lighting' for public use of the space while greatly reducing upward escaping light leaving the sky as dark as practical. Lighting will be in accordance with International Dark-sky Association (IDA) recommendations. Specifics of lights to be purchased will be provided prior to construction.
- A net environmental benefit is expected as a result of this proposal. Measures to improve the terrestrial environment include; planting with native species and increased integration with surrounding native plant areas and into the dunes.

Biodiversity Management and Mitigation Measures

If the development is approved mitigation works will be required.

Before works:

- Tree Protection
- Native plant seed collection and propagation
- Effective site management to minimise sediment runoff

During works:

- Weed / exotic plant management
- Native species landscaping and foreshore remediation and planting
- Delineation of work zones
- Ongoing sediment and erosion control

After completion of works:

- Maintaining landscaping and native species and plantings around car-parking.
- Fauna habitat improvements
- On-going light management

Table of Contents

1 Introduction

Ecological Consultants Australia (ECA) has been contracted by London Lakes Pty Ltd to provide an Ecological Assessment and Biodiversity Management Plan in relation to a development application at Station Beach Boat House Wharf, 1191 Barrenjoey Rd Palm Beach. The site is within the Northern Beaches Local Government Area (LGA).

1.1 Site information and general description

The Subject Site (the "Site") is the area of direct and likely indirect impacts and is defined as the whole of the property at 1191 Barrenjoey Rd Palm Beach (I.e. "boathouse, associated structures and gardens"). The Study Area includes the Subject Site, as well as any additional surrounding land traversed during the field survey. See below.

The proposed study area is within Lot 298/ DP 721522, in the local government area of the Northern Beaches Council.

Table 1 - Site Administrative Information

Category	Details
Title Reference (Lot/DP)	The site is subject to split zoning as detailed below; – -Lot 298 DP721522 - the land below MHWM containing the Boathouse café zoned E2 Environmental Conservation. – -Lot 7005 DP 1117451 comprising the licensed area extending from the MHWM easterly for approximately 25 metres, generally in line with Barrenjoey Beach and the foreshore is zoned RE1 Public Recreation. – -Lot 7002 DP1117592 is the most eastern portion of the site and generally covers the street frontage and the adjacent access road car park is zoned RE1 Public Recreation.
Street Address	1191 Barrenjoey Rd Palm Beach, NSW, 2108.
LGA	Northern Beaches
Land Zoning	E2: Environmental Conservation RE1 Public Recreation.

Figure 1.1 Study site outlined in yellow. Purple shaded area is provided as an indication as to where landscaping concept has been extended north. Actual landscape area is smaller – see plans later in this report. Base map source: SixMaps 2020.

1.2 People, Place and Context

Understanding the use of the site assist in predicting impacts from people using the area. The site has operated as a café and boat hire business for years and is a drop-in venue for local and international visitors. Destination points include natural attractions such as the beach, foreshore and Lighthouse.

Linking these natural destination points are the places with food and drink. Outlets vary from formal sit-down meals at the Palm Beach RSL club to those with a mix of casual coffee and meals. Figure 1.2 shows the layout of these venues.

All provide different settings and are situated approximately 300 m apart to provide a choice of locations for visitors while retaining the feel of a predominantly natural area within which they are eating/drinking. While the Dunes and the cafe at North Palm Beach surf club are relatively close (less than 150 m) they offer different purposes and products and cater for different user group needs.

The boathouse is the only coffee/eating location on the Northern side and is directly on route to and from the Lighthouse. Being the most northerly restaurant, it caters for people at the northern end and this takes pressure away from the Oceanside. Oceanside is often busy with limited parking on weekends as South Palm Beach is a key recreational area.

The Boat House provides a key stopping place for early morning bike riders and walkers, dog walkers and as a meet up place for a variety of group sizes. It is also used by those walking to the Lighthouse and other natural areas. Access to the outdoor area on the eastern side of the cafe enables large groups (such as writers) to be together that is providing social opportunities. Observation from morning tea through to lunch indicates the use of groups are varied with couples, families and small groups being the most common. The area is frequented during the week by locals who are at Palm Beach for a variety of reasons predominantly recreational.

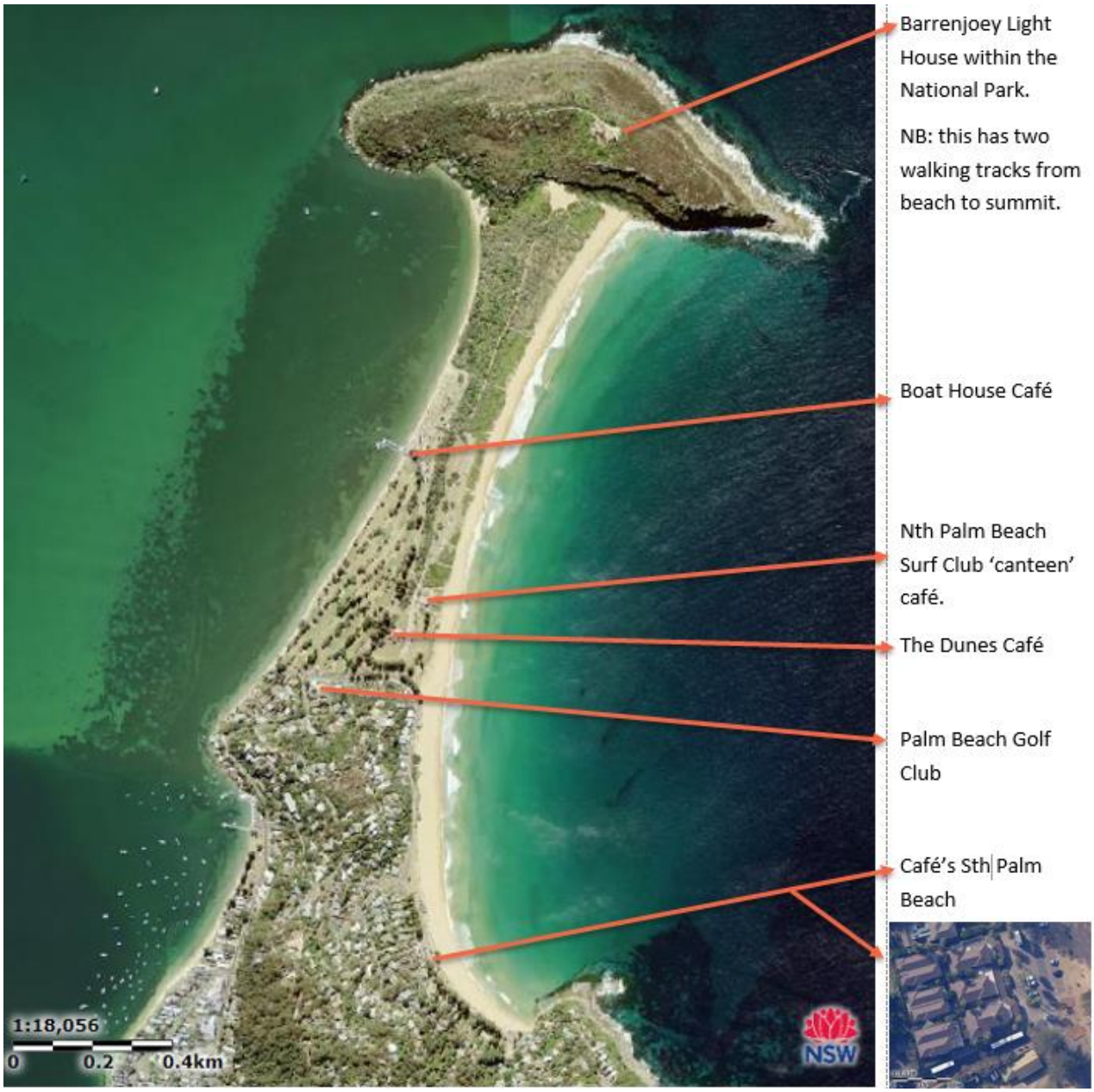


Figure 1.2 Destination Points Base Map Source: SixMaps 2020

1.3 The Proposal

The proposal involves the demolition of the existing building and construction of a replacement 2 story structure and ancillary structure for use as a café, boat hire and seaplane office. Proposed works are detailed in the development application package including the set of drawings DA00-DA19 Feb 2020 by Roslyn Miller of Canvas Architecture & Design. Figures 1.3 and 1.4 are extracts from the drawing package showing the over-all planned works and their relative locations.

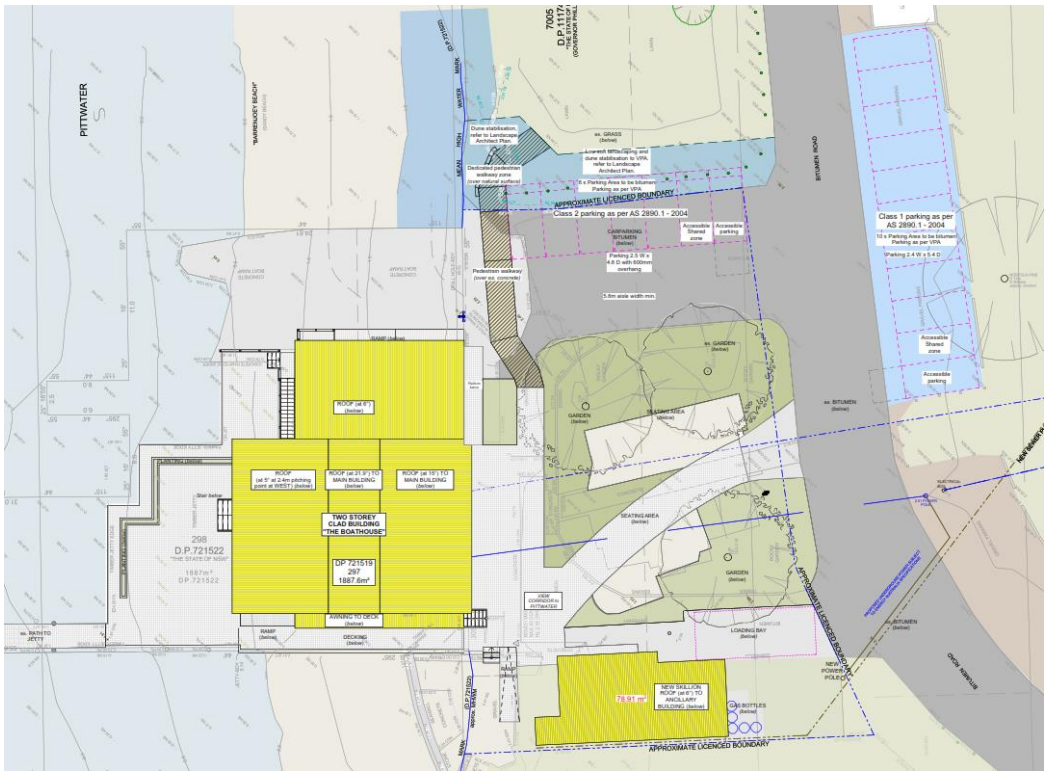


Figure 1.3 site design and layout. Source DA drawing package. Canvas Architecture & Design Feb 2021

Figure 1.4 site design. Source DA drawing package. Canvas Architecture & Design Feb 2021

1.3.1 Site Photos

Plate 1 Current landscaping within the site at Palm Beach Boat House.

Plate 2. Current landscaping within the site at Palm Beach Boat House, looking west.

Plate 3. Current landscaping within the site at Palm Beach Boat House

Plate 4. Current landscaping within the site at Palm Beach Boat House, looking north.

Plate 5. Southern foreshore adjacent to Palm Beach Boat House, looking south.

Plate 6. Southern foreshore adjacent to Palm Beach Boat House, looking north.

Plate 7. Northern foreshore adjacent to Palm Beach Boat House, an example of the space being used for community events. Erosion is evident, proposed landscaping and soft engineering is expected to mitigate the effects of erosion while facilitating use of this area.

Plate 8. Northern side of Palm Beach Boat House, looking southwest.

1.4 Sources of information used in the assessment

The following sources of information were used for this assessment:

- SeedMaps 2020 and 2021
- Sydney Metropolitan Area Vegetation Mapping - Version 3.1 (OEH, 2016) VIS_ID 4489
- BioNet DPIE (2020) and 2021
- Hydroline spatial data 1.0. NSW Department of Finance, Services & Innovation.
- *Site Plans Canvas Architecture & Design 05/08/2020* and updates Feb 2021
- Aquatic Ecology Report Boat House, Palm Beach. 10th September 2020. Cardno
- Arboricultural Impact Assessment, Station Beach Boat House Wharf 1191 Barrenjoey Rd Palm Beach. March 2020 and update Feb 2021 by Urban Forestry Australia.
- Landscape Plan LP01-C. Boat Shed Palm Beach 04.02.2021. Selena Hannan Landscape Design.
- *Stage 2 Detailed Site Investigation (DSI), Proposed Development 'The Boathouse' Governor Phillip Park Palm Beach* EBG Environmental Geoscience, NSW 2108. October 2020
- *Geotechnical Investigation into Acid Sulfate Soils*, Crozier Geotechnical Consultants, September 2020

1.5 Legislative context and statutory requirements

1.5.1 Commonwealth Environmental Protection and Biodiversity Conservation Act 1999

The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) would only become relevant 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.

1.5.2 NSW Environmental Planning and Assessment Act 1979

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

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

1.5.3 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 that exceeds the biodiversity offsets scheme threshold.

The NSW *Biodiversity Conservation Regulation 2017* sets out the Biodiversity Offsets Scheme entry threshold for Part 4 developments under the EP&A Act 1979. If the development triggers as least one (1) entry threshold, the development must be assessment under The BC Act using the Biodiversity Assessment Method (BAM) (OEH 2017).

1.5.3.1 Biodiversity Offsets Scheme entry requirements

The Biodiversity Offsets Scheme applies to local development (assessed under Part 4 of the Environmental Planning and Assessment Act 1979) that triggers the Biodiversity Offsets Scheme (BOS) threshold or is likely to significantly affect threatened species based on the test of significance in section 7.3 of the Biodiversity Conservation Act 2016. The proposal does not trigger the BOS as the development will not impact areas mapped on the BV map nor does the proposal trigger the BOS area clearing threshold.

BOS Area clearing threshold

The area threshold applies to all proposed native vegetation clearing associated with a proposal, regardless of whether this clearing is across multiple lots. In the case of a subdivision, the proposed clearing must include all future clearing likely to be required for the intended use of the land after it is subdivided.

Table 1.1 BOS Area clearing threshold.

Lot size	**0.03Ha**
Threshold for clearing, above which the BAM and offsets scheme apply	**0.25Ha**
Impact area	**N/A**

Area clearing threshold

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

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

Figure 1.5 The area clearing threshold as per the BOS entry requirements.

Biodiversity Values (BV) Map

The Biodiversity Values (BV) Map identifies land with high biodiversity value, as defined by clause 7.3(3) of the Biodiversity Conservation Regulation 2017. The proposed development area is not within an area mapped as 'high biodiversity value' as per Biodiversity Values map published by the Chief Executive of the NSW Office of Environment and Heritage.

Figure 1.6 Biodiversity Map – Site identified with red marker. Source:
https://www.lmbc.nsw.gov.au/Maps/index.html?viewer=BOSETMap

1.5.4 Coastal Management SEPP 2018

Cl. 13 Development on land within the coastal environment area.

It is unlikely that the proposal will significantly impact upon the coastal environmental values, natural processes, biotic or abiotic factors at the site or within immediate vicinity. Sediment and erosion control measures will be implemented throughout the construction phase to ensure sediment transport does not affect the surrounding environment. In the aquatic zone there will be temporary disturbance in the shallow marine zone but not in areas of current seagrass.

A net environmental benefit is expected as a result of this proposal. Measures to improve the terrestrial environment include; planting with native species and increased integration with surrounding native plant areas and into the dunes. The foreshore and immediate marine environment is also expected to benefit following the implementation of foreshore stabilisation measures and improvement of public access ways, thus reducing erosion and runoff potential.

1.5.5 Koala Habitat Protection SEPP 2019

The Koala Habitat Protection SEPP 2019 is applicable to the proposal as the adjoining lot (in the same ownership) is captured by the Koala Development Application Map. Ecologists believe that the proposal satisfies, Tier 1 - Low or no direct impact development criteria. Tier 1 criteria is outlined below;

1. Indirect impacts that will not result in clearing of native vegetation within koala habitat
2. The development is below the Biodiversity Offsets Scheme threshold under the BC Act
3. There is no native vegetation removal
4. The development footprint will not impede movement between koala habitat

5. Adequate mitigation measures for factors including; dog attacks, vehicle strike, bushfire, drowning in pools are implemented as necessary

The proposal will not result in clearing of native vegetation within koala habitat. The proposal does not trigger the BOS threshold nor will the proposal remove native trees. The proposal will remain within the existing development footprint and will not impede koala movement. Appropriate mitigation measures will be implemented when necessary. The closest koala sighting to the site is ~2km south and was recorded in 1982 (Bionet, 2020). The species has low likelihood of occurrence at the site, impacts on the koala will be negligible.

1.5.6 Pittwater Local Environment Plan 2014 (PLEP 2014)

Clause 7.6 Biodiversity of the PLEP 2014, states that the consent authority must consider the following;

(i) any adverse impact on the condition, ecological value and significance of the fauna and flora on the land,

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

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

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

(b) any appropriate measures proposed to avoid, minimise or mitigate the impacts of the development.

The site is highly modified from its natural state, with landscaped gardens covering most the site. The condition and ecological value of the site is expected to increase post development. Native species landscaping will increase the ecological value and significance of the site for native flora and fauna. The proposal is expected to result in a net environmental benefit.

The existing Norfolk Island Pines will be retained, post construction and protected throughout the construction phase. All surface treatments within the tree protection zones shall be porous. It is anticipated that the existing Norfolk Island Pine tree protection zones will be fenced to exclude any construction activity to a distance as determined by the Arboricultural Impact Assessment (AIA) by Urban Forestry and any temporary access within the fenced area is supervised by a AQF level 5 Arborist.

The proposal is unlikely to fragment, disturb or diminish landscape connectivity. The site is void of significant biodiversity features which may facilitate connectivity between important habitat for threatened species. Proposed native landscaping is expected to increase landscape connectivity within the area. The proposal is not expected to result in a significant impact to native flora or fauna. Impacts on biodiversity is expected to be negligible, the site is highly modified from its natural state. Native species landscaping is expected to mitigate the impacts of the development, see section below for mitigation measures.

1.5.7 Pittwater 21 Development Control Plan (P21 DCP)

The following section addresses P21 DCP and more specifically *Section B4.4 Flora and Fauna Habitat Enhancement Category 2 and Wildlife Corridor & Section B4.22 Preservation of Trees and Bushland Vegetation.*

The proposal is expected to have a negligible impact upon threatened species, endangered populations, endangered ecological communities and other locally native species. Vegetation on site consists of landscaped areas, which current support marginal habitat value for native species. The proposed planting schedule will primarily consist of native locally native species. The aim is to provide additional habitat for native species and maximise habitat linkage within Governor Phillip Park and the Barrenjoey peninsula. The existing Norfolk Island Pines will be retained, post construction and protected throughout the construction phase.

The Arboricultural Impact Assessment (AIA) by Urban Forestry includes specific tree protection measures for each of the three Norfolk Island Pines on site. Recommended protection measures include, but are not limited to; Tree protection fencing, removal of non-porous surfaces in the SRZ and planting of native species with non-invasive roots at the site. See AIA by for specific tree protection measures. Current habitat value at the site, for native flora and fauna, is marginal. Proposed native landscaping is expected to increase habitat value of the site, thus resulting in a net environmental benefit.

2 Native vegetation

2.1 Plant Community Types (PCTs) and Vegetation Zones

A review of the most up-to-date vegetation mapping, Sydney Metropolitan Area Vegetation Mapping - Version 3.1 (OEH, 2016 now DPIE) VIS_ID 4489), identified no PCT within the terrestrial site and Seagrass meadows (PCT 1913) in the intertidal area and beyond Figure 2.1.

PCT 1913 - *Seagrass meadows of the estuaries and lagoons of the New South Wales coast is mapped around the wharf structures.* Please refer to the Aquatic Ecology Report Boat House, Palm Beach, Cardno (September 2020) for an impact assessment and detailed seagrass mapping.

PCT 771 - *Coast Banksia - Coast Tea-tree low moist forest on coastal sands and headlands, Sydney Basin Bioregion and South East Corner Bioregion* (Brown in figure 2.1), is situated east of the subject site. This native vegetation will not be impacted by the proposal.

Figure 2.1 Plant Community Type (PCT) mapping within the site. Source: SEED 2021.

2.2 Field survey

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

Multiple site investigations have been conducted by ECA staff between 2018 – Feb 2021, including by senior ecologist Geraldene Dalby-Ball. Field surveys included opportunistic surveys, notes and photos were taken of the vegetation types and flora and fauna present onsite were recorded. Surveys were general and opportunistic in nature and were performed by traversing the site.

Survey results concluded that the site is highly modified and vegetation on site has previously been planted as landscaped gardens. The foreshore on which the structure sits is susceptible to erosion. This is evident on the northern and southern side of the structure. Recommendations to improve terrestrial biodiversity outcomes and integrity of the foreshore are included in Section 6.

3 Threatened Species - Flora

3.1 Threatened flora

BioNet records within 10km of the study site had 7 flora species currently listed as vulnerable or endangered under state and/or commonwealth legislation. The vulnerable and endangered species can be seen in Table 3.1 below. Vulnerable and endangered species with a moderate (or higher) likelihood of occurrence are identified in bold (two microbat species known in this area – foraging habitat only and Fur Seals fish int eh area and bask on the rocks of Barrenjoey Headland). See Appendix II for the threatened species likelihood of occurrence for the site.

Table 3.1. Threatened flora recorded within a 10km radius since 1993. NSW DPIE Bionet 2021.

Family	Scientific Name	Common Name	NSW status	Cwealth status	Records
Araliaceae	*Astrotricha crassifolia*	Thick-leaf Star-hair	V	V	42
Myrtaceae	*^^Callistemon linearifolius*	Netted Bottle Brush	V,3		23
Myrtaceae	*Eucalyptus nicholii*	Narrow-leaved Black Peppermint	V	V	1
Myrtaceae	*Rhodamnia rubescens*	Scrub Turpentine	E4A		11
Myrtaceae	*Syzygium paniculatum*	Magenta Lilly Pilly	E1	V	8
Proteaceae	*Grevillea shiressii*		V	V	1
Proteaceae	*^^Persoonia hirsuta*	Hairy Geebung	E1,P,3	E	5

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

Search criteria: Public Report of all Valid Records of Threatened (listed on BC Act 2016) or Commonwealth listed Plants in selected area [North: -33.54 West: 151.27 East: 151.37 South: -33.64] recorded since 01 Jan 1993 until 05 Sep 2020 returned a total of 91 records of 7 species. Report generated on 5/09/2020 8:04 AM.

4 Threatened Species - fauna

BioNet records within 10km of the study site had 48 fauna species currently listed as vulnerable or endangered under state and/or commonwealth legislation. The vulnerable and endangered species can be seen in Table 4.1. Vulnerable and endangered species with a moderate (or higher) likelihood of occurrence are identified in bold. See Appendix II for the threatened species likelihood of occurrence for the site.

Table 4.1 Threatened fauna recorded within a 10km radius since 1993. NSW DPIE Bionet 2020.

Class	*Scientific Name*	Common Name	NSW status	Cwealth status	Records 1980-2020
Amphibia	*Heleioporus australiacus*	Giant Burrowing Frog	V,P	V	86
Amphibia	*Pseudophryne australis*	Red-crowned Toadlet	V,P		66
Reptilia	*Caretta caretta*	Loggerhead Turtle	E1,P	E	2
Reptilia	*Chelonia mydas*	Green Turtle	V,P	V	7
Reptilia	*Eretmochelys imbricata*	Hawksbill Turtle	P	V	2
Reptilia	*Varanus rosenbergi*	Rosenberg's Goanna	V,P		3
Aves	*Ptilinopus regina*	Rose-crowned Fruit-Dove	V,P		2
Aves	*Diomedea exulans*	Wandering Albatross	E1,P	E	1
Aves	*Diomedea gibsoni*	Gibson's Albatross	V,P	V	1
Aves	*Haliaeetus leucogaster*	White-bellied Sea-Eagle	V,P		32
Aves	*Hieraaetus morphnoides*	Little Eagle	V,P		1
Aves	*^^Pandion cristatus*	Eastern Osprey	V,P,3		2
Aves	*Burhinus grallarius*	Bush Stone-curlew	E1,P		40
Aves	*Esacus magnirostris*	Beach Stone-curlew	E4A,P		1
Aves	*Haematopus fuliginosus*	Sooty Oystercatcher	V,P		5
Aves	*Numenius madagascariensis*	Eastern Curlew	P	CE,C,J,K	7
Aves	*^^Callocephalon fimbriatum*	Gang-gang Cockatoo	V,P,3		1
Aves	*^Calyptorhynchus lathami*	Glossy Black-Cockatoo	V,P,2		41

Class	*Scientific Name*	Common Name	NSW status	Cwealth status	Records 1980-2020
Aves	*Glossopsitta pusilla*	Little Lorikeet	V,P		1
Aves	*^^Lathamus discolor*	Swift Parrot	E1,P,3	CE	2
Aves	*^^Neophema pulchella*	Turquoise Parrot	V,P,3		1
Aves	*^^Ninox connivens*	Barking Owl	V,P,3		6
Aves	*^^Ninox strenua*	Powerful Owl	V,P,3		118
Aves	*^^Tyto novaehollandiae*	Masked Owl	V,P,3		2
Aves	*^Dasyornis brachypterus*	Eastern Bristlebird	E1,P,2	E	1
Aves	*Artamus cyanopterus cyanopterus*	Dusky Woodswallow	V,P		1
Aves	*Petroica boodang*	Scarlet Robin	V,P		1
Mammalia	*Dasyurus maculatus*	Spotted-tailed Quoll	V,P	E	12
Mammalia	*Isoodon obesulus obesulus*	Southern Brown Bandicoot (eastern)	E1,P	E	10
Mammalia	*Phascolarctos cinereus*	Koala in the Pittwater Local Government Area	E2,V,P	V	2
Mammalia	*Phascolarctos cinereus*	Koala	V,P	V	48
Mammalia	*Cercartetus nanus*	Eastern Pygmy-possum	V,P		6
Mammalia	*Petaurus norfolcensis*	Squirrel Glider on Barrenjoey Peninsula, north of Bushrangers Hill	E2,V,P		1
Mammalia	*Petaurus norfolcensis*	Squirrel Glider	V,P		1
Mammalia	*Pteropus poliocephalus*	Grey-headed Flying-fox	V,P	V	63
Mammalia	***Micronomus norfolkensis***	**Eastern Coastal Free-tailed Bat**	**V,P**		**3**
Mammalia	***Chalinolobus dwyeri***	**Large-eared Pied Bat**	**V,P**	**V**	**6**
Mammalia	***Myotis macropus***	**Southern Myotis**	**V,P**		**4**

Class	*Scientific Name*	Common Name	NSW status	Cwealth status	Records 1980-2020
Mammalia	*Scoteanax rueppellii*	Greater Broad-nosed Bat	V,P		3
Mammalia	*Vespadelus troughtoni*	Eastern Cave Bat	V,P		3
Mammalia	*Pseudomys novaehollandiae*	New Holland Mouse	P	V	2
Mammalia	***Arctocephalus forsteri***	**New Zealand Fur-seal**	**V,P**		**3**
Mammalia	***Arctocephalus pusillus doriferus***	**Australian Fur-seal**	**V,P**		**2**
Mammalia	***Miniopterus australis***	**Little Bent-winged Bat**	**V,P**		**20**
Mammalia	***Miniopterus orianae oceanensis***	**Large Bent-winged Bat**	**V,P**		**25**

Search criteria: Public Report of all Valid Records of Threatened (listed on BC Act 2016) or Commonwealth listed Animals in selected area [North: -33.54 West: 151.27 East: 151.37 South: -33.64] recorded since 01 Jan 1993 until 05 Sep 2020 returned a total of 661 records of 48 species. Report generated on 5/09/2020 8:02 AM.

4.1 Endangered Populations

Two (2) **endangered populations** have been recorded to occur within 10km of the site. Table 4.2 outlines the populations. Neither endangered population is expected to occur within the study site. No further assessment is required for these communities.

Table 4.2 Endangered Populations within 10km of site.

Class	Family	Scientific Name	Common Name	NSW status	Comm. status	Records
Mammalia	Phascolarctidae	*Phascolarctos cinereus*	Koala in the Pittwater Local Government Area	E2,V,P	V	2
Mammalia	Petauridae	*Petaurus norfolcensis*	Squirrel Glider on Barrenjoey Peninsula	E2,V,P		1

Likelihood of occurrence

The likelihood of occurrence is a broad categorisation to indicate the potential for a species to occur within the study area. It is based the relative value of a study area for a species. See Appendix III for rationale of likelihood of occurrence.

5 Impacts

5.1 Direct Impacts

5.1.1 Vegetation

No trees will be removed. The current landscaped gardens will be modified and a net environmental benefit will occur. The planting schedule is comprised of locally native flora species. See landscaping section and Appendix III.

5.1.2 Light – keeping it dark for fauna

This is an existing facility and the replacement will have the same or fewer lights. In addition lighting has been specifically chosen to reduce light emission upwards and in general. In natural settings, blue light at night has been shown to adversely affect wildlife behaviour and reproduction. This could include migratory species, such as birds that stop on the flats at low-tide and congregate at Careel Bay. All recommendations for the 'Night Sky' project (see section 5) are neutral or beneficial to wildlife.

5.2 Indirect Impacts

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

5.2.1 Runoff

Appropriate soil and erosion controls will be continually imposed throughout the construction phase.

5.3 Aquatic Ecology

Seagrass mapping by Cardno has been reviewed and is accurate as of August 2020. It has been concluded that impacts on seagrass or potential habitat will be very minor.

The following is an extract form the Aquatic Ecology report by Cardno (September 2020);

No seagrass was present under, and immediately adjacent to (within 5 m) of the boathouse decking areas and where the alterations to piling would take place. The closest seagrass in proximity to the work zone are medium density patch of Zostera adjacent to jetty and medium density Halophila, approximately 15 m from the deck. No Posidonia was present within approximately 25 m of the area of proposed pile placement.

Figure 5.1. Aerial of the Property with the indicative location of seagrasses present within the Study Area at the time of the survey. Wave screen impact 8/8 and 8/7 zones highlighted in yellow. The red arrows indicate the recommended path for the barge movements to avoid areas of Posidonia.

Source –*Aquatic Ecology Report Boat House, Palm Beach. 10th September 2020. Cardno.*

5.3.1 Impact assessment and recommendations

The following is a summary of key findings and recommendations are derived from the Aquatic Ecology report by Cardno (September 2020);

- Direct impacts will be occur within a small area of soft sediment and bare sand habitat in the footprint of the additional decking piles. The impact from the loss of a small area of soft sediment/bare sand is very minor as there is a considerable amount of equivalent habitat in the surrounding area.
- Piling via a barge must be completed at high tide in suitable weather, to avoid impacts on seagrass. In comparison, piling via a truck mounted probe must be conducted at the lowest possible tide in suitable weather conditions to avoid run-off of excavated material.
- The proposal may result in increased local turbidity, although it is unlikely to affect patches of seagrass. If the water column remains turbid for extended periods, mitigation measures (vertical slats) will be introduced to address the issue.
- The proposal is unlikely to cause a change in long-shore drift patterns for the site. The new arrangement of piles is very unlikely to cause a build-up of sediment such that it would encroach upon

seagrass. Importantly, the nearest of the threatened *Posidonia* meadows are further than 35 m away from the area of proposed pile placement.

- Pontoons north of the jetty have been removed, thus decreasing the area of shaded seabed and providing opportunity for these areas to be colonised by pioneering species *Zostera* and *Halophila*.
- As part of the DA, an upgrade of the sewer system allowing trade waste water is to be treated to a higher quality than the existing system. The system includes a modern grease arrestor (approved by Sydney Water) and on-site pumping facility designed to hold a maximum 24-hour's worth of storage to prevent surcharge in the event of a breakdown. The incorporation of these design measures are likely to be sufficient to prevent any overflow impacts to the marine environment.
    - The upgraded sewer system will be connected to a pump –out line, which runs toward Beach Road, - as per plan lodged with Sydney Water Board (now Sydney Water) in 1995 by Pittwater council (now Northern Beaches Council), see assessment report and dangerous goods advice 11th of August 2020 by TFA Project Group.
    - The fuel/chemical storage facility has been designed in accordance to AS1940. The Assessment Report and Dangerous Goods Advice (August 2020 TFA Project Group) has been reviewed and indicates that potential inundation, spills and other possible impacts from chemicals can be adequately managed). The Cardno report (2020) also states a spill kit and a spill prevention and clean-up procedure would be implemented once the development is operational. Vessel fuel would be carried from the storage facility and care taken when refuelling. NB no aviation fuel is kept here.

6 Biodiversity Management

6.1.1 Current site value

Currently, the site is of poor/marginal habitat value for native flora and fauna. Several Norfolk Island Pines currently occupy the site and will be retained post construction. However, these trees and the existing landscaped gardens do not support optimal habitat requirements (breeding or foraging) for threatened fauna. Habitat for reptiles (lizards and skinks) is evident on site, in the form of basking rocks. Although it is anticipated that these species be not be significantly affected by the proposal.

Similarly, as the site is landscaped, there is no evidence of remnant vegetation regrowth within site boundaries. As such, it is unlikely that native flora and/or remnant vegetation will be affected by the proposal. Proposed native species landscaping is expected to improve habitat values for native flora and fauna post development.

6.1.2 Weeds

Weeds on site are a variety of garden plants including Frangipani, Giant bird of paradise (*Strelitzia Nicolai*), exotic succulents and introduced grasses, that were part of the previous landscaping plan. There are no Biosecurity Weeds that need treatment.

6.1.3 Fauna findings and habitat

Fauna sightings

No native mammals were observed during site visits. No threatened species were recorded onsite nor have any threatened species been recorded onsite via previous recordings (Bionet). Fauna observed during the site assessment are provided in Table 6.1. NB: see Aquatic report by Cardno (2020) for aquatic species.

Table 6.1 Fauna species identified onsite.

Fauna Common Name	Fauna Scientific Name
Rainbow Lorikeet	*Trichoglossus moluccanus*
Noisy Minor	*Manorina melanocephala*
Pelican	*Pelecanus conspicillatus*
Fence Skink	*Cryptoblepharus virgatus*
Common Skink	*Lampropholis guichenoti*
Dragonfly spp. and Damselfly spp.	
Garden Snail	*Cornu aspersum*

6.2 Biodiversity Mitigation Measures

6.2.1 Aquatic Environment

Impacts on the aquatic environment and coastal foreshore are expected to be negligible. The aquatic report by Cardno (2020) details expected impacts and mitigation.

Building protection

Works include under building foreshore stabilisation and wave protection both of which are largely confined to the footprint under the existing building. Sheet piling will be used for retaining walls and this minimises the works footprint as most work is over a vertical area rather than horizontal. The proposed retaining wall will be almost wholly under the existing (proposed to be replaced) structure. The sheet piles are proposed to go 1m below (RL -2) the identified scour level for the site, this will again reinforce the foreshore below the structure and limit erosion potential. These methods have been applied to reduce construction time within the foreshore area and therefore limit estuarine disturbance.

The sewer pump tank and grease trap will be sunken but outside of the tidal inundation and protected from storm surges and weather impacts (see Dangerous Goods assessment and Cardno report for detail) and the architectural drawings Feb 2021.

Appropriate sediment controls will be installed and maintained throughout the construction phase and are detailed in the Cardno report of 2020.

6.2.2 Foreshore stabilisation: planting and soft engineering

Existing car-parking along the rear and side of the fore dune is proposed to be remediated with the use of native plants and foreshore stabalisation using 'soft' engineering techniques. This is shown in Figure 6.1 which is an extract from the landscape plan. It is noted that this foreshore treatment continues north for approximately 13m and this equates to the first Pine north within the grasses area as can be seen in the aerial image (figure 6.2). The light green is the area be planted at grade north of the existing parking. The Brown area shown inside the brown line is to have sand/soil added (nourishment), soft protection installed (coir/log/edging) and then planted. Sand/soil nourishment will be with clean preferably local estuary material. Virgin Excavated Natural Material (VENM) removed from the building site is recommend to be used here. It is noted the soil contamination tests showed this material is VENM and its sandy texture is suitable for the purpose of fore dune rehabilitation. Use of local material also mitigates cross contamination and is best practice in terms of reducing material to landfill.

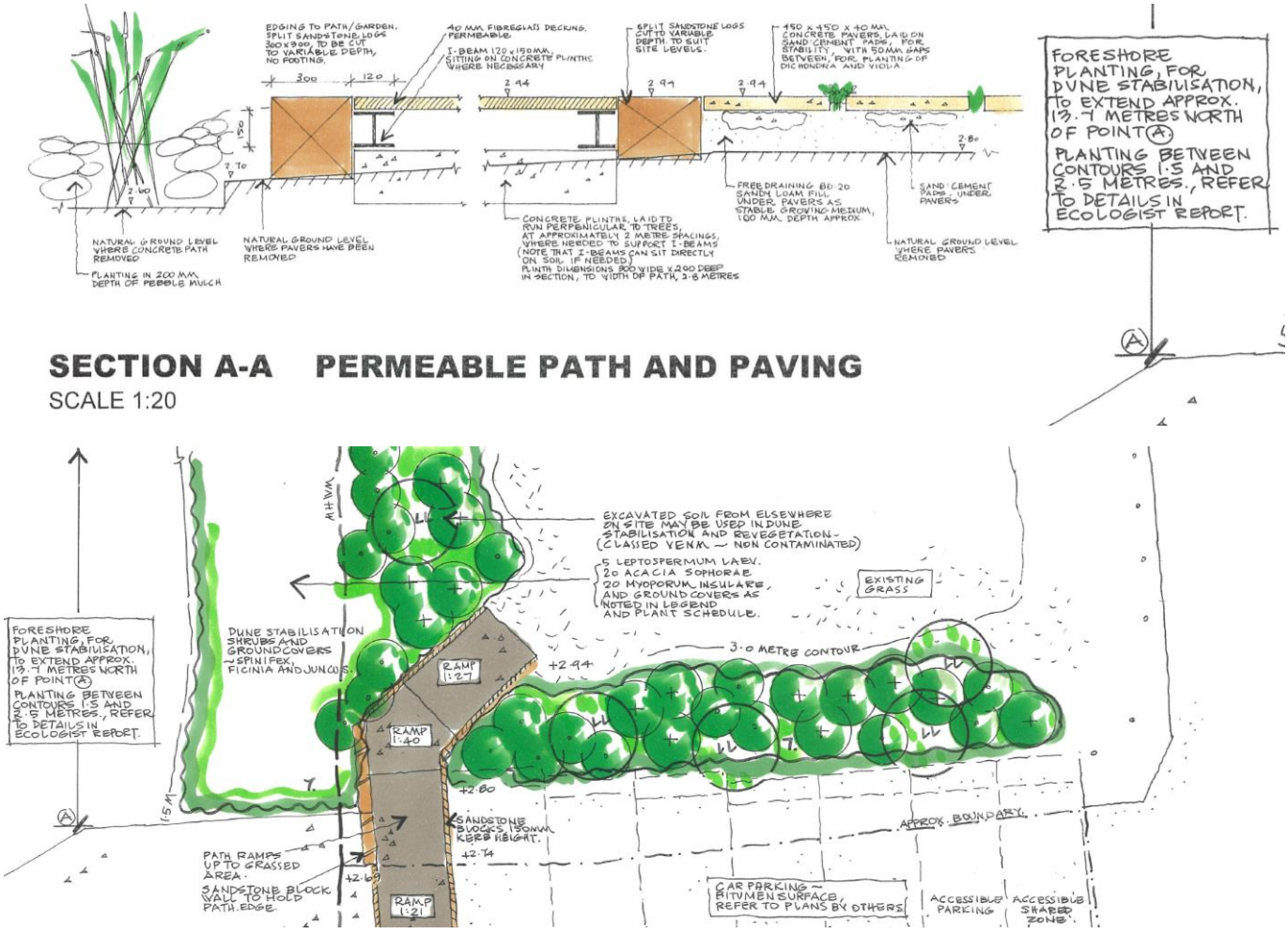


Figure 6.1 proposed foreshore and car-parking rehabilitation area. Source: Selena Hannan Landscape Plan LP-01D, dated 22.2.2021

Figure 6.2 proposed foreshore and car-parking rehabilitation area. Base map Source: SixMaps accessed Feb 2021

Light green – area to be planted along existing parking location. Brown – area to have soil nourishment and planted**.**

Plants selected are locally native and include the species in the plant schedule below as well as all in Appendix III including Spinifex and *Leucopogon parviflorus*, Coast Beard-heath / Native Currant both of which are growing locally and are prolific on the ocean beach side.

Appendix III has a full list of recommended plants and includes images, growth size and ecological and social values.

Vines have been recommended, Trailing Guinea Flower and Dusky Coral Pea, in the open space foreshore zone to provide colour, habitat and "rooms" (delineated areas) for sitting on the foreshore.

Both are recommended for over copper-log posts and along rails used to delineate access ways on the estuary foreshore.

See Appendix III for full recommendations on plant locations and species noting this is consistent with the landscape plan February 2021. See plant schedule below – extract Selena Hannan Landscape Design LP-01D, dated 22.2.2021.

PLANT SCHEDULE

- Plant species as per Kingfisher Urban Ecology and Wetlands report.
- All plants are locally native species.
- Quantities and spacings of mixes of groundcovers and climbers to future specification.
- Plant mixes for groundcovers and climbers, in areas shown on plan to be:
  1. Ficinia, Scaevola and Carpobrotus.
  2. Ficinia and Viola.
  3. Hardenbergia and Smilax.
  4. Tetragonia, Hibbertia and Ficinia.
  5. Tetragonia, Viola and Scaevola.
  6. Dichondra and Viola, in between pavers.
  7. Juncus, Ficinia and Spinifex.

Botanical Name	Common Name	Height x Spread at Maturity (mm)	Pot Size, minimum	Quantity
TREES				
Banksia integrifolia	Coastal Banksia	8000 x 6000	300mm	6
Leptospermum laevigatum	Coastal Tea Tree	3000 x 3000	200mm	11
SHRUBS				
Acacia longifolia subsp. sophorae	Coastal Wattle	2000 x 2000	150mm	42
Ficus coronata	Sandpaper Fig	4000 x 3000	150mm	3
Myoporum insulare	Common Boobialla	2500 x 1500	150mm	37
Westringia fruticosa	Coastal Rosemary	700 x 700	150mm	32
GROUNDCOVERS AND CLIMBERS				
Carpobrotus glaucescens	Pig Face	30 x 1000	100mm	
Dichondra repens	Kidney Weed	50 x 400	100mm	
Ficinia nodosa	Knobby Club Rush	500 x 500	100mm	
Hardenbergia violacea	Purple Coral Pea	1000 x 1000	100mm	
Hibbertia scandens	Trailing Guinea Flower	2000 x 1000	100mm	
Juncus kraussii	Sea Rush	500 x 500	100mm	
Scaevola aemula	Purple Fanfare	200 x 600	100mm	
Smilax glyciphylla	Native Sarsparilla	2000 x 2000	100mm	
Spinifex sericeus	Spinifex	500 x 1000	100mm	
Tetragonia tetragonioides	Warrigal Greens	300 x 600	100mm	
Viola hederacea	Native Violet	100 x 500	100mm	

Source: Extract from Selena Hannan Landscape Design LP-01D, dated 22.2.2021.

6.2.3 Foreshore access management and fore dune stabilisation outside scope of works

Foreshore access management and fore dune stabilisation are not addressed in detail in this report as they are out of the scope of work.

Foreshore works however are highly recommended along the section shown in Figure 6.3 aerial showing the zone that is the most unprotected. Foreshore on the southern side of the Boathouse has the golf course providing some rear-dune stabilisation. Dune areas North of the beach shown in Figure 6.5 has a level of protection from the vegetated dunes.

Foreshore works in the highlighted area can be done 'lightly' to retain the character and will be ecologically and socially beneficial.

While the area around the car parking will be rehabilitated as part of these works the treatment is needed along the remaining foreshore. Figures 6.4 and 6. 5 are indicative of recommended works.

Figure 6.3 Unprotected foreshore area

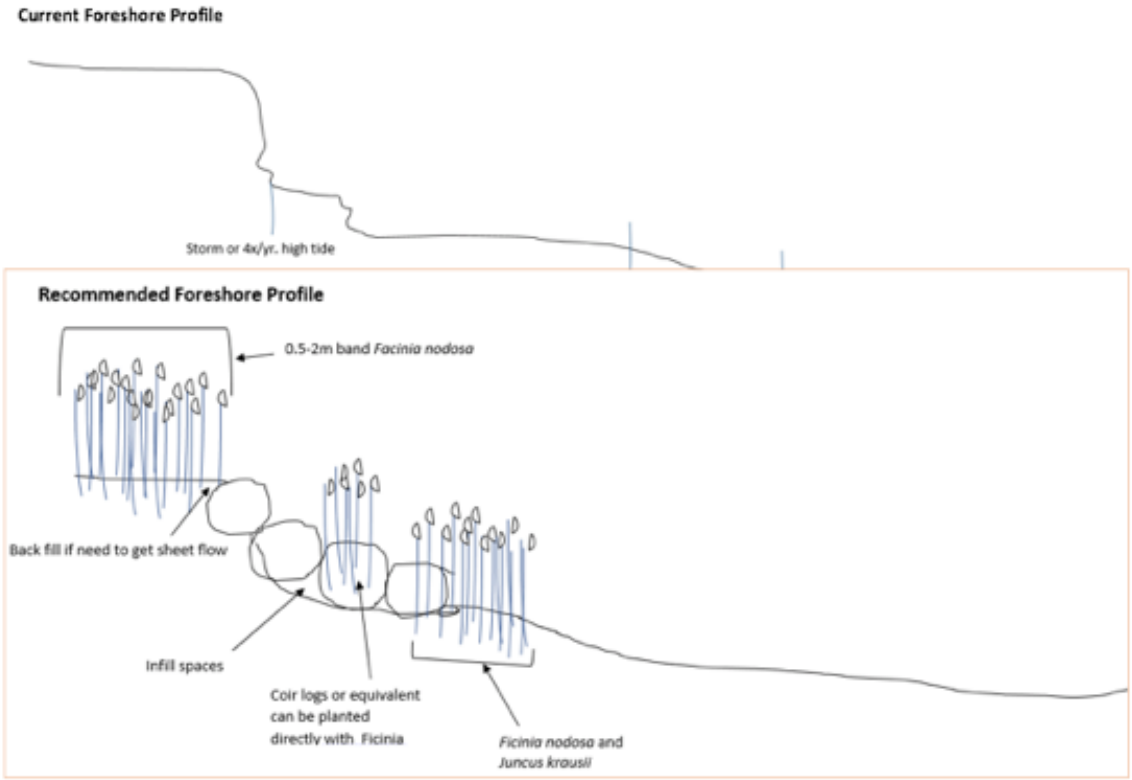


Figure 6.4. Cross-section of the recommended for foreshore rehabilitation.

Figure 6.5 Aerial view showing potential locations for foreshore treatment (blue) and an example access route defined with native plants including vines (purple), low rail and recycled wood or recycled plastic.

6.2.4 Acid Sulfate Soils and Soil Analysis

Acid Sulfate Soil investigation for the site has been carried out by Crozier Geotechnical Consultants. Results are summarised below: (Geotechnical Investigation into Acid Sulfate Soils, Crozier Geotechnical Consultants, September 2020)

- Acid Sulfate testing
  - The results of the testing show that the tested soils below the water table (with varying Reduced Levels of R.L. -0.50m and -2.90m) are not considered Acid Sulphate or Potential Acid Sulphate Soils. Previous testing identified the soils above the water table were also not AASS or PASS.
- Corrosion Resistance
  - The results were compared against Table 6.4.2 (C) Exposure Classification for Concrete Piles – Piles in Soil. The results indicate that the soils are 'non-aggressive' to concrete from pH, chloride and sulphate.
  - The results were also compared against Table 6.5.2 (C) Exposure Classification for Steel Piles – Piles in Soil. The results indicate that the soil is 'non-aggressive' to steel with regard to pH, chloride and sulphate.

- VENM

– Borehole sampling conducted by EBG Environmental Geoscience highlights on page 36.

Sub-surface deeper undisturbed orange and grey natural sand located beneath the '*mixed sandy fill'* (deeper than 0.1-0.2 metres varying over the site), shall be classified as ***Virgin Excavated Natural Material*** *(VENM)* as per DECC NSW *Fact Sheet.*

6.2.5 Fauna Management

Habitat creation and management

Habitat features including; Leaf litter, logs, large rocks and/or hollows will be provided as habitat.

Injured fauna or unexpected threatened species finds

If injured fauna or unexpected threatened species occur on site, personnel must report the finding to a qualified ecologist or wildlife handler.

6.2.6 Tree protection

A detailed arborist report accompanies this DA and its recommendations have been chosen in consultation with the ecologists. All tree protection measures will be in accordance with the approved Arborist Report (Feb 2021).

6.2.7 Planting and Preparation

Weed management

Weed species are present in the dunal area and will be appropriately managed so they do not spread. Weed removal consists of hand removal techniques. Exotic plants approved for removal within the current lease area may require assistance of a small crane to effectively remove roots and potentially salvage plants for more suitable locations.

Plant Species and Establishment

Plant species and locations have all be chosen in consultation between the landscape designer, arborist and engineers. Planting is as per the landscape plan. Plants species may be substituted with approval from the ecologist and plants will be locally native and correct for the location.

Plant Replacement

Any plants that fail are to be replaced by another individual of the same species, except for the case that an entire species displays low success rates. In this case, individuals from the same growth form (and locally native) may be substituted.

6.2.1 Erosion and runoff

Sediment controls will be in place see – Cardno plan and building plan for details. Both have been reviewed by the ecologists and determined to be appropriate for the works planned. Sediment controls will be reviewed during site inspections and after significant rainfall.

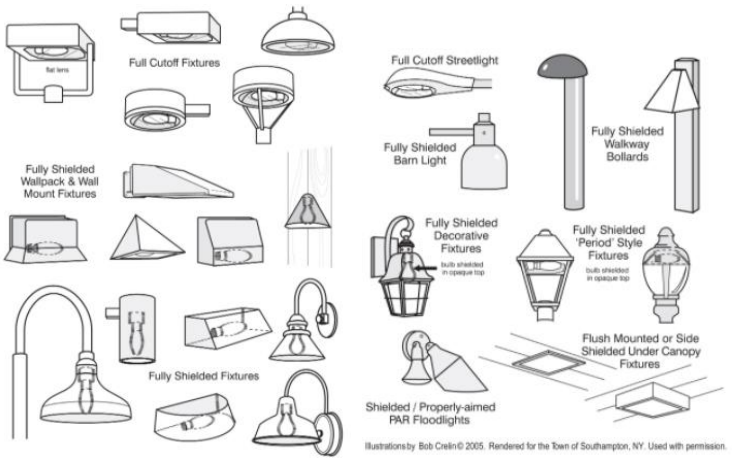
6.3 Night Sky Project – keeping the sky dark

The following matters will be applied in the light purchase and placement.

Use of "warm" or filtered LEDs (CCT < 3,000 K; S/P ratio < 1.2) to minimize blue emission. Warm-coloured compact fluorescents (CFLs) can also be used. LED lighting allows for reduced illuminance without compromising visibility. International Dark Sky Association (IDA) recommends that only warm light sources be used for outdoor lighting and this includes Low-pressure Sodium (LPS), High-pressure Sodium (HPS) and low-colour-temperature LEDs. Outdoor lighting with strong blue content not be used.

A culture of light awareness is being created with a focus to turn off unnecessary indoor lighting. Dimmers, motion sensors and timers will be used to reduce the illumination levels.

Outdoor lighting fixtures will be 'Dark Sky Friendly' and in accordance with the recommendations of the IDA. Acceptable light fixtures are as per https://imgur.com/a/x84vq this includes having shields over the light source to minimize glare and light trespass.



Examples shown here Source: https://www.darksky.org/our-work/lighting/lighting-for-citizens/lighting-basics/

7 Appendices

7.1 Appendix I– Key Weed Removal Methods

Physical removal – this can be applied to exotic species in the garden area and the dune

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.

7.2 Appendix II – Threatened species likelihood of occurrence

Appendix II is based on BioNet records within 10km of the study site. Bionet has 58 threatened flora and fauna species currently listed as vulnerable or endangered under state and/or commonwealth legislation. The likelihood of occurrence for the 58 threatened flora and fauna species is listed below.

Scientific Name	Common Name	Habitat Requirements	Site Suitability
Chamaesyce psammogeton	Sand Spurge	Grows on fore-dunes, pebbly strandlines and exposed headlands, often with Spinifex (Spinifex sericeus) and Prickly Couch (Zoysia macrantha). Flowering recorded in spring and summer. Sand Spurge seeds float, so some dispersal between beaches may occur. Longevity of the species is approximately 5 – 30 years with a primary juvenile period of less than 1 year. Plant growth occurs in spring and summer.	No flora bearing the key identifying features of this species was seen within the site. No potential habitat within the site boundaries. No further assessment required. Low likelihood of occurrence
Astrotricha crassifolia	Thick-leaf Star-hair	Occurs in dry sclerophyll woodland on sandstone. Flowers in spring. Resprouter from root suckers or basal stem buds after fire. Seed storage and dispersal ecology and germination requirements are unknown. Not enough data to rank sensitivity to either frequent or infrequent fires.	No flora bearing the key identifying features of this species was seen within the site. No potential habitat within the site boundaries. No further assessment required. Low likelihood of occurrence.
Maundia triglochinoides		Grows in swamps, lagoons, dams, channels, creeks or shallow freshwater 30 - 60 cm deep on heavy clay, low nutrients. Flowering occurs during warmer months November-January. Associated with wetland species e.g. *Triglochin procerum*. Probably wind pollinated. Diaspore is the seed and root tubers, which are probably dispersed by water. Spreads vegetatively, with tufts of leaves arising along rhizome. Populations expand following flood events and contract to more permanent wetlands in times of low rainfall.	No flora bearing the key identifying features of this species was seen within the site. No potential habitat within the site boundaries. No further assessment required. Low likelihood of occurrence.

Scientific Name	Common Name	Habitat Requirements	Site Suitability
^^Callistemon linearifolius	Netted Bottle Brush	Recorded from the Georges River to Hawkesbury River in the Sydney area, and north to the Nelson Bay area of NSW. Recorded in 2000 at Coalcliff in the northern Illawarra. For the Sydney area, recent records are limited to the Hornsby Plateau area near the Hawkesbury River. Grows in dry sclerophyll forest on the coast and adjacent ranges.	No flora bearing the key identifying features of this species was seen within the site. No potential habitat within the site boundaries. No further assessment required. Low likelihood of occurrence.
Eucalyptus nicholii	Narrow-leaved Black Peppermint	Typically grows in dry grassy woodland, on shallow soils of slopes and ridges. Found primarily on infertile soils derived from granite or metasedimentary rock.	No flora bearing the key identifying features of this species was seen within the site. No potential habitat within the site boundaries. No further assessment required. Low likelihood of occurrence.
Syzygium paniculatum	Magenta Lilly Pilly	On the south coast the species occurs on grey soils over sandstone, restricted mainly to remnant stands of littoral (coastal) rainforest. On the central coast species occurs on gravels, sands, silts and clays in riverside gallery rainforests and remnant littoral rainforest communities.	No flora bearing the key identifying features of this species was seen within the site. No potential habitat within the site boundaries. No further assessment required. Low likelihood of occurrence.
^^Persoonia hirsuta	Hairy Geebung	The Hairy Geebung is found in sandy soils in dry sclerophyll open forest, woodland and heath on sandstone from near sea level to 600m altitude. It is usually present as isolated individuals or very small populations	No flora bearing the key identifying features of this species was seen within the site. No potential habitat within the site boundaries. No further assessment required. Low likelihood of occurrence.

Scientific Name	Common Name	Habitat Requirements	Site Suitability
Rhodamnia rubescens	Scrub Turpentine	Occurs in coastal districts north from Batemans Bay in New South Wales. Populations of R. rubescens typically occur in coastal regions and occasionally extend inland onto escarpments up to 600 m a.s.l. in areas with rainfall of 1,000-1,600 mm. Found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest usually on volcanic and sedimentary soils.	No flora bearing the key identifying features of this species was seen within the site. No potential habitat within the site boundaries. No further assessment required. Low likelihood of occurrence.
^Genoplesium baueri	Bauer's Midge Orchid	Grows in dry sclerophyll forest and moss gardens over sandstone. A terrestrial orchid 6-15 cm high, fleshy, brittle, yellowish-green or reddish. Inflorescence sparse, 1-3 cm long, 1-6-flowered. Flowers approximately 15 mm across, green and red or wholly reddish. Dorsal sepal approximately 3.5 mm long, 4 mm wide; lateral sepals linear to lanceolate, 9-10 mm long, approximately 1.5 mm wide, widely divergent. Petals approximately 3 mm long, 1.5 mm wide, striped. Labellum approximately 4 mm long, approximately 2.5 mm wide, margins incurved; callus raised, of 2 linear, curved lobes extending about halfway to the labellum apex.	No flora bearing the key identifying features of this species was seen within the site. No potential habitat within the site boundaries. No further assessment required. Low likelihood of occurrence.
^Cryptostylis hunteriana	Leafless Tongue Orchid	Does not appear to have well defined habitat preferences and is known from a range of communities, including swamp-heath and woodland. It appears to prefer open areas in the understorey and is often found in association with the Large Tongue Orchid and the Tartan Tongue Orchid.	No flora bearing the key identifying features of this species was seen within the site. No potential habitat within the site boundaries. No further assessment required. Low likelihood of occurrence.
Grevillea shiressii		Grows along creek banks in wet sclerophyll forest with a moist understorey in alluvial sandy or loamy soils. Flowers mainly late winter to Spring (July-December), with seed released at maturity in October.	No flora bearing the key identifying features of this species was seen within the site. No potential habitat within the site boundaries. No

Scientific Name	Common Name	Habitat Requirements	Site Suitability
		Flowers are bird pollinated and seeds are dispersed by ants. A fire sensitive obligate seeder that is highly susceptible to local extinction due to frequent fire, however, fire is likely to be relatively infrequent in the habitat of *G. shiressii*. Seed germination does occur in the absence of fire, however some physical disturbance is likely to promote seed germination.	further assessment required. Low likelihood of occurrence.
Boronia umbellata	Orara Boronia	This Boronia grows as an understorey shrub in and around gullies in wet open forest. It appears to regenerate well after disturbance, but it is not known whether prolonged or repeated disturbance affects long-term persistence. Orara Boronia is an open shrub, 1 – 2 m tall, with upright branches. The fragrant, paired leaves are divided into one or two pairs of leaflets with a longer terminal leaflet. Dense hairs cover the underside of the leaves, branchlets and new shoots. Clusters of dark pink, four-petalled flowers, 7 - 10 mm long, are held at the base of the leaves, and are produced in spring and early summer. The fruit is smooth and has four lobes.	No flora bearing the key identifying features of this species was seen within the site. No potential habitat within the site boundaries. No further assessment required. Low likelihood of occurrence.

Fauna

Scientific Name	Common Name	Habitat Preferences	Site Suitability
Pseudophryne australis	Red-crowned Toadlet	Occurs in open forests on Hawkesbury and Narrabeen Sandstones. Inhabits ephemeral drainage lines below sandstone ridges. Requires shelter in the form of rocks, dense vegetation and thick leaf litter.	Low potential for the species to occur within the site due to low habitat quality of the site. No further assessment or consideration is required. Low likelihood of occurrence
Heleioporus australiacus	Giant Burrowing Frog	Sites must have native vegetation. The species has not been found on cleared land. Occurs in hanging swamps on sandstone shelves and along perennial creeks. The species is not restricted to watercourses.	Low potential for the species to occur within the site due to low habitat quality of the site. No further assessment or consideration is required. Low likelihood of occurrence.
Litoria aurea	Green and Golden Bell Frog	Optimum habitat includes water-bodies that are unshaded, free of predatory fish such as Plague Minnow (Gambusia holbrooki), have a grassy area nearby and diurnal sheltering sites available. Some sites, particularly in the Greater Sydney region occur in highly disturbed areas. The species is active by day and usually breeds in summer when conditions are warm and wet	Low potential for the species to occur within the site due to low habitat quality of the site. No further assessment or consideration is required. Low likelihood of occurrence.
Varanus rosenbergi	Rosenberg's Goanna	Found in heath, open forest and woodland. Associated with termites, the mounds of which this species nests in; termite mounds are a critical habitat component. Individuals require large areas of habitat. Feeds on carrion, birds, eggs, reptiles and small mammals. Shelters in hollow logs, rock crevices and in burrows, which they may dig for themselves, or they may use other species' burrows, such as rabbit warrens.	Low potential for the species to occur within the site due to low habitat quality of the site. No further assessment or consideration is required. Low likelihood of occurrence

Scientific Name	Common Name	Habitat Preferences	Site Suitability
Ptilinopus regina	Rose-crowned Fruit-Dove	Rose-crowned Fruit-doves occur mainly in sub-tropical and dry rainforest and occasionally in moist eucalypt forest and swamp forest, where fruit is plentiful. They are shy pigeons, not easy to see amongst the foliage, and are more often heard than seen. They feed entirely on fruit from vines, shrubs, large trees and palms.	Low potential for the species to occur within the site due to low habitat quality of the site. No further assessment or consideration is required. Low likelihood of occurrence
Ptilinopus superbus	Superb Fruit-Dove	The species is found in rainforests, rainforest margins, mangroves, wooded stream-margins, and even isolated figs, lilly pillies and pittosporums. The Superb Fruit-Dove may migrate to New Guinea in winter, but little is known of its movements, or the reasons for its sometimes southerly flights as far as Tasmania. Feeds almost exclusively on fruit, mainly in large trees.	Low potential for the species to occur within the site due to low habitat quality of the site. No further assessment or consideration is required. Low likelihood of occurrence
Hirundapus caudacutus	White-throated Needletail	White-throated Needletails often occur in large numbers over eastern and northern Australia. They arrive in Australia from their breeding grounds in the northern hemisphere in about October each year and leave somewhere between May and August. They are aerial birds and for a time it was commonly believed that they did not land while in Australia. It has now been observed that birds will roost in trees, and radio-tracking has since confirmed that this is a regular activity. The White-throated Needletail feeds on flying insects, such as termites, ants, beetles and flies. They catch the insects in flight in their wide gaping beaks. Birds usually feed in rising thermal currents associated with storm fronts and bushfires and they are commonly seen moving with wind fronts. White-throated Needletails are non-breeding migrants in Australia.	Low potential for the species to occur within the site due to low habitat quality of the site. No further assessment or consideration is required. Low likelihood of occurrence.

Scientific Name	Common Name	Habitat Preferences	Site Suitability
Haliaeetus leucogaster	White-bellied Sea-Eagle	Occurs along the coastline and occasionally larger waterways. Birds are normally seen, perched high in a tree, or soaring over waterways and adjacent land. In addition to Australia, the species is found in New Guinea, Indonesia, China, south-east Asia and India. The White-bellied Sea-Eagle feeds mainly off aquatic animals, such as fish, turtles and sea snakes, but it takes birds and mammals as well	Low potential for the species to occur within the site due to low habitat quality of the site. No further assessment or consideration is required. Low likelihood of occurrence
Hieraaetus morphnoides	Little Eagle	Occupies open eucalypt forest, woodland or open woodland. Sheoak or Acacia woodlands and riparian woodlands of interior NSW are also used. Nests in tall living trees within a remnant patch, where pairs build a large stick nest in winter. Lays two or three eggs during spring, and young fledge in early summer. Preys on birds, reptiles and mammals, occasionally adding large insects and carrion.	Low potential for the species to occur within the site due to low habitat quality of the site. No further assessment or consideration is required. Low likelihood of occurrence.
^^*Lophoictinia isura*	Square-tailed Kite	Inhabits dry woodlands and open forests, particularly along timbered watercourses. Specialist hunter of passerines, especially honeyeaters, and most particularly nestlings, and insects in the tree canopy, picking most prey items from the outer foliage.	Low potential for the species to occur within the site due to low habitat quality of the site. No further assessment or consideration is required. Low likelihood of occurrence
^^*Pandion cristatus*	Eastern Osprey	Inhabits coastal areas, especially the mouths of large rivers, lagoons and lakes. Feeds on fish over clear, open water. Breed from July to September in NSW. Nests are made high up in dead trees or in dead crowns of live trees, usually within one kilometre of the sea.	Low potential for the species to occur within the site due to low habitat quality of the site. No further assessment or consideration is required. Low likelihood of occurrence.
Burhinus grallarius	Bush Stone-curlew	Inhabits open forests and grassy woodlands. Fallen branches and logs are key habitat features that provides camouflage for the bird as well as areas for foraging. It is found in all states, except for	Low potential for the species to occur within the site due to low habitat quality of the site.

Scientific Name	Common Name	Habitat Preferences	Site Suitability
		Tasmania. Feeds at night on insects and small vertebrates including frogs, lizards, snakes and mice.	No further assessment or consideration is required. Low likelihood of occurrence.
Haematopus fuliginosus	Sooty Oystercatcher	Inhabits rocky headlands, rocky shelves, exposed reefs with rock pools, beaches and muddy estuaries. Forages on exposed rock or coral at low tide for foods such as limpets and mussels. Breeds in spring and summer, almost exclusively on offshore islands, and occasionally on isolated promontories.	Low potential for the species to occur within the site due to low habitat quality of the site. No further assessment or consideration is required. Low likelihood of occurrence.
Haematopus longirostris	Pied Oystercatcher	Favours intertidal flats of inlets and bays, open beaches and sandbanks. Forages on exposed sand, mud and rock at low tide, for molluscs, worms, crabs and small fish. The chisel-like bill is used to pry open or break into shells of oysters and other shellfish. Nests mostly on coastal or estuarine beaches although occasionally they use saltmarsh or grassy areas. Nests are shallow scrapes in sand above the high tide mark, often amongst seaweed, shells and small stones. Two to three eggs are laid between August and January. The female is the primary incubator and the young leave the nest within several days.	Low potential for the species to occur within the site due to low habitat quality of the site. No further assessment or consideration is required. Low likelihood of occurrence.
Esacus magnirostris	Beach Stone-curlew	The Beach Stone-curlew has been recorded around the north coast of Australia, mainly between mid-north Western Australia and north-east NSW. The species has largely disappeared from the south-east of its former range and is now rarely recorded on ocean beaches in NSW. Occurs on open, undisturbed beaches, islands, reefs, and estuarine intertidal sandflats and mudflats; beaches with estuaries or mangroves nearby are preferred; may also frequent	Low potential for the species to occur within the site due to low habitat quality of the site. No further assessment or consideration is required. Low likelihood of occurrence.

Scientific Name	Common Name	Habitat Preferences	Site Suitability
		river mouths, offshore sandbars and rock platforms. Individuals forage with slow deliberate heron-like actions. The diet consists of crabs and other marine invertebrates.	
Numenius madagascariensis	Eastern Curlew	The Eastern Curlew is most commonly associated with sheltered coasts, especially estuaries, bays, harbours, inlets and coastal lagoons, with large intertidal mudflats or sandflats, often with beds of seagrass. The Eastern Curlew mainly forages on soft sheltered intertidal sandflats or mudflats, open and without vegetation or covered with seagrass, often near mangroves, on saltflats and in saltmarsh.	Low potential for the species to occur within the site due to low habitat quality of the site. No further assessment or consideration is required. Low likelihood of occurrence.
Onychoprion fuscata	Sooty Tern	The Sooty Tern is found over tropical and sub-tropical seas and on associated islands and cays around Northern Australia. Occasionally seen along coastal NSW, especially after cyclones. Large flocks can be seen soaring, skimming and dipping but seldom plunging in off shore waters. Breeds in large colonies in sand or coral scrapes on offshore islands and cays including Lord Howe and Norfolk Islands.	Low potential for the species to occur within the site due to low habitat quality of the site. No further assessment or consideration is required. Low likelihood of occurrence.
^^Callocephalon fimbriatum	Gang-gang Cockatoo	In spring and summer, generally found in tall mountain forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. In autumn and winter, the species often moves to lower altitudes in drier more open eucalypt forests and woodlands, particularly box-gum and box-ironbark assemblages, or in dry forest in coastal areas and often found in urban areas. Favours old growth forest and woodland attributes for nesting and roosting.	Low potential for the species to occur within the site due to low habitat quality of the site. No further assessment or consideration is required. Low likelihood of occurrence.

Scientific Name	Common Name	Habitat Preferences	Site Suitability
		Nests are located in hollows that are 10 cm in diameter or larger and at least 9 m above the ground in eucalypts.	
^Calyptorhynchus lathami	Glossy Black-Cockatoo	Lives in coastal woodlands and drier forest areas, open inland woodlands or timbered watercourses where casuarinas (or sheoaks), its main food trees, are common. Glossy black-cockatoos occasionally eat seeds from eucalypts, angophoras, acacias and hakeas, as well as eating insect larvae.	Low potential for the species to occur within the site due to low habitat quality of the site. No further assessment or consideration is required. Low likelihood of occurrence.
Glossopsitta pusilla	Little Lorikeet	Prefers open Eucalypt forest and woodlands. Primarily feeds within the canopy of Eucalyptus, Angophora and Melaleuca trees. Prefers riparian areas but may visit isolated trees in open or cleared land.	Low potential for the species to occur within the site due to low habitat quality of the site. No further assessment or consideration is required. Low likelihood of occurrence.
^^Lathamus discolor	Swift Parrot	Breeds in Tasmania during spring and summer, migrating in the autumn and winter months to south-eastern Australia from Victoria and the eastern parts of South Australia to south-east Queensland. In NSW mostly occurs on the coast and south west slopes. 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.	Low potential for the species to occur within the site due to low habitat quality of the site. No further assessment or consideration is required. Low likelihood of occurrence.

Scientific Name	Common Name	Habitat Preferences	Site Suitability
		Return to home foraging sites on a cyclic basis depending on food availability.	
^^*Neophema pulchella*	Turquoise Parrot	Occurs on edges of eucalypt woodlands, ridges through forests and creeks. Prefers shading for ground foraging.	Not habitat
^^*Ninox connivens*	Barking Owl	Inhabits woodland and open forest, including fragmented remnants and partly cleared farmland. It is flexible in its habitat use, and hunting can extend in to closed forest and more open areas. Sometimes able to successfully breed along timbered watercourses in heavily cleared habitats (e.g. western NSW) due to the higher density of prey on these fertile soils. Roost in shaded portions of tree canopies, including tall midstorey trees with dense foliage such as Acacia and Casuarina species.	Not habitat
^^*Ninox strenua*	Powerful Owl	The species requires large tracts of forest or woodland, however fragmented landscapes can contribute to their range. Breeds in forests and woodlands but may forage in open areas. Mainly preys upon medium sized arboreal mammals. Requires tree hollows for breeding.	Low potential for the species to occur within the site due to low habitat quality of the site. No further assessment or consideration is required. Low likelihood of occurrence.
^^*Tyto novaehollandiae*	Masked Owl	The species prefers dry eucalypt forests and woodlands and hunts along the edges and forests and roadsides. Mainly preys upon arboreal and ground mammals, primarily rats. Requires tree hollows in moist gullies for breeding.	Low potential for the species to occur within the site due to low habitat quality of the site. No further assessment or consideration is required. Low likelihood of occurrence.
^*Dasyornis brachypterus*	Eastern Bristlebird	Habitat for central and southern populations is characterised by dense, low vegetation including heath and open woodland with a	Not habitat.

Scientific Name	Common Name	Habitat Preferences	Site Suitability
		heathy understorey. In northern NSW the habitat occurs in open forest with dense tussocky grass understorey and sparse mid-storey near rainforest ecotone; all of these vegetation types are fire prone.	
Anthochaera phrygia	Regent Honeyeater	The species inhabits dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests of River Sheoak. Regent Honeyeaters inhabit woodlands that support a significantly high abundance and species richness of bird species. These woodlands have significantly large numbers of mature trees, high canopy cover and abundance of mistletoes. This species has been seen foraging in flowering coastal Swamp Mahogany and Spotted Gum forests.	Low potential for the species to occur within the site due to low habitat quality of the site. No further assessment or consideration is required. Low likelihood of occurrence.
Daphoenositta chrysoptera	Varied Sittella	Inhabits eucalypt forests and woodlands, especially those containing rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland. Feeds on arthropods gleaned from crevices in rough or decorticating bark, dead branches, standing dead trees and small branches and twigs in the tree canopy.	Low potential for the species to occur within the site due to low habitat quality of the site. No further assessment or consideration is required. Low likelihood of occurrence.
Artamus cyanopterus cyanopterus	Dusky Woodswallow	Migratory bird primarily inhabit dry, open eucalypt forests and woodlands, including mallee associations, with an open or sparse understorey of eucalypt saplings, acacias and other shrubs, and ground-cover of grasses or sedges and fallen woody debris. Feeds on invertebrates, mainly insects.	Low potential for the species to occur within the site due to low habitat quality of the site. No further assessment or consideration is required. Low likelihood of occurrence.

Scientific Name	Common Name	Habitat Preferences	Site Suitability
Petroica boodang	Scarlet Robin	The Scarlet Robin lives in dry eucalypt forests and woodlands. The understorey is usually open and grassy with few scattered shrubs. This species lives in both mature and regrowth vegetation. It occasionally occurs in mallee or wet forest communities, or in wetlands and tea-tree swamps. Scarlet Robin habitat usually contains abundant logs and fallen timber: these are important components of its habitat.	Low potential for the species to occur within the site due to low habitat quality of the site. No further assessment or consideration is required. Low likelihood of occurrence.
Petroica phoenicea	Flame Robin	The Flame Robin is endemic to SE Australia, and ranges from near the Queensland border to SE South Australia and also in Tasmania. In NSW, it breeds in upland areas and in winter, many birds move to the inland slopes and plains. Prefers clearings or areas with open understoreys. The groundlayer of the breeding habitat is dominated by native grasses and the shrub layer may be either sparse or dense. Occasionally occurs in temperate rainforest, and also in herbfields, heathlands, shrublands and sedgelands at high altitudes.	Low potential for the species to occur within the site due to low habitat quality of the site. No further assessment or consideration is required. Low likelihood of occurrence.
Isoodon obesulus obesulus	Southern Brown Bandicoot (eastern)	Species found in heath or open forest with a heathy understory on sandy or friable soils. hey feed on a variety of ground-dwelling invertebrates and the fruit-bodies of hypogenous (underground-fruiting) fungi.	Low potential for the species to occur within the site due to low habitat quality of the site. No further assessment or consideration is required. Low likelihood of occurrence.
Dasyurus maculatus	Spotted-tailed Quoll	Recorded across a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline. Individual animals use hollow-bearing trees, fallen logs, small caves, rock outcrops and rocky-cliff	The site presents low quality and low potential for the species to occur within the site. No further assessment or consideration is required.

Scientific Name	Common Name	Habitat Preferences	Site Suitability
		faces as den sites. Mostly nocturnal animal feeding on medium-sized (500g-5kg) mammals.	
Phascolarctos cinereus	Koala	Inhabit eucalypt woodlands and forests. Feeds on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred browse species.	The site presents low quality and low potential for the species to occur within the site. No further assessment or consideration is required. Bionet recordings within 2km. However no feed trees and site inaccessible for the species.
Phascolarctos cinereus	Koala in the Pittwater Local Government Area	Inhabit eucalypt woodlands and forests. Feed on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred browse species. Inactive for most of the day, feeding and moving mostly at night. Spend most of their time in trees, but will descend and traverse open ground to move between trees. Home range size varies with quality of habitat, ranging from less than two ha to several hundred hectares in size.	Not Koala habitat. Bionet recordings within 2km. However no feed trees are present.
Cercartetus nanus	Eastern Pygmy-possum	Found in rainforests communities to sclerophyll (including Box-Ironbark) forests, woodland and heath. Feeds largely on nectar and pollen collected from banksias, eucalypts and bottlebrushes, soft fruits are eaten when flowers are unavailable and insects.	The site presents low quality and low potential for the species to occur within the site. No further assessment or consideration is required.
Petaurus norfolcensis	Squirrel Glider	Inhabits mature or old growth Blackbutt-Bloodwood forests with heath understorey in coastal areas. Prefers mixed species stands with a shrub or Acacia midstorey. Requires abundant tree hollows	The site presents low quality and low potential for the species to occur within the

Scientific Name	Common Name	Habitat Preferences	Site Suitability
		for refuge and nest sites. Diet varies seasonally and consists of Acacia gum, eucalypt sap, nectar, honeydew and manna, with invertebrates and pollen providing protein.	site. No further assessment or consideration is required.
Petaurus norfolcensis	Squirrel Glider on Barrenjoey Peninsula, north of Bushrangers Hill	The availability of a year-round supply of carbohydrates (nectar, sap, gum, and honeydew) appears to be an important habitat feature. In NSW, this corresponds to a high diversity of tree and shrub species, including a high nectar producing species and one or more winter flowering species. In Pittwater, important food sources are likely to be the winter flowering Coast Banksia (*Banksia integrifolia*) and Spotted Gum (*Corymbia maculata*) and the summer flowering Old Man Banksia (*B. serrata*) and Grey Ironbark (*Eucalyptus paniculata*). Other likely food sources include *Angophora costata, Banksia spinulosa, Corymbia gummifera, Eucalyptus botryoides, E. punctata, E. robusta, Melaleuca quinquernervia*, mistletoes and *Xanthorrhoea* species. This animal will gouge and lick incisions on the trunks and main branches of *Eucalyptus, Corymbia* and *Angophora* trees to feed on sap and on *Acacia* trees and shrubs to feed on gum, especially when nectar is in short supply.	The site presents low quality and low potential for the species to occur within the site. No further assessment or consideration is required.

Scientific Name	Common Name	Habitat Preferences	Site Suitability
Petauroides volans	Greater Glider	The greater glider chooses habitat based on several factors, the dominant factor being the presence of specific species of eucalypt. Distribution levels are higher in regions of montane forest containing manna gum (E. viminalis) and mountain gum (E. dalrympleana, E. obliqua). Furthermore, the presence of E. cypellocarpa appears to improve the quality of habitat for the greater glider in forests dominated by E. obliqua.	Low potential for the species to occur within the site due to low habitat quality of the site. No further assessment or consideration is required. Low likelihood of occurrence.
Pteropus poliocephalus	Grey-headed Flying-fox	Occurs within tall sclerophyll forests and woodlands, heath, swamp subtropical and temperate rainforests, and urban areas. Occurs within 20km of a significant food source. May be found close to gullies and water within vegetation with a dense canopy.	Low potential for the species to occur within the site due to low habitat quality of the site. No further assessment or consideration is required. Low likelihood of occurrence.
Micronomus norfolkensis	Eastern Coastal Free-tailed Bat	The Eastern Freetail-bat has dark brown to reddish brown fur on the back and is slightly paler below. Like other freetail-bats it has a long (3 - 4 cm) bare tail protruding from the tail membrane. Freetail-bats are also known as mastiff-bats, having hairless faces with wrinkled lips and triangular ears. They weigh up to 10 grams.	Low potential for the species to occur within the site due to low habitat quality of the site. No further assessment or consideration is required. Low likelihood of occurrence.
Chalinolobus dwyeri	Large-eared Pied Bat	Roosts in caves, cliff crevices, mine shafts and in old nests of the Fairy Martin. Typically inhabits low to mid elevation well-timbered dry open forests and woodlands in close proximity to suitable nesting. Prefers areas containing gullies.	The site presents low quality and low potential for the species to occur within the site. No further assessment or consideration is required.

Scientific Name	Common Name	Habitat Preferences	Site Suitability
Myotis macropus	Southern Myotis	Roosts in groups of 10-15 in areas close to water. Will utilise caves, mine shafts, tree hollows, storm water drains, buildings, bridges and dense foliage. Forages over water bodies catching insects and small fish.	The site presents low quality and low potential for the species to occur within the site. No further assessment or consideration is required.
Scoteanax rueppellii	Greater Broad-nosed Bat	Roosts in tree hollows but may be found in buildings. Primarily found in gullies and river systems that drain the Great Dividing Range. Occurs in a range of habitats including woodlands to moist or dry eucalypt forest, rainforest with greatest preference for tall wet forests. Forages along creeks and river corridors.	The site presents low quality and low potential for the species to occur within the site. No further assessment or consideration is required.
Vespadelus troughtoni	Eastern Cave Bat	Roosts in caves, mine shafts. Generally found in dry open forest and woodlands. Prefers areas near cliffs and rocky overhangs.	The site presents low quality and low potential for the species to occur within the site. No further assessment or consideration is required.
Pseudomys gracilicaudatus	Eastern Chestnut Mouse	In NSW the Eastern Chestnut Mouse mainly occurs north from the Hawkesbury River area as scattered records along to coast and eastern fall of the Great Dividing Range extending north into Queensland. There are however isolated records in the Jervis bay area. In NSW the Eastern Chestnut Mouse is mostly found, in low numbers, in heathland and is most common in dense, wet heath and swamps. In the tropics it is more an animal of grassy woodlands. Optimal habitat appears to be in vigorously regenerating heathland burnt from 18 months to four years previously. By the time the heath is mature, the larger Swamp Rat becomes dominant, and Eastern Chestnut Mouse numbers drop again. Feeds at night via	The site presents low quality and low potential for the species to occur within the site. No further assessment or consideration is required.

Scientific Name	Common Name	Habitat Preferences	Site Suitability
		runways through the grassy and sedge understorey, within an area of less than half a hectare. It has a broad diet of grass stems, invertebrates, fungi and seeds, with the relative significance of each component varying seasonally. Up to three litters are produced from spring to autumn; this strategy allows rapid build-up of numbers in years following fire.	
Pseudomys novaehollandiae	New Holland Mouse	The New Holland Mouse has a fragmented distribution across Tasmania, Victoria, New South Wales and Queensland. Known to inhabit open heathlands, open woodlands with a heathland understorey and vegetated sand dunes. Lives predominantly in burrows shared with other individuals	The site presents low quality and low potential for the species to occur within the site. No further assessment or consideration is required.
Miniopterus australis	Little Bentwing-bat	Roosts in tree hollows, caves, tunnels, mine shafts, stormwater drains, culverts, bridges and buildings. Forages for insects in the tree canopy in densely vegetated areas. Prefers moist eucalyptus forests, rainforests, vine thickets, wet and dry sclerophyll forests, Melaleuca swamps, dense coastal forests and banksia scrub. Prefers well-timbered areas.	The site presents low quality and low potential for the species to occur within the site. No further assessment or consideration is required.
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.	The site presents low quality and low potential for the species to occur within the site. No further assessment or consideration is required.

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

7.3 Appendix III–Locally native species recommended for planting

Table 8 lists locally native species recommended for planting at Palm Beach Boat House and foreshore north and south. Species provide habitat for native fauna (NF) while several species are native bush foods (BF). Increasing habitat opportunities for native fauna, particularly invertebrates, in the area and contributing to community education regarding native foods.

Most species chosen are suitable for stabilising fore-dunes as part of a vegetation complex. Low growing plants, both rhizomatous and sprawling have been selected to cover sand while retaining views. Shrubs and small trees have been recommended for planting in clusters near existing plantings.

Table 1. Locally native species recommended for planting at Palm Beach Boat House.

Common Name	Scientific Name	Photo	Growth Habit	Notes (NF) habitat for native fauna, (BF) Bush Food.
Coastal Tea Tree	*Leptospermum laevigatum*		Small Tree	NF Planting within the East Area as entry plant set back from the road and path so it can grow without needing pruning. Suitable for cluster planting in the open grass area near car parks.

Common Name	Scientific Name	Photo	Growth Habit	Notes (NF) habitat for native fauna, (BF) Bush Food.
Coastal Banksia	*Banksia integrifolia*		Small Tree	NF Planting within the East area as entry plant set back from the road and path so it can grow without needing pruning. Suitable for cluster planting in the open grass area near car parks.
Sandpaper Fig	*Ficus coronata*		Small Tree	NF, BF Planting within the East Area in shaded areas including close to Norfolk Pines providing there will be no root damage.

Common Name	Scientific Name	Photo	Growth Habit	Notes (NF) habitat for native fauna, (BF) Bush Food.
Myoporum insulare	*Common Boobialla*		Shrub	NF, BF Planting within the East Area as entry plant set back from the road and path so it can grow without needing pruning. Planting along the boat hire boundary recommended. Inter-planting with Coastal Wattle. Suitable for cluster planting in the open grass area near car parks.
Coastal Wattle	*Acacia longifolia* subsp. *sophorae*		Shrub	NF, BF Planting along the boat hire boundary recommended. Inter-planting with Boobialla. Suitable for cluster planting in the open grass area near car parks.

Common Name	Scientific Name	Photo	Growth Habit	Notes (NF) habitat for native fauna, (BF) Bush Food.
Coast beard-heath or Native Currant	*Leucopogon parviflorus*		Shrub to 1.5m	NF, BF Butterfly habitat and Bush food. Edible white fruits.
Knobby Club-Rush	*Ficinia nodosa*		Tussock	NF Edge Plant with in East Area as entry plant and along path ways. Inter-planting with Pigface and Sea Rush. Plant around tree plantings in open space grass areas to protect tree roots from excess compaction. Rhizomatous root structure.

Common Name	Scientific Name	Photo	Growth Habit	Notes (NF) habitat for native fauna, (BF) Bush Food.
Sea Rush	*Juncus kraussii*		Tussock	NF Edge Plant inter-planting with Pigface and Sea Rush along the foreshore stabilisation areas. Best closest to the area that would be inundated in highest tides. Rhizomatous root structure.
Spinifex	*Spinifex sericeus*		Ground Cover	NF Inter-planting with Nobby Club Rush and Sea Rush on the foreshore. Plant around tree plantings in open space grass areas to protect tree roots from excess compaction. Sprawling root mass.

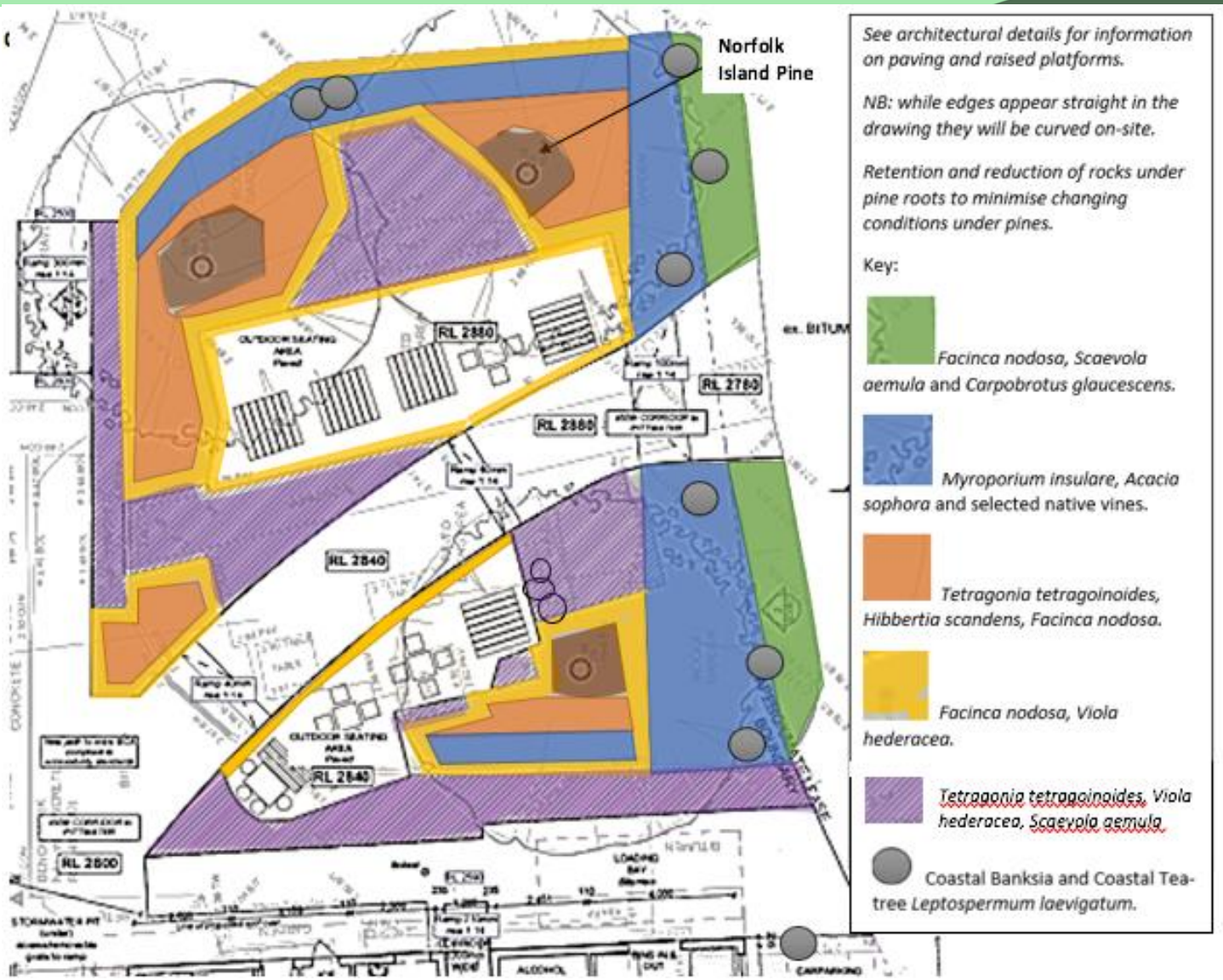
Common Name	Scientific Name	Photo	Growth Habit	Notes (NF) habitat for native fauna, (BF) Bush Food.
Pig Face	*Carpobrotus glaucescens*		Ground Cover	NF, BF Entry plant and along path ways. Will grow on edges under pines. Inter-planting with Nobby Club Rush and Sea Rush on the foreshore. Plant around tree plantings in open space grass areas to protect tree roots from excess compaction. Sprawling root mass.
Purple Fanfare	*Scaevola aemula*		Ground Cover	NF Entry plant and along path ways. Will grow on edges under pines. Inter-planting with Nobby Club Rush and Sea Rush on the foreshore. Plant around tree plantings in open space grass areas to protect tree roots from excess compaction. Sprawling root mass.

Common Name	Scientific Name	Photo	Growth Habit	Notes (NF) habitat for native fauna, (BF) Bush Food.
Native Violet	*Viola hederacea*		Ground Cover	NF Along path ways directly on edge to create open edge on path. Possible to plant under raised walkways as well. Will grow on edges under pines. Sprawling root mass.
Warrigal Greens	*Tetragonia tetragoinoides*		Ground Cover	Will grow on edges in shaded areas. Main reason for planting is the high bush-tucker value. Sprawling plant and root mass.

Common Name	Scientific Name	Photo	Growth Habit	Notes (NF) habitat for native fauna, (BF) Bush Food.
Trailing Guinea Flower	*Hibbertia scandens*		Vine	NF All four vines species can be inter-planted. Trailing Guinea Flower and Purple Coral Pea are the most appropriate as Dusky Coral Pea can be very vigorous in growth. Trailing Guinea Flower and Dusky Coral Pea are recommended in the open space foreshore zone to provide colour, habitat and "rooms" (delineated areas) for sitting on the foreshore. Both are recommended for over copper-log posts and along rails used to delineate access ways on the estuary foreshore.
Dusky Coral Pea	*Kennedia rubicunda*		Vine	NF Dusky Coral Pea is recommended in the open space foreshore zone to provide colour, habitat and "rooms" (delineated areas) for sitting on the foreshore also for over copper-log posts and along rails used to delineate access ways on the estuary foreshore. Too vigorous for within east area.

Common Name	Scientific Name	Photo	Growth Habit	Notes (NF) habitat for native fauna, (BF) Bush Food.
Purple Coral Pea	*Hardenbergia violacea*		Vine	NF Purple Coral Pea is one of the most appropriate species to plant within the open space area near dining and in pots in and around the Built areas.
Native Sarsaparilla	*Smilax glyciphylla*		Vine	NF, BF The least aesthetic of the recommended vines Native Sarsaparilla has been chosen due to it plant food and tea attributes. Leaves are sweet and make local tea.

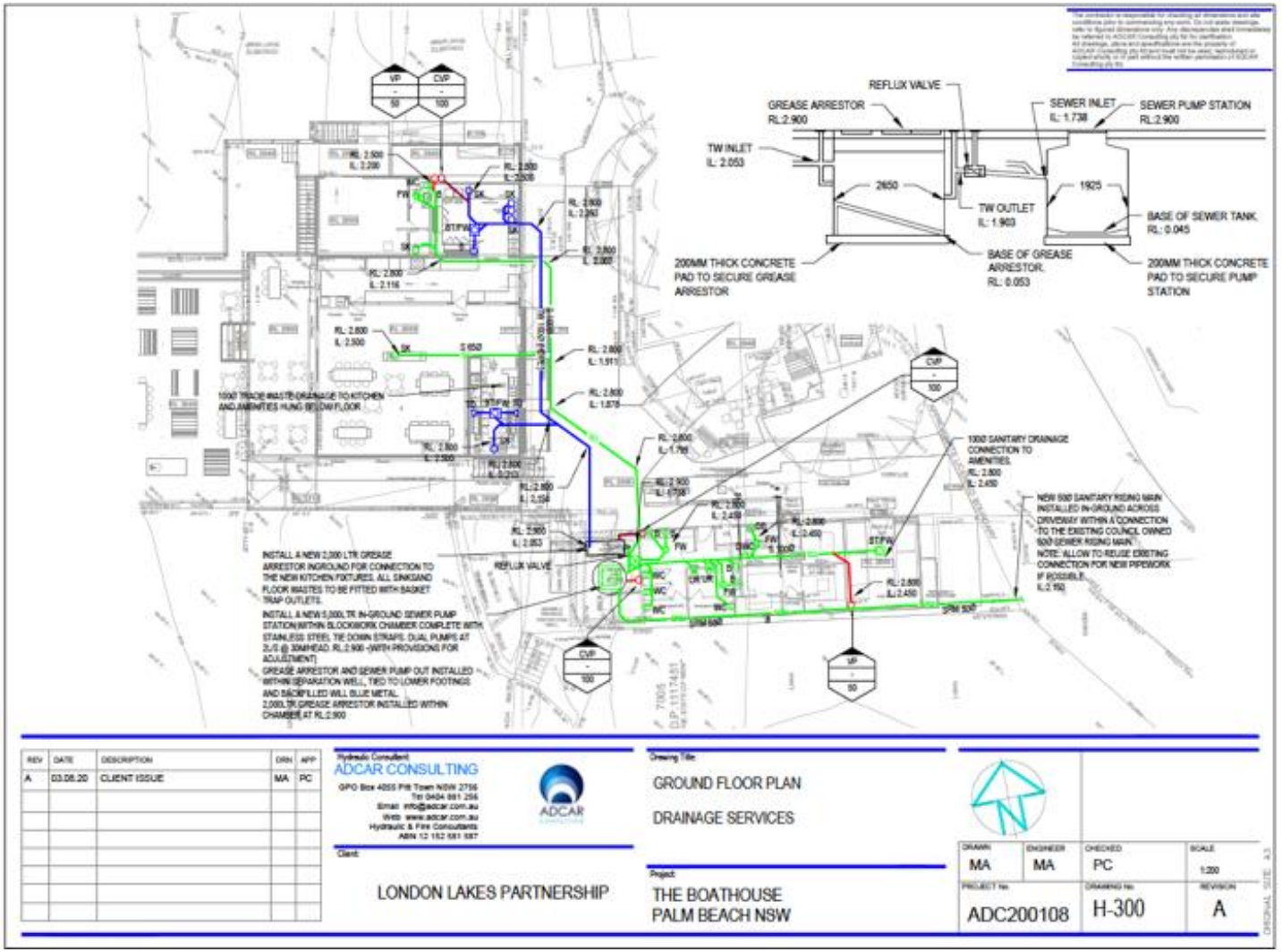
Note - Habitat for Native Fauna (NF), Bush Food (BF)



Aerial view of proposed area for planting areas and species - Please note – See 7.4.2 landscape plan Feb 2021 for final layout.

7.4 Appendix IV – Additional Plans

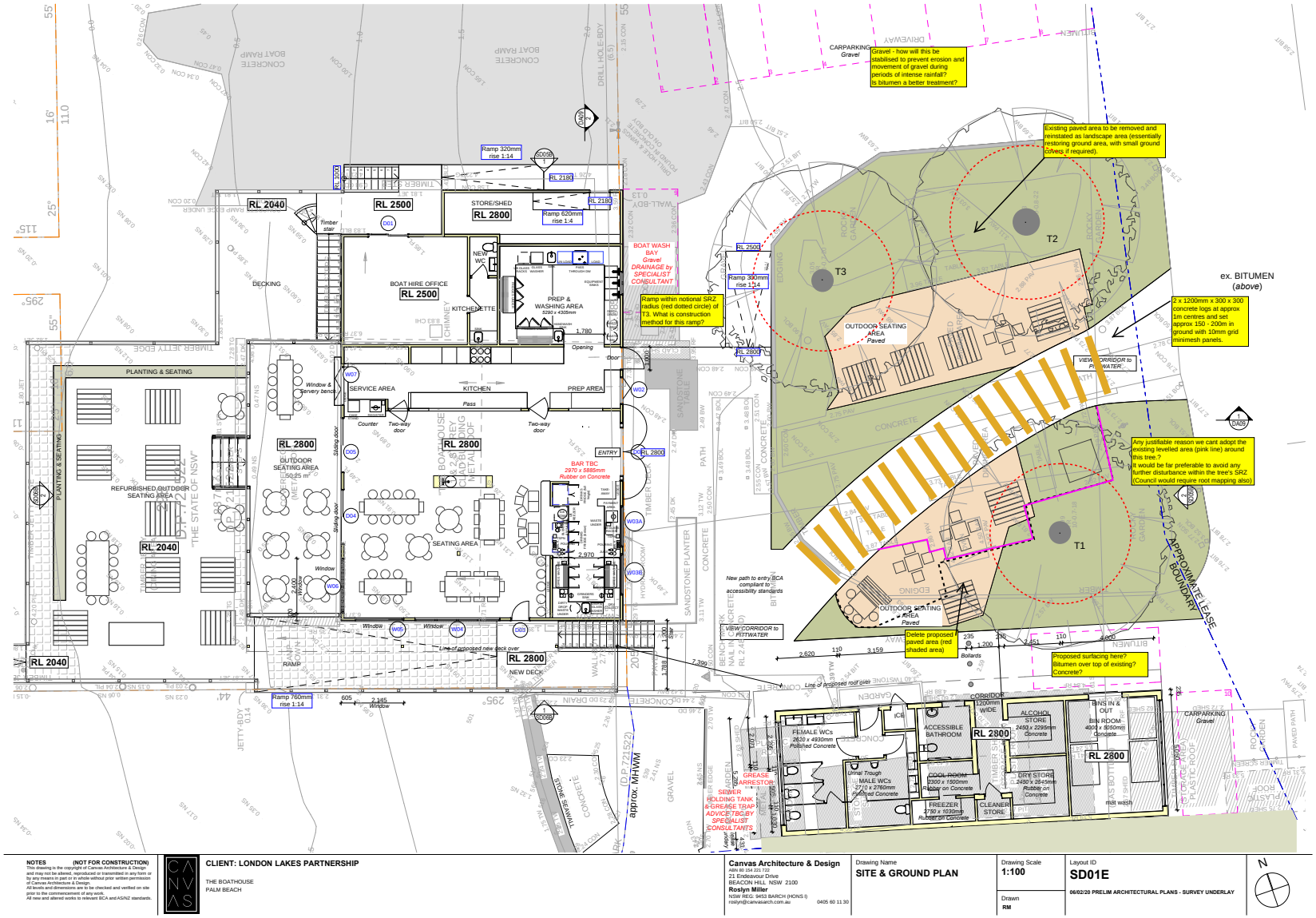
7.4.1 Sewer System Connection



7.4.2 Landscape Plan

Landscape Plan by Selena Hannan Designs updated to LP-01D, dated 22.2.2021

7.4.3 Arborist Site and Ground Plan



7.5 Authors

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.

Geraldene Dalby-Ball

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.
- **Accredited Biobank assessor**

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.**