BIODIVERSITY DEVELOPMENT ASSESSMENT REPORT

43,45-49 Warriewood Road, Warriewood, NSW

April 2020

Lesnok ENVIRONMENTAL

Biodiversity Development Assessment Report

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Report produced at the request of Creative Planning Solutions on behalf of the property owner.

Cover photograph: The character of the vegetation that is present within the western portion of the subject land.

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Disclaimer

This document has been prepared in accordance with the brief provided by Creative Planning Solutions ('the client'). This investigation has relied upon information collected during the course of field investigations, and as available in current known literature and data sources (including those available online). All findings, conclusions or recommendations contained within this document are based upon the abovementioned circumstances. The study has been prepared for use by the client, and no responsibility for its use by other parties is accepted by Lesryk Environmental Pty Ltd.

This Biodiversity Development Assessment Report has been prepared in accordance with the Biodiversity Assessment Method prepared by NSW Office of Environment and Heritage (2019). The Biodiversity Assessment Method is a legal document prescribed by the NSW Biodiversity Conservation Act 2016.

The relevant pieces of environmental legislation, databases and threatened ecological communities and species listings considered in this report are of a dynamic nature. As such, this report has been prepared with a consideration of the best available data as of 31 January 2020. Lesryk Environmental Pty Ltd does not accept responsibility for any relevant legislative listings or changes between this date and the submission of a development application to a determining authority

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This report is prepared in accordance with the 6th Edition of the Commonwealth of Australia (2002) Style Manual.

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Glossary

Abbreviation	Definition
^{0}C	Degrees Celsius
APZ	Asset Protection Zone
ASL	Above Sea Level
BAAS	Biodiversity Assessors Accreditation System
BAM	Biodiversity Assessment Method
BAM-C	Biodiversity Assessment Method Calculator
BMP	Biodiversity Management Plan
BMP Area	The proportion of the study area to be conserved and managed by the BMP specifically, the land from the south of the development area to the southern property boundary
BC Act	NSW *Biodiversity Conservation Act 2016*
BCT	Biodiversity Conservation Trust
BDAR	Biodiversity Development Assessment Report
BOS	Biodiversity Offsets Scheme
Buffer Area	1500 m around the edge of the subject land
BVMTT	Biodiversity Values Map and Threshold Tool
CM Act	NSW *Coastal Management Act 2016*
CPS	Creative Planning Solutions
DAWE	Department of Agriculture, Water and the Environment
DBH	Diameter at Breast Height (in reference to trees)
DE	Commonwealth Department of the Environment (now known as the Commonwealth Department of the Environment and Energy)
DEC	Department of Environment and Conservation
DECC	NSW Department of Environment and Climate Change (now known as the NSW Office of Environment and Heritage)
DPIE	NSW Department of Planning, Industry and Environment
EPA Act	NSW *Environmental Planning and Assessment Act 1979*
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
ha	hectare
IBRA	Interim Biogeographic Regionalisation for Australia
LEP	Local Environment Plan
LGA	Local Government Area
mm/cm/m/m^2/km	Millimetres, centimetres, metres, square metres, kilometres
MNES	Matter of National Environmental Significance
NSW	New South Wales
OEH	NSW Office of Environment and Heritage (now known as DPIE)
PCT	Plant Community Type
PMST	Protected Matters Search Tool
the Regulation	NSW Biodiversity Conservation Regulation 2017
RoTAP	Rare or Threatened Australian Plant
SAII	Serious and Irreversible Impact
SEPP	State Environmental Planning Policy
Subject Land	The maximum total extent of the proposed development footprint and associated direct impact.
Subject Property	43,45-49 Warriewood Road, Warriewood NSW Lot 1 & 2 / DP 349085
TEC	Threatened Ecological Community

VI	Vegetation Integrity

For the purpose of this report:

Areas of outstanding biodiversity	An area of outstanding biodiversity value is: ○ an area important at a State, national or global scale, and ○ an area that makes a significant contribution to the persistence of at least one of the following: i. multiple species or at least one threatened species or ecological community ii. irreplaceable biological distinctiveness iii. ecological processes or ecological integrity iv. outstanding ecological value for education or scientific research. ○ The declaration of an area may relate, but is not limited, to protecting threatened species or ecological communities, connectivity, climate refuges and migratory species.
Subject Property	43, 45-49 Warriewood Road, Warriewood, NSW
Subject land	Is defined as the area directly affected by the proposed development, and all associated vegetation clearing.

1. Introduction

At the request of CPS, on behalf of the property owner, Lesryk has been engaged to prepare a BDAR to consider the impact on biodiversity, and to determine any offset requirements for the impact of the proposed subdivision and development of the property at 43,45-49 Warriewood Road, Warriewood, NSW (Figure 1).

To permit the proposed development, a small area of native vegetation will require removal.

Under the BC Act, the BOS (Part 6 of the Act) applies to developments and clearing when:

- the thresholds under Part 7.1 of the NSW Biodiversity Conservation Regulation 2017 (the Regulation) are exceeded, these being:
  - the clearing of native vegetation of an area declared by Clause 7.2
  - the clearing of native vegetation on land included on the Biodiversity Values Map
- a proposed development is likely to significantly affect threatened species based on the test of significance in section 7.3 of the Act.

Where the BOS applies, a BDAR (this incorporating the BAM) is required in accordance with Part 7 of the BC Act. The BDAR must be prepared by a person who has been accredited by the Environmental Agency Head to apply the BAM.

In regard to the proposal, the BOS is triggered based on the presence of an area of Biodiversity Value (mapped on the BVMTT) within the southern portion of the property.

This BDAR shall accompany the Development Application being submitted to Northern Beaches Council[1].

1.1. Site description

1.1.1. Overview

Site details for the subject land are provided in **Table 1**

Table 1. Site details

Location	43, 45-49 Warriewood Road, Warriewood NSW (Figures 1 and 2)
Lot / DP	Lot 1 & 2 / DP 349085
Area of Subject Property	2.2 ha
Area of Subject land (development)	1.23 ha
Local Government Area	Northern Beaches
Zoning	R3 (Medium Density Residential) (Figure 3)
Grid reference	Easting 342266, Northing 6271270
Elevation	Between 5 m and 14 m ASL
Topography	Level to gently undulating plains, undulating to rolling rises and low hills.
Meteorological data[2] (average)	Maximum – 27 °C (January); Minimum – 7.7 °C (July); Rainfall (annual) – 1077.1 mm
Existing land use within subject land and locality	Within the site, two (2) dilapidated dwellings, outbuildings and several disused greenhouses; with further residential properties, council reserves and urban infrastructure within the locality.

[1] Northern Beaches Council was formed in 2016 after the amalgamation of Manly, Pittwater and Warringah Councils. As a LEP has not yet been made for Northern Beaches Council, where necessary, this report will defer to the former Pittwater LEP 2014.
[2] Nearest operating weather station: Terrey Hills AWS (Bureau of Meteorology 2020).

Figure 1. Site Map

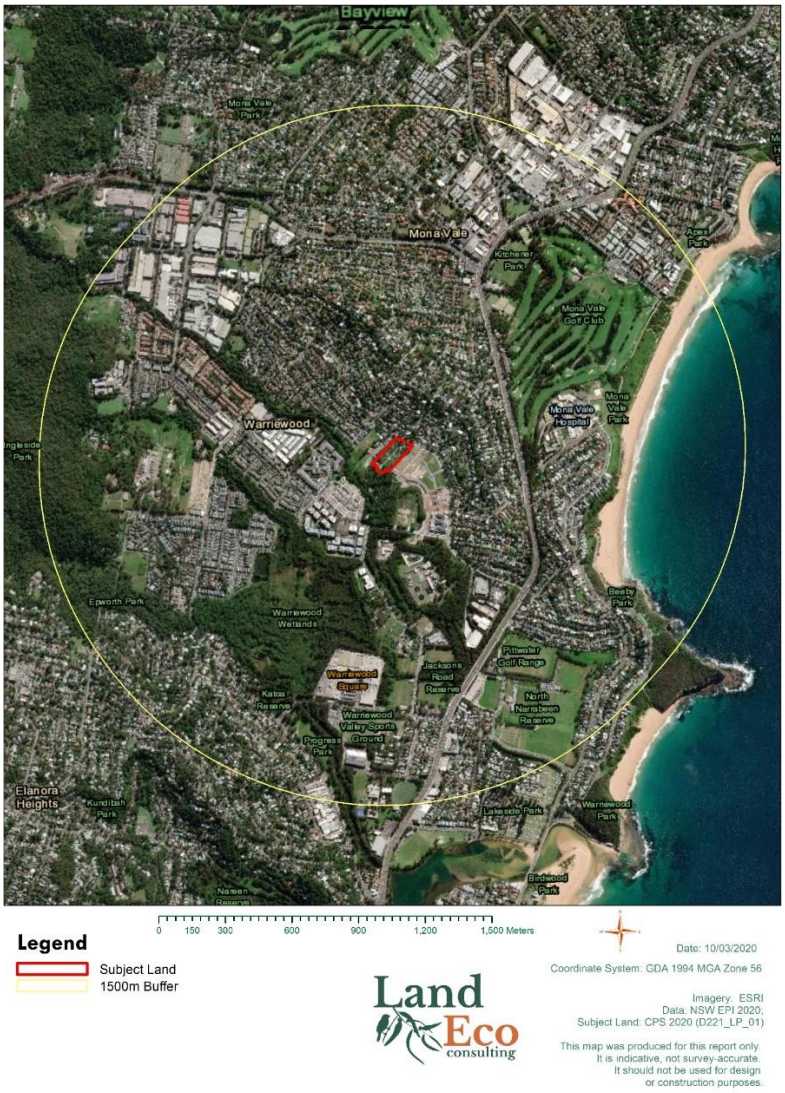

Figure 2. Location map and 1500 m buffer area

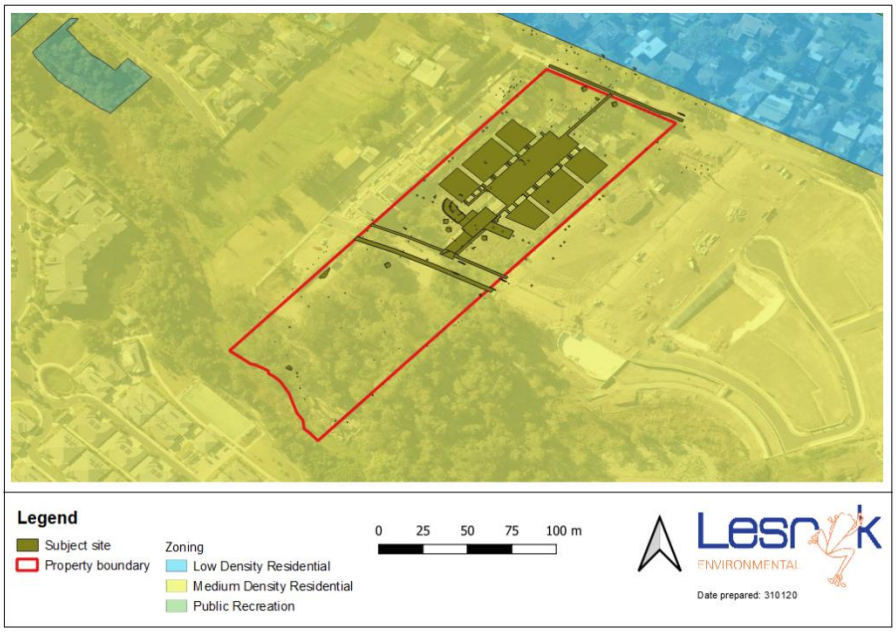

Figure 3. Zoning

1.1.2. Landscape context

The physical characteristics of 43, 45-49 Warriewood Road, Warriewood and its local environs are summarised in Table 2.

Table 2. Physical characteristics of the subject land and surrounding landscape

IBRA bioregion / subregion		Sydney Basin / Pittwater (Figure 4).
NSW landscape region		Sydney Basin Pittwater and Sydney Basin Coastal Barriers (Figure 5).
Cleared areas		Around 0.53 ha of the site has been cleared and built upon. The remaining areas are heavily disturbed and have been historically cleared and weed infested.
Evidence to support differences between mapped vegetation extent and aerial imagery		Previous studies undertaken by the authors. Ground-truthed the subject land. Relevant vegetation mapping.
Rivers and streams classified according to stream order		No waterbodies occur within the subject land. The nearest natural water body is Narrabeen Creek (2nd order stream [Strahler]) that is present along the south-eastern boundary of the property approximately 115 m south-east of the proposed development.
Wetlands within, adjacent to and downstream of the site		One coastal wetland, and the proximity area for coastal wetlands, occurs within [and extends beyond] the property, including the subject land (Figure 6).
Connectivity features		The subject land is not part of any local or regional corridor.
Areas of geological significance and soil hazard features		No significant areas of rock, caves or karst topography are present. The property has been mapped by Chapman and Murphy (1989) (Figure 7) as comprising the following soil landscapes: • Warriewood – geology is Holocene silty to peaty quartz sand; medium to fine marine sand with podzols. Soils consist of deep, well sorted, sand *Humus Podzols* and dark, mottled *Siliceous Sands*, overlaying buried *Acid Peats* in depressions; deep *Podzols* and pale *Siliceous Sands* on sandy rises. Limitations are localised flooding and run-on, high water tables, and highly permeable soil. • Disturbed Terrain – underlying geology is artificial fill - dredged estuarine sand and mud, demolition rubble, industrial and household waste; also includes rocks and local soil materials. Soils consist of turfed filled areas commonly capped with up to 40 cm of sandy loam or up to 60 cm of compacted clay over fill or waste material. Limitations are dependent on nature of fill material; mass movement hazard, unconsolidated low wet-strength materials, impermeable soil, poor drainage, localised very low fertility and toxic materials. • Erina - Terrigal Formation of the Narrabeen Group consisting of lithic and quartz sandstone and siltstone, minor sedimentary breccia, claystone and conglomerate. Soils are moderately deep to deep *Yellow Podzolic Soils* on sandstone crests and slopes; moderately deep *Red Podzolic Soils* on shale crests and steeper slopes; deep *Yellow Podzolic Soils* on shale lower slopes and some deep *Yellow Earths* on colluvial foot slopes. Limitations are very high soil erosion hazard, impermeable plastic low wet-strength subsoil, localised run-on and seasonal waterlogging of foot slopes.
Site context	**Method applied**	Site-based.
	Native vegetation cover in the landscape (i.e. buffer area)	46% (Figure 8).
Patch size		190 ha
Areas of outstanding biodiversity values		None.

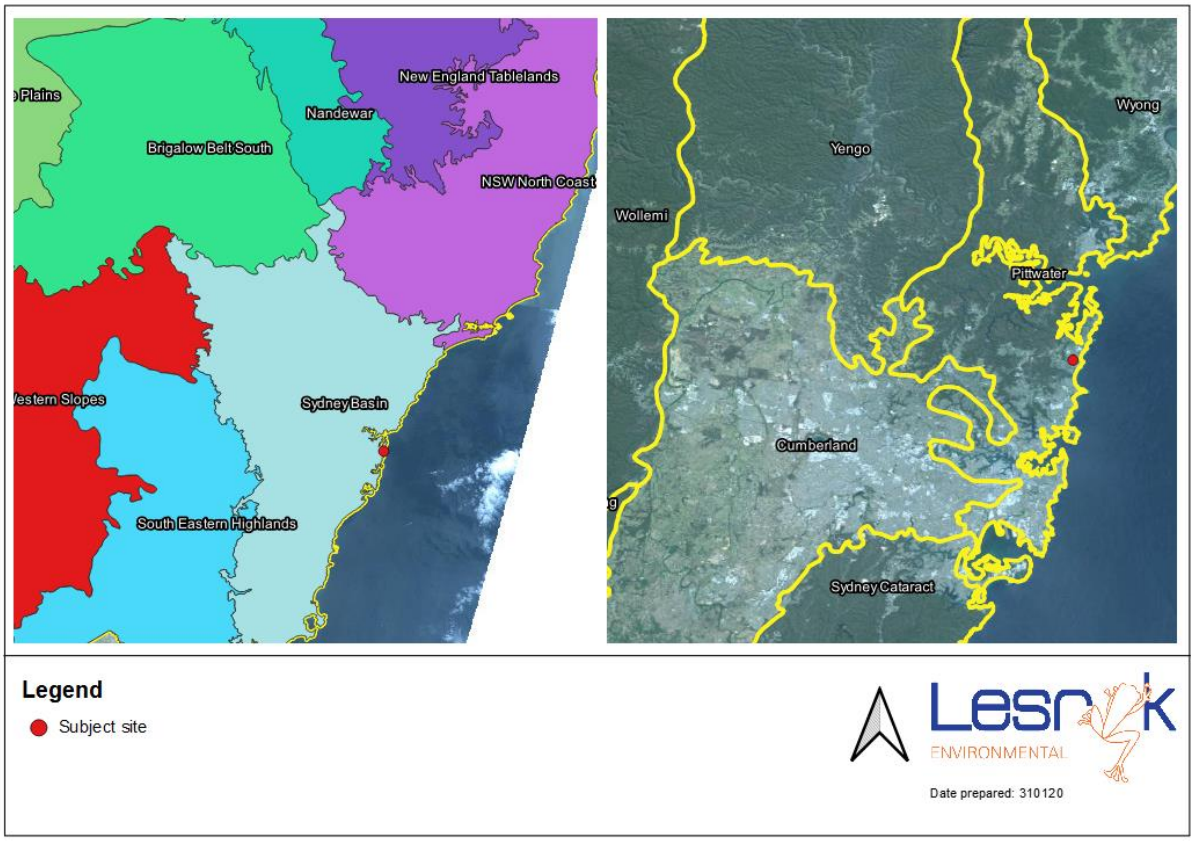

Figure 4. IBRA region and sub-region

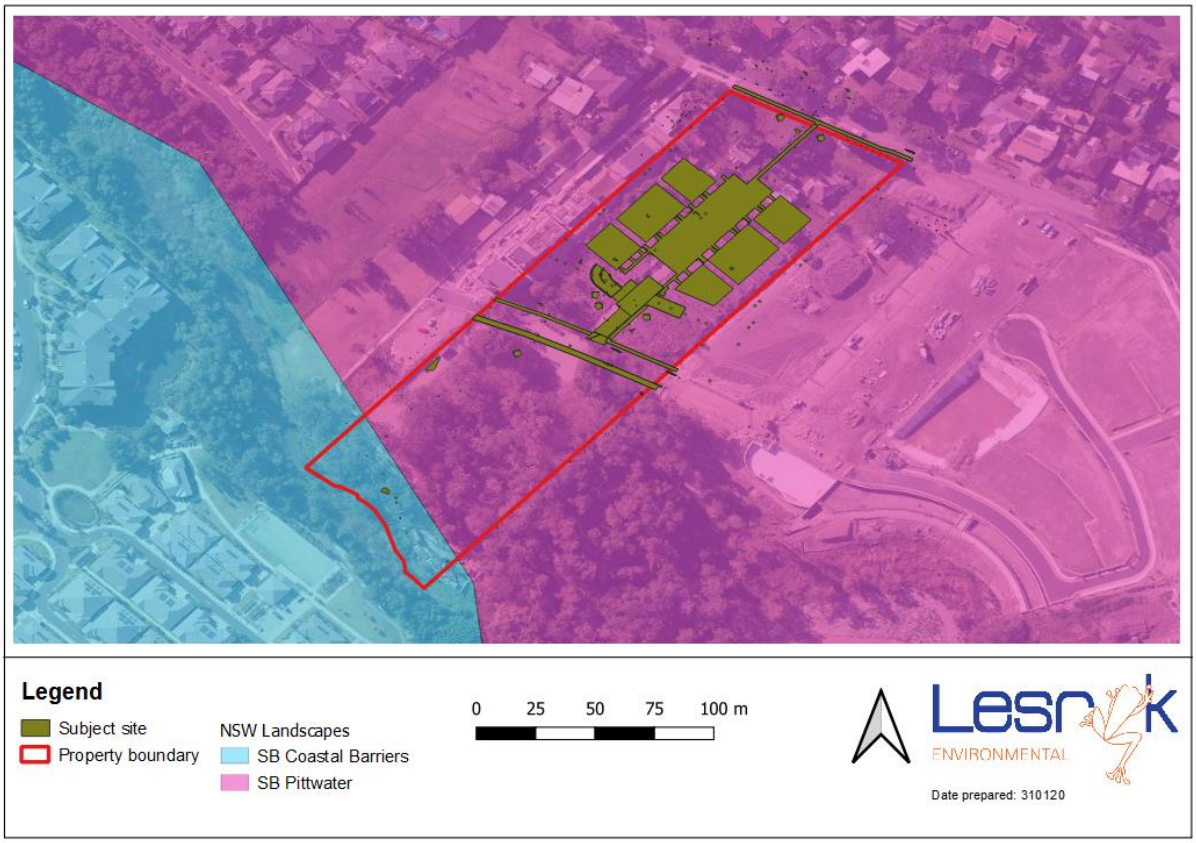

Figure 5. NSW Mitchell Landscapes

Figure 6. Coastal Wetland and Coastal Wetland Proximity Area

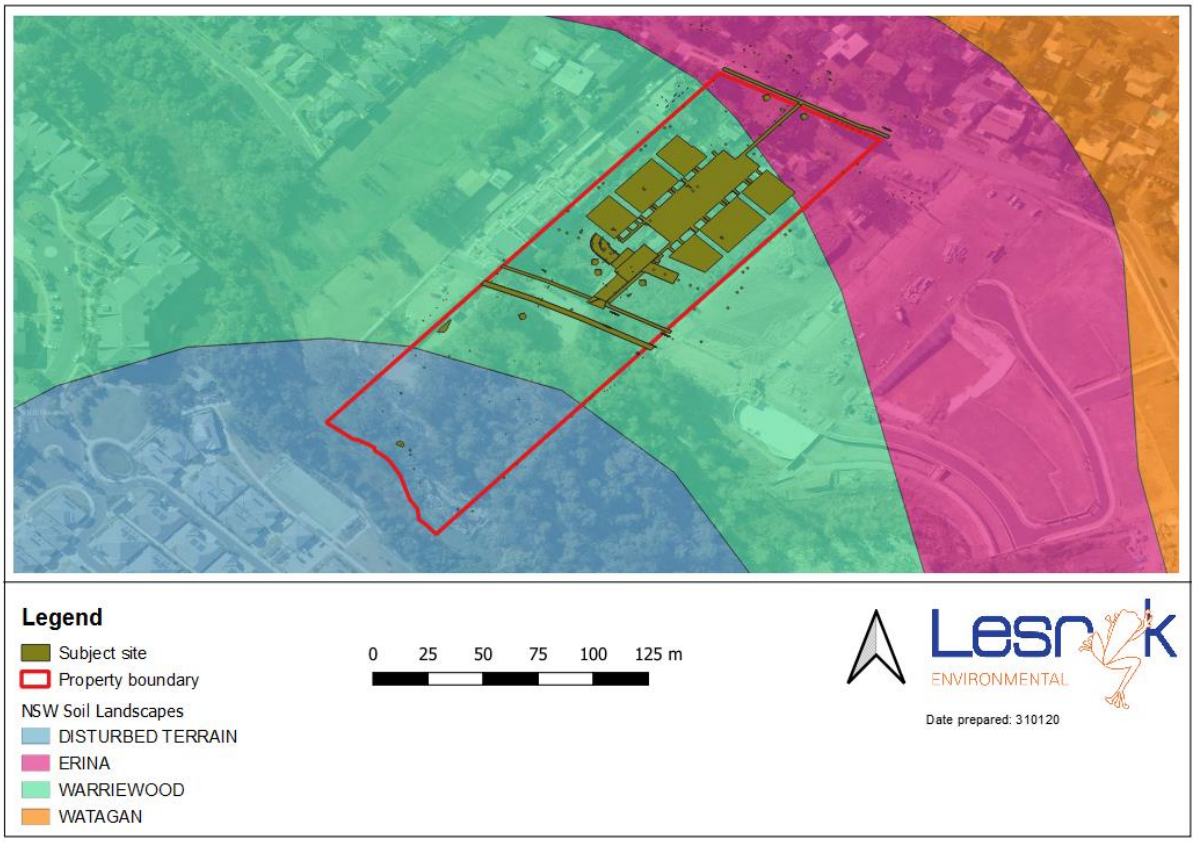

Figure 7. Soil Landscapes

Figure 8. Native vegetation cover within the 1500 m buffer

1.2. Proposed scope of work

The work proposed to be undertaken within the subject land is illustrated on Figure 9 and is to include:

- The utilisation of the majority of the subject land, this involving the clearing of native vegetation;
- The construction of 20 ‘townhouse’ apartments;
- Associated hard and soft landscaping;
- Extension of a road ‘Lorikeet Grove’ through the property;
- Carpark; and
- A landscaped strip around the boundary of the area investigated.

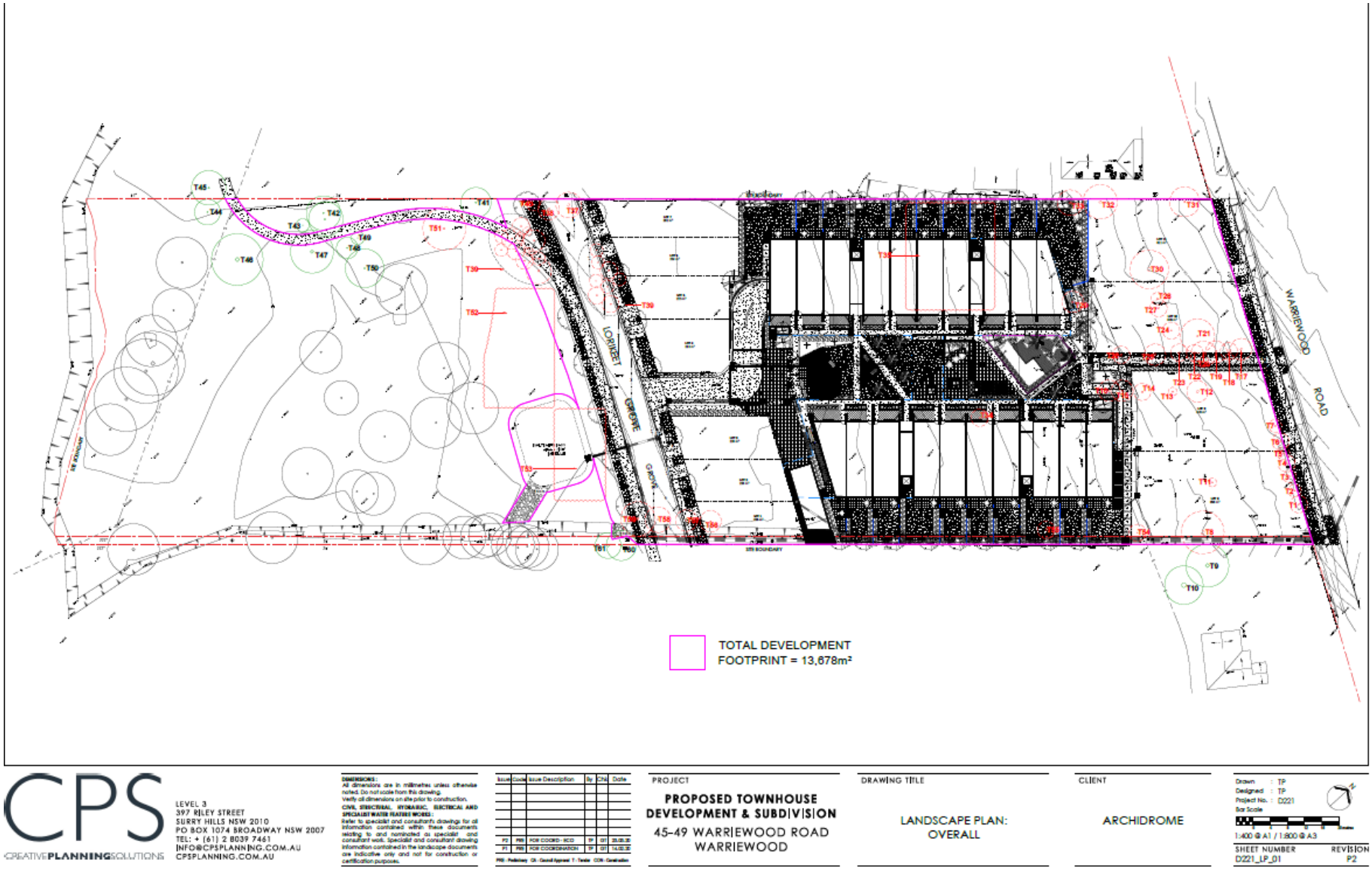

Figure 9. Proposed development plan

1.3. Legislative requirements

1.3.1. NSW *Environmental Planning and Assessment Act 1979*

The EPA Act sets out the laws under which planning in NSW takes place. The Minister responsible for the Act is the Minister for Planning.

The proposal will require approval under Part 4 (Development Assessment) of the EPA Act.

1.3.2. NSW *Biodiversity Conservation Act 2016*

The purpose of the BC Act s to maintain a healthy, productive and resilient environment for the greatest well-being of the community, now and into the future, consistent with the principles of ecologically sustainable development.

A number of objectives have been written into the Act, including:

- the conservation of biodiversity at bioregional and State scales
- the establishment of a framework to avoid, minimise and offset the impacts of proposed development and land use change on biodiversity
- the establishment of a scientific method for assessing the likely impacts on biodiversity values of proposed development and land use change, for calculating measures to offset those impacts and for assessing improvements in biodiversity values
- the establishment of market-based conservation mechanisms through which the biodiversity impacts of development and land use change can be offset at landscape and site scales.

The BC Act provides robust tools to avoid, minimise and offset biodiversity impacts from development and clearing through the BOS (Part 6 of the Act).

The BOS applies to developments and clearing when:

- the thresholds under Part 7.1 of the Regulation are exceeded, these being:
    - the clearing of native vegetation of an area declared by Clause 7.2
    - the clearing of native vegetation on land included on the Biodiversity Values Map
- a proposed development is likely to significantly affect threatened species based on the test of significance in section 7.3 of the Act
- all state significant developments.

Where impacts on biodiversity are considered likely to occur, the biodiversity offset credits that will be required to undertake the development can be determined through use of the BAM-C. Credits can be located and purchased through consultation of the OEH Register, or by engaging a broker. The offsets payment calculator can also be used to determine the credit obligation cost which can then be transferred to the BCT.

A BDAR must be prepared by a person who has been accredited by the Environmental Agency Head to apply the BAM. Kurtis Lindsay is an accredited BAM assessor (BAAS18059).

This BDAR has been prepared under Parts 6 and 7 of this Act.

1.3.3. NSW *Fisheries Management Act 1994*

The object of this Act is to conserve, develop and share the fishery resources of the State for the benefit of present and future generations. In particular, the Act aims to:

a) conserve fish stocks and key fish habitats
b) conserve threatened species, populations and ecological communities of fish and marine vegetation
c) promote ecologically sustainable development, including the conservation of biological diversity.

No waterways are to be directly or indirectly affected by the proposal. As such, this Act is not applicable to the proposed development.

1.3.4. NSW *Coastal Management Act 2016*

The objectives of the CM Act are to manage the coastal environment of NSW in a manner consistent with the principles of ecologically sustainable development for the social, cultural and economic well-being of the people of the State. The following objective is relevant to biodiversity:

- to protect and enhance natural coastal processes and coastal environmental values including natural character, scenic value, biological diversity and ecosystem integrity and resilience.

The CM Act defines the coastal zone as the area of land comprised of the following coastal management areas:

(a) the coastal wetlands and littoral rainforests area
(b) the coastal vulnerability area
(c) the coastal environment area
(d) the coastal use area.

The CM Act provides management objectives for each management area.

With reference to the SEPP (Coastal management) 2018 map (Figure 6 [DP&E 2020a]), and as defined in Part 2 s.5 of the CM Act, portions of the subject land [and property] are mapped as:

- Coastal Wetlands
- Proximity Area for Coastal Wetlands.

No Littoral Rainforest occurs within the area investigated, nor is it mapped as a Coastal Environment Area or Coastal Use Area.

With reference to SEPP (Coastal Management) 2018 (NSW Government 2018), Clause 10 states:

1) The following may be carried out on land identified as “coastal wetlands” or “littoral rainforest” on the Coastal Wetlands and Littoral Rainforests Area Map only with development consent—
   a) the clearing of native vegetation within the meaning of Part 5A of the *Local Land Services Act 2013*,
   b) the harm of marine vegetation within the meaning of Division 4 of Part 7 of the *Fisheries Management Act 1994*,
   c) the carrying out of any of the following—
      (i) earthworks (including the depositing of material on land),
      (ii) constructing a levee,
      (iii) draining the land,
      (iv) environmental protection works,
   d) any other development.
2) Development for which consent is required by subclause (1), other than development for the purpose of environmental protection works, is declared to be designated development for the purposes of the Act.
4) A consent authority must not grant consent for development referred to in subclause (1) unless the consent authority is satisfied that sufficient measures have been, or will be, taken to protect, and where possible enhance, the biophysical, hydrological and ecological integrity of the coastal wetland or littoral rainforest.
5) Nothing in this clause requires consent for the damage or removal of a priority weed within the meaning of clause 32 of Schedule 7 to the *Biosecurity Act 2015*.

Clause 11 of this SEPP requires that:

1) Development consent must not be granted to development on land identified as “proximity area for coastal wetlands” or “proximity area for littoral rainforest” on the Coastal Wetlands and Littoral Rainforests Area Map unless the consent authority is satisfied that the proposed development will not significantly impact on:

    a) the biophysical, hydrological or ecological integrity of the adjacent coastal wetland or littoral rainforest, or
    b) the quantity and quality of surface and ground water flows to and from the adjacent coastal wetland or littoral rainforest.

The proposed development is located within the ‘Coastal Wetland Proximity Area’ and within a mapped ‘Coastal Wetland’ area.

Harming or removing native vegetation, draining the land, constructing a levee, environmental protection works and all other development within a mapped coastal wetlands (or littoral rainforests area) requires consent, and is generally designated development, meaning that a environmental impact statement must be prepared to support any development application. This process requires a BDAR (this document) to accompany the application.

The proposed development is conducive to the requirements of the ‘Coastal Wetland Area’. All stormwater runoff will be appropriately managed on site in accordance with the recommendations of an accredited stormwater engineer. All weeds on the subject land will be eradicated and managed on an on-going basis. All the highest quality, habitat complex native vegetation on the subject property will be retained and managed under a Biodiversity Management Plan. This incorporates all the area mapped ‘Coastal Wetland’.

1.3.5. Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*

Under this Act an action will require approval from the Federal Minister if the action has, will have, or is likely to have, a significant impact on a MNES, such as:

- listed threatened species and communities
- listed migratory species
- wetlands of international importance protected under international agreements
- Commonwealth marine environment
- world heritage properties
- national heritage places.

Where applicable, the assessment criteria relevant to this Act must be drawn upon to determine whether there would be a significant effect on these listed places and/or species and hence whether referral to the Federal Minister is required.

No further assessment of MNES is considered necessary for this proposal. This is owing to the small scale of development impact and the lack of EPBC Act listed threatened species, populations or communities impacted by the proposed development.

1.4. Application of BOS

The BOS applies when the following thresholds are exceeded:

a) the clearing of native vegetation of an area declared by Clause 7.2 of the Regulation

    The minimum lot size is used to determine the clearing threshold. The minimum lot size is usually prescribed by the LEP. Where that does not exist the actual lot size is used.

    With reference to the Pittwater LEP 2014 (NSW Government 2019), the minimum lot size for the subject land is 550 m^2. As such, the clearing threshold is 0.25 ha (the smallest category).

However, section 7.2(2)(a) of the Regulation stipulates that if an environmental planning instrument under the EPA Act (i.e. LEP) prescribes a standard minimum lot size, then this is the applicable minimum lot size.

Therefore, given that the proposed development is to result in the removal/disturbance of less than 0.88 ha of native vegetation, this threshold is exceeded, and the BOS applies under this trigger.

b) the clearing of native vegetation on land included on the BVMTT.

With reference to the BVMTT prepared by OEH (DP&E 2020b), he south-western limits of the subject land, particularly that affected by the extension of Lorikeet Grove, and the proposed walking track to the south of Lorikeet Grove has been mapped as containing areas of biodiversity value (Figure 10). As such, this threshold is exceeded, and the BOS applies under this trigger.

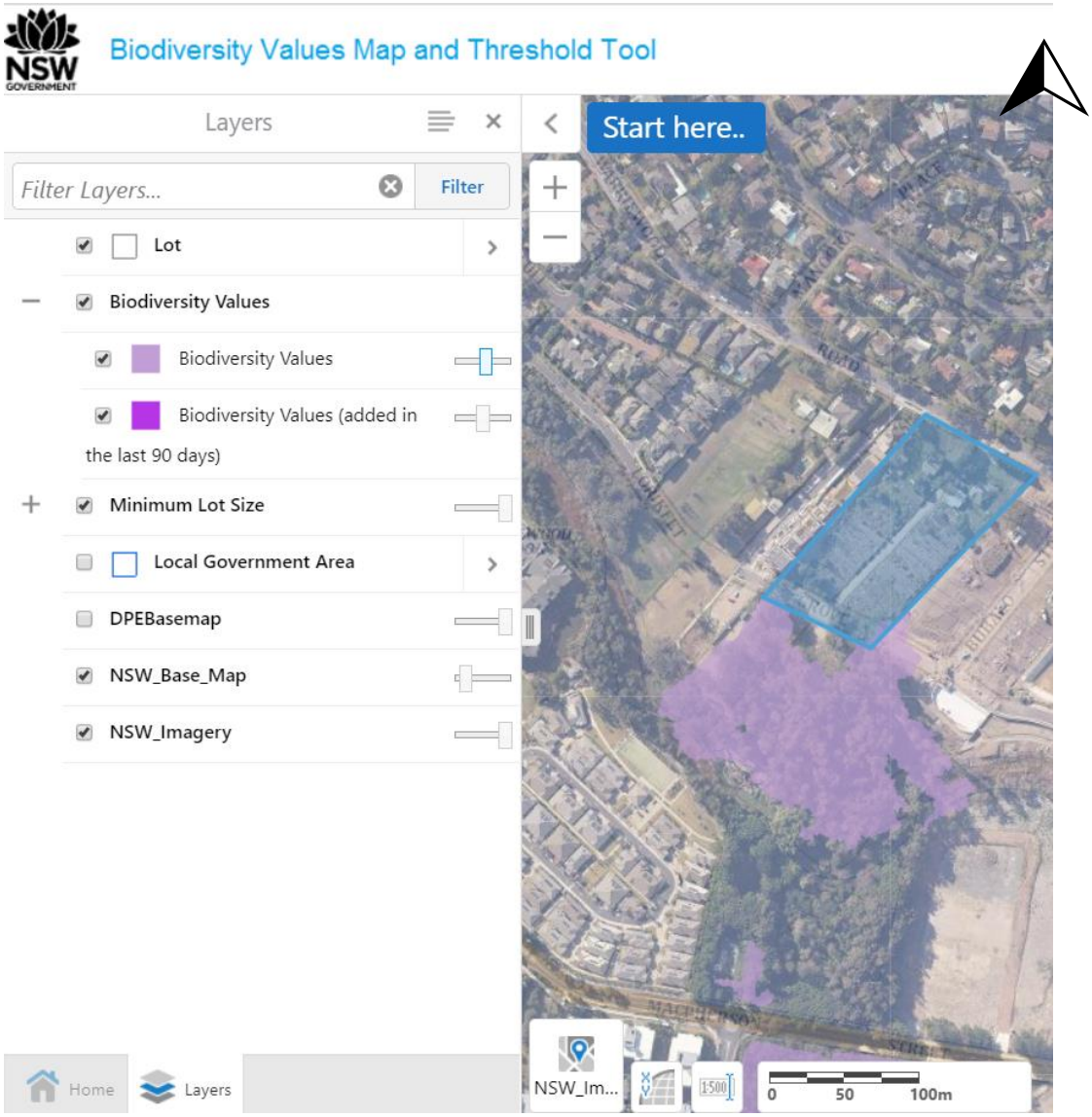

Figure 10. Biodiversity Values Map in relation to the subject land (as of 11.3.2020)

2. Methodology

2.1. Information sourced

The following databases, reports, mapping and spatial information systems were referenced as part of this assessment:

- OEH's BioNet Atlas (NSW Government 2020b)
- OEH's BioNet Vegetation Classification database (NSW Government 2020c)
- OEH's Threatened Biodiversity Data Collection database (NSW Government 2019b)
- DAWEs PMST (DAWE 2019a)
- the Royal Botanic Gardens and Domain Trust flora database (2019)
- the native vegetation of the Sydney Metropolitan Area (NSW Government 2016b)
- NSW Imagery/aerial photography (NSW Spatial Services 2018).

2.2. Site survey

A field investigation of the subject land was carried out by Kurtis Lindsay (B.Sc. HONS) [botanist] on 10 – 11 February 2020 and again on 12 March 2020. Deryk Engel (B.Env.Sc.HONS) [zoologist] on 20 January, and 4 February 2020. The weather conditions experienced during these visits were warm, humid (>28°C), overcast skies (60-100% cloud cover) and still conditions.

Access across most of the subject land was made possible via a central track. Accessibility to the rest of the subject land was variable. The subject land is densely vegetated with weeds, including dense *Lantana spp*. There are also bodies of water located on either side of the central track that are of unknown depth as they are densely vegetated with vegetative growth (weeds). The location, and depth of this water is hard to determine because of the overgrown condition of the vegetation. Further to this, there has been extensive dumping of artificial wastes, and collapse of historically constructed buildings and glass houses with shards of metal and glass protruding throughout the site. Much of this is covered in vegetation so is difficult to detect, even when walking around.

2.2.1. Botanical

2.2.1. (a) Vegetation integrity plots

In line with the BAM (OEH 2017a), the assessment of the site's VI is essential. To determine this integrity, vegetation plots are established within each of the PCT's and vegetation zones present. These sites are determined with reference to aerial mapping, vegetation mapping and previous studies undertaken at, and/or near, the site. These plots are used to record vegetation composition, structure and function, which are necessary to ascertain the biodiversity values of the site through use of the BAM-C.

A standard VI plot is 0.1 ha (50 m x 20 m) and consists of recording the following:

- Composition and structure (within a 400 m^2 standard 20 m x 20 m floristic plot)
    - stratum
    - growth form
    - species name
    - cover and abundance
    - high threat exotic vegetation cover (while used to assess function this number is derived from the floristic plot).
- Functional attributes (entire plot)
    - number of large trees present
    - tree regeneration
    - stem size class
    - length of fallen logs

- five 1 m^2 sub-plots in which average litter cover and other optional groundcover components are recorded
- presence of hollow-bearing trees.

- Assessment of habitat suitability for threatened species.

Given the size of the subject land, the vegetation mapping undertaken for the region and aerial photography that covers the area investigated (OEH 2013), the following survey plots were undertaken:

- Plot A: a 55 m x 20 m VI plot within the 'native canopy (weed-infested)' zone (Figure 13). Note, this plot was sampled from vegetation located to the immediate south of the subject land, this is because the vegetation was more contiguous and accessible to sample a plot. This plot was extended by 5 m to account for the cleared pathway that dissected it.

- Plot B: a 60 m x 20 m VI plot within the 'exotic-dominant' zone (Figure 11). Note, this plot was extended by 10 m to account for the 10 m x 10 m of 'cleared/building' that occurred within the plot.

Regarding the documentation of functional attributes, these were recorded in the following way:

- number of large trees - a general survey of an additional 0.05 ha adjoining the survey plot was undertaken
- tree regeneration - a general survey of an additional 0.05 ha adjoining the survey plot was undertaken
- stem size class - a general survey of an additional 0.05 ha adjoining the survey plot was undertaken
- length of fallen logs - the floristic plot was used to gain a value then, as documented by OEH in correspondence received @ 9.59am on 9 October 2018, extrapolated to meet the 0.1 ha requirement
- litter cover - an average within the 50 m x 10 m was recorded
- hollow-bearing trees - a general survey of an additional 0.05 ha adjoining the survey plot was undertaken.

2.2.1. (b) Targeted Flora Surveys

Considering the access and safety constraints on the subject land (see 2.2), it is impossible to implement the transect methods required under the NSW Guide to Surveying Threatened Plants (NSW 2016a). In light of this, the assessing Botanist followed the 'Random Meander Method' (Cropper 1993) which involves conducting foot traverses through those sites that require investigation, during which time qualitative notes are made on the structure and floristic composition of the native vegetation present.

The 'Random Meander Method' is consistent with the stratified random sampling design as specified in section 5.1 (Stratification, sampling and replication) of the publication titled, *Threatened biodiversity survey and assessment: Guidelines for development and activities (working draft)* (DEC 2004). This method is also mentioned under sections 5.2.1 (Sampling techniques) and 5.2.7 (Targeting threatened plants) of this publication. The Random Meander Method is suitable for covering large areas and for locating any rare species (and their associated vegetation communities/habitat types) that may occur within a particular site.

2.2.2. Fauna

Experienced Zoologist, Deryk Engel (Lesryk) carried out the entire fauna survey component of this BDAR. As a supplement to Mr Engel's assessment, Kurtis Lindsay provided opportunistic species records, and habitat searches while undertaking flora assessments on site. This included the assessment of candidate species credits based on a review of the BioNet NSW Atlas records (NSW Government 2020b), literature review and consideration of the habitat requirements of those fauna species identified as potentially occurring, a targeted survey for 11 'species credit' species was undertaken by Deryk Engel (Table 3). No other species credit species were surveyed for.

In consultation with aerial photography and those plans provided, and given the disturbed character of the habitats present, no other targeted fauna investigations (e.g. call playbacks, nocturnal work) have been undertaken as part of this BDAR (refer to Section 4.1.).

A general fauna survey was conducted, the methods employed during the investigation being:

- the direct observation of those fauna species present within, or adjacent to, the subject land
- diurnal call identifications of fauna species, with all calls being identified in the field
- echolocation detection targeting insectivorous bats (microchiropterans)
- use of a Wildlife Acoustics SM2 SongMeter™ to identify vocal nocturnal species
- the identification of any indirect evidence such as tracks, scats, scratchings and diggings that would suggest the presence of a particular fauna species
- ground debris, leaf litter and tree bark searches for sheltering reptiles and amphibians
- habitat assessment
- identification of hollow-bearing trees.

Where required, a more detailed description on one or more of the survey methods employed is provided below (Table 3).

The survey methods employed, and level of effort required were generally based on the descriptions provided in the following:

- the DEC 2004 publication
- the DE survey guidelines for Australia's threatened animals (DAWE various dates).

Table 3. Survey Effort for Species Credit Fauna Undertaken by D.Engel (Lesryk)

Species Credit Species	Recommended Survey (or component thereof) from guidelines	Habitat Constraint	Method employed to target species by Lesryk during Warriewood survey
Koala (*Phascolarctos cinereus*)	Spot Assessment Technique	Habitat constraint (breeding) species - No suitable habitat identified as being present	Scat searches under those eucalypts present Direct observation of the few eucalypts present Use of SongMeter to record any Koalas broadcasting calls – no Koala calls recorded
Southern Brown Bandicoot (*Isoodon obesulus obesulus*)	In areas >5 ha: Diurnal search for suitable habitat along transects spaced at 50-100 m intervals, or quadrants to ensure area is systematically searched (2 hrs per 1 ha). Techniques can incl. trapping or spotlighting. Diurnal search for activity (i.e. scats, tracks, diggings) - 2 hrs per 1 ha. Incl. collection of scats.	Habitat constraint: Requires dense ground cover in a variety of habitats. - No suitable habitat identified as being present	Diurnal searches for activity. Small diggings consistent with those of the Long-nosed Bandicoot observed.
Squirrel Glider (*Petaurus norfolcensis*)	No specific guidelines	N/A	SongMeter to record nocturnal calls. Unit left on site for 15 nights No characteristic calls recorded. Calls of the common to abundant Sugar Glider recorded through use of this method.

Species Credit Species	Recommended Survey (or component thereof) from guidelines	Habitat Constraint	Method employed to target species by Lesryk during Warriewood survey
Large-eared Pied Bat (*Chalinolobus dwyeri*)	Within an area <50 ha the following methods are recommended: Passive acoustic detection (unattended recorders): 16 nights (4 min.).	Habitat constraint: Within 2 km of rocky areas containing caves, overhangs, escarpments, outcrops, or crevices, or within 2 km of old mines or tunnels. - No suitable habitat identified as being present	Use of two echolocation units left on site for 15 nights. Four microchiropterans confidently recorded through use of this method. In addition, three probable identifications made. Of those species confidently or probably recorded two are listed under the BC Act. No calls of this species recorded
Eastern Cave Bat (*Vespadelus troughtoni*)	**As above**	As above	As above
Southern Myotis (*Myotis macropus*)	Acoustic detection: 16 trap nights set over 4 separate nights (min.) from dusk-dawn and placed at least 50 m apart	Habitat constraint: Hollow-bearing trees within 200 m of riparian zone. Bridges, caves or artificial structures within 200 m of riparian zone. Waterbodies - incl. rivers, creeks, billabongs, lagoons, dams and other waterbodies on or within 200 m of the site. - No suitable habitat identified as being present	As above In addition, one detector place in vicinity western drainage line No suitable cave or cave-substitute habitat on-site
Bush Stone Curlew (*Burhinus grallarius*)	Diurnal search: flush species by walking through potential habitat.	Coarse woody debris	Diurnal searches of site – 20-minute blocks of bird surveying including stationary and walking surveys SongMeter to record nocturnal calls. No characteristic calls recorded. Calls of other vocal nocturnal birds recorded.
Green & Golden Bell Frog (*Litoria aurea*)	Call detection.	Semi-permanent/ephemeral wet areas Within 1km of wet areas|Swamps Within 1km of swamp|Waterbodies Within 1km of waterbody	SongMeter to record nocturnal calls. No characteristic calls recorded. Calls of the common to abundant frogs recorded through use of this method. Note extensive rain experienced by region during survey period.
Green-thighed Frog (*Litoria brevipalmata*)	Call detection.	As above	As above
Giant Burrowing Frog (*Heleioporus australiacus*)	Call detection.	Wet areas and soaks on sandstone.	As above but no suitable habitat present within development area

Species Credit Species	Recommended Survey (or component thereof) from guidelines	Habitat Constraint	Method employed to target species by Lesryk during Warriewood survey
Red-crowned Toadlet (*Pseudophryne australis*)	Call detection.	Wet areas and soaks on sandstone.	As above but no suitable habitat present within development area

2.2.2. (a) Echolocation

Anabat Express™ echolocation detectors were used to determine the presence of any microchiropterans that may be occupying or utilising the subject land. These detectors were placed within the subject land, their locations being shown on (Figure 11). For reference, the GPS coordinates of these locations are:

- Unit #2 - Easting[E]342281; Northing[N]6271270; within the central portion of property
- Unit #4 - E342144; N6271162; south-western corner portion of the site.

Being programmable and waterproof, the detectors were set to record microchiropteran calls between sunset and sunrise[3]. The units were placed out on the site on 20 January 2020 and collected 16 days later.

The sites selected for echolocation were chosen as they corresponded to those habitats likely to be used by microchiropterans during their foraging and dispersal periods (i.e. woodlands and habitat ecotones).

Any calls recorded were analysed in house using AnalookW.exe computer software.

2.2.2. (b) SongMeter

To identify those vocal nocturnal species that occupy or may utilise the subject land on occasion, a Wildlife Acoustics SongMeter™ was employed (Figure 11). For reference, the GPS coordinates of the site where this unit was located is E342234; N6271189 (unit place south-eastern 'corner' of property).

This device was set to record calls during three scheduled intervals, these being from:

- 2015 to 2215
- 2330 to 0130
- 0330 to 0500.

The SongMeter was placed out on the site on 20 January 2020 and collected 16 days later.

Calls were analysed in-house using Wildlife Acoustics Kaleidoscope Pro 5.

[3] Sunset during the time of survey period was at 2005 (dusk 2033), with sunrise being about 0614 (dawn 0546).

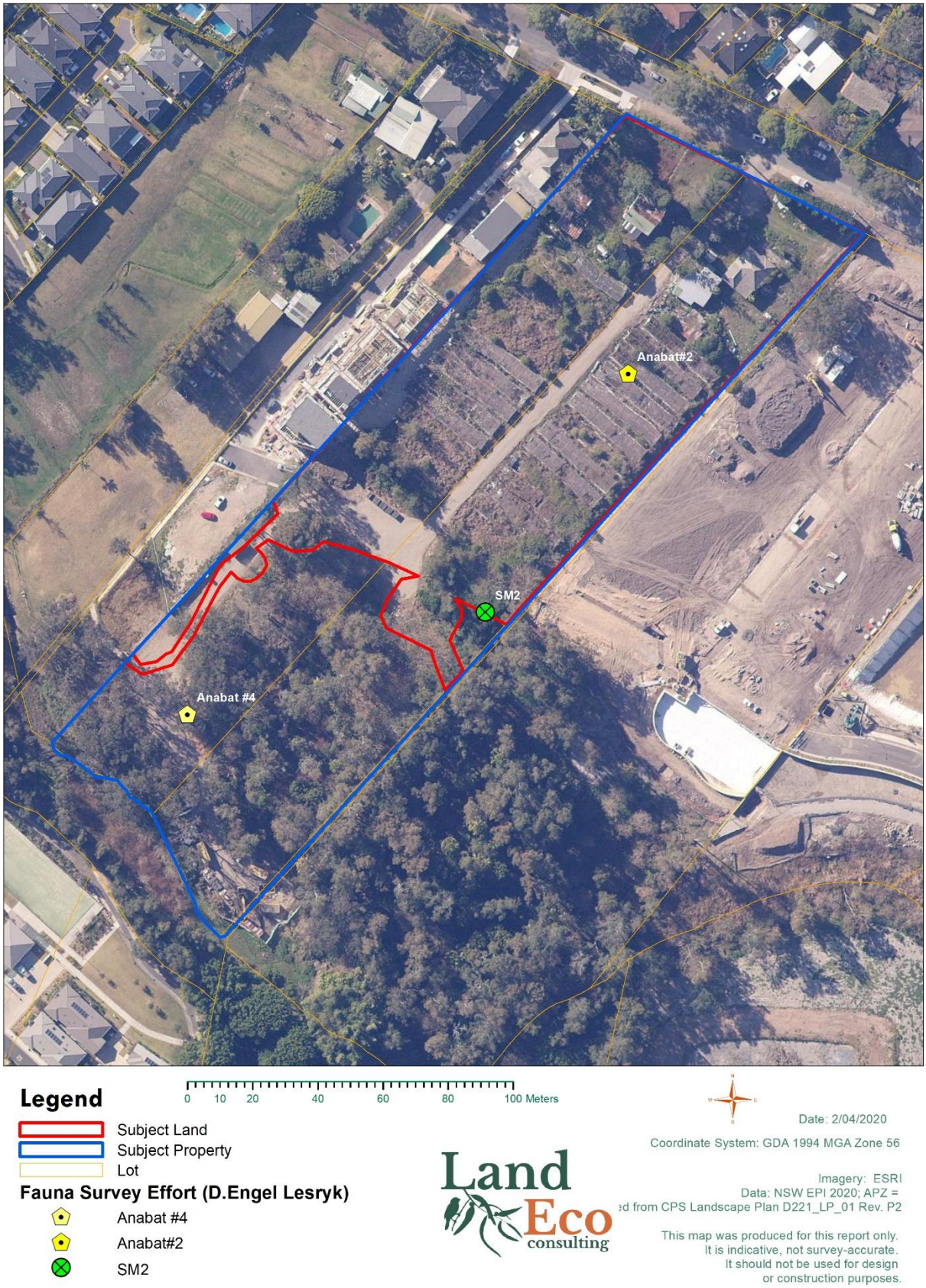

Figure 11. Fauna Survey Effort undertaken by D.Engel (Lesryk) in January – February 2020

2.3. Survey effort

By the completion of the field investigation, the following effort was accumulated:

- Approximately four hours of active searches, this including ground debris and bird surveys. Given the physical condition and size of the area investigated, this length of time is considered more than adequate when endeavouring to determine the diversity of native species present, their associated habitats and the conservation status of each of these.
- Echolocation detection – 240 hours
- Audible detection – 82.5 hours.
- Flora surveys – 18 hours

2.4. Limitations

Access to all parts of the subject land was not possible owing to physical accessibility constraints (see section 2.2).

No adverse weather conditions were encountered during either site investigation.

Given the January – March timing of the field investigations, the above ground presence of some plants (i.e. orchids) was not evident.

While live trapping was not a component of this study, it is not considered that the scientific rigour of the field inspection was compromised.

Not all animals and plants can be fully accounted for within any given study area. The presence of threatened species is not static; it changes over time, often in response to longer term natural forces that can, at any time, be dramatically influenced by human-made disturbances.

In order to overcome the above limitations:

a) database searches were conducted for threatened species, populations and ecological communities known to occur within the region
b) the precautionary principle was adopted where necessary (i.e. suitable habitat for those threatened species known to occur, or that have been previously recorded within the surrounding locality, was identified).

This report is based upon data acquired from the current investigation; however, it should be recognised that the data gathered is indicative of the environmental conditions of the site at the time the field work was conducted.

3. Results

3.1. Historical vegetation mapping

Vegetation mapping prepared for the 'Vegetation of the Sydney Metropolitan Region 3.0'(NSW Government 2016b) (Figure 12) indicated the following ecological communities occur within the study area:

- S_F0W02: Coastal Flats Swamp Mahogany Forest
- S_F0W03: Coastal Flats Swamp Mahogany Forest
- Urban_E/N: Urban Exotic/Native
- Weed_Ex: Weeds and Exotics.

This mapping was undertaken at a low level of accuracy and was based off aerial photographic interpretation with little ground truthing. While the mapping is broadly indicative site assessment was necessary to identify the true type and extent of each vegetation community.

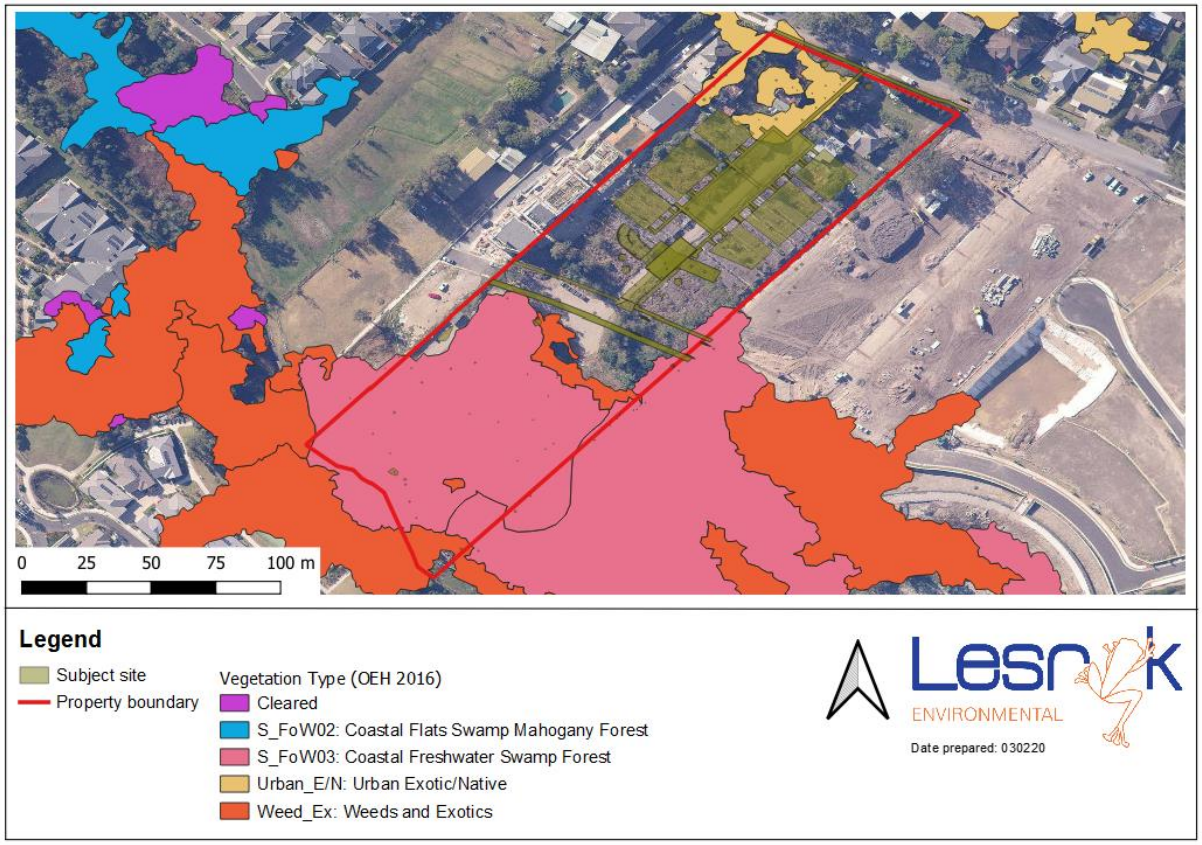

Figure 12. Historical vegetation mapping of the subject land (NSW Government 2016b)

3.2 Native vegetation on site

With reference to aerial photography that covers the subject land, and the findings of the current investigation, the majority of the subject land is cleared of remnant vegetation (Figure 13).

The botanical survey identified one vegetation community present within the subject land:

- S_FoW02: Coastal Flats Swamp Mahogany Forest

In order to arrive to this decision, the floristic characteristics of each candidate community were compared.

Coastal Flats Swamp Mahogany Forest corresponds to Plant Community Type (PCT) *1795: Swamp Mahogany / Cabbage Tree Palm - Cheese Tree - Swamp Oak tall open forest on poorly drained coastal alluvium in the Sydney basin.*

The entire extent of native canopy trees and shrubs on the subject property corresponds to the threatened ecological community '*Swamp sclerophyll forest on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions*' which is listed as an EEC under BC Act (NSW Scientific Committee 2005). It is not listed under the EPBC Act.

The parts of the subject land that are dominated by exotic canopy, shrub or ground layer do not qualify as this EEC, however these areas are still mapped as PCT1795 (albeit poor quality) in accordance with the BAM as there was no other suitable PCT to assign this vegetation.

The overall condition of the vegetation across the subject property was extremely poor owing to historical land use and intense weed infestation.
Land Eco mapped the vegetation across the subject property into two distinct zones, based on the extent of historical clearing, historical ornamental/agricultural planting, and the level of weed infestation (Figure 13).
They were:

- PCT1795 Exotic Dominant (poor condition)
- PCT1795 Native Canopy Weed Infested (low condition)

There were no areas of vegetation on the subject land which were of a condition that was

Within the subject land, only two condition classes were present:

- Exotic Dominant (poor condition)
- Native Canopy Weed Infested (low condition)

A description of each vegetation zone has been provided in Sections 3.1.1.and 3.1.2., respectively.

A BAM VIS plot was sampled within each zone.

The results of the BAM VIS plots sampled have been provided as data sheets in Appendix 1.

None of the species recorded on the subject land are threatened, nor of regional, State or National conservation significance.

Figure 13. Vegetation Zones Mapped Across the Subject land

3.2.1. Assigning PCT

The results of an analysis of the floristic and landscape characteristics of each 'candidate PCT' are presented (Table 4).

Table 4. Process for Determining Candidate PCT

Candidate PCT	1232: Swamp Oak-Prickly Tea-tree-Swamp Paperbark Swamp Forest on Coastal Floodplains, Sydney Basin and South East Corner S_FoW03: Coastal Freshwater Swamp Forest		1795: Swamp Mahogany swamp sclerophyll forest on coastal lowlands of the Sydney Basin Bioregion and South East Corner Bioregion. S_FoW02: Coastal Flats Swamp Mahogany Forest	
ESTIMATED CLEARED VALUE (%)	95%		50%	
TEC STATUS	Endangered		Endangered	
TEC NAME	Swamp Oak Floodplain Forest		Swamp Sclerophyll Forest	
	NSW Government 2016b	Subject land	NSW Government 2016b	Subject land
VEGETATION FORMATION	Forested Wetlands	Present	Forested Wetlands	Present
VEGETAION CLASS	Coastal Swamp Forests	Present	Coastal Swamp Forests	Present
CHARACTERISTIC CANOPY FLORA SPECIES	***Casuarina glauca;*** *Melaleuca quinquenervia;*	1 of 2 species present (50%)	***Eucalyptus robusta;*** ***Casuarina glauca****;*	2 of 2 species present (100%)
CHARACTERISTIC MIDSTRATUM FLORA SPECIES	*Myoporum spp.;* ***Melaleuca ericifolia;*** *Melaleuca styphelioides;*	1 of 3 species present (33%)	*Elaeocarpus reticulatus;* *Glochidion ferdinandi* ***Livistona australis;*** ***Melaleuca linariifolia;*** *Melaleuca styphelioides;* *Pittosporum undulatum;* *Acacia longifolia;* *Dodonaea triquetra;* *Homalanthus populifolius;*	2 of 9 (22%)
CHARACTERISTIC GROUND FLORA SPECIES	***Juncus kraussii;*** *Samolus repens;* *Sarcocornia quinqueflora;* *Suaeda australis;* *Baumea juncea;* ***Cynodon dactylon;*** *Alternanthera denticulata;* *Carex appressa;* *Centella asiatica;* ***Commelina cyanea;*** ***Phragmites australis;***	4 of 11 (36%)	*Alternanthera denticulata;* *Blechnum camfieldii;* ***Calochlaena dubia;*** *Centella asiatica;* ***Commelina cyanea*** *;Entolasia marginata;* ***Gahnia clarkei;*** *Hydrocotyle peduncularis;* *Hypolepis muelleri;* *Oplismenus aemulus;* *Oplismenus imbecillis;* *Phragmites australis;* *Pteridium esculentum;* *Viola hederacea;*	3 of 14 (21%)
Summary	The main component that distinguishes PCT 1232 from PCT 1795 is the dominance of *Eucalyptus robusta. Eucalyptus robusta* occurs throughout the subject property along with *Livistonia australis* and *Casuarina glauca*. All are components of PCT 1795. In contrast, the characteristic canopy of PCT1232 only contains *Casuarina glauca* and a species of paperbark which is absent from the subject property. The subject land itself was found to contain more groundcover species typical of PCT1232, however, this difference of a couple of species is insignificant. It is expected that more characteristic groundcover species of PCT1795 would be found if the surveys of the vegetation on the subject property extended further outside of the subject land which has been historically degraded and weed infested.			

3.2.2. Vegetation Zones

A description of the floristics and habitat features of the two vegetation zones present on the subject land is presented (Table 5).

Table 5. Description of the two vegetation zones on the Subject land

Zone Name	PCT 1795 Weed & Exotic Dominant	PCT 1795 Canopy Remnant
Occurrence in Subject land	Found throughout the subject land	Restricted to the south and north-east corner of the subject land
Area within subject land	0.68 ha	0.20
Dominant Species Canopy	Native *Casuarina glauca 2.5%*	Native *Casuarina glauca 15%* *Eucalyptus robusta 12%*
	Exotic *Acer negundo 45%* *Ligustrum lucidum 20%* *Cinnamomum camphora 15%*	Exotic *Erythrina sykesii 78%* *Erythrina crista-galli 15%*
Dominant Species Midstratum	Native Nil	Native *Melaleuca ericifolia 0.1%* *Livistona australis 0.1%*
	Exotic *Lantana camara 70%* *Cestrum parqui 8%* *Ligustrum sinense 5%* *Phytolacca octandra 3%* *Sida rhombifolia 2%* *Gomphocarpus physocarpus 2%*	Exotic *Ligustrum lucidum 15%* *Ligustrum sinense 12%* *Lantana camara 5%* *Cestrum parqui 3%* *Ricinus communis 2%* *Ochna serrulata 1%*
Dominant Species Groundcover	Native *Commelina cyanea 2%* *Calochlaena dubia 2%* *Cyperus polystachyos 1%* *Typha orientalis 0.1%* *Solanum americanum 0.1%* *Geranium solanderi 1.5%* *Cyperus gracilis 0.1%* *Rumex brownii 0.1%*	Native *Cynodon dactylon 2%* *Eriochloa procera 2%* *Microlaena stipoides 1%* *Gahnia spp. 2%* *Phragmites ausralis 1%* *Cyperus polystachyos 0.1%*
	Exotic *Ipomoea indica 30%* *Cenchrus clandestinum 12%* *Ageratina Adenophora 10%* *Araujia sericifera 10%* *Paspalum dilatatum 2%* *Asparagus aethiopicus 1.5%*	Exotic *Ipomoea indica 30%* *Araujia sericifera 10%* *Ageratina adenophora 10%* *Acetosa sagittata 3%* *Colocasia esculenta 0.2%*
Leaf litter	Dense >95%	Dense >95%
Coarse Woody Debris	Sparse	Abundant
Tree Hollows	None	None

3.2.3. Patch size

The patch size area of the native vegetation contiguous with the subject land is 190 ha.

Extensive native woody native vegetation is present within ≤ 30m of the vegetation on the subject land. This extensive vegetation patch is associated with the Narrabeen Creek which drains south-east through the subject property (outside of the subject land).

3.2.4. Vegetation integrity

Through use of the BAM-C the current VI for each zone of PCT 1795 has been determined. The composition, structure and function attributes used in the BAM-C to calculate the VIS are provided in Table 6.

Table 6. Vegetation Integrity, Composition and Structure scores for the Vegetation Zones on the Subject land

Vegetation Zone	**VIS**	**Composition and structure**			**Function**	
PCT 1795 Native Canopy Weed Infested	**39.5**	**Growth form groups**	**Sum values**	**Sum of cover**	**Attribute**	
		Tree	2	27	Number of large trees[4]	2
		Shrub	1	0.1	Tree regeneration	Present
		Grass and grass like	8	8.7	Tree stem size classes (CM)	5-9 2-29 30-49
		Forb	0	0.0	Total length of fallen logs (m)	78
		Fern	0	0	Litter cover	96.6
		Other	2	0.3	Hollow bearing trees	0
		Score	32.8	24.9	High threat exotic vegetation cover	100
					Score	**77.8**
		Composition and structure			**Function**	
PCT 1795 Exotic Dominant	**18.1**	**Growth form groups**	**Sum values**	**Sum of cover**	**Attribute**	
		Tree	1	2.5	Number of large trees	0
		Shrub	0	0	Tree regeneration	Present
		Grass and grass like	4	1.3	Tree stem size classes (cm)	5-9
		Forb	6	3.8	Total length of fallen logs (m)	11
		Fern	0	0	Litter cover	98.6
		Other	1	2	Hollow bearing trees	0
		Score	33.3	5.1	High threat exotic vegetation cover	100
					Score	35.1

[4] The large tree threshold for PCT 1795 is >50 cm DBH.

To measure the direct impact on native vegetation and threatened species habitat, the change, or loss, in the VI score must be calculated. This is to be undertaken for each vegetation zone.

The change in VI is the difference between the VI scores determined above and the expected future VI score. The future VI score is determined by accounting for the impacts of development.

When taking into consideration the impacts of the proposed development, it has been assumed that, all of the mapped Swamp Sclerophyll Forest is to be removed from the subject land. As such, the following was used in determining the future VI for the subject land when entering values into the BAM-C:

- The composition and structure values for will reduce to 0.
- The composition and structure values for tree, shrub, grass and grass-like, forb, fern and other will reduce to, or remain at (where relevant), to 0.
- The number of large trees will remain at 0.
- Leaf litter will reduce to 0%.
- Coarse woody debris will remain at 0 m.
- Stem size classes is to reduce to 0.
- Regeneration stems (i.e. <5 cm DBH) is to remain at absent.
- The high threat exotic vegetation cover is to reduce to 0.

Based on the results of the BAM-C, the future VIS PCT 1795 (both zones) will be zero (0) on the subject land, post development.

3.2. Fauna recorded

By the completion of the field investigation 13 mammals (including three introduced), 49 birds (including three introduced), four reptiles and four amphibians had been detected within, or in close proximity to, the subject land. A number of introduced animals were also recorded. For reference, those species recorded, and their detection methods, have been provided in Table 7.

Of those native animals recorded or indirectly identified, three are listed under the Schedules to the BC Act, these being the:

- Little Bent-winged Bat (*Miniopterus australis*) - listed as vulnerable
- Large Bent-winged Bat (*Miniopterus orianae oceanensis*) - vulnerable
- Barking Owl (*Ninox connivens*) - vulnerable.

No fauna species listed, or currently being considered for listing, under the EPBC Act was recorded.
Table 7. Fauna species recorded

Key
C - Confident Identification. Small possibility of confusion of calls with those of other bat species.
P - Probable Identification. Some possibility of confusion of calls with those of other bat species.

Table 7. Fauna recorded on, or in the vicinity of, the Subject Property

Species	Status	Method of detection
MAMMALS		
Long-nosed Bandicoot (*Perameles nasuta*)	Not listed	Characteristic diggings observed
Sugar Glider (*Petaurus breviceps*)	Not listed	SongMeter
Gould's Wattled Bat (*Chalinolobus gouldii*)	Not listed	Echolocation (C)
Chocolate Wattled Bat (*Chalinolobus morio*)	Not listed	Echolocation (P)
Eastern Broad-nosed Bat (*Scotorepens orion*)	Not listed	Echolocation (C)
Eastern Forest Bat (*Vespadelus pumilus*)	Not listed	Echolocation (P)
Little Forest Bat (*Vespadelus vulturnus*)	Not listed	Echolocation (C)
Little Bent-winged Bat (*Miniopterus australis*)	Vulnerable (BC Act)	Echolocation (C)
Large Bent-winged Bat (*Miniopterus orianae oceanensis*)	Vulnerable (BC Act)	Echolocation (P)
Swamp Wallaby (*Wallabia bicolor*)	Not listed	Scat; Observed
*European Red Fox (*Vulpes vulpes*)	Introduced Pest	Scat
* Domestic Dog (*Canis familiaris*)	Introduced	Scat
* Rabbit (*Oryctolagus cuniculus*)	Introduced Pest	Observed
BIRDS		
Australian Brush Turkey (*Alectura lathami*)	Not listed	Observed
Brown Goshawk (*Accipiter fasciatus*)	Not listed	Observed
Grey Goshawk (*Accipiter novaehollandiae*)	Not listed	Observed
Pacific Black Duck (*Anas superciliosa*)	Not listed	Observed
* Spotted Dove (*Streptopelia chinensis*)	Introduced	Observed
Crested Pigeon (*Ocyphaps lophotes*)	Not listed	Observed
Australian White Ibis (*Threskiornis moluccus*)	Not listed	Observed
Masked Lapwing (*Vanellus miles*)	Not listed	SongMeter
Dusky Moorhen (*Gallinula tenebrosa*)	Not listed	Observed
Buff-banded Rail (*Gallirallus phillippensis*)	Not listed	Observed
Sulphur-crested Cockatoo (*Cacatua galerita*)	Not listed	Observed
Rainbow Lorikeet (*Trichoglossus haematodus*)	Not listed	Heard calling

Species	Status	Method of detection
Scaly-breasted Lorikeet (*Trichoglossus chlorolepidotus*)	Not listed	Observed
Eastern Koel (*Eudynamys orientalis*)	Not listed	Heard calling
Southern Boobook (*Ninox novaeseelandiae*)	Not listed	SongMeter
Barking Owl (*Ninox connivens*)	Vulnerable (BC Act)	SongMeter
Laughing Kookaburra (*Dacelo novaeguineae*)	Not listed	Heard calling, SongMeter
Dollarbird (*Eurystomus orientalis*)	Not listed	Observed
Shining Bronze Cuckoo (*Chrysococcyx lucidus*)	Not listed	Observed
Superb Fairy-wren (*Malurus cyaneus*)	Not listed	Observed
Variegated Fairyw-wren (*Malurus lamberti*)	Not listed	Observed
White-browed Scrubwren (*Sericornis frontalis*)	Not listed	Observed
Brown Gerygone (*Gerygone mouki*)	Not listed	Observed
Yellow Thornbill (*Acanthiza nana*)	Not listed	Observed
Brown Thornbill (*Acanthiza pusilla*)	Not listed	Observed
Spotted Pardalote (*Pardalotus punctatus*)	Not listed	Observed
Little (Brush) Wattlebird (*Anthochaera chrysoptera*)	Not listed	Observed
Lewin's Honeyeater (*Meliphaga lewinii*)	Not listed	Observed
Brown Honeyeater (*Lichmera indistincta*)	Not listed	Observed
Eastern Whipbird (*Psophodes olivaceus*)	Not listed	Observed
White-cheeked Honeyeater (*Phylidonyris niger*)	Not listed	Observed
Black-faced Cuckoo-shrike (*Coracina novaehollandiae*)	Not listed	Observed
Pied Currawong (*Strepera graculina*)	Not listed	Observed
Grey Butcherbird (*Cracticus torquatus*)	Not listed	Observed
Australian Magpie (*Cracticus tibicen*)	Not listed	Observed
Australasian Figbird (*Sphecotheres vieilloti*)	Not listed	Observed
Grey Fantail (*Rhipidura albiscapa*)	Not listed	Observed
Rufous Fantail (*Rhipidura rufifrons*)	Migratory (EPBC Act)	Observed
Willie Wagtail (*Rhipidura leucophrys*)	Not listed	Observed
Australian Raven (*Corvus coronoides*)	Not listed	Observed
Magpie-lark (*Grallina cyanoleuca*)	Not listed	Observed
Eastern Yellow Robin (*Eopsaltria australis*)	Not listed	Observed
Silvereye (*Zosterops lateralis*)	Not listed	Observed
* Red-whiskered Bulbul (*Pycnonotus jocosus*)	Introduced	Observed
* Common Myna (*Sturnus tristis*)	Introduced	Observed
Red-browed Finch (*Neochmia temporalis*)	Not listed	Observed
Welcome Swallow (*Hirundo neoxena*)	Not listed	Observed
* House Sparrow (*Passer domesticus*)	Introduced	Observed
Mistletoebird (*Dicaeum hirundaceum*)	Not listed	Observed
REPTILES		
Eastern Water Skink (*Eulamprus quoyii*)	Not listed	Observed
Bar-sided Forest Skink (*Eulampus tenuis*)	Not listed	Observed
Pale-flecked Sunskink (*Lampropholis guichenoti*)	Not listed	Observed
Eastern Water Dragon (*Intellagama lesueurii*)	Not listed	Observed
AMPHIBIANS		
Brown-striped Frog (*Limnodynastes peronii*)	Not listed	Heard calling, SongMeter
Dwarf Tree frog (*Litoria fallax*)	Not listed	Observed; Heard calling
Peron's Tree Frog (*Litoria peronii*)	Not listed	Heard calling, SongMeter
Common Eastern Froglet (*Crinia signifera*)	Not listed	Observed; Heard calling

4. Habitat suitability for threatened species

Based on the results of the BAM-C a list of ecosystem credit species and species credit species that are associated with PCT 1795 has been derived. Table 8 provides a list of the ecosystem credit species while Table 9 tabulates the species credit species.

In accordance with Step 3 (s.6.4.1.17(a)) of the BAM (OEH 2017a) a consideration of whether those candidate species credit species listed in Table 9 were likely to occur was made. This was based on the carrying out of a field assessment, this identifying the habitat constraints or microhabitats on the subject land, and the determination that the habitat(s) present are substantially degraded such that the species in Table 9 are unlikely to utilise the subject land (or specific vegetation zones).

The justification for the inclusion or exclusion of each species listed in Tables 8 and 9 is provided within each of these.

4.2. Threatened species survey

An analysis of habitat features present on the subject land, against the suite of ecosystem credit species predicted in the BAM-C and additional species historically recorded within 10km of the subject land (BioNet Atlas records NSW Government 2020b) revealed a diverse suite of ecosystem credit species with potential to occur on the subject land. None of the predicted species were rule-out (Table 8).

Table 8. Ecosystem credits species predicted to occur in the subject land

Species	Assumed Present	Reason
Australian Painted Snipe *Rostratula australis*	Yes	Suitable vegetated wetland habitat albeit this species would only occur as a vagrant.
Barking Owl *Ninox connivens*	Confirmed	Species confirmed to forage within, or fly over, the subject land.
Black Bittern *Ixobrychus flavicollis*	Yes	Suitable vegetated wetland habitat for roosting and breeding.
Black-chinned Honeyeater *Melithreptus gularis gularis* (eastern subspecies)	Yes	Suitable foraging resources *Eucalyptus robusta* and mistletoes albeit this species would only occur as a vagrant.
Dusky Woodswallow *Artamus cyanopterus cyanopterus*	Yes	Suitable habitat for foraging and nesting amongst *Eucalyptus robusta.*
Large Bentwing-bat *Miniopterus orianae oceanensis*	Confirmed	Species confirmed to forage within, or fly over, the subject land.
Eastern Freetail-bat *Micronomus norfolkensis*	Yes	Species may forage within, or fly over, the subject land.
Eastern Osprey Pandion cristatus	Yes	Likely to perch or roost in tall trees within the subject land.
Glossy Black-Cockatoo Calyptorhynchus lathami (Foraging)	Yes	May forage or roost within the subject land. Presence of abundant *Casuarina* for foraging.
Grey-headed Flying-fox *Pteropus poliocephalus*	Yes	Species likely to forage within, or fly over, the subject land.
Koala *Phascolarctos cinereus*	Yes	Suitable feed trees, *Eucalyptus robusta*. No recent proximal records, but connectivity to larger remnants may allow this species to occur at a point in the future.
Little Bentwing-bat *Miniopterus australis*	Confirmed	Species confirmed present
Little Eagle *Hieraaetus morphnoides*	Yes	May roost, perch or hunt prey within the subject land.
Little Lorikeet *Glossopsitta pusilla*	Yes	Suitable foraging resources *Eucalyptus robusta* and mistletoes.
Masked Owl *Tyto novaehollandiae*	Yes	Likely to roost and hunt in the subject land.
Powerful Owl *Ninox strenua*	Yes	Likely to roost and hunt in the subject land.
Regent Honeyeater *Anthochaera phrygia*	Yes	Suitable foraging habitat in *Eucalyptus robusta* and mistletoes.

Species	Assumed Present	Reason
Rose-crowned Fruit-Dove *Ptilinopus regina*	Yes	Suitable foraging habitat in *Livistonia australis* and soft-fruited weeds (e.g. Privet and Camphor). May nest in dense vegetated areas.
Rosenberg's Goanna *Varanus rosenbergi*	Yes	Suitable foraging habitat. No suitable nesting habitat, requires termite mounds or caves.
Scarlet Robin *Petroica boodang*	Yes	Suitable woodland habitat albeit this species would only occur as a vagrant.
Spotted-tailed Quoll *Dasyurus maculatus*	Yes	Suitable habitat and connectivity to larger remnants
Square-tailed Kite *Lophoictinia isura*	Yes	May roost, perch or hunt prey within the subject land.
Superb Fruit-Dove Ptilinopus superbus	Yes	Suitable foraging habitat in *Livistonia australis* and soft-fruited weeds (e.g. Privet and Camphor). May nest in dense vegetated areas.
Swift Parrot *Lathamus discolor*	Yes	Suitable foraging resources *Eucalyptus robusta* and mistletoes.
Varied Sittella *Daphoenositta chrysoptera*	Confirmed	Suitable habitat for foraging and nesting in swamp forest. A flock of up to seven birds observed in the remnant forest south of the development site.
White-bellied Sea-Eagle *Haliaeetus leucogaster*	Yes	May roost, perch or hunt prey within the subject land.
Wompoo Fruit Dove *Ptilinopus magnificus*	Yes	Suitable foraging habitat in *Livistonia australis* and soft-fruited weeds (e.g. Privet and Camphor). May nest in dense vegetated areas.
Yellow-bellied Sheathtail-bat *Saccolaimus flaviventris*	Yes	Species may forage within, or fly over, the subject land.

Table 9. Species credit species predicted to occur on the subject land

Species credit species	Presence on site	Habitat on Subject land *(justification for inclusions and exclusions based on habitat features)*	Survey Effort	Location where presence assumed/determined	Biodiversity Risk Weighting[5]
Fauna					
Barking Owl *Ninox connivens* (Breeding)	No	No suitable habitat. Requires tree hollows >10cm diameter. No suitable sized tree hollows in the subject land.	Deployment of a SongMeter of revealed at least one individual calling, but there is no suitable breeding habitat in the subject land.	N/A	N/A
Bush Stone-curlew *Burhinus grallarius*	No	Coarse woody debris.	Field searches and deployment of a SongMeter for 15 nights revealed no individuals.	N/A	N/A
Loggerhead Turtle *Caretta caretta*	No	No suitable habitat. Only found in marine and intertidal areas.	None – excluded from assessment because habitat not suitable.	N/A	N/A
Eastern Cave Bat *Vespadelus troughtoni*	No	Within two kilometres of rocky areas containing caves, overhangs, escarpments, outcrops, crevices or boulder piles, or within two kilometres of old mines, tunnels, old buildings or sheds.	Anabat Express to record echolocation. Unit left on site for 15 nights. No individuals recorded.	N/A	N/A
Eastern Osprey *Pandion cristatus* (Breeding)	No	No suitable habitat. No stick-nests in living and dead trees (>15m) or artificial structures within 100m of a floodplain for nesting).	None – excluded from assessment because habitat not suitable.	N/A	N/A
Eastern Pygmy-possum *Cercartetus nanus*	No	No suitable foraging shrubs (e.g. Banksia) and no suitably sized hollows for roosting.	None – excluded from assessment because habitat not suitable.	N/A	N/A
Giant Burrowing Frog *Heleioporus australiacus*	No	No suitable wet areas on sandstone ridge top or ridge slope.	Despite no suitable habitat, Lesryk deployed a SongMeter for 15 night. No individuals recorded.	N/A	N/A
Glossy Black-Cockatoo (Breeding) *Calyptorhynchus lathami*	No	No suitable tree hollows for nesting.	None – excluded from assessment because habitat not suitable.	N/A	N/A
Green and Golden Bell Frog *Litoria aurea*	No	Suitable, reedy, wet habitat occurs across the southern end of the subject land.	Lesryk deployed a SongMeter for 15 nights between January and February 2020. No individuals recorded.	N/A	N/A
Green Turtle *Chelonia mydas*	No	No suitable habitat. Only found in marine and intertidal areas.	None – excluded from assessment because habitat not suitable.	N/A	N/A
Grey-headed Flying-fox *Pteropus poliocephalus*	No	No Flying-fox camps were observed within, nor are any known to occur in	None – excluded from assessment because habitat not suitable.	N/A	N/A

[5] Only given for those species recorded or their presence assumed.

Species credit species	Presence on site	Habitat on Subject land *(justification for inclusions and exclusions based on habitat features)*	Survey Effort	Location where presence assumed/determined	Biodiversity Risk Weighting[5]
		close proximity to, the subject land. The nearest Flying-fox camp is at Warriewood Wetlands which is approximately 500m from the subject land.			
Koala *Phascolarctos cinereus* (breeding)	No	*Addressed in Table 8.*	SongMeter to record nocturnal calls. Unit left on site for 15 nights. No individuals recorded.	N/A	N/A
Koala in the Pittwater Local Government Area *Phascolarctos cinereus* - endangered population	No	*Addressed in Table 8.*	SongMeter to record nocturnal calls. Unit left on site for 15 nights. No individuals recorded.	N/A	N/A
Large-eared Pied Bat *Chalinolobus dwyeri*	No	Within two kilometres of rocky areas containing caves, overhangs, escarpments, outcrops, or crevices, or within two kilometres of old mines or tunnels.	AnaBat Express to record echolocation. Unit left on site for 15 nights. No individuals recorded.	N/A	N/A
Large Bent-winged Bat *Miniopterus orianae oceanensis* (breeding)	No	No suitable habitat. Requires caves, tunnels, culverts, bridges or other complex cavernous structures for breeding.	None – excluded from assessment because habitat not suitable for breeding.	N/A	N/A
Little Bent-winged Bat *Miniopterus australis*	No	No suitable habitat. Requires caves, tunnels, culverts, bridges or other complex cavernous structures for breeding.	None – excluded from assessment because habitat not suitable for breeding.	N/A	N/A
Little Eagle *Hieraaetus morphnoides* (breeding)	No	Nest trees - live (occasionally dead) large old trees within vegetation.	Site survey for Little Eagle or large stick nests carried out over two days by Lesryk and three days by Land Eco between January and March. No individuals recorded.	N/A	N/A
Masked Owl *Tyto novaehollandiae* (breeding)	No	No suitable habitat. Requires large tree hollows for nesting. No suitable sized tree hollows in the subject land.	None – excluded from assessment because habitat not suitable.	N/A	N/A
Powerful Owl *Ninox strenua* (breeding)	No	No suitable habitat. Requires large tree hollows for nesting. No suitable sized tree hollows in the subject land.	None – excluded from assessment because habitat not suitable.	N/A	N/A
Pied Oystercatcher *Haematopus longirostris*	No	No suitable habitat. Requires marine, estuarine or intertidal habitat.	None – excluded from assessment because habitat not suitable.	N/A	N/A
Regent Honeyeater *Anthochaera phrygia*	No	Subject land not located in the 'important areas' map.	None – excluded from assessment because habitat not important.	N/A	N/A

Species credit species	Presence on site	Habitat on Subject land *(justification for inclusions and exclusions based on habitat features)*	Survey Effort	Location where presence assumed/determined	Biodiversity Risk Weighting[5]
Red-crowned Toadlet *Pseudophryne australis*	No	No suitable wet areas on sandstone ridge top or ridge slope.	Despite no suitable habitat, Lesryk deployed a SongMeter for 15 night. No individuals.	N/A	N/A
Southern Myotis *Myotis macropus*	No	The subject land lacks the necessary habitat requirements of this species, i.e. suitable hollows or suitable artificial structures.	AnaBat Express to record echolocation. Unit left on site for 15 nights. No individuals recorded.	N/A	N/A
Sooty Oystercatcher *Haematopus fuliginosus*	No	No suitable habitat. Requires marine, estuarine or intertidal habitat.	None – excluded from assessment because habitat not suitable.	N/A	N/A
Square-tailed Kite *Lophoictinia isura* (breeding)	No	Nest trees - live (occasionally dead) large old trees within vegetation.	Site survey for Square-tailed Kite or large stick nests carried out over two days by Lesryk and three days by Land Eco between January and March. No individuals recorded.	N/A	N/A
Squirrel Glider *Petaurus norfolcensis*	No	Suitable foraging habitat.	Lesryk deployed a SongMeter for 15 nights between January and February 2020. No individuals recorded, despite recording vocal activity of the closely related Sugar Glider (*Petaurus breviceps*).	N/A	N/A
Petaurus norfolcensis - endangered population Squirrel Glider on Barrenjoey Peninsula, north of Bushrangers Hill	No	As above	As above	N/A	N/A
Swift Parrot *Lathamus discolor*	No	Subject land not located in the 'important areas' map.	None – excluded from assessment because habitat not important.	N/A	N/A
Terek Sandpiper *Xenus cinereus*	No	No suitable habitat. Requires marine, estuarine or intertidal habitat. Subject land not within the 'Important Areas' map.	None – excluded from assessment because habitat not suitable or important.	N/A	N/A
White-bellied Sea-Eagle *Haliaeetus leucogaster* (breeding)	No	Living or dead mature trees within suitable vegetation within 1km of a rivers, lakes, large dams or creeks, wetlands and coastlines.	Site survey for Little Eagle or large stick nests carried out over two days by Lesryk and three days by Land Eco between January and March. No individuals recorded.	N/A	N/A
Flora					
Asterolasia elegans	No	Habitat on the subject land is not suitable. Only known to occur on sheltered sandstone slopes and gullies.	Botanist surveyed the subject land for this distinctive shrub in February and March 2020. Revealed no individuals.	N/A	N/A
Chamaesyce psammogeton	No	Habitat on the subject land is not suitable. Only known to occur on dunes and beaches.	Botanist surveyed site for this distinctive forb in February and March 2020. Revealed no individuals.	N/A	N/A

Species credit species	Presence on site	Habitat on Subject land *(justification for inclusions and exclusions based on habitat features)*	Survey Effort	Location where presence assumed/determined	Biodiversity Risk Weighting[5]
Callistemon linearifolius	No	Habitat suitable, albeit degraded.	Botanist surveyed the subject land for this distinctive shrub in February and March 2020. Revealed no individuals.	N/A	N/A
Epacris purpurascens var. *purpurascens*	No	Habitat on the subject land is not suitable. Only known to occur on sheltered sandstone, shale and laminate ridges, slopes and gullies.	Botanist surveyed the subject land for this distinctive shrub in February and March 2020. Revealed no individuals.	N/A	N/A
Eucalyptus camfieldii	No	Habitat on the subject land is not suitable. Only known to occur on sandstone and lateritic ridgetops and slopes.	Botanist surveyed the subject land for this distinctive tree in February and March 2020. Revealed no individuals.	N/A	N/A
Genoplesium baueri	No	Habitat on the subject land is not suitable. Only known to occur on sandstone and lateritic ridgetops along the edges of sandstone rock plates, amongst moss gardens and beside tracks.	Botanist surveyed the subject land for this orchid on 17th March 2020, following advice from DPIE Threatened Species Accountable Officer Dr David Bain (pers comm.) that survey timing was suitable for survey of this cryptic species.	N/A	N/A
Grammitis stenophylla	No	Habitat suitable along edge of creek. No suitable sandstone escarpment habitat typically associated with the species.	Botanist surveyed the subject land for this distinctive small fern in February and March 2020. Revealed no individuals.	N/A	N/A
Grevillea caleyi	No	Habitat on the subject land is not suitable. Only known to occur on sheltered laterite, sandstone, shale and laminate ridges and slopes.	Botanist surveyed the subject land for this distinctive shrub in February and March 2020. Revealed no individuals.	N/A	N/A
Kunzea rupestris	No	Habitat on the subject land is not suitable. Only known from exposed sandstone rock plates.	Botanist surveyed the subject land for this distinctive shrub in February and March 2020. Revealed no individuals.	N/A	N/A
Lasiopetalum joyceae	No	Habitat on the subject land is not suitable. Only known to occur on sheltered laterite, sandstone, shale and laminate ridges and slopes.	Botanist surveyed the subject land for this distinctive shrub in February and March 2020. Revealed no individuals.	N/A	N/A
Microtis angusii	Yes	Habitat on the subject land is marginally suitable. The species is known to occur in weedy, open grassy areas in a wide-variety of soil types between French's Forest – Terrey Hills – Ingleside and Oxford Falls. It is not impossible for this species to occur at Warriewood.	No survey has been undertaken as timing for survey period has not been met. The applicant desires to submit this BDAR with the DA, then survey the site for *M.angussii* while the DA is being assessed, or, soon after. If DA is approved in this time, the applicant would be open to surveying *M.angussii* as a condition of consent, knowing they would be expected to pay to offset the species if they cannot survey it,	Entire subject land.	3.00 – Very High

Species credit species	Presence on site	Habitat on Subject land *(justification for inclusions and exclusions based on habitat features)*	Survey Effort	Location where presence assumed/determined	Biodiversity Risk Weighting[5]
			or they find it during a survey effort. The offset obligation for this species is 15 credits.		
Persoonia hirsuta	No	Habitat on the subject land is not suitable. Only known to occur on sheltered laterite, sandstone, shale and laminate ridges and slopes.	Botanist surveyed the subject land for this distinctive shrub in February and March 2020. Revealed no individuals.	N/A	N/A
Pimelea curviflora var. curviflora	No	Habitat on the subject land is not suitable. Only known to occur on sheltered laterite, sandstone, shale and laminate ridges and slopes.	Botanist surveyed the subject land for this herb in February and March 2020. Revealed no individuals.	N/A	N/A
Prostanthera densa	No	Habitat on the subject land is not suitable. Grows in sclerophyll forest and shrubland on coastal headlands and near coastal ranges, chiefly on sandstone, and rocky slopes near the sea.	Botanist surveyed the subject land for this distinctive shrub in February and March 2020. Revealed no individuals.	N/A	N/A
Prostanthera marifolia	No	Habitat on the subject land is not suitable. Grows in localised patches in or in close proximity to the endangered Duffys Forest ecological community. Located on deeply weathered clay-loam soils associated with laterite and/or scattered shale lenses, soil type which only occur on ridge tops.	Botanist surveyed the subject land for this distinctive shrub in February and March 2020. Revealed no individuals.	N/A	N/A
Rhodamnia rubescens	No	Habitat on the subject land is suitable. Occurs in rainforest, sandstone gullies and swamp sclerophyll forest.	Botanist surveyed the subject land for this distinctive tree in February and March 2020. Revealed no individuals.	N/A	N/A
Syzygium paniculatum	No	Habitat on the subject land is suitable. Occurs in rainforest, sandstone gullies and swamp sclerophyll forest.	Botanist surveyed the subject land for this distinctive tree in February and March 2020. Revealed no individuals.	N/A	N/A
Tetratheca glandulosa	No	Habitat on the subject land is not suitable. Only known to occur on sheltered laterite, sandstone, shale and laminate ridges and slopes.	Botanist surveyed the subject land for this distinctive shrub in February and March 2020. Revealed no individuals.	N/A	N/A

5. Impact of development

5.1. Impacts

The proposed action will result in the removal/modification of a cumulative total of 0.79 ha of highly modified '*Swamp Mahogany / Cabbage Tree Palm - Cheese Tree - Swamp Oak tall open forest on poorly drained coastal alluvium'*, this being comprised of:

- 0.68 ha of Exotic/Weed Dominant
- 0.20 ha of Canopy Remnant (weed-infested)

The proposed development is to retain and maintain a large, remnant bushland area under a BMP which will protect the majority of the remnant vegetation on the subject property, including the most species diverse, structurally diverse habitat containing the only hollow-bearing trees. This area will protect approximately 0.75 ha of vegetation, which will be managed under a BMP (Land Eco Consulting 2020).

No threatened species listed under the BC Act are expected to be directly or indirectly impacted by the proposed development. The only threatened species recorded in the subject property were mobile fauna, expected to be passing through, or using the habitat at the rear of the property which will be protected and enhanced. It is possible that the Barking Owl could nest on the subject property (not within the subject land), as there are at least two large hollows, located in large, remnant *Eucalyptus robusta.* These trees which will be retained on the subject property and managed under the BMP.

No hollow-bearing trees or other areas of significant habitat (rock outcropping, caves or karst areas, or intact vegetation) were recorded in the subject land itself.

5.2. Indirect impacts

A suite of potential indirect impacts from the project to biodiversity, have been assessed (Table 10).

Table 10. Potential Indirect Impacts from the Development

Indirect Impact	Impacted entities (threatened species and/or threatened ecological communities and their habitats)	Extent and duration	Consequences of the impacts for the bioregional persistence of the threatened species, threatened ecological communities and their habitats.
(a) inadvertent impacts on adjacent habitat or vegetation	Swamp Sclerophyll Forest EEC All potentially occurring threatened species and their habitats, particularly nocturnal fauna such as Barking Owl, Powerful Owl, Grey-headed Flying-fox and microbats.	The proposed development will include the following impacts on adjacent habitat and vegetation. i) Increased light usage and light spill into surrounding vegetation at night. Lighting will be used on the subject land when the development is complete. Apartment lighting could spill into bushland however, it is unlikely lighting will increase significantly beyond the existing light sources associated with the existing townhouse developments to the east and west of the subject land and the streetlights along Warriewood Road. ii) Increased noise and vibration from construction. Noise and vibration-causing activities will take place from 7:00am to 6:00pm Monday to Friday, 8:00am to 1:00pm on Saturday with no work performed on Sundays and Public Holidays. Since no diurnal threatened species were observed on the Subject land, it is not likely that the short-term increased noise	There will be no consequences of the impacts for the bioregional persistence of the threatened species, threatened ecological communities and their habitats. Impacts will be minor, localised and unlikely to increase significantly beyond the current base level of noise, vibration and light spill.

Indirect Impact	Impacted entities (threatened species and/or threatened ecological communities and their habitats)	Extent and duration	Consequences of the impacts for the bioregional persistence of the threatened species, threatened ecological communities and their habitats.
		caused by the proposed development would impact on such species. iii) Increased risk of erosion and sedimentation into Narrabeen Creek This will remain a risk during the construction phase. It is not expected that sediment and erosion to be a significant issue on the subject land or the areas surrounding it. The applicant will follow the recommendations of their geotechnical engineer, and the 'Blue Book' (Landcom 2004) at all times when undergoing earthworks and construction. A sediment fence will be constructed on both sides of Lorikeet Grove so as to prevent sediment from entering Narrabeen Creek from the construction site. This fence will be monitored and maintained. iv) Increases to rubbish dumping The subject land is currently full of anthropogenic wastes including dilapidated buildings, machinery and other items. The development of the subject land will include tidying of the subject property and removal of wastes. The BMP (Land Eco 2020) will detail on-going maintenance of the subject property to keep it free from anthropogenic wastes and dumping. v) Weeds The subject land is severely infested by weeds, including multiple Priority Weed species. The proposed development will trigger the control these priorities weed infestations which will be managed under a BMP (Land Eco Consulting 2020). It is unlikely that the proposed development will increase weed infestation, erosion/sedimentation, increased pest activity or rubbish dumping.	
(b) reduced viability of adjacent habitat due to edge effects	None	The proposed development is not likely to cause reduced viability of adjacent habitat due to edge effects. The landscape is already severely weed infested and edge effected from historical land uses. All areas of groundcover are dominated by exotic grass weeds and garden beds contain exotic ornamental plants and weeds. A Landscape Plan and BMP have been prepared for the subject property. These documents detail how the proposed landscaping for the development will consist of 100% locally indigenous flora representative of Swamp Sclerophyll Forest EEC.	There will be no consequences of the impacts for the bioregional persistence of the threatened species, threatened ecological communities and their habitats.
(c) reduced viability of adjacent habitat due to noise, dust or light spill	See a) above	Artificial lighting and noise will increase during the construction phase of the development	It is not expected that increased artificial lighting will impact upon breeding habitat. Effort will be taken to precent light spill from the development, into the retained bushland areas.

Indirect Impact	Impacted entities (threatened species and/or threatened ecological communities and their habitats)	Extent and duration	Consequences of the impacts for the bioregional persistence of the threatened species, threatened ecological communities and their habitats.
(d) transport of weeds and pathogens from the site to adjacent vegetation	Swamp Sclerophyll Forest EEC	The proposed construction operations may introduce novel weeds to the Subject land and remaining Subject Property transported on plant and machinery. It is unlikely any significant new pathogens will be introduced. It is expected that Myrtle Rust, Phytophthora and Chytrid Fungus already occur in the Subject land, as they do in most disturbed landscapes around greater Sydney. One of the primary vectors of Chytrid, *Limnodynastes peronii is* common throughout the subject land.	There will be no consequences of the impacts for the bioregional persistence of the threatened species, threatened ecological communities and their habitats. Impacts will be minor, localised and unlikely to increase significantly beyond the current base level weed and pathogen assemblages and composition.
(e) increased risk of starvation, exposure and loss of shade or shelter	Swamp Sclerophyll Forest EEC All potentially occurring threatened species and their habitats.	It is unlikely that the proposed development will cause a significant increased risk of starvation, exposure and loss of shade or shelter. Most of the subject land is free of native trees, the majority of the current shelter, shade and food resources within the subject land are associated with dense weed growth, which can be legally removed at any time regardless of this DA. It is possible that the removal of the dilapidated houses and dense weedy growth from the subject land may displace common native fauna such as frogs, lizards and small birds.	All of the potentially occurring threatened woodland birds, wetland birds, raptors, owls, microbats and Grey-headed Flying-fox are mobile and capable of travelling large distances for foraging and breeding. It is possible that roosting microbats (in disused buildings), sheltering frogs, reptiles and nesting birds may be displaced during the land clearing and earthworks stage of the development. The impacts upon local biodiversity are expected to be minor and will be mitigated through the presence of a Project Ecologist during such works.
(f) loss of breeding habitats	Nil	The proposed development will not remove any important breeding habitats as the site is already highly disturbed and has been historically cleared. Potential breeding habitat for mobile wetland birds, and woodland birds occurs in larger, native trees, particularly those with rough-bark, dense canopy or containing mistletoes to the south of the subject land. It is not expected that increased artificial lighting will impact upon breeding habitat. Effort will be taken to precent light spill from the development, into the retained bushland areas.	All of the potentially occurring threatened woodland birds, wetland birds, raptors are mobile and capable of travelling large distances for foraging and breeding. No suitable breeding habitat will be impacted within the subject land.
(g) trampling of threatened flora species	Nil	No threatened flora species were identified within the Subject land. Residents/visitors will not be permitted to enter BMP areas off designated tracks. It is unlikely that trampling is an impact risk at this location.	N/A
(h) inhibition of nitrogen fixation and	Nil	The proposed development will remove groundcover which will reduce nitrogen fixation; however, it is not expected the extent of this impact will be significant. It	N/A

Indirect Impact	Impacted entities (threatened species and/or threatened ecological communities and their habitats)	Extent and duration	Consequences of the impacts for the bioregional persistence of the threatened species, threatened ecological communities and their habitats.
increased soil salinity		is not expected that soil salinity will increase as a result of this development.	
(i) fertiliser drift	Nil	It is not likely that fertiliser usage in the subject land will be increase as a result of the proposed development. The previous land use of the subject land was as an orchard and farm which grew multiple species of ornamental and food crops. Fertiliser usage likely peaked at that time. It is unlikely that fertiliser usage as a result of the development will cause any impacts at the subject land or surrounds.	N/A
(j) rubbish dumping	Nil	This issue is not expected to be exacerbated as a result of the proposed development. All rubbish generated during construction will be disposed of by the relevant contractors responsible for creating the rubbish. Rubbish disposal will be managed in accordance with the guest rules of the resort (Elephants Foot Recycling Solutions 2019).	N/A
(k) wood collection	Nil	The coarse woody debris that occurs on the subject is in low density and mostly derived from small, weed trees (e.g. *Acer negundo*) that have senesced and fallen over. The highest density of woody debris occurs in the BMP area located south of the subject land. This area will be retained of woody debris.. Residents and visitors to the subject land will be forbidden from collecting wood from the property for any purpose.	N/A
(l) bush rock removal and disturbance	Nil	This issue is not relevant to the Subject land as there is no bush rock.	N/A
(m) increase in predatory species populations	Nil	The Subject land is already inhabited by predatory pest species that wander from residential gardens, such as Feral Cat. The proposed development will 'tidy-up' the subject land and remove 'harbour' for these species, so it is unlikely that the proposed development will increase predatory species populations.	N/A
(n) increase in pest animal populations	Nil	The Subject land is already highly degraded and supports a population of common pest fauna including, Common Myna and Rabbit. The proposed development will 'tidy-up' the subject land and remove 'harbour' for these species, so it is unlikely that the proposed development will increase pest species populations. Therefore, it is unlikely that the proposed developments will significantly increase pest species populations on the subject land or surrounds. As part of the BMP detail will be provided into managing the existing pest issues on the Subject land.	N/A
(o) increased risk of fire	Nil	It is unlikely that the proposed development will increase risk of fire to any bushland in or around the Subject land. It is more likely that the development will reduce local fire risk as a result of removing fuels.	N/A

Indirect Impact	Impacted entities (threatened species and/or threatened ecological communities and their habitats)	Extent and duration	Consequences of the impacts for the bioregional persistence of the threatened species, threatened ecological communities and their habitats.
(p) disturbance to specialist breeding and foraging habitat, e.g. beach nesting for shorebirds.	Nil	The proposed development will not result in the removal of any important breeding or foraging habitat for threatened species.	N/A

5.3. Prescribed impacts

Prescribed impacts have been considered in **Table 11**.

5.4. Serious and irreversible impacts

With reference to BioNet (2020b) *Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions* EEC is not listed as a potential entity at risk of SAII.

No threatened species recorded on, or nearby the subject land are SAII entities.

The spring-flowering orchid, *Microtis angussii,* is an SAII entity that could not be surveyed for by the time this DA had to be submitted to Council. However, it is not expected that this species will occur on the subject land. It is expected that targeted surveys undertaken at a time when the species is known to be flowering (confirmed by a visit to a known reference population) will reveal no individuals on the subject land. This assumption is based on the low diversity of native ground flora overall, and the complete lack of any other native ground orchids recorded. Considering this, no further assessment into the impacts of the proposed DA upon this SAII entity will be undertaken until such unlikely event that the species is recorded on the subject land, or assumed present, and requires offset.

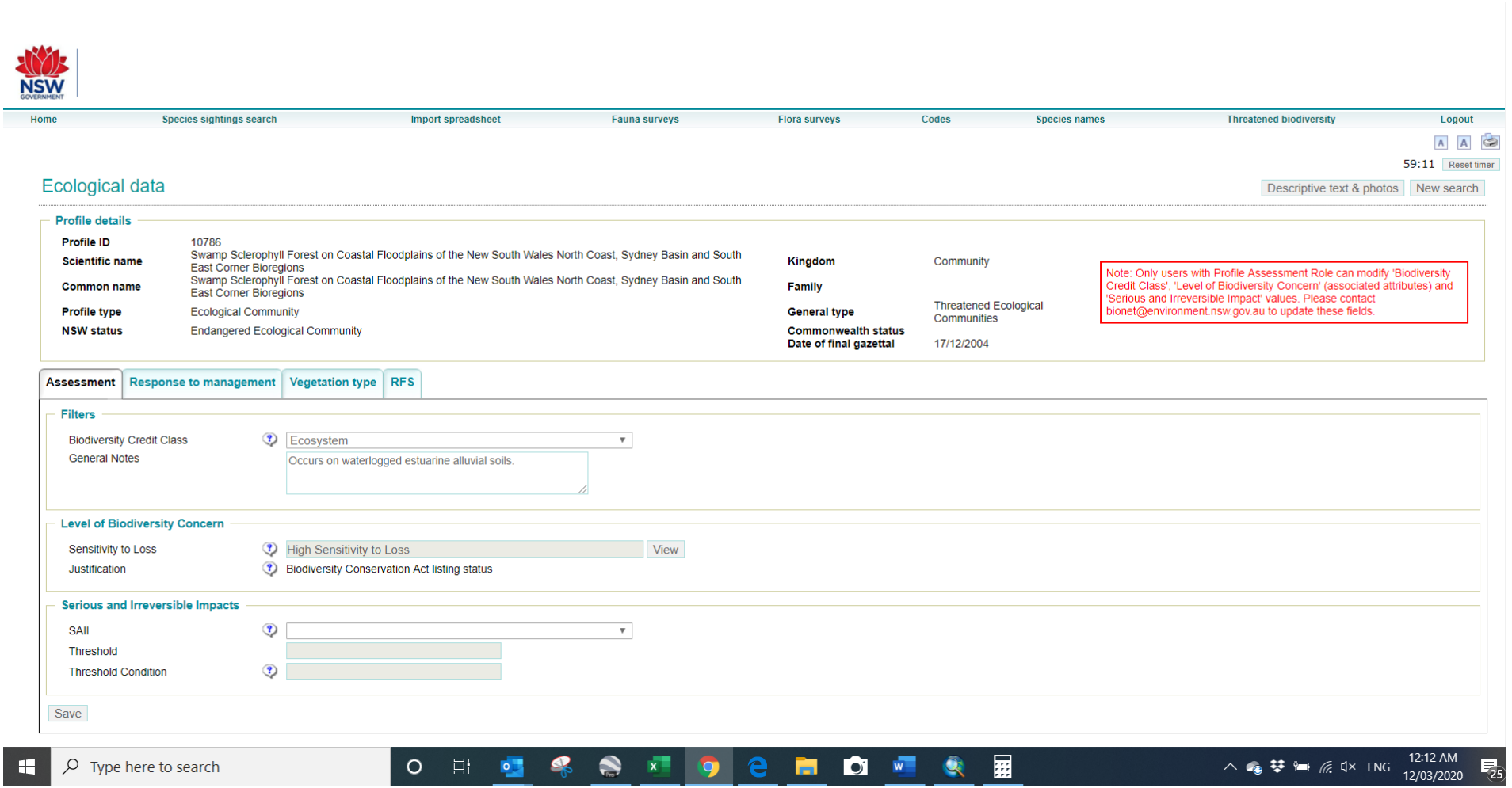

Figure 14. Screenshot from BioNet (12.3.2020) showing Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions is not an SAII entity

Table 11. Prescribed impacts on the subject land

Feature	Present	Description of feature characteristics and location	Potential impact	Threatened species or community using or dependent on feature	Section of the BAR where prescribed impact is addressed
Karst, caves, crevices, cliffs or other geologically significant feature	☐Yes / ☒No	N/A	No karst, caves, crevices, cliffs or other geologically significant feature present on subject land.	N/A	N/A
Rocks	☐Yes / ☒No	N/A	No areas of natural rock on subject land.	N/A	N/A
Human-made structure	☒Yes / ☐No	Two dilapidated dwellings and several old glass houses and sheds. May provide temporary roost habitat for microbats.	None. These structures would not be relied upon by any threatened fauna species; however, microbats may use them.	None identified however, any locally occurring threatened microbat may utilise such shelter on occasion.	Section 5.5. *Avoidance and minimisation of impacts*
Non-native vegetation	☒Yes / ☐No	Extensive throughout the subject land. The only habitat values are rank grass growth which may provide habitat for wetland birds, and fruiting privet, camphor and lantana which may provide forage for fruit-doves and flying-foxes.	Potential to lose intermittent foraging and sheltering habitat as a result of clearing and 'tidying up' for the development.	Grey-headed Flying-fox (foraging)	Section 5.5. *Avoidance and minimisation of impacts*
Habitat connectivity and movement	☒Yes / ☐No	Narrabeen Creek flows through the rear of the subject property. A small wetland associated with this creek exists immediately south of the subject land. All of this area is densely vegetated and forms a significant component of an extensive vegetation/habitat corridor which connects Warriewood Wetlands to the Warriewood escarpment.	The only habitat to be directly impacted by the proposed development, has been historically cleared and weed-infested. Scattered canopy trees exist in this area; however, the important areas of habitat connectivity will remain protected outside of the subject land. These areas will be managed under a BMP (Land Eco Consulting 2020).	Barking Owl Powerful Owl Black Bittern Varied Sittella Grey-headed Flying-fox Swamp Sclerophyll Forest EEC	Section 5.5. *Avoidance and minimisation of impacts*
Hydrological process sustaining/interacting with rivers, streams or wetlands	☐Yes / ☒No	Wet areas exist either side of southern end of the track that dissects the subject land. These areas are only expected to hold water after periods of extensive rainfall. These wet areas are stormwater ditches. Surface water naturally drains from the subject	The subject land does not contain any mapped wetlands or watercourses. An area of wetland has been mapped directly south of the subject land. It is possible that the development could cause increased sedimentation and	None identified, however, threatened wetland birds may utilise such habitat, including the Black Bittern which occurs locally.	Section 5.5. *Avoidance and minimisation of impacts*

Feature	Present	Description of feature characteristics and location	Potential impact	Threatened species or community using or dependent on feature	Section of the BAR where prescribed impact is addressed
		land along the central track into Narrabeen Creek to the south of the subject land.	stormwater runoff into this wetland.		
Wind farm development	☐Yes / ☒No	N/A	No wind farm proposed on site.	N/A	N/A
Vehicle strikes	☒Yes / ☐No	Machinery during demolition, earthworks and construction. Residential vehicles post development.	During construction/operation of the site there is the potential for fauna to be struck by plant and machinery. However, given the slow vehicle travel speeds that can be achieved in the subject land, the likelihood of coming into contact with any fauna is low.	None identified	N/A
Other	☐Yes / ☒No	N/A	No additional prescribed impacts identified.	N/A	N/A

5.5. Avoidance and minimisation of impacts

The development has been deliberately sited in the 'area of least impact' to avoid the remnant bushland at the rear of the subject property, and the mapped 'Coastal Wetland' area. This environmentally sensitive design has reduced the overall number of residential units that the proponent was originally intending to construct, however, it has resulted in an optimal outcome for biodiversity.
The design has been situated to avoid any impacts to the Narrabeen Creek habitat corridor.

The following measures have been provided to mitigate against any potential impacts to threatened species, ecological communities or their habitat:

- An Ecologist should search the buildings (where safe to do so) for any roosting microbats prior to demolition. These microbats should be captured and taken to a wildlife carer for eventual release back into the wild. Focus on chimneys and other dark places. The Ecologist should use a portable microbat detector in order to identify the activity of any bats during this pre-clearing survey.
- Prior to clearing of any vegetation (native or exotic) an Ecologist should undertake a pre-clearing survey. This should take place no more then two days before clearing. During the survey the Ecologist will identify any sensitive fauna, active nests, tree hollows or other habitat structures which will require the attention of an Ecologist during the clearing process.
- During the vegetation clearing processes, an Ecologist should be present on the subject land to capture and relocate any displaced fauna. If fauna is found it should be safely captured and taken to a wildlife carer, or if safe to do so, released into the bushland at the rear of the subject property.
- The BMP area to the south of the subject land is off limits to all plant, machinery and personnel.
- This 'zone' requires construction and sedimentation fencing which should be erected around the BMP area zone prior to any earth works taking place on the subject land. Both the standard fencing and sedimentation fencing should be monitored every six months and repaired as required. Any known damage to a fence should be repaired immediately.
- The limits of clearing to be denoted by flagging/fencing and identified on a site plan provided to the contractors.
- The 'BMP area' should be monitored annually to:
    - determine the vegetation integrity of the vegetation in line with the modified BAM used as part of this BDAR.
    - identify weeds present, particularly those listed under the NSW *Biosecurity Act 2015* and/or as a priority within the Greater Sydney region (NSW Department of Primary Industries 2019) and undertake the necessary removal/treatment method.
- Retain large trees present where feasible.
- Noise and vibration-causing activities will take place from 7:00am to 6:00pm Monday to Friday, 8:00am to 1:00pm on Saturday with no work performed on Sundays and Public Holidays.
- Do not undertake earthworks on windy days, unless a heavy-duty water hose or water cart is present to keep the soil surface moist and free of dust. If aerial dust is caused at any time during the development, the proponent should cease work until the soils surfaces are moistened wet and dust subsides.
- During construction phase, until access tracks and roads through the subject land are paved, the applicant should install appropriate erosion and sediment control into the tracks (see 'The Blue book' Land Com 2004)
- Where possible, plant a vegetative screen (e.g. dense *Casuarina glauca*) between the development and the BMP area in order to reduce the ecological effects of artificial light spill, and noise from the development.
- Keep speed limits to <5m when operating vehicles and plant in the subject property so as to minimise potential road-trauma impacts to fauna.
- Utilise 100% locally indigenous flora representative of Swamp Sclerophyll Forest EEC in all landscaping efforts.
- Ensure residents and visitors do not collect woody debris from the subject property at any time.
- A BMP has been prepared for the site. It provides management guidance for on-going weed and biodiversity management.

6. Offsets required

Using the BAM-C, the following reports have been produced:

- Credit Summary Report
- Candidate Species Report
- Predicted Species Report
- Vegetation Zones Report
- Biodiversity Credit Report (Like for like)
- Biodiversity Credit Report (Variations)
- Biodiversity payment summary report.

A copy of each of these has been provided in Appendix 2.

The Biodiversity payment summary report:

- identifies the credit class for ecosystem credits and species credits
- provides a cost for each credit
- provides a total cost that can be paid into the BCF.

A summary of the type and number of offset credits to be retired it presented (Table 12). Note, if (post DA submission) appropriately timed targeted surveys for *M.angussii* are undertaken in spring, the species is confirmed absent, and Council are willing to accept such surveys, no offset credits will be required for that species.

Table 12. Summary of Offset Credit Obligations for Proposed Development

PCT	TEC	Area Cleared	Credits
1795-Swamp Mahogany / Cabbage Tree Palm - Cheese Tree - Swamp Oak tall open forest on poorly drained coastal alluvium in the Sydney basin	Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	0.9	10
Microtis angusii / Angus's Onion Orchid	NA	0.9	15

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APPENDIX 1

Data Sheets

BAM Site - Field Survey Form						
Date:	10.2.2020	**Plot ID:**	A			Counts apply when the **number of tree stems** within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30…, 100, 200, 300…). For a **multi-stemmed tree**, only the largest living stem is included in the count/estimate. **Tree stems must be living.**
Zone:	56H	**Plot Dimensions:**	20m x 50m	**Easting:**	342204	
Datum:	GDA94	**Middle Bearing (o) at 0m:**	NW 305	**Northing:**	6271187	
PCT:	1231 - Swamp Mahogany swamp sclerophyll forest	**Condition Class**	Native Canopy - Weedy	**Ecologists:**	Kurtis Lindsay	
Growth Form	**Scientific Name**	**Cover**	**Abundance**	**DBH**	**# Tree Stems Count**	**Number of Hollow-bearing Trees**
HTE	*Erythrina crista-galli*	15	N/A	**80+cm**	**0**	**0**
HTE	*Erythrina sykesii*	78	N/A	**50-79cm**	**2**	
HTE	*Ligustrum lucidum*	15	N/A	**30-49cm**	**Yes**	
HTE	*Ligustrum sinense*	12	N/A	**20-29cm**	**Yes**	
HTE	*Ochna serrulata*	1	9	**10-19cm**	**0**	
HTE	*Cestrum parqui*	3		**5-9cm**	**Yes**	
HTE	*Lantana camara*	5		**<5cm**	**Yes**	
HTE	*Tradescantia fluminensis*	1	20			For **hollows**, count only the presence of a stem containing hollows. For a **multi-stemmed tree**, only the largest stem is included in the count/estimate. **Stems may be dead and may be shrubs.**
Exotic	*Passiflora edulis*	0.2	3	**Length of Logs (m)**	**78**	
Exotic	*Sida rhombifolia*	1	6	(≥10 cm diameter, >50 cm in length)		
HTE	*Senna pendula*	2				
HTE	*Ipomoea indica*	3		**BAM Attribute (1 x 1m plots)**	**Litter Cover (%)**	
Exotic	*Conyza bonariensis*	2		**1**	100	
Exotic	*Verbena rigidus*	0.5	8	**2**	98	
Exotic	*Paspalum urvillei*	4		**3**	100	
HTE	*Ricinus communis*	2		**4**	90	
HTE	*Cyperus eragrostis*	0.5		**5**	95	
Exotic	*Cirsium vulgare*	0.5		**Average (#no./5)**	**96.6**	
Grass & grasslike (GG)	*Cynodon dactylon*	2		Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.		
Exotic	*Hydrocotyle bonariensis*	1	10			
Grass & grasslike (GG)	*Sporobolus elongatus*	0.5	3			
Exotic	*Modiola carolinana*	0.2	12			

HTE	*Paspalum dilatatum*	2				
Grass & grasslike (GG)	*Eriochloa procera*	2				
Exotic	*Verbena bonariensis*	1	6	**Growth Form**	**Composition Data**	**Structure Data**
Exotic	*Aster subulatus*	0.1	1	**Tree**	**2**	**27**
Grass & grasslike (GG)	*Microlaena stipoides*	1	30	**Shrub**	**1**	**0.1**
Tree (TG)	*Eucalyptus robusta*	12	N/A	**Grass**	**8**	**8.7**
Other (OG)	*Livistona australis*	0.1	1	**Forb**	**0**	**0.0**
Exotic	*Colocasia esculenta*	0.2	3	**Fern**	**0**	**0**
Exotic	*Anagallis arvensis*	0.1	15	**Other**	**2**	**0.3**
Exotic	*Solanum maritianum*	0.2	2	**H.T.E**	**17**	**153.5**
Shrub (SG)	*Melaleuca ericifolia*	0.1	1	**Cover:** 0.1, 0.2, 0.3, …, 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover); Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m		
Tree (TG)	*Casuarina glauca*	15	N/A			
Grass & grasslike (GG)	*Juncus kraussii subsp. australiensis*	0.1	2			
Grass & grasslike (GG)	*Gahnia spp.*	2		**Abundance:** 1, 2, 3, …, 10, 20, 30, … 100, 200, …, 1000, …		
Grass & grasslike (GG)	*Phragmites australis*	1	3			
HTE	*Anredera cordifolia*	10	N/A			
HTE	*Cenchrus clandestinum*	1.5	15			
HTE	*Stenotaphrum secundatum*	1.5	10			
HTE	*Acer negundo*	1	3			
Grass & grasslike (GG)	*Cyperus polystachyos*	0.1	2			
Other (OG)	*Amyema cambagei*	0.2	1			

BAM VIS Plot A. Start (facing 305º)

BAM VIS Plot A. Photograph from North-east corner

BAM Site - Field Survey Form						
Date:	11.2.2020	**Plot ID:**	B			Counts apply when the **number of tree stems** within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30…, 100, 200, 300…). For a **multi-stemmed tree**, only the largest living stem is included in the count/estimate. **Tree stems must be living.**
Zone:	56 H	**Plot Dimensions:**	20m x 50m	**Easting:**	342239.81	
Datum:	UTM GDA94	**Middle Bearing (o) at 0m:**	35 North	**Northing:**	6271280.61	
PCT:	1231 - Swamp Mahogany swamp sclerophyll forest	**Condition Class**	Weed/Exotic Dominant	**Ecologists:**	Kurtis Lindsay	
Growth Form	**Scientific Name**	**Cover**	**Abundance**	**DBH**	**# Tree Stems Count**	**Number of Hollow-bearing Trees**
Tree (TG)	*Casuarina glauca*	2.5		**80+cm**	**0**	**0**
HTE	*Acer negundo*	45	N/A	**50-79cm**	**0**	
HTE	*Ligustrum lucidum*	20	N/A	**30-49cm**	**0**	
HTE	*Cinnamomum camphora*	15	N/A	**20-29cm**	**0**	
HTE	*Cestrum parqui*	8	N/A	**10-19cm**	**0**	
HTE	*Lantana camara*	70	N/A	**5-9cm**	**Present**	
HTE	*Ligustrum sinense*	5		**<5cm**	**Present**	
Exotic	*Phytolacca octandra*	3				For **hollows**, count only the presence of a stem containing hollows. For a **multi-stemmed tree**, only the largest stem is included in the count/estimate. **Stems may be dead and may be shrubs.**
HTE	*Ageratina adenophora*	10	N/A	**Length of Logs (m)**	**11**	
Exotic	*Verbena bonariensis*	2		(≥10 cm diameter, >50 cm in length)		
Exotic	*Verbena rigidus*	2				
Exotic	*Conyza bonariensis*	5		**BAM Attribute (1 x 1m plots)**	**Litter Cover (%)**	
Exotic	*Paspalum urvillei*	12	N/A	**1**	99	
Exotic	*Morus alba*	2		**2**	98	
Exotic	*Hydrocotyl bonariensis*	2		**3**	100	
HTE	*Araujia sericifera*	10	N/A	**4**	96	
HTE	*Ipomoea indica*	30	N/A	**5**	100	
HTE	*Acetosa sagittata*	3		**Average (#no./5)**	**98.6**	
Exotic	*Rumex crispus*	2		Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.		
Grass & grasslike (GG)	*Cyperus polystachyos*	1	6			
Grass & grasslike (GG)	*Carex inversa*	0.1	5			

Grass & grasslike (GG)	*Typha orientalis*	0.1	2			
Forb (FG)	*Commelina cyanea*	2				
Exotic	*Lilium formosanum*	0.5	5			
HTE	*Ricinus communis*	1.5	4	**Growth Form**	**Composition Data**	**Structure Data**
Exotic	*Solanum mauritianum*	0.5	3	**Tree**	**1**	**2.5**
HTE	*Paspalum dilatatum*	2		**Shrub**	**0**	**0**
Exotic	*Cirsium vulgare*	0.2	10	**Grass**	**4**	**1.3**
HTE	*Cenchrus clandestinum*	12	N/A	**Forb**	**5**	**3.8**
Forb (FG)	*Geranium solanderi*	1.5	25	**Fern**	**0**	**0**
Exotic	*Sida rhombifolia*	2		**Other**	**1**	**2**
Other (OG)	*Calochlaena dubia*	2		**H.T.E**	**15**	**234**
Exotic	*Gomphocarpus physocarpus*	2		**Cover:** 0.1, 0.2, 0.3, …, 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover); Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m		
Exotic	*Rubus fruiticosus*	4				
HTE	*Asparagus aethiopicus*	1.5	50			
Exotic	*Senna pendula var. glabrata*	0.2	15	**Abundance:** 1, 2, 3, …, 10, 20, 30, … 100, 200, …, 1000, …		
Exotic	*Anderea cordifolia*	2				
Exotic	*Oxalis debilis*	0.1	10			
Exotic	*Pteris cretica var. nervosa*	0.5	3			
Exotic	*Hedychium gardnerianum*	0.5	5			
HTE	*Bidens pilosa*	1	30			
Exotic	*Modiola caroliana*	0.2	15			
Exotic	*Megathyrstus maxima*	2				
Exotic	*Centarium sp.*	0.1	4			
Forb (FG)	*Solanum americanum*	0.1				
Exotic	*Anagallis arvensis*	0.1	8			
Forb (FG)	*Oxalis perennans*	0.1	4			
Exotic	*Rumex acestosella*	0.1	3			
Exotic	*Trifolium sp.*	0.1	2			
Grass & grasslike (GG)	*Cyperus gracilis*	0.1	5			
Exotic	*Cyperus brevifolius*	0.1	2			
Forb (FG)	*Rumex brownii*	0.1	1			
Exotic	*Zantedeschia aethiopica*	0.1	1			

BAM VIS Plot B. Photograph taken at the 20m mark facing 15º (not directly facing the direction of the plot)

BAM VIS Plot B. Showing Immature Casuarina glauca. Photograph taken at centre, start of plot, facing 300º (perpendicular to the plot)

APPENDIX 2

BAM-C reports

BAM Biodiversity Credit Report (Like for like)

Proposal Details

Assessment Id
00019193/BAAS18059/20/00019194

Proposal Name
45 to 49 Warriewood Road Warriewood

BAM data last updated *
26/11/2019

Assessor Name

Assessor Number

BAM Data version *
22

Proponent Names

Report Created
31/03/2020

BAM Case Status
Open

Assessment Revision
0

Assessment Type
Part 4 Developments (General)

Date Finalised
To be finalised

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

Potential Serious and Irreversible Impacts

Nil

Species
Microtis angusii / Angus's Onion Orchid
Microtis angusii / Angus's Onion Orchid

Additional Information for Approval

PCTs With Customized Benchmarks

No Changes

Predicted Threatened Species Not On Site

No Changes

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

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	Number of credits to be retired
1795-Swamp Mahogany / Cabbage Tree Palm - Cheese Tree - Swamp Oak tall open forest on poorly drained coastal alluvium in the Sydney basin	Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	0.9	10.00

1795-Swamp Mahogany / Cabbage Tree Palm - Cheese Tree - Swamp Oak tall open forest on poorly drained coastal alluvium in the Sydney basin

Like-for-like credit retirement options

Name of offset trading group	Trading group	HBT	IBRA region
Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions This includes PCT's: 837, 839, 971, 1064, 1092, 1227, 1230, 1231, 1232, 1235, 1649, 1715, 1716, 1717, 1718, 1719, 1721, 1722, 1723, 1724, 1725, 1730, 1795, 1798	-	Yes	Pittwater, Cumberland, Sydney Cataract, Wyong and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

1795-Swamp Mahogany / Cabbage Tree Palm - Cheese Tree - Swamp Oak tall open forest on poorly drained coastal alluvium in the Sydney basin	

Species Credit Summary

Species	Area	Credits
Microtis angusii / Angus's Onion Orchid	0.9	15.00

Microtis angusii/ Angus's Onion Orchid	1795_Exotic_Dom	**Like-for-like credit retirement options**	
		Spp	IBRA region
		Microtis angusii/Angus's Onion Orchid	Any in NSW
	1795_Native_Canopy	**Like-for-like credit retirement options**	
		Spp	IBRA region
		Microtis angusii/Angus's Onion Orchid	Any in NSW

Microtis angusii/ Angus's Onion Orchid	1795_Native_Canopy

Biodiversity payment summary report

Assessment Id	Payment data version	Assessment Revision	Report created
00019193/BAAS18059/20/00019194	63	0	31/03/2020

Assessor Name	Assessor Number	Proposal Name	BAM Case Status
		45 to 49 Warriewood Road Warriewood	Open

Assessment Type	Date Finalised
Part 4 Developments (General)	To be finalised

PCT list

Price calculated	PCT common name	Credits
Yes	**1795 -** Swamp Mahogany / Cabbage Tree Palm - Cheese Tree - Swamp Oak tall open forest on poorly drained coastal alluvium in the Sydney basin	10

Species list

Price calculated	Species	Credits
Yes	***Microtis angusii*** (Angus's Onion Orchid)	15

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

Biodiversity payment summary report

IBRA sub region	PCT common name	Threat status	Offset trading group	Risk premium	Administrative cost	Methodology adjustment factor	Price per credit	No. of ecosystem credits	Final credits price
Pittwater	**1795 -** Swamp Mahogany / Cabbage Tree Palm - Cheese Tree - Swamp Oak tall open forest on poorly drained coastal alluvium in the Sydney basin	No	Coastal Swamp Forests >=50% and <70%	19.73%	$283.70	2.0773	$8,775.51	10	$87,755.05

Subtotal (excl. GST)	**$87,755.05**
GST	**$8,775.50**
Total ecosystem credits (incl. GST)	**$96,530.56**

Species credits for threatened species

Species profile ID	Species	Threat status	Price per credit	Risk premium	Administrative cost	No. of species credits	Final credits price
10531	***Microtis angusii*** (Angus's Onion Orchid)		$173.02	34.3100%	$80.00	15	$4,685.75

Subtotal (excl. GST)	**$4,685.75**
GST	**$468.58**

Total species credits (incl. GST)	**$5,154.32**

Grand total	**$101,684.88**

Biodiversity payment summary report