Ecological Constraints Assessment Report

Frank Vickery Village

101-151 Port Hacking Road, Sylvania NSW

Report prepared by Narla Environmental for Midson Group c/- Wesley Mission

November 2020

NARLA
environmental

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Report Certification

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Glossary

Acronym/ Term	Definition
ASL	Above Sea Level
BAM	Biodiversity Assessment Method
BC Act	New South Wales Biodiversity Conservation Act 2016
BDAR	Biodiversity Development Assessment Report
DA	Development Application
Development	The use of land, and the subdivision of land, and the carrying out of a work, and the demolition of a building or work, and the erection of a building, and any other act, matter or thing referred to in section 26 that is controlled by an environmental planning instrument but does not include any development of a class or description prescribed by the regulations for the purposes of this definition (Environmental Planning and Assessment Act 1979).
DoEE	Department of Environment and Energy
DPI	Department of Primary Industries
DPIE	Department of Planning, Industry and Environment
EP&A Act	Environmental Planning & Assessment Act 1979
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999
FFA	Flora and Fauna Assessment Report
ha	Hectares
km	Kilometre
LGA	Local Government Area
Locality	The area within a 10 km radius of the Subject Site. The same meaning when describing a local population of a species or local occurrence of an ecological community.
m	metres
mm	millimetres
NSW	New South Wales
OEH	Office of Environment and Heritage (now known as the DPIE)
PCT	Plant Community Type
SEPP	State Environmental Planning Policy
SSDCP	Sutherland Shire Local Environmental Plan 2015
SSLEP	Sutherland Shire Development Control Plan 2015
Subject Site	Lot 1/DP 1025954
Threatened species, populations and ecological communities	Species, populations and ecological communities specified in Schedules 1 and 2 of the BC Act 2016

1. Introduction

1.1 Project Background

Narla Environmental Pty Ltd (Narla) was engaged by Midson Group on behalf of Wesley Mission Frank Vickery Village, Sylvania ('the proponent') to prepare an Ecological Constraints Assessment Report (ECA) to determine the development potential and ecological constraints of 101-151 Port Hacking Road, Sylvania NSW (Lot 1/DP 1025954), hereafter referred to as the 'Subject Site' (**Figure 1**).

It is understood that the proponent wishes to determine the ecological constraints identified within the Subject Site, particularly those associated with any Threatened Ecological Communities (TECs) and threatened species listed under the Biodiversity Conservation Act 2016 (BC Act) and the Environmental Protection and Biodiversity Conservation Act 1999 (EPBC Act).

Narla have produced this report in order to assess any potential impacts associated with the proposal and to recommend appropriate measures to mitigate any potential ecological impacts.

1.2 Site Description and Location

The Subject Site is located at 101-151 Port Hacking Road within the locality of Sylvania in the Sutherland Shire Local Government Area (LGA). The Subject Site covers an area of approximately 5.7 ha and is bordered by Port Hacking Road to the east, Box Road to the south, and Bellingara Road to the west. The Subject Site is located within an urban environment with the surrounding blocks of land adjoining the Subject Site comprised mostly of low-density residential land.

1.3 Topography, Geology and Soil

The western side of the Subject Site is elevated at approximately 24 metres above sea level (ASL). This elevated section runs south to north within the property. The land slopes downward from west to east to the Port Hacking Road boundary, reaching an elevation of approximately 12 metres ASL.

The Subject Site is situated on two (2) mapped soil landscapes: Disturbed Terrain and Gymea of the Wollongong-Port Hacking Soil Landscape (Hazelton and Till 1990).

The Disturbed Terrain soil landscape makes up most of the Subject Site. The original soil has been removed, greatly disturbed or buried. Most of these areas have been levelled. Artificial fill includes dredged sand or mud, rocks, local soil materials, demolition rubble, and industrial and household waste.

Gymea soil landscape is characterised by undulating to rolling rises and low hills on Hawkesbury Sandstone. Hawkesbury Sandstone consists of medium to coarse-grained quartz sandstone with minor shale and laminite lenses. Outcrops of sandstone are a natural feature of the landscape including many that were located throughout the northern part of the Subject Site.

1.4 Hydrology

No mapped or unmapped watercourses, dams, or soaks were identified within the Subject Site at the time of the site assessment.

1.5 Scope of Assessment

The objectives of this Ecological Constraints Assessment were to assess all possible ecological constraints of the proposed activity within the Subject Site; pursuant to Part 4 of the EP&A Act 1979, the BC Act, the EPBC Act, and the local planning provisions of the Sutherland Shire Council, including to:

- Undertake background research to determine the likelihood for NSW and/or Commonwealth threatened biota to utilise or occur within the Subject Site during any point of their lifecycles;
- Establish the likelihood of occurrence of migratory species, threatened species, endangered populations, and threatened ecological communities as listed under the BC Act and/or the EPBC Act;
- Identify and map the distribution of vegetation communities within the Subject Site and discuss patch size and condition;
- Record presence and the extent of any priority weed infestations that require management by law;
- Determine potential ecological impacts or risks that may result due to the proposed works;
- Recommendation of any controls or additional actions to be taken to protect or improve environmental outcomes of the proposed works; and
- Recommend any controls or additional actions to be taken to protect or improve ecological / biodiversity values of the Subject Site.

Figure 1. Subject Site within the Locality

1.6 Sutherland Shire Local Environmental Plan 2015 (SSLEP)

1.6.1 Zoning

The Subject Site is zoned 'R2: Low Density Residential'.

The SSLEP requires that the development satisfies the zone objectives which are to:

- To provide for the housing needs of the community within a low-density residential environment;
- To enable other land uses that provide facilities or services to meet the day to day needs of residents;
- To protect and enhance existing vegetation and other natural features and encourage appropriate bushland restoration particularly along ridgelines and in areas of high visual significance;
- To allow the subdivision of land only if the size of the resulting lots retains natural features and allows a sufficient area for development; and
- To ensure the single dwelling character, landscaped character, neighbourhood character and streetscapes of the zone are maintained over time and not diminished by the cumulative impact of multi dwelling housing or seniors housing.

1.7 Sutherland Shire Development Control Plan 2015 (SSDCP)

1.7.1 Threatened Species (Chapter 39, Section 3)

1.7.1.1 Controls

The controls relating to threatened species in Chapter 39, Section 3 of the SSDCP are as follows:

- Development in areas which contain threatened species, populations or ecological communities or in adjoining buffer areas which may impact on these species, populations or ecological communities requires special consideration under the Biodiversity Conservation Act 2016, the NSW Fisheries Management Act 1994, the Environmental Protection and Biodiversity Conservation Act 1999 (EPBC) and the Environmental Planning and Assessment Act 1979 (EP&A Act).
    - Note: Under s7.7 of the Biodiversity Conservation Act 2016 (BCA), a biodiversity development assessment reports (BDAR) needs to accompany a development application for consent under Part 4 of the EPAA (except applications for State significant development or complying development) if the proposal is likely to significantly affect threatened species. Under s 7.9 of the BCA, applications for State significant development and State significant infrastructure also need to be accompanied by a BDAR unless both the Secretary of the Department of Planning and Environment and the Chief Executive of the Office of Environment and Heritage determine that the proposal is not likely to have any significant impact on biodiversity values.
    - Note: Under s7.2 of the BCA, a proposal is likely to significantly affect threatened species if it:
        - Is found to do so pursuant to the test set out in s7.3 of the BCA;
        - Exceeds the biodiversity offsets scheme threshold if the biodiversity offsets scheme
        - Applies to the impacts of the proposal on biodiversity values; or
        - Is carried out in a declared area of outstanding biodiversity value

A full Flora and Fauna Assessment Report (FFA) will be required to assess the potential for the proposed activity to have any significant effect on any of the potentially occurring threatened fauna against the relevant Commonwealth 'EPBC Act Significant Guidelines' and State (Section 5AA of the EP&A Act) 'Assessment of

Significance'. The FFA should be submitted as part of an application for any clearing of native vegetation on the Subject Site. If the clearing of native vegetation exceeds the clearing thresholds described in **Section 1.8**, a Biodiversity Development Assessment Report will be required.

1.7.2 Tree and Bushland Vegetation (Chapter 39, Section 4)

This section applies to all land to which Sutherland Shire Local Environmental Plan 2015 (SSLEP2015) applies, except land zoned National Parks and SP2 Infrastructure (Defence) and any land under the ownership or care, control and management of Sutherland Shire Council where the work is carried out by or on behalf of Council.

1.7.2.1 Objectives

The objectives relating to threatened species in Chapter 39, Section 4 of the SSDCP are as follows:

- Ensure the retention and protection of trees and bushland vegetation that are important to the conservation of biodiversity in Sutherland Shire, and the maintenance of the scenic quality and treed character of Sutherland Shire;
- Ensure trees in urban areas are managed in a way that reduces known risks to life and property;
- Ensure the retention and protection of valuable trees and vegetation on development sites and on adjacent property;
- Require the retention or restoration of vegetation on steep gradients or along waterways to assist in minimising slope instability and soil erosion;
- Ensure appropriate measures are adopted to eliminate environmental weeds;
- Ensure effective bushland regeneration;
- Ensure proper pruning of trees and vegetation; and
- Permit residents to manage trees on their land.

1.7.2.2 Controls for Clearing of Trees and Vegetation

This section specifies the trees and vegetation to which the controls for the clearing of trees and vegetation contained in State Environmental Planning Policy (Vegetation in Non-Rural Areas) 2017, apply.

This section applies to any tree or bushland vegetation which satisfies any one or more of the following criteria:

- A single or multi trunked tree with a diameter of 100mm or more measured at 500mm above ground level;
- Any bushland vegetation, including mangroves. Bushland vegetation for the purpose of this clause means vegetation which is either remnant of the natural vegetation of the land or, if altered, is representative of the structure and the floristics of the natural vegetation. For the purposes of this sub-clause, bushland vegetation includes trees of any size, shrubs and all herbaceous species; and
- Any tree and/or riparian vegetation growing within 4 metres of a creek or watercourse.

Note: There are two methods of obtaining authority to remove trees and bushland vegetation:

- As part of a development consent; or
- A permit granted by the council.

If authorisation is required as part of a development consent, the development application must clearly identify the trees and bushland vegetation to be removed. A permit cannot allow the clearing of vegetation that is or forms part of a heritage item, that is or forms part of an Aboriginal object or place unless the proposal is of a minor nature (see Cl. 10 of SEPP Vegetation in NonRural Areas 2017). A permit may be granted under this Part subject to any conditions specified in the permit.

1.7.2.3 Species Exempt from this Order

Despite any other provision of this plan, any development comprised in the removal of any of the vegetation listed in the Table to this clause may be carried out without consent unless the vegetation is or forms part of a heritage item.

Table 1. Flora Species That Can Be Removed Without Consent Unless It Forms Part of a Heritage Item

Species Name	Common Name
Acacia podalyriifolia	Queensland Silver Wattle
Acacia saligna	Golden wreath wattle
Acer negundo	Box elder
Araucaria bidwillii	Bunya pine
Arundinaria spp	Clumping Bamboo
Chamaecyparis pisifera spp	Sawara Cypress
Cinnamomum camphora	Camphor laurel
Citrus spp	Cumquat, Grape Fruit, Lemon, Lime, Mandarin, Orange (edible species)
Cupressus macrocarpa var *brunniana*	Brunnings Golden Cypress
Cupressus sempervirens *Cupressocyparis leylandii*	Pencil Pine or Italian Cypress Leyland Cypress (and their cultivars)
Eriobotrya japonica	Loquat
Erythrina X sykesii	Coral tree
Ficus benjamina	Weeping fig
Ficus elastica	Rubber tree
Grevillea robusta	Silky oak
Ligustrum lucidum	Large leaf privet
Ligustrum sinense	Small leaf privet
Liquidambar styraciflua	Liquidambar
Morus nigra	Black Mulberry
Olea europaea subsp cuspidata	African Olive
Phoenix canariensis	Canary Island Date Palm
Phyllostachys aurea	Fishpole Bamboo
Phyllostachys nigra	Black Bamboo
Pinus radiata	Radiata Pine or Monterey Pine
Pomme spp	Apple, Crab Apple, Nashi Fruit, Pear, Quince (edible species)
Populus nigra	Lombardy poplar
Prunus spp	Apricot, Cherry, Nectarine, Peach, Plum
Robinia pseudoacacia	Black Locust
Schefflera actinophylla	Umbrella tree
Syagrus romanzoffiana	Cocos palm

1.7.2.4 Special Consideration for Dead Trees which Contain Habitat

The objective of this section of the DCP is to preserve habitat and breeding sites of native fauna.

The following assessment principles apply:

- This clause must be read in conjunction with the other assessment criteria specified in this section. Considerations of public safety, bushfire risk and hardship will override considerations of habitat in dead trees.
- Dead trees are generally exempt from protection except where they contain hollows or nesting sites for native fauna.
- Existing hollows and/or nesting sites in trees will be required to be retained. However, in such cases, Council will consent to works to the tree to ensure public safety; such as pruning.

- Note: Hollows are critical habitat elements for native fauna. Hollows are essential for breeding of a large number of species. Yet very few trees produce hollows and they are particularly rare in urban areas.

1.7.2.5 Replacement Trees

Where Council consents to the removal of an existing tree or bushland in accordance with this section, it will require the replanting of species on the land the subject of the application at a ratio of 8:1. Replacement tree species will be specified by Council and will be indigenous species of a type suitable for the site.

Where the land can gain views of waterways, replacement species will consist of open form species to allow views to be gained through the canopy.

Replacement trees are to be cared for by the land owner until established to a size which is covered by the controls for tree and bushland vegetation i.e. diameter of 10 0mm or more measured at 500 mm above ground level.

1.7.2.6 Controls for the Protection of Trees and Bushland during Construction

The following controls apply in regards to the protection of trees and bushland during construction:

- Where viable canopy trees or remnant bushland exist on a site, development shall be carefully designed and sited so that the removal of valuable trees and bushland is minimised;
- Where no construction works are proposed, any existing indigenous undergrowth is to be retained;
- All construction works (including the installation of services, site sheds, buildings and stockpile materials and rubbish) shall be located outside the tree protection zone (in accordance with Australian Standard AS 4970-2009 Protection of Trees on Development Sites) of the trees and bushland areas to be retained. This requirement also applies to street trees and trees on adjoining land;
    - Consideration of the tolerance of individual species to disturbance may modify the minimum acceptable distance from that shown in this table;
    - Minimum distance refers to the location of the tree protection fence when measured from the centre of the tree trunk at 1.4m above ground level to protective fencing;
    - With appropriate precautions, temporary site works may occur within the protected area; and
    - The use of under boring techniques at depths below 600mm, is required to be retained to minimise the impacts of installation of service conduits, pipelines or the like on trees and bushland.
- An arborist, horticulturalist or bush regenerator may be required to undertake and supervise works on or near areas of bushland or individual trees required to be retained;
- Temporary fencing and siltation control measures shall be provided between site works and any trees or bushland on or adjacent to the site required to be retained;
- Surface and ground water flows to bushland areas and individual trees shall be maintained in their natural state;
- The position and alignment of foundations and underground services shall be designed and located to avoid the severing of tree roots greater than 50mm in diameter;
- Developments are to be designed to ensure that existing natural ground levels within Tree Protection Zones are maintained. Cut and fill within such areas is not permitted; and
- Development should maintain vegetative cover on slopes greater than 18 degrees.

1.7.2.7 Controls for the Elimination of Weeds

The following controls apply for eliminating weeds:

- Sites that contain noxious or environmental weeds listed in Clause 4.3 shall have these weeds removed in such a manner as to ensure that native vegetation is not destroyed. Ongoing management of the land must ensure that regeneration of such weeds does not occur;
- Any imported fill or topsoil or other landscaping material to be used at the development site shall be free of noxious and environmental weeds; and
- Areas which have undergone weed removal shall be stabilised and rehabilitated to prevent erosion and loss of sediment in accordance with the provisions for environmental site management in Sutherland Shire Environmental Specification 2007 - Environmental Site Management.

1.8 Biodiversity Assessment Pathway

The requirements of the BC Act 2016 and Biodiversity Conservation Regulation 2017 are mandatory for all Development Applications (DA) assessed pursuant to Part 4 of the Environmental Planning and Assessment Act 1979 (EP&A Act) submitted in the Sutherland Shire Local Government Area.

The BC Act and its regulations stipulate clearing 'area threshold' values (**Table 2**) that determine whether a development is required to be assessed in accordance with the 'Biodiversity Offset Scheme' (BOS). Minimum entry thresholds for vegetation clearing depend on the minimum lot size (shown in the Lot Size Maps made under the relevant Local Environmental Plan (LEP)), or actual lot size (where there is no minimum lot size provided for the relevant land under the LEP).

The minimum lot size prescribed by the SSLEP to the Subject Site is 550 m^2. To avoid triggering the Biodiversity Offset Scheme, the proponent must avoid the clearing/management of native vegetation in excess of 0.25 ha per Development Application.

Table 2. Biodiversity Offset Scheme Entry Thresholds

Minimum lot size associated with the property	Threshold for clearing, above which the BAM and offsets scheme apply
Less than 1 ha	**0.25 ha or more**
1 ha to less than 40 ha	0.50 ha or more
40 ha to less than 1000 ha	1 ha or more
1000 ha or more	2 ha or more

The Subject Site has not been mapped as containing 'biodiversity values' within the Biodiversity Values Map (DPIE 2020).

1.9 Relevant Legislation and Policy

The legislation and policy that are addressed in this report are listed in **Table 3.**

Table 3. Relevant Legislation and Policy Addressed.

Legislation/ Policy	Relevant Ecological Feature on Site	Triggered	Action Required
Environmental Planning and Assessment Act 1979 (EP&A Act)	All threatened species, populations and ecological communities and their habitat that occur or are likely to occur on the Subject Site during a part of their lifecycle.	Yes	This ecological assessment and all subsequent recommendations relevant to the planning process under 'Part 4 Development assessment and consent'.
Biodiversity Conservation Act (BC Act) (New South Wales)	Potential suitable habitat for several BC Act-listed (NSW) threatened fauna species is present.	Yes	A Test of Significance of impact from any proposed works on BC Act listed threatened species will be required. This is to be included in a Flora and Fauna Assessment Report.
Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) (Commonwealth)	Potential suitable habitat for several EPBC Act-listed (Commonwealth) threatened fauna species is present.	Yes	An assessment of significance of impact from the proposed works on Matters of National Environmental Significance (MNES) EPBC Act Assessment of Significant Impact Criteria. This is to be included in a Flora and Fauna Assessment Report (FFA) or Biodiversity Development Assessment Report (BDAR).
Biosecurity Act 2015 (Bio Act)	Two (2) priority weeds for the Greater Sydney region were identified on the Subject Site: ▪ *Asparagus aethiopicus;* ▪ *Olea europaea* subsp. *cuspidata*	Yes	Listed priority weeds must be managed in accordance with the Biosecurity Act 2015.
State Environmental Planning Policy (Koala Habitat Protection) 2019	The Subject Site occurs within Sutherland Shire LGA which is not listed in Schedule 1 of the Koala Habitat Protection 2019 SEPP, therefore, the Koala Habitat Protection 2019 SEPP does not apply.	No	None.
State Environmental Planning Policy (Coastal Management) 2018	The Subject Site is not mapped as containing land identified as 'coastal wetlands', 'littoral rainforest', or proximity to either on the 'Coastal Wetlands and Littoral Rainforests Area Map'.	No	None.

2. Methodology

2.1 Desktop Assessment and Literature Review

A thorough literature review of local information relevant to the Sutherland Shire Council area was undertaken. Searches using NSW Wildlife Atlas (BioNet) (DPIE 2020) and the Commonwealth Protected Matters Search Tool (DoEE 2020) were conducted to identify all current threatened flora and fauna, as well as migratory fauna records within a 10 km² search area centred on the Subject Site. This data was used to assist in establishing the presence or likelihood of any ecological values as occurring on or adjacent to the Subject Site, and helped inform our Ecologist on what to look for during the site assessment.

Soil landscape and geological mapping was examined to gain an understanding of the environment on the Subject Site and to assist in determining whether any threatened flora or ecological communities may occur there (Hazelton and Till 1990).

2.2 Ecological Site Assessment

2.2.1 General Survey

A site assessment was undertaken by Narla Environmental Ecologist Polina Zadorojnaya on Tuesday the 26th of May 2020. During the site assessments, the following activities were undertaken:

- Identifying and recording the vegetation communities present on the Subject Site, with focus on identifying any Threatened Ecological Communities (TEC);
- Recording a detailed list of flora species encountered on the Subject Site, with a focus on threatened species, species diagnostic of threatened ecological communities, and priority weeds;
- Recording opportunistic sightings of any fauna species seen or heard on or within the immediate surrounds of the Subject Site;
- Identifying and recording the locations of notable fauna habitat such as important nesting, roosting or foraging microhabitats;
- Targeting the habitat of any threatened and regionally significant fauna including:
    - Tree hollows (habitat for threatened large forest owls, parrots, cockatoos, and arboreal mammals);
    - Caves and crevices (habitat for threatened reptiles, small mammals, and microbats);
    - Termite mounds (habitat for threatened reptiles);
    - Soaks (habitat for threatened frogs);
    - Wetlands (habitat for threatened fish, frogs, and water birds);
    - Drainage lines (habitat for threatened fish and frogs);
    - Fruiting trees (food for threatened frugivorous birds and mammals);
    - Flowering trees (food for threatened nectivorous mammals and birds);
    - Trees and shrubs supporting nest structures (habitat for threatened birds and arboreal mammals);
    - Logs, bark and artificial debris (habitat for threatened frogs, reptiles, and snails);
    - Any other habitat features that may support fauna (particularly threatened) species; and
    - Assessing the connectivity and quality of the vegetation within the Subject Site and surrounding area.

2.2.2 Weather Conditions

Weather conditions recorded at the nearest weather station (Sydney Airport) prior to and during the general flora and fauna survey period are provided in Table 4 (BOM 2020). The data reveals some rainfall leading up to and during the survey, these weather conditions may be conducive to the emergence of annual herbs.

Table 4. Weather Conditions Recorded at Sydney Airport (station 066037) Preceding and During the Site Assessment (survey date in bold).

Survey date	Day	Minimum Temp. (°C)	Maximum Temp. (°C)	Rainfall (mm)
19/05/2020	Tuesday	13.9	22.4	0.4
20/05/2020	Wednesday	12.4	25.4	0
21/05/2020	Thursday	15.1	18.2	0
22/05/2020	Friday	8.9	16.7	29.0
23/05/2020	Saturday	11.3	17.7	2.6
24/05/2020	Sunday	13.6	16.9	0
25/05/2020	Monday	13.4	16.0	0.2
26/05/2020	**Tuesday**	**13.1**	**20.0**	**25.0**

2.2.3 Mapping and Analysis of Vegetation Communities

Narla examined local satellite imagery, geological mapping, soil landscape mapping and topographic mapping, in addition to existing vegetation mapping (The Native Vegetation of the Sydney Metropolitan Area - Version 3.1 [OEH 2016]) in order to stratify the Subject Site and guide the site assessment survey efforts. The following documents were consulted during assessment to assist with the identification of vegetation communities present within the Subject Site:

- Department of Planning, Industry and Environment NSW (DPIE 2020) eSPADE v2.0;
- Hazelton PA and Tille PJ (1990) Soil Landscapes of the Wollongong-Port Hacking 1:100,000 Sheet map and report, Soil Conservation Service of NSW, Sydney; and
- NSW Office of Environment and Heritage (OEH) (2016) The Native Vegetation of the Sydney Metropolitan Area. Volume 2: Vegetation Community Profiles. Version 3.0.

3. Flora

3.1 Vegetation Community

3.1.1 Historically Mapped Vegetation Communities

The Native Vegetation of the Sydney Metropolitan Area - Version 3.1 (OEH 2016) identified the vegetation within the Subject Site as Urban Exotic/Native. It also showed the following Plant Community Types (PCTs) as occurring within the broader locality (**Figure 2**):

- PCT 920: Mangrove Forests in estuaries of the Sydney Basin Bioregion and South East Corner Bioregion;
- PCT 1234: Swamp Oak swamp forest fringing estuaries, Sydney Basin Bioregion and South East Corner Bioregion;
- PCT 1776: Smooth-barked Apple - Red Bloodwood open forest on enriched sandstone slopes around Sydney and the Central Coast; and
- PCT 1795: Swamp Mahogany / Cabbage Tree Palm - Cheese Tree - Swamp Oak tall open forest on poorly drained coastal alluvium in the Sydney basin.

3.1.2 Field Validated Vegetation Communities

Field survey conducted by the Narla Ecologist identified one (1) plant community type (PCT) within the Subject Site (**Figure 3**):

- PCT 1776: Smooth-barked Apple - Red Bloodwood open forest on enriched sandstone slopes around Sydney and the Central Coast.

PCT 1776 was restricted to the north, east, and western perimeters of the Subject Site. There were also areas of Urban Exotic/Native vegetation that had been planted throughout the undeveloped parts of the Subject Site

A description of these vegetation communities can be found in **Table 5** and **Table 6**.

3.2 Weeds

Of the exotic plant species identified within the Subject Site, two (2) are currently classified as Priority Weeds within the Sutherland Shire LGA, and these weeds must be managed in accordance with the Biosecurity Act 2015. These species include:

- *Asparagus aethiopicus* (Ground Asparagus); and
- *Olea europaea* subsp. *cuspidata* (African Olive)

Table 5. Description of PCT 1776 Occurring Within the Subject Site

PCT 1776: Smooth-barked Apple - Red Bloodwood open forest on enriched sandstone slopes around Sydney and the Central Coast	
	
Vegetation Formation / Keith Class	Dry Sclerophyll Forests (Shrubby sub-formation) / Sydney Coastal Dry Sclerophyll Forest
Condition of PCT	Poor-moderate quality
Extent within Subject Site (approximate)	0.89 ha
Description of the Vegetation in the Subject Site	
The vegetation within the Subject Site consisted of poor-moderate quality PCT 1776. This included a fairly thick canopy layer comprised of *Angophora costata* (Sydney Red Gum), and *Corymbia gummifera* (Red Bloodwood), with some *Eucalyptus piperita* (Sydney Peppermint), and *Eucalyptus resinifera* (Red Mahogany) spread throughout. There was a thick understorey of shrubs and mid-storey species including *Allocasuarina littoralis* (Black She-oak), *Ceratopetalum gummiferum* (NSW Christmas Bush), and *Elaeocarpus reticulatus* (Blueberry Ash) with ground species such as *Dianella caerulea* (Blue Flax-lily), *Lomandra longifolia* (Spiny-headed Mat-rush) and *Pteridium esculentum* (Common Bracken). Weed species were fairly abundant within the ground layer including *Bidens pilosa* (Cobblers Pegs), *Bryophyllum delagoense* (Mother-of-millions), and the priority weed *Asparagus aethiopicus* (Ground Asparagus).	
Description from DPIE (2020)	
Coastal Enriched Sandstone Dry Forest is commonly encountered on the upper slopes and dry gullies of Sydney urban areas. It is a tall open eucalypt forest with an understorey of dry sclerophyll shrubs with ferns and forbs amongst the ground cover. The commonly recorded eucalypts are smooth-barked apple (*Angophora costata*), red bloodwood	

PCT 1776: Smooth-barked Apple - Red Bloodwood open forest on enriched sandstone slopes around Sydney and the Central Coast		
(*Corymbia gummifera*) and Sydney peppermint (*Eucalyptus piperita*). Blackbutt (*Eucalyptus pilularis*) is common on gully slopes of the north shore and Hacking River valley while broad-leaved white mahogany (*Eucalyptus umbra*) replaces this species along the Warringah and Pittwater escarpments. A sparse layer of small trees such as *Allocasuarina littoralis* and old-man banksia (*Banksia serrata*) is common above a variety of wattles, tea-trees, gee bungs and grass trees. In long unburnt areas sweet pittosporum (*Pittosporum undulatum*) may be prevalent. It is widespread on the Hornsby plateau in areas that receive greater than 1000 millimetres of mean annual rainfall and are at elevations less than 200 metres above sea level. It extends north of the Sydney area into the hinterland of the Central Coast.		
Justification of Vegetation Assignment	**Characteristic Flora Species**	**Geology and Landscape Position**
	This vegetation within this area contained four (4) canopy species that are characteristic of PCT 1776 *Angophora costata*, *Corymbia gummifera*, *Eucalyptus piperita*, and *Eucalyptus resinifera*. The following ten (10) characteristic species were also present: *Allocasuarina littoralis*, *Ceratopetalum gummiferum*, *Dianella caerulea*, *Elaeocarpus reticulatus*, *Glochidion ferdinandi*, *Lomandra longifolia*, *Persoonia linearis*, *Pittosporum undulatum*, *Pteridium esculentum*, and *Smilax glyciphylla*.	PCT 1776 appears to persist in areas that have subtle clay enrichment to the sandstone soils. Typically, sites are located downslope from large residual shale caps or on exposed Narrabeen sandstone or thin clay bands on coastal sandstone ridgetops. It is widespread on the Hornsby plateau in areas that receive greater than 1000 millimetres of mean annual rainfall and are at elevations less than 200 metres above sea level (ASL). The Subject Site is lower than 200m ASL and is situated on two (2) mapped soil landscapes: Gymea and Disturbed Terrain of the Wollongong-Port Hacking Soil Landscape (Hazelton and Till 1990). Gymea soil landscape is characterised by undulating to rolling rises and low hills on Hawkesbury Sandstone. The Subject Site also contains numerous sandstone outcrops. The Subject Site is located within the Sydney Cataract IBRA sub-bioregion. PCT 1776 is known to occur within this sub-bioregion.
BC Act Status	There are currently no BC Act listed threatened ecological communities associated with this PCT.	
EPBC Act Status	There are currently no EPBC Act listed threatened ecological communities associated with this PCT.	
References	Department of Planning, Industry and Environment (DPIE) (2020) NSW Bionet. The website of the Atlas of NSW Wildlife http://www.bionet.nsw.gov.au/ NSW Office of Environment and Heritage (OEH) (2016) The Native Vegetation of the Sydney Metropolitan Area. Volume 2: Vegetation Community Profiles. Version 3.0	

Table 6. Description of Urban Exotic/Native Vegetation Occurring Within the Subject Site

Urban Exotic/Native Vegetation	
	
Extent within Subject Site (approximate)	2.00 ha
Description of the Vegetation in the Subject Site	
This area consisted of common native species including *Acacia* spp., *Banksia integrifolia* (Coast Banksia), and *Melia azedarach* (White Cedar), mixed with planted exotic species such as *Citharexylum spinosum* (Fiddlewood), *Jacaranda mimosifolia* (Jacaranda), and *Plumeria rubra* (Red Frangipani). There was also the presence of the priority weed *Olea europaea subsp. cuspidate* (African Olive). Many areas were covered with common lawn grass species.	
Justification of Vegetation Assignment	The vegetation within this area was comprised of planted native and exotic species characteristic of an urban environment.
BC Act Status	Not listed
EPBC Act Status	Not listed
References	N/A

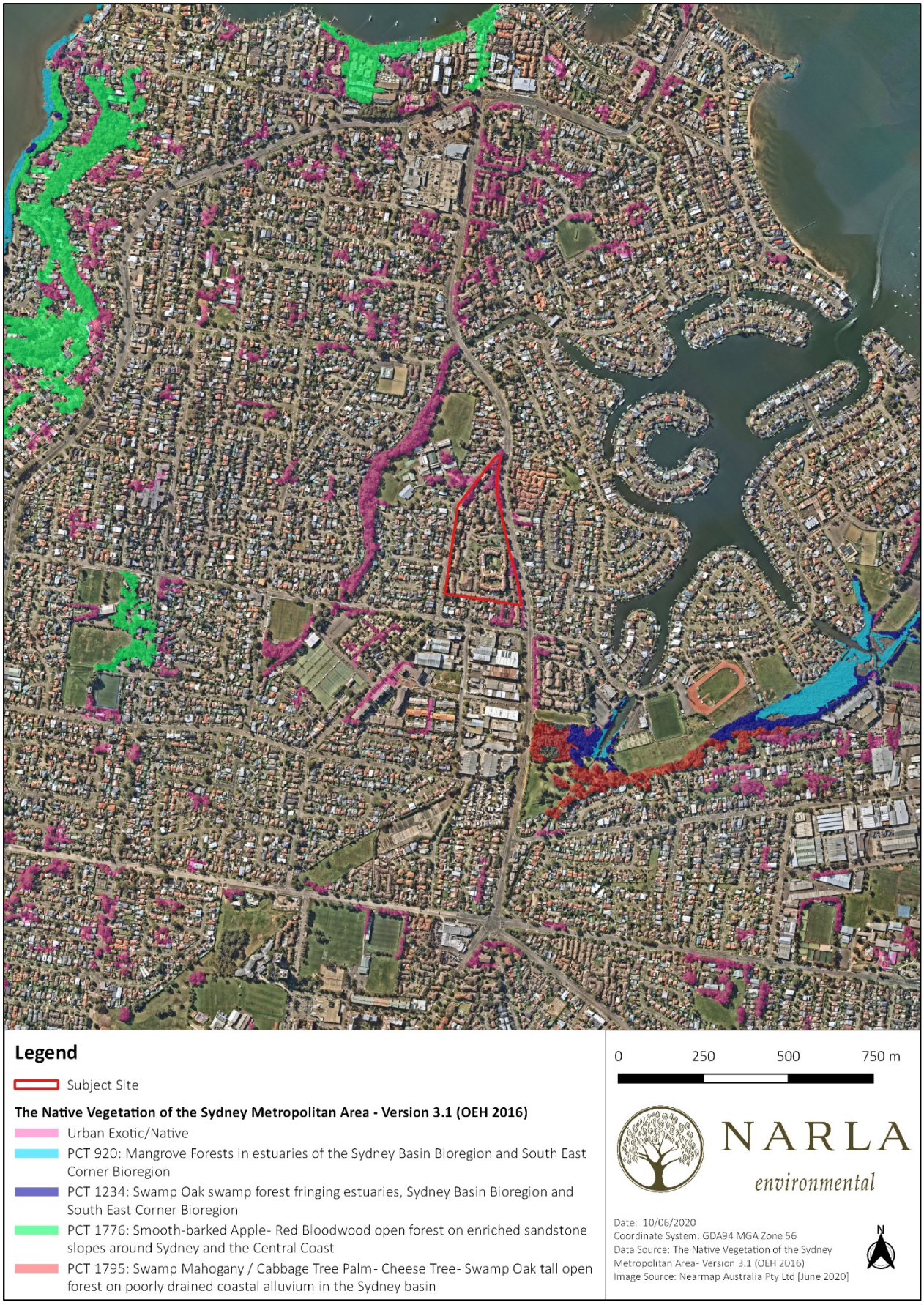

Figure 2. Historically Mapped Vegetation within the Locality

Figure 3. Narla Field-validated Vegetation within the Subject Site

3.3 Threatened Flora

Desktop analysis revealed a range of threatened flora as occurring or having the potential to occur on or within a 10 km radius of the Subject Site. Thorough targeted surveys were undertaken throughout the Subject Site for potentially occurring threatened flora however, none we located at the time of the site assessment.

The following locally occurring species were assessed for their potential to occur on the Subject Site (**Table 7**).

Table 7. Likelihood of Occurrence of Threatened Flora Species Within the Subject Site.

Species	BC Act	EPBC Act	Number of historical records within 10km of the Subject Site	Habitat Requirements (DPIE 2020)	Likelihood of Occurrence
Acacia prominens (Gosford Wattle, Hurstville and Kogarah Local Government Areas)	Endangered Population	-	2	Gosford Wattle occurs in open situations on clayey or sandy soils. Occurs at a few sites along the railway line at Penshurst, at Carss Bush Park, Carss Park and there is an unconfirmed siting at Oatley Park, Oatley.	Low. This species in known to occur in the former Hurstville and Kogarah government areas. In addition to the geographic restrictions the vegetation within the Subject Site is dense and weed infested, making the occurrence of this endangered population unlikely. A targeted survey was undertaken however, no individuals were identified.
Allocasuarina diminuta subsp. *mimica* (*Allocasuarina diminuta* subsp. *mimica* population in the Sutherland Shire and Liverpool City local government areas)	Endangered Population	-	1	The endangered population occurs along sandstone ridges and upper hillsides in the region northwest from Heathcote, towards Menai and Holsworthy, in heathy and low open woodland communities. It is restricted to the Local Government Areas listed in this instance (Sutherland and Liverpool). Found in heathy woodland, heathlands, and low open woodlands.	Low. Woodland vegetation was present within the Subject Site, although it was highly fragmented. A targeted survey was undertaken however, no individuals were identified.

Species	BC Act	EPBC Act	Number of historical records within 10km of the Subject Site	Habitat Requirements (DPIE 2020)	Likelihood of Occurrence
Caladenia tessellata (Thick Lip Spider Orchid)	Endangered	Vulnerable	17	Generally found in grassy sclerophyll woodland on clay loam or sandy soils, though the population near Braidwood is in low woodland with stony soil.	Low-moderate. No such soil exists within the Subject Site. Optimal survey months are September-October; therefore, the site assessment was carried outside the optimal survey period. This species, although unlikely to occur, couldn't be confirmed as being absent from the Subject Site.
Callistemon linearifolius (Netted Bottle Brush)	Vulnerable	-	4	Grows in dry sclerophyll forest on the coast and adjacent ranges. For the Sydney area, recent records are limited to the Hornsby Plateau area near the Hawkesbury River. The species was more widespread in the past, and there are currently only 5-6 populations remaining from the 22 populations historically recorded in the Sydney area. Three of the remaining populations are reserved in Ku-ring-gai Chase National Park, Lion Island Nature Reserve and Spectacle Island Nature Reserve.	Low. Appropriate habitat requirements were identified within the Subject Site. A targeted survey was undertaken however, no individuals were identified.
Maundia triglochinoides	Vulnerable	-	3	Grows in swamps, lagoons, dams, channels, creeks or shallow freshwater 30 - 60 cm deep on heavy clay, low nutrients.	Low. No such habitat occurs within the Subject Site. A targeted survey was undertaken however, no individuals were identified.

Species	BC Act	EPBC Act	Number of historical records within 10km of the Subject Site	Habitat Requirements (DPIE 2020)	Likelihood of Occurrence
Melaleuca deanei (Deane's Paperbark)	Vulnerable	Vulnerable	6	The species occurs mostly in ridgetop woodland, with only 5% of sites in heath on sandstone. Deane's Paperbark occurs in two distinct areas, in the Ku-ring-gai/Berowra and Holsworthy/Wedderburn areas respectively.	Low. Appropriate habitat requirements were identified within the Subject Site. A targeted survey was undertaken however, no individuals were identified.
Persoonia hirsuta (Hairy Geebung)	Endangered	Endangered	2	The Hairy Geebung is found in sandy soils in dry sclerophyll open forest, woodland and heath on sandstone. It is usually present as isolated individuals or very small populations.	Low. Appropriate habitat requirements were identified within the Subject Site. A targeted survey was undertaken however, no individuals were identified.
Prostanthera densa (Villous Mint-bush)	Vulnerable	Vulnerable	5	*Prostanthera densa* generally grows in sclerophyll forest and shrubland on coastal headlands and near coastal ranges, chiefly on sandstone, and rocky slopes near the sea.	Low. Most recent proximal record was 1987 (DPIE 2020). A targeted survey was undertaken however, no individuals were identified.
Syzygium paniculatum (Magenta Lilly Pilly)	Endangered	Vulnerable	29	On the central coast Magenta Lilly Pilly occurs on gravels, sands, silts and clays in riverside gallery rainforests and remnant littoral rainforest communities.	Low. No such habitat was identified within the Subject Site. A targeted survey was undertaken however, no individuals were identified.

4. Fauna

4.1 Fauna Encountered

A few predominantly native, common avian fauna species were identified within and surrounding the Subject Site during the site assessment. All native fauna species encountered were listed as 'protected' under the BC Act (Appendix A).

4.2 Threatened Fauna

4.2.1 Threatened Fauna Habitat

Details of the fauna habitat recorded in the Subject Site are included in Table 8. The likelihood of occurrence of threatened fauna species on the Subject Site is presented in Table 9.

Table 8. Fauna Habitat Values

Habitat component	Site values
Coarse woody debris	Some logs and debris material present on the northern part of the Subject Site. Course woody debris is an important component of the structure of forests and woodlands and provides refuge habitat for ground-dwelling fauna.
Rock outcrops and bush rock	Sandstone outcropping and bush rock were identified within the northern part of the Subject Site which may provide potential habitat for common native reptile and invertebrate species.
Caves, crevices and overhangs	One small crevice within the sandstone outcrop was identified within the northern part of the Subject Site. This may provide potential habitat for common native reptile and invertebrate species. It is unlikely to provide suitable breeding habitat for any threatened cave-roosting microbats as it is overgrown with roots and is covered with plant debris. No fauna were observed within the crevice at the time of the Site Assessment.
Culverts, bridges, mine shafts, or abandoned structures	Absent.
Nectar/lerp-bearing Trees	Many nectar-bearing trees were recorded within the Subject Site including Sydney Redgum, Red Bloodwood, and Sydney Peppermint. These trees may provide intermittent nectar and/or lerp sources for nomadic nectivores, such as Grey-headed Flying-fox.
Nectar-bearing shrubs	Nectar-bearing shrubs were recorded within the Subject Site including Coast Banksia and NSW Christmas Bush. These trees may provide intermittent nectar and/or lerp sources for similar nectivores.
Koala and Greater Glider browse	The following Koala feed trees were identified on the Subject Site: *Allocasuarina littoralis, Angophora costata, Corymbia gummifera, Eucalyptus botryoides, Eucalyptus haemastoma, Eucalyptus piperita*, *Eucalyptus punctata*, *Eucalyptus resinifera* and *Eucalyptus robusta.* Although, the lack of recent, proximal records of this distinct arboreal mammal suggests the potential for Koala presence is low. The Eucalypt species are also potential feed trees for the Greater Glider, but there is also a lack of recent, proximal records.
Large stick nests	No large stick nests suitable for threatened raptorial birds of prey were observed on the Subject Site.
Sap and gum sources	Native sap and gum source trees were recorded within the Subject Site including Sydney Redgum, Sydney Peppermint, and Red Mahogany.

Habitat component	Site values
She-oak fruit (Glossy Black Cockatoo feed)	*Allocasuarina littoralis*, which may provide foraging habitat for Glossy Black Cockatoos, was found on the Subject Site however, the lack of recent, proximal records of this distinct parrot suggests the potential for Glossy Black Cockatoo presence is low.
Seed-bearing trees and shrubs	Seed-bearing trees such as Eucalypt species may provide foraging habitat for Gang-gang Cockatoo.
Soft-fruit-bearing trees	Some some-fruit-bearing trees were identified within the Subject Site such as *Glochidion ferdinandi* (Cheese Tree) and may provide potential foraging habitat for bird species.
Dense shrubbery and leaf litter	Some leaf litter was present in the northern section of the Subject Site. This may provide habitat for native reptiles and invertebrates.
Tree hollows	Hollow-bearing trees, with hollows varying from small to large, were identified on the Subject Site. These trees may provide roosting/breeding habitats for various bird and bat species.
Decorticating bark	Half-bark Eucalypts such as *E. piperita* provide decorticating bark habitat within the Subject Site. This may be an important resource for arboreal fauna that feed on insects which shelter in decorticating bark. Microbat species may also roost in this habitat.
Wetlands, soaks and streams	Absent.
Open water bodies	Absent.
Estuarine, beach, mudflats, and rocky foreshores	Absent.

4.2.2 Migratory Fauna Species

The following EPBC Act listed migratory fauna species were considered to potentially utilise habitat within or around the Subject Site for foraging or passage:

- *Cuculus optatus* (Oriental Cuckoo);
- *Hirundapus caudacutus* (White-throated Needletail);
- *Monarcha melanopsis* (Black-faced Monarch);
- *Motacilla flava* (Yellow Wagtail);
- *Myiagra cyanoleuca* (Satin Flycatcher); and
- *Rhipidura rufifrons* (Rufous Fantail).

Based on the heavily urbanised nature of the Subject Site, it is deemed that any potential occurrence of these species would be purely sporadic fly ins. It is not deemed likely that future development within the Subject Site would result in a significant impact to any of these species.

Table 9. Likelihood of Occurrence of Threatened Fauna Species Within the Subject Site.

Species	BC Act	EPBC Act	Number of Historical Records within 10km of the Subject Site	Distribution (DPIE 2020)	Habitat and Ecology (DPIE 2020)	Likelihood of Occurrence
Botaurus poiciloptilus (Australasian Bittern)	Endangered	Endangered	1	Australasian Bitterns are widespread but uncommon over south-eastern Australia. In NSW they may be found over most of the state except for the far north-west.	Favours permanent freshwater wetlands with tall, dense vegetation, particularly bullrushes (*Typha* spp.) and spikerushes (*Eleocharis* spp.). Hides during the day amongst dense reeds or rushes and feed mainly at night on frogs, fish, yabbies, spiders, insects and snails. Feeding platforms may be constructed over deeper water from reeds trampled by the bird; platforms are often littered with prey remains. Nests are built in secluded places in densely-vegetated wetlands on a platform of reeds.	Low. No such habitat was identified within the Subject Site.
Calidris canutus (Red Knot)	-	Endangered	28	The Red Knot is a non-breeding migratory visitor from Arctic regions of Siberia. It is capable of flying non-stop between north-eastern China and northern Australia. Birds arrive between September and October and leave between March and April, with a small number of individuals overwintering. In NSW, it is recorded in small numbers along some of the major river estuaries and sheltered embayments of the coastline, in particular the Hunter River estuary.	In NSW the Red Knot mainly occurs in small numbers on intertidal mudflats, estuaries, bays, inlets, lagoons, harbours and sandflats and sandy beaches of sheltered coasts. It is occasionally found on sandy ocean beaches or shallow pools on exposed wave-cut rock platforms and is a rare visitor to terrestrial saline wetlands and freshwater swamps. It usually forages near the water's edge, with feeding activity regulated by the tide as birds closely follow the tide-edge.	Low. No such habitat was identified within the Subject Site.

Species	BC Act	EPBC Act	Number of Historical Records within 10km of the Subject Site	Distribution (DPIE 2020)	Habitat and Ecology (DPIE 2020)	Likelihood of Occurrence
Calidris ferruginea (Curlew Sandpiper)	Endangered	Critically Endangered	67	The Curlew Sandpiper is distributed around most of the Australian coastline (including Tasmania). It occurs along the entire coast of NSW, particularly in the Hunter Estuary, and sometimes in freshwater wetlands in the Murray-Darling Basin. Inland records are probably mainly of birds pausing for a few days during migration. The Curlew Sandpiper breeds in Siberia and migrates to Australia (as well as Africa and Asia) for the non-breeding period, arriving in Australia between August and November, and departing between March and mid-April.	It generally occupies littoral and estuarine habitats, and in New South Wales is mainly found in intertidal mudflats of sheltered coasts. It also occurs in non-tidal swamps, lakes and lagoons on the coast and sometimes inland. It forages in or at the edge of shallow water, occasionally on exposed algal mats or waterweed, or on banks of beach-cast seagrass or seaweed. It roosts on shingle, shell or sand beaches; spits or islets on the coast or in wetlands; or sometimes in salt marsh, among beach-cast seaweed, or on rocky shores.	Low. No such habitat was identified within the Subject Site.
Calidris tenuirostris (Great Knot)	Vulnerable	Critically Endangered	5	In NSW, the species has been recorded at scattered sites along the coast down to about Narooma. It has also been observed inland at Tullakool, Armidale, Gilgandra and Griffith.	Occurs within sheltered, coastal habitats containing large, intertidal mudflats or sandflats, including inlets, bays, harbours, estuaries and lagoons. Often recorded on sandy beaches with mudflats nearby, sandy spits and islets and sometimes on exposed reefs or rock platforms.Forages for food by methodically thrusting its bill deep into the mud to search for invertebrates, such as bivalve molluscs, gastropods, polychaete worms and crustaceans.	Low. No such habitat was identified within the Subject Site.

Species	BC Act	EPBC Act	Number of Historical Records within 10km of the Subject Site	Distribution (DPIE 2020)	Habitat and Ecology (DPIE 2020)	Likelihood of Occurrence
Epthianura albifrons (White-fronted Chat)	Vulnerable	-	62	The White-fronted Chat is found across the southern half of Australia, from southernmost Queensland to southern Tasmania, and across to Western Australia as far north as Carnarvon. Found mostly in temperate to arid climates and very rarely sub-tropical areas, it occupies foothills and lowlands up to 1000 m above sea level. In NSW, it occurs mostly in the southern half of the state, in damp open habitats along the coast, and near waterways in the western part of the state. Along the coastline, it is found predominantly in saltmarsh vegetation but also in open grasslands and sometimes in low shrubs bordering wetland areas.	Gregarious species, usually found foraging on bare or grassy ground in wetland areas, singly or in pairs. They are insectivorous, feeding mainly on flies and beetles caught from or close to the ground. Have been observed breeding from late July through to early March, with 'open-cup' nests built in low vegetation. Nests in the Sydney region have also been seen in low isolated mangroves. Nests are usually built about 23 cm above the ground (but have been found up to 2.5 m above the ground).	Low. No such habitat was identified within the Subject Site.
Haematopus fuliginosus (Sooty Oystercatcher)	Vulnerable	-	10	Sooty Oystercatchers are found around the entire Australian coast, including offshore islands, being most common in Bass Strait. Small numbers of the species are evenly distributed along the NSW coast. The availability of suitable nesting sites may limit populations.	Favours rocky headlands, rocky shelves, exposed reefs with rock pools, beaches and muddy estuaries. Forages on exposed rock or coral at low tide for foods such as limpets and mussels. Breeds in spring and summer, almost exclusively on offshore islands, and occasionally on isolated promontories.	Low. No such habitat was identified within the Subject Site.

Species	BC Act	EPBC Act	Number of Historical Records within 10km of the Subject Site	Distribution (DPIE 2020)	Habitat and Ecology (DPIE 2020)	Likelihood of Occurrence
Haematopus longirostris (Pied Oystercatcher)	Endangered	-	739	The species is distributed around the entire Australian coastline, although it is most common in coastal Tasmania and parts of Victoria, such as Corner Inlet. In NSW the species is thinly scattered along the entire coast, with fewer than 200 breeding pairs estimated to occur in the State.	Favours intertidal flats of inlets and bays, open beaches and sandbanks. Forages on exposed sand, mud and rock at low tide, for molluscs, worms, crabs and small fish. The chisel-like bill is used to pry open or break into shells of oysters and other shellfish. Nests mostly on coastal or estuarine beaches although occasionally they use saltmarsh or grassy areas. Nests are shallow scrapes in sand above the high tide mark, often amongst seaweed, shells and small stones.	Low. No such habitat was identified within the Subject Site.
Haliaeetus leucogaster (White-bellied Sea-Eagle)	Vulnerable	-	19	The White-bellied Sea-eagle is distributed around the Australian coastline, including Tasmania, and well inland along rivers and wetlands of the Murray Darling Basin. In New South Wales it is widespread along the east coast, and along all major inland rivers and waterways.	Habitats are characterised by the presence of large areas of open water including larger rivers, swamps, lakes, and the sea. Terrestrial habitats include coastal dunes, tidal flats, grassland, heathland, woodland, and forest (including rainforest). Breeding habitat consists of mature tall open forest, open forest, tall woodland, and swamp sclerophyll forest close to foraging habitat. Nest trees are typically large emergent eucalypts and often have emergent dead branches or large dead trees nearby which are used as 'guard roosts'.	Low. The Subject Site is unlikely to provide suitable habitat due to the heavily altered environment with large amounts of human activity. Additionally no nests were identified during the site assessment.

Species	BC Act	EPBC Act	Number of Historical Records within 10km of the Subject Site	Distribution (DPIE 2020)	Habitat and Ecology (DPIE 2020)	Likelihood of Occurrence
Lophoictinia isura (Square-tailed Kite)	Endangered	-	3	In NSW, scattered records of the species throughout the state indicate that the species is a regular resident in the north, north-east and along the major west-flowing river systems. It is a summer breeding migrant to the south-east, including the NSW south coast, arriving in September and leaving by March.	Found in a variety of timbered habitats including dry woodlands and open forests. Shows a particular preference for timbered watercourses. Is a specialist hunter of passerines, especially honeyeaters, and most particularly nestlings, and insects in the tree canopy, picking most prey items from the outer foliage. Appears to occupy large hunting ranges of more than 100km^2. Breeding is from July to February, with nest sites generally located along or near watercourses, in a fork or on large horizontal limbs.	Low. The highly urbanised environment of the Subject Site makes the presence of this raptor highly unlikely. No watercourses exist on the Subject Site and no nests were identified during the site assessment.
Miniopterus orianae oceanensis (Large Bent-winged Bat)	Vulnerable	-	6	Eastern Bentwing-bats occur along the east and north-west coasts of Australia.	Caves are the primary roosting habitat, but also use derelict mines, storm-water tunnels, buildings and other man-made structures. Breeding or roosting colonies can number from 100 to 150,000 individuals. Hunt in forested areas, catching moths and other flying insects above the tree tops.	Low. No suitable roosting habitat exists within the Subject Site. The highly urbanised and fragmented vegetation of the Subject Site is unlikely to provide suitable foraging habitat.

Species	BC Act	EPBC Act	Number of Historical Records within 10km of the Subject Site	Distribution (DPIE 2020)	Habitat and Ecology (DPIE 2020)	Likelihood of Occurrence
Ninox strenua (Powerful Owl)	Vulnerable	-	96	The Powerful Owl is endemic to eastern and south-eastern Australia, mainly on the coastal side of the Great Dividing Range from Mackay to south-western Victoria. In NSW, it is widely distributed throughout the eastern forests from the coast inland to tablelands, with scattered records on the western slopes and plains suggesting occupancy prior to land clearing. Now at low densities throughout most of its eastern range, rare along the Murray River and former inland populations may never recover.	The species breeds and hunts in open or closed sclerophyll forest or woodlands and hunts small mammals. It roosts by day in dense vegetation comprising species such as Turpentine *Syncarpia glomulifera*, Black She-oak *Allocasuarina littoralis*, Blackwood *Acacia melanoxylon*, Rough-barked Apple *Angophora floribunda*, Cherry Ballart *Exocarpus cupressiformis* and a number of eucalypt species. This species favours hollows >20cm in diameter.	Low-Moderate. Black She-oak and Eucalypt species were found within the Subject Site, as well as large hollows, but the highly fragmented vegetation is unlikely to provide suitable habitat for this large owl.
Numenius madagascariensis (Eastern Curlew)	-	Critically Endangered	401	Within Australia, the Eastern Curlew has a primarily coastal distribution. The species is found in all states, particularly the north, east, and south-east regions including Tasmania. Eastern Curlews are rarely recorded inland. In NSW the species occurs across the entire coast but is mainly found in estuaries such as the Hunter River, Port Stephens, Clarence River, Richmond River and ICOLLs of the south coast.	It generally occupies coastal lakes, inlets, bays and estuarine habitats, and in New South Wales is mainly found in intertidal mudflats and sometimes saltmarsh of sheltered coasts. Occasionally, the species occurs on ocean beaches (often near estuaries), and coral reefs, rock platforms, or rocky islets. It forages in or at the edge of shallow water, occasionally on exposed algal mats or waterweed, or on banks of beach-cast seagrass or seaweed.	Low. No such habitat was identified within the Subject Site.

Species	BC Act	EPBC Act	Number of Historical Records within 10km of the Subject Site	Distribution (DPIE 2020)	Habitat and Ecology (DPIE 2020)	Likelihood of Occurrence
Pteropus poliocephalus (Grey-headed Flying Fox)	Vulnerable	Vulnerable	250	Grey-headed Flying-foxes are generally found within 200 km of the eastern coast of Australia, from Rockhampton in Queensland to Adelaide in South Australia. In times of natural resource shortages, they may be found in unusual locations.	Occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy. Individual camps may have tens of thousands of animals and are used for mating, and for giving birth and rearing young. This species feeds on the nectar and pollen of native trees, in particular *Eucalyptus*, *Melaleuca* and *Banksia*, and fruits of rainforest trees and vines.	Low-Moderate – No roosting camps were observed within the Subject Site although the mobile species may visit the Subject Site to forage.

Species	BC Act	EPBC Act	Number of Historical Records within 10km of the Subject Site	Distribution (DPIE 2020)	Habitat and Ecology (DPIE 2020)	Likelihood of Occurrence
Sternula albifrons (Little Tern)	Endangered	-	1,283	Migrating from eastern Asia, the Little Tern is found on the north, east and south-east Australian coasts, from Shark Bay in Western Australia to the Gulf of St Vincent in South Australia. In NSW, it arrives from September to November, occurring mainly north of Sydney, with smaller numbers found south to Victoria.	Almost exclusively coastal, preferring sheltered environments; however may occur several kilometres from the sea in harbours, inlets and rivers (with occasional offshore islands or coral cay records). Nests in small, scattered colonies in low dunes or on sandy beaches just above high tide mark near estuary mouths or adjacent to coastal lakes and islands. Often seen feeding in flocks, foraging for small fish, crustaceans, insects, worms and molluscs by plunging in the shallow water of channels and estuaries, and in the surf on beaches, or skipping over the water surface with a swallow-like flight.	Low. No such habitat occurs was identified within the Subject Site.
Varanus rosenbergi (Rosenberg's Goanna)	Vulnerable	-	4	Rosenberg's Goanna occurs on the Sydney Sandstone in Wollemi National Park to the north-west of Sydney, in the Goulburn and ACT regions and near Cooma in the south. There are records from the South West Slopes near Khancoban and Tooma River. Also occurs in South Australia and Western Australia.	Found in heath, open forest and woodland. Associated with termites, the mounds of which this species nests in; termite mounds are a critical habitat component. Individuals require large areas of habitat. Feeds on carrion, birds, eggs, reptiles and small mammals. Shelters in hollow logs, rock crevices and in burrows, which they may dig for themselves, or they may use other species' burrows, such as rabbit warrens.	Low. Few proximal records (DPIE 2020). Although potential foraging habitat may exist on the Subject Site, it is surrounded by busy roads that this species is unlikely to cross. No termite mounds were found.

Species	BC Act	EPBC Act	Number of Historical Records within 10km of the Subject Site	Distribution (DPIE 2020)	Habitat and Ecology (DPIE 2020)	Likelihood of Occurrence
Xenus cinereus (Terek Sandpiper)	Vulnerable	-	32	A rare migrant to the eastern and southern Australian coasts, being most common in northern Australia, and extending its distribution south to the NSW coast in the east. The two main sites for the species in NSW are the Richmond River estuary and the Hunter River estuary. The latter has been identified as nationally and internationally important for the species.	In Australia, has been recorded on coastal mudflats, lagoons, creeks and estuaries. Favours mudbanks and sandbanks located near mangroves, but may also be observed on rocky pools and reefs, and occasionally up to 10 km inland around brackish pools. Generally roosts communally amongst mangroves or dead trees, often with related wader species.	Low. No such habitat occurs was identified within the Subject Site.

5. Recommendations

5.1 Avoidance of Impacts

5.1.1 Hollow-bearing Trees

Minimising the removal of native trees in general will reduce the overall ecological impact of the proposed development and improve the likelihood of obtaining DA approval. Where possible, mature native trees should be retained and protected. Hollow-bearing trees are habitat for fauna and should be retained as much as possible.

If hollow-bearing trees cannot be avoided, a qualified ecologist should be on site to oversee the removal and to safely relocate any fauna that may be inside. If any hollows are required to be removed, they are to be replaced by nest boxes elsewhere on the Subject Site.

5.1.2 Vegetation Clearing Threshold

The vegetation mapped as PCT 1776 by Narla makes up a total area of approximately 0.89 ha (**Figure 3**). If vegetation clearing exceeds the minimum threshold of 0.25 ha, the BOS applies to the proposed development including biodiversity impacts prescribed by clause 6.1 of the Biodiversity Regulation 2017. In this instance, the proponent will be required to prepare a Biodiversity Development Assessment Report (BDAR) to assess the impacts of the proposed development and calculate the required offsets to continue to DA approval.

If the BOS is avoided, an 'Assessment of Significance', also known as a '5-part test', will be required in order to determine whether the proposed activity will have a significant impact on biodiversity (in particular, threatened species). The 'Assessment of Significance' comes as part of a Flora and Fauna Assessment Report (FFA) that must be submitted with the DA.

5.2 Biodiversity Constraints Mapping

Narla has mapped the Subject Site into three (3) levels of 'Biodiversity Development Constraints'. The interpretation of each zone is detailed in **Table 10**.

This map was produced using information gathered from both desktop assessment of existing/historical mapping and data obtained from fieldwork undertaken by the Narla Ecologist. It is to be used as a guide only and a strong degree of caution must be expressed when interpreting it. No one should rely on or make financial decisions based on this mapping. This map is presented in **Figure 4**.

Table 10. Biodiversity Constraints Mapping Key

Zone	Description
Low Constraints Area - Green	This zone is deemed to have high potential for future development with accompaniment of the appropriate environmental assessments and implementation of appropriate restrictions and guidelines. This zone encompasses: ▪ Urban Exotic/Native Vegetation; and ▪ Existing structures and developed areas.
Moderate Constraints Area - Orange	This zone is deemed to have a moderate potential for future development without the requirement of further, detailed environmental assessments and implementation of impact mitigation strategies. This zone encompasses: ▪ Vegetation mapped as 'PCT 1776: Smooth-barked Apple - Red Bloodwood open forest on enriched sandstone slopes around Sydney and the Central Coast'.
High Constraints Area - Red	This zone is deemed to have a low potential for future development without the implementation of impact mitigation strategies. This zone encompasses: ▪ Potential threatened species habitat (hollow-bearing trees).

Figure 4. Biodiversity Constraints Mapped within the Subject Site

6. Ecological Constraints in Relation to Proposed Master Plan

The proposed master plan (GroupGSA 2020) (**Figure 5**) is largely situated on areas deemed to contain low biodiversity constraints (**Figure 6**). The proposed master plan involves minimal encroachment into moderate and high biodiversity constraint areas which may involve pruning of native vegetation or select tree removal. The impacts to native vegetation based on the proposed plans are anticipated to be below the native vegetation clearing threshold of 0.25 ha, therefore any future development on site should only warrant the preparation of a Flora and Fauna Assessment.

ILLUSTRATIVE MASTER PLAN

Ground Floor Plan

The indicative ground floor plan has organised all communal indoor and communal open spaces along the central spine road and the through site link, adopting best CPTED principles and ensuring an activated ground plan. Dispersed through the site, communal facilities can be realised as the masterplan progresses, ensuring amenity forms part of each stage and that facilities are equitable for all residents.

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Figure 5. Proposed Master Plan (GroupGSA 2020)

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Figure 6. Biodiversity Constraints in relation to Proposed Master Plan

7. Conclusion

Considering all biodiversity constraints detailed within this report, it is considered feasible that development within the Subject Site can be achieved successfully with minimal impact to the flora and fauna of the Subject Site and surrounding area. Due to the densely vegetated northern part of the Subject Site, any development will need to be mindful of not exceeding the clearing threshold of 0.25 ha. If vegetation impacts exceed this limit, the production of a Biodiversity Development Assessment Report and entry into the biodiversity offset scheme will be required to proceed.

8. References

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9. Appendices

Appendix A. Flora Species Identified Within the Subject Site.

Appendix B. Fauna Species Identified Within and Surrounding the Subject Site.

Appendix A. Flora Species Identified Within the Subject Site.

Scientific Name	Groundcover	Mid-Story	Canopy
Abelia chinensis *		x	
Acacia binervata		x	
Acacia longifolia subsp. *longifolia*		x	
Acacia podalyriifolia *		x	
Acetosa sagittata *	x		
Aeonium arboreum *	x		
Agave attenuata *	x		
Allocasuarina littoralis		x	
Angophora costata			x
Arctotheca calendula *	x		
Asparagus aethiopicus *	x		
Banksia integrifolia		x	
Bidens pilosa *	x		
Breynia oblongifolia		x	
Bryophyllum delagoense *	x		
Callitris rhomboidea		x	
Camellia spp. *		x	
Celtis occidentalis *			x
Cenchrus clandestinus *	x		
Ceratopetalum gummiferum		x	
Chlorophytum comosum *	x		
Citharexylum spinosum *			x
Clivia miniata *	x		
Commelina cyanea	x		
Corymbia gummifera			x
Corymbia torelliana *			x
Cupressus spp. *		x	
Cyathea australis		x	
Cynodon dactylon	x		
Dianella caerulea	x		
Dracaena draco *		x	
Ehrharta erecta *	x		
Elaeocarpus reticulatus		x	
Eucalyptus botryoides			x
Eucalyptus haemastoma			x
Eucalyptus piperita			x
Eucalyptus punctata			x
Eucalyptus resinifera			x
Eucalyptus robusta			x
Glochidion ferdinandi		x	
Jacaranda mimosifolia *			x
Lepidium bonariense *	x		
Lomandra longifolia	x		

Scientific Name	Groundcover	Mid-Story	Canopy
Medicago sp. *	x		
Melia azedarach			x
Modiola caroliniana *	x		
Monotoca elliptica		x	
Morus alba *		x	
Muehlenbeckia complexa *	x		
Murraya paniculata *		x	
Nandina domestica *		x	
Nephrolepis cordifolia	x		
Olea europaea subsp. *cuspidata*		x	
Oxalis latifolia *	x		
Persoonia linearis		x	
Phoenix canariensis *		x	
Photinia serratifolia *		x	
Pittosporum undulatum		x	
Plantago lanceolata *	x		
Plumeria rubra *		x	
Portulaca pilosa *	x		
Pteridium esculentum	x		
Richardia brasiliensis *	x		
Schefflera actinophylla *			x
Senecio madagascariensis *	x		
Sida rhombifolia *	x		
Smilax glyciphylla	x		
Solanum nigrum *	x		
Soliva sessilis *	x		
Strelitzia nicolai *		x	
Tecoma capensis *	x		
Triadica sebifera *			x
Vinca major *	x		

** Denotes exotic species*

Appendix B. Fauna Species Identified Within and Surrounding the Subject Site.

Class	Scientific Name	Common Name	Status
Aves	*Chenonetta jubata*	Maned Duck	Protected
	Eolophus roseicapilla	Galah	
	Gymnorhina tibicen	Australian Magpie	
	Manorina melanocephala	Noisy Miner	
	Rhipidura leucophrys	Willie Wagtail	
	Strepera graculina	Pied Currawong	
	Trichoglossus haematodus	Rainbow Lorikeet	

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