Flora and Fauna Assessment Report and Waterway Impact Statement

Proposed Warringah Golf and Community Club

Report prepared by Narla Environmental

for Warringah Golf Club

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NARLA
environmental

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Report Certification

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Glossary

Acronym/ Term	Definition
BAM	Biodiversity Assessment Methodology
BC Act	New South Wales Biodiversity Conservation Act 2016
BDAR	Biodiversity Development Assessment Report
DA	Development Application
DAFF	Department of Agriculture, Fisheries and Forestry
DCCEEW	Department of Climate Change, Energy, the Environment and Water
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)
DPE	Department of Planning and Environment
DPI	Department of Primary Industries
DPIE	Department of Planning, Industry and Environment (Now DPE)
EP&A Act	Environmental Planning & Assessment Act 1979
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999
FFA	Flora and Fauna Assessment
ha	Hectares
km	Kilometre
LGA	Local Government Area
Locality	The area within a 10 km radius of the Subject Property
m	metres
WDCP	Warringah Development Control Plan 2011
WLEP	Warringah Local Environmental Plan 2011
mm	millimetres
NSW	New South Wales
OEH	Office of Environment and Heritage (now known as the DPE)
SEPP	State Environmental Planning Policy
Subject Property	292 Condamine Street North Manly 2100 (Lot 2742/-/DP752038).
Subject Site	The footprint of the proposed development
Threatened species, populations and ecological communities	Species, populations and ecological communities specified in Schedules 1 and 2 of the BC Act 2016
TPZ	Tree Protection Zone

1. Introduction

1.1 Project Background

Narla Environmental (Narla) were engaged by Warringah Golf Club ('the proponent') to prepare a Flora and Fauna Assessment (FFA) and a Waterway Impact Statement (WIS), for the proposed development at 292 Condamine Street North Manly 2100 (Lot 2742/-/DP752038), hereafter referred to as the 'Subject Property' (**Figure 1**). The proposed development involves the building of a new clubhouse and will include ancillary works including the demolition of existing buildings and infrastructure, tree removal and the development of parking areas, a pedestrian bridge, landscaping, wastewater treatment system, a rainwater tank and new recreation facilities. All works associated with the proposed development will hereafter be referred to as the 'Subject Site' (**Figure 1**, **Appendix A**,).

Narla have produced this report in order to assess any potential impacts associated with the proposed development on terrestrial ecology, particularly threatened species, populations, and ecological communities listed under the Biodiversity Conservation Act 2016 (BC Act), and, the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act). The report will also recommend appropriate measures to mitigate any potential impacts in line with all relevant State Environmental Planning Policies (SEPP) and local government plans, namely the Warringah Local Environmental Plan 2011 (WLEP 2011) the Warringah Development Control Plan 2011 (WDCP 2011), and the Warringah Council Waterways Impact Statement Guidelines.

1.2 Site Description and Location

The Subject Property is located within the locality of North Manly in the Northern Beaches Local Government Area (LGA). The site boundary was defined by cadastral boundaries provided on the NSW Government Land and Property Information Spatial Information Exchange map viewer (NSW SixMaps 2023). The Subject Property is currently utilised as a golf course and covers an area of approximately 17.3ha, bound by Pittwater Road to the east, Kentwell Road to the south and Condamine Street to the west. The surrounding area is a highly urbanised landscape.

The Subject Site covers an area of approximately 1.28ha and currently contains the Warringah Recreation Centre comprising of tennis courts, soccer fields, and squash courts located in the south-eastern portion of the Warringah Golf Course. Riparian vegetation is present on both sides of Brookvale Creek that intersects the Subject Site.

1.3 Topography, Geology and Soil

The Subject Site is located in a low-lying area with elevation ranging from approximately 3m above sea level (asl) to approximately 5m asl (Google 2023) and is situated on the Warriewood soil landscape as described in the Soil Landscapes of the Sydney 1:100,000 sheet (Chapman et al. 2009). This soil landscape is characterised by level to gently undulating plains with local relief <10 m and slope gradients <5% on in-filled coastal barrier dunes, lakes and lagoons as well as swale depressions in dunefields. Geology consists of Quaternary (Holocene) silty to peaty quartz sand and medium to fine marine sand with podzols. Dominant soil materials include dark grey loamy sand, massive sand, black sticky peat, brown soft iron pan and dark brown soft organic pan.

1.4 Hydrology

One (1) mapped 3rd order stream, Brookvale Creek, is located within the Subject Site. No other mapped or unmapped water features were identified within the Subject Site.

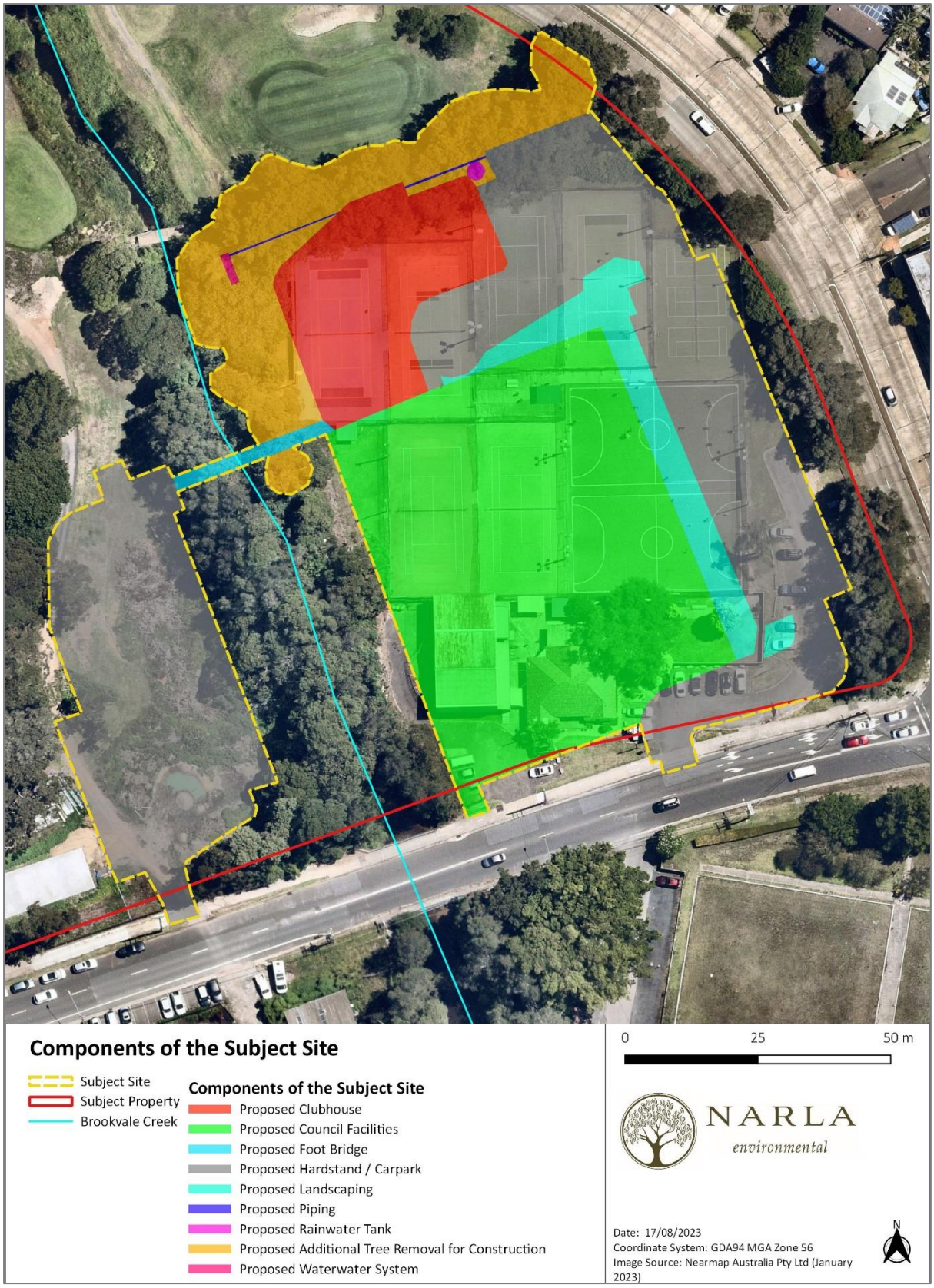

Figure 1. Components of the Subject Site.

1.5 Relevant Legislation and Policy

The legislation and policy that are addressed in this report are listed in **Table 1.**

Table 1. 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 Property during a part of their lifecycle.	Yes	This Flora and Fauna 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)	One (1) BC Act listed endangered ecological community occurs within the Subject Site: ▪ Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East Corner Bioregion. One (1) BC Act listed species, *Callistemon linearifolius* (Netted Bottle Brush), occurs within close proximity to the Subject Site, however it will not be directly impacted by the proposal. No other threatened species or populations listed under the BC Act were identified within the Subject Site at the time of the site assessment; however, suitable habitat for various threatened species listed under the BC Act was identified.	Yes	This FFA, particularly the likelihood tables for threatened fauna and flora species occurring or potentially occurring within the Subject Site, as well as severity of potential impacts. A test of significance (5 Part Test) was prepared for Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East Corner Bioregion (**Appendix D**).
Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) (Commonwealth)	One (1) EPBC Act listed Threatened Ecological Communities is present within the Subject Site: ▪ Coastal Swamp Oak (*Casuarina glauca*) Forest of South-east Queensland and New South Wales. No threatened species, populations or endangered ecological communities listed under the EPBC Act were identified within the Subject Site at the time of the site assessment; however, suitable habitat for various threatened species listed under the EPBC Act was identified included.	Yes	This FFA, particularly the likelihood tables for threatened fauna and flora species occurring or potentially occurring within the Subject Site, as well as severity of potential impacts. An assessment of significant impact was prepared for Coastal Swamp Oak (*Casuarina glauca*) Forest of South-east Queensland and New South Wales (**Appendix E**)
Biosecurity Act 2015 (Bio Act)	Four (4) Priority weeds for the Greater Sydney region were identified within the Subject Property: ▪ *Asparagus aethiopicus* (Ground Asparagus); ▪ *Rubus fruticosus spp. agg* (Blackberry);	Yes	The listed Priority weeds must be managed in accordance with the Biosecurity Act 2015.

Legislation/Policy	Relevant Ecological Feature on Site	Triggered	Action Required
	▪ *Lantana camara* (Lantana); and ▪ *Anredera cordifolia* (Madeira Vine).		
State Environmental Planning Policy (Resilience and Hazards) 2021 - Chapter 2 Coastal Management	The Subject Site does not contain areas mapped as 'Coastal Wetlands', 'Littoral Rainforest', or proximity to either, therefore, Chapter 2 of this SEPP does not apply.	No	None
State Environmental Planning Policy (Biodiversity and Conservation) 2021 – Chapter 4 Koala Habitat Protection 2021	The Subject Site occurs within an LGA listed in Schedule 2 of the SEPP and the Subject Property has an area of more than 1 ha. Therefore, chapter 4 of this SEPP applies	Yes	The requirements of this chapter have been discussed in Section 1.9 and no further action should be required.
Water Management Act 2000	Brookvale Creek, a 3rd order stream, and its associated riparian corridor is mapped as occurring in the centre of the Subject Site.	Yes	Works occurring within 40 metres of the highest bank of the river, lake or estuary are considered controlled activities under the WM Act. Applicants may need to obtain a controlled activity approval from the NSW DPE – Water before commencing the controlled activity (Section 1.10)
Fisheries Management Act 1994	The Subject Site contains land mapped as Key Fish Habitat (KFH). Therefore, the Fisheries Management Act 1994 applies.	Yes	Any works that involve dredging or reclamation will require a Part 7 permit under the act (Section 1.11).

1.6 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 Northern Beaches LGA.

The Biodiversity Values (BV) Map (DPE 2023a) identifies land with high biodiversity values that are particularly sensitive to impacts from development and clearing. The map forms part of the Biodiversity Offsets Scheme Entry Threshold which is one of the triggers for determining whether the Biodiversity Offset Scheme (BOS) applies to a clearing or development proposal. The map has been prepared by the Department of Planning and Environment (DPE) under Part 7 of the Biodiversity Conservation Act 2016 (BC Act). No areas identified as containing Biodiversity Values are located within the Subject Site or broader Subject Property.

The BC Act and its regulations also stipulate clearing 'area threshold' values (Table 2) that determine whether a development is required to be assessed in accordance with the 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).

As no minimum lot size is prescribed by the WLEP to the Subject Property, the actual lot size of 17.3ha determines the clearing threshold. To avoid triggering the BOS, the proponent must avoid the clearing/management of native vegetation in excess of 0.5ha. The proposed development will require approximately 0.19ha of native vegetation to be cleared within the Subject Site; therefore, the BOS is not triggered by the clearing threshold.

As such, the Biodiversity Offset Scheme is not triggered and a Biodiversity Development Assessment Report (BDAR) is not required. As such, a standard Flora and Fauna Assessment Report (this report) has been produced to assess the impact of the proposed DA.

Table 2. Biodiversity offset scheme entry thresholds. Bold indicates the threshold relevant to this report.

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

1.7 Warringah Local Environmental Plan 2011 (WLEP)

1.7.1 Zoning

The Subject Property is zoned 'RE1: Public Recreation'. The WLEP requires that the development satisfies the zone objectives which are:

- To enable land to be used for public open space or recreational purposes.
- To provide a range of recreational settings and activities and compatible land uses.
- To protect and enhance the natural environment for recreational purposes.
- To protect, manage and restore public land that is of ecological, scientific, cultural or aesthetic value.
- To prevent development that could destroy, damage or otherwise have an adverse effect on those values.

The proposed development satisfies the objectives of this zone by providing public recreation activities.

1.8 Warringah Development Control Plan 2011 (WDCP)

1.8.1 Preservation of Trees or Bushland Vegetation

Part E1 of the WDCP applies to the land. The objectives of this clause are to:

- To protect and enhance the urban forest of the Northern Beaches;
- To effectively manage the risks that come with an established urban forest through professional management of trees;
- To minimise soil erosion and to improve air quality, water quality, carbon sequestration, storm water retention, energy conservation and noise reduction;
- To protect, enhance bushland that provides habitat for locally native plant and animal species, threatened species populations and endangered ecological communities;
- To promote the retention and planting of trees which will help enable plant and animal communities to survive in the long-term; and

- To protect and enhance the scenic value and character that trees and/or bushland vegetation provide.

Although the proposed development will require the removal of native bushland, revegetation is proposed to enhance the long-term survival of the community present and protect retained vegetation during and following construction.

1.8.2 Prescribed Vegetation

Part E2 of the WDCP applies to land identified within mapping as containing high conservation habitat, wildlife corridors or native vegetation The objectives of this clause are to:

- To preserve and enhance the area's amenity, whilst protecting human life and property;
- To improve air quality, prevent soil erosion, assist in improving water quality, carbon sequestration, storm water retention, energy conservation and noise reduction;
- To provide habitat for local wildlife, generate shade for residents and provide psychological & social benefits;
- To protect and promote the recovery of threatened species, populations and endangered ecological communities;
- To protect and enhance the habitat of plants, animals and vegetation communities with high conservation significance;
- To retain and enhance native vegetation communities and the ecological functions of wildlife corridors;
- To reconstruct habitat in non-vegetated areas of wildlife corridors that will sustain the ecological functions of a wildlife corridor and that, as far as possible, represents the combination of plant species and vegetation structure of the original 1750 community; and
- Promote the retention of native vegetation in parcels of a size, condition and configuration which will as far as possible enable plant and animal communities to survive in the long-term.

Development is to be situated and designed to minimise the impact on prescribed vegetation, including remnant canopy trees, understorey vegetation, and ground cover species. Although the proposed development will require the removal of native bushland, revegetation is proposed to enhance the long-term survival of the community present and protect retained vegetation during and following construction.

1.8.3 Threatened species, populations, ecological communities listed under State or Commonwealth legislation, or High Conservation Habitat

This control applies to land identified on WDCP Map as an Endangered Ecological Community (EEC) is present; therefore, this control applies. The objectives of this control are:

- To protect and promote the recovery of threatened species, populations and endangered ecological communities;
- To protect and enhance the habitat of plants, animals and vegetation communities with high conservation significance;
- To preserve and enhance the area's amenity, whilst protecting human life and property;
- To improve air quality, prevent soil erosion, assist in improving water quality, carbon sequestration, storm water retention, energy conservation and noise reduction; and
- To provide natural habitat for local wildlife, maintain natural shade profiles and provide psychological & social benefits.

Although the proposed development will require the removal of native bushland, revegetation is proposed to enhance the long-term survival of the community present and protect retained vegetation during and following construction. A VMP will be implemented for the continued enhancement and protection of the EEC within and adjacent to the Subject Site.

1.8.4 Wildlife Corridors

No areas mapped as 'Wildlife Corridors' on the WDCP Map are present within the Subject Property. No wildlife corridors will be affected by the proposed development. Therefore, this clause does not apply.

1.8.5 Native Vegetation

Although no areas mapped as 'Native Vegetation' on the WDCP Map are present within the Subject Property; native vegetation was observed during the site assessment, therefore, this clause applies. The objectives of this clause are:

- To preserve and enhance the area's amenity, whilst protecting human life and property;
- To improve air quality, prevent soil erosion, assist in improving water quality, carbon sequestration, storm water retention, energy conservation and noise reduction;
- To provide natural habitat for local wildlife, maintain natural shade profiles and provide psychological & social benefits;
- Promote the retention of native vegetation in parcels of a size, condition and configuration which will as far as possible enable local plant and animal communities to survive in the long term; and
- To maintain the amount, local occurrence and diversity of native vegetation in the area.

Although the proposed development will require the removal of native bushland, revegetation is proposed to enhance the long-term survival of the community present and protect retained vegetation during and following construction. A VMP will be implemented for the continued enhancement and protection of the EEC within and adjacent to the Subject Site.

1.8.6 Waterways and Riparian land

Part E8 of the WDCP applies to land identified as waterways and riparian lands. Objectives are:

- Protect, maintain and enhance the ecology and biodiversity of waterways and riparian land;
- Encourage development to be located outside waterways and riparian land;
- Avoid impacts that will result in an adverse change in watercourse or riparian land condition;
- Minimise risk to life and property from stream bank erosion and flooding by incorporating appropriate controls and mitigation measures;
- Maintain and improve access, amenity and scenic quality of waterways and riparian lands; and
- Development on waterways and riparian lands shall aim to return Group B and Group C creeks to a Group A standard (as described in Warringah Creek Management Study, 2004) through appropriate siting and development of development.

The proposed development is located adjacent to Brookvale Creek which is classed as a Group C creek. Catchments that are classed as Group C generally have a low to moderate ecological value with the catchment also containing a 15 to 20% connected impervious area (WDCP 2011). As a portion of the project development and activities are to occur within land mapped as Waterways and Riparian Land, the controls required by this part of the WDCP are to be implemented by (Table 3).

Table 3. Developmental controls required by the pursuant for Part E8 of the WDCP (2011)

Control requirement pursuant to Part E8	Response of the Proposal
1. Development is to be designed to address any distinctive environmental features of the site and on adjoining nearby land.	The proposal has been designed to minimise direct impacts on the creek. The proposed pedestrian bridge will be located above the creek to avoid instream works and impacts. Riparian vegetation which is associated with a Threatened Ecological Community (TEC) will be impacted by the proposal, however this impact is mainly associated within the proposed bridge

Control requirement pursuant to Part E8	Response of the Proposal
	and will be supplemented by a VMP. The threatened *Callistemon linearifolius* (Netted Bottle Brush) is located near the Subject Site, however is not anticipated to be impacted.
2. Development should respond to these features through location of structures, outlook, design and materials.	The proposed bridge has been designed to sit above the water level of the creek, at the same height as the creek banks, so that the proposed development does not impede on water flow. A Construction Management Plan (CMP) has been prepared to ensure any excess sediment and erosion will be controlled to avoid discharges into Brookvale Creek and minimise surface water flow velocity. Temporary stabilisation techniques such as strategically placed erosion matting, sediment screens, hay bale energy dissipaters, mulching and annual grass species establishment will be implemented on disturbed areas.
3. The applicant shall submit a Waterway Impact Statement.	Proposal complies through the preparation of this FFA and WIS.
4. Developments shall comply with the requirements of Council's Protection of Waterway and Riparian Land Policy and Water Management Policy.	Proposal complies as it satisfies all the objectives laid out in the WLEP 2011 and WDCP 2011.
5. Infrastructure such as roads, drainage, stormwater structures, services, etc. should be located outside land identified as Waterways and Riparian Land.	Owing to the location of the existing recreation centre, all of the proposed development could not be located outside of the Waterways and Riparian Land. However, mitigation methods have been outlined in this report and the CMP to limit impacts to this land and Brookvale Creek.
6. The Asset Protection Zone must not extend into land identified as Waterways and Riparian Land. Refer to NSW Rural Fire Service for site assessment methodology.	Not applicable.

1.9 State Environmental Planning Policy (Biodiversity and Conservation) 2021: Chapter 4 - Koala Habitat Protection 2021

This chapter applies to LGAs that are listed in Schedule 2 'Local government areas' of the SEPP. As the Northern Beaches LGA is included in Schedule 2, this SEPP applies to the Subject Site. As such, the following development control provisions apply to development applications relating to the land, as the land:

- Has an area of at least 1 hectare (including adjoining land within the same ownership); and
- Does not have an approved koala plan of management applying to the land.

Before a council may grant consent to a development application for consent to carry out development on the land, the council must assess whether the development is likely to have any impact on koalas or koala habitat. If the council is satisfied that the development is likely to have low or no impact on koalas or koala habitat, the council may grant consent to the development application.

A site assessment was undertaken to determine whether the land contained core koala habitat, which is defined by the SEPP as:

> a) an area of land which has been assessed by a suitably qualified and experienced person as being highly suitable koala habitat and where koalas are recorded as being present at the time of assessment of the land as highly suitable koala habitat, or
> b) an area of land which has been assessed by a suitably qualified and experienced person as being highly suitable koala habitat and where koalas have been recorded as being present in the previous 18 years.

The Subject Property did contain suitable habitat (where 15% or greater of the total number of trees are the regionally relevant species of those listed in Schedule 3 of the SEPP), however no signs of koalas or koala occupancy (scats, scratch marks) were observed at the time of the site assessment. Furthermore, there are only two (2) records of Koalas within 2.5km of the Subject Property in the last 18 years. Due to the urban nature of the Subject Site and low number of proximal records, it is considered unlikely to be core Koala habitat and no further assessment under the SEPP (i.e. Koala Assessment Report) should be required.

1.10 Water Management Act 2000

Controlled activities carried out in, on or under waterfront land are regulated by the Water Management Act 2000 (WM Act). The Natural Resources Access Regulator (NRAR) administers the WM Act and is required to assess the impact of any proposed controlled activity to ensure that no more than minimal harm will be done to waterfront land. Water front land include the bed and bank of any river, lake or estuary and all land within 40 meters of the highest bank of the river, lake or estuary.

The proposed development involves a water crossing and riparian works, which are considered a controlled activity. Therefore, a controlled activity approval must be obtained from the NRAR before commencing the proposed development. Additionally, when a proposed controlled activity disturbs or substantially modifies the riparian corridor (e.g. through vegetation removal or excavation), its restoration and/or rehabilitation will be a requirement of the controlled activity approval. A Vegetation Management Plan (VMP) may be required that details how the restoration or rehabilitation will be carried out for crossing and riparian works.

1.11 Fisheries Management Act 1994

One of the objectives of the Fisheries Management Act 1994 is to 'conserve key fish habitats'. 'Key Fish Habitat' (KFH) was defined to include all marine and estuarine habitats up to highest astronomical tide level (that are reached by 'king' tides) and most permanent and semi-permanent freshwater habitats including rivers, creeks, lakes, lagoons, billabongs, weir pools and impoundments up to the top of the bank.

Brookvale Creek within the Subject Site is mapped as containing KFH (**Figure 2**). NSW DPI assesses development proposals with consideration to the water way class (**Table 4**) and habitat sensitivity type (**Table 5**), which factors in the importance, resilience and functionality of the waterway as fish habitat (DPI 2013). Brookvale Creek within the Subject Site meets the definition of 'Class 1 – Major key fish habitat' and 'Type 3 – Minimally sensitive key fish habitat'.

Any works that involve dredging or temporary obstruction of fish passage within KFH would require a Part 7 Fisheries Permit under section 201 and 219 of the FM Act.

Table 4. Classification of waterways for fish passage. Green shading = Class within the Subject Site (DPI 2013).

Water Way Classification	Characteristics of Waterway Class	Features present within the Subject Site
Class 1 – Major key fish habitat	Marine or estuarine waterway, or permanently flowing or flooded freshwater waterway (e.g. river or major creek), habitat of a threatened or protected fish species or 'critical habitat'.	Brookvale Creek is a perennial (permanently flowing) waterway.
Class 2 – Moderate key fish habitat	Non-permanently flowing (intermittent) stream, creek or waterway (generally named) with clearly defined bed and banks with semi-permanent to permanent waters in pools or in connected wetland areas. Freshwater aquatic vegetation is present. Type 1 and 2 habitat present.	N/A
Class 3 – Minimal key fish habitat	Named or unnamed waterway with intermittent flow and sporadic refuge, breeding or feeding areas for aquatic fauna (e.g. fish, yabbies). Semi-permanent pools form within the waterway or	N/A

Water Way Classification	Characteristics of Waterway Class	Features present within the Subject Site
	adjacent wetlands after a rain event. Otherwise, any minor waterway that interconnects with wetlands or other Class 1-3 fish habitats	
Class 4 – Unlikely key fish habitat	Waterway (generally unnamed) with intermittent flow following rain events only, little or no defined drainage channel, little or no flow or free-standing water or pools post rain events (e.g. dry gullies or shallow floodplain depressions with no aquatic flora present).	N/A

Table 5. Key fish habitat and associated sensitivity classification scheme. Green shading = Class within the Subject Site (DPI 2013).

Sensitivity Classification	Characteristics of Sensitivity Class	Features present within the Subject Site
Type 1 – Highly sensitive key fish habitat	▪ *Posidonia australis* (strapweed) ▪ *Zostera, Heterozostera*, *Halophila* and *Ruppia* species of seagrass beds >5m2 in area ▪ Coastal saltmarsh >5m2 in area ▪ Coral communities ▪ Coastal lakes and lagoons that have a natural opening and closing regime (i.e. are not permanently open or artificially opened or are subject to one off unauthorised openings) ▪ Marine Park, an aquatic reserve or intertidal protected area ▪ SEPP 14 coastal wetlands, wetlands recognised under international agreements (e.g. Ramsar, JAMBA, CAMBA, ROKAMBA wetlands), wetlands listed in the Directory of Important Wetlands of Australia ▪ Freshwater habitats that contain in-stream gravel beds, rocks greater than 500 mm in two dimensions, snags greater than 300 mm in diameter or 3 metres in length, or native aquatic plants ▪ Any known or expected protected or threatened species habitat or area of declared 'critical habitat' under the FM Act ▪ Mound springs	Not present
Type 2 – Moderately sensitive key fish habitat:	▪ *Zostera, Heterozostera, Halophila* and *Ruppia* species of seagrass beds <5m^2 in area ▪ Mangroves ▪ Coastal saltmarsh <5m^2 in area ▪ Marine macroalgae such as *Ecklonia* and *Sargassum* species ▪ Estuarine and marine rocky reefs ▪ Coastal lakes and lagoons that are permanently open or subject to artificial opening via agreed management arrangements (e.g. managed in line with an entrance management plan) ▪ Aquatic habitat within 100 m of a marine park, an aquatic reserve or intertidal protected area ▪ Stable intertidal sand/mud flats, coastal and estuarine sandy beaches with large populations of in-fauna ▪ Freshwater habitats and brackish wetlands, lakes and lagoons other than those defined in Type 1 ▪ Weir pools and dams up to full supply	Not Present
Type 3 – Minimally sensitive key fish habitat may include	▪ Unstable or unvegetated sand or mud substrate, coastal and estuarine sandy beaches with minimal or no in-fauna ▪ Coastal and freshwater habitats not included in Type 1 or 2 ▪ Ephemeral aquatic habitat not supporting native aquatic or wetland vegetation	Present. Brookvale Creek is a coastal habitat that does not have features listed in Type 1 or 2.

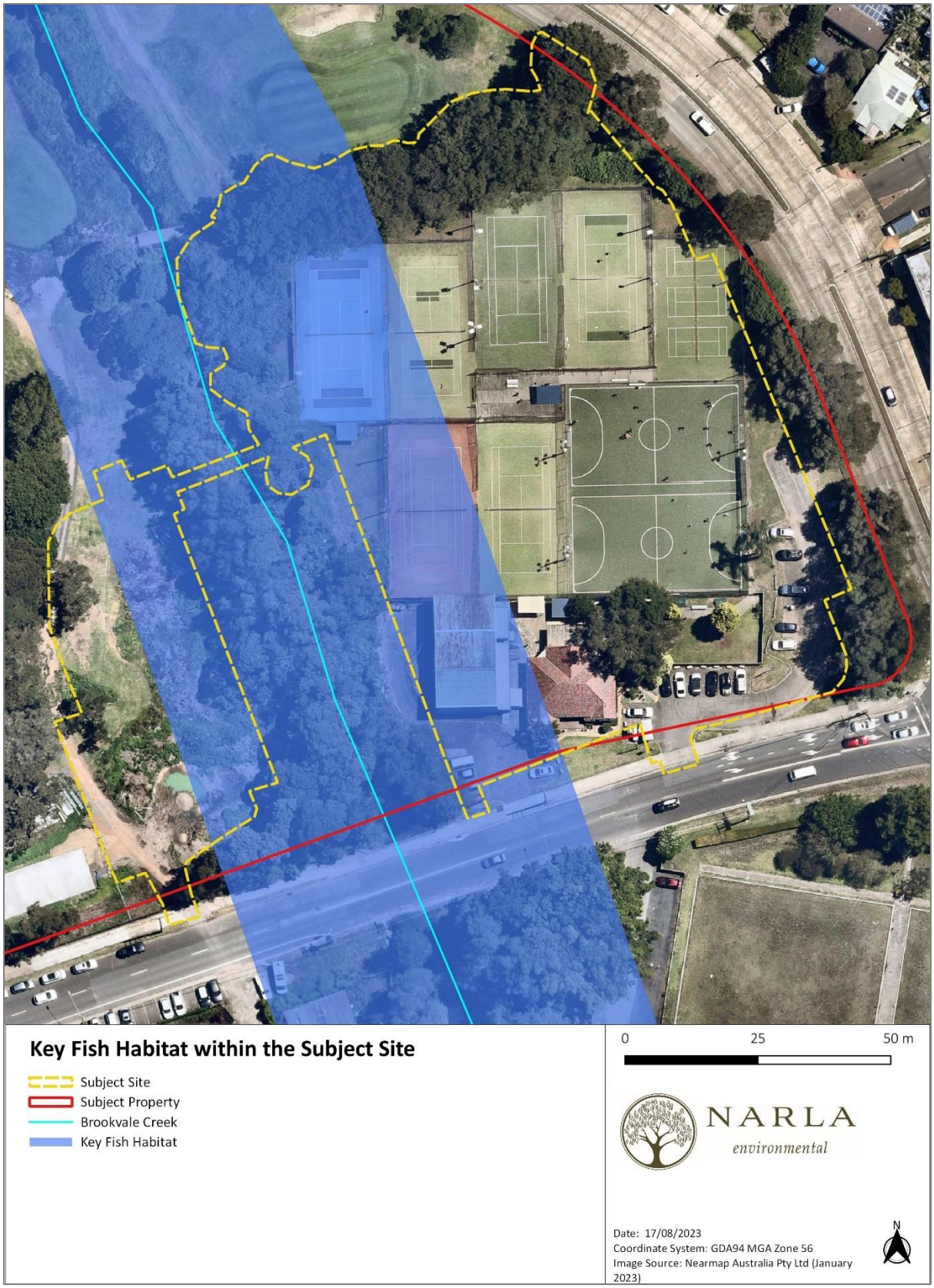

Figure 2. Key Fish Habitat within the Subject Site.

1.12 Scope of Assessment

1.12.1 Objectives of the Fauna and Flora Assessment

The objectives of this FFA were to:

- 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;
- Assess any potential impacts to species and/or communities listed under the BC Act and EPBC Act;
- Assess the ecological impacts of the proposed development on the waterway and riparian land that is within the Subject Site;
- Identify and map the distribution of vegetation communities within the Subject Property;
- Record presence and the extent of any known or potential fauna habitat features such as nests, dreys, caves, crevices, culverts, pools, soaks, flowering trees, fruiting trees, or hollow-bearing trees and provide recommendations for on-going management of these habitat features and any fauna present;
- Record presence and the extent of any priority weeds or weed infestations and provide recommendations for on-going management; and
- Recommend any controls or additional actions to be taken to protect or improve environmental outcomes of the proposed activity.

1.12.2 Objectives of the Water Impact Statement

The objectives of this WIS were to:

- Determine impacts upon water quality;
- Determine impacts on channel form, erosion rate and bank stability;
- Identify ecological impacts of the proposed development;
- Establish any landscaping impacts of the proposed development;
- Assess bank stability by demonstrating that the building and development is not at risk from erosion processes;
- Identify the extent of native vegetation proposed to be removed; and
- Determine any modifications to natural creek lines and overland flow.

1.13 Study Limitations

This study was not intended to provide a complete inventory of all flora and fauna species with potential to occur on the Subject Property. The species list provided for the Subject Property in this report was restricted to what was observed during the site assessment by the Narla Ecologist. The timing of the survey may not have coincided with emergence times of some species of flora and fauna, such as seasonally flowering herbs, seasonal migratory fauna, or nocturnal fauna. To account for those species that could not be identified during the field survey, detailed habitat assessments were combined with desktop research and local ecological knowledge to establish an accurate prediction of the potential for such species to occur on or adjacent the Subject Property.

2. Methodology

2.1 Desktop Assessment and Literature Review

A thorough literature review of local information relevant to the Northern Beaches Council area was undertaken. Searches using NSW Wildlife Atlas (BioNet; DPE 2023b) and the Commonwealth Protected Matters Search Tool (DCCEEW 2023) were conducted to identify all current threatened flora and fauna, as well as migratory fauna records within a 10km x 10km cell search area centred on the Subject Site. These data were used to assist in establishing the presence or likelihood of any ecological values as occurring on or adjacent the Subject Site, and helped inform the Ecologist on what to look for during the site assessment.

Soil landscape and geological mapping was examined to understanding of the environment on the Subject Site and assisted in determining whether any threatened flora or ecological communities may occur there (Chapman et al. 2009).

2.2 Ecological Site Assessment

2.2.1 Ecological Survey

A site assessment was undertaken by Narla Ecologists, Jonathan Coy and Jayden Maloney, on Wednesday 2nd of August 2023. During the site assessment, the following activities were undertaken:

- Identifying and recording the vegetation communities present within the Subject Site, with focus on identifying any threatened ecological communities (TEC);
- Recording a detailed list of flora species encountered within 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;
- Targeted surveys for threatened flora;
- Identifying and recording the locations of notable fauna habitat such as important nesting, roosting, or foraging microhabitats;
- Assessing the impact of the proposed development on the present waterway and riparian land;
- Assessing the connectivity and quality of the vegetation within the Subject Site and surrounding area; and
- Targeting the habitat of any threatened and regionally significant fauna including:
    - Tree hollows (habitat for threatened large forest owls, parrots, 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 nectarivorous birds and mammals);
    - Trees and shrubs supporting nest structures (habitat for threatened birds and arboreal mammals); and
    - Any other habitat features that may support fauna (particularly threatened) species.

2.2.2 Weather Conditions

Weather conditions recorded at the nearest weather station (Terrey Hills AWS #066059) prior to and during the site assessment are provided in **Table 6** (BOM 2022). The data revealed mild to low temperatures and no rainfall in the lead up to the site assessment, these conditions may not have been conducive to the emergence of flowering plants.

Table 6. Weather conditions recorded at Terrey Hills AWS (station 066059) preceding and during the site assessment (site assessment date in bold)

Survey date	Day	Minimum Temp. (°C)	Maximum Temp. (°C)	Rainfall (mm)
27/07/2023	Thursday	7.9	19.5	0
28/07/2023	Friday	10.7	22.7	0
29/07/2023	Saturday	13.9	21.2	0
30/07/2023	Sunday	12.9	24	0
31/07/2023	Monday	11.5	21.8	0
01/08/2023	Tuesday	7.7	19.4	0
02/08/2023	**Wednesday**	**11.3**	**17.8**	**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 State Vegetation Type Map (DPE 2022) in order to stratify the Subject Site and guide the site assessment survey efforts. The following documents were also consulted during the site assessment to assist with the identification of vegetation communities present within the Subject Site:

- Chapman G.A., Murphy C.L., Tille P.J., Atkinson G. and Morse R.J. (2009) Soil Landscapes of the Sydney 1:100,000 Sheet map, Ed. 4, Department of Environment, Climate Change and Water, Sydney.
- Department of Planning and Environment (DPE) (2023d) eSPADE v2.2 https://www.environment.nsw.gov.au/eSpade2Webapp#
- Department of Planning and Environment (DPE) (2022) State Vegetation Type Map

2.2.4 Impact Assessment

An assessment of likely occurrence was carried out for locally occurring threatened species (**Table 11** and **Table 13**) and threatened migratory species. It was then determined if a further impact assessment (5-Part Test; test of significance) was required for any locally occurring threatened species or communities (**Appendix D**; **Appendix E**).

2.3 Waterways Impact Assessment

2.3.1 Waterways Impact Survey

A site assessment was undertaken by Narla Ecologist, Jonathan Coy and Jayden Maloney, on Wednesday 2nd of August 2023. During the site assessment, the following activities were undertaken:

- Observing water quality and turbidity;
- Recording the presence of litter, rubbish and pollutants;
- Identifying potential development-related impacts upon water quality;
- Determining potential impacts on channel form, erosion rate and bank stability;
- Identifying any potential fauna habitat;
- Establishing any potential landscaping impacts of the proposed development;

- Assessing the current state of bank stability; and
- Determining any potential modifications to natural creek lines and overland flow.

3. Native Vegetation

3.1 Historically Mapped Vegetation Communities

Historical vegetation mapping of the Subject Property utilizing the "State Vegetation Type Map" (DPE 2022) was conducted and identified the vegetation on site as non-classified. The nearest native vegetation mapped is Estuarine Swamp Oak Twig-rush Forest (**Figure 3**).

3.2 Field-validated Vegetation Communities

The field survey conducted by Narla identified the vegetation within the Subject Property as best conforming to two (2) vegetation community (**Figure 4**):

- Estuarine Swamp Oak Twig-rush Forest (**Table 7**);
- Exotic Dominated Vegetation (**Table 8**).

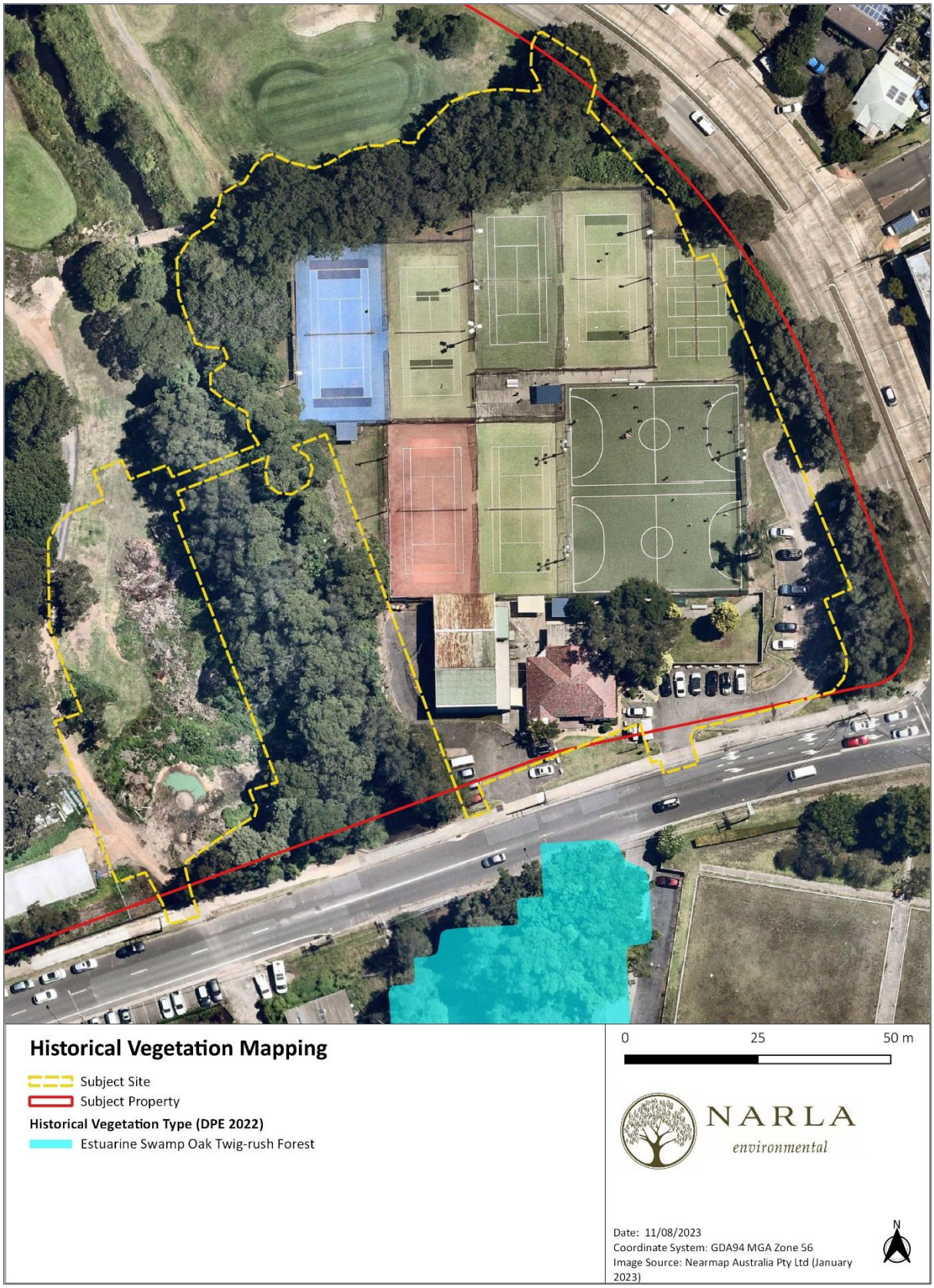

Figure 3. Historical Vegetation Mapping of the Subject Site.

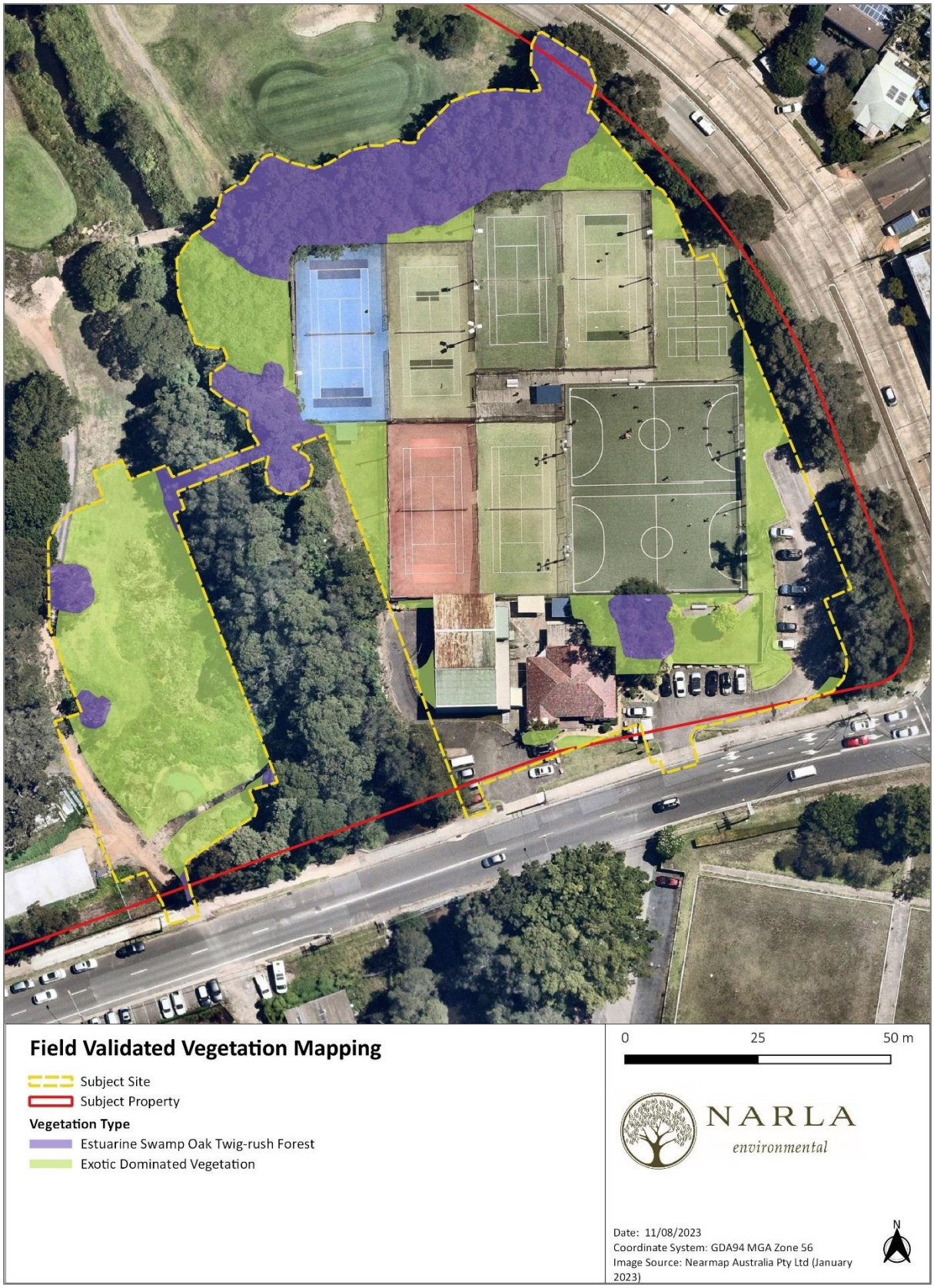

Figure 4. Field Validated Vegetation Mapping of the Subject Site.

Table 7 Description of Estuarine Swamp Oak Twig-rush Forest identified within the and surrounding the Subject Site.

Estuarine Swamp Oak Twig-rush Forest	
	
Extent within the Subject Site (approx.)	0.19ha
Description (DPE 2022)	
A tall to very tall open forest or woodland featuring *Casuarina glauca* and usually *Baumea juncea* and *Juncus kraussii* subsp. *australiensis*, occurring on the edges of tidal estuarine flats and tidal creek flats along the NSW coast, usually at elevations of below 10 metres asl. *Casuarina glauca* almost always forms a sparse to mid-dense tree layer, rarely accompanied by *Melaleuca quinquenervia*. A sparse or very sparse small tree or scrub layer of *Melaleuca ericifoli*a is occasionally present, while other *Melaleuca* species and other trees or shrubs only rarely occur. The mid-dense ground layer is primarily comprised of sedges, rushes, reeds and grasses that are tolerant of inundation, very frequently including *Baumea juncea* and *Juncus kraussii* subsp. *australiensis*, commonly with Phragmites australis. Other species occasionally occurring in the ground layer include *Samolus repens, Lobelia anceps* and *Gahnia clarkei*, while more rare species include *Sporobolus virginicus, Apium prostratum* and *Hemarthria uncinata*, the latter three with variable cover from site to site. This PCT has been recorded from Sawtell south to Tuross Head, however is likely to occur elsewhere along the NSW coast on the margins of brackish water bodies and watercourses. It is floristically related to PCT 4026 which occurs in similar environments, however PCT 4028 has a more consistent cover of *Casuarina glauca* and includes more species that are not tolerant of saline conditions. PCT 4028 occurs at slightly higher elevations than PCT 4026, or further upstream in areas with less frequent inundation. PCT 4028 overlaps spatially in the Hunter region with PCT 4038, with which it also weakly overlaps floristically, however PCT 4038 has thick *Melaleuca nodosa* which is only very rare and very sparse in PCT 4028.	

Estuarine Swamp Oak Twig-rush Forest	
Description of the Vegetation within and adjacent to the Subject Site	
This vegetation community was a tall open forest that was historically disturbed with a weed dominated understorey. The canopy layer was dominated by *Casuarina glauca* in conjunction with high quantities of *Melaleuca quinquenervia, Melaleuca linariifolia* and *Callistemon salignus,* with sporadic occurrences of *Eucalyptus robusta* and *Angophora costata*. Minor occurrences of the weeds *Cinnamomum camphora* and *Erythrina x sykesii* were also present within this stratum. The midstratum was generally sparse and dominated by *Homalanthus populifolius, Pittosporum undulatum* and *Acacia longifolia*. Exotic species in the midstratum included *Senna pendula, Lantana camara* and *Asparagus aethiopicus*. The ground layer was primarily exotic, however native species present included *Pteridium esculentum, Commelina cyanea, Lomandra longifolia, Cissus antarctica* and *Dichondra repens* Dominated exotic species includes *Ipomoea purpurea, Araujia sericifera, Ehrharta erecta, Ageratina adenophora, Parietaria Judaica, Cenchrus clandestinus, Anredera cordifolia* and *Eragrostis curvula.*	
Justification of Vegetation Assignment	This vegetation within the Subject Land is located on a tidal creek flat below 10m asl and contains diagnostic species in the canopy and midstratum, particularly *Casuarina glauca, Melaleuca quinquenervia* and *Melaleuca linariifolia.*
BC Act 2016 Status	The vegetation within the Subject Site conforms to the BC Act listed EEC Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East Corner Bioregions
EPBC Act 1999 Status	The vegetation within the Subject Site conforms to the EPBC Act listed EEC Coastal Swamp Oak Forest of South-east Queensland and New South Wales Community

Table 8 Description of Exotic Dominated Vegetation identified within the and surrounding the Subject Site.

Exotic Dominated Vegetation	
	
Extent within the Subject Site (approx.)	0.32ha
Description of the Vegetation within the Subject Property	
This vegetation community was dominated by common garden environmental exotics and noxious weeds, as well as areas of turf and planted gardens and trees. The canopy layer contained exotic species including *Phoenix canariensis* and *Harpephyllum caffrum.* The mid-storey was dominated by exotic species such as *Anethum graveolens, Lantana camara, Solanum nigrum, Ricinus communis* and *Strelitzia nicolai*. The ground layer was heavily dominated by exotic species, including *Ipomoea purpurea, Araujia sericifera, Ehrharta erecta, Ageratina adenophora, Parietaria Judaica, Cenchrus clandestinus, Anredera cordifolia* and *Eragrostis curvula.* The only native species within this zone was *Cynodon dactylon* which was located in areas of turf.	
Justification of Vegetation Assignment	This assemblage of species within the landscape of the Subject Property did not conform to any locally occurring community.
BC Act 2016 Status	Not Listed.
EPBC Act 1999 Status	Not Listed.

4. Threatened Entities

4.1 Threatened Ecological Communities

4.1.1 Listing under the BC Act: Swamp Oak Floodplain Forest in the NSW North Coast, Sydney Basin and South East Corner Bioregions, Endangered Ecological Community

Estuarine Swamp Oak Twig-rush Forest is associated with to Swamp Oak Floodplain Forest (SOFF) in the Sydney Basin Bioregion Endangered Ecological Community (EEC). Swamp Oak Floodplain Forest is associated with grey-black clay-loams and sandy loams, where the groundwater is saline or sub-saline, on waterlogged or periodically inundated flats, drainage lines, lake margins and estuarine fringes associated with coastal floodplains, generally below 20 m (NSW Scientific Committee 2011). The Subject Site occurs on such soils on a costal floodplain below 20m asl, and contains the following diagnostic species:

- *Callistemon salignus;*
- *Casuarina glauca;*
- *Commelina cyanea;*
- *Glochidion ferdinandi;*
- *Lomandra longifolia;* and
- *Melaleuca quinquenervia.*

Therefore, this community within the conforms to the EEC SOFF in the Sydney Basin Bioregion.

4.1.2 Listing under the EPBC Act: Coastal Swamp Oak (*Casuarina glauca*) Forest of South-east Queensland and New South Wales

Estuarine Swamp Oak Twig-rush Forest is associated with Coastal Swamp Oak (*Casuarina glauca*) Forest of South-east Queensland and New South Wales (CWOF) EEC. In order to be considered a Matter of National Significance, areas of the ecological community must meet both:

- the key diagnostic characteristics (Table 9); and
- at least the minimum condition thresholds for Category C (Table 10).

As Estuarine Swamp Oak Twig-rush Forest within the Subject Site meets the key diagnostic characteristics and minimum condition thresholds (Category C), this vegetation meets the definition of CWOF EEC.

Table 9. Key Diagnostic Characteristics of Coastal Swamp Oak (*Casuarina glauca*) Forest of South-east Queensland and New South Wales.

Key Diagnostic Characteristic	Features Present within the Subject Site?
Occurs from south-east Queensland to southern NSW within the South Eastern Queensland, NSW North Coast, Sydney Basin, or South East Corner bioregions	Yes. The Subject Site is located within the Sydney Basin Bioregion.
Occurs in coastal catchments at elevations up to 50 m ASL, typically less than 20 m ASL, on coastal flats, floodplains, drainage lines, lake margins, wetlands and estuarine fringes where soils are at least occasionally saturated, water-logged or inundated. There are also minor occurrences on coastal dune swales or flats, particularly deflated dunes and dune soaks.	Yes. The Subject Site occurs at <10m asl on a coastal floodplain.

Key Diagnostic Characteristic	Features Present within the Subject Site?
Occurs on soils derived from unconsolidated sediments (including alluvium), typically hydrosols (grey-black clay-loam and/or sandy loam soils) and sometimes organosols (peaty soils). It may occur in transitional soils (or catenas) where shallow unconsolidated sediments border lithic substrates.	Yes. The Subject Site is mapped as occurring on alluvial soils including loamy sand and peaty soils.
Has an open woodland, woodland, forest, or closed forest structure, with a tree canopy that has a total crown cover of at least 10 per cent.	Yes. Canopy cover is < 10%.
Has a canopy of trees dominated by *Casuarina glauca*	Yes. *Casuarina glauca* is the dominant species.

Table 10. Condition Thresholds for Coastal Swamp Oak (*Casuarina glauca*) Forest of South-east Queensland and New South Wales (Green Box indicates condition class).

Vegetation Quality Class	Large Patch The patch ≥5 ha	Medium Patch The patch ≥2ha and <5 ha	Small Contiguous Patch The patch ≥0.5ha and <2ha, and is connected to a larger area of native vegetation of at least 5 ha	Small Patch The patch ≥0.5ha and <2ha
High Quality - Predominantly native understorey Non-native species comprise less than 20% of total understorey vegetation cover	Category A	Category B		Category C
Good Quality -Mostly native understorey Non-native species comprise less than 50% of total understorey vegetation cover and transformer species comprise less than 30% of total understorey vegetation cover*	Category B	Category C		N/A
Moderate Quality -Some native understorey Non-native species comprise less than 80% of total understorey vegetation cover and transformer species comprise less than 50% of total understorey vegetation cover	Category C		N/A	N/A
As non-native species comprise less than 80% of total understorey vegetation cover and transformer species comprise less than 50% of total understorey vegetation cover with a patch size >5ha, Estuarine Swamp Oak Twig-rush Forest within the Subject Site conforms to Condition Class C.				

4.1 Threatened Flora

Desktop analysis revealed a range of threatened flora as occurring or having the potential to occur on or within a 10km x 10km cell centred on the Subject Site. Thorough targeted surveys were undertaken throughout the Subject Site for potentially occurring threatened flora whose survey period coincided within the time of the site assessment (August 2023; **Figure 5**). No threatened flora whose survey period coincided with the time of the site assessment were identified at the time of the site assessment.

A comprehensive list of flora species identified during the site assessment is presented in **Appendix B .** The following locally occurring species were assessed for their potential to occur within the Subject Site (**Table 11**). Based on unsuitable habitat, geographic distribution and/or the small scale of the development, it was determined that the proposed works are unlikely to significantly impact upon these species. Therefore, no further assessment of impacts pursuant the BC Act (e.g. Biodiversity Development Assessment Report [BDAR]) and/or EPBC Act Referral to Commonwealth will be required.

Table 11. Assessment of likely occurrence of threatened flora species within the Subject Site. E = Endangered, CE = Critically Endangered, EP = Endangered Population, V = Vulnerable.

Species	BC Act	EPBC Act	Habitat Requirements (DPE 2023e)	Likelihood of occurrence within the Subject Site	Further Impact Assessment Required?
Acacia bynoeana (Bynoe's Wattle)	E	V	Occurs in heath or dry sclerophyll forest on sandy soils. Prefers open, sometimes slightly disturbed sites such as trail margins, edges of roadside spoil mounds and in recently burnt patches.	Absent. No heath or dry sclerophyll forest occurs within the Subject Site; however, a targeted survey was conducted during the approved survey period for this species (DPE 2023b) and no individuals were identified.	No
Acacia terminalis subsp. *terminalis* (Sunshine Wattle)	E	E	Coastal scrub and dry sclerophyll woodland on sandy soils. Habitat is generally sparse and scattered. Most areas of habitat or potential habitat are small and isolated. Most sites are highly modified or disturbed due to surrounding urban development. Flowers in autumn but may be through to early winter.	Low. Sandy soils were not present within the Subject Site; furthermore, the degraded and altered state of the Subject Site makes this species presence unlikely.	No
Allocasuarina portuensis (Nielsen Park She-oak)	E	E	The original known habitat of the Neilsen Park She-oak is at Nielsen Park, in Woollahra local government area. There are no plants left at the original site where it was discovered. However, propagation material has been planted successfully at a number of locations at Nielsen Park and other locations in the local area, e.g. Gap Bluff, Hermit Point and Vaucluse House. The Subject Site is outside this distribution.	Low. The original known habitat of the Neilsen Park She-oak is at Nielsen Park, in Woollahra local government area. There are no plants left at the original site where it was discovered. However, propagation material has been planted successfully at a number of locations at Nielsen Park and other locations in the local area, e.g. Gap Bluff, Hermit Point and Vaucluse House. The Subject Site is outside this distribution.	No
Caladenia tessellata (Thick Lip Spider Orchid)	E	V	Within NSW, *Caladenia tessellata* is currently known from two disjunct areas; one population near Braidwood on the Southern Tablelands and three populations in the Wyong area on the Central Coast. Records in the Sydney area old from 1945 and it is likely extinct in these locations.	Low. As the Subject Site is outside of this current distribution it is unlikely to occur.	No
Callistemon linearifolius	V	-	Grows in dry sclerophyll forest on the coast and adjacent ranges.	**Present outside of the Subject Site.** This species was observed adjacent to Brookvale Creek outside of the	No

Species	BC Act	EPBC Act	Habitat Requirements (DPE 2023e)	Likelihood of occurrence within the Subject Site	Further Impact Assessment Required?
(Netted Bottle Brush)				Subject Site. Therefore, no impact is expected for this species.	
Chamaesyce psammogeton (Sand Spurge)	E	-	Grows on fore-dunes, pebbly strandlines and exposed headlands, often with Spinifex (*Spinifex sericeus*) and Prickly Couch (*Zoysia macrantha*).	Absent. No fore-shore dunes, pebbly strandlines, exposed headlands or the species associated with this species are located within the Subject Site. A targeted survey was conducted during the approved survey period for this species (DPE 2023b) and no individuals were identified.	No
Epacris purpurascens var. *purpurascens*	V	-	Found in a range of habitat types, most of which have a strong shale soil influence. Lifespan is recorded to be 5-20 years, requiring 2-4 years before seed is produced in the wild. Killed by fire and re-establishes from soil-stored seed.	Low. The Subject Site does not contain strongly shale influenced soils. Furthermore, the degraded state of the Subject Site makes this species presence unlikely.	No
Eucalyptus camfieldii (Camfield's Stringybark)	V	V	Occurs in poor coastal country in shallow sandy soils overlying Hawkesbury sandstone. Coastal heath mostly on exposed sandy ridges. Occurs mostly in small scattered stands near the boundary of tall coastal heaths and low open woodland of the slightly more fertile inland areas. Associated species frequently include stunted species of *E. oblonga* Narrow-leaved Stringybark, *E. capitellata* Brown Stringybark and *E. haemastoma* Scribbly Gum.	Absent. While the Subject Site occurs on Hawkesbury sandstone, a targeted survey was conducted during the approved survey period for this species (DPE 2023b) and no individuals were identified.	No
Genoplesium baueri (Bauer's Midge Orchid)	E	E	Grows in dry sclerophyll forest and moss gardens over sandstone. Flowers February to March.	Low. The associated habitat for this species (dry sclerophyll forest) does not occur within the Subject Site. Furthermore, the highly disturbed nature of the Subject Site also makes the occurrence of this threatened plant highly unlikely.	No.

Species	BC Act	EPBC Act	Habitat Requirements (DPE 2023e)	Likelihood of occurrence within the Subject Site	Further Impact Assessment Required?
Grevillea caleyi (Caley's Grevillea)	CE	CE	All natural remnant sites occur within a habitat that is both characteristic and consistent between sites. All sites occur on the ridgetop between elevations of 170 to 240m asl, in association with laterite soils and a vegetation community of open forest, generally dominated by *Eucalyptus sieberi* and *E. gummifera*. Commonly found in the endangered Duffys Forest ecological community (EEC).	Absent. No ridgetops between elevations of 170-240 asl are present within the Subject Site, however, a targeted survey was conducted during the approved survey period for this species (DPE 2023b) and no individuals were identified.	No
Hibbertia superans	E	-	Flowering time is July to December. The species occurs on sandstone ridgetops often near the shale/sandstone boundary. Occurs in both open woodland and heathland, and appears to prefer open disturbed areas, such as tracksides.	Absent. No ridgetops near the shale/sandstone boundary are present within the Subject Site. A targeted survey was conducted during the approved survey period for this species (DPE 2023b) and no individuals were identified.	No
Melaleuca biconvexa (Biconvex Paperbark)	V	V	Biconvex Paperbark generally grows in damp places, often near streams or low-lying areas on alluvial soils of low slopes or sheltered aspects. Flowering occurs over just 3-4 weeks in September and October.	Absent. Although suitable habitat for this species is present within the Subject Site, a targeted survey was conducted during the approved survey period for this species (DPE 2023b) and no individuals were identified.	No
Microtis angusii (Angus's Onion Orchid)	E	E	It is not easy to define the preferred natural habitat of this orchid as the Ingleside location is highly disturbed. The dominant species occurring on the site are introduced weeds *Hyparrhenia hirta* (Coolatai grass) and *Acacia saligna*. The Ingleside population occurs on soils that have been modified but were originally those of the restricted ridgetop lateritic soils in the Duffys Forest - Terrey Hills - Ingleside and Belrose areas. These soils support a specific and distinct vegetation	Low. The Subject Site does not contain strongly shale influenced soils; furthermore, the degraded and altered state of the Subject Site makes this species presence unlikely.	No

Species	BC Act	EPBC Act	Habitat Requirements (DPE 2023e)	Likelihood of occurrence within the Subject Site	Further Impact Assessment Required?
			type, the Duffys Forest Vegetation Community and ranges from open forest to low open forest and rarely woodland.		
Persoonia hirsuta (Hairy Geebung)	E	E	The Hairy Geebung is found in clayey and sandy soils in dry sclerophyll open forest, woodland and heath, primarily on the Mittagong Formation and on the upper Hawkesbury Sandstone. It is usually present as isolated individuals or very small populations.	Absent. Sandy soil landscape is present within the Subject Site; however, a targeted survey was conducted during the approved survey period for this species (DPE 2023b) and no individuals were identified.	No
Pimelea curviflora var. *curviflora*	V	V	Occurs on shaley/lateritic soils over sandstone and shale/sandstone transition soils on ridgetops and upper slopes amongst woodlands. Also recorded in Illawarra Lowland Grassy Woodland habitat at Albion Park on the Illawarra coastal plain.	Low. Appropriate habitat requirements were not identified within the Subject Site, furthermore, the degraded and altered state of the Subject Site makes this species presence unlikely.	No
Prostanthera marifolia (Seaforth Mintbush)	CE	CE	Occurs in localised patches in or in close proximity to the endangered Duffys Forest ecological community. Located on deeply weathered clay-loam soils associated with ironstone and scattered shale lenses, a soil type which only occurs on ridge tops and has been extensively urbanised.	Absent. The endangered Duffys Forest ecological community is not in close proximity to the Subject Site. A targeted survey was still conducted during the approved survey period for this species (DPE 2023b) and no individuals were identified.	No
Rhodamnia rubescens (Scrub Turpentine)	CE	CE	Occurs in coastal districts north from Batemans Bay in New South Wales, approximately 280 km south of Sydney, to areas inland of Bundaberg in Queensland. Populations of *R. rubescen*s typically occur in coastal regions and occasionally extend inland onto escarpments up to 600 m asl. in areas with rainfall of 1,000-1,600 mm. Found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest usually on volcanic and sedimentary soils.	Absent. There was no presence of littoral, warm temperate and subtropical rainforest or wet sclerophyll forest usually on volcanic and sedimentary soils on the Subject Site. A targeted survey was still conducted during the approved survey period for this species (DPE 2023b) and no individuals were identified.	No.
Senecio spathulatus	E	-	Coast Groundsel occurs in Nadgee Nature Reserve (Cape Howe) and between Kurnell in Sydney and Myall Lakes	Absent. No frontal dunes were present within the Subject Site. A targeted survey was still conducted during the	No

Species	BC Act	EPBC Act	Habitat Requirements (DPE 2023e)	Likelihood of occurrence within the Subject Site	Further Impact Assessment Required?
(Coastal Groundsel)			National Park (with a possible occurrence at Cudmirrah). In Victoria there are scattered populations from Wilsons Promontory to the NSW border. Coast Groundsel grows on frontal dunes.	approved survey period for this species (DPE 2023b) and no individuals were identified.	
Syzygium paniculatum (Magenta Lilly Pilly)	E	V	On the south coast the Magenta Lilly Pilly occurs on grey soils over sandstone, restricted mainly to remnant stands of littoral (coastal) rainforest. On the central coast Magenta Lilly Pilly occurs on gravels, sands, silts and clays in riverside gallery rainforests and remnant littoral rainforest communities.	Low. Appropriate habitat requirements were not identified within the Subject Site, furthermore, the degraded and altered state of the Subject Site makes this species presence unlikely.	No
Tetratheca glandulosa	V	-	Associated with shale-sandstone transition habitat where shale-cappings occur over sandstone, with associated soil landscapes such as Lucas Heights, Gymea, Lambert and Faulconbridge. Topographically, the plant occupies ridgetops, upper-slopes and to a lesser extent mid-slope sandstone benches.	Low. Appropriate habitat requirements were not identified within the Subject Site, furthermore, the degraded and altered state of the Subject Site makes this species presence unlikely.	No

4.2 Threatened Fauna

Details of the fauna habitat recorded within the Subject Site are included in **Table 12** and displayed **Figure 5**. The likelihood of occurrence of threatened fauna species within the Subject Site is presented in **Table 13**.

Based on unsuitable habitat, geographic distribution and/or the small scale of the development, it was determined that the proposed works are unlikely to significantly impact upon a local viable population or occurrence of any of the threatened species. Therefore, no assessment under the '5-Part Test Assessment of Significance' was required and no BDAR or EPBC Act Referral to the Commonwealth is considered necessary for the proposed development.

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. The list of fauna recorded during the site visit was produced opportunistically (**Appendix C**).

Table 12. Fauna habitat values within the Subject Site.

Habitat component	Site values
Coarse woody debris	Absent.
Rock outcrops and bush rock	Absent.
Caves, crevices and overhangs	Absent.
Culverts, bridges, mine shafts, or abandoned structures	Absent.
Nectar/lerp-bearing Trees	*Eucalyptus spp.* were present within the Subject Site. This species of tree may provide intermittent nectar sources for nomadic nectivores such as the Grey-headed Flying-fox.
Nectar-bearing shrubs	Present. *Melaleuca spp.* and *Callistemon spp.* were present within the Subject Site.
Koala use trees	Present.
Large stick nests	Absent.
Sap and gum sources	*Eucalyptus spp.* were present within the Subject Site. and can potentially be a sap and gum source.
She-oak fruit (Glossy Black Cockatoo feed)	Present in the form of *Casuarina glauca*
Seed-bearing trees and shrubs	Seed-bearing trees including *Angophora* species may provide foraging habitat for various bird species.
Soft-fruit-bearing trees	*Pittosporum undulatum* was identified within the Subject Site and may provide foraging habitat for fructivores such as the Grey-headed Flying-fox.
Dense shrubbery and leaf litter	Absent.
Tree hollows	Absent.
Decorticating bark	Absent.
Wetlands, soaks, and streams	Brookvale Creek is present within the Subject Site.
Open water bodies	Absent.
Estuarine, beach, mudflats, and rocky foreshores	Absent.
Smaller nests and possums dreys	Absent.

4.2.1 Migratory Fauna Species

Desktop analysis revealed the following EPBC Act listed migratory terrestrial fauna species were considered to have the potential to utilise habitat within the Subject Site (e.g. foraging or passage) during part of their lifecycles:

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

It was determined that the proposed works are unlikely to have a significant impact on these species. Therefore, a Referral to Commonwealth pursuant to the EPBC Act is not required.

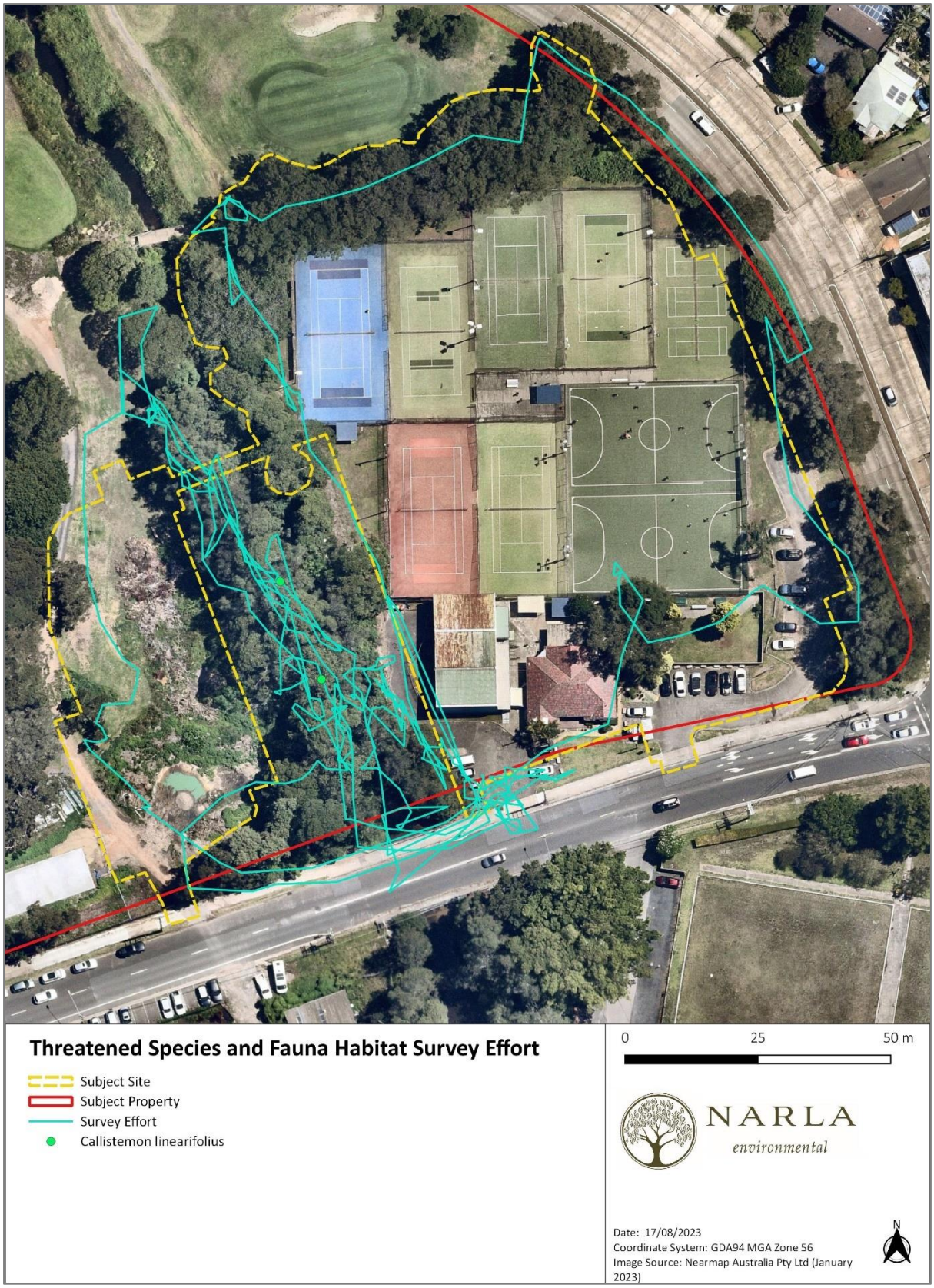

Figure 5. Threatened Species and Fauna Habitat Survey Effort.

Table 13. Assessment of likely occurrence of threatened fauna species within the Subject Site. E = Endangered, CE = Critically Endangered, EP = Endangered Population, V = Vulnerable.

Species	BC Act	EPBC Act	Likelihood of Occurrence	Foraging Habitat Present Within the Subject Site	Breeding Habitat Present Within the Subject Site	Anticipated Impact	Further Impact Assessment Required?
Anthochaera phrygia (Regent Honeyeater)	CE	CE	Low	Inhabits dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests of River Sheoak These woodlands have significantly large numbers of mature trees, high canopy cover and abundance of mistletoes. Foraging habitat may be present within the Subject Site, however, due to its degraded nature it is sub-optimal in condition.	There are three known key breeding areas, two of them in NSW - Capertee Valley and Bundarra-Barraba regions. The species breeds between July and January in Box-Ironbark and other temperate woodlands and riparian gallery forest dominated by River Sheoak. Such habitat is not present within the Subject Site	Minimal impact to potential sub-optimal foraging habitat given the small area of removal and the degraded nature of the Subject Site. No anticipated loss of foraging or breeding habitat. Furthermore, the Subject Site is not located on the important areas map for this species.	No
Artamus cyanopterus (Dusky Wood swallow)	V	-	Low	Primarily inhabit dry, open eucalypt forests and woodlands, including mallee associations, with an open or sparse understorey of eucalypt saplings, acacias and other shrubs, and ground-cover of grasses or sedges and fallen woody debris. Foraging habitat may be present within the Subject Site, however, due to its degraded nature it is sub-optimal in condition.	Nest is an open, cup-shape, nest sites vary greatly, but generally occur in shrubs or low trees, living or dead, horizontal or upright forks in branches, spouts, hollow stumps or logs, behind loose bark or in a hollow in the top of a wooden fence post. Nest sites may be exposed or well concealed by foliage. No such nests were observed within the Subject Site. Due to highly urbanized and degraded nature of the Subject Site, the species is highly unlikely to use the Subject Site as breeding habitat.	Minimal impact to potential sub-optimal foraging habitat given the small area of removal and the degraded nature of the Subject Site. No anticipated loss of foraging or breeding habitat.	No

Species	BC Act	EPBC Act	Likelihood of Occurrence	Foraging Habitat Present Within the Subject Site	Breeding Habitat Present Within the Subject Site	Anticipated Impact	Further Impact Assessment Required?
Botaurus poiciloptilus (Australasian Bittern)	E	E	Very Low	This species 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. No such habitat was identified within the Subject Site.	This species nests in densely vegetated wetlands. No such habitat was identified within the Subject Site.	Negligible, no anticipated net loss of foraging or breeding habitat.	No
Burhinus grallarius (Bush Stone-curlew)	E	-	Low	This species inhabits open forests and woodlands with a sparse grassy ground layer and fallen timber. No such habitat was identified within the Subject Site.	This species nests on the ground in a scrape or small bare patch. No such nests were identified within the Subject Site. Due to highly urbanized and degraded nature of the Subject Site, the species is highly unlikely to use the Subject Site as breeding habitat.	Negligible. No anticipated loss of foraging or breeding habitat.	No
Calidris alba (Sanderling)	V	-	Low	This species is found in coastal areas on low beaches of firm sand, near reefs and inlets, along tidal mudflats and bare open coastal lagoons; individuals are rarely recorded in near-coastal wetlands. No suitable foraging habitat was found within the Subject Site.	N/A. Breeding occurs in the Northern Hemisphere.	Negligible. No anticipated loss of foraging or breeding habitat.	No.
Calidris canutus (Red Knot)	-	E	Low	This species mainly occurs in small numbers on intertidal mudflats, estuaries, bays, inlets, lagoons, harbours and sandflats and sandy beaches of sheltered coasts. No suitable foraging habitat was found within the Subject Site.	N/A. Breeding occurs in the Northern Hemisphere.	Negligible. No anticipated loss of foraging or breeding habitat.	No.

Species	BC Act	EPBC Act	Likelihood of Occurrence	Foraging Habitat Present Within the Subject Site	Breeding Habitat Present Within the Subject Site	Anticipated Impact	Further Impact Assessment Required?
Calidris ferruginea (Curlew Sandpiper)	E	CE	Low	The species generally occupies littoral and estuarine habitats, and in New South Wales is mainly found in intertidal mudflats of sheltered coasts. 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. No suitable foraging habitat was found within the Subject Site.	N/A. Breeding occurs in the Northern Hemisphere.	Negligible. No anticipated loss of foraging or breeding habitat.	No
Calidris tenuirostris (Great Knot)	V	CE	Low	This species 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. No potential foraging habitat was found within the Subject Site.	N/A. Breeding occurs in the Northern Hemisphere.	Negligible. No anticipated loss of foraging or breeding habitat.	No
Calyptorhynchus lathami lathami (Southern Glossy Black-Cockatoo)	V	V	Low	This species feeds almost exclusively on the seeds of several species of she-oak (*Casuarina* and *Allocasuarina* species). Inhabits open forest and woodlands of the coast and the Great Dividing Range where stands of she-oak occur. Such habitat is present within the Subject Site.	Dependent on large hollow-bearing eucalypts for nest sites. No hollows were present within the Subject Site	Minimal impact to potential sub-optimal foraging habitat given the small area of removal and the degraded nature of the Subject Site. No anticipated net loss of breeding habitat.	No
Cercartetus nanus	V	-	Low	This species is found in a broad range of habitats from rainforest through	Shelters in tree hollows, rotten stumps, holes in the ground, abandoned bird-	Minimal impact to potential sub-optimal	No

Species	BC Act	EPBC Act	Likelihood of Occurrence	Foraging Habitat Present Within the Subject Site	Breeding Habitat Present Within the Subject Site	Anticipated Impact	Further Impact Assessment Required?
(Eastern Pygmy-possum)				sclerophyll (including Box-Ironbark) forest and woodland to heath, but in most areas woodlands and heath appear to be preferred. Feeds largely on nectar and pollen collected from banksias, eucalypts and bottlebrushes, as well as insects. Such habitat is present within the Subject Site., although sub-optimal due to its degraded and urban nature.	nests, Ringtail Possum dreys or thickets of vegetation, although hollows are preferred. No such habitat was present within the Subject Site.	foraging habitat given the small area of removal and the degraded nature of the Subject Site. No anticipated net loss of breeding habitat.	
Chalinolobus dwyeri (Large-eared Pied Bat)	V	V	Low	This species forages for small, flying insects in well-timbered areas. Such habitat is present within the Subject Site., although sub-optimal due to its degraded and urban nature.	Roosts in caves (near their entrances), crevices in cliffs, old mine workings and in the disused, bottle-shaped mud nests of the Fairy Martin (*Petrochelidon ariel*). No such habitat was identified within the Subject Site.	Minimal impact to potential sub-optimal foraging habitat given the small area of removal and the degraded nature of the Subject Site. No anticipated net loss of breeding habitat.	No
Charadrius leschenaultii (Greater Sand-plover)	V	V	Low	Almost entirely restricted to coastal areas in NSW, occurring mainly on sheltered sandy, shelly or muddy beaches or estuaries with large intertidal mudflats or sandbanks. Roosts during high tide on sandy beaches and rocky shores; begin foraging activity on wet ground at low tide, usually away from the edge of the water; individuals may forage and roost with other waders. No suitable foraging habitat was found within the Subject Site.	N/A. This species does not breed in Australia.	Negligible. No anticipated loss of foraging or breeding habitat.	No.

Species	BC Act	EPBC Act	Likelihood of Occurrence	Foraging Habitat Present Within the Subject Site	Breeding Habitat Present Within the Subject Site	Anticipated Impact	Further Impact Assessment Required?
Charadrius mongolus (Lesser Sand-plover)	V	E	Low	This species almost entirely coastal in NSW, favouring the beaches of sheltered bays, harbours and estuaries with large intertidal sandflats or mudflats; occasionally occurs on sandy beaches, coral reefs and rock platforms. Roosts during high tide on sandy beaches, spits and rocky shores; forage individually or in scattered flocks on wet ground at low tide, usually away from the water's edge. No suitable foraging habitat was found within the Subject Site.	N/A. This species does not breed in Australia.	Negligible. No anticipated loss of foraging or breeding habitat.	No.
Climacteris picumnus victoriae (Brown Treecreeper (eastern subspecies))	V	-	Low	Mainly inhabits woodlands dominated by stringybarks or other rough-barked eucalypts, usually with an open grassy understorey, sometimes with one or more shrub species. Fallen timber is an important habitat component for foraging. No fallen timber was present within the Subject Site making it unsuitable for this species.	Hollows in standing dead or live trees and tree stumps are essential for nesting. No hollows were present within the Subject Site	Negligible. No anticipated loss of foraging or breeding habitat.	No.
Daphoenositta chrysoptera (Varied Sittella)	V	-	Low	Species feeds on arthropods from crevices in rough or decorticating bark. Such habitat is present within the Subject Site, although sub-optimal due to its degraded and urban nature.	This species nests in shrubs and low trees, creating an open cup shaped nest. No such nests were observed within the Subject Site. No such nests were observed within the Subject Site.	Minimal impact to potential sub-optimal foraging habitat given the small area of removal and the degraded nature of the Subject Site. No anticipated net loss of breeding habitat.	No

Species	BC Act	EPBC Act	Likelihood of Occurrence	Foraging Habitat Present Within the Subject Site	Breeding Habitat Present Within the Subject Site	Anticipated Impact	Further Impact Assessment Required?
Dasyurus maculatus (Spotted-tailed Quoll)	V	E	Low	Consumes a variety of prey, including gliders, possums, small wallabies, rats, birds, bandicoots, rabbits, reptiles and insects. Also eats carrion and takes domestic fowl. Potential prey items may exist within the Subject Site.	This species uses hollow-bearing trees, fallen logs, small caves, rock outcrops and rocky-cliff faces as den sites. No such habitat is present within the Subject Site.	Minimal impact to potential sub-optimal foraging habitat given the small area of removal and the degraded nature of the Subject Site. No anticipated net loss of breeding habitat.	No
Esacus magnirostris (Beach Stone-curelw)	CE	-	Low	Beach Stone-curlews are found exclusively along the coast, on a wide range of beaches, islands, reefs and in estuaries, and may often be seen at the edges of or near mangroves. They forage in the intertidal zone of beaches and estuaries, on islands, flats, banks and spits of sand, mud, gravel or rock, and among mangroves. No suitable foraging habitat was present within the Subject Site.	Beach Stone-curlews breed above the littoral zone, at the backs of beaches, or on sandbanks and islands, among low vegetation of grass, scattered shrubs or low trees; also among open mangroves. There are no beaches within the Subject Site, thus no suitable breeding habitat is present.	Negligible. No anticipated loss of foraging or breeding habitat.	No
Eudyptula minor (Little Penguin in the Manly Point Area)	EP	-	Low	N/A. This species forages at sea.	This endangered population occurs from just north of Smedley's Point to Cannae Point, North Sydney Harbour, Manly. The Subject Site is not within this distribution.	Negligible. No anticipated loss of foraging or breeding habitat.	No
Glossopsitta pusilla (Little Lorikeet)	V	-	Low	This species forages primarily in the canopy of open Eucalyptus Forest and woodland, yet also finds food in *Angophora*, *Melaleuca,* and other tree species. Mostly feeds on nectar and pollen of flowers in the open canopy of woodland trees. Such habitat is present	Nests in proximity to feeding areas if possible, most typically selecting hollows in the limb or trunk of smooth-barked Eucalypts. Entrance is small (3cm) and usually high above the ground (2–15m). No such habitat is present within Subject Site.	Minimal impact to potential sub-optimal foraging habitat given the small area of removal and the degraded nature of the Subject Site. No	No

Species	BC Act	EPBC Act	Likelihood of Occurrence	Foraging Habitat Present Within the Subject Site	Breeding Habitat Present Within the Subject Site	Anticipated Impact	Further Impact Assessment Required?
				within the Subject Site, although sub-optimal due to its degraded and urban nature.		anticipated net loss of breeding habitat.	
Haematopus fuliginosus (Sooty Oystercatcher)	V	-	Low	Forages on exposed rock or coral at low tide for foods such as limpets and mussels. No suitable foraging habitat was present within the Subject Site.	Breeds in spring and summer, almost exclusively on offshore islands, and occasionally on isolated promontories. No such habitat is present within Subject Site.	Negligible. No anticipated loss of foraging or breeding habitat.	No
Haematopus longirostris (Pied Oystercatcher)	E	-	Low	This species 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. No suitable foraging habitat is present within the Subject Site.	This species nests mostly on coastal or estuarine beaches although occasionally they use saltmarsh or grassy areas. No suitable breeding habitat was found within the Subject Site.	Negligible. No anticipated loss of foraging or breeding habitat	No
Haliaeetus leucogaster (White-bellied Sea-Eagle)	V	-	Low	Habitats are characterised by the presence of large areas of open water including larger rivers, swamps, lakes, and the sea. Occurs at sites near the sea or sea-shore, such as around bays and inlets, beaches, reefs, lagoons, estuaries, and mangroves. Feed mainly on fish and freshwater turtles, but also waterbirds, reptiles, mammals and carrion. Such habitat is present within the Subject Site.	Breeding habitat consists of mature tall open forest, open forest, tall woodland, and swamp sclerophyll forest close to foraging habitat. Nests are large structures built from sticks and lined with leaves or grass. No nests or potential breeding sites were identified during the site assessment.	Minimal impact to potential sub-optimal foraging habitat given the small area of removal and the degraded nature of the Subject Site. No anticipated net loss of breeding habitat.	No
Heleioporus australiacus (Giant Burrowing Frog)	V	V	Low	Species occurs in heath, woodland and dry sclerophyll forest. It forages on invertebrates up to 300m from breeding site. No such habitat is present within or surrounding the Subject Site.	The species breeds in soaks and second order streams. As Brookvale Creek is a third order stream, such habitat is not present within the Subject Site.	Negligible, no anticipated net loss of foraging or breeding habitat.	No

Species	BC Act	EPBC Act	Likelihood of Occurrence	Foraging Habitat Present Within the Subject Site	Breeding Habitat Present Within the Subject Site	Anticipated Impact	Further Impact Assessment Required?
Hieraaetus morphnoides (Little Eagle)	V	-	Low	This species occupies open eucalypt forest, woodland or open woodland. Preys on birds, reptiles and mammals, occasionally adding large insects and carrion. Such habitat is present within the Subject Site, although sub-optimal due to its degraded and urban nature.	Nests in tall living trees within a remnant patch, where pairs build a large stick nest in winter. No suitably sized nests were identified during the site assessment.	Minimal impact to potential sub-optimal foraging habitat given the small area of removal and the degraded nature of the Subject Site. No anticipated net loss of breeding habitat.	No
Hirundapus caudacutus (White-throated Needletail)	-	V	Low	This species feeds on flying insects, such as termites, ants, beetles and flies. They catch the insects in flight in their wide gaping beaks. Birds usually feed in rising thermal currents associated with storm fronts and bushfires and they are commonly seen moving with wind fronts. Such habitat is present within the Subject Site, although sub-optimal due to its degraded and urban nature.	N/A. Does not breed in Australia.	Minimal impact to potential sub-optimal foraging habitat given the small area of removal and the degraded nature of the Subject Site. No anticipated net loss of breeding habitat.	No
Isoodon obesulus obesulus (Southern Brown Bandicoot [eastern])	E	E	Low	Typically found in heath or open forest with a heathy understorey on sandy or friable soils. They feed on a variety of ground-dwelling invertebrates and the fruit-bodies of hypogeous (underground-fruiting) fungi. The Subject Site may provide suboptimal foraging habitat for this species given the lack of heath or a heathy understorey, no distinctive scratching's were observed within the Subject Site.	Nest during the day in a shallow depression in the ground covered by leaf litter, grass or other plant material. Nests may be located under Grass trees *Xanthorrhoea* spp., blackberry bushes, and other shrubs, or in rabbit burrows. No such breeding habitat is present within the Subject Site.	Minimal impact to potential sub-optimal foraging habitat given the small area of removal and the degraded nature of the Subject Site. No anticipated net loss of breeding habitat.	No

Species	BC Act	EPBC Act	Likelihood of Occurrence	Foraging Habitat Present Within the Subject Site	Breeding Habitat Present Within the Subject Site	Anticipated Impact	Further Impact Assessment Required?
Ixobrychus flavicollis (Black Bittern)	V	-	Low	Inhabits both terrestrial and estuarine wetlands, generally in areas of permanent water and dense vegetation. No such habitat was identified within the Subject Site.	Nests, built in spring, are located on a branch overhanging water and consist of a bed of sticks and reeds on a base of larger sticks. No such nests were identified within the Subject Site.	Negligible, no anticipated net loss of foraging or breeding habitat.	No
Lathamus discolor (Swift Parrot)	E	CE	Low	On the mainland, this species occurs in areas where eucalypts are flowering profusely or where there are abundant lerp infestations (from sap-sucking bugs). Such habitat is present within the Subject Site, although sub-optimal due to its degraded and urban nature.	N/A. This species breeds in Tasmania.	Negligible, no anticipated net loss of foraging or breeding habitat. The Subject Site is not mapped on the Swift Parrot Important Areas Map (DPE 2023b).	No
Litoria aurea (Green and Gold Bell Frog)	E	V	Low	This species inhabits marshes, dams and stream-sides, particularly those containing bullrushes (*Typha* spp.) or spikerushes (*Eleocharis* spp.). Brookvale Creek within the Subject Site lacks aquatic vegetation, making it sub-optimal for this species.	Breeding habitat in NSW includes water bodies that are still, shallow, ephemeral, unpolluted (but the frog can be found in polluted habitats), unshaded, with aquatic plants and free of Mosquito Fish (Gambusia holbrooki) and other predatory fish, with terrestrial habitats that consisted of grassy areas and vegetation no higher than woodlands, and a range of diurnal shelter site. Brookvale Creek within the Subject Site lacks aquatic vegetation, making it sub-optimal for this species.	Minimal impact to potential sub-optimal foraging and breeding habitat given the small area of removal and the degraded nature of the Subject Site.	No
Lophoictinia isura (Square-tailed Kite)	V	-	Low	Found in a variety of timbered habitats including dry woodlands and open forests. The species is a Is a specialist hunter of passerines, especially	Species nests along or near watercourses, in a fork or a larger horizontal limb. No nests were seen	Minimal, impact to potential foraging and breeding habitat given the small area	No

Species	BC Act	EPBC Act	Likelihood of Occurrence	Foraging Habitat Present Within the Subject Site	Breeding Habitat Present Within the Subject Site	Anticipated Impact	Further Impact Assessment Required?
				honeyeaters, and most particularly nestlings, and insects in the tree canopy. Prey species may occur within the Subject Site.	within the Subject Site. Potential for nesting sites, however unlikely.	of removal and degraded nature of the Subject Site.	
Micronomus norfolkensis (Eastern Coastal Free-tailed Bat)	V	-	Low	Species insectivorous and occur in dry sclerophyll forest, woodland, swamp forests and mangrove forests east of the Great Dividing Range. Potential prey items may exist within the Subject Site.	Roost in caves, tunnels, tree hollows, abandoned mines, stormwater drains, culverts, bridges, and sometimes buildings during the day. A building, tree hollow and stormwater channel are present within the Subject Site. No such habitat is present within the Subject Site.	Minimal, impact to potential foraging and breeding habitat given the small area of removal and degraded nature of the Subject Site.	No
Miniopterus australis (Little Bent-winged Bat)	V	-	Low	Found in moist eucalypt forest, rainforest, vine thicket, wet and dry sclerophyll forest, Melaleuca swamps, dense coastal forests and banksia scrub. Generally found in well-timbered areas. At night, this species forages for small insects beneath the canopy of densely vegetated habitats. Such habitat is present within the Subject Site, although sub-optimal due to its degraded and urban nature.	Only five (5) nursery sites/maternity colonies are known in Australia. They require large colonies roosting together to provide the high temperatures needed to rear their young. No suitable breeding habitat was identified within the Subject Site.	Minimal impact to potential sub-optimal foraging habitat given the small area of removal and the degraded nature of the Subject Site. No anticipated net loss of breeding habitat.	No
Miniopterus orianae oceanensis (Large Bent-winged Bat)	V	-	Low	Hunt in forested areas, catching moths and other flying insects above the tree tops. Such habitat is present within the Subject Site, although sub-optimal due to its degraded and urban nature.	This species only breeds in caves. No cave habitat was identified within the Subject Site.	Minimal impact to potential sub-optimal foraging habitat given the small area of removal and the degraded nature of the Subject Site. No anticipated net loss of breeding habitat.	No

Species	BC Act	EPBC Act	Likelihood of Occurrence	Foraging Habitat Present Within the Subject Site	Breeding Habitat Present Within the Subject Site	Anticipated Impact	Further Impact Assessment Required?
Myotis macropus (Southern Myotis)	V	-	Low	This species forages over streams and pools catching insects and small fish by raking their feet across the water surface. Foraging habitat may be present within the Subject Site, however, due to its degraded nature, it is sub-optimal in condition.	Generally, roost in groups of 10-15 close to water in caves, mine shafts, hollow-bearing trees, storm water channels, buildings, under bridges, and in dense foliage. No suitable breeding habitat was identified within the Subject Site.	Minimal impact to potential foraging habitat given the small area of removal and degraded nature of the Subject Site. Minimal impact to breeding habitat due to its degraded nature and sub-optimal condition.	No
Neophema pulchella (Turquoise Parrot)	V	-	Low	This species lives on the edges of eucalypt woodland adjoining clearings, timbered ridges and creeks in farmland. It forges on seeds or grasses and herbaceous plants. Sub-optimal potential foraging habitat is present on the Subject Site.	This species nests in tree hollows, logs or posts. No suitable breeding habitat was identified within the Subject Site.	Minimal, impact to potential foraging and breeding habitat given the small area of removal and degraded nature of the Subject Site.	No
Ninox connivens (Barking Owl)	V	-	Low	Inhabits woodland and open forest, including fragmented remnants and partly cleared farmland. It is flexible in its habitat use, and hunting can extend in to closed forest and more open areas. Preferentially hunts small arboreal mammals such as Squirrel Gliders and Common Ringtail Possums, but when loss of tree hollows decreases these prey populations the owl becomes more reliant on birds, invertebrates, and terrestrial mammals such as rodents and rabbits. Potential	This species nests in large hollows. No large hollows were seen within the Subject Site.	Minimal impact to potential sub-optimal foraging habitat given the small area of removal and the degraded nature of the Subject Site. No anticipated net loss of breeding habitat	No

Species	BC Act	EPBC Act	Likelihood of Occurrence	Foraging Habitat Present Within the Subject Site	Breeding Habitat Present Within the Subject Site	Anticipated Impact	Further Impact Assessment Required?
				prey items may occur within the Subject Site.			
Ninox strenua (Powerful Owl)	V	-	Low	The species breeds and hunts in open or closed sclerophyll forest or woodlands and hunts small mammals. Foraging habitat may be present within the Subject Site, however, due to its degraded nature, it is sub-optimal in condition	This species favours hollows >20cm in diameter. No suitable breeding habitat was identified within the Subject Site.	Minimal impact to potential sub-optimal foraging habitat given the small area of removal and the degraded nature of the Subject Site. No anticipated net loss of breeding habitat	No
Numenius madagascariensis (Eastern Curlew)	-	CE	Low	The species 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. 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. No such habitat is present within or surrounding the Subject Site.	N/A. This species does not breed in Australia	Negligible. No anticipated loss of foraging or breeding habitat	No
Pandion cristatus (Eastern Osprey)	V	-	Low	Favour coastal areas, especially the mouths of large rivers, lagoons, and lakes. Feed on fish over clear, open water. Suboptimal foraging habitat is present within the Subject Site.	Nests are made high up in dead trees or in dead crowns of live trees, usually within one kilometre of the sea. No suitably sized nests were identified within the Subject Site.	Minimal, impact to potential foraging and breeding habitat given the small area of removal and degraded nature of the Subject Site.	No
Petroica boodang (Scarlet Robin)	V	-	Low	The species live in dry eucalypt forests and woodlands, habitat usually contains abundant logs and fallen	This species' nest is an open cup made of plant fibres and cobwebs and is built in the fork of tree usually more than 2	Minimal impact to potential sub-optimal foraging habitat given	No

Species	BC Act	EPBC Act	Likelihood of Occurrence	Foraging Habitat Present Within the Subject Site	Breeding Habitat Present Within the Subject Site	Anticipated Impact	Further Impact Assessment Required?
				timber. Birds forage from low perches, fence-posts or on the ground, from where they pounce on small insects and other invertebrates which are taken from the ground. Foraging habitat may be present within the Subject Site, however, due to its degraded nature, it is sub-optimal in condition.	metres above the ground. No such nests were seen within the Subject Site.	the small area of removal and the degraded nature of the Subject Site. No anticipated net loss of breeding habitat	
Phascolarctos cinereus (Koala)	E	E	Low	Inhabit eucalypt woodlands and forests. Feed on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred browse species. Foraging habitat may be present within the Subject Site, however, due to its degraded nature, it is sub-optimal in condition.	The urbanised and fragmented nature of the Subject Site makes the potential for Koala presence extremely low.	Minimal impact to potential sub-optimal foraging habitat given the small area of removal and the degraded nature of the Subject Site. No anticipated net loss of breeding habitat	No
Pseudomys novaehollandiae (New Holland Mouse)	-	V	Low	Species is known to inhabit open heathlands, woodlands and forests with a heathland understorey and vegetated sand dunes. The Subject Site does not contain woodland and heathland understorey.	This species breeds in burrows. No burrows were identified within the Subject Site.	Negligible, no anticipated net loss of foraging or breeding habitat.	No
Pseudophryne australis (Red-crowned Toadlet)	V	-	Low	Occurs in open forests, mostly on Hawkesbury and Narrabeen Sandstones. Inhabits periodically wet drainage lines below sandstone ridges that often have shale lenses or cappings. No potential foraging habitat was seen within the Subject Site.	Breeding congregations occur in dense vegetation and debris beside ephemeral creeks and gutters. No potential breeding habitats were seen within the Subject Site.	Negligible, no anticipated net loss of foraging or breeding habitat.	No

Species	BC Act	EPBC Act	Likelihood of Occurrence	Foraging Habitat Present Within the Subject Site	Breeding Habitat Present Within the Subject Site	Anticipated Impact	Further Impact Assessment Required?
Pteropus poliocephalus (Grey-headed Flying-fox)	V	V	Low	Feed on the nectar and pollen of native trees, in particular *Eucalyptus*, *Melaleuca*, and *Banksia*, and fruits of rainforest trees and vines. Foraging habitat may be present within the Subject Site.	No breeding camps were identified within or surrounding the Subject Site.	Minimal impact to potential sub-optimal foraging habitat given the small area of removal and the degraded nature of the Subject Site. Negligible anticipated loss of breeding habitat.	No
Ptilinopus magnificus (Wompoo Fruit-Dove)	V	-	Low	Occurs in, or near rainforest, low elevation moist eucalypt forest and brush box forests. Feeds on a diverse range of tree and vine fruits and is locally nomadic - following ripening fruit. Thought to be an effective medium to long-distance vector for seed dispersal. Feeds alone, or in loose flocks at any height in the canopy. Rainforest, low elevation moist eucalypt forest or brush box forests are not located in proximity to the Subject Site.	The nest is a typical pigeon nest - a flimsy platform of sticks on a thin branch or a palm frond, often over water, usually 3 - 10 m above the ground.	Negligible, no anticipated net loss of foraging or breeding habitat.	No
Ptilinopus regina (Rose-crowned Fruit-Dove)	V	-	Low	Rose-crowned Fruit-doves occur mainly in sub-tropical and dry rainforest and occasionally in moist eucalypt forest and swamp forest, where fruit is plentiful. Sub-tropical, dry rainforest, moist eucalypt forest or swamp forest do not occur within the Subject Site.	The species nest in rainforests with dense growth vines. The nest is a frail loosely woven cup of twigs and tendrils. No such nests were observed on site. No potential breeding habitat was seen within the Subject Site.	Negligible, no anticipated net loss of foraging or breeding habitat.	No
Ptilinopus superbus	V	-	Low	Inhabits rainforest and similar closed forests where it forages high in the	The nest is a structure of fine interlocked forked twigs, giving a	Negligible, no anticipated net loss	No

Species	BC Act	EPBC Act	Likelihood of Occurrence	Foraging Habitat Present Within the Subject Site	Breeding Habitat Present Within the Subject Site	Anticipated Impact	Further Impact Assessment Required?
(Superb Fruit-dove)				canopy, eating the fruits of many tree species such as figs and palms. It may also forage in eucalypt or acacia woodland where there are fruit-bearing trees. The Subject Site does not contain rainforest or closed forests.	stronger structure than its flimsy appearance would suggest, and is usually 5-30m up in rainforest and rainforest edge tree and shrub species. No nests were observed within the Subject Site.	of foraging or breeding habitat.	
Saccolaimus flaviventris (Yellow-bellied Sheathtail-bat)	V	-	Low	This species forages for small, flying insects. The species flies high and fast over the forest canopy, but lower in more open country. Potential foraging habitat is present within the Subject Site	This species roosts in trees hollows and dilapidated buildings. No such habitat is present within the Subject Site.	Minimal impact to potential foraging and breeding habitat given the small area of removal and degraded nature of the Subject Site.	No
Scoteanax rueppellii (Greater Broad-nose bat)	V	-	Low	Species Forages after sunset, flying slowly and directly along creek and river corridors at an altitude of 3 - 6 m. Foraging habitat may be present within the Subject Site, however, due to its degraded nature, it is sub-optimal in condition.	This species roosts in trees hollows and dilapidated buildings. No such habitat is present within the Subject Site.	Minimal impact to potential foraging and breeding habitat given the small area of removal and degraded nature of the Subject Site.	No
Thinornis cucullatus cucullatus (Eastern Hooded Dotterel)	CE	V	Low	Prefer sandy ocean beaches, especially those that are broad and flat, with a wide wave-wash zone for feeding, much beachcast seaweed, and backed by sparsely vegetated sand-dunes for shelter and nesting. No such habitat is present within the Subject Site.	Usually breed from August to March on sandy ocean beaches strewn with beachcast seaweed, in a narrow strip between the high-water mark and the base of the fore-dunes. No such habitat is present within the Subject Site.	Negligible, no anticipated net loss of foraging or breeding habitat.	No
Tyto novaehollandiae Masked Owl)	V	-	Low	Lives in dry eucalypt forests and woodlands from sea level to 1100m. The species often hunts along the edges of forests, including roadsides. Its diet consists of tree-dwelling and	This species nests in large hollows. No breeding habitat was present within the Subject Site.	Minimal impact to potential foraging and breeding habitat given the small area of removal and	No

Species	BC Act	EPBC Act	Likelihood of Occurrence	Foraging Habitat Present Within the Subject Site	Breeding Habitat Present Within the Subject Site	Anticipated Impact	Further Impact Assessment Required?
				ground mammals, especially rats. Suboptimal foraging habitat was identified within the Subject Site.		degraded nature of the Subject Site. Negligible anticipated loss of breeding habitat.	
Tyto tenebricosa (Sooty Owl)	V	-	Low	Occurs in rainforest, including dry rainforest, subtropical and warm temperate rainforest, as well as moist eucalypt forests. Hunts by night for small ground mammals or tree-dwelling mammals such as the Common Ringtail Possum (*Pseudocheirus peregrinus*) or Sugar Glider (*Petaurus breviceps*). Suboptimal foraging habitat was identified within the Subject Site.	Nests in very large tree-hollows. No potential breeding habitat was present within the Subject Site.	Minimal impact to potential foraging and breeding habitat given the small area of removal and degraded nature of the Subject Site. Negligible anticipated loss of breeding habitat.	No
Varanus rosenbergi (Rosenburg's Goanna)	V	-	Low	Species is found in heath, open forest and woodland and associated with termites. The species feeds on carrion, birds, eggs, reptiles and small mammals. Sub-optimal foraging habitat was identified within the Subject Site.	The species lays up to 14 eggs in a termite mound; the hatchlings dig themselves out of the mounds. No termite mounds were identified within the Subject Site. No breeding habitat was present within the Subject Site.	Minimal impact to potential foraging and breeding habitat given the small area of removal and degraded nature of the Subject Site. Negligible anticipated loss of breeding habitat.	No
Vespadelus troughtoni (Eastern Cave Bat)	V	-	Low	Little is understood of its feeding or breeding requirements or behaviour. Therefore, foraging habitat may be present within the Subject Site.	A cave-roosting species that is usually found in dry open forest and woodland, near cliffs or rocky overhangs. No breeding habitat was present within the Subject Site.	Minimal impact to potential foraging and breeding habitat given the small area of removal and degraded nature of	No

Species	BC Act	EPBC Act	Likelihood of Occurrence	Foraging Habitat Present Within the Subject Site	Breeding Habitat Present Within the Subject Site	Anticipated Impact	Further Impact Assessment Required?
						the Subject Site. Negligible anticipated loss of breeding habitat.	

5. Impact Summary

5.1 Vegetation Impact

The proposed development will require the removal of the following vegetation within the Subject Site:

- 0.19ha of Estuarine Swamp Oak Twig-rush Forest which conforms to the BC Act listed Swamp Oak Floodplain Forest in the NSW North Coast, Sydney Basin and South East Corner Bioregions and EPBC listed Coastal Swamp Oak (*Casuarina glauca*) Forest of South-east Queensland and New South Wales; and
- 0.32ha of Exotic Dominated Vegetation.

5.1.1 Threatened Ecological Communities: Swamp Oak Floodplain Forest Local Occurrence

Local occurrence is defined as the ecological community that occurs within the study area (OEH 2018). However, the local occurrence may include adjacent areas if the ecological community on the study area forms part of a larger contiguous area of that ecological community and the movement of individuals and exchange of genetic material across the boundary of the study area can be clearly demonstrated (OEH 2018).

Narla estimated that approximately 0.19ha of SOFF/CSOF occurs within the locality (the local occurrence) utilising the State Vegetation Type Map (DPE 2022) and field validated vegetation mapping of the Subject Site (Figure 6). The vegetation proposed for removal on the Subject Site therefore represents approximately 3.3% of the estimated local occurrence of SOFF.

5.2 Threatened Species

No threatened species are anticipated to be significantly impacted by the proposed works. One (1) threatened species, *Callistemon linearifolius* (Netted Bottle Brush), does occur in close proximity to the site, however it has been purposely avoided. Furthermore, a VMP will be prepared to guide the ongoing management and protection of the species within the vicinity of the works.

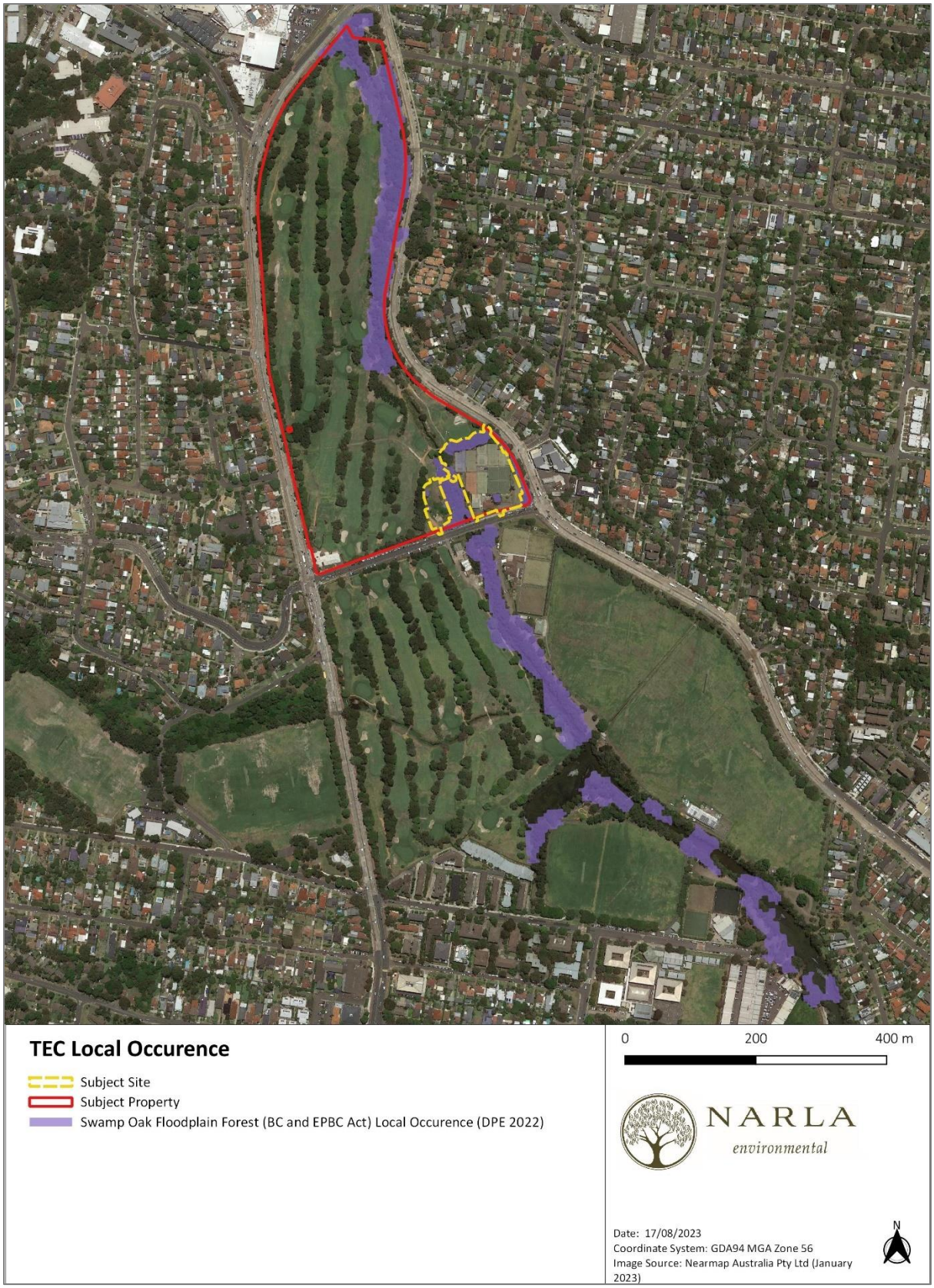

Figure 6. Local Occurrence of Swamp Oak Floodplain Forest (BC and EPBC Act)

5.3 Riparian Land and Waterway Impact

Potential impacts of construction and operation on the riparian land and waterway are to be controlled as per the CMP.

5.3.1 Impact Upon Water Quality

The existing waterway within the Subject Site is in a poor condition due to the continuous stormwater runoff it receives, with the water appearing murky and turbid. Although the health of the waterway on site is already degraded, water quality may be further impacted by pollutants during construction through the increase of stormwater and erosion during construction. A stormwater overflow outlet will be constructed to flow into Brookvale Creek, however it is not expected that this would impact water quality as it would only occur during overflow events.

In order to minimise impacts to water quality and the waterway on site, a CMP will be implemented during construction, which will apply the following principles:

- Sediment and erosion control measures will be constructed in accordance with "Managing Urban Stormwater: Soils and Construction (Landcom 2004)" The Blue Book
- All stormwater and erosion control structures will be in place before the commencement of construction and continue to operate after completion of the construction until the land is stabilised.
- Uncontaminated runoff from outside the construction site will be diverted around the site.
- No untreated construction site runoff will be discharged into receiving waters such including Brookvale Creek and Kentwell Road stormwater drains.
- Drainage through and from areas of construction will be designed to minimise surface flow velocities.
- All silt fences, silt traps and sedimentation basins will be cleaned out once 30% of their capacity has been filled.
- Bare areas will be stabilised within 20 days of the completion of construction activities or 14 days in areas where erosion is more likely to occur.
- Temporary stabilisation techniques such as strategically placed erosion matting, sediment screens, hay bale energy dissipaters, mulching and annual grass species establishment will be implemented on disturbed areas.

If the mitigation measures recommended in the CMP are undertaken, water quality within the waterway on site (which is already in a poor health) will not be adversely impacted by the proposed development.

5.3.2 Impacts On Channel Form, Erosion Rate and Bank Stability

There was no evidence of erosion or sedimentation issues identified during the site visit with the banks consisting primarily of sandstone blocks. Although minor impacts to the banks stability and erosion may occur during construction of the pedestrian bridge, it is not expected the impact the channel form. A stormwater overflow outlet will be constructed to flow into Brookvale Creek; however, it is not expected that this would impact bank stability as it will be supported by rock headwall via a lined swale to flow into the creek. Bank stability and erosion will be managed by an CMP during construction, and a VMP will be prepared to guide to management of the vegetation on the banks and riparian area post-construction.

5.3.3 Riparian Ecological Impacts of the Development

The vegetation surrounding the degraded waterway was exotic dominated, particularly in the groundlayer. Overall, 0.19ha of native riparian vegetation and 0.32ha of exotic riparian vegetation will be removed as part of the proposal, which may impact up bank stability and general ecological health. However, a VMP will be prepared

to mitigate against the impacts to riparian vegetation through requirements of revegetation following construction and the ongoing management of the remnant riparian vegetation.

The proposal has the potential to impose indirect impacts on vegetation and within the stormwater channel that are on site, as well to those that occur downstream. Alteration to the amount and quality of runoff from the development areas has the potential to alter sensitive downstream environments, through the introduction of hard surfaces (roofs, driveways, access roads, hard landscaping) and the reduction of vegetation cover. Furthermore, it is possible to the proposed development will introduce weeds to vegetation directly adjacent the Subject Site. Such impacts will be managed through the implementation of the CMP and VMP.

5.3.4 Landscape Impacts of the Development

The natural landscape of the Subject Site will remain largely intact. No alterations to the naturally occurring waterway will occur, with only minor impacts to the banks associated with the proposed pedestrian bridge. The proposal has been designed to minimise impacts to the natural waterway and potential overland flows across the site, which will be managed through the implementation of CMP. No other modification to the landscape of the waterway is expected as part of the proposal.

6. Recommendations

6.1 Impact Mitigation and Minimisation Recommendations

This section of the report details recommended efforts to avoid and minimise impacts on biodiversity values associated with the proposed development. Measures to be implemented before, during, and post construction are detailed in **Table 14.**

Table 14. Measures to be implemented before, during and after construction to avoid and minimise the impacts of the proposed development

Action	Outcome	Timing	Responsibility
Project Location, Design and Planning	The development proposal is concentrated in the areas of existing infrastructure and disturbance with aims to avoid remnant riparian vegetation, where possible. One (1) threatened species, *Callistemon linearifolius* (Netted Bottle Brush), does occur in close proximity to the site, however it has been purposely avoided by the proposal.	Pre-construction phase	Proponent
Assigning a Project Ecologist	Prior to the implementation of the development, the proponent should commission the services of a qualified and experienced Ecologist with a minimum tertiary degree in Science, Conservation, Biology, Ecology, Natural Resource Management, Environmental Science or Environmental Management. The Ecologist must be licensed with a current Department of Primary Industries Animal Research Authority permit and New South Wales Scientific License issued under the BC Act. The Ecologist will be commissioned to: ▪ Undertake an extensive pre-clearing survey; delineating habitat-bearing trees and shrubs to be retained/removed; and ▪ Supervise the clearance of trees and shrubs (native and exotic) in order to capture, treat and/or relocate any displaced fauna particularly	Pre-construction phase	Proponent
Vegetation Management Plan (VMP)	A Vegetation Management Plan (VMP) is to be prepared by a suitably qualified Ecologist to guide the revegetation of the riparian corridor following construction. All revegetation should use species that conform to Estuarine Swamp Oak Twig-rush Forest and be undertaken in accordance with '*Controlled activities – Guidelines for vegetation management plans on waterfront land*' (DPE 2022). The VMP should also guide the management of retained riparian vegetation adjacent to the Subject Site within the Subject Property, particularly the management and enhancement of Swamp Oak Floodplain forest EEC and *Callistemon linearifolius* (Netted Bottle Brush) through the reduction of weeds.	Pre-construction phase	Proponent Project Ecologist

Action	Outcome	Timing	Responsibility
Tree Protections	Australian Standard 4970 (2009) Protection of Trees on Development Sites (AS-4970) outlines that a Tree Protection Zone (TPZ) is the principal means of protecting trees on construction sites. It is an area isolated from construction disturbance so that the tree remains viable. Ideally, works should be avoided within the TPZ. A Minor Encroachment is less than 10% of the TPZ and is outside the SRZ. A Minor Encroachment is considered acceptable by AS-4970 when it is compensated for elsewhere and contiguous within the TPZ. A Major Encroachment is greater than 10% of the TPZ or inside the SRZ. Major Encroachments generally require root investigations undertaken by non-destructive methods or the use of tree sensitive construction methods. Trees proposed for retention should be delineated by temporary fencing by the Project Arborist. Temporary fencing should be erected at a minimum distance of the structural root zone of each tree proposed for retention.	Pre-construction phase	Proponent Arborist
Removal of Priority Weeds	The four (4) Priority weeds identified within the Subject Site should be removed in accordance with the Biosecurity Act 2015 and NSW Weedwise, these weed species include: ▪ *Asparagus aethiopicus* (Ground Asparagus); ▪ *Rubus fruticosus spp. agg* (Blackberry); ▪ *Lantana camara* (Lantana); and ▪ *Anredera cordifolia* (Madeira Vine).	Construction Phase	Proponent Ecologist
Erosion, Sedimentation and Stormwater.	A CMP has been prepared to guide the management of Erison, Sediment and Stormwater during construction. The following principles will be applies to ensure effects of Brookvale Creek and minimised: ▪ Sediment and erosion control measures will be constructed in accordance with "Managing Urban Stormwater: Soils and Construction (Landcom 2004)" – The Blue Book; ▪ All stormwater and erosion control structures will be in place before the commencement of construction and continue to operate after completion of the construction until the land is stabilised; ▪ Uncontaminated runoff from outside the construction site will be diverted around the site; ▪ No untreated construction site runoff will be discharged into receiving waters such including Brookvale Creek and Kentwell Road stormwater drains; ▪ Drainage through and from areas of construction will be designed to minimise surface flow velocities;	Construction phase	Proponent Construction Contractor

Action	Outcome	Timing	Responsibility
	▪ All silt fences, silt traps and sedimentation basins will be cleaned out once 30% of their capacity has been filled; ▪ Bare areas will be stabilised within 20 days of the completion of construction activities or 14 days in areas where erosion is more likely to occur; and ▪ Temporary stabilisation techniques such as strategically placed erosion matting, sediment screens, hay bale energy dissipaters, mulching and annual grass species establishment will be implemented on disturbed areas.		
Landscaping	Landscaping within the Subject Property should incorporate species representative of the local community being Estuarine Swamp Oak Twig-rush Forest.	Post-construction	Proponent Landscape Architect
Storage and Stockpiling (Soil and Materials)	Allocate all storage, stockpile, and laydown sites away from any vegetation that is planned to be retained. Avoid importing any soil from outside the site as this can introduce weeds and pathogens to the site in order to avoid the potential of incurring indirect impacts on biodiversity values.	Construction phase	Construction Contractors
Riparian Lands and Waterways	Impact mitigation and minimisation measures are to be implemented and followed before, during and after construction works as described within the project CMP. This plan outlines measures to be followed in regards to impacts on vegetation, riparian ecology, bank stability, erosion and sedimentation, water quality and landscaping. Specific outcomes of these mitigation and minimisation measures include: ▪ Protecting native species and communities; ▪ Preventing loss of natural diversity through protecting waterway and riparian vegetation (including non-native vegetation); ▪ Minimising damage to public and private property by waterway processes through maintaining the relative stability of the beds and banks; and ▪ Preserving natural ecological processes.	All phases	Proponent Construction Architect

7. Conclusion

This assessment indicates that the relevant biodiversity conservation provisions of the Environmental Planning and Assessment Act 1979 and the relevant provisions of the WLEP 2011 and the WDCP 2011 have been fulfilled. The proposed development will require the removal of the following vegetation within the Subject Site:

- 0.19ha of Estuarine Swamp Oak Twig-rush Forest which conforms to the BC Act listed Swamp Oak Floodplain Forest in the NSW North Coast, Sydney Basin and South East Corner Bioregions and EPBC listed Coastal Swamp Oak (*Casuarina glauca*) Forest of South-east Queensland and New South Wales; and
- 0.32ha of Exotic Dominated Vegetation.

No threatened species are expected to be significantly impacts by the proposed development. One (1) threatened species, *Callistemon linearifolius* (Netted Bottle Brush), does occur in close proximity to the site, however it has been purposely avoided.

In addition, the proposed development is considered unlikely to result in adverse impacts on the waterway. Brookvale Creek is already heavily disturbed with turbid water and weed dominated riparian vegetation. The overall impact to the creek is minimal, with no instream works proposed.

If the appropriate recommendations in this report are followed, the proposed DA will have minimal ecological impacts. This includes the preparation of a VMP and the implementation of the site CMP.

8. References

Australian Standard 4970 (2009) Protection of Trees on Development Sites (AS-4970)

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9. Appendices

Appendix A. Site Plan (Group Architects 2023)

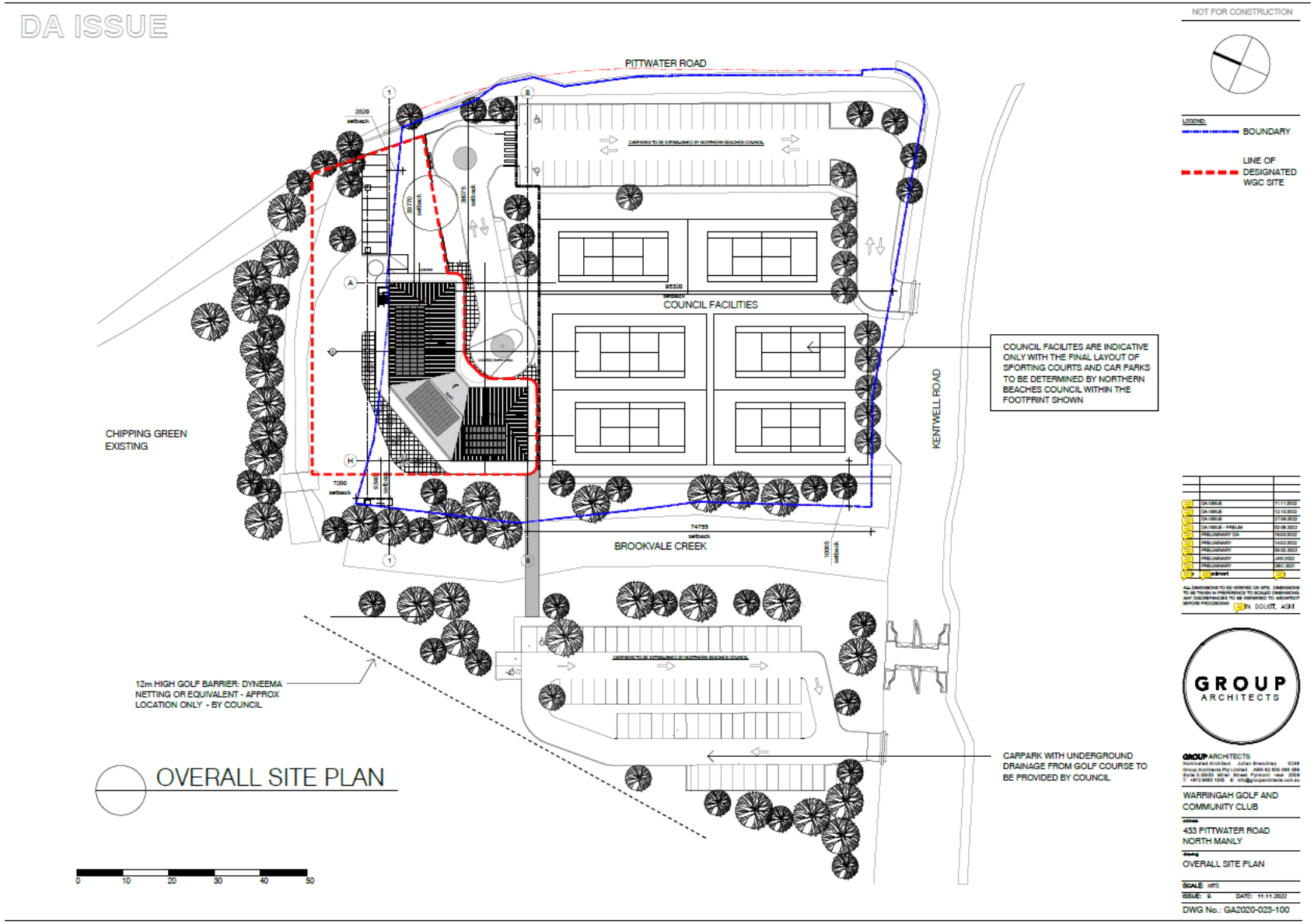
Appendix B. Flora species identified within the Subject .

Appendix C. Fauna species identified within and surrounding the Subject Property.

Appendix D. Biodiversity Conservation Act 2016 - Test of Significance for Swamp Oak Floodplain Forest.

Appendix E. EPBC Act Assessment of Significant Impact for Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland

Appendix A. Site Plan (Group Architects 2023)



Appendix B. Flora species identified within the Subject Site and immediate surrounds.

Scientific Name	Canopy	Mid-Story	Ground
Acacia longifolia		x	
*Acetosa sagittata**			x
*Ageratina adenophora**			x
*Anethum graveolens**		x	
Angophora costata	x		
*Anredera cordifolia***			x
*Araujia sericifera**			x
*Asparagus aethiopicus***		x	
*Bidens pilosa**			x
Brachychiton acerifolius	x		
*Bromus catharticus**			x
Callistemon linearifolius (Vulnerable)		x	
Callistemon salignus	x		
Callistemon viminalis		x	
Casuarina glauca	x		
*Cenchrus clandestinus**			x
*Cinnamomum camphora**	x		
Cissus antarctica			x
*Colocasia spp. **			x
Commelina cyanea			x
*Conyza bonariensis**			x
Cupaniopsis anacardioides		x	
Cyathea australis		x	
Cynodon dactylon			x
*Cyperus eragrostis**			x
Dichondra repens			x
*Ehrharta erecta**			x
*Eragrostis curvula**			x
*Erythrina x sykesii**	x		
Eucalyptus robusta	x		
Ficus rubiginosa		x	
*Fumaria officinalis**			x
Glochidion ferdinandi		x	
*Harpephyllum caffrum**		x	
Homalanthus populifolius		x	
*Hydrocotyle bonariensis**			x
*Ipomoea purpurea**			x
*Lantana camara***		x	
Livistona australis	x		
Lomandra longifolia			x
Melaleuca linariifolia	x		
Melaleuca quinquenervia	x		
*Modiola caroliniana**			x

Scientific Name	Canopy	Mid-Story	Ground
*Nephrolepis cordifolia**			x
*Parietaria judaica**			x
*Phoenix canariensis**	x		
Phragmites australis			x
Pittosporum undulatum		x	
*Poa annua**			x
Pteridium esculentum			x
*Ricinus communis**			x
*Rubus fruticosus spp. agg.***		x	
*Senna pendula**		x	
*Sifa rhombifolia**			x
*Solanum nigrum**		x	
*Soliva sessilis**			x
*Sonchus oleraceus**			x
*Stellaria media**			x
*Strelitzia nicolai**			x
*Thunbergia alata**			x
*Tradescantia fluminensis**			x
*Vicia sativa**			x

* Denotes exotic species, ** Denotes Priority Weed

Appendix C. Fauna species identified within and surrounding the Subject Property.

Class	Scientific Name	Common Name	Status
Aves	*Chenonetta jubata*	Australian Wood Duck	Protected
	Cracticus torquatus	Grey Butcherbird	
	Manorina melanocephala	Noisy Miner	
	Porphyrio porphyrio	Purple Swamphen	
	Vanellus miles	Masked Lapwing	
	Manorina melanocephala	Noisy Miner	
Reptilia	*Cracticus torquatus*	Grey Butcherbird	

Appendix D. Biodiversity Conservation Act 2016 - Test of Significance for Swamp Oak Floodplain Forest.

Biodiversity Conservation Act 2016 – Test of Significance (5-part Test) for Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East Corner Bioregions (SOFF)		
BC Act Status: Endangered Ecological Community		
(a) in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,	Not applicable – Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East Corner Bioregions (SOFF) is not a species	
(b) in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:	(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or	The proposed activity is not likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction. In total, 0.19ha of this community will be impacted which accounts for less than 3.3% of the local occurrence of this community. Large areas of this community will continue to exist in the adjoining landscape.
	(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,	The proposed activity is not likely to substantially and adversely modify the composition of SOFF such that its local occurrence is likely to be placed at risk of extinction. In total, 0.19ha of the local occurrence of the EEC is proposed to be impacted. The vegetation to be cleared is in poor condition with a predominately exotic groundlayer with common canopy and mid-storey species present, making it unlikely the composition of the community within the locality would be reduced.
(c) in relation to the habitat of a threatened species or ecological community:	(i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and	Approximately 0.19ha will be removed to accommodate the proposed activity.
	(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of	The 0.19ha SOFF to be impacted located on the edge of an existing patch adjacent to a road. The removal of this small amount of vegetation is

Biodiversity Conservation Act 2016 – Test of Significance (5-part Test) for Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East Corner Bioregions (SOFF)		
BC Act Status: Endangered Ecological Community		
	habitat as a result of the proposed development or activity, and	not expected to lead to any further fragmentation.
	(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality,	All areas that support viable patches of SOFF are important. However, impacts to the patch in question will not cause significant fragmentation or isolation of the EEC as representative vegetation will continue to occur throughout the locality. Impacts to 0.19ha of the EEC is highly unlikely to decrease the long-term survival of the community.
(d) whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),	The proposed activity is not likely to have an adverse effect on any declared area of outstanding biodiversity value, directly or indirectly.	
(e) whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.	The following Key Threatening Processes (KTPs) listed under Schedule 4 of the BC Act are relevant to the protection of potential habitat in the scope of the proposed activity within the Subject Site for this EEC: Clearing of native vegetation; ▪ Invasion of native plant communities by exotic perennial grasses; and ▪ Invasion, establishment and spread of Lantana (*Lantana camara*).	
References NSW Department of Planning and Environment (DPE) (2021) Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions – profile. NSW Government (2021) NSW Legislation: Biodiversity Conservation act 2016 No 63, Schedule 4: Key Threatening Processes https://www.legislation.nsw.gov.au/acts/2016-63.pdf		

Appendix E. EPBC Act Assessment of Significant Impact for Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland

Commonwealth Environment Protection and Biodiversity Conservation Act 1999 Assessment of Significant Impact Criteria for Coastal Swamp Oak (*Casuarina glauca*) Forest of New South Wales and South East Queensland (CSOF)	
EPBC Act Status: Endangered	
Significant impact criteria An action is likely to have a significant impact on a critically endangered or endangered ecological community if there is a real chance or possibility that it will:	
• reduce the extent of an ecological community	The proposed development is not likely to reduce the extent of the ecological community. The proposed subdivision will result in the removal of approximately 0.19ha of CSOF which makes up approximately 3.3% of the community within the Subject Property. The extent of CSOF to be removed is in poor condition and is expected to persist in the broader Subject Property and locality
• fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines	It is not likely that CSOF within the Subject Site will become fragmented. Vegetation consisting of CSOF will persist directly adjacent to the Subject Site to the north and the south. A small pedestrian bridge will be built within the patch however connectivity is expected to remain either side of the bridge.
• adversely affect habitat critical to the survival of an ecological community	The proposed development will not adversely affect habitat critical to the survival of CSOF. The extent of CSOF to be removed is in poor condition due to the invasion of weeds. It is not expected the removal of 0.19ha will significantly impact the long-term survival of the ecological community in the locality.
• modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns	The proposed development will not modify or destroy abiotic factors necessary for the survival of CSOF. The proposed activities will result in the removal/management of approximately 0.19ha of CSOF. The removal of this small amount of vegetation is not likely to have any impact on groundwater or surface water drainage patterns, particularly through the implementation of the CMP during the construction until revegetation works are complete.
• cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting	The proposed development will result in the removal of approximately 0.19ha of CSOF. The vegetation to be cleared is in poor condition with a predominately exotic groundlayer with common canopy and mid-storey species present, making it unlikely the composition of the community within the locality would be reduced within the locality.
• cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to: – assisting invasive species, that are harmful to the listed ecological community, to become established, or	The proposed development will not cause a substantial reduction in the quality or integrity of CSOF. The extent of CSOF to be removed is 3.3% of the local occurrence and consists of a predominately exotic groundlayer.

Commonwealth Environment Protection and Biodiversity Conservation Act 1999 Assessment of Significant Impact Criteria for Coastal Swamp Oak (*Casuarina glauca*) Forest of New South Wales and South East Queensland (CSOF)	
EPBC Act Status: Endangered	
– causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community, or	
• interfere with the recovery of an ecological community	It is not expected that the removal of 0.19ha of CSOF will interfere with the recovery of this community given the implementation of the impact mitigation measures as outlined in this report.
References: Department of the Environment and Energy (2018). Conservation advice (incorporating listing advice) for the Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community. Canberra: Department of the Environment and Energy.	

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