Bank Street Park
Blackwattle Bay / Tjerruing

SSD-53386706

Appendix AP

Biodiversity Development Assessment Report (Eco Logical)

December 2023

Bank Street Park
Biodiversity Development Assessment Report

Infrastructure NSW

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DOCUMENT TRACKING

Project Name	Bank Street Park – Biodiversity Development Assessment Report
Project Number	23WOL-5380
Project Manager	Belinda Failes
Accredited assessor certification	I certify that this report has been prepared on the basis of the requirements of, and information provided under, the Biodiversity Assessment Method and s.6.15 of the BC Act. In preparing this assessment I have acted in accordance with the Accredited BAM Assessor Code of Conduct. I declare that I have considered the circumstances and there is no actual, perceived, or potential conflict of interest.  Belinda Failes (BAAS18159)
Prepared by	Belinda Failes, Alice Ridyard and Claire Plunkett
Reviewed by	Dr Meredith Henderson and Dr Daniel McDonald
Approved by	Dr Meredith Henderson
Status	Final
Version Number	4
Last saved on	27 November 2023

This report should be cited as 'Eco Logical Australia. 2023 Bank Street Park - Biodiversity Development Assessment Report. Prepared for Infrastructure NSW.'

ACKNOWLEDGEMENTS

This document has been prepared by Eco Logical Australia Pty Ltd with support from Infrastructure NSW.

Executive Summary

Eco Logical Australia Pty Ltd (ELA) was commissioned by Infrastructure NSW to conduct a Biodiversity Development Assessment Report (BDAR). The BDAR was prepared to meet the requirements of the Biodiversity Assessment Method (BAM) 2020 and the Planning Secretary's Environmental Assessment Requirements (SEARs) pertaining to biodiversity for State Significant Development (SSD–53386706).

The relevant SEARs for this SSD–53386706 are provided in the table below.

No.	SEARs	Response
4. Landscape Design and Public Domain	Demonstrate how the development aligns with the Blackwattle Bay Design Guidelines.	Design guidelines relevant to terrestrial ecology are identified and addressed in Section 9.4 of this report.
12. Biodiversity	Assess any biodiversity impacts associated with the development in accordance with the Biodiversity Conservation Act 2016 (BC Act), Biodiversity Assessment Regulation 2017, and the Biodiversity Assessment Method 2020 (BAM), including the preparation of a Biodiversity Development Assessment Report (BDAR) unless a waiver is granted, or the site is on biodiversity certified land.	This BDAR has been prepared to assess the impacts of the development in accordance with the BC Act, Biodiversity Assessment Regulation 2017 and the BAM. A waiver has not been sort. The development is not on biodiversity certified lands.
	The BDAR must document the application of the avoid, minimise and offset framework including assessing all direct, indirect and prescribed impacts in accordance with the Biodiversity Assessment Method 2020.	Section 6 of this BDAR demonstrates avoid and minimise impacts to biodiversity values. Impacts including indirect impacts and prescribed impacts are provided in Section 7 of this report.
	If seeking approval to use the variation rules, the BDAR must contain details of the reasonable steps that have been taken to obtain requisite like-for-like biodiversity credits.	This assessment does not require offset of species or ecosystem credits. This assessment does not seek approval to use the variation rules.
	The BDAR must be submitted with all spatial data associated with the survey and assessment as per the Biodiversity Assessment Method.	The spatial data will be provided to the consent authority at SSD lodgement.
	The BDAR must be prepared by a person accredited in accordance with the Accreditation Scheme for the Application of the Biodiversity Assessment Method Order 2017.	This BDAR has been prepared in accordance with the BAM 2020 under the BC Act by an accredited person as per the certification on page i and Section 1.
	Provide a detailed description of any works and materials to be used that will impact aquatic ecology including any dredging, piling, seawall treatments, height of the facility above the substrate and in relation to the Mean High Water Mark, type of material/s to be used and whether any reclamation is associated with the proposal.	A separate Marine Ecology report (ELA 2023b) has been prepared for this project. The result of the report has been discussed in this BDAR.

No Plant Community Type (PCT) as defined by the NSW BioNet Vegetation Classification system has been mapped within the subject land. The field survey identified that the subject land contains planted native vegetation (such as *Eucalyptus saligna*) in a landscape setting. No remnant vegetation was observed within the subject land. The planted native vegetation is not part of a mosaic of existing native vegetation. The planted native vegetation could not be assigned to a locally indigenous PCT. Without the presence of a PCT, information could not be entered into the BAM-Calculator (BAM-C) and therefore, no offsets were generated.

Due to the absence of PCTs within the subject land, no ecosystem credit or species credit species were able to be predicted by the BAM-C. To determine the Likelihood of Occurrence of threatened species, a 5 km search of BioNet records of threatened species under the *Biodiversity Conservation Act 2016* (BC Act), and 5 km Protected Matters search for threatened species under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), was conducted.

The subject land contains existing buildings which will be removed and refurbished for the future development. The initial field surveys identified that the buildings and seawall may provide habitat for threatened microchiropteran species.

Targeted surveys were conducted 4 – 9 October 2023 in accordance with the *'Species credit' threatened bats and their habitats - NSW survey guide for the Biodiversity Assessment Method* (Office of Environment and Heritage - OEH, 2018). Targeted surveys also included ecosystem credit species which were assessed as Prescribed Impacts.

Three possible species credit species were recorded during targeted surveys including:

- *Miniopterus australis* (Little Bent-winged Bat) - listed as vulnerable under the BC Act
- *Miniopterus orianae oceanensis* (Large Bent-winged Bat) - listed as vulnerable under the BC Act
- *Myotis macropus* (Southern Myotis) - listed as vulnerable under the BC Act

The total number of calls during the targeted surveys were very low with only one call from possible *Myotis macropus* and one call for *Miniopterus australis* and potential eight calls for grouped *Miniopterus orianae oceanensis* / non-threatened species. The results from the targeted surveys indicate that microbats only utilise the subject land on rare occasions and are not roosting/breeding or regularly foraging within the subject land. Due to an absence of roosting/breeding habitat for species credit species, no species credits were generated for the proposed works. Additionally, no ecosystem credit species microbats were detected during targeted surveys.

Mitigation measures have been included in this report to minimise indirect impacts to microbat species during and post construction works. A Microbat Management Plan (MMP) will be prepared prior to demolition works to minimise impacts to microbats from the proposed construction.

The subject land does not contain any mapped streams or important wetlands; however, the subject land is located over a portion of Blackwattle Bay. The subject land includes Key Fish Habitat and mapped Migratory Shorebird Important Habitat for *Limosa lapponica baueri* (Bar-tailed Godwit) and *Calidris ferruginea* (Curlew Sandpiper). The field survey identified that very marginal habitat was present for each species. A species polygon was prepared for the Migratory Shorebirds. Curlew Sandpiper is also listed as a Serious and Irreversible Impact (SAII) entity. An assessment for SAII was included in this

report. No species credits were generated for these species given that no case study has been completed for this assessment in the BAM-C. An email was sent to the DPE on 25 September 2023 and again on 20 October 2023 requesting a review of the migratory shorebirds mapping on hard surfaces within the subject land. The response from DPE suggests that migratory shorebirds are assessed as prescribed impacts (Appendix D). This has been included in this report.

The planted native vegetation may provide occasional foraging habitat for *Pteropus poliocephalus* (Grey-headed Flying-fox), listed as vulnerable under the BC Act and *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Three Matters of National Environmental Significance (MNES) listed under the EPBC Act were identified, Bar-tailed Godwit, Curlew Sandpiper and Grey-headed Flying-fox. Assessments of significance were undertaken for these MNES in accordance with *Significant impact guidelines 1.1* (Commonwealth of Australia, 2013). These assessments concluded that the proposed works are unlikely to have a significant impact on these species.

Potential indirect impacts of the proposed works would include sediment runoff, mitigated by using sediment barriers, and light spill to adjacent open waterbody (occasional foraging habitat for Southern Myotis), mitigated by intentional direction of lighting.

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Abbreviations

Abbreviation	Description
BAM	Biodiversity Assessment Method 2020
BAM-C	Biodiversity Assessment Method Credit Calculator
BC Act	NSW *Biodiversity Conservation Act 2016*
BDAR	Biodiversity Development Assessment Report
DAWE	Commonwealth Department of Agriculture, Water and the Environment (now DCCEEW)
DCCEEW	Commonwealth Department of Climate Change, Energy, the Environment and Water
DPE	Department of Planning and Environment
DPIE	Department of Planning, Industry and Environment (now DPE)
ELA	Eco Logical Australia Pty Ltd
EP&A Act	NSW *Environmental Planning and Assessment Act 1979*
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
FM Act	NSW *Fisheries Management Act 1994*
GIS	Geographic Information System
GPS	Global Positioning System
IBRA	Interim Biogeographic Regionalisation for Australia
INSW	Infrastructure NSW
KFH	Key Fish Habitat
LGA	Local Government Area
LLS	Local Land Service
MMP	Microbat Management Plan
MNES	Matters of National Environmental Significance
NSW	New South Wales
PCT	Plant Community Type
SEARs	Secretary's Environmental Assessment Requirements
SEPP	State Environmental Planning Policy
SSD	State Significant Development
SSDA	State Significant Development Application
TBDC	Threatened Biodiversity Data Collection
TEC	Threatened Ecological Community
VIS	Vegetation Information System
WM Act	NSW *Water Management Act 2000*

1. Stage 1: Biodiversity assessment

This Biodiversity Development Assessment Report (BDAR) was prepared in 2023 by Belinda Failes, an Accredited Person (BAAS18159) under the NSW *Biodiversity Conservation Act 2016* (BC Act). The report was prepared to meet the requirements of the Biodiversity Assessment Method (BAM) 2020. The report has been peer reviewed by accredited assessor Dr Meredith Henderson (BAAS17001) and Dr Daniel McDonald (BAAS17056).

The Biodiversity Development Assessment Report has been prepared to address the Secretary's Environmental Assessment Requirements (SEARs) issued for State Significant Development (SSD) application SSD-53386706 for the proposed Bank Street Park development (i.e., the subject land).

The subject land is located at 1A-19 Bank Street, Pyrmont (the 'subject land') and includes harbour development in Blackwattle Bay. The terrestrial component of the site, that is the subject of this report is located on land zoned RE1 - Public Recreation in accordance with the Sydney Local Environmental Plan (LEP) 2012. The subject land is bound by Bank Street to the east, Glebe Island Bridge in the Blackwattle Bay in the west and south and commercial buildings in the north-east. The subject land contains shipping containers, dragon boat storage area/ramp, marina and derelict buildings in the north. The subject land forms the northern portion of the Blackwattle Bay State Significant Precinct Study.

Proposed development on over-water areas of the site is assessed in a separate report (see Bank Street Park - Marine Ecology Assessment (ELA 2023)).

The 'development footprint' refers to the extent of the proposed development for this SSD (construction and operational footprints). The subject land and development footprint are displayed in two maps the Site Map (Figure 1) and location map (Figure 2).

Definitions of terminology used throughout this report are presented in Biodiversity Assessment Method (BAM) are presented in Appendix A.

This report has assessed the biodiversity impacts of the SSD application.

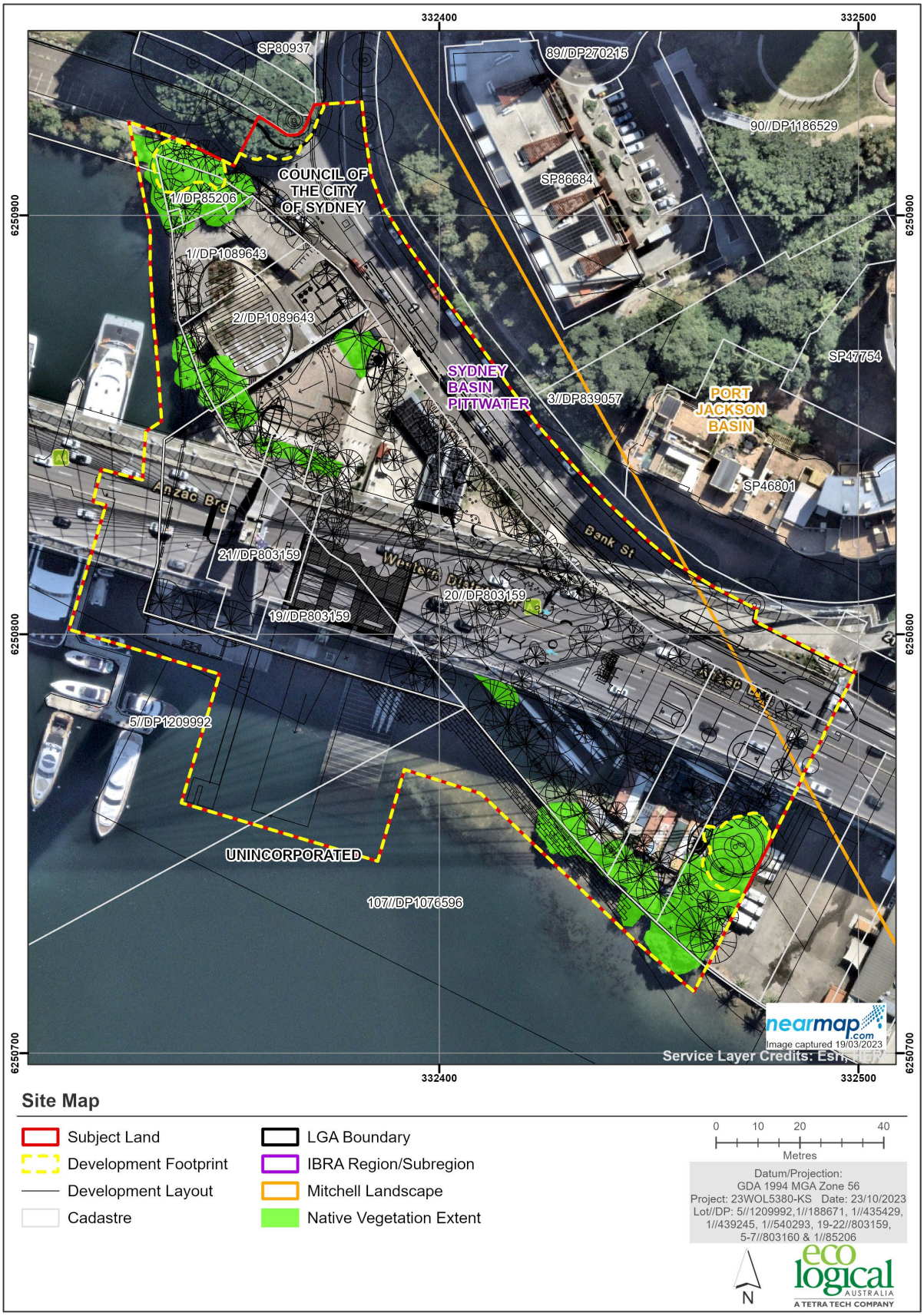

Figure 1: Site Map

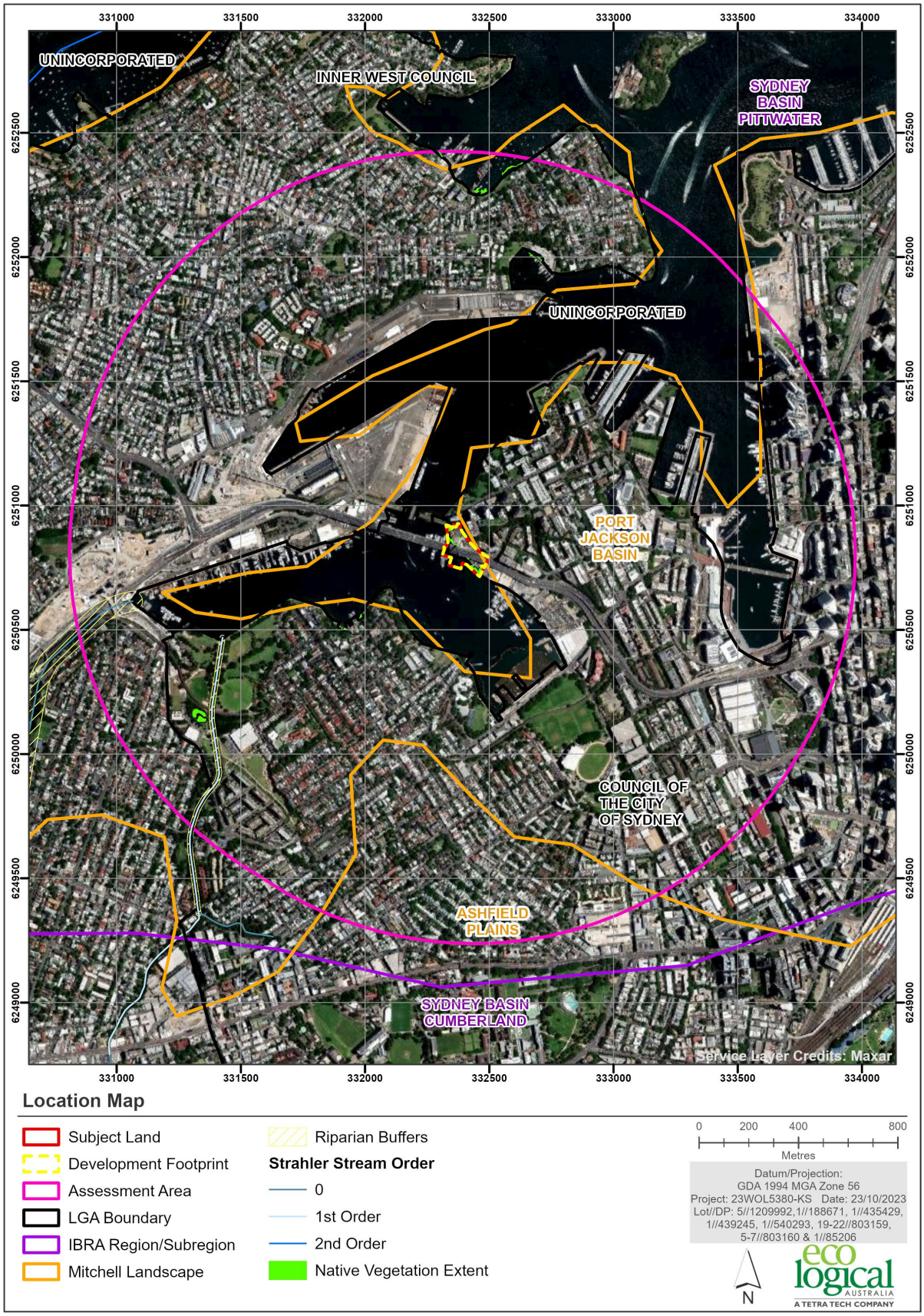

Figure 2: Location Map

1.1. Introduction

The purpose of this report is to satisfy the requirements of the Biodiversity Assessment Method (BAM) 2020, to support a SSDA Application for a new waterfront public park within Blackwattle Bay, to be known as Bank Street Park (SSD-53386706). Bank Street Park is located at 1A-19 Bank Street, Pyrmont on the shoreline of Tjerruing Blackwattle Bay and adjacent areas of Blackwattle Bay.

1.2. Blackwattle Bay Precinct

Bank Street Park forms part of the Blackwattle Bay Precinct, which is an area of predominantly government owned land located on the western edge of the Pyrmont Peninsula and adjoining the waters of Blackwattle Bay (Figure 3).

Figure 3 Blackwattle Bay Precinct

SOURCE: INSW

The precinct was rezoned in December 2022 to facilitate a new mixed-use community, providing for around 2,000 new residents and 5,600 new jobs and creating a vibrant 24/7 economy. Updated planning and land use controls were incorporated into the Sydney Local Environmental Plan 2012, along with site specific design guidance in the *Blackwattle Bay Design Guidelines.*

A critical part of the Blackwattle Bay Precinct is the high quality public domain which includes a series of parks and open spaces connected by a foreshore promenade. Bank Street Park will bring new active and passive recreation uses into a unique park environment, catering for both existing and future communities in the vicinity.

1.3. Site description

Bank Street Park is located at 1A-19 Bank Street, Pyrmont NSW within the City of Sydney local government area (LGA) and includes harbour development in Blackwattle Bay. The site area is approximately 1.1 hectare (excluding water). The relevant lot and deposited plans and the respective ownership for the site are detailed in Table 1 and shown in Figure 4.

Table 1: Summary of land title details of the site

Street address	Lot and Deposited Plan details	Ownership
1A Bank Street, Pyrmont NSW 2009	Lot 1 DP 85206 Lot 1 DP 188671	Transport for NSW
1-3 Bank Street, Pyrmont NSW 2009	Lots 1-2 DP 1089643 Lot 1 DP 439245	Infrastructure NSW
5 Bank Street, Pyrmont NSW 2009	Lot 20 DP 803159	Transport for NSW
7 Bank Street, Pyrmont NSW 2009	Lot 19 DP 803159	Transport for NSW
9 Bank Street, Pyrmont NSW 2009	Lot 21 DP 803159	Transport for NSW
11 Bank Street, Pyrmont NSW 2009	Lot 22 DP 803159	Transport for NSW
17-19 Bank Street, Pyrmont NSW 2009	Lots 5-6 DP 803160	Transport for NSW
Sydney Harbour	Lot 5 DP 1209992	Roads and Maritime Services (Transport for NSW)
Sydney Harbour	Lot 107 in DP 1076596	Transport for NSW
Part Bank Street road reserve	N/A	City of Sydney Council

Bank Street Park is located on Gadigal Land, one of the twenty-nine clans of the great Eora Nation. It adjoins the foreshores of Glebe to the west and Pyrmont Bridge Road and Wentworth Park to the south.

Figure 4: Site context map

THE INDICATIVE SITE LOCATION IS OUTLINED IN RED. SOURCE: SIXMAPS WITH ARCHITECTUS EDITS (2023)

Figure 5: Bank Street Park site location within Blackwattle Bay State Significant Precinct

THE INDICATIVE SITE LOCATION IS OUTLINED IN RED.
SOURCE: BLACKWATTLE BAY DESIGN GUIDELINES WITH ARCHITECTUS EDITS (2023)

1.4. Proposed development

Development consent is being sought for a *recreation area* for the primary purpose of a *public park* (Figure 6), comprising:

- Site preparation works, including tree removal, earthworks and remediation to facilitate proposed use.
- Demolition of three existing buildings at 1-3 Bank Street.
- New community facilities for community use, including:
    - New single storey building to accommodate flexible community space, café, and marina office/store facilities, with green roof and photovoltaics
    - Adaptive reuse of Building D for public amenities, bins and other storage
    - Boat launching ramp and pontoon for passive watercraft, including dragon boats and kayaks
    - Boat storage building with change facilities for dragon boat users with publicly accessible rooftop deck
- Public domain works, including:
    - 'Interpretation Garden' in existing building 'ruins' at 1-3 Bank Street
    - Split level foreshore promenade
    - Multi-purpose court with edge seating and partial fence
    - Nature-based inclusive playspace for ages 2-12
    - Fitness equipment
    - Public plaza and grassed open space areas
    - New tree plantings and planter beds
    - Public art, wayfinding and interpretative signage, lighting, bike parking and seating
- Harbour works, including
    - Overwater boardwalk
    - Land/water interface works, including sandstone terracing into water and support structure, to improve marine habitat
    - Demolition and construction of a new timber launching ramp for dragon boats
    - Kayak/passive craft pontoon
    - Restoration, repair and alterations to the existing seawall for new stormwater outlets
- Works to Bank Street road reserve, including
    - Road space reallocation to provide separated cycleway
    - Cycleway transition to Bank Street to continue south as part of future works
    - Reinstatement of existing on-street parallel parking
    - Tree planting
    - Accessible parking space
    - Loading zone adjacent 1-3 Bank Street.

1.4.1. Landscaped Area

Table 2: Landscaping schedule and calculations

Item	Description
No. of existing trees	23
No. of trees proposed for removal	17
No. of trees proposed to be retained	6
No. of trees proposed for planting	114
Existing tree canopy cover	120
Proposed tree removal canopy cover	760 m^2 (7%)
Proposed tree canopy cover as part of landscaping works	396 m^2 (3%)
Total tree canopy cover	4244 m^2 (37%)
Pervious area	4608 m^2 (40%)
Impervious area (court, paths etc)	5204 m^2 (45%)
Deep Soil	6252 m^2 (55%)

Figure 6: Final plans (13 October 2023)

1.5. Planning Secretary's Environmental Assessments Requirements

This report has been prepared in response to the relevant requirements outlined within the Planning Secretary's Environmental Assessments Requirements (SEARs) issued on 11 May 2023 for application SSD-53386706. Table 3 addresses the relevant SEARs requirements and provides a project response.

Table 3: Secretary's Environmental Assessments Requirements

Item	SEARs	Relevant report section(s)
4. Landscape Design and Public Domain	Demonstrate how the development aligns with the Blackwattle Bay Design Guidelines.	Design guidelines relevant to terrestrial ecology are identified an addressed in Section 9.4.
12. Biodiversity	Assess any biodiversity impacts associated with the development in accordance with the Biodiversity Conservation Act 2016 (BC Act), Biodiversity Assessment Regulation 2017, and the Biodiversity Assessment Method 2020 (BAM), including the preparation of a Biodiversity Development Assessment Report (BDAR) unless a waiver is granted, or the site is on biodiversity certified land.	This BDAR has been prepared to assess the impacts of the development in accordance with the BC Act, Biodiversity Assessment Regulation 2017 and the BAM. A BDAR waiver has not been sought. The development is not on biodiversity certified lands.
	The BDAR must document the application of the avoid, minimise and offset framework including assessing all direct, indirect and prescribed impacts in accordance with the Biodiversity Assessment Method 2020.	Section 6 of this BDAR demonstrates avoid and minimise impacts to biodiversity values. Impacts including indirect impacts and prescribed impacts are provided in Section 7 of this report.
	If seeking approval to use the variation rules, the BDAR must contain details of the reasonable steps that have been taken to obtain requisite like-for-like biodiversity credits.	This assessment does not require offset of species or ecosystem credits. This assessment does not seek approval to use the variation rules.
	The BDAR must be submitted with all spatial data associated with the survey and assessment as per the Biodiversity Assessment Method.	All spatial data will be provided to the consent authority at SSD lodgement.
	The BDAR must be prepared by a person accredited in accordance with the Accreditation Scheme for the Application of the Biodiversity Assessment Method Order 2017.	This BDAR has been prepared in accordance with the BAM 2020 under the BC Act by an accredited person.
	Provide a detailed description of any works and materials to be used that will impact aquatic ecology including any dredging, piling, seawall treatments, height of the facility above the substrate and in relation to the Mean High Water Mark, type of material/s to be used and whether any reclamation is associated with the proposal.	A separate Marine Ecology report (ELA 2023) has been prepared for this project. The result of the report has been discussed in this BDAR.

1.6. Blackwattle Bay Design Guidelines

The Blackwattle Bay Design Guidelines (DPE 2022) supplements the provisions of Sydney Local Environmental Plan 2012 (SLEP 2012) by providing more detailed provisions to guide development in Blackwattle Bay. Guiding principles relevant to terrestrial ecology are:

- Open space and amenity
  - Principle 1: Improve access to Blackwattle Bay, the foreshore and water activities for all users.
  - Principle 3: Maintain and enhance water uses and activities.
- Sustainability
  - Principle 4: Pursue leading edge sustainability outcomes including climate change resilience, improved water quality and restoration of natural ecosystems.
  - Principle 5: Deliver development that is economically, socially, culturally and environmentally viable.

Design guidelines that have an implication on foreshore structures and marine ecology are:

- Section 4 Environmental management and sustainability
  - 4.3 Urban and marine ecology.

These design guidelines are address in Section 9.4 of this report.

1.7. Sources of information used

The following data sources were reviewed as part of this report:

- BioNet Vegetation Classification (VIS) (NSW Department of Planning and Environment DPE 2023a)
- Threatened Biodiversity Data Collection (DPE 2023b)
- NSW BioNet / Atlas of NSW Wildlife 5 km database search (accessed 1 April 2023)
- Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act Protected Matters Search Tool 5 km database search (Department of Climate Change, Energy, the Environment and Water (DCCEEW 2023a) (Accessed 15 May 2023)
- The Native Vegetation of the Sydney Metropolitan Area v.3 (NSW Office of Environment & Heritage (OEH 2016)
- NSW State Vegetation Type Map (DPE 2022) – Sharing and Enabling Environmental Data in NSW
- NSW Government ePlanning Spatial Viewer
- Soil Landscapes of Central and Eastern NSW – v2.1, NSW Department of Planning and Environment (DPE 2020)
- Department of Planning, Industry and Environment (DPIE) 2016. NSW (Mitchell) Landscapes – version 3.1.
- Department of Planning and Environment (DPE) 2022d Register of Declared Areas of Outstanding Biodiversity Value
- Additional Geographic Information Systems (GIS) datasets including soil, topography, geology and drainage
- Bank Street Park Tree Plan prepared for Infrastructure NSW (treeiQ 2023).

1.8. Legislative context

Legislation relevant to the subject land is outlined in Table 4.

Table 4: Legislative context

Name	Relevance to the project
Commonwealth	
Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)	The EPBC Act provides protection for Matters of National Environmental Significance (MNES). If an action may have a significant impact on MNES, the action must be assessed by the Commonwealth. Two MNES have been assessed on the subject land. The DPE Migratory Shorebird Important Habitat areas were located within the subject land boundary. Assessments of Significance for Bar-tailed Godwit and Curlew Sandpiper were prepared for this SSD (Section 9.1) and concluded that the development is not likely to have a significant impact on MNES.
State	
Environmental Planning and Assessment Act 1979 (EP&A Act)	The EP&A Act is the principal planning legislation for NSW. It provides a framework for the overall environmental planning and assessment of development proposals. The proposed development is to be assessed as a State Significant Development (SSD) under Part 4.7 (or 5.1) of the EP&A Act. The SEARs have been issued. This report addresses Section 13 Biodiversity requirements.
Biodiversity Conservation Act 2016 (BC Act)	The proposed development is to be assessed as an SSD and therefore requires the submission of a BDAR.
Local Land Services Amendment Act 2016 (LLS Act)	The LLS Act does not apply to areas of the state to which the Vegetation SEPP applies. The Vegetation SEPP applies to the City of Sydney local government area.
Fisheries Management Act 1994 (FM Act)	The subject land overlaps areas mapped as Key Fish Habitat (KFH) (Figure 7). If the works involve dredging, reclamation or obstruction of fish passage, a permit or consultation under the FM Act is required. See Bank Street Park – Marine Ecology Assessment (ELA 2023)
Water Management Act 2000 (WM Act)	The WM Act aims to provide for the sustainable and integrated management of water resources for NSW. The Act requires developments on waterfront land to be ecologically sustainable and recognises the benefits of aquatic ecosystems to agriculture, fisheries, and recreation. The WM Act is administered by the Department of Planning and Environment – Water and establishes an approval regime for activities within waterfront land, defined as the land 40 m from the highest bank of a river, lake or estuary. For State Significant Development, approval in accordance with the WM Act under Section 4.41(g) of the EP&A Act, is not required.
Planning instruments	
State Environmental Planning Policy (Resilience and Hazards) 2021	Chapter 2 of the Resilience and Hazards SEPP 2021 aims to manage development within coastal zones and protect the environmental assets of the coast. In accordance with Section 5 of the *Coastal Management Act 2016* the term coastal zone is defined as any area of land that is comprised of the following coastal management areas: • Coastal wetlands and littoral rainforests • Coastal vulnerable areas • Coastal environment areas • Coastal use areas.

Name	Relevance to the project
	The subject land is mapped under the NSW Department of Planning and Environment Coastal Management SEPP Interactive Map. The proposed works are located within the Coastal Environment Area and Coastal Use Area (Figure 8). Section 2.10(3) of the Resilience and Hazards SEPP states that the development controls for Coastal Environment Areas and Coastal Use Areas do not apply to land within the Foreshores and Waterways area within the meaning of State Environmental Planning Policy (Biodiversity and Conservation) 2021, Chapter 6. The subject land is within the Foreshores and Waterways Areas. Therefore, Chapter 2 of the Resilience and Hazards SEPP does not apply.
State Environmental Planning Policy 2021 (Biodiversity and Conservation)	The following Chapters of the SEPP Biodiversity and Conservation are relevant for this project and includes: • Chapter 2 - Vegetation in Non-Rural Areas of the SEPP, which applies to development that does not require consent. As the proposed works requires consent under the EP&A Act, Chapter 2 does not apply. • Chapter 6 – Water Catchments. The subject land is part of the Sydney Harbour Catchment so Clause 6.6 Water quality and quantity, 6.7 Aquatic ecology, 6.8 Flooding and Clause 6.9 Recreation and Public Access apply to the SSD. As of the 8 September 2023 the subject land is not part of the Strategic Foreshores site under the SEPP Biodiversity and Conservation. See Bank Street Park - Marine Ecology Assessment for assessment of Part 6.3 Division3 Clause 6.28 General and 6.32 Rocky foreshores and significant seagrasses of the SEPP (ELA 2023).
Greater Sydney Regional Plan (Eastern City)	The Greater Sydney Regional Plan is the regional plan that applies to the broader Sydney region including its future growth centres. It sets out the vision to build a city in which most residents live within thirty minutes of employment, education, health, services, and open spaces. The subject land is within the 'Eastern City', one of five districts under the plan. One of the key directions of the plan is to create 'a city of great places', which can be achieved through creating great places that bring people together (Objective 12) and conserving and enhancing environmental heritage (Objective 13). An indicator for the achievement of these goals is increased access to open space. The proposed development is consistent with the aims.
Sydney Local Environment Plan 2012 (LEP)	The terrestrial component of the subject land is zoned RE1 Public Recreation under the Sydney LEP. The objectives of RE1 zoning 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 provide links between open space areas. • To retain and promote access by members of the public to areas in the public domain including recreation facilities and waterways and other natural features. • To protect sun access to publicly accessible land. The proposed works are consistent with the objectives of the RE1 zoning under the LEP.
Blackwattle Bay Design Guidelines	The Blackwattle Bay Design Guidelines 2022 supplement the provisions of the Sydney LEP 2012 by providing guidance for future development within the Blackwattle Bay. Section 4.3 Urban and Marine Ecology of the guidelines is relevant to this project and addressed in Section 9.4.

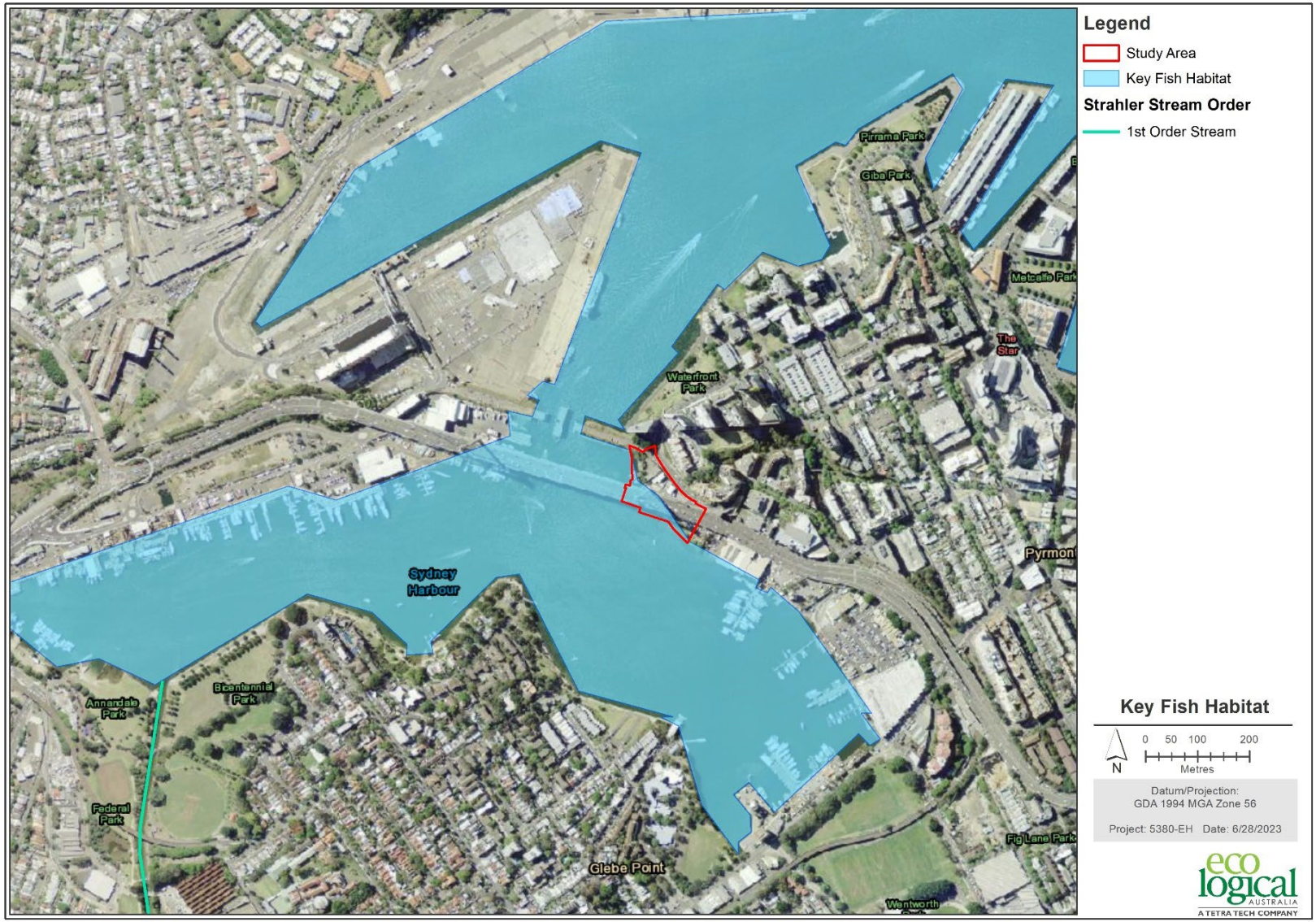

Figure 7: Key Fish Habitat

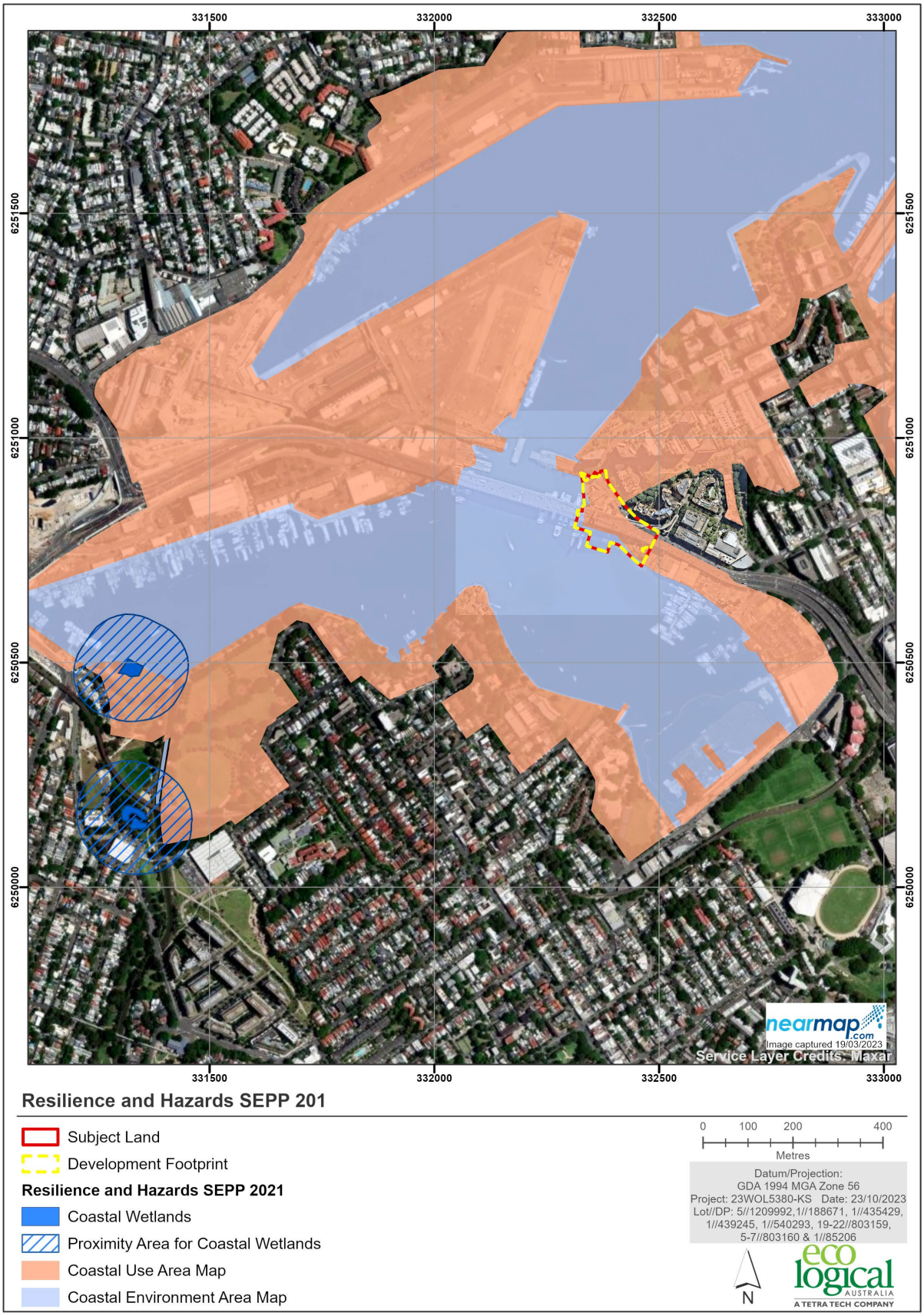

Figure 8: SEPP Resilience and Hazards 2021 (Coastal Management)

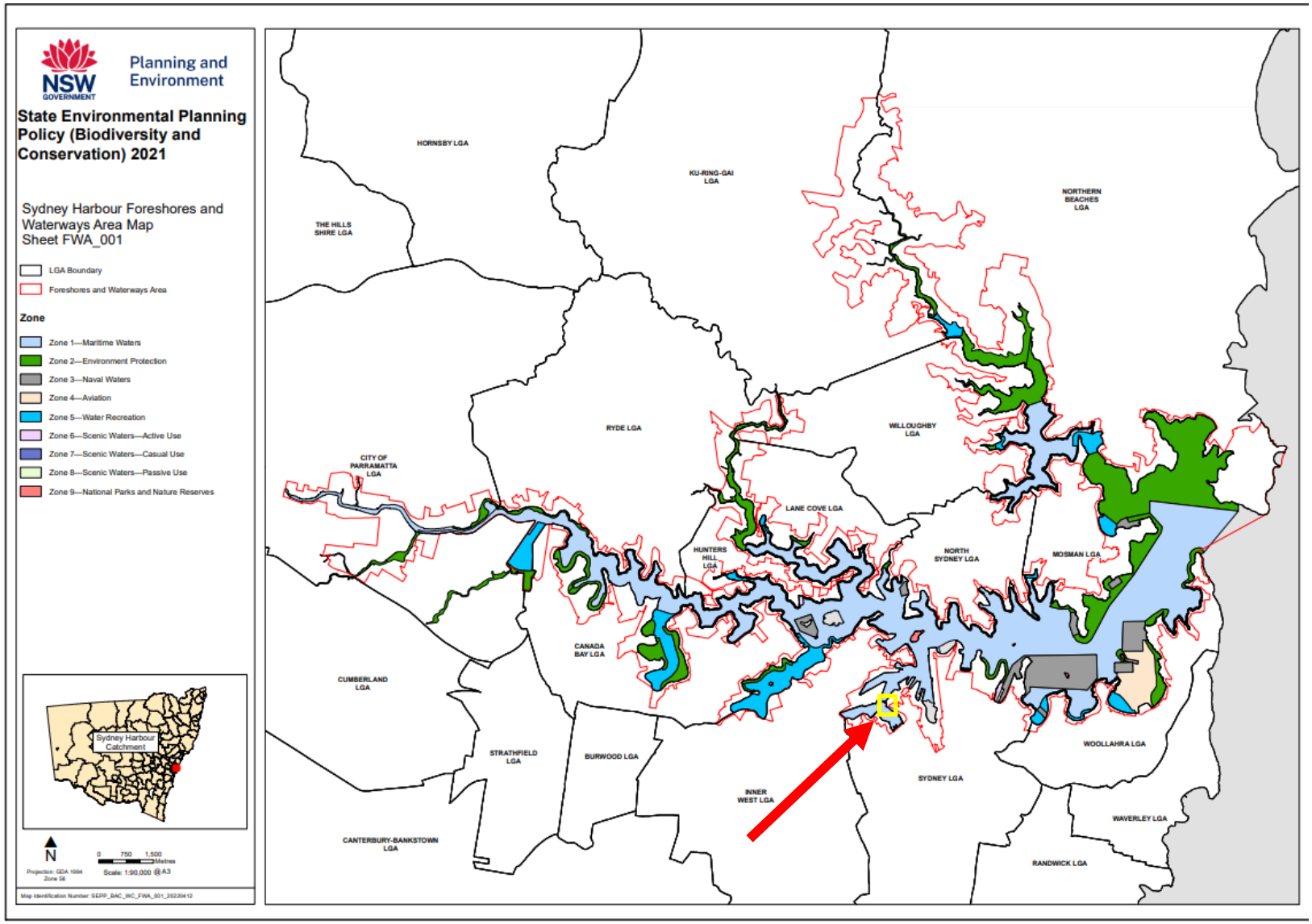

Figure 9: SEPP Biodiversity and Conservation 2021 (Foreshores and waterways)

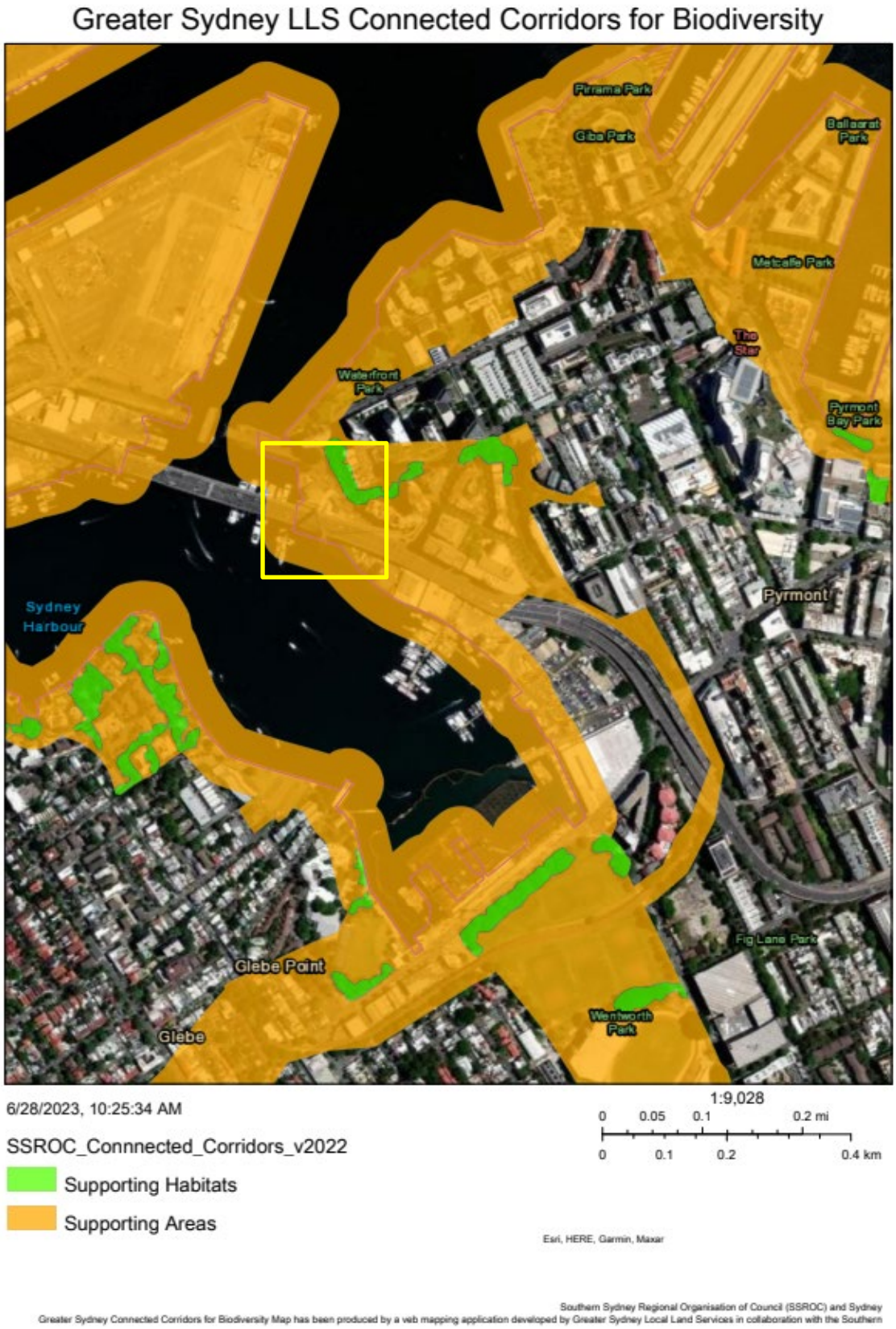

Figure 10: Greater Sydney Local Land Services – biodiversity corridor mapping (GSLLS 201) (refer to connectivity in table below)

2. Streamlined Assessment Module

The streamlined assessment module –Planted Native Vegetation was applied for this assessment.

Appendix D of the BAM 2020 outlines a streamlined assessment module for assessing planted native vegetation. The streamlined assessment module can be applied where part of the subject land contains planted native vegetation.

Section 2.2 of the BAM contains a streamlined assessment module for planted native vegetation. The streamlined assessment can be used where the native vegetation was planted for purposes such as street trees and other roadside plantings, windbreaks, landscaping in parks and gardens, and revegetation for environmental rehabilitation.

The streamlined assessment module for planted native vegetation has been applied to part of the subject land where areas of planted native vegetation will be impacted.

The planted native vegetation within the subject land has been planted for the purpose of landscape plantings such as within the existing gardens. A review of historical satellite imagery indicates that the subject land has been substantially modified since earliest imagery in 1930 (see Section 4.2.1. Current vegetation mapping indicates that there is no mapped native vegetation within 1.5 km of the subject land (refer to Section 4.2 below). The field surveys confirmed there is no remnant native vegetation present in the subject land. Revegetation works has occurred as part of landscaping. Species identified within the subject land includes species which are commonly found in landscaped areas within Sydney Basin.

Several *Ficus rubiginosa* (Port Jackson Fig) was recorded growing out of the seawall and were identified as (assumed) self-sown specimens in the Arboricultural Impact Assessment (Tree iQ 2023). While the *Ficus rubiginosa* are highly unlikely to have been planted, they are growing on a constructed seawall. A locally indigenous plant growing on a constructed seawall is highly unlikely to be considered *remnant native vegetation.*

Appendix D of the BAM provides a decision-making key for the assessment of the planted native vegetation. This decision-making key was applied to the sections of planted native vegetation mapped within the subject land. This assessment is displayed in Table 5.

Table 5: Decision-making key for planted native vegetation

Question	Response
A1: Does the planted native vegetation occur within an area that contains a mosaic of planted and remnant native vegetation and which can be reasonably assigned to a PCT known to occur in the same IBRA subregion as the proposal?	• **No** – Planted native vegetation located within the development occurs in small patches and is disconnected from remnant vegetation via hard surfaces such as roads and buildings. Planted native vegetation was lacking the key characteristic species of local indigenous PCTs, such as mature *Angophora costata* (Sydney Red Gum).
A2: Is the planted native vegetation: • planted for the purpose of environmental rehabilitation or restoration under an existing	• **No** – Planted native vegetation contained species such as *Casuarina glauca* (Swamp She-Oak) and *Ficus rubiginous* (Port Jackson Fig) which are representative species of local PCTs 3594 and 4028. However, areas

Question	Response
conservation obligation listed in BAM Section 11.9(2.), and • the primary objective was to replace or regenerate a plant community type or a threatened plant species population or its habitat?	of vegetation containing representative species occurred in small, landscaped garden beds. These areas lacked additional key diagnostic species and contained widely cultivated native species. These areas had a simplified vegetation structure and have been planted for landscape purposes, not for the purpose of rehabilitation. Other planted native vegetation included *Eucalyptus saligna* (Sydney Blue Gum) which is not characteristic of PCTs 3594 or 4028.
A3: Is the planted/translocated native vegetation individuals of a threatened species or other native species planted/translocated for the purpose of providing threatened species habitat under one of the following: • species recovery project • *Saving our Species* project • other types of government funded restoration project • condition of consent for a development approval that required those species to be planted or translocated for the purpose of providing threatened species habitat • legal obligation as part of a condition or ruling of court. This includes regulatory directed or ordered remedial plantings (e.g. Remediation Order for clearing without consent issued under the BC Act or the Native Vegetation Act) • ecological rehabilitation to re-establish a PCT or TEC that was, or is carried out under a mine operations plan, or • approved vegetation management plan (e.g. as required as part of a Controlled Activity Approval for works on waterfront land under the NSW *Water Management Act 2000*)?	• **No** – the native species present are not listed as threatened under the BC Act or EPBC Act. They have not been planted for rehabilitation works and have not been planted or translocated for the purposes listed.
A4: Was the planted native vegetation (including individuals of a threatened flora species) undertaken voluntarily for revegetation, environmental rehabilitation or restoration without a legal obligation to secure or provide for management of the native vegetation?	• **No** – the planted native vegetation forms part of the landscaping of the existing dwellings and pedestrian infrastructure within the subject land.
A5: Is the native vegetation (including individuals of a threatened flora species) planted for functional, aesthetic, horticultural or plantation forestry purposes? This includes examples such as: windbreaks in agricultural landscapes, roadside plantings (including street trees, median strips, roadside batters), landscaping in parks, gardens and sport fields/complexes, macadamia plantations or teatree farms?	• **Yes** – the planted native vegetation has been planted for functional purposes associated with aesthetics for landscaping. • Go to D.2 Assessment of planted native vegetation for threatened species habitat (the use of Chapters 4 and 5 of the BAM are not required to be applied)
A6: Is the planted native vegetation a species listed as a widely cultivated native species on a list approved by the Secretary of the Department (or an officer authorised by the Secretary)?	• N/A

Section D.2 of Appendix D of the BAM requires that the planted native vegetation is assessed for threatened species habitat. Opportunistic survey and habitat assessment for threatened flora and fauna habitat was undertaken as part of the field survey. Following a habitat assessment of this area it was determined that the planted native vegetation is unlikely to provide suitable habitat for threatened flora species. Planted native vegetation may provide foraging habitat for threatened fauna which has been assessed as part of this report.

3. Landscape features

The landscape features considered for this assessment are presented in Table 6, Figure 1 and Figure 2.

The site-based method was applied for this assessment; therefore, the assessment area is the 1,500 m buffer surrounding the outside edge of the boundary of the subject land.

Table 6: Landscape features

Landscape feature	Subject land	Assessment area	Data source
IBRA Region(s)	Sydney Basin	Sydney Basin	Interim Biogeographic Regionalisation for Australia, Version 7
IBRA subregion(s)	Pittwater	Pittwater	Interim Biogeographic Regionalisation for Australia, Version 7
NSW (Mitchell) Landscapes	A very small portion of the subject land (south eastern corner) is located on Port Jackson Basin (85% cleared). The remaining portion is not mapped.	Port Jackson Basin	NSW (Mitchell) Landscapes - version 3.1 (DPIE 2016)
Rivers and streams	No rivers or streams are present within the subject land. The subject land is located adjacent, with a small portion located over, Sydney harbour which is a large intertidal open waterbody.	The assessment area includes Johnstons Creek which is a Strahler stream 1st and 2nd Order) located in the south-west (Figure 1).	NSW Hydrography mapping (SEED Map accessed July 2023), Aerial imagery
Estuaries and wetlands	The assessment area and subject land include a portion of Blackwattle Bay which is an estuarine water body (Figure 11). Matters relating to the estuarine water body is addressed in the Marine Aquatic Report (ELA 2023). There are no coastal wetlands or littoral rainforest areas identified within the subject land under the SEPP (Resilience and Hazards 2021) (Figure 8). Therefore, the subject land does not contain Important or Local Wetlands.	The assessment area includes Rozelle Bay which includes a coastal wetland mapped approximately 800 m south-east of the subject land under the SEPP (Resilience and Hazards 2021) (Figure 8). This wetland is an Important Wetland.	NSW Wetland mapping (SEED Map accessed October 2023), Aerial imagery

Landscape feature	Subject land	Assessment area	Data source
Connectivity of different areas of habitat	The subject land contains planted native vegetation and exotic vegetation. It does not contain vegetation which is part of a native Plant Community Type (PCT). The planted native vegetation is fragmented, providing marginal habitat connectivity. There is a narrow band of macroalgae attached to rocky rubble located approximately 3-10 m off the seawall which has been identified as Key Fish Habitat and provides habitat connectivity for aquatic species. See Bank Street Park – Aquatic Ecology Assessment (ELA 2023) for further information. The subject land is located over Blackwattle Bay. Blackwattle Bay is part of Sydney Harbour catchment and includes significant waterbodies such as Port Jackson estuarine wetland. Blackwattle Bay aquatic environment provides connectivity features for marine dependent species. The subject land is mapped as providing a Biodiversity Corridor under the Greater Sydney Local Land Services Biodiversity Corridor Mapping (Figure 10). Given the urban context of the subject land and the type of specific habitat provided (landscape plantings) the mapping of the subject land is taken to refer primarily to highly mobile species such as birds and bats.	Connectivity across the assessment area is poor. There is a high level of degradation due to an extensive history of clearing of vegetation and urbanisation. Native street trees and landscaping provides some connectivity for urban species. The presence of open water limits connectivity for the majority of fauna species which may utilise the assessment area.	Aerial imagery, field surveys conducted 7 and 21 June 2023 Biodiversity Corridors Mapping (GSLLS 2019) Biodiversity Values Map (DPE 2023d) Fisheries NSW Spatial Data Portal (DPI 2023)
Geological features of significance and soil hazard features	The subject land and assessment area do not contain any geological features of significance (i.e., karst, caves, crevices, cliffs etc.). The subject land contains a high probability of occurrence of Acid Sulfate Soils which are considered a soil hazard feature.	The assessment area does not contain any geological features of significance (i.e., karst, caves, crevices, cliffs etc.) The assessment area contains a high probability of occurrence of Acid Sulfate Soils.	Aerial imagery Field survey Topography and contour data sets
Biodiversity Values	There subject land does not contain land mapped under the Biodiversity Values map (DPE 2023d) (Accessed 23 October 2023).	The assessment area does not contain land mapped under the Biodiversity Values map (DPE 2023d) (Accessed 23 October 2023).	Biodiversity Values Map and Threshold Tool
Areas of Outstanding Biodiversity Value	The subject land does not include areas of declared critical habitat (accessed 23 October 2023).	The assessment area does not include areas of declared critical habitat (accessed 23 October 2023).	Register of Declared Areas of Outstanding Biodiversity Value (DPIE 2020)

Landscape feature	Subject land	Assessment area	Data source
Percent (%) of native vegetation extent	The total subject land is approximately 1.924 ha (this includes water) and contains 0.173 ha of planted native vegetation.	The assessment area is approximately 706.9 ha and contains approximately 0.356 ha of marine vegetation, 36.852 ha of urban exotic/native 0.173 ha of planted native vegetation as mapped by OEH 2016 and ELA field surveys. The State Vegetation Type Map (DPE 2022) did not record the presence of native PCTs within the assessment area. Instead, the Sydney Metro Vegetation 2016 mapping dataset was used to calculate extent of native vegetation. A total of 37.025 ha of planted native and urban exotic/native vegetation within the assessment area. Therefore, there is less than 0.25 ha and extent of native vegetation is 4.6% based on 37.025 ha of vegetation mapped by OEH (2016).	Calculated using aerial imagery and ArcGIS software Native Vegetation of the Sydney Metropolitan Area - Version 3.1 (OEH 2016) The State Vegetation Type Map (DPE 2022) Field survey

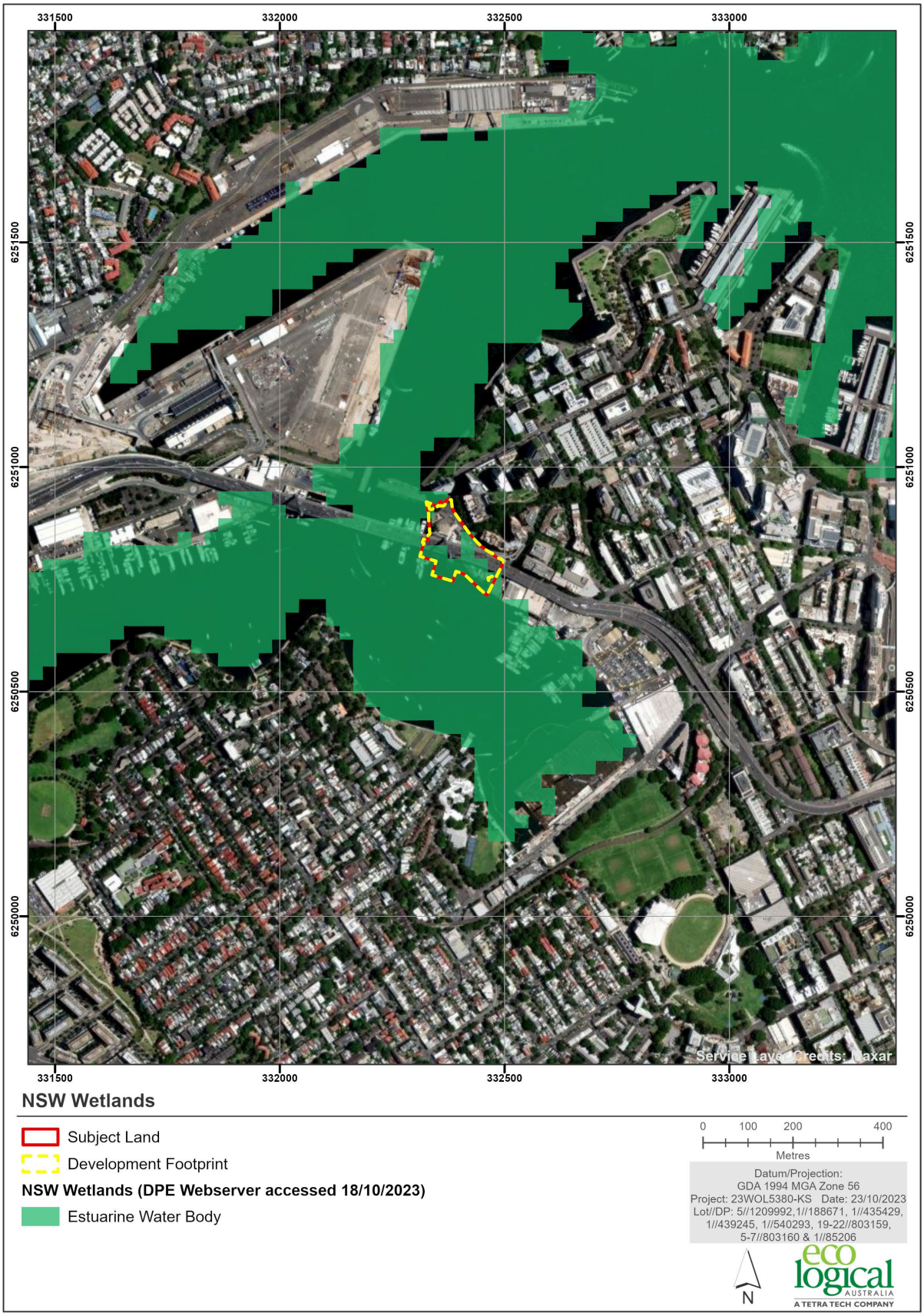

Figure 11: Estuarine Water Body mapped by the NSW Wetlands (DPE 2023)

4. Native vegetation

4.1. Survey effort

4.1.1. Vegetation and species habitat assessment

Belinda Failes, senior ecologist, with assistance from ecologist Claire Plunkett, conducted a field survey on 7 June 2023 of the subject land for SSD Bank Street Park (SSD 53386706) over four hours with a focus on the following:

- Validation of existing vegetation mapping, determining type, condition and extent within the subject land.
- One full floristic plot assessed in accordance with BAM 2020.
- Identification of threatened fauna habitat, including important habitat features, such as hollow bearing trees or waterways.
- Diurnal inspection around external of human-made structures for microchiropteran bats (microbats) or signs of microbats.
- Opportunistic fauna sightings.
- Visual assessment of presence of aquatic habitat from promenade.

Following the survey, it was determined that microbat surveys were required for the human-made structures. This is discussed in Section 4.9 below.

No Plant Community Types (PCTs) as defined by the BioNet Vegetation Classification system were identified within the subject lands. One vegetation integrity plot was conducted to justify the absence of a PCT. The plot was undertaken in a garden landscape. The data is presented in Appendix C.

4.2. Plant Community Types present

4.2.1. Review of vegetation mapping and historic imagery

A literature review of previous vegetation mapping and a review of historical imagery was conducted to assist in justification of the vegetation mapping following the field surveys.

The subject land did not contain any naturally occurring or remnant native vegetation, or vegetation which conforms to a PCT. This is consistent with vegetation mapping from the Native Vegetation of the Sydney Metropolitan Area – Version 3.1 (OEH 2016) and State Vegetation Type Map (DPE 2022) (Figure 14).

Historic aerial imagery accessed via the NSW Historical Imagery viewer (Spatial Services 2023) show that clearing of land and construction of numerous buildings and streets had occurred by 1930 (Figure 12). The subject land remains void of vegetation within the subject land and within the adjoining broader landscape. Some vegetation can be seen from 2002 images which appears to be part of street tree and landscaping plantings. Some of the plantings from 2002 are still present today.

The historic aerial photography indicates that the subject land has a long history of disturbance and clearing of vegetation. The subject land is located within a highly urbanised environment which lacks connectivity features. The vegetation within the subject land is disconnected from patches of mapped

intact native vegetation and has been planted for landscape purposes, not for ecological restoration. A map of validated vegetation is provided in (Figure 15).

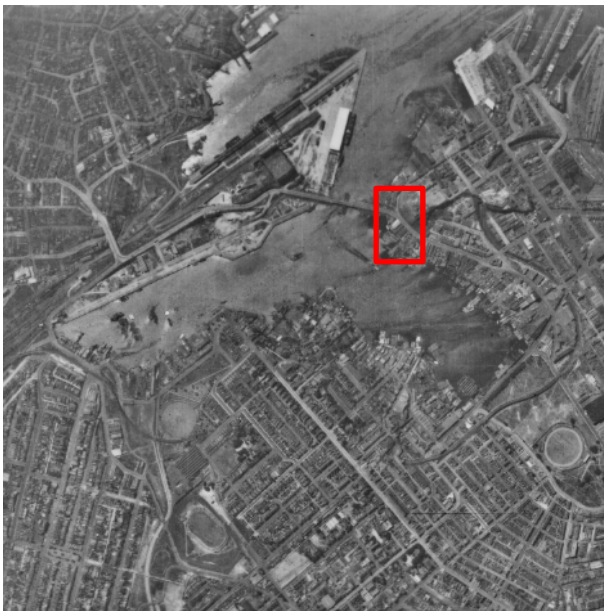

Figure 12: 1930 aerial imagery (Spatial Services 2023)

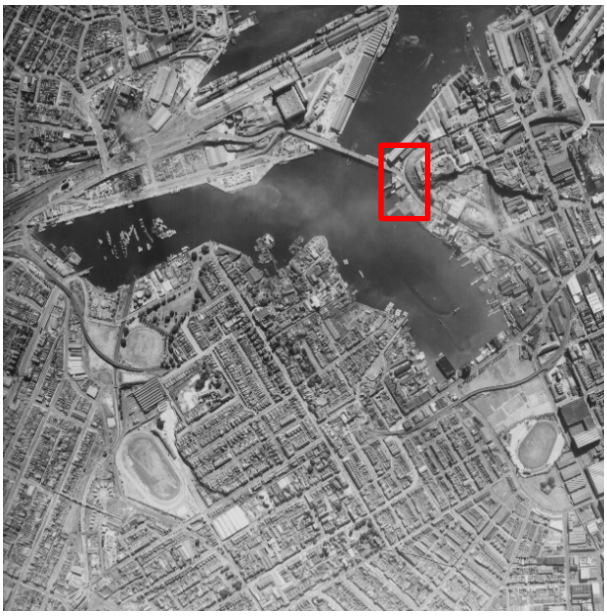

Figure 13: 1951 aerial imagery (Spatial Services 2023)

4.2.2. Planted native vegetation

The vegetation within the subject land has been established through planting of native vegetation in informal gardens. The vegetation lacks remnant trees which indicate native seeds within the soil seed bank.

Planted native vegetation within the subject land included a small cluster of immature *Casuarina glauca* (Swamp She-Oak) (Figure 16) in the central portion of the subject land.

Two mature *Ficus microcarpa* var. *hilli* (Hills Weeping Fig) were located overhanging the northern boundary and several smaller *Ficus rubiginosa* (Port Jackson Fig) were located along the sandstone seawall in the western boundary of the subject land. A stand of *Eucalyptus saligna* (Sydney Blue Gum) with an exotic grass layer and a mix of shrubs including *Pittosporum undulatum* (Sweet Pittosporum) and *Callistemon viminalis* (Weeping Callistemon) and smaller shrubs including *Kunzea ambigua* (Tick Bush) and *Banksia ericifolia* have been recently planted along the south-eastern boundary (Figure 17). *Eucalyptus saligna* is not considered a locally indigenous species to the subject land and is not considered part of PCTs recorded in the broader landscape of the subject land.

As previously discussed, the subject land has an extensive history of disturbance and absence of remnant vegetation as seen in aerial imagery from 1930s (Figure 12) the land was cleared of all vegetation more than 100 years ago. Furthermore, the subject site is not connected to areas of intact native vegetation (Figure 14). Therefore, the native vegetation within the subject land has been established through informal landscape works and does not represent part of a PCT.

4.2.3. Exotic vegetation

The subject land contains exotic vegetation which contained a mix of species planted to form gardens or opportunistic weeds. Exotic planted vegetation includes several mature *Celtis sinensis* (Chinese Hackberry), *Syagrus romanzoffiana* (Cocos Palm) and several *Cupressus* sp. located in the north of the subject land (Figure 18).

Opportunistic weeds included *Cotoneaster* spp., *Cortaderia selloana* (Pampas grass), *Pennisetum alopecuroides* (Fountain Grass), *Senecio madagascariensis* (Fireweed), *Ricinus communis* (Castor Oil), and *Lantana camara* (Lantana).

The subject land also contains open exotic grasslands which are subject to regular mowing regime (Figure 19).

4.3. PCT selection justification

No PCTs were mapped within subject land. The entire subject land is located on soil mapped as 'Disturbed Terrain'. These areas were previously swamps, wetlands and estuarine habitats and have been cut and filled using various materials. Therefore, it was unlikely that remnant terrestrial native vegetation would currently occur within the subject land.

Aquatic vegetation comprising of macroalgae was recorded within the foreshores of the subject land (Figure 20). Further information regarding aquatic vegetation (and impacts to marine species i.e., *Hippocampus whitei* (Whites Seahorse)) is outlined in the Bank Street Park – Aquatic Ecology Assessment (ELA 2023).

4.4. Threatened Ecological Communities

No threatened ecological communities (TECs) were identified within the subject land.

4.5. Vegetation integrity assessment

No PCTs were identified within the subject land, and thus a vegetation integrity assessment as part of the BAM 2020 was not required.

4.6. Use of local data

Use of local data instead of benchmark integrity scores is not proposed.

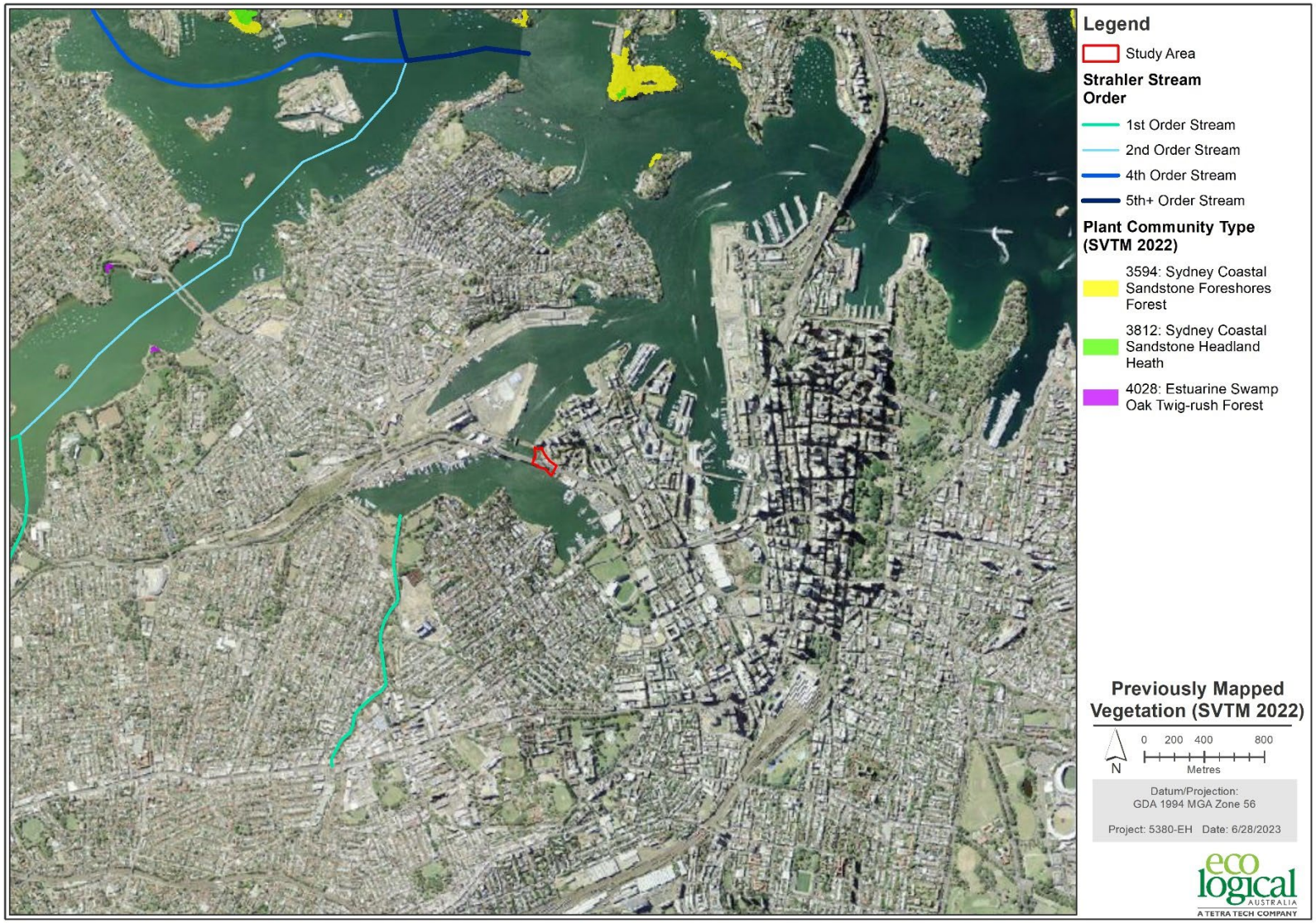

Figure 14 Previously mapped vegetation

Figure 15: Validated vegetation and habitat features

Figure 16: Example of planted native vegetation that does not conform to a PCT. A cluster of planted *Casuarina glauca* within the subject land

Figure 17: Example of planted native vegetation in an informal garden which contains native vegetation which does not represent a local PCT. This stand of *Eucalyptus saligna* is located on the southern portion of the subject land and will not be impacted.

Figure 18: Example of exotic vegetation recorded within the northern portion of the subject land

Figure 19: Open cleared land represents the majority of the subject land

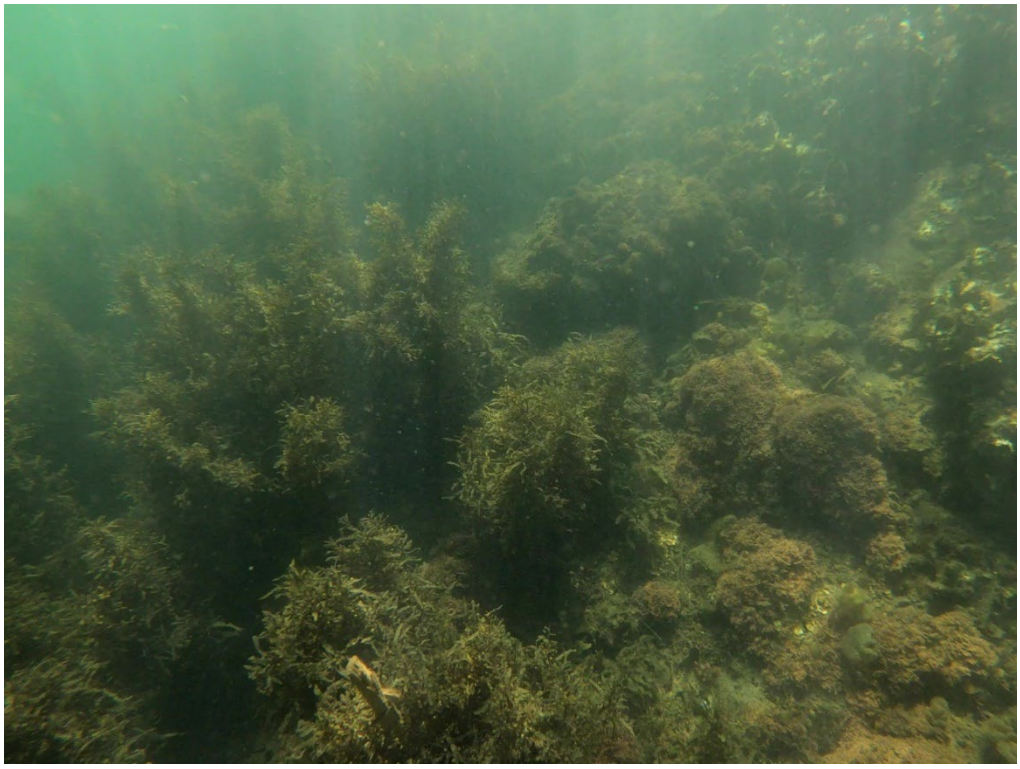

Figure 20: Macroalgae (*Sargassum linearifolium*) on rocky rubble fringing the subject land (potential habitat for Whites Seahorse)

4.7. Threatened species

4.7.1. Ecosystem credit species

The BAM requires that a list of threatened species that can be reliably predicted by habitat surrogates that are identified. These species are called ecosystem credit species and they are automatically generated based on the PCT, the IBRA subregion of the project footprint, the condition and patch size of vegetation. The BAM allows an assessor to determine whether any of the habitat components for the predicted threated species are present or not. If they are not present, an assessor does not need to further assess the ecosystem credit species as present in the vegetation zone. However, due to the lack of PCTs within the subject land, data was not entered into the BAM Calculator (BAM-C) and no list of ecosystem credit species were generated from the BAM-C.

4.7.2. Species credit species

4.7.2.1. Candidate species credit species

Species credit species are typically predicted by the assessment tool based on the PCTs present within the project footprint, and a series of habitat and geographic location questions formulated by the BAM-C assessment tool. Once the species credit species are identified, they undergo a second filtering step to determine whether they are filtered into the assessment for consideration as a species credit species.

No species credit species were identified from the tool and therefore no species credit species were considered for further assessment. Due to the lack of PCTs mapped within the subject land, potential candidate species (including species credit species) were assessed as part of Prescribed Impacts (see Section 5). BioNet records within a 5 km radius of the subject lands are provided in Figure 23 and Figure 24 and an assessment of likelihood of occurrence is presented in Appendix B. Two groups of candidate species were identified, Migratory Shorebirds and microbats. A discussion of each is provided in the following section.

4.7.2.1.1. Migratory Shorebird Important Habitat

The subject land is located on land mapped on the Migratory Shorebird Important Habitats (Figure 25). Two species, *Limosa lapponica baueri* (Bar-tailed Godwit) and *Calidris ferruginea* (Curlew Sandpiper) were identified as associated with habitat with Port Jackson wetland along the Parramatta River. The Migratory Shorebirds Important Habitats includes all of Parramatta River and extends into Blackwattle Bay. The subject land includes mapped areas of Migratory Shorebirds Important Habitat. The field survey identified these mapped areas include the marina (Figure 21) and fringing exotic and planted native vegetation above the sandstone seawall and muddy substrate with macroalgae in the foreshores (Figure 22).

The Bar-tailed Godwit is listed as vulnerable under the EPBC Act and is not listed under the NSW BC Act. This species is a non-breeding migratory species which migrates to New South Wales in August from Arctic breeding grounds. Foraging habitat includes sandflats, mudflats, estuaries and harbours where it utilises seagrasses and edge of mangroves to forage for crustaceans, worms and insects. Roosting habitat consists of high tide areas on sandy beaches, sandbars, or saltmarsh (DPE 2020). There is one BioNet record of this species within a 5 km radius of the subject land (Figure 24). This BioNet record is located around the intertidal zone along Rozelle Bay (i.e. adjacent to Rodd Park and Iron Cove), approximately 3.5 km west of the subject land.

The Curlew Sandpiper is listed as endangered under the BC Act and critically endangered under the EPBC Act. It migrates to Australia from its breeding grounds in Siberia in August and departs in March. It occurs on littoral and estuarine habitats and generally associated with intertidal mudflats of sheltered coastlines but may forage along shallow waters or on beaches with seaweed (DPE 2021). There are eight BioNet records for this species within a 5 km radius of the subject land (Figure 24), however, these are all historic records from 1959-1993.

According to the Threatened Biodiversity Data Collection (TBDC) Bar-tailed Godwit and Curlew Sandpiper are dual ecosystem/species credit species with areas mapped on the Migratory Shorebird Important Habitats identified as a habitat constraint species credit. All other areas where these species are likely to occur are identified as a habitat constraint ecosystem credit. The subject land is located on mapped areas, as such a species polygon is required for each of these two species. These species are considered candidate species credit species. An assessment is required for these species under the BC Act. This report has assessed the two migratory shorebirds as prescribed impacts. An assessment of these species in accordance with the EPBC Act is provided in Section 9. Macroalgae and disturbed foreshores have been considered marginal foraging habitat for these species. No roosting habitat or breeding habitat is present within the subject land.

Impacts to the waterways which contains macroalgae requires assessment and has been included in the Marine Ecology report (ELA 2023).

An email was sent on 31 July 2023 to the BOS support helpdesk to seek clarification regarding calculating credits impacts on non-native vegetation and planted native vegetation. A response was provided on 7 August 2023 and is provide in Appendix C. In summary, the response indicated that the accredited assessor must assess the impacts to important habitat through PCT mapping or assess the planted native vegetation in accordance with Appendix D Streamlined Assessment Module – Planted Native Vegetation. Impacts to important habitat of the two Migratory Shorebirds where there is “not native vegetation" should be assessed as prescribed impacts in accordance with Section 8.3.2 of the BAM.

Additionally, the email response from BOS helpdesk also notes” *There is no standard method for generating species credits for a prescribed impact. The approach to calculating any proposed offsets should be determined in consultation with the decision-maker, justified and documented in the BDAR. The decision-maker can also request the retirement of additional biodiversity credits or alternative measures to address these impacts (see section 7.13(4) of the BC Act and clause 6.1(2)(b) of the BC Regulation).*”

Impacts to mapped Migratory Shorebirds Important Habitat has been assessed as prescribed impacts and no species credits species have been generated as the subject land contains very marginal habitat for these species.

Figure 21: Areas included on the Migratory Shorebirds habitat mapping which includes the existing marina

Figure 22: Areas included on the Migratory Shorebirds habitat map which includes the seawall

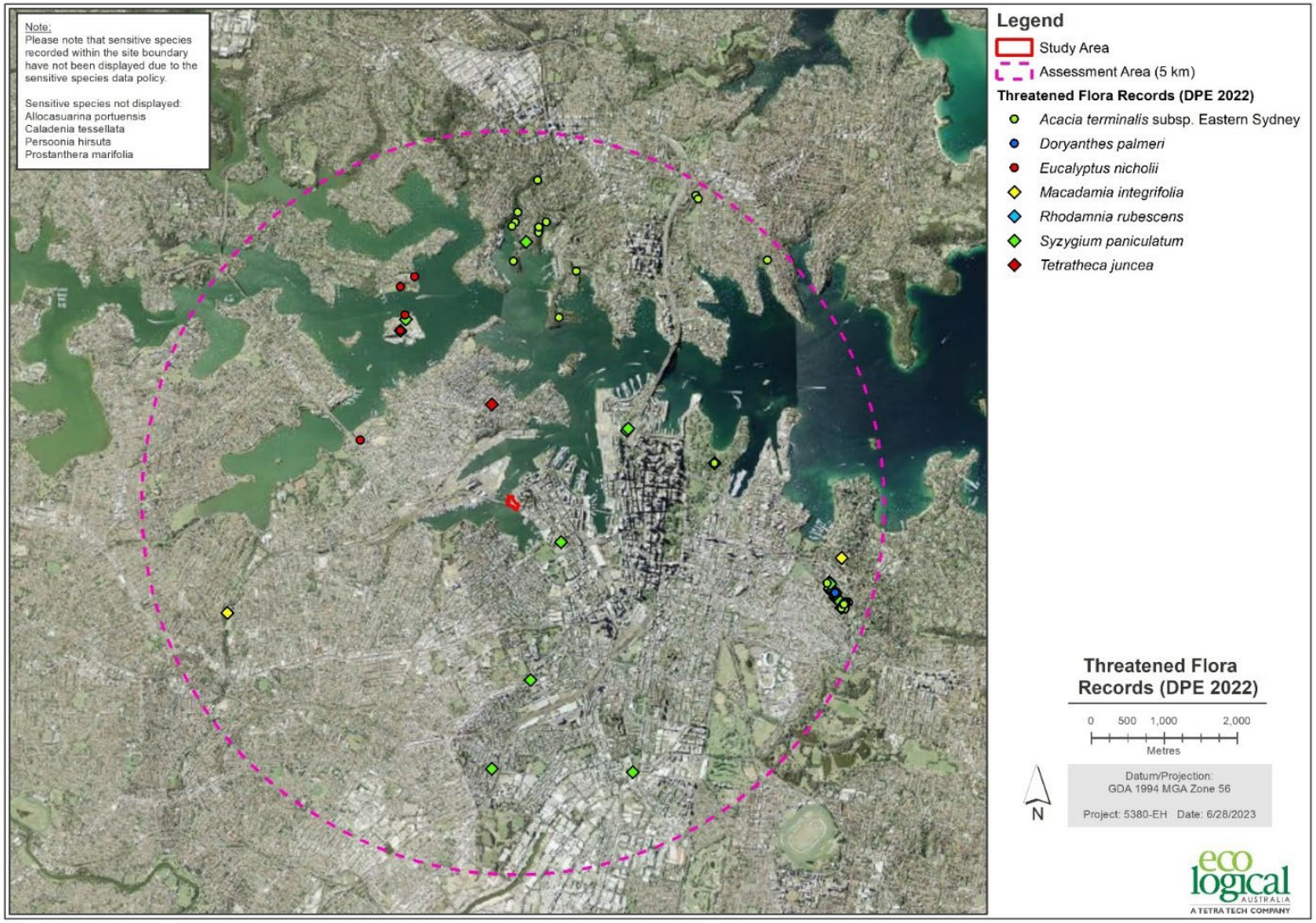

Figure 23: Threatened flora records within a 5 km radius of the subject land

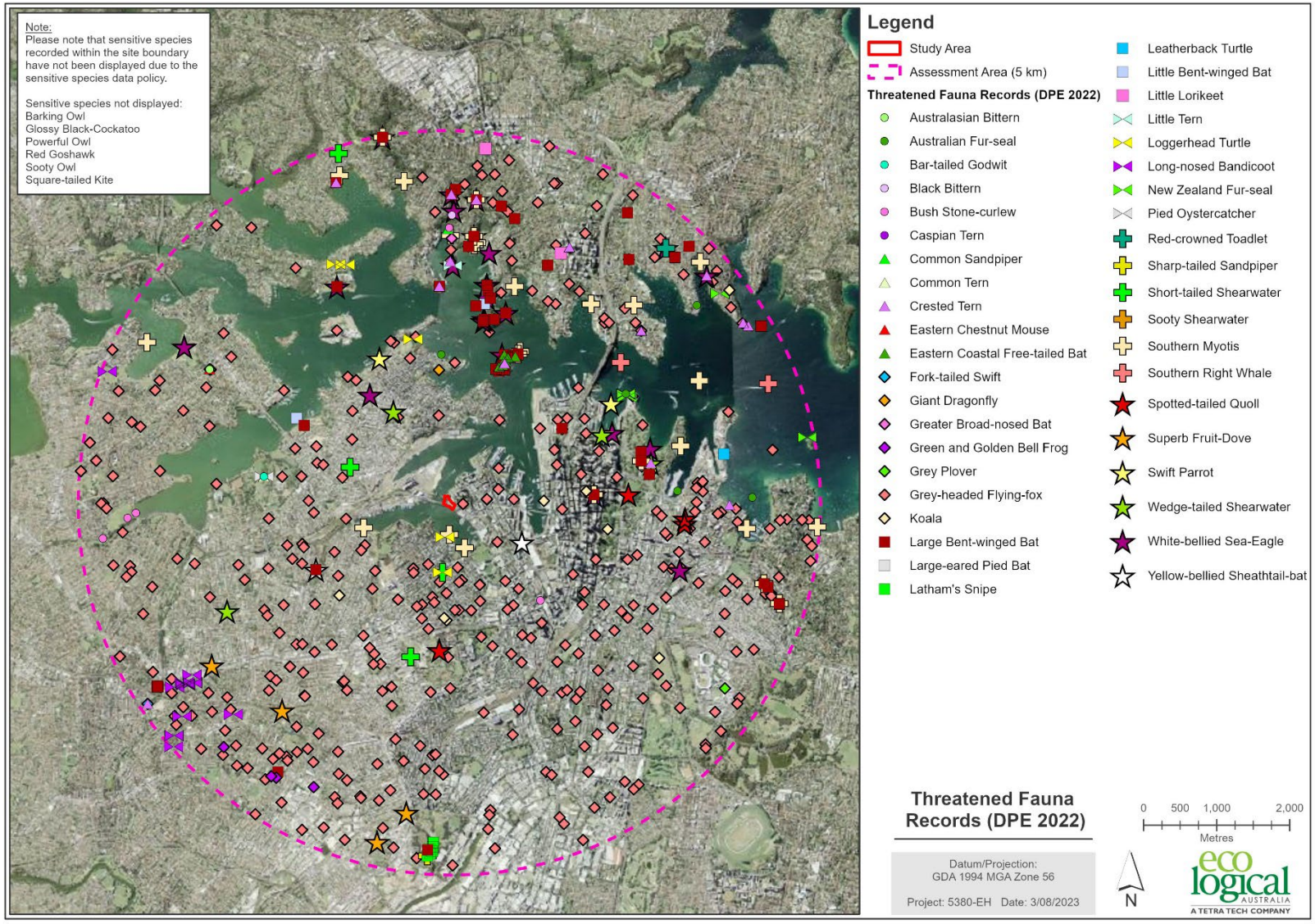

Figure 24: Threatened fauna records within a 5 km radius of the subject land

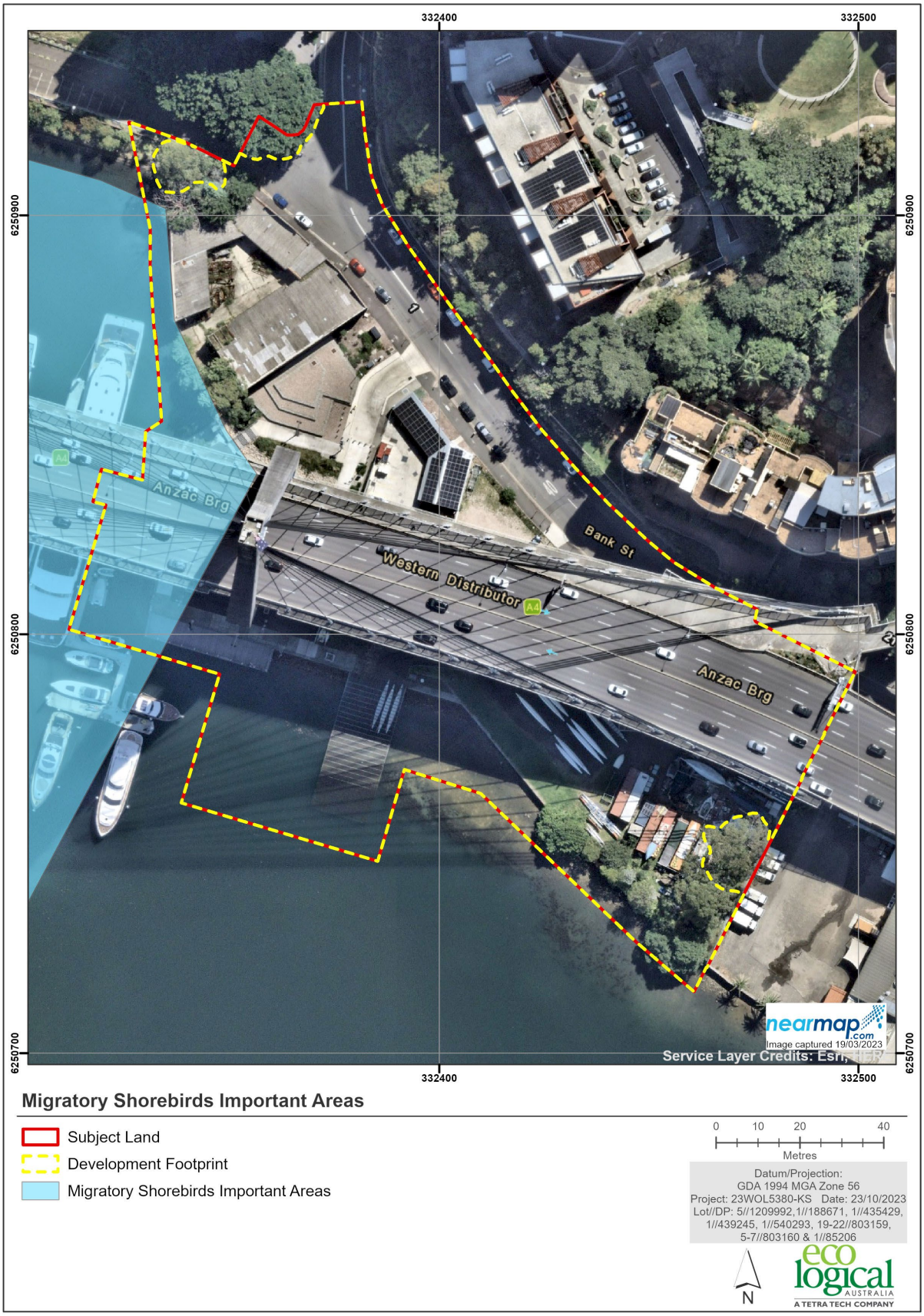

Figure 25: Migratory Shorebird Important Habitats (accessed 31 July 2023)

4.7.2.2. Microbat assessment

4.7.2.2.1. Literature review of microbats

A literature review was conducted to identify if buildings or other human-made structures could potentially be utilised as a roosting resource by microbats, including reviewing the BioNet records from within 5 km of the subject land. Some microbat species are dual credit species with only breeding habitat considered for species credits. The literature review identified that *Myotis macropus* (Southern Myotis) has potential to utilise human-made structures (buildings) located within the subject land as breeding habitat and roosting habitat (seawall crevices and buildings). A summary of the literature review of microbats and their foraging, roosting and breeding habitat requirements is provided below. A list of potential microbat candidate species which require further assessment was determined from the literature review and is discussed in the following section.

Chalinolobus dwyeri (Large-eared Pied Bat) is a species credit species and listed as vulnerable under the BC Act and EPBC Act. It is known to roost in west-facing cliff faces without large caverns and preferred foraging along moist drainage gullies with moist vegetation (Williams and Thomson 2018). There are only two records of this species from within 5 km of the subject land. The initial habitat assessment determined that the subject land does not contain suitable breeding habitat or suitable foraging habitat (i.e. woodlands and forests on high fertility soils along the edges of sandstone escarpments) for this species. An analysis of high-resolution aerial imagery and topographical maps did not record the presence of rocky areas containing caves, overhangs, escarpments, outcrops or crevices within 2 km of the subject land. This species is unlikely to be present within the subject land and unlikely to be impacted by the proposed development. No additional consideration of this species is required for this assessment.

Vespadelus troughtoni (Eastern Cave Bat) is a species credit species and listed as vulnerable under the BC Act. According to the Threatened Biodiversity Database Collection (TBDC) this species is difficult to predict as present based on vegetation types or habitat features for breeding or foraging. A review scientific literature identified that maternity roosts are located in overhangs of large sandstone caves with a dome roof (Law *et al* 2005). The literature also identified that this species has not been known to roost in tree hollows, crevices or overhangs (Law *et al* 2005). However, this species has been recorded breeding in human-made structures (Law and Chidel 2007). According to the TBDC breeding habitat for this species is within 2 km of rocky areas containing caves, overhangs, escarpments, outcrops, crevices or boulder piles or within 2 km of old mines, tunnels, old buildings or sheds. A review of BioNet records did not record this species within a 5 km radius of the subject land. A broader radius was applied for this species. There are no BioNet records for this species within a 10 km radius of the subject land. According to the Australasian Bat Society (Batmap), its known distribution does not extend to south of Sydney harbour (Figure 26). Based on an absence of BioNet records and the fact its geographic distribution is unlikely to extent to the subject land, this species does not require further assessment.

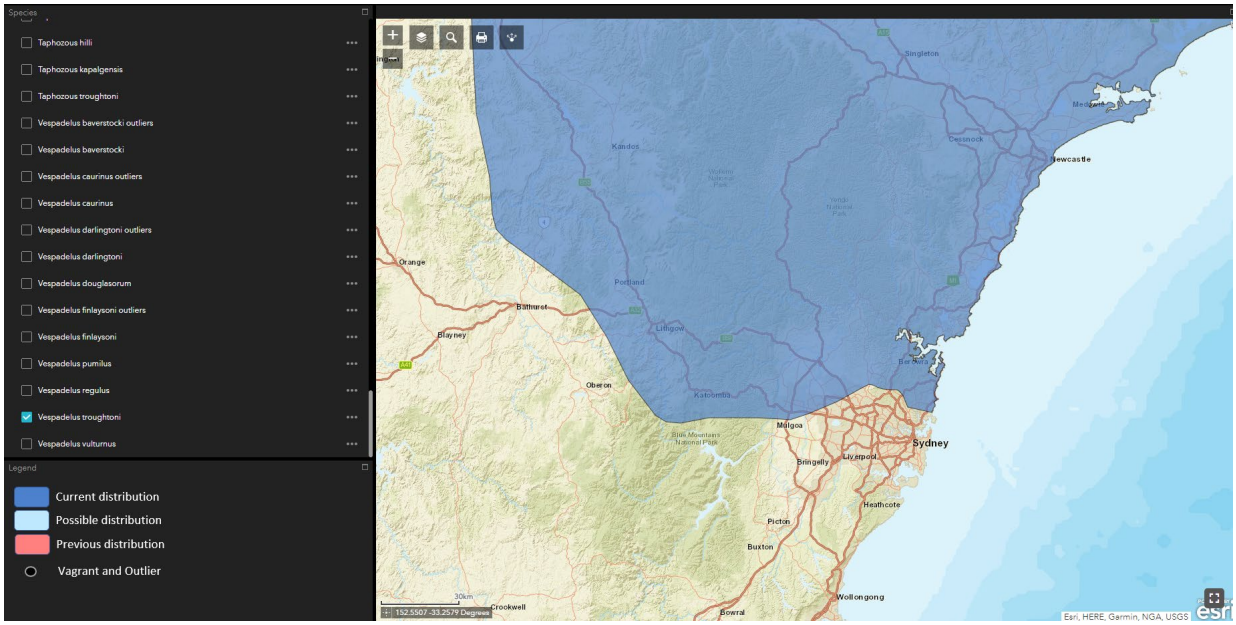

Figure 26: Current distribution of Eastern Cave Bat does not include the subject land (BatMap accessed 3/8/23).

Myotis macropus (Southern Myotis) is a dual credit species and only considered a species credit species for breeding habitat. It is a specialist feeder, according to the TBDC this species requires waterbodies greater than 3m wide to forage. It is known to roost in tree hollows, human-made structures including buildings, bridges, wharves and culverts. The subject land contains old buildings which were identified during field surveys as potential breeding habitat. The field surveys also identified suitable gaps within the seawall which was also considered suitable roosting habitat for this species. As such this species is considered a candidate species which requires further assessment.

Miniopterus orianae oceanensis (Large Bent-winged Bat) and *Miniopterus australis* (Little Bent-winged Bat) are both subterranean roosting species. Both species congregate in large numbers at a few known maternity caves outside of the Sydney Basin over spring and summer to breed and raise young and disperse to winter hibernation roosts up to 300 km away from maternity roosts (Large Bent-winged Bat) in autumn (Churchill 2008). These species are both known to inhabit the Sydney Basin throughout the winter months with some non-breeding individuals remaining in the area throughout the year. There are multiple Large and Little Bent-winged Bat records within a 5 km radius of the subject land. It should be noted that the human-made structures within the subject land do not represent breeding habitat for either the Large, or Little Bent-winged Bat species. Large aggregations (1000s) of Large and Little Bent-winged Bats are required to sustain a maternity roost. These species are not known to breed in human-made structures (such as buildings) and there is no evidence of large aggregations of these species within a 5 km radius of the subject land. However, where microbat roosting habitat exists there is potential for these species to utilise cavities within the existing buildings or the seawall as over-winter roosting habitat or as non-breeding roosting habitat throughout the year. Both Bent-winged bat species are considered candidates for non-breeding (over-winter) roosting habitat and foraging habitat. Non-breeding roost sites are considered important to the overall security of the populations, however, only breeding habitat is considered for assessment as a species credit species. Therefore, this BDAR has

assessed the buildings and planted native vegetation as habitat for ecosystem credit species. Given the absence of a PCT, these species will be assessed as Prescribed Impacts in Section 5.

Saccolaimus flaviventris (Yellow-bellied Sheath-tailed Bat), *Micronomus norfolkensis* (Eastern Coastal Free-tailed Bat), *Falsistrellus tasmaniensis* (Eastern False Pipistrelle) and *Scoteanax rueppellii* (Greater Broad-nosed Bat) are all ecosystem credit species known to utilise tree hollows for breeding but have also been known to roost occasionally in buildings (Churchill 2008). There are no tree hollows recorded within the subject land, however, the buildings within the subject land represents potential non-breeding roosting habitat for these species. None of these species are particularly adapted to the highly urbanised environment present at the subject land. However, targeted surveys are required to determine the presence of these species. Features present within the subject land may be used as roosting habitat and may also provide suitable breeding habitat for some species such as the Eastern-Coastal Free-tailed Bat. These ecosystem species will be assessed as part of the prescribed impacts in Section 5 of this report.

Following the literature review, database searches and habitat assessment, a list of potentially occurring threatened microbat species (candidate species) was produced. These species are listed in Table 7 and Table 8.

Additionally, *Pteropus poliocephalus* (Grey-headed Flying Fox) which is a megabat, is listed as both an ecosystem and species credit species. The species credit listing relates to breeding camps only. No Grey-headed Flying Fox breeding camps are located within or near the subject land, and thus no targeted survey was conducted for this species. Impacts to foraging habitat have been considered as part of Prescribed Impacts (Section 5) and planted native vegetation assessment.

4.7.3. Previous microbat surveys in the locality

Targeted microbat surveys by ELA have been conducted within the Blackwattle Bay as part of the approved new Sydney Fish Market (application SSD 8925). Targeted surveys were requested by Department of Planning, Industry and Environment (now DPE) - Environment, Energy and Science (EES) scientific review team. Surveys were conducted for ecosystem and credit species microbat species and microbat roosting habitat in suitable habitat including under the wharf and in the one of the buildings. Surveys were required as part of the assessed of Prescribed Impacts. Southern Myotis was recorded during targeted surveys and was likely to utilise the new Fish Markets as roosting, breeding and foraging habitat. As no PCTs were assigned to vegetation within the site, impacts to species credit species could not be offset. Instead, impacts were addressed through prescribed impacts. Due to impacts on Southern Myotis and possibly other threatened microbats, a Microbat Management Plan (MMP) was required prior to construction and included additional mitigation measures and monitoring works.

4.7.4. Habitat assessment

A diurnal visual inspection of all existing buildings was undertaken on 7 June 2023 by ELA ecologists Belinda Failes and Claire Plunkett. The exterior of the buildings was visually inspected for cracks, gaps, holes, crevices, seams in the roof and walls that may provide potential microbat roosting habitat using binoculars and a spotlight.

The existing buildings (Figure 28) were identified as potential non-breeding habitat for microbat species and breeding habitat for Southern Myotis. The small gaps in the sandstone boulders which forms part

of the seawall (Figure 28) was identified as very marginal habitat. Small gaps well above high tide, may provide marginal and temporary roosting habitat for Southern Myotis (i.e. not breeding habitat). No other species is considered likely to utilise this habitat.

Figure 27: Potential entry and exit points for microbats in eaves and roofing of derelict building.

Figure 28: Potential microbat habitat in derelict buildings and tunnels/gaps in the sandstone blocks above high tide

4.8. Candidate species requiring further assessment

All species specified in Table 7 require assessment for this BDAR and targeted species-specific surveys. The proposed timing of these surveys has been determined by the survey months specified in the BAMC, BioNet and additional literature sources. The optimal survey season for microbat species is between October to January. Targeted surveys for species credit species were undertaken in October 2023 in accordance with the BAM guidelines and discussed in Section 4.9 of this report.

4.8.1.1. Final candidate species

As previously discussed, due to the absence of a PCT, no candidate species were initially predicted by the BAM-C. However, based on the literature review and habitat assessment as list of candidate species has been created. It is noted that microbat species have habitat requirements that cannot be predicted by PCTs, and therefore cannot be predicted by the assessment tool. Particularly those species that can utilise human made structures or non-native vegetation. A conservative list of likely species is provided in Table 7.

This list is based on the species Likelihood of Occurrence (Appendix B), which was informed by database searches, previous studies, and specific habitat features present within the subject land.

The list of final candidate species is then used to determine whether the species requires further assessment in the BAM-C and whether targeted surveys are required.

A list of targeted species assessed in accordance with Prescribed Impacts are provided in Table 13.

Furthermore, it is noted that a candidate species is typically not considered present by the BDAR where:

- The habitat is substantially degraded.
- An expert report states that the species is unlikely to be present.
- The species is a vagrant and is unlikely to frequently use habitat in the project footprint.
- Records of the species are at least 20 years old or have doubtful authenticity.

One candidate species, *Myotis macropus* (Southern Myotis) was considered in this assessment as a species credit species. Targeted surveys were conducted for Southern Myotis to determine if the subject land contained suitable roosting and breeding habitat (Table 7). The remaining species listed in Table 8 below were included in targeted surveys in accordance with the assessment of Prescribed Impacts and not for species credits. Please refer to Section 4.9 regarding targeted survey. The Bar-tailed Godwit and Curlew Sandpiper do not require targeted surveys. The mapped Important Habitat assumes presence and therefore requires the preparation of a species polygon.

Table 7: Final candidate species credit species list

Scientific name	Common name	Species type	Habitat constraint	Sensitivity to gain class	BC Act status	EPBC Act status
Myotis macropus	Southern Myotis	Species credit (breeding)	- Hollow bearing trees - Within 200 m of riparian zone/other	High	Vulnerable	Not listed

Scientific name	Common name	Species type	Habitat constraint	Sensitivity to gain class	BC Act status	EPBC Act status
			- Bridges, caves or artificial structures within 200m of riparian zone/waterbodies - this includes rivers, creeks, billabongs, lagoons, dams and other waterbodies on or within 200m of the site			

Table 8: Candidate species assessed for prescribed impacts

Scientific name	Common name	Species type	Habitat constraint	Sensitivity to gain class	BC Act status	EPBC Act status
Falsistrellus tasmaniensis	Eastern False Pipistrelle	Ecosystem credit	-	High	Vulnerable	Not Listed
Micronomus norfolkensis	Eastern Coastal Free-tailed Bat	Ecosystem credit	-	High	Vulnerable	Not Listed
Miniopterus australis	Little Bent-winged Bat (Breeding)	Dual species Only Ecosystem credit (foraging) considered in this assessment	Cave, tunnel, mine, culvert or other structure known or suspected to be used for breeding including species records in BioNet with microhabitat code 'IC – in cave' observation type code 'E nest-roost' with numbers of individuals >500 or from the scientific literature	Very High	Vulnerable	Not Listed
Miniopterus orianae oceanensis	Large Bent-winged Bat (Breeding)	Dual species Only Ecosystem credit (foraging) considered in this assessment	Cave, tunnel, mine, culvert or other structure known or suspected to be used for breeding	Very High	Vulnerable	Not Listed
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	Ecosystem credit	-	High	Vulnerable	Not listed
Scoteanax rueppellii	Greater Broad-nosed Bat	Ecosystem credit	-	High	Vulnerable	Not listed

4.9. Targeted microbat surveys

Targeted microbat surveys were undertaken to assess whether threatened microbat species (listed as species credit species) are roosting within the buildings and along the seawall. Ecosystem credit species were also included in targeted surveys for prescribed impacts.

Targeted surveys were conducted in accordance with the *'Species credit' threatened bats and their habitats - NSW survey guide for the Biodiversity Assessment Method* (OEH, 2018). Southern Myotis survey in accordance with the BAM can be conducted from October to March. Targeted surveys for ecosystem species (assessed as part of prescribed impacts) do not have a specified survey period in the TBDC. Ultrasonic detectors were used in accordance with the *'Species credit' threatened bats and their habitat NSW survey guide for the BAM*.

Four (4) Wildlife Acoustics devices (three Anabat swifts and one Song Meter Mini) (Figure 29) were deployed around the buildings on 4 October 2023 and collected 9 October 2023. Acoustic devices were positioned at regular intervals approximately 10 m away from the buildings to record emergence of microbats. An AudioMoth was positioned around the sandstone seawall (above high tide) on 4 – 9 October 2023. The AudioMoth was positioned to record emergent microbats.

According to the threatened bat survey guideline the minimum number of survey nights is 16 nights. This survey conducted 20 survey nights. The location of detectors placed around the subject land is provided in Figure 17 and survey weather conditions are provided in Table 9. The data from the Acoustic devices were reviewed by ELA's bat expert Dr Kristen Thompson.

Table 9: Survey weather conditions (BOM Station 066214) recorded over four nights from 4 – 9 October 2023

Date	Rainfall (mm)	Min temperature (°C)	Max temperature (°C)
4 October 2023	0	20	27.9
5 October 2023	8.2	12.9	23.1
6 October 2023	0.2	11.6	22.9
7 October 2023	1.8	11.5	20.1
8 October 2023	0	12.6	22.9

Figure 29: Examples of Microbat ultrasonic devices (Anabat Swift) from the targeted field surveys

Figure 30: Location of ultrasonic bat detectors within the subject area

4.10. Targeted survey results

4.10.1.1. Habitat assessment results

Most of the areas within the subject land were considered unsuitable for microbats due to the high level of noise from ANZAC bridge and lights. No evidence of bats (i.e. guano) were observed on buildings or along seawall during initial surveys in 7 June 2023. A dead black Rat (*Rattus rattus*) present in the subject land on 9 October 2023 indicates rat activity within the subject land and may reduce some locations as suitable roosting habitat for microbats due to predation by rats. The gaps in the seawall were also identified as suitable for rat habitat. Two culverts recorded within the subject land were visibly inspected during surveys on 7 June 2023 and again 4 October 2023. Both times, spider webs were located across the entrance to the culverts indicating no microbat activity.

4.10.1.2. Acoustic data results

An analysis of the acoustic data identified a very low microbat activity within the subject land (Appendix E). Several calls were clumped into a group of species due to difficulties distinguishing these species from calls. The acoustic analysis of bat calls identified eight potential microbat species including some ambiguous calls (Table 11). Of which, three potential species are listed as vulnerable under the BC Act. No species listed under the EPBC Act were recorded.

The acoustic analysis was able to identify one potential call from *Myotis macropus* (Southern Myotis) (Table 10). Southern Myotis is listed as a vulnerable species under the BC Act. It is a specialist feeder, according to to the Threatened Biodiversity Database Collection (TBDC) this species requires waterbodies greater than 3 m wide to forage. It roosts in tree hollows, human-made structures including buildings, wharves and culverts. The surveys were conducted in October within the survey season or peak activity to determine the presence of this species, according to the TBDC and threatened bat survey guidelines.

As only one potential call from Southern Myotis was recorded and only identified on one single night during the survey, the survey indicates this species does not roost within the subject lands. It indicates that this species may on rare occasions utilise the subject lands to traverse habitats during foraging. Therefore, a species polygon and species credits are not required for this species.

The Acoustic analysis also recorded one definite *Miniopterus australis* (Little Bent-winged Bat) call and eight potential *M. orianae oceanensis* (Large Bent-winged Bat)/non-threatened species calls within the subject land. Both Bent-winged Bat species are a dual species and only considered species credit when breeding habitat is present. No breeding habitat in the form of maternity caves are present in the subject land or within 200 m of the subject land, therefore, no further assessment for this species is required in accordance with the BAM. The subject land may provide occasional foraging habitat or connectivity flyway for these species.

The Audiomoth was positioned above one of the cavities in the seawall. No microbat data was extracted from the Audiomoth. As such no microbat activity was identified from the seawall.

A Microbat Management Plan (MMP) will be prepared to minimise impacts on microbats during construction. The MMP will ensure no microbats are utilizing the subject land prior to demolition works. The MMP will include mitigation measures and compensatory measures for loss of marginal habitat.

Table 10: Occurrence of microbat species and call frequency in the subject land (bold indicates threatened species)

Scientific name	Common name	Identified from # of detectors	Reliability	Total # of calls
Vespadelus regulus / *V. darlingtonia* / ***Miniopterus orianae oceanensis***	Southern Forest Bat / Large Forest Bat / **Large Bent-winged Bat**	Identified from 3 of the 4 detectors	Present	8
Myotis macropus / *Nyctophilus* spp.	**Southern Myotis** / Large eared-Bat	Identified from 1 of the 4 detectors	Present	1
Ozimops ridei / Chalinolobus gouldii	Free-tailed Bat / Gould's Wattled Bat	Identified from 1 of the 4 detectors	Present	1
Vespadelus regulus	Southern Forest Bat	Identified from 3 of the 4 detectors	Present	5
Miniopterus australis	**Little Bent-winged Bat**	Identified from 1 of the 4 detectors	Present	1

Table 11: List of potential microbat species recorded within subject land and their habitat requirements

Scientific name	Common name	Conservation status	Roosting habitat requirements	Foraging habitat requirements
Chalinolobus gouldii	Gould's Wattled Bat	N/A	Roosts in tree hollows or in buildings if trees are limited.	Can travel 10 km each night searching for food.
Miniopterus australis	Little Bent-winged Bat	Vulnerable under BC Act	Bent-winged Bat roosts in caves, mines and buildings. Females travel to maternity caves	Forages in vegetated areas.
Miniopterus orianae oceanensis	Large Bent-winged Bat	Vulnerable under BC Act	Bent-winged Bat roosts in caves, mines and buildings. Females travel to maternity caves	Forages in vegetated areas.
Myotis macropus	Southern Myotis	Vulnerable under BC Act	Roosts near water in tree hollows or human-made structures	Forages over water
Nyctophilus spp.	Long-eared Bat	N/A	Roosts in tree hollows	Forages in vegetated areas
Ozimops ridei	Free-tailed bat	N/A	Roosts in tree hollows or buildings	Forages in vegetated areas
Vespadelus darlingtonia	Large Forest Bat	N/A	Vespadelus species roost in tree hollows.	Forages in vegetated areas
Vespadelus regulus	Southern Forest Bat	N/A	Tree roosting species if limited, can roost in houses. Females form maternity colonies in spring.	Sensitive to urban fragmented environments. Prefers vegetated areas.

4.11. Species credit species included in this assessment

Following the literature review and field survey, the species credit species that are included in this assessment are outlined in Table 12.

Table 12: Species credit species included in the assessment

Species	Common name	Species presence	Impact (ha)	Biodiversity risk weighing	Species polygon description
Migratory Shorebird					
Limosa lapponica baueri	Bar-tailed Godwit	Yes – mapped areas of Important Habitat as per BOAMS	0.184	2.00	Areas within the Migratory Shorebirds Important Habitat are included in the species polygon. See Figure 31. No species credits were generated, instead impacts were assessed through Prescribed Impact.
Calidris ferruginea	Curlew Sandpiper	Yes – mapped areas of Important Habitat as per BOAMS	0.184	3.00	Areas within the Migratory Shorebirds Important Habitat are included in the species polygon. See Figure 31. No species credits were generated, instead impacts were assessed through Prescribed Impact.

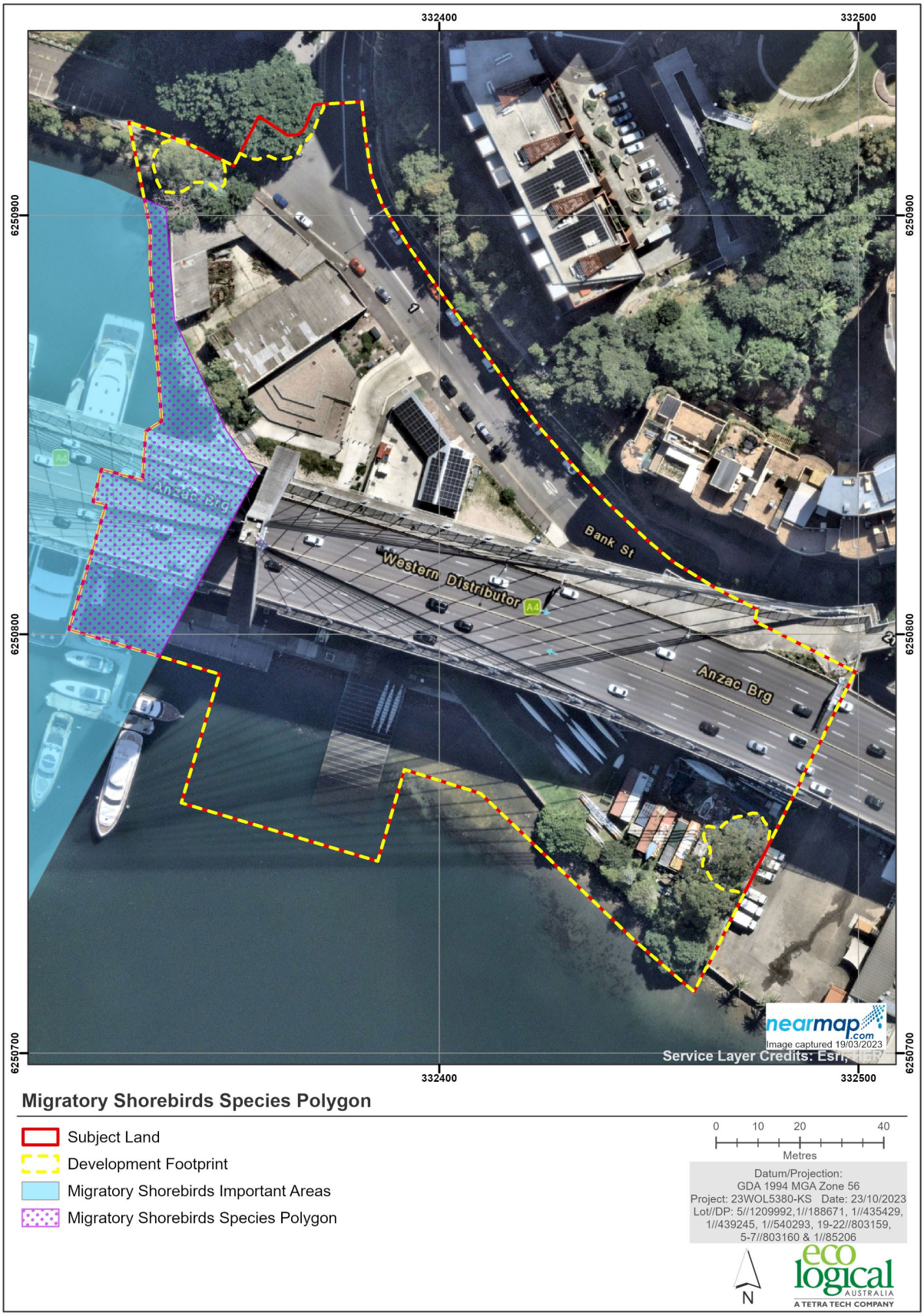

Figure 31: Migratory shorebirds species polygon

5. Prescribed biodiversity impacts

5.1. Identification and assessment of prescribed biodiversity impact entities

5.1.1. Karst, caves, crevices, cliffs, rocks and other geological features of significance

There are no karst, caves, crevices, cliffs, rocks, or other geological features of significance within the subject land.

5.1.2. Human-made structures and non-native vegetation

The subject land contains existing human-made structures which are located within the subject land. Human-made structures include, shipping containers, derelict buildings, bridge pylons, sandstone seawalls, existing marina demountable buildings and hardstand. Human-made structures within the subject land were assessed during field survey. Derelict buildings in the north and sandstone seawalls lining the west were identified as potential habitat for roosting or breeding microchiropteran bats (Figure 28). However, targeted surveys for microbat did not indicate that microbats utilise the human-made structures for breeding/roosting.

The subject site also contains a very small amount of planted exotic landscape species within gardens.

Table 13: Assessment of prescribed impacts to human-made structures and non-native vegetation

Criteria in accordance with BAM 2020 Section 6.1.2	Response
2. If human-made structures (e.g. bridges, culverts, abandoned buildings) and non-native vegetation (e.g. camphor laurel trees) provides habitat for threatened species, the assessor must:	
a. provide a description of the type of human-made structure or non-native vegetation habitat	The subject land contains four derelict buildings in the north which contain cracks and entry points into the roof cavities which may provide suitable habitat for threatened microbat species. Sandstone blocks along the foreshores were found to contain small cracks and crevices located above the high tide mark which may also provide marginal roosting habitat for Southern Myotis. Targeted surveys for microbats recorded a very low number of calls which indicates that no microbats are currently roosting within the subject land.
b. prepare a list of threatened species that use these features as habitat	The following species (microbats) are known to utilise human-made structures and have potential to occur within the existing buildings within the subject land on occasion: • *Falsistrellus tasmaniensis* (Eastern False Pipistrelle) • *Micronomus norfolkensis* (Eastern Coastal Free-tailed Bat) • *Miniopterus australis* (Little Bent-wing Bat) • *Miniopterus orianae oceanensis* (Large Bent-wing Bat) • *Myotis macropus* (Southern Myotis) • *Saccolaimus flaviventris* (Yellow-bellied Sheathtail-bat) • *Scoteanax rueppellii* (Greater Broad-nosed Bat). Diurnal field and acoustic targeted surveys did not record evidence of microbat use in derelict buildings or crevices in the seawalls (i.e. in the form of guano). Targeted surveys did not record evidence of

Criteria in accordance with BAM 2020 Section 6.1.2	Response
	roosting or breeding habitat by threatened microbat species within the subject land.
c. describe how each threatened species could, or does, use the human-made structure or non-non-native vegetation as habitat (based on published literature and other reliable sources).	Derelict buildings may provide roosting habitat for the above threatened microbat species. Three species credit species; Southern Myotis, Large Bent-winged Bat and Little Bent-winged Bat were potentially recorded in very low frequencies within the subject land during targeted surveys. Southern Myotis and Eastern Coastal Free-tailed Bat (ecosystem species) are known to utilise buildings for breeding habitat as well. However, the low number of calls recorded during surveys indicates that individuals do not currently occupy the subject land. Large Bent-winged and Little Bent-winged Bat were potentially recorded during targeted surveys. The females of these two species utilise known maternity colonies in specific caves (Mills 2021, Augusteyn et al 2021) and do not utilise human-made structure as part of breeding habitat. According to literature documented in TBDC the preferred roosting habitat of the following species includes: • Southern Myotis - this species will use tree hollows, bridges, culverts, caves, mines, tunnels, and wharves as roosting habitat. There are several known Southern Myotis maternity roosts within Sydney Harbour (Gonsalves and Law 2017) and this species is also known from the Hawkesbury River region, the Cumberland Plain area surrounding the Nepean and Georges River systems and within Royal National Park on the Hacking River. • Eastern False Pipistrelles, Eastern Coastal Free-tailed Bats, Yellow-bellied Sheathtail-bat and Greater Broad-nosed Bats are known to roost in buildings and tree hollows. Eastern Coastal Free-tailed Bats are also known to breed in old buildings. The targeted surveys indicated that no microbats are currently utilising the subject land for breeding/roosting habitat or foraging habitat due to the low number of calls. As mentioned above, the non-native vegetation may provide supplementary foraging habitat for Grey-headed Flying-fox. Some of this vegetation will be removed for this SSD.

5.1.3. Habitat connectivity

The subject land has limited connectivity due to an absence of indigenous plant community types and urbanised landscape surrounding the subject site. According to the Biodiversity Corridor under the Greater Sydney Local Land Services the subject land is located on the Biodiversity Corridor Mapping (Figure 10). Terrestrial connectivity is limited to planted native and exotic vegetation which is present in limited amount in the broader landscape of the subject land. The Grey-headed Flying-fox may utilise the vegetation within the subject lands as part of wider foraging resources. The Large and Little Bent-winged Bats may require habitat connectivity to move between breeding maternity caves and urban landscape. The ecosystem credit species may utilise the planted vegetation as part of foraging habitat.

Connectivity of the waterbody is important for the passage of fish and movement of Southern Myotis to feeding and roosting habitat and mapped areas of migratory shorebirds habitat.

Table 14: Assessment of prescribed impacts to habitat connectivity

Criteria in accordance with BAM 2020 Section 6.1.3	Response
2. Where corridors or other areas of connectivity link habitat for threatened entities, the assessor must:	
a. prepare a list of threatened entities that are likely to use or are a part of the connectivity or corridor	Highly mobile Grey-headed Flying-fox may forage on the planted native trees. Southern Myotis and Bar-tailed Godwit and Curlew Sandpiper may forage within Blackwattle Bay which includes the water within the subject land. Microbat species may utilise the subject land for foraging and connectivity to other habitats. • Eastern False Pipistrelle • Eastern Coastal Free-tailed Bat • Little Bent-wing Bat • Large Bent-wing Bat • Southern Myotis • Yellow-bellied Sheathtail-bat • Greater Broad-nosed Bat.
b. describe the importance of the connectivity to threatened entities, particularly for maintaining movement that is crucial to the species' life cycle	Connectivity between the vegetation within the subject land and adjoining land is very minimal. Stepping-stone habitat may be present for highly mobile species such as Grey-headed Flying-fox. Blackwattle Bay also provides connectivity features for foraging Southern Myotis. The vegetation may provide important connectivity (in the form of canopy cover) for movement of Little and Large Bent-wing Bats as they move between maternity caves and non-breeding habitat and other microbats moving between foraging habitats. The waterbodies may provide connectivity for migratory birds such as the Bar-tailed Godwit and Curlew Sandpiper. Potential breeding habitat was noted for Southern Myotis and Eastern Coastal Free-tailed Bat (ecosystem), although none was recorded during targeted surveys.

5.1.4. Water bodies, water quality and hydrological processes

As identified in Section 3, the subject land contains coastal waterbody (Blackwattle Bay which is part of Sydney Harbour). See Bank Street Park – Aquatic Ecology Assessment (ELA 2023) for information on potential impacts to aquatic ecology.

The proposed project will not result in significant impacts to the water bodies, water quality and hydrological processes within the subject land. An assessment of prescribed impacts to water bodies, water quality and hydrological processes is presented in Table 15.

Table 15: Assessment of prescribed impacts to water bodies, water quality and hydrological processes

Criteria in accordance with BAM 2020 Section 6.1.4	Response
1. Where water bodies or any hydrological processes that sustain threatened entities occur on the subject land, the assessor must:	
a. prepare a list of threatened entities that may use or depend on water bodies or hydrological processes for all or part of their life cycle, or b. prepare a list of threatened entities that will be, or are likely to be impacted by changes to existing water bodies or hydrological processes or the construction of a new water body	Species with waterbodies as habitat constraints, including: • Southern Myotis. • Bar-tailed Godwit • Curlew Sandpiper. The project also has potential to impact upon the *Hippocampus whitei* (Whites Seahorse), however, this has been assessed in the Aquatic report and has concluded it will not be a significant impact to this species.
c. describe the habitat provided for each threatened entity by the water body or hydrological process, including consideration of water quality, volume, flow paths and seasonal patterns	The subject land currently contains has existing buildings and hardstand which will be redeveloped and extended into the waterbody in the west. The proposed project may result in changes to surface water flow from the development due to the construction of the new stormwater outlets. See Bank Street Park – Aquatic Ecology Assessment (ELA 2023).

5.1.5. Wind farm developments

The proposed development is not related to a wind farm.

5.1.6. Vehicle strikes

It is considered unlikely for fauna other than highly mobile species to be present within the subject land. There may be increased vehicle use during construction, however if fauna is generally not present, there will generally be no impacts. The operation of the project does not involve a change in vehicle traffic. Therefore, the proposed development would be unlikely to result in vehicle strike during construction or during operation.

6. Avoiding and Minimising impacts to Biodiversity Values

6.1. Locating a project to avoid and minimise direct and indirect impacts on native vegetation, threatened species, threatened ecological communities and their habitats

The project currently contains 0.17 ha of planted native vegetation and 1.73 ha of built form. The project will remove 0.14 ha of planted native vegetation. About 0.04 ha of planted native vegetation will be retained as two separate patches, one in the north and one in the south of the subject land.

Targeted surveys were conducted for species credit and ecosystem credit microbats and have been included in this assessment. The results indicates that no microbats currently utilise the subject land for roosting/breeding or foraging based on the lack of calls. This assessment has included impacts to mapped Migratory Shorebirds Important Habitat. This BDAR assesses potential indirect impacts and prescribed impacts.

Table 16: Locating a project to avoid and minimise impacts on vegetation and habitat

Approach	How addressed and justification
Locating and designing the project in areas where there are no biodiversity values	The project does not involve removal of the PCTs or high value habitat features. The subject land is approximately 1.92 ha (including the water), of which 1.73 ha is located on previously developed areas which currently represents the existing buildings and cleared lands or water. The placement of the subject land has primarily occurred on areas of existing development and urban infrastructure, containing low biodiversity values as the subject land lacks presence of PCTs, it contains no threatened ecological communities and does not contain habitat for threatened flora species. The buildings may provide habitat for threatened microbat including roosting, breeding and foraging habitat. The existing buildings were assessed as potential habitat for threatened microbat species as a precautionary approach. Targeted surveys confirmed that no microbats currently utilise the buildings as roosting/breeding habitat or foraging habitat. A small portion of the subject land is mapped on the Key Fish Habitat and impacts have been assessed in the Marine Aquatic Report (ELA 2023).
Locating and designing the project in areas where the native vegetation or threatened species habitat is in the poorest condition	There are no mapped PCTs identified within the subject land. The planted native vegetation in the form of *Casuarina glauca* and other shrubs (0.14 ha) will be removed under the project. Some native vegetation (0.04 ha) will be retained in the north and south of the subject land. Additional planted native species indigenous to the area will be planted as part of landscaping for this SSD application. The subject land does not contain hollow-bearing trees and lacks other important habitat features. The subject land contains open water and existing buildings. Targeted surveys have been conducted to determine the presence of threatened microbats utilising the buildings. The surveys indicate the subject land does not provide breeding or roosting habitat for this species. Some modification of foraging habitat for Southern Myotis may occur due to changes over the water such as the new wharf and boat ramp. The targeted surveys also recorded a very small number of possible Little and Large Bent-winged Bat calls. The low number of calls indicate individuals

Approach	How addressed and justification
	moving through the subject land and does not indicate individuals are foraging or roosting within the subject land.
Locating the proposal (including ancillary facilities) in areas that avoid habitat for species with a high biodiversity risk weighting or land mapped on the important habitat map, or native vegetation that is a TEC, a highly cleared PCT or an entity at risk of a serious and irreversible impact (SAII)	The project is predominantly located on existing built form which contains buildings, cleared lands and a small amount of planted native vegetation. There are no PCTs or TEC identified within the subject land. The subject land overlays Migratory Shorebirds Important Habitats for Bar-tailed Godwit and Curlew Sandpiper. The areas which overlap mapped Important Habitat contains disturbed muddy substrate and seawalls. The subject land does not represent important habitat for either species. However, the project directly impacts upon mapped important habitat for these species. Curlew Sandpiper is also listed as a SAII entity.
Locating the proposal in areas outside of the buffer area around breeding habitat features such as nest trees or caves	The proposal does not contain nests, trees (or hollows) or caves. The project may impact upon potential habitat for Southern Myotis within the existing buildings. Targeted surveys were conducted for microbat species and determined that no breeding habitat occur within the subject land.
Locating the project such that connectivity enabling movement of species and genetic material between areas of adjacent or nearby habitat is maintained	There is limited vegetative connectivity between the subject lands and adjacent lands. The project will result in the removal of a small amount of planted native vegetation. Supplementary plantings have been proposed as part of the final design of the project. The western portion of the subject lands includes waterbody (Blackwattle Bay) which is an enclosed marine environment. The project will involve works within the waterbody including a new wharf and boat ramp. The works will permit the movement of fish and access by microbat species which may forage within the subject land.

6.2. Designing the project to avoid or minimise direct and indirect impacts on native vegetation, threatened species, threatened ecological communities and their habitat

The development has been designed in a way which avoids and minimises impacts as outlined in Table 17.

Table 17: Designing a project to avoid and minimise impacts on vegetation and habitat

Approach	How addressed and justification
Reducing the proposal's clearing footprint by minimising the number and type of facilities	The subject land currently contains existing buildings within a highly developed environment. The subject land contains only a small amount of planted native vegetation (0.17 ha) of which 0.14 ha will be removed. The project has undergone several project design options to retain the existing buildings. Due to the structural degradation of the buildings, it was determined that only one of the buildings can remain and will be refurbished. The remaining three buildings will be demolished. A reduction in the proposed footprint will not result in a gain of biodiversity values.
Locating ancillary facilities in areas that have no biodiversity values	The project has been located in areas where there are low biodiversity values. The subject land contains existing buildings and 0.17 ha of planted native vegetation. A small portion (0.04 ha) of the planted native vegetation will be retained and contain some biodiversity values for foraging habitat for Grey-headed Flying-fox. Additional native species will be incorporated

Approach	How addressed and justification
	into the landscape design and will contribute to the long-term foraging habitat for the Grey-headed Flying-fox. The project will impact upon buildings which may provide breeding habitat for Southern Myotis. However, targeted surveys only recorded one potential call from Southern Myotis. As such the buildings are unlikely to have habitat values for this species and other ecosystem credit microbat species. The project contains mapped Key Fish Habitat and Migratory Shorebird Important Habitat. No other habitat features or biodiversity values were identified within the subject land.
Locating ancillary facilities in areas where the native vegetation or threatened species habitat is in the poorest condition (i.e. areas with the lowest vegetation integrity scores)	No PCTs were identified within the subject lands or were identified within the assessment area. The project will result in the removal of threatened species habitat in the form of existing buildings. The project has been located in areas where there are no biodiversity values, however, some impacts to threatened species habitat will occur.
Locating ancillary facilities in areas that avoid habitat for species and vegetation that has a high threat status (e.g. an endangered ecological community (EEC) or critically endangered ecological community (CEEC) or is an entity at risk of a serious and irreversible impact (SAII)	No PCTs or TECs have been mapped within the subject land. A review of previous vegetation mapping from OEH (2016) identified 0.04 ha of Estuarine Mangrove Forest and 0.03 ha of Seagrass Meadows within assessment area (1,500 m buffer around the subject land). These communities are listed as TECs. However, these TECs are disconnected from the subject land. The updated SVTM (DPE 2022) did not record the presence of any PCTs or TECs. The project does not impact upon PCT or TECs. The project does impact upon a SAII entity, Curlew Sandpiper which has habitat mapped as part of a large-scale mapping of Migratory Shorebirds Important Habitat. The field surveys identified that the subject land does not provide suitable foraging or roosting habitat for this species. A small amount of macroalgae and disturbed foreshores will be impacted by the proposal and includes marginal foraging habitat for this species. Therefore, no species credits were generated for this species.
Actions and activities that provide for rehabilitation, ecological restoration and/or ongoing maintenance of retained areas of native vegetation, threatened species, threatened ecological communities and their habitat on the subject land.	The project does not include terrestrial rehabilitation or restoration works as part of its application. A landscape plan has been created which includes planting of native indigenous species including canopy, shrub and ground species which will provide habitat for local fauna. Aquatic restoration is covered by the Marine Ecology Report (ELA 2023).

6.3. Locating a proposal to avoid and minimise prescribed biodiversity impacts

The development has been located and designed in a way which avoids and minimises prescribed biodiversity impacts as outlined in Table 18.

Table 18: Locating a proposal to avoid and minimise prescribed biodiversity impacts

Approach	How addressed and justification
Locate surface works to avoid direct impacts on the habitat features	The project does not impact upon habitat features which are important to threatened entities. The subject land contains built form and does not contain PCTs.

Approach	How addressed and justification
	The project impacts upon potential roosting habitat for threatened microbat species (Southern Myotis). However, targeted surveys indicate that no microbat species currently utilise the subject land for foraging, roosting or breeding habitat. The project does not involve impacts to seagrass, mangroves or saltmarsh which are part of Key Fish Habitat. The subject land does not contain mudflats or sandflats or intertidal habitat which would provide habitat for Migratory Shorebirds such as the Bar-tailed Godwit and Curlew Sandpiper which has important habitat located within the subject land boundary.
Locating the envelope of sub-surface works, both in the horizontal and vertical plane, to avoid and minimise operations beneath the habitat features, e.g. locating long wall panels away from geological features of significance or water dependent plant communities and their supporting aquifers	The project will involve excavation into the water body and disturbance to macroalgae which is a marine aquatic algae and is not part of a water dependent plant community. There are no geological features of significance which will be impacted by the project. The project will impact upon mapped Migratory Shorebirds Important Habitats.
Locating the project to avoid severing or interfering with corridors connecting different areas of habitat and migratory flight paths to important habitat or preferred local movement pathways	The project is located on Migratory Shorebirds Important Habitats which has been mapped as part of Parramatta River and extends into Blackwattle Bay. Mapped habitat for two migratory birds (Bar-tailed Godwit and Curlew Sandpiper) have been identified within the subject land. The project will involve works on mapped Important Habitats. However, the project does not contain habitat which is important to these species. It will not interfere with the flight path for migratory birds. The project will not sever connectivity between habitats for Southern Myotis. It is likely that the Southern Myotis utilises the water within Blackwattle Bay as part of its broader foraging habitat. The project will not sever connectivity such as installing additional structures into the waterbody such that this species cannot access the waterbody under the subject land. The subject land is located within a noisy environment and bright lights which illuminate over the water body at night. The project will not increase the lighting or noise production such that the Southern Myotis would not long access under the subject land to forage. A potential call for Little and Large Bent-winged Bat was recorded during targeted surveys. The very low number of calls from these two species indicates that these individuals were moving through the subject land, possibly females migrating to maternity caves. The project will not sever important flyways for these two species. Instead, the revegetation of additional native vegetation for the landscaping will provide additional cover for migrating species such as microbats.
Locating the project to avoid direct impacts on water bodies	The project will involve direct impacts on water bodies. A separate Aquatic assessment has been prepared for this project.

6.4. Designing a project to avoid and minimise prescribed biodiversity impacts

Habitat connectivity, human-made structures, non-native vegetation and waterbodies were identified as prescribed impacts in Section 5. The development has been designed in a way which avoids and minimises prescribed biodiversity impacts as outlined in Table 19.

Table 19: Designing a project to avoid and minimise prescribed biodiversity impacts

Approach	How addressed and justification
Design of project elements to minimise interactions with threatened entities	The project has utilised existing disturbed areas which do not contain PCTs or breeding/roosting habitat for threatened entities. The project seeks approval for the construction of future works. These works will impact upon human-made structures, waterbodies and habitat connectivity which may be used by threatened entities. Threatened entities have been considered potential to occur in the subject lands. Southern Myotis and Eastern Coastal Free-tailed Bat (ecosystem credit species) may utilise the buildings as breeding habitat. The project will remove structures and modify the existing environment within the subject land. Despite potential habitat present for these species, no Eastern Coastal Free-tailed Bat was recorded during targeted surveys and only one potential call from Southern Myotis was recorded. The Little and Large Bent-winged Bat was also identified during surveys, but the low number of calls indicates these species were only moving through the landscape and were not foraging or roosting within the subject land. The subject land is also located on areas mapped as Migratory Shorebird Important Habitats. Two species have been mapped are Bar-tailed Godwit and Curlew Sandpiper. However, the project does not contain habitat which is important to these migratory species.
Maintain environmental processes that are critical to the formation and persistence of habitat features not associated with native vegetation	The subject land contains human-made structures which are considered habitat features not associated with native vegetation. The project will result in the removal of three buildings and alteration of the fourth building. The environmental processes that are critical to the formation of habitat features were not identified within the subject land. Environmental process which are likely to be critical to the formation and persistence of habitat features include creation of hollows in non-native vegetation or formation of crevices in human-made structures for microbat habitat. The project will not impact environmental processes that are critical to the formation of habitat features.
Maintain hydrological processes that sustain threatened entities	No hydrological process that sustains threatened entities were recorded within the subject land. However, the subject land is located within a portion of Blackwattle Bay which receives hydrological processes. One threatened microbat species (Southern Myotis) is dependent upon the presence of waterbodies for foraging habitat and roosting habitat adjacent to waterbodies. The design involves direct impacts upon the waterbody for the design. There is potential for short-term impacts to foraging habitat. Additionally, Migratory Shorebirds are dependent upon intertidal habitats which are sustained by hydrological processes. The design will result in changes to the foreshores and removal of macroalgae.
Controlling the quality of water released from the site, to avoid or minimise downstream impacts on threatened entities	The project includes an existing waterbody. The Stormwater Management Plan includes three new outlets for the proposal. This is discussed in more detail in the Marine Ecology report (ELA 2023). The design does not involve release of waterflow from the subject land.

7. Assessment of impacts

7.1. Direct impacts

The direct impacts of the development as assessed using the BAM is outlined below:

- No PCTs were identified within the subject land, and thus 0 ha of PCT will be cleared during the proposed works
- Impacts to threatened species are provided in Table 21
- Prescribed Biodiversity Impacts were discussed in Section 5
- Direct impacts including the final project footprint (construction and operation) are shown in Figure 32.

The subject land contains 0.17 ha of planted native vegetation which does not conform to a PCT or TEC.

No threatened flora species will be impacted by the development.

Impacts to potential threatened fauna habitat is provided below.

Table 20: Direct impact from the proposed works

Description	Total in Subject land (ha)	Area impacted (ha)	Retained (ha)
Planted native	0.17	0.14	0.03
Exotic	0.001	0.001	0
Macroalgae	0.02	0.02	0
Built and water	1.72	1.72	0
Total	**1.92**	**1.88**	0.03

Table 21: Direct impact on threatened species and their potential habitats

Species	Common name	Direct impact (ha)	BC Act listing	EPBC Act listing
Limosa lapponica baueri	Bar-tailed Godwit	0.184	Not listed	Vulnerable
Calidris ferruginea	Curlew Sandpiper	0.184	Endangered	Critically Endangered

7.1.1. Change in vegetation integrity

No PCTs were identified within the subject land, and thus a vegetation integrity assessment has not been conducted.

7.2. Indirect impacts

The indirect impacts of the development are outlined in Table 22 and displayed on Figure 33 . A 10 m buffer around the subject land has been added for indirect impacts.

Indirect impacts include, but are not limited to:

- Increase ambient light spill on adjacent waters which may result in avoidance by nocturnal species such as fish and microbats or roosting birds (non-threatened)
- reduced water quality viability of adjacent habitats due to noise, dust or pollutants
- transport of weeds and pathogens which may float on the water to new habitats
- rubbish dumping into the water body and impacts to marine species
- increase in pest or feral species.

The residual indirect impacts from the project are absent. Mitigation measures designed to decrease the potential indirect impacts are outlined in Section 7.4.

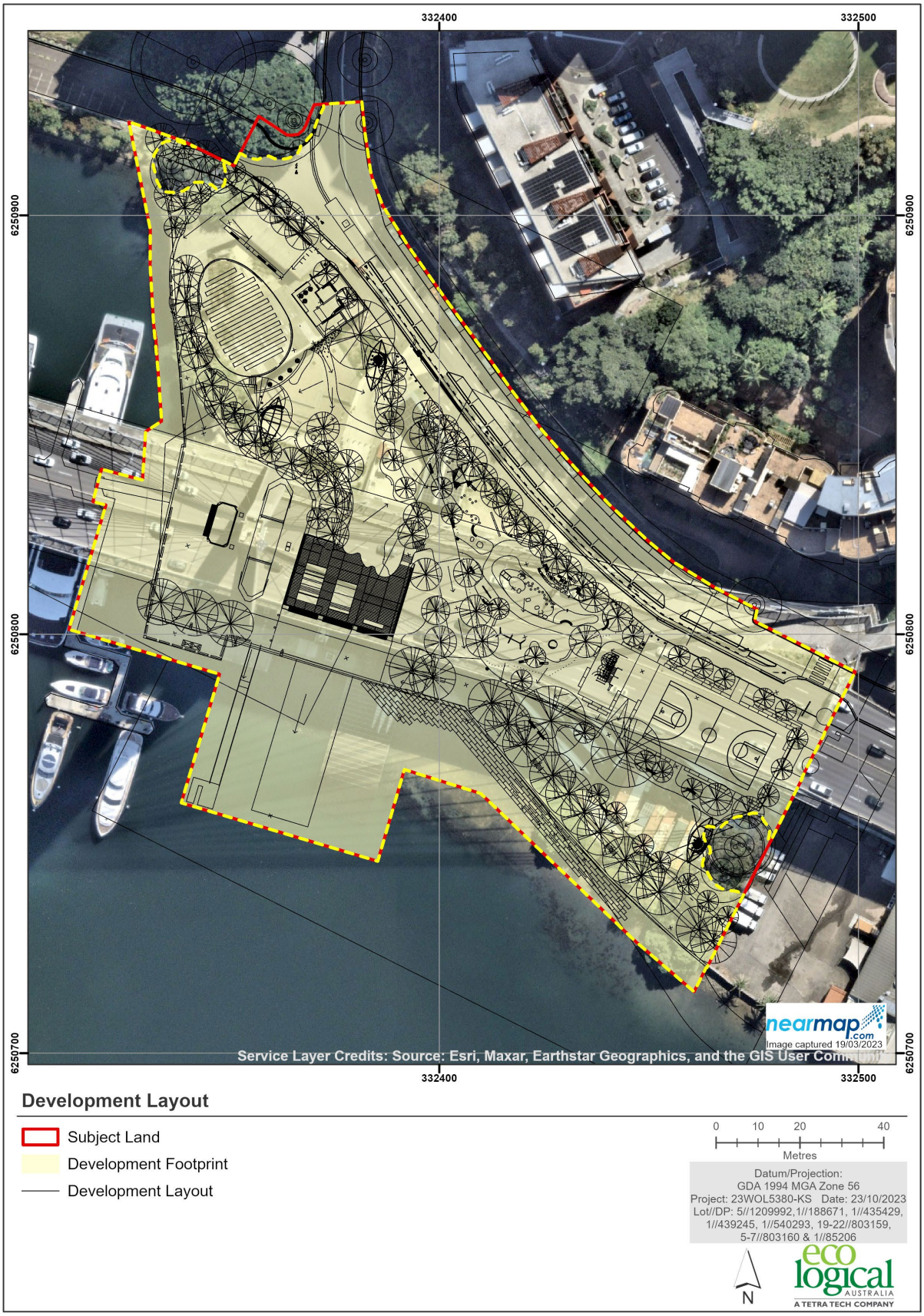

Figure 32: Development footprint

Figure 33: Indirect impacts around the development footprint

Table 22: Indirect Impacts

Indirect impact	Description (nature, extent and frequency)	Biodiversity value affected	Duration/Timing	Consequence
Increased risk of starvation or exposure due to additional light spill	Permanent loss of shade/shelter due to increase in light spill from future infrastructure. Permanent loss of dark foraging habitat for threatened microbats or non-threatened marine fish.	Native fauna	Short and long term impacts, during life of project	Permanent loss of shade or shelter for some fauna species, however, the subject land is currently exposed to light spill and the project is unlikely to increase the risk of light spill.
Sedimentation and nutrient run-off	Increase in construction materials which may be washed into the adjacent waterbody during rainfall events.	Aquatic fauna	Short and long term impacts, during life of project	Changes to water quality and therefore degradation of habitat quality for marine species.
Reduced viability of adjacent water habitat due to noise, dust or light spill	Noise and dust created from machinery during daytime construction. Night work is not expected as part of the construction works therefore, no light spill associated with night works. However, it is expected that outdoor night lighting will be used as part of the operational phase.	Native fauna, native vegetation	Short term impacts (construction phase) Ongoing impacts (life of project)	Noise and dust deter native fauna from the subject land in the short term. Dust may inhibit plant growth in the short term. Night lighting may influence fauna behaviour in the long-term, e.g. attraction of invertebrates to lighting, therefore species such as microbats may be increasingly attracted to the area. Night lighting may also disrupt fauna movement and activity, including foraging.
Transport of weeds and pathogens from the site to adjacent waterbody	Weeds and pathogens introduced into subject land, resulting from transport of topsoil or machinery.	Adjacent waterbody	Construction phase. May cause long-term impacts.	Potential for weed spread into adjacent waterbody and affect quality of vegetation for native terrestrial and aquatic flora and fauna. Potential for pathogens to be introduced into the subject land through use of machinery.

Indirect impact	Description (nature, extent and frequency)	Biodiversity value affected	Duration/Timing	Consequence
Rubbish dumping	Within and adjacent to the subject land during construction and operational phases.	Native vegetation, threatened ecological community	Short-term and long-term impacts	Rubbish dumping may impact on quality and health of fauna or flora species and habitat within adjacent waterbody. Dumped rubbish may have downwind effects where it is loose and makes its way into sensitive ecosystems or suffocates fauna.
Increase in predators	Increased predation on native fauna from rats and foxes. Resulting from commercial development and opportunistic increase in predators.	Native fauna	Long term impacts	Decreased native fauna diversity and population sizes.
Increase in pest animal populations	Resulting from urbanised development and opportunistic increase in pest/invasive species (including opportunistic native species such as Silver Gull and White Ibis) that thrive in urban spaces. Increased native fauna competition in surrounding habitat. Likely limited effects considering limited existing habitat in surrounds.	Native fauna	Long term impacts	Decreased native fauna diversity and population sizes.
Disturbance to specialist breeding and foraging habitat, e.g., beach nesting for shorebirds	Disturbance/removal of foraging habitat for highly mobile species (such as Grey-headed Flying-fox). Ongoing light and/or noise impacts to native fauna associated with the operational phase. Loss of marginal habitat for Southern Myotis.	Native fauna	Short-term and long-term impacts. Life of project.	Reduced numbers of species in vicinity. Deter or alter breeding and foraging regimes for fauna in proximity to development.

7.3. Prescribed biodiversity impacts

Prescribed biodiversity impacts within the subject land are outlined in Table 8.

Table 8: Direct impacts on prescribed biodiversity impacts

Prescribed biodiversity impact	Description (Nature, extent and frequency)	Consequences	Justification
Karst, caves, crevices, cliffs, rocks and other geological features of significance	There are no karsts, caves, crevices, cliffs, rocks or other geological features in the development footprint	Since there are none of these features, there are no consequences.	Not required for this proposal since there are not geological features.
Human made structures or non-native vegetation	There are human made structures in the subject land. This report has assumed presence of microbats until targeted surveys can be conducted. There is potential for microbats to utilise the existing human-made structures and non-native vegetation.	Potential loss of foraging and breeding habitat for Southern Myotis and Eastern Coastal Free-tailed Bat and foraging and roosting habitat for other threatened ecosystem microbats.	A Microbat Management Plan will be prepared and will include mitigation measures prior to construction.
Habitat connectivity	The subject land contains planted native vegetation. Planted native vegetation may assist in facilitating the movement of threatened microbats, megabats and other species through the landscape. However, the subject land is located over a waterbody which contains marine habitat connectivity features for species which are dependent upon the waterbody. Some avoidance by water dependent species may occur during night works or if the final design results in an increase in light spill into the waterbody.	The potential disruptions to habitat connectivity are limited, given that no native PCTs are located within the subject land. However, there is potential that the project may result in temporary disruptions for fauna species movement across the landscape. The subject land contains aquatic connectivity features including foraging for Southern Myotis and migratory shorebird.	Vegetation within the subject land will be retained. Landscaping plans will include native species and increase in connectivity across the subject land and to the adjacent urban area. Connectivity of the waterbody adjacent Blackwattle Bay will be retained.
Water bodies, water quality and hydrological processes	The subject land is located adjacent to water body (Blackwattle Bay).	Assessed in Bank Street Park – Aquatic Ecology Assessment 2023	Assessed in Bank Street Park – Aquatic Ecology Assessment 2023
Wind turbine strikes on protected animals	This is not required for this proposal, since the project is not a wind farm.	This is not required for this proposal, since the project is not a wind farm.	This is not required for this proposal, since the project is not a wind farm.

Prescribed biodiversity impact	Description (Nature, extent and frequency)	Consequences	Justification
Vehicle strikes	There would be no increase in vehicle traffic during operation of the project. During construction, there would be increased vehicle presence, however the impacts on biodiversity would be limited due to the absence of resident native fauna populations.	The consequences of the increased vehicle usage during construction would be minor since most fauna using the subject land are nocturnal.	Works would not be carried out during the day. During operation, vehicles would generally be absent from the pedestrian promenade.

7.4. Mitigating and managing direct and indirect impacts

Measures proposed to mitigate and manage impacts at the subject land before, during and after construction, including managing prescribed biodiversity impacts, are outlined in Table 23.

Table 23: Measures proposed to mitigate and manage impacts

Measure	Risk before mitigation	Risk after mitigation	Action	Outcome	Timing	Responsibility
Sediment barriers or sedimentation ponds to control the quality of water released from the site into the receiving environment	Moderate	Minor	Appropriate controls are to be utilised to manage exposed soil surfaces and stockpiles to prevent sediment discharge into retained lands. Soil and erosion measures such as sediment fencing, clean water diversion must be in place prior the commencement of the construction work.	Erosion and sedimentation will be controlled	For the duration of construction works	Project Manager
Prevent impacts of noise, dust and light spill on fauna species	Moderate	Minor	Construction lights or development lights should be positioned to prevent shine into waterbody. Proposed street lights are required under the SSDA and should use ecologically sensitive designs including use of shields and timers and positioned away from waterbodies. Noise should be limited to construction hours only.	Avoid impacts from artificial lighting on nocturnal or diurnal species. Reduction of noise outside of operation hours. Management of dust.	For the duration of the construction works and long-term	Project Manager

Measure	Risk before mitigation	Risk after mitigation	Action	Outcome	Timing	Responsibility
			Dust should be managed through appropriate dust control management plan.			
Preparation of a MMP	Moderate	Minor	A MMP will be prepared prior to construction and include additional surveys to ensure no microbats are utilising the buildings or seawall for roosting prior to construction.	Prevent impact to microbats	Prior to construction	Project Manager
Hygiene protocols to prevent the spread of weeds or pathogens between infected areas and uninfected areas	Minor	Negligible	Vehicles, machinery should be cleaned of soil prior to entry into the subject land as external soil may contain pathogens or disease.	Spread of weeds prevented	Post-construction	Project Manager
Timing works to avoid critical life cycle events such as breeding or nursing individuals	Moderate	Minor	Where possible within construction timelines, avoid clearing works in later winter/spring during breeding/ nesting season for animals.	Impacts to fauna during nesting/nursing season avoided	During clearing works	Project Manager
Making provision for the ecological restoration, rehabilitation and/or ongoing maintenance of retained native vegetation habitat on or adjacent to the development footprint	Minor	Negligible	Retaining microbat foraging areas in the north west and south east corners of the subject land.	Providing habitat for threatened species.	Prior to construction and following completion of construction activities.	Project Manager
Prevent the dumping of rubbish found on site	Minor	Negligible	Waste bins to be present on site. Covers to be used to prevent blown litter and the entry of pest animals or rain. Removal and appropriate disposal of general rubbish.	Dumping of rubbish during construction prevented	For the duration of the construction works	Project Manager

Measure	Risk before mitigation	Risk after mitigation	Action	Outcome	Timing	Responsibility
Fencing to protect significant environmental features such as riparian zones	High	Low	Temporary fencing and signage to be installed at the edge of the subject land to prevent entry into the adjacent waterbody.	No unintended disturbance to adjacent waterbody.	During construction and operational phase of the development.	Project Manager
Staff training and site briefing to communicate environmental features to be protected and measures to be implemented	Minor	Negligible	Construction staff to be briefed prior to work commencing to be made aware of any sensitive biodiversity values present and environmental procedures such as: • Site environmental procedures (vegetation management, sediment and erosion control, exclusion fencing and weeds, control of construction waste) • What to do in case of environmental emergency (chemical spills, fire, injured fauna) • Key contacts in case of environmental emergency.	All staff entering the subject land are fully aware of all the ecological values present within the Lot and environmental aspects relating to the development and know what to do in case of any environmental emergencies.	To occur for all staff entering/working at the subject land. Site briefings should be updated based on phase of the work and when environmental issues become apparent.	Project Manager

8. Impact summary

8.1. Serious and Irreversible Impacts (SAII)

The subject land has one candidate Serious and Irreversible Impacts (SAII) values as outlined in Table 24. Detailed consideration of whether impacts on candidate species that are serious and irreversible are included in Table 25 and Table 26.

Table 24: Serious and Irreversible Impact Summary

Species / Community	Common Name	Principle	Direct impact individuals / area (ha)	Threshold
Calidris ferruginea	Curlew Sandpiper (Migratory Shorebirds Important Habitat)	Principle 1	0.184	N/A

Table 25: Curlew Sandpiper - Determining which Principles apply to serious and irreversible candidate entities (Clause 6.7 of the BC Regulation)

Determining whether impacts are serious and irreversible	Assessment
Principle 1	
Does the proposal impact on a species, population or ecological community that is a candidate entity because it is in a rapid rate of decline?	Yes, the TBDC has identified that this species is a SAII entity due to Principle 1 - the reduction of the population by >80% in the last 10 years or three generations.
If yes, is the impact in excess of any threshold identified and therefore likely to be serious and irreversible?	There are no thresholds identified for this species. The proposed development will result in 0.184 ha of impact to areas mapped as Important Habitat.
Principle 2	
Does the proposal impact on a species that is a candidate entity because it has been identified as having a very small population size?	N/A
If yes, is the impact in excess of any threshold identified and therefore likely to be serious and irreversible?	
Principle 3	
Does the proposal impact on the habitat of a species or an area of an ecological community that is a candidate entity because it has a very limited geographic distribution?	N/A
If yes, is the impact in excess of any threshold identified and therefore likely to be serious and irreversible?	
Principle 4	
Does the proposal impact on a species, a component of species habitat or an ecological community that is a candidate entity because it is irreplaceable?	N/A
b. If yes, is the impact in excess of any threshold identified and therefore likely to be serious and irreversible?	

Table 26: Curlew Sandpiper - Evaluation of impacts on candidate species consistent with Section 9.1.2 of the BAM

Impact Assessment Provision	Assessment
1. the action and measures taken to avoid the direct and indirect impact on the species at risk of an SAII. Where these have been addressed elsewhere the assessor can refer to the relevant sections of the BDAR or BCAR.	A small portion of the subject land contains water mapped as Migratory Shorebirds Important Habitat for Curlew Sandpiper. The field survey identified this area was located along foreshores which includes tall sandstone boulders, existing marina and muddy substrate. The marine assessment (ELA 2023) identified a small area of macroalgae. This species may occasionally forage on algal mats. The project may result in some minor impact to foraging habitat for this species, as such the project does not avoid impact to this SAII entity.
2a. evidence of rapid decline (Principle 1, clause 6.7(2)(a) BC Regulation) presented by an estimate of the: i. decline in population of the species in NSW in the past 10 years or three generations (whichever is longer), or ii. decline in population of the species in NSW in the past 10 years or three generations (whichever is longer) as indicated by: an index of abundance appropriate to the species; decline in geographic distribution and/or habitat quality; exploitation; effect of introduced species, hybridisation, pathogens, pollutants, competitors or parasites	The Curlew Sandpiper is a non-breeding migrant to Australia. This species has declined. According to the Conservation Advice for the Curlew Sandpiper, the 2002-2008 estimates were 1,350,000, however, the Conservation Advice acknowledges these estimates are out of date. Approximately 13% of the global population fly the Eastern Asian-Australasian Flyway (i.e. approximately 180,000 individuals (Threatened Species Scientific Committee 2015). About 115,000 individuals were thought to visit Australia in 2008 but numbers across sites in Australia continue to decline (Threatened Species Scientific Committee 2015).
2b. evidence of small population size (Principle 2, clause 6.7(2)(b) BC Regulation) presented by: i. an estimate of the species' current population size in NSW, and ii. an estimate of the decline in the species' population size in NSW in three years or one generation (whichever is longer), and iii. where such data is available, an estimate of the number of mature individuals in each subpopulation, or the percentage of mature individuals in each subpopulation, or whether the species is likely to undergo extreme fluctuations	In Australia, the Curlew Sandpiper is considered one population. There are no population estimates but estimates from surveys during 1983 to 2007 indicate that the population decreased by 82% across 49 sites across Australia (Threatened Species Scientific Committee 2015).
2c. evidence of limited geographic range for the threatened species (Principle 3, clause 6.7(2)(c) BC Regulation) presented by: i. extent of occurrence ii. area of occupancy iii. number of threat-defined locations (geographically or ecologically distinct areas in which a single threatening event may rapidly affect all species occurrences), and iv. whether the species' population is likely to undergo extreme fluctuations	The Curlew Sandpiper is a migratory species which breeds in Siberia and migrates annually to mainland Australia in Summer. The population which arrives in Australia is considered one whole population. This species does not have a limited geographic range. The area of occupancy has significantly declined due to habitat loss and human disturbance and pollution (Threatened Species Scientific Committee 2015). There are no current estimates of congregations of Curlew Sandpiper in NSW. In some sites in Tasmania, the numbers have decreased by 100%. The number of Curlew Sandpiper has reduced by approximately 80% in Australia. This species does not undergo extreme fluctuations; so the declines are significant.

Impact Assessment Provision	Assessment
2d. evidence that the species is unlikely to respond to management (Principle 4, clause 6.7(2)(d) BC Regulation) because: i. known reproductive characteristics severely limit the ability to increase the existing population on, or occupy new habitat (e.g. species is clonal) on, a biodiversity stewardship site ii. the species is reliant on abiotic habitats which cannot be restored or replaced (e.g. karst systems) on a biodiversity stewardship site, or iii. life history traits and/or ecology is known but the ability to control key threatening processes at a biodiversity stewardship site is currently negligible (e.g. frogs severely impacted by chytrid fungus).	There are no management actions recorded in the TBDC. This species relies upon foraging resources and roosting habitat in Australia and breeding habitat in Siberia. Restoration of non-breeding and foraging habitats may benefit this species within Australia. The Conservation Advice for this species considered retaining habitat for this species and avoiding coastal development which has a negative impact upon this species. Pollution is also a threat to this species by reducing its availability to foraging resources (Threatened Species Scientific Committee 2015).
3. Where the TBDC indicated that data is 'unknown' or 'data deficient' for a TEC for a criterion listed in subsection 9.1.1(2), the assessor must record this in the BDAR or BCAR.	The TBDC has not identified any criterion as data deficient.
4a. the impact on the species' population (Principles 1 and 2) presented by: i. an estimate of the number of individuals (mature and immature) present in the subpopulation on the subject land (the site may intersect or encompass the subpopulation) and as a percentage of the total NSW population, and ii. an estimate of the number of individuals (mature and immature) to be impacted by the proposal and as a percentage of the total NSW population, or iii. if the species' unit of measure is area, provide data on the number of individuals on the site, and the estimated number that will be impacted, along with the area of habitat to be impacted by the proposal	There are no current estimates of congregations of Curlew Sandpiper in NSW. The literature of current population estimates acknowledges that the estimates are out of date. According to the Conservation Advice for the Curlew Sandpiper, the 2002-2008 estimates were 1,350,000, however, the Conservation Advice acknowledges these estimates are out of date. Approximately 13% of the global population fly the Eastern Asian-Australasian Flyway (i.e. approximately 180,000 individuals (Threatened Species Scientific Committee 2015). About 115,000 individuals were thought to visit Australia in 2008 but numbers across sites in Australia continue to decline (Threatened Species Scientific Committee 2015).
4b. impact on geographic range (Principles 1 and 3) presented by: i. the area of the species' geographic range to be impacted by the proposal in hectares, and a percentage of the total AOO, or EOO within NSW ii. the impact on the subpopulation as either: all individuals will be impacted (subpopulation eliminated); OR impact will affect some individuals and habitat; OR impact will affect some habitat, but no individuals of the species will be directly impacted iii. to determine if the persisting subpopulation that is fragmented will remain viable, estimate (based on published and unpublished sources such as scientific publications, technical reports, databases or documented field observations) the habitat area required to support the remaining population, and habitat available within dispersal distance, and distance over which genetic exchange can occur (e.g. seed dispersal) and pollination distance for the species	The project will impact upon 0.184 ha of areas mapped on the Migratory Shorebirds Important Habitat. This includes 0.02 ha of macroalgae which does not provide foraging for this species. This species is an intertidal forager in shallow water. It does not dive or forage in deeper water which contains macroalgae such as identified within the subject land. The remaining area within the subject land includes water or disturbed habitat and was not considered foraging or roosting habitat for this species. The entire population of Curlew Sandpiper in Australia is considered one whole population. This population is not reliant on the macroalgae, or any other habitat mapped within the subject land. The project will reduce a small area of mapped habitat for this species through disturbance of macroalgae during in-water construction works. The macroalgae is located adjacent to the public marina and dragonboat launch pad. The macroalgae is unlikely to be considered significant habitat for this species. This species is an intertidal forager and does not forage underwater on macroalgae. Previous

Impact Assessment Provision	Assessment
iv. to determine changes in threats affecting remaining subpopulations and habitat if the proposed impact proceeds, estimate changes in environmental factors including changes to fire regimes (frequency, severity); hydrology, pollutants; species interactions (increased competition and effects on pollinators or dispersal); fragmentation, increased edge effects, likelihood of disturbance; and disease, pathogens and parasites. Where these factors have been considered elsewhere in relation to the target species, the assessor may refer to the relevant sections of the BDAR or BCAR.	records (historic) are located within Rozelle Bay and Port Jackson Wetlands (Parramatta River) which provides suitable habitat and foreshores for this species. The project will increase usage of the subject land for both human presence and boat usage which may deter presence of any Curlew Sandpipers in the area. The project involves disturbance to macroalgae and potential pollutants and water quality during construction. These are likely to be temporary disturbances and may be reduced through effective mitigation measures. Given that this species is mobile, the project will not fragment populations. The project does not involve changes to fire regime, or disease.

8.2. Impacts requiring offsets

No PCTs were recorded within the subject land. Therefore, no ecosystem credit offsets are required (see Figure 34).

Additionally, the targeted surveys indicate that the subject land does not support breeding/roosting or foraging habitat for microbat species. Therefore, no offsets are required for species credit microbat species.

The impacts to Migratory Shorebirds have been assessed under Prescribed Impacts and therefore, no species credits have been generated for these species.

Therefore, there are no impacts to species credits which require offsetting, see section 8.5 for further information.

8.3. Impacts not requiring offsets

The impacts not requiring offset include 0.14 ha of planted native vegetation and are shown in Figure 35.

8.4. Areas not requiring assessment

The built forms and cleared area which do not require assessment are shown in Figure 36.

8.5. Credit summary

Targeted surveys were conducted for candidate species credit species (Southern Myotis). One potential Southern Myotis call, and possible calls from Large and Little Bent-wing Bat indicates that microbat activity within the subject land is very low. The low number of calls indicates that microbats are not currently utilising the buildings as breeding or roosting habitat and microbats are not foraging within the vegetation or adjacent water. Due to the low number of calls, it is assumed no breeding habitat for species credit species is present within the subject land. Therefore, no species credits are required to offset impacts for the proposed works.

The proposed design impacts upon areas mapped as Migratory Shorebirds Important Habitat. As no PCT could be added to the BAMC, no credits were generated for these species. ELA has sent multiple requests to EES to discuss credits for the species below when there is no PCT including a reassessment of mapped habitat within the subject land, but no outcome has been determined. For this assessment, no species credited have been proposed, instead the mapped Migratory Shorebirds Important Habitat was assessed under Prescribed Impacts.

In accordance with Section 8.6(4) of the BAM, "*Where part or all of the indirect or prescribed impacts cannot be avoided, minimised or mitigated, the assessor may propose offsets or other measures that benefit threatened entities and their habitat. The approach to calculating any proposed offsets should be documented and justified*".

A MMP will be prepared to mitigate impacts during construction.

Table 27: Species credit summary

Species	Common name	Direct Impact (ha)	Credits required
Limosa lapponica baueri	Bar-tailed Godwit	0.184	N/A
Calidris ferruginea	Curlew Sandpiper	0.184	N/A

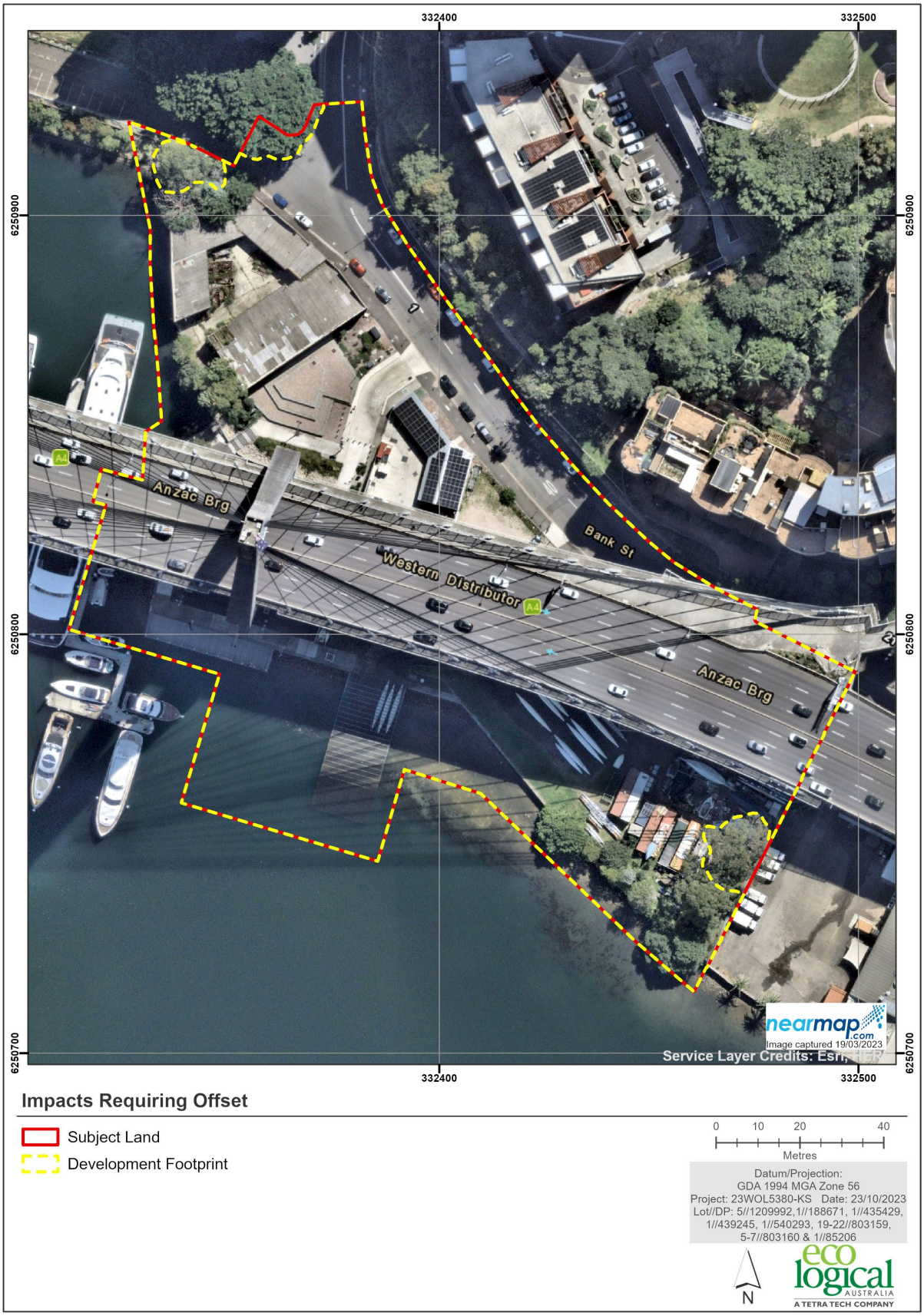

Figure 34: Impacts requiring offsets

Figure 35: Impacts not requiring offset

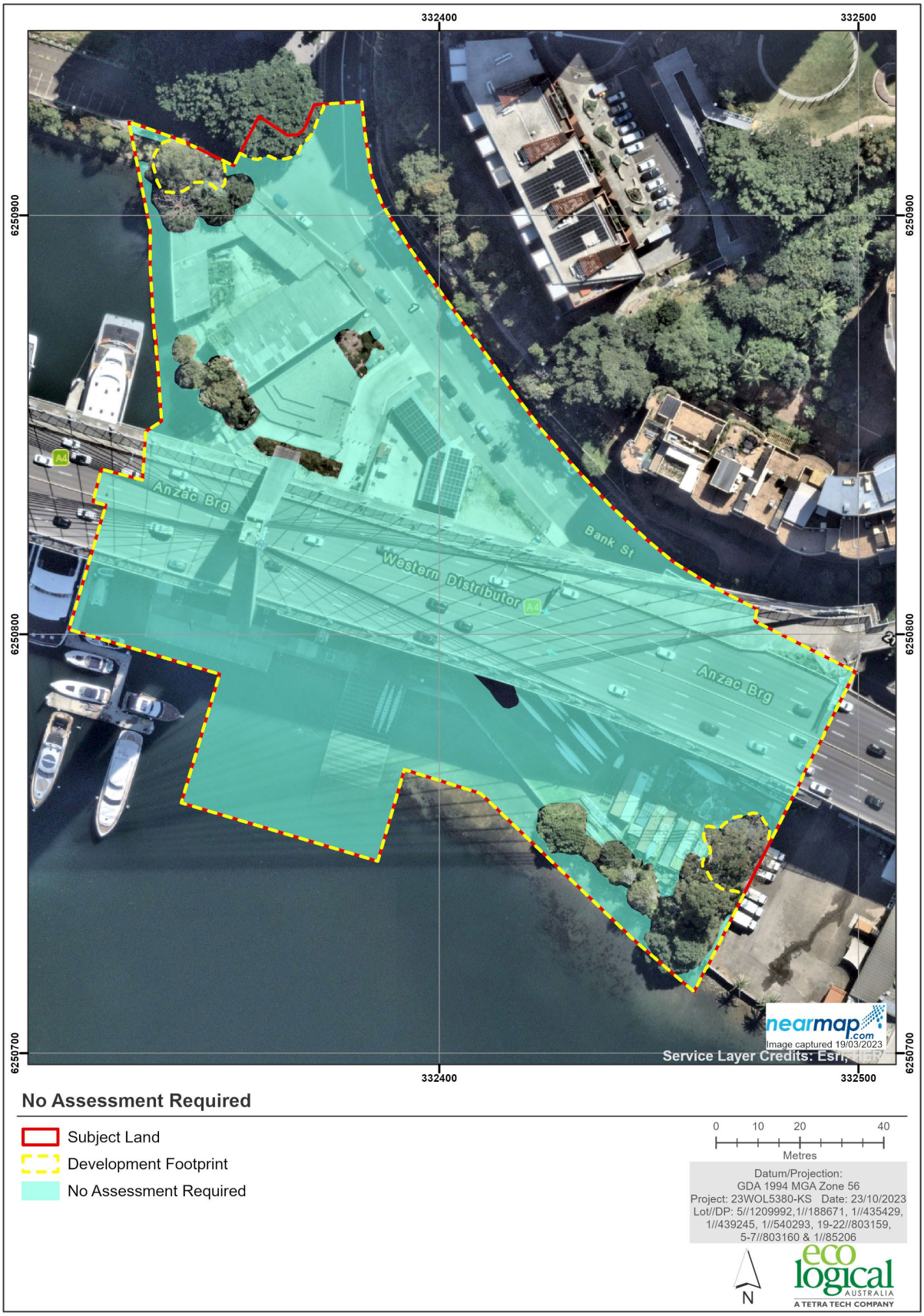

Figure 36: Areas not requiring assessment

9. Consistency with legislation and policy

Additional matters relating to impacts on flora and fauna which are not covered by the BC Act must also be addressed for the project footprint. Potential MNES in accordance with the EPBC Act have been addressed below.

9.1. Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act establishes a process for assessing the environmental impact of activities and developments where MNES may be affected. Under the Act, any action which "has, will have, or is likely to have a significant impact on a matter of MNES" is defined as a "controlled action", and requires approval from the Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW), which is responsible for administering the EPBC Act.

A habitat assessment and Likelihood of Occurrence was completed for listed threatened species that represent MNES (Appendix B). The following MNES were assessed as either having the potential to occur within the subject land, likely to occur or known from the subject land:

- Bar-tailed Godwit
- Curlew Sandpiper
- Grey-headed Flying-fox.

The assessments in this section were prepared in accordance with the EPBC Act Matters of National Environmental Significance: Significant Impact Guidelines 1.1 (Department of Environment 2013). These guidelines were established to assist proponents to determine whether a proposed action is likely to result in a significant impact on a matter of national environmental significance.

It was determined that the action is unlikely to have a significant impact on the threatened species listed above.

9.1.1. Bar-tailed Godwit (*Limosa lapponica baueri*)

The Bar-tailed Godwit is listed as vulnerable under the EPBC Act. It migrates from its breeding grounds in the Arctic to NSW in August-October and leaves in February (DPE 2020). A small number of individuals overwinter in Australia (DPE 2020). Regular sightings of Bar-tailed Godwit occur around Tweed, Richmond, Clarence, Macleay, Hastings, Hunter and Shoalhaven River estuaries and along Port Stephens and Botany Bay tidal zones (DPE 2020). The subject land does not contain BioNet records for this species or suitable habitat in the form of shallow waters along intertidal sandflats, mudflats and marine vegetation (seagrass, edge of mangroves or saltmarsh). The subject land includes areas mapped on the Migratory Shorebird Important Habitat; therefore, consideration of this species is required in this assessment and in accordance with the EPBC Act. The field surveys did not record the presence of suitable marine vegetation or shallow waters which may provide roosting or foraging habitat for this non-breeding migrant. A small amount of macroalgae was recorded and may provide marginal habitat for this species.

Table 28: Application of Significant Impact Criteria for Bar-tailed Godwit

Criterion	Question	Response
An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility of the following:		
1)	will the action lead to a long-term decrease in the size of an important population of a species Note: An 'important population' is a population that is necessary for a species' long-term survival and recovery.	The Bar-tailed Godwit is a non-breeding migratory species to NSW. The entire population of Bar-tailed Godwit is considered one population. The field survey and database assessment did not record suitable habitat for this species within the subject land. The proposed actions will affect 0.184 ha mapped as Migratory Shorebird Important Habitat. The action involves construction of a Public Park, over water boardwalk and ancillary infrastructure. The action does not involve direct removal or indirect impacts to important foraging or roosting habitat for this species. The action will not result in the long-term decrease of the population size.
2)	will the action reduce the area of occupancy of an important population	The proposed action would result in the construction of human-made structures within existing built and landscaped urban environment. The subject land overlaps Migratory Shorebird Important Habitat. The mapped areas include mapping along the waterbody of Parramatta River and Rozelle Bay where BioNet records for this species have been identified. The important habitat also includes a portion of the waterbody within Blackwattle Bay which includes the subject land. There are no historic (>30 years) or recent BioNet records for this species within Blackwattle Bay or the subject lands. The important habitat mapping has included areas where there are built structures and no suitable intertidal vegetation or shorelines. The north western portion of the subject land includes the Migratory Shorebird Important Habitat is situated around a wharf and sandstone seawalls along the water's edge where tidal flats are absent. The proposed action will not result in the reduction of an important population as the subject land does not contain suitable habitat for this species.
3)	will the action fragment an existing population into two or more populations	As previously mentioned, the population of Bar-tailed Godwit within Australia is considered one population. The proposed action will not fragment an existing population into two or more populations.
4)	will the action adversely affect habitat critical to the survival of a species	The Migratory Shorebird Important Habitat is considered habitat critical to its survival. The project will result in disturbance to the water, foreshores and macroalgae. The subject land did not contain mudflats or other suitable foraging habitat. The subject land contains mown exotic grass, disturbed foreshores and small amount of macroalgae which does not provide roosting habitat for this species.

Criterion	Question	Response
		Therefore, the proposed action will not result in the loss of habitat critical to the survival of this species such as intertidal zones or marine vegetation.
5)	will the action disrupt the breeding cycle of an important population	The proposed action will not disrupt the breeding cycle of the Bar-tailed Godwit as this is a non-breeding migrant. It is noted that non-breeding foraging habitat in NSW is considered important to the survival of this species. Sufficient foraging resources are required to a support the migration of a healthy population to breeding grounds in the Arctic. The proposed action will not impact upon significant foraging habitat for this species.
6) i	will the action modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The proposed action will affect 1.73 ha of built environment and 0.14 ha of planted native vegetation. The action will involve disturbance to foreshores substrate and macroalgae. The subject land did not contain suitable foraging or roosting habitat for this species. The action will not result in loss or degradation of habitat for this species.
6) ii	will the action result in invasive species that are harmful to a critically endangered or endangered species becoming established in the vulnerable species' habitat	The proposed action is unlikely to result in the establishment of an invasive species in the habitat of the Bar-tailed Godwit.
7)	will the action introduce disease that may cause the species to decline	The Bar-tailed Godwit is susceptible to avian influenza. The outbreak of the disease may result in a decline in the population of this species. The proposed actions will not result in the introduction of avian influenza.
8)	will the action interfere with the recovery of the species	The proposed actions will not impact upon the recovery of this species as no habitat will be affected.
Conclusion	Is there likely to be a significant impact?	No, the project is unlikely to be a significant impact. A referral is not required.

9.1.2. Curlew Sandpiper (*Calidris ferruginea*)

The Curlew Sandpiper is listed as critically endangered under the EPBC Act. It is a non-breeding migratory species to Australia (DPE 2021). This species regularly visits the Hunter Estuary and Murray-Darling Basin (DPE 2021). Suitable foraging habitat includes non-tidal swamps, coastal lagoons and lakes. This species can be seen foraging in shallow waters for molluscs and worms. Roosting habitat is usually in adjacent areas such as sand beaches or wetlands.

There are no BioNet records for this species within the subject land and suitable habitat was not identified within the subject land. The subject land overlaps DPE mapped Migratory Shorebird Important Habitat, therefore, consideration of this species is required in this assessment and in accordance with the EPBC Act. The field surveys did not record the presence of suitable marine vegetation or shallow waters which may provide roosting or foraging habitat for this non-breeding migrant.

Table 29: Application of Significant Impact Criteria for Curlew Sandpiper

Criterion	Question	Response
An action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility of the following:		
1)	will the action lead to a long-term decrease in the size of a population	The Curlew Sandpiper is a non-breeding migratory species to NSW. The entire population of Curlew Sandpiper is considered one population. The field survey and database assessment did not record suitable habitat for this species within the subject land. The proposed actions will affect 1.73 ha of human-made structures and 0.14 ha of planted native vegetation which do not represent habitat for the Curlew Sandpiper. The action involves construction of Public Park and infrastructure in existing built environment and new marina in the water. The action does not involve direct removal to foraging or roosting habitat for this species. However, there may be indirect impacts due to changes of water quality during construction. This will be mitigated during construction. Therefore, the action will not result in the long-term decrease of the population size.
2)	will the action reduce the area of occupancy of the species	The proposed action would result in the construction of human-made structures within existing built landscape. There are eight BioNet records for this species within a 5 km radius with all records historic (1959-1993) and located at Five Dock, approximately 5 km west of the subject land. The subject land abuts the boundary of the Migratory Shorebird Important Habitat. The mapped habitat includes Sydney Harbour and Blackwattle Bay which includes the subject land. The important habitat mapping has included areas where there are no suitable intertidal vegetation or shorelines. The subject land contains sandstone blocks along the waters edge and no tidal flats. The proposed action will not result in the reduction of the area of occupancy for this species as the subject land does not contain suitable habitat for this species.
3)	will the action fragment an existing population into two or more populations	As previously mentioned, the population of Curlew Sandpiper within Australia is considered one population. The proposed action will not fragment an existing population into two or more populations.
4)	will the action adversely affect habitat critical to the survival of a species	The Migratory Shorebird Important Habitat is considered habitat critical to its survival. The subject land will not result in the loss of habitat critical to the survival of this species. The proposed action will involve impacts to suitable habitat for this species such as intertidal zones or marine vegetation.
5)	will the action disrupt the breeding cycle of a population	The proposed action will not disrupt the breeding cycle of the Curlew Sandpiper as this is a non-breeding migrant. It is noted that non-breeding foraging habitat in NSW is

Criterion	Question	Response
		considered important to the survival of this species. Sufficient foraging resources are required to a support the migration of a healthy population to breeding grounds in the Arctic. The proposed action will not impact upon important foraging habitat for this species.
6) i	will the action modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The proposed action will affect 1.73 ha of built environment. The action will involve some impacts to the waterbody but no marine vegetation (except a small amount of macroalgae) will be directly impacted. The action will not result in loss or degradation of habitat for this species.
6) ii	will the action result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat	The proposed action is unlikely to result in the establishment of an invasive species in the habitat of the Curlew Sandpiper.
7)	will the action introduce disease that may cause the species to decline	The Curlew Sandpiper is susceptible to avian influenza. The outbreak of the disease may result in a decline in the population of this species. The proposed actions will not result in the introduction of avian influenza.
8)	will the action interfere with the recovery of the species	The proposed actions will not impact upon the recovery of this species as no habitat will be affected.
Conclusion	Is there likely to be a significant impact?	No, the project is unlikely to be a significant impact. A referral is not required.

9.2. Sydney Local Environmental Plan 2012 (LEP)

The land based component of the subject land is zoned RE1 Public Recreation under the LEP.

9.3. SEPP Biodiversity and Conservation 2021 - Part 6.3 Foreshores and Waterways Area

The harbour component of the subject land has been mapped as Foreshores and Waterways Area Boundary and Water Zoning under the SEPP (Biodiversity and Conservation) 2021.

The subject land does not contain significant seagrasses, so Section 6.32 does not apply under the SEPP. Section 6.28 has been provided for consideration.

6.28 General

(1) In deciding whether to grant development consent to development in the Foreshores and Waterways Area, the consent authority must consider the following—

(a) whether the development is consistent with the following principles—

(i) Sydney Harbour is a public resource, owned by the public, to be protected for the public good,

(ii) the public good has precedence over the private good,

(iii) the protection of the natural assets of Sydney Harbour has precedence over all other interests,

(b) whether the development will promote the equitable use of the Foreshores and Waterways Area, including use by passive recreation craft,

(c) whether the development will have an adverse impact on the Foreshores and Waterways Area, including on commercial and recreational uses of the Foreshores and Waterways Area,

(d) whether the development promotes water-dependent land uses over other land uses,

(e) whether the development will minimise risk to the development from rising sea levels or changing flood patterns as a result of climate change,

(f) whether the development will protect or reinstate natural intertidal foreshore areas, natural landforms and native vegetation,

(g) whether the development protects or enhances terrestrial and aquatic species, populations and ecological communities, including by avoiding physical damage to or shading of aquatic vegetation,

(h) whether the development will protect, maintain or rehabilitate watercourses, wetlands, riparian lands, remnant vegetation and ecological connectivity.

(2) Development consent must not be granted to development in the Foreshores and Waterways Area unless the consent authority is satisfied of the following—

(a) having regard to both current and future demand, the character and functions of a working harbour will be retained on foreshore sites,

(b) if the development site adjoins land used for industrial or commercial maritime purposes—the development will be compatible with the use of the adjoining land,

(c) if the development is for or in relation to industrial or commercial maritime purposes—public access that does not interfere with the purposes will be provided and maintained to and along the foreshore,

(d) if the development site is on the foreshore—excessive traffic congestion will be minimised in the zoned waterway and along the foreshore,

(e) the unique visual qualities of the Foreshores and Waterways Area and its islands, foreshores and tributaries will be enhanced, protected or maintained, including views and vistas to and from—

(i) the Foreshores and Waterways Area, and

(ii) public places, landmarks and heritage items.

A Marine Ecology Report (ELA 2023) has addressed the above legislation.

9.4. Blackwattle Bay Design Guidelines

An assessment of the proposal against the Blackwattle Bay Design Guidelines (DPE 2022) relative to terrestrial ecology is provided below in Table 30. Where criteria aren't currently met, but could be met during the detailed design phase (i.e. post approval) it is assumed a commitment will be made to ensure the recommendations in Section Table 23 are conditioned or implemented, or an alternative but equally valuable measure is applied if unforeseen constraints prevent its application.

Table 30: Blackwattle Bay Design Guidelines assessment for terrestrial ecology

Blackwattle Bay Design Guidelines provision	Assessment
4 Environmental Management and Sustainability **Ecology and landscape**	
p. Enhance terrestrial and marine ecology within the Precinct	Enhancement of terrestrial ecology can be achieved through revegetation works utilising vegetation consistent with historic PCTs (i.e. PCT 3594) and introducing connectivity corridors throughout the Precinct through planting native vegetation, including mature native vegetation. Marine ecology has been addressed in a separate report (ELA 2023). The proposal can meet this design provision.
4.3 Urban and marine ecology	
1. The consent authority may require the preparation of an impact assessment (Biodiversity Assessment Report (BDAR) and Marine Impact Assessment) where terrestrial and/or marine ecology is likely to be adversely affected by development. The impact assessment should measure loss and calculate biodiversity offsets and include targeted micro-bat surveys around built structures.	This BDAR has been prepared to meet the requirements of BAM and assess terrestrial and marine ecology impacts. A separate Marine Ecology report has also been prepared for the project (ELA 2023). A microbat survey has been included in this assessment and the analysis report is in Appendix E.
2. Aquatic habitat enhancement opportunities, summarised in Table 4, should be considered during the detailed design of the public domain.	Information to address Aquatic habitat enhancement is provided in the Marine Ecology Assessment (ELA 2023).
3. Terrestrial habitat features are to be incorporated into landscape plans and building designs. This should aim to provide both micro-habitats, stratified habitats and improve connectivity along existing or broken habitat corridors wherever practicable.	The Landscaping Plan has established additional connectivity corridors along the north-south direction of the subject land which were not present in its current state. The Landscape Plans include revegetation of locally indigenous species and includes canopy, shrub and ground cover species which will provide important terrestrial habitat feature in the subject land.

10. Conclusion

Eco Logical Australia Pty Ltd (ELA) was engaged by Infrastructure NSW to prepare a BDAR to meet the requirements of the BAM 2020 and the SEARs pertaining to biodiversity for SSD 53386706.

The subject land is located at 1A-19 Bank Street, Pyrmont within the City of Sydney local government area (LGA) and includes harbour development in Blackwattle Bay.

The subject lands do not contain locally indigenous or remnant vegetation which can be assigned a suitable Plant Community Type (PTC). No PCT or data could be entered into the BAM-C. Ecosystem or species credit species lists were created using BioNet records and an assessment of habitat features. A list of threatened microbats was identified as suitable candidate species for further assessment and was assessed as Prescribed Impacts for ecosystem credit species.

One species credit species, *Myotis macropus* (Southern Myotis) was identified as potential to breed/roost within the existing buildings and seawall and forage in the water within the subject land.

Targeted surveys were conducted using acoustic devices for microbats to determine species presence and activity within the subject land. Three possible species credit species were recorded during targeted surveys including:

- *Miniopterus australis* (Little Bent-winged Bat) - listed as vulnerable under the BC Act
- *Miniopterus orianae oceanensis* (Large Bent-winged Bat) - listed as vulnerable under the BC Act
- *Myotis macropus* (Southern Myotis) - listed as vulnerable under the BC Act

Some of the calls were difficult to distinguish between species and therefore, these were grouped into similar species which includes threatened and non-threatened species. As an example, *Myotis macropus* / *Nyctophilus* spp. were grouped together based on similarities of the call. *Nyctophilus* spp. are not listed as threatened species.

The total number of calls during the targeted surveys were very low with only one call from possible *Myotis macropus*/ *Nyctophilus* spp. and one call for *Miniopterus australis* and potential eight calls for grouped *Miniopterus orianae oceanensis* / non-threatened species. The results from the targeted surveys indicate that microbats only utilise the subject land on rare occasion and are not breeding or foraging within the subject land. Therefore, no species polygon or species credits were generated for microbat species.

The proposed development impacts upon areas mapped on the DPE Migratory Shorebirds Important Habitat and therefore, species polygon has been prepared for *Limosa lapponica baueri* (Bar-tailed Godwit) and *Calidris ferruginea* (Curlew Sandpiper). Impacts to migratory shorebirds were assessed under Prescribed Impacts. No species credits were generated for these species.

The planted native vegetation provides occasional foraging habitat for *Pteropus poliocephalus* (Grey-headed Flying-fox).

Two Matters of Environmental Significance were identified and assessed in this report, Grey-headed Flying-Fox and Curlew Sandpiper. This assessment concluded that the proposed actions will not result in a significant impact upon these species.

This report considers the development footprint; describes the biodiversity values within the development footprint; describes the indicative impacts; and outlines the measures to be taken to avoid, minimise and mitigate impacts to the vegetation and species habitat present within the subject land.

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Appendix A Definitions

The following terminology has been used throughout this report for the purposes of describing the impacts of the proposal in the context of a biodiversity assessment in accordance with the NSW Biodiversity Assessment Method 2020. This terminology may or may not align with other technical documents associated with the proposed development.

Terminology	Definition
Accredited person	A person accredited under section 6.10 of the BC Act to prepare those reports in accordance with the biodiversity assessment method.
Assessment area	Includes the subject land and the area of land within the 1500 m buffer zone surrounding the subject land (or 500 m buffer zone for linear proposals)
Biodiversity credit report	The report produced by the Credit Calculator that sets out the number and class of biodiversity credits required to offset the remaining adverse impacts on biodiversity values at a subject land, or on land to be biodiversity certified, or that sets out the number and class of biodiversity credits that are created at a biodiversity stewardship site.
BioNet Atlas	The BioNet Atlas (formerly known as the NSW Wildlife Atlas) is the OEH database of flora and fauna records. The Atlas contains records of plants, mammals, birds, reptiles, amphibians, some fungi, some invertebrates (such as insects and snails) and some fish
Connectivity	The measure of the degree to which an area(s) of native vegetation is linked with other areas of vegetation.
Credit Calculator	The computer program that provides decision support to assessors and proponents by applying the BAM, and which calculates the number and class of biodiversity credits required to offset the impacts of a development or created at a biodiversity stewardship site.
Development	Has the same meaning as development at section 4 of the EP&A Act, or an activity in Part 5 of the EP&A Act. It also includes development as defined in section 115T of the EP&A Act.
Development footprint	The area of land that is directly impacted on by a proposed development, including access roads, and areas used to store construction materials.
Development site	An area of land that is subject to a proposed development that is under the EP&A Act.
Ecosystem credits	A measurement of the value of EECs, CEECs and threatened species habitat for species that can be reliably predicted to occur with a PCT. Ecosystem credits measure the loss in biodiversity values at a subject land and the gain in biodiversity values at a biodiversity stewardship site.
Hollow bearing tree	A living or dead tree that has at least one hollow. A tree is considered to contain a hollow if: (a) the entrance can be seen; (b) the minimum entrance width is at least 5 cm; (c) the hollow appears to have depth (i.e. you cannot see solid wood beyond the entrance); (d) the hollow is at least 1 m above the ground. Trees must be examined from all angles.
Linear shaped development	Development that is generally narrow in width and extends across the landscape for a distance greater than 3.5 kilometres in length
Local population	The population that occurs in the subject land. In cases where multiple populations occur in the subject land or a population occupies part of the subject land, impacts on each subpopulation must be assessed separately.
Local wetland	Any wetland that is not identified as an important wetland (refer to definition of Important wetland).
Mitchell landscape	Landscapes with relatively homogeneous geomorphology, soils and broad vegetation types, mapped at a scale of 1:250,000.

Terminology	Definition
Multiple fragmentation impact development	Developments such as wind farms and coal seam gas extraction that require multiple extraction points (wells) or turbines and a network of associated development including roads, tracks, gathering systems/flow lines, transmission lines
Operational Manual	The Operational Manual published from time to time by OEH, which is a guide to assist assessors when using the BAM
Patch size	An area of intact native vegetation that: a) occurs on the subject land or biodiversity stewardship site, and b) includes native vegetation that has a gap of less than 100 m from the next area of native vegetation (or ≤30 m for non-woody ecosystems). Patch size may extend onto adjoining land that is not part of the subject land or stewardship site.
Proponent	A person who intends to apply for consent to carry out development or for approval for an activity.
Reference sites	The relatively unmodified sites that are assessed to obtain local benchmark information when benchmarks in the Vegetation Benchmarks Database are too broad or otherwise incorrect for the PCT and/or local situation. Benchmarks can also be obtained from published sources.
Regeneration	The proportion of over-storey species characteristic of the PCT that are naturally regenerating and have a diameter at breast height <5 cm within a vegetation zone.
Remaining impact	An impact on biodiversity values after all reasonable measures have been taken to avoid and minimise the impacts of development. Under the BAM, an offset requirement is calculated for the remaining impacts on biodiversity values.
Retirement of credits	The purchase and retirement of biodiversity credits from an already-established biobank site or a biodiversity stewardship site secured by a biodiversity stewardship agreement.
Riparian buffer	Riparian buffers applied to water bodies in accordance with the BAM
Sensitive biodiversity values land map	Development within an area identified on the map requires assessment using the BAM.
Site attributes	The matters assessed to determine vegetation integrity. They include: native plant species richness, native over-storey cover, native mid-storey cover, native ground cover (grasses), native ground cover (shrubs), native ground cover (other), exotic plant cover (as a percentage of total ground and mid-storey cover), number of trees with hollows, proportion of over-storey species occurring as regeneration, and total length of fallen logs.
Site-based development	a development other than a linear shaped development, or a multiple fragmentation impact development
Species credits	The class of biodiversity credits created or required for the impact on threatened species that cannot be reliably predicted to use an area of land based on habitat surrogates. Species that require species credits are listed in the Threatened Biodiversity Data Collection.
Subject land	Is land to which the BAM is applied in Stage 1 to assess the biodiversity values of the land. It includes land that may be a subject land, clearing site, proposed for biodiversity certification or land that is proposed for a biodiversity stewardship agreement.
Threatened Biodiversity Data Collection	Part of the BioNet database, published by OEH and accessible from the BioNet website.
Threatened species	Critically Endangered, Endangered or Vulnerable threatened species as defined by Schedule 1 of the BC Act, or any additional threatened species listed under Part 13 of the EPBC Act as Critically Endangered, Endangered or Vulnerable.

Terminology	Definition
Vegetation Benchmarks Database	A database of benchmarks for vegetation classes and some PCTs. The Vegetation Benchmarks Database is published by OEH and is part of the BioNet Vegetation Classification.
Vegetation zone	A relatively homogenous area of native vegetation on a subject land, land to be biodiversity certified or a biodiversity stewardship site that is the same PCT and broad condition state.
Wetland	An area of land that is wet by surface water or ground water, or both, for long enough periods that the plants and animals in it are adapted to, and depend on, moist conditions for at least part of their life cycle. Wetlands may exhibit wet and dry phases and may be wet permanently, cyclically or intermittently with fresh, brackish or saline water
Woody native vegetation	Native vegetation that contains an over-storey and/or mid-storey that predominantly consists of trees and/or shrubs

Appendix B EPBC Act Likelihood of Occurrence

An assessment of likelihood of occurrence was made for threatened and migratory species identified from the Protected Matters Search Tool and Atlas of NSW Wildlife (BioNet). Five terms for the likelihood of occurrence of species are used in this report. This assessment was based on database or other records, presence or absence of suitable habitat, features of the proposal site, results of the subject land inspection and professional judgement. Some Migratory or Marine species identified from the Commonwealth database search have been excluded from the assessment, due to lack of habitat. The terms for likelihood of occurrence are defined below:

- 'known' = the species was or has been observed on the subject land
- 'likely' = a medium to high probability that a species uses the subject land
- 'potential' = suitable habitat for a species occurs on the subject land, but there is insufficient information to categorise the species as likely to occur, or unlikely to occur
- 'unlikely' = a very low to low probability that a species uses the subject land
- 'no' = habitat within the subject land and in the vicinity is unsuitable for the species.

A significance assessment conducted for threatened species or ecological communities that were recorded within the subject land or had a higher likelihood of occurring and were not recorded during the site visit. It is noted that some threatened fauna species that are highly mobile, wide ranging and vagrant may use portions of the subject land intermittently for foraging. For these fauna species, the habitat present and likely to be impacted is not considered to be important to the threatened species, particularly in relation to the amount of similar habitat remaining in the surrounding landscape. As such, a test of significance in reference to State or Commonwealth legislation was not considered necessary.

Information provided in the distribution and habitat column has primarily been extracted (and modified) from the Commonwealth Species Profile and Threats Database and the NSW Threatened Species Profiles.

Table 31: Likelihood of occurrence for threatened ecological communities listed under the EPBC Act.

Community Name	EPBC Act Status	Distribution	Habitat	Habitat within subject land	Impact Assessment Required
Castlereagh Scribbly Gum and Agnes Banks Woodlands of the Sydney Basin Bioregion	E	Sydney Basin Bioregion, mostly in the Cumberland IBRA sub-region, with small occurrences in the Sydney Cataract, Wollemi and Burragorang sub-regions. It occurs primarily in the Castlereagh area in the north-west of the Cumberland Plain with other known occurrences near Holsworthy, Kemps Creek and Longneck Lagoon.	Occurs primarily on Tertiary sands and gravels of the Hawkesbury-Nepean river system. At Agnes Banks it primarily occurs on aeolian (wind-blown) sands overlying Tertiary alluvium. Found on flat or gently undulating terrain in rain shadow areas typically receiving 700–900 mm annual rainfall. The ecological community occurs primarily at low elevations up to 80 m above sea level (ASL), including old ridges, dunes and terraces.	No this community was not identified during field survey.	No
Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community	E	The ecological community occurs in sub-tropical, sub-humid and temperate climatic zones from Curtis Island, north of Gladstone, in Queensland to Bermagui in southern New South Wales.	Typically found where groundwater is saline or brackish, but can occur in areas where groundwater is relatively fresh. It is typically found on coastal flats, floodplains, drainage lines, lake margins, wetlands and estuarine fringes where soils are at least occasionally saturated, water-logged or inundated.	No this community was not identified during field survey.	No
Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland	E	The Coastal Swamp Sclerophyll Forest ecological community occurs on the mainland and islands near to the coast (within 20 km) within the following IBRA2 Bioregions: South East Queensland; NSW North Coast; Sydney Basin; and the Bateman subregion of the South East Corner.	Typically occurs in low-lying coastal alluvial areas with minimal relief, such as swamps, floodplain pockets, depressions, alluvial flats, back-barrier flats, fans, terraces, and behind fore-dunes.	No this community was not identified during field survey.	No
Coastal Upland Swamps in the Sydney Basin Bioregion	E	Endemic to NSW and confined to the Sydney Basin Bioregion. It occurs in the eastern Sydney Basin from the Somersby district in the north (Somersby-Hornsby plateau) to the Robertson district in the south (n the Woronora plateau).	Occur primarily on impermeable sandstone plateau with shallow groundwater aquifers in the headwaters and impeded drainage lines of streams, and on sandstone benches with abundant seepage moisture. Generally associated with acidic soils.	No this community was not identified during field survey.	No
Cooks River/Castlereagh Ironbark Forest of the Sydney Basin Bioregion	CE	Occurs in western Sydney, with the most extensive stands occurring in the Castlereagh and Holsworthy areas. Smaller remnants occur in the Kemps Creek	Mainly occurs on clay soils derived from the deposits of ancient river systems (alluvium), or on shale soils of the Wianamatta Shales.	No this community was not identified	No

Community Name	EPBC Act Status	Distribution	Habitat	Habitat within subject land	Impact Assessment Required
		area and in the eastern section of the Cumberland Plain.		during field survey.	
Eastern Suburbs Banksia Scrub of the Sydney Region	CE	Occurs in Sydney's eastern suburbs. Surviving stands totalling approximately 146 hectares have been recorded from the local government areas of Botany, Randwick, Waverley, and Manly.	Occurs on disjunct patches of nutrient poor aeolian (wind blown) dune sand.	No this community was not identified during field survey.	No
Posidonia australis seagrass meadows of the Manning-Hawkesbury ecoregion	E	Occurs within estuaries along the central east coast of NSW. This TEC is limited to the Hawkesbury and Manning Shelf bioregions and is known to occur in Wallis Lake, Port Stephens, Lake Macquarie, Brisbane Water, Hawkesbury River, Pittwater, Port Jackson (Sydney Harbour), Botany Bay, Port Hacking and around Broughton Island.	Occurs mostly within the sheltered environments of permanently open estuaries, from Wallis Lake to Port Hacking. Occurring in warm temperate waters, this TEC typically occurs in subtidal waters from less than 1m to 10 m, on sand and silty mud substrate.	No this community was not identified during field survey.	No
River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria	CE	This encompasses the area from around Sale on the south-east coast of Victoria to around Raymond Terrace, just north of Newcastle on the New South Wales east coast.	Occurs on alluvial landforms related to coastal river floodplains and associated sites where transient water accumulates, including floodplains, river-banks, riparian zones, lake foreshores, creek lines (including the floors of tributary gullies), floodplain pockets, depressions, alluvial flats, fans, terraces, and localised colluvial fans.	No this community was not identified during field survey.	No
Shale Sandstone Transition Forest of the Sydney Basin Bioregion	CE	Occurs at the edges of the Cumberland Plain in western Sydney, most now occurs in the Hawkesbury, Baulkham Hills, Liverpool, Parramatta, Penrith, Campbelltown and Wollondilly local government areas.	Intergrade between clay soils from the shale rock and earthy and sandy soils from sandstone, or where shale caps overlay sandstone.	No this community was not identified during field survey.	No
Western Sydney Dry Rainforest and Moist Woodland on Shale	CE	Cumberland Plain Sub-region of the Sydney Basin Bioregion.	It generally occurs in rugged terrain and other patches may occur on undulating terrain, with dry rainforest patches typically occupying steep lower slopes and gullies, and moist woodland patches typically	No this community was not identified	No

Community Name	EPBC Act Status	Distribution	Habitat	Habitat within subject land	Impact Assessment Required
			occupying upper sections of the slope Occurs almost exclusively on clay soils derived from Wianamatta Group shales.	during field survey.	

E = ENDANGERED ECOLOGICAL COMMUNITY, CE = CRITICALLY ENDANGERED ECOLOGICAL COMMUNITY, V = VULNERABLE ECOLOGICAL COMMUNITY

Table 32: Likelihood of occurrence assessment for threatened flora species

Scientific name	Common Name	EPBC Act Status	Distribution and Habitat	Number of Records within 5 km	Likelihood of Occurrence	Impact Assessment Required
Acacia bynoeana	Bynoe's Wattle	V	Found in central eastern NSW, from the Hunter District (Morisset) south to the Southern Highlands and west to the Blue Mountains. Heath or dry sclerophyll forest on sandy soils.	0	No - suitable habitat not recorded within the subject land, no local records.	No
Acacia pubescens	Downy Wattle	V	Restricted to the Sydney region around the Bankstown-Fairfield-Rookwood and Pitt Town area, with outliers occurring at Barden Ridge, Oakdale and Mountain Lagoon. Open woodland and forest, including Cooks River/Castlereagh Ironbark Forest, Shale/Gravel Transition Forest and Cumberland Plain Woodland. Occurs on alluviums, shales and at the intergrade between shales and sandstones.	0	No - suitable habitat not recorded within the subject land, no local records.	No
Acacia terminalis subsp. *terminalis*	Sunshine Wattle	E	Limited mainly to near-coastal areas from the northern shores of Sydney Harbour south to Botany Bay. Coastal scrub and dry sclerophyll woodland on sandy soils.	48	No - suitable habitat not recorded within the subject land, no local records.	No
Allocasuarina glareicola		E	Castlereagh woodland on lateritic soil. Found in open woodland with *Eucalyptus parramattensis, Eucalyptus fibrosa, Angophora bakeri, Eucalyptus sclerophylla* and *Melaleuca decora.*	0	No - suitable habitat not recorded within the subject land, no local records.	No
Asterolasia elegans		E	Hawkesbury sandstone.	0	No - suitable habitat not recorded within the subject land, no local records.	No
Caladenia tessellata	Thick Lip Spider Orchid	V	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. Grassy sclerophyll woodland on clay loam or sandy soils, or low woodland with stony soil.	0	No - suitable habitat not recorded within the subject land, no local records.	No

Scientific name	Common Name	EPBC Act Status	Distribution and Habitat	Number of Records within 5 km	Likelihood of Occurrence	Impact Assessment Required
Cryptostylis hunteriana	Leafless Tongue Orchid	V	In NSW, recorded mainly on coastal and near coastal ranges north from Victoria to near Forster, with two isolated occurrences inland north-west of Grafton. Coastal heathlands, margins of coastal swamps and sedgelands, coastal forest, dry woodland, and lowland forest.	0	No - suitable habitat not recorded within the subject land, no local records.	No
Darwinia biflora		V	Woodland, open forest or scrub-heath on the edges of weathered shale-capped ridges, where these intergrade with Hawkesbury Sandstone.	0	No - suitable habitat not recorded within the subject land, no local records.	No
Eucalyptus camfieldii	Camfield's Stringybark	V	Narrow band from the Raymond Terrace area south to Waterfall. Coastal heath on shallow sandy soils overlying Hawkesbury sandstone, mostly on exposed sandy ridges.	0	No - suitable habitat not recorded within the subject land, no local records.	No
Genoplesium baueri	Bauer's Midge Orchid	E	Has been recorded from locations between Nowra and Pittwater and may occur as far north as Port Stephens. Dry sclerophyll forest and moss gardens over sandstone. Heath and shrubby woodland to open forest on sandy or light clay soils usually over thin shales.	0	No - suitable habitat not recorded within the subject land, no local records.	No
Haloragodendron lucasii		E	Dry sclerophyll forest and low open woodland on sheltered slopes near creeks, in moist sandy loam soils.	0	No - suitable habitat not recorded within the subject land, no local records.	No
Lasiopetalum joyceae		V	Heath on lateritic to shaley ridgetops over sandstone.	0	No - suitable habitat not recorded within the subject land, no local records.	No

Scientific name	Common Name	EPBC Act Status	Distribution and Habitat	Number of Records within 5 km	Likelihood of Occurrence	Impact Assessment Required
Melaleuca biconvexa	Biconvex Paperbark	V	Only found in NSW, populations found in the Jervis Bay area in the south and the Gosford-Wyong area in the north. Damp places, often near streams or low-lying areas on alluvial soils.	0	No - suitable habitat not recorded within the subject land, no local records.	No
Melaleuca deanei	Deane's Paperbark	V	Heath on sandstone	0	No - suitable habitat not recorded within the subject land, no local records.	No
Persicaria elatior	Tall Knotweed	V	Beside streams and lakes, swamp forest or disturbed areas.	0	No - suitable habitat not recorded within the subject land, no local records.	No
Persoonia hirsuta	Hairy Geebung	E	Scattered distribution around Sydney, from Singleton in the north, along the east coast to Bargo in the south and the Blue Mountains to the west. Sandy soils in dry sclerophyll open forest, woodland and heath on sandstone.	0	No - suitable habitat not recorded within the subject land, no local records.	No
Pimelea curviflora var. *curviflora*	-	V	Confined to the coastal area of the Sydney and Illawarra regions between northern Sydney and Maroota in the north-west and Croom Reserve near Albion Park in the south. Woodland, mostly on shaley/lateritic soils over sandstone and shale/sandstone transition soils on ridgetops and upper slopes.	0	No - suitable habitat not recorded within the subject land, no local records.	No
Pimelea spicata	Spiked Rice-flower	E	Two disjunct areas; the Cumberland Plain (Marayong and Prospect Reservoir south to Narellan and Douglas Park) and the Illawarra (Landsdowne to Shellharbour to northern Kiama). Well-structured clay soils. *Eucalyptus moluccana* (Grey Box) communities and in areas of ironbark on the Cumberland Plain. Coast Banksia open woodland or coastal grassland in the Illawarra.	0	No - suitable habitat not recorded within the subject land, no local records.	No

Scientific name	Common Name	EPBC Act Status	Distribution and Habitat	Number of Records within 5 km	Likelihood of Occurrence	Impact Assessment Required
Prostanthera densa	Villous Mint-bush	-	Sclerophyll forest and shrubland on coastal headlands and near-coastal ranges, chiefly on sandstone in Jervis Bay and Royal National Park.	0	No - suitable habitat not recorded within the subject land, no local records.	No
Rhizanthella slateri	Eastern Australian Underground Orchid	E	Sclerophyll forest in shallow to deep loams.	0	No - suitable habitat not recorded within the subject land, no local records.	No
Rhodamnia rubescens	Scrub Turpentine	CE	Subtropical Rainforests, Northern Warm Temperate Rainforests, Littoral Rainforest, North Coast Wet	1	No - suitable habitat not recorded within the subject land, no local records.	No
Rhodomyrtus psidioides	Native Guava	CE	Subtropical Rainforests, Warm Temperate Rainforests, Littoral Rainforest, and Wet Sclerophyll Forests.	0	No - suitable habitat not recorded within the subject land, no local records.	No
Syzygium paniculatum	Magenta Lilly Pilly	V	Only in NSW, in a narrow, linear coastal strip from Upper Lansdowne to Conjola State Forest. Subtropical and littoral rainforest on gravels, sands, silts and clays.	43	No - suitable habitat not recorded within the subject land, no local records.	No
Thesium australe	Austral Toadflax	V	In eastern NSW it is found in very small populations scattered along the coast, and from the Northern to Southern Tablelands. Grassland on coastal headlands or grassland and grassy woodland away from the coast.	0	No - suitable habitat not recorded within the subject land, no local records.	No

Table 33: Likelihood of occurrence assessment for threatened fauna species

Scientific name	Common Name	EPBC Act Status	Distribution and Habitat	Number of Records within 5 km	Likelihood of Occurrence	Impact Assessment Required
Actitis hypoleucos	Common Sandpiper	Mar, M	The population that migrates to Australia breeds in the Russian far east. Utilises a wide range of coastal wetlands and some inland wetlands, with varying levels of salinity, and is mostly found around muddy margins or rocky shores and rarely on mudflats.	1	Unlikely – lack of suitable habitat for this species.	No
Anous stolidus	Common Noddy	Mar, M	During the breeding season, the Common Noddy usually occurs on or near islands, on rocky islets and stacks with precipitous cliffs, or on shoals or cays of coral or sand. During the non-breeding period, the species occurs in groups throughout the pelagic zone (open ocean).	0	Unlikely – no record of species in region	No
Anthochaera phrygia	Regent Honeyeater	CE	Eucalypt woodland and open forest, wooded farmland and urban areas with mature eucalypts, and riparian forests of *Casuarina cunninghamiana* (River Oak).	0	Unlikely – no record of species in region	No
Apus pacificus	Fork-tailed Swift	Mar, M	Marine vagrant. Non-breeding visitor.	1	Unlikely – lack of suitable habitat for this species.	No
Arctocephalus forsteri	New Zealand Fur-seal	Mar	Marine vagrant. Non-breeding visitor.	25	Unlikely – lack of suitable habitat for this species.	No
Arctocephalus pusillus doriferus	Australian Fur-seal	Mar	Reported to have bred at Seal Rocks, near Port Stephens and Montague Island in southern NSW.	6	Unlikely – lack of suitable habitat for this species.	No
Ardenna carneipes	Flesh-footed Shearwater	Mar, M	Visitor to waters of the continental shelf and continental slope off southern Australia, Lord Howe Island. Pairs breed on 41 islands off the	0	Unlikely – lack of suitable habitat for this species.	No

Scientific name	Common Name	EPBC Act Status	Distribution and Habitat	Number of Records within 5 km	Likelihood of Occurrence	Impact Assessment Required
			coast of south-western Western Australia, Smith Island and Lord Howe Island.			
Ardenna grisea	Sooty Shearwater	Mar, M	Breeds on islands off New South Wales (NSW) and Tasmania. Forages in pelagic (open ocean) sub-tropical, sub-Antarctic and Antarctic waters. The species migrates and forages in the North Pacific and Atlantic Oceans during the non-breeding season. Sooty Shearwaters may forage inshore occasionally, especially during rough weather.	1	Unlikely – lack of suitable habitat for this species.	No
Arenaria interpres	Arenaria interpres	Mar, M	In non-breeding season, found in most coastal regions, with occasional records of inland populations. Breeds on the coasts of Europe, Asia and North America.	0	Unlikely – lack of suitable habitat for this species.	No
Balaenoptera edeni	Bryde's Whale	Cetacean, M	Temperate to tropical waters, both oceanic and inshore. No specific feeding or breeding grounds.	0	Unlikely - too close to shore.	No
Balaenoptera musculus	Blue Whale	E, M, Mar	Widespread. It is likely that the whales occur around the continent at various times of the year. However, much of the Australian continental shelf and coastal waters have no particular significance to the whales and are used only for migration and opportunistic feeding	0	Unlikely - too close to shore.	No
Botaurus poiciloptilus	Australasian Bittern	E	Found over most of NSW except for the far north-west. Permanent freshwater wetlands with tall, dense vegetation, particularly *Typha* spp. (bullrushes) and *Eleocharis* spp. (spikerushes).	1	Unlikely – lack of suitable habitat for this species.	No

Scientific name	Common Name	EPBC Act Status	Distribution and Habitat	Number of Records within 5 km	Likelihood of Occurrence	Impact Assessment Required
Calidris acuminata	Sharp-tailed Sandpiper	Mar, M	Non-breeding season: Most of the population migrates to Australia, mostly to the south-east and are widespread in both inland and coastal locations and in both freshwater and saline habitats. Breeds in northern Siberia.	1	Unlikely – lack of suitable habitat for this species.	No
Calidris canutus	Red Knot	E, M	Summer migrant to Australia. In NSW, widespread in suitable habitat along the coast. Occasionally recorded inland in all regions. Intertidal mudflats, sandflats sheltered sandy beaches, estuaries, bays, inlets, lagoons, harbours, sandy ocean beaches, rock platforms, coral reefs, terrestrial saline wetlands near the coast, sewage ponds and saltworks. Rarely inland lakes or swamps.	0	Unlikely – lack of suitable habitat for this species. No local records.	No
Calidris ferruginea	Curlew Sandpiper	CE, M	Occurs along the entire coast of NSW, and sometimes in freshwater wetlands in the Murray-Darling Basin. Littoral and estuarine habitats, including intertidal mudflats, non-tidal swamps, lakes and lagoons on the coast and sometimes inland.	0	Unlikely – lack of suitable habitat for this species. No local records.	No
Calidris melanotos	Pectoral Sandpiper	Mar, M	In Australasia, the Pectoral Sandpiper prefers shallow fresh to saline wetlands. The species is found at coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands. Breeds in northern Russia and North America.	0	Unlikely – lack of suitable habitat for this species. No local records.	No
Calidris ruficollis	Calidris ruficollis	Mar, M	The Red-necked Stint has been recorded in all coastal regions and found inland in all states when conditions are suitable. Breeds in Siberia and sporadically in north and west Alaska	0	Unlikely – lack of suitable habitat for this species. No local records.	No

Scientific name	Common Name	EPBC Act Status	Distribution and Habitat	Number of Records within 5 km	Likelihood of Occurrence	Impact Assessment Required
Calidris tenuirostris	Great Knot	CE	Sheltered coastal habitat containing large intertidal mudflats or sandflats including inlets, bays, harbours, estuaries and lagoons. Often recorded on sandy beaches with mudflats nearby, sand spites and inlets and expose reef or rock platforms.	0	No - lack of suitable habitat for this species within the subject land, no local records.	No
Callocephalon fimbriatum	Gang-gang Cockatoo	E	In NSW, distributed from the south-east coast to the Hunter region, and inland to the Central Tablelands and south-west slopes. Isolated records known from as far north as Coffs Harbour and as far west as Mudgee. Tall mountain forests and woodlands in summer; in winter, may occur at lower altitudes in open eucalypt forests and woodlands, and urban areas.	0	No - lack of suitable habitat for this species within the subject land.	No
Calonectris leucomelas	Streaked Shearwater	Mar, M	Breeding on the coast and on offshore islands of Japan, Russia, China and Korean Peninsula. Breeding begins in March at colonies on offshore islands, occupying burrows in forested hills. It undergoes trans-equatorial migration traveling south during winter, to the coasts of Vietnam, New Guinea, the Philippines, Australia, southern India and Sri Lanka	0	No - lack of suitable habitat for this species within the subject land.	No
Calyptorhynchus lathami lathami	South-eastern Glossy Black-Cockatoo	V	In NSW, distribution relies on nine species of sheoaks (*Allocasuarina* spp. and *Casuarina* spp.) for feeding (Chapman 2007), with species used varying depending on the region. Birds often only feed on one or two species in one region (Higgins 1999)	0	Unlikely – subject land contains a small number of *Casuarina glauca* but this is very marginal foraging habitat. No local records and no evidence of species	No

Scientific name	Common Name	EPBC Act Status	Distribution and Habitat	Number of Records within 5 km	Likelihood of Occurrence	Impact Assessment Required
					occupation during field surveys.	
Caperea marginata	Pygmy Right Whale	Cetacean, M	Found in temperate and sub-Antarctic waters of the Southern Hemisphere	0	Unlikely - too close to shore.	No
Carcharhinus longimanus	Oceanic Whitetip Shark	M	Migratory	0	Unlikely - lack of suitable habitat for this species within the subject land.	No
Carcharias taurus (east coast population)	Grey Nurse Shark (east coast population)	CE, Mar	Broad inshore distribution, primarily in subtropical to cool temperate waters around the main continental land masses. The Australian east coast population is considered to extend from the Capricornia coast (central Queensland) to Narooma in southern New South Wales.	0	Unlikely - lack of suitable habitat for this species within the subject land.	No
Carcharodon carcharias	White Shark, Great White Shark	V, M, Mar	Widely distributed throughout temperate and sub-tropical regions in the northern and southern hemispheres.	0	Unlikely - lack of suitable habitat for this species within the subject land.	No
Caretta caretta	Loggerhead Turtle	E, M, Mar	In NSW, they are seen as far south as Jervis Bay and have been recorded nesting on the NSW north coast and feeding around Sydney.	5	Unlikely - lack of suitable habitat for this species within the subject land.	No
Chalinolobus dwyeri	Large-eared Pied Bat	V	Recorded from Rockhampton in Qld south to Ulladulla in NSW. Largest concentrations of populations occur in the sandstone escarpments of the Sydney basin and the NSW north-west slopes. Wet and dry sclerophyll forests, Cyprus Pine dominated forest,	2	Unlikely - lack of suitable habitat for this species within the subject land.	No

Scientific name	Common Name	EPBC Act Status	Distribution and Habitat	Number of Records within 5 km	Likelihood of Occurrence	Impact Assessment Required
			woodland, sub-alpine woodland, edges of rainforests and sandstone outcrop country.			
Charadrius bicinctus	Double-banded Plover	Mar, M	Non-breeding season, it is common in eastern and southern Australia. Breeds only in New Zealand,	0	Unlikely - lack of suitable habitat for this species within the subject land.	No
Charadrius leschenaultii	Greater Sand Plover	V, M, Mar	Favours coastal areas including beaches, mudflats and mangroves where they forage. They may be seen roosting during high tide on sandy beaches or rocky shores.	0	Unlikely - lack of suitable habitat for this species within the subject land.	No
Charadrius mongolus	Lesser Sand Plover	E	Favours coastal areas including beaches, mudflats and mangroves where they forage. They may be seen roosting during high tide on sandy beaches or rocky shores.	0	Unlikely - lack of suitable habitat for this species within the subject land.	No
Chelonia mydas	Green Turtle	V	Occurs in coastal waters of NSW, where it is generally seen on the north or central coast, with occasional records from the south coast.	0	No - lack of suitable habitat for this species within the subject land, no local records.	No
Climacteris picumnus victoriae	Brown Treecreeper (south-eastern)	V	Endemic to eastern Australia and occurs in eucalypt forests and woodlands of inland plains and slopes of the Great Dividing Range.	0	No - lack of suitable habitat for this species within the subject land, no local records.	No
Cuculus optatus	Oriental Cuckoo	M	Non-breeding season (Sept- May) in coastal regions across northern and eastern Australia as well as offshore islands. The species uses a range of vegetated habitats such as monsoon rainforest, wet sclerophyll forest, open	0	No - lack of suitable habitat for this species within the subject land, no local records.	No

Scientific name	Common Name	EPBC Act Status	Distribution and Habitat	Number of Records within 5 km	Likelihood of Occurrence	Impact Assessment Required
			woodlands and appears quite often along edges of forests, or ecotones between forest types.			
Dasyornis brachypterus	Eastern Bristlebird	E	A small ground dwelling bird which favours dense ground or understory vegetation.	0	No - lack of suitable habitat for this species within the subject land, no local records.	No
Dasyurus maculatus	Spotted-tailed Quoll	E	Found in Eastern NSW, habitat types include rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline.	4	Unlikely - lack of suitable habitat for this species within the subject land.	No
Dermochelys coriacea	Leatherback Turtle	E	Found in tropical and temperate waters, this species feeds in coastal waters from southern Queensland to the central coast of NSW.	1	Unlikely - lack of suitable habitat for this species within the subject land.	No
Diomedea antipodensis	Antipodean Albatross	V, M, Mar	The Antipodean Albatross is marine, pelagic and aerial. It is endemic to New Zealand, however forages on cephalopods, fish and crustaceans in open water in the south-west Pacific Ocean, Southern Ocean and the Tasman Sea, notably off the coast of NSW.	0	No - lack of suitable habitat for this species within the subject land, no local records.	No
Diomedea antipodensis gibsoni	Gibson's Albatross	V, M, Mar	The Gibson's Albatross is marine, pelagic and aerial. It is endemic to New Zealand, however forages on cephalopods, fish and crustaceans in open water in the south-west Pacific Ocean, Southern Ocean and the Tasman Sea, notably off the coast of NSW.	0	No - lack of suitable habitat for this species within the subject land, no local records.	No

Scientific name	Common Name	EPBC Act Status	Distribution and Habitat	Number of Records within 5 km	Likelihood of Occurrence	Impact Assessment Required
Diomedea epomophora	Southern Royal Albatross	V	The Southern Royal Albatross is marine and pelagic. During the non-breeding season, it has a wide and possibly circumpolar distribution, ranging north to about 35°S. It is moderately common throughout the year in offshore waters of southern Australia, mostly off south-eastern NSW, Victoria and Tasmania. It has been observed where the water surface temperature is 6 to 20°C.	0	No - lack of suitable habitat for this species within the subject land, no local records.	No
Diomedea exulans	Wandering Albatross	E	The Wandering Albatross is marine, pelagic and aerial. It occurs where water surface temperatures range from -2° to 24°C. In the Australasian region, it occurs inshore, offshore and in pelagic waters.	0	No - lack of suitable habitat for this species within the subject land, no local records.	No
Diomedea sanfordi	Northern Royal Albatross	E	This species breeds on Chatham Island and Taiaroa Head on the South Island of New Zealand. It can be found in open waters off SE Australia.	0	No - lack of suitable habitat for this species within the subject land, no local records.	No
Epinephelus daemelii	Black Rockcod, Black Cod, Saddled Rockcod	V, Mar	Found in warm temperate and subtropical parts of the south-western Pacific. In NSW, it occurs along the coast. Inhabits caves, gutters and crevices. Usually found in depths up to 50 m, although individuals have been collected from below 100 m. Juveniles are found inshore, often in coastal rockpools and estuaries.	0	No - lack of suitable habitat for this species within the subject land, no local records.	No
Eretmochelys imbricata	Hawksbill Turtle	V, M, Mar	Forages over coral reefs, rock outcroppings, and seagrass beds. In Australia the hawksbill turtle is found along the tropical coasts of northern and eastern Australia, from mid-western Western Australia to southern Queensland.	0	Unlikely - lack of suitable habitat for this species within the subject land.	No

Scientific name	Common Name	EPBC Act Status	Distribution and Habitat	Number of Records within 5 km	Likelihood of Occurrence	Impact Assessment Required
Erythrotriorchis radiatus	Red Goshawk	V	Very rare in NSW, extending south to about 30°S, with most records north of this. inhabit open woodland and forest, preferring a mosaic of vegetation types, a large population of birds as a source of food, and permanent water, and are often found in riparian habitats along or near watercourses or wetlands.	0	Unlikely - lack of suitable habitat for this species within the subject land.	No
Eubalaena australis	Southern Right Whale	E, M	Seasonally present along the Australian coast between late April and early November. Concentrates in certain areas to breed	2	Unlikely – too close to shore.	No
Falco hypoleucos	Grey Falcon	V	Occurs in arid environments including acacia shrublands and near timbered lowland plains and watercourses.	0	Unlikely - lack of suitable habitat for this species within the subject land.	No
Fregata ariel	Lesser Frigatebird	Mar, M	Found throughout tropical waters in the Indian, west and central Pacific Oceans. The Lesser Frigatebird breeds on small, remote tropical and sub-tropical islands, in mangroves or bushes, and even on bare ground. Outside the breeding season it is sedentary, with immature and non-breeding individuals dispersing throughout tropical seas, especially of the Indian and Pacific Oceans	0	No - lack of suitable habitat for this species within the subject land, no local records.	No
Fregata minor	Fregata minor	Mar, M	Major breeding populations are found in tropical waters of the Pacific and Indian Oceans. The Great Frigatebird breeds on small, remote tropical and sub-tropical islands, in mangroves or bushes and occasionally on bare ground.	0	No - lack of suitable habitat for this species within the subject land, no local records.	No

Scientific name	Common Name	EPBC Act Status	Distribution and Habitat	Number of Records within 5 km	Likelihood of Occurrence	Impact Assessment Required
Fregetta grallaria	White-bellied Storm Petrel	V	In Australia, it breeds on offshore islands in the Lord Howe Island group.	0	No - lack of suitable habitat for this species within the subject land, no local records.	No
Gallinago hardwickii	Latham's Snipe	Mar, M	Non-breeding visitor to south-eastern Australia. Usually inhabit open, freshwater wetlands with low, dense vegetation.	8	Unlikely - lack of suitable habitat for this species within the subject land.	No
Glossopsitta pusilla	Little Lorikeet	-	In NSW, found from the coast westward as far as Dubbo and Albury. Dry, open eucalypt forests and woodlands, including remnant woodland patches and roadside vegetation.	2	Unlikely - lack of suitable habitat for this species within the subject land.	No
Grantiella picta	Painted Honeyeater	V	Widely distributed in NSW, predominantly on the inland side of the Great Dividing Range but avoiding arid areas. Boree, Brigalow and Box-Gum Woodlands and Box-Ironbark Forests.	0	No - lack of suitable habitat for this species within the subject land, no local records.	No
Haliaeetus leucogaster	White-bellied Sea-Eagle	Mar	Distributed along the coastline of mainland Australia and Tasmania, extending inland along some of the larger waterways, especially in eastern Australia. Freshwater swamps, rivers, lakes, reservoirs, billabongs, saltmarsh and sewage ponds and coastal waters. Terrestrial habitats include coastal dunes, tidal flats, grassland, heathland, woodland, forest and urban areas.	33	Unlikely - lack of suitable habitat for this species within the subject land.	No
Heleioporus australiacus	Giant Burrowing Frog	V	South eastern NSW and Victoria, in two distinct populations: a northern population in the sandstone geology of the Sydney Basin as far south as Ulladulla, and a southern population occurring from north of Narooma through to Walhalla, Victoria. Heath, woodland and open	0	No - lack of suitable habitat for this species within the subject land, no local records.	No

Scientific name	Common Name	EPBC Act Status	Distribution and Habitat	Number of Records within 5 km	Likelihood of Occurrence	Impact Assessment Required
			dry sclerophyll forest on a variety of soil types except those that are clay based.			
Hippocampus whitei	**White's Seahorse, Crowned Seahorse, Sydney Seahorse**	**E**	**Known to occur in eight estuaries on the NSW Coast, but is most abundant in Port Stephens, Sydney Harbour and Port Hacking. Utilises natural habitats such as sponge gardens, seagrass meadows and soft corals. It is also known to use artificial habitats such as protective swimming net enclosures and jetty pylons.**	**0**	**Potential – macroalgae in sheltered areas may provide habitat for this species and will be impacted by the development.**	**Yes – assessed in Bank Street Park – Marine Ecology Assessment (2023)**
Hirundapus caudacutus	White-throated Needletail	V,M	All coastal regions of NSW, inland to the western slopes and inland plains of the Great Divide. Occur most often over open forest and rainforest, as well as heathland, and remnant vegetation in farmland.	0	No - lack of suitable habitat for this species within the subject land, no local records.	No
Hoplocephalus bungaroides	Broad-headed Snake	V	Largely confined to Triassic and Permian sandstones within the coast and ranges in an area within approximately 250 km of Sydney. Dry and wet sclerophyll forests, riverine forests, coastal heath swamps, rocky outcrops, heaths, grassy woodlands.	0	No - lack of suitable habitat for this species within the subject land, no local records.	No
Hydroprogne caspia	Caspian Tern	Mar, M	Found in both coastal and inland habitat in sheltered coastal embayments (harbours, lagoons, inlets, bays, estuaries and river deltas) and those with sandy or muddy margins are preferred.	1	Unlikely - lack of suitable habitat for this species within the subject land.	No

Scientific name	Common Name	EPBC Act Status	Distribution and Habitat	Number of Records within 5 km	Likelihood of Occurrence	Impact Assessment Required
Isoodon obesulus obesulus	Southern Brown Bandicoot (eastern)	E	Found in south-eastern NSW, east of the Great Dividing Range south from the Hawkesbury River. Heath or open forest with a heathy understorey on sandy or friable soils.	0	No - lack of suitable habitat for this species within the subject land, no local records.	No
Lagenorhynchus obscurus	Dusky Dolphin	Cetacean, M	Occur across southern Australia from Western Australia to Tasmania	0	Unlikely – too close to shore	No
Lamna nasus	Porbeagle	M	In Australia, the species occurs in waters from southern Queensland to south-west Australia. Animals typically occur in oceanic waters off the continental shelf, although they occasionally enter coastal waters.	0	No - lack of suitable habitat for this species within the subject land, no local records.	No
Lathamus discolor	Swift Parrot	CE	Migrates from Tasmania to mainland in Autumn-Winter. In NSW, the species mostly occurs on the coast and southwest slopes. Box-ironbark forests and woodlands.	3	Potential – a small number of flowering eucalypt trees are present; these may provide very marginal foraging habitat	No
Limosa lapponica baueri	**Bar-tailed Godwit**	**V**	**Summer migrant to Australia. Widespread along the coast of NSW, including the offshore islands. Also numerous scattered inland records. Intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons, bays, seagrass beds, saltmarsh, sewage farms and saltworks, saltlakes and brackish wetlands near coasts, sandy ocean beaches, rock platforms, and coral reef-flats. Rarely inland wetlands, paddocks and airstrips.**	**1**	**Potential - lack of suitable habitat for this species within the subject land. However, part of the subject land is mapped as Important Area for Migratory Shorebirds**	**Yes**
Limosa limosa	Black-tailed Godwit	M	A non-breeding migrant from Mongolia/ Eastern Siberia. It prefers sheltered bays, estuaries and lagoons with intertidal mudflats or sandflats.	0	No - lack of suitable habitat for this species within the subject land, no local records.	No

Scientific name	Common Name	EPBC Act Status	Distribution and Habitat	Number of Records within 5 km	Likelihood of Occurrence	Impact Assessment Required
Litoria aurea	Green and Golden Bell Frog	V	Since 1990, recorded from ~50 scattered sites within its former range in NSW, from the north coast near Brunswick Heads, south along the coast to Victoria. Records exist west to Bathurst, Tumut and the ACT region. Marshes, dams and stream-sides, particularly those containing Typha spp. (bullrushes) or Eleocharis spp. (spikerushes). Some populations occur in highly disturbed areas.	5	Unlikely - lack of suitable habitat for this species within the subject land.	No
Macquaria australasica	Macquarie Perch	E	Within NSW, considered isolated to the upper reaches of the Lachlan and Murrumbidgee Rivers in southern NSW. Riverine, schooling species. It prefers clear water and deep, rocky holes with lots of cover.	0	No - lack of suitable habitat for this species within the subject land, no local records.	No
Macronectes giganteus	Southern Giant-Petrel	E, M, Mar	The Southern Giant-Petrel is marine bird that occurs in Antarctic to subtropical waters. It possibly concentrates north of 50° S in winter, as it is rare in waters of the southern Indian Ocean, but common off South America, South Africa, Australia and New Zealand. It occurs in both pelagic and inshore waters.	0	No - lack of suitable habitat for this species within the subject land, no local records.	No
Macronectes halli	Northern Giant-Petrel	V, M, Mar	The Northern Giant-Petrel is marine and oceanic. Visits areas off the Australian mainland mainly during the winter months (May-October). Immature and some adult birds are commonly seen during this period in offshore and inshore waters from around Fremantle (WA) to around Sydney (NSW).	0	No - lack of suitable habitat for this species within the subject land, no local records.	No
Melanodryas cucullata cucullata	South-eastern Hooded Robin	E	Prefers lightly wooded country, usually open eucalypt woodland, acacia scrub and mallee, often in or near clearings or open areas.	0	No - lack of suitable habitat for this species	No

Scientific name	Common Name	EPBC Act Status	Distribution and Habitat	Number of Records within 5 km	Likelihood of Occurrence	Impact Assessment Required
					within the subject land, no local records.	
Meridolum maryae	Maroubra Woodland Snail, Maroubra Land Snail	E	Confined to a narrow band of habitat along the coast from the north-eastern corner of the Royal National Park to Palm Beach in Sydney. Found in the leaf litter of coastal vegetation communities, most commonly in heathland on foredunes	0	No - lack of suitable habitat for this species within the subject land, no local records.	No
Mixophyes balbus	Stuttering Frog	V	Along the east coast of Australia from southern Qld to north-eastern Victoria. Rainforest and wet, tall open forest in the foothills and escarpment on the eastern side of the Great Dividing Range.	0	No - lack of suitable habitat for this species within the subject land, no local records.	No
Mobula alfredi	Reef Manta Ray	M	Occurs in tropical and subtropical parts of the Indo-Pacific.	0	Unlikely – no recent records and unlikely to regularly use the area.	No
Mobula birostris	Giant Manta Ray	M	Widespread distribution in tropical and temperate waters worldwide	0	Unlikely – no recent records and unlikely to regularly use the area.	No
Monarcha melanopsis	Black-faced Monarch	Mar, M	Mainly occurs in rainforest ecosystems, including semi-deciduous vine-thickets, complex notophyll vine-forest, tropical (mesophyll) rainforest, subtropical (notophyll) rainforest, mesophyll (broadleaf) thicket/shrubland, warm temperate rainforest, dry (monsoon) rainforest and (occasionally) cool temperate rainforest	0	No - lack of suitable habitat for this species within the subject land, no local records.	No
Motacilla flava	Yellow Wagtail	Mar, M	Regular wet season visitor to northern Australia. Increasing records in NSW suggest this species is an occasional but regular summer visitor to the Hunter River region. Habitat typically includes open grassy flats near water.	0	Unlikely – outside of known distribution, no local records.	No

Scientific name	Common Name	EPBC Act Status	Distribution and Habitat	Number of Records within 5 km	Likelihood of Occurrence	Impact Assessment Required
Myiagra cyanoleuca	Satin Flycatcher	Mar, M	Eucalypt forest and woodland inhabitants. They are particularly common in tall wet sclerophyll forest, often in gullies or along water courses.	0	No - lack of suitable habitat for this species within the subject land, no local records.	No
Natator depressus	Flatback Turtle	V, M, Mar	Feeds in the northern coastal regions of Australia, extending as far south as the Tropic of Capricorn. Has a preference for shallow, soft-bottomed seabed habitats away from reefs.	0	Unlikely - lack of suitable habitat for this species within the subject land, no local records.	No
Neophema chrysogaster	Orange-bellied Parrot	CE	This species breeds in south-west Tasmania in summer and winters in south-east mainland Australia. In NSW it inhabits coastal habitats including saltmarsh, coastal dunes.	0	No - lack of suitable habitat for this species within the subject land, no local records.	No
Neophema chrysostoma	Blue-winged Parrot	V, Mar	Range of habitats from coastal, sub-coastal and inland areas, through to semi-arid zones. They tend to favour grasslands and grassy woodlands and are often found near wetlands both near the coast and in semi-arid zones.	0	Unlikely - lack of suitable habitat for this species within the subject land, no local records.	No
Notamacropus parma	Parma Wallaby	V	Their range is now confined to the coast and ranges of central and northern NSW from the Gosford district to south of the Bruxner Highway between Tenterfield and Casino. Habitat is comprised of moist eucalypt forest with thick, shrubby understorey, often with nearby grassy areas, rainforest margins and occasionally drier eucalypt forest.	0	No - lack of suitable habitat for this species within the subject land, no local records.	No

Scientific name	Common Name	EPBC Act Status	Distribution and Habitat	Number of Records within 5 km	Likelihood of Occurrence	Impact Assessment Required
Numenius madagascariensis	Eastern Curlew	CE, M	Summer migrant to Australia. Primarily coastal distribution in NSW, with some scattered inland records. Estuaries, bays, harbours, inlets and coastal lagoons, intertidal mudflats or sandflats, ocean beaches, coral reefs, rock platforms, saltmarsh, mangroves, freshwater/brackish lakes, saltworks and sewage farms.	0	Unlikely - lack of suitable habitat for this species within the subject land, no local records.	No
Numenius phaeopus	Whimbrel	Mar, M	Often found on the intertidal mudflats of sheltered coasts. It is also found in harbours, lagoons, estuaries and river deltas, often those with mangroves, but also open, unvegetated mudflats.	0	Unlikely - lack of suitable habitat for this species within the subject land, no local records.	No
Pachyptila turtur subantarctica	Fairy Prion	V	Breeds on Macquarie Island and a number of other subantarctic islands outside of Australia. Some individuals may migrate towards New Zealand and southern Australia in winter.	0	No - lack of suitable habitat for this species within the subject land, no local records.	No
Pandion haliaetus	Osprey	Mar, M	Occur in littoral and coastal habitats and terrestrial wetlands of tropical and temperate Australia and offshore islands.	0	Unlikely - lack of suitable habitat for this species within the subject land, no local records.	No
Petauroides volans	Greater Glider	E	In Eastern Australia, it is found from the Windsor Tableland in north Queensland through to central Victoria (Wombat State Forest). Eucalypt forests and woodlands. It is typically found in highest abundance in taller, montane, moist eucalypt forests with relatively old trees and abundant hollows.	0	No - lack of suitable habitat for this species within the subject land, no local records.	No

Scientific name	Common Name	EPBC Act Status	Distribution and Habitat	Number of Records within 5 km	Likelihood of Occurrence	Impact Assessment Required
Petaurus australis australis	Yellow-bellied Glider (south-eastern)	V	Along the eastern coast to the western slopes of the Great Dividing Range, from southern Queensland to Victoria. Occurs in tall mature eucalypt forest generally in areas with high rainfall and nutrient rich soils.	0	No - lack of suitable habitat for this species within the subject land, no local records.	No
Phaethon lepturus	White-tailed Tropicbird	Mar, M	The species is most common off North West Australia and a rare visitor to the Coral Sea and east coast. The species is primarily oceanic in tropical waters, rarely inshore, and only is near land when breeding. Nests are located on islands and atolls.	0	No - lack of suitable habitat for this species within the subject land, no local records.	No
Phascolarctos cinereus	Koala	E	In NSW it mainly occurs on the central and north coasts with some populations in the west of the Great Dividing Range. There are sparse and possibly disjunct populations in the Bega District, and at several sites on the southern tablelands. Eucalypt woodlands and forests.	8	Unlikely - lack of suitable habitat for this species within the subject land.	No
Philomachus pugnax	Ruff	Mar, M	Found on generally fresh, brackish of saline wetlands with exposed mudflats at the edges. It is found in terrestrial wetlands including lakes, swamps, pools, lagoons, tidal rivers, swampy fields and floodlands.	0	Unlikely - lack of suitable habitat for this species within the subject land, no local records.	No
Pluvialis fulva	Pacific Golden Plover	Mar, M	In non-breeding grounds in Australia this species usually inhabits coastal habitats, though it occasionally occurs around inland wetlands. Pacific Golden Plovers usually occur on beaches, mudflats and sandflats (sometimes in vegetation such as mangroves, low saltmarsh such as Sarcocornia, or beds of seagrass) in sheltered areas including harbours, estuaries and lagoons, and also in evaporation ponds in	0	Unlikely - lack of suitable habitat for this species within the subject land, no local records.	No

Scientific name	Common Name	EPBC Act Status	Distribution and Habitat	Number of Records within 5 km	Likelihood of Occurrence	Impact Assessment Required
			saltworks. Key breeding population breeds in Alaska.			
Pluvialis squatarola	Grey Plover	Mar, M	In non-breeding grounds in Australia, Grey Plovers occur almost entirely in coastal areas, where they usually inhabit sheltered embayments, estuaries and lagoons with mudflats and sandflats. Breed in Siberia, Alaska and Canada.	1	Unlikely - lack of suitable habitat for this species within the subject land.	No
Prototroctes maraena	Australian Grayling	V	Very little is known about the specific environmental requirements or habitats occupied during the estuarine or marine phase of the life cycle as very few specimens have been collected.	0	Unlikely – no records of this species in catchment.	No
Pseudomys novaehollandiae	New Holland Mouse	V	Fragmented distribution across eastern NSW. Open heathlands, woodlands and forests with a heathland understorey, vegetated sand dunes.	0	No - lack of suitable habitat for this species within the subject land, no local records.	No
Pterodroma leucoptera leucoptera	Gould's Petrel	E	Marine vagrant	0	No - lack of suitable habitat for this species within the subject land, no local records.	No
Pterodroma neglecta neglecta	Kermadec Petrel	V	Marine vagrant.	0	No - lack of suitable habitat for this species within the subject land, no local records.	No
Pteropus poliocephalus	Grey-headed Flying-fox	V	Along the eastern coast of Australia, from Bundaberg in Qld to Melbourne in Victoria. Subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops.	1101	Potential – marginal foraging habitat for this species including flowering *Eucalyptus* spp. and *Ficus* spp.	No

Scientific name	Common Name	EPBC Act Status	Distribution and Habitat	Number of Records within 5 km	Likelihood of Occurrence	Impact Assessment Required
Pycnoptilus floccosus	Pilotbird	V	Marine vagrant	0	No - lack of suitable habitat for this species within the subject land, no local records.	No
Rhincodon typus	Whale Shark	V, M, Mar	In Australia, Whale Sharks occur mainly off northern Australia, with patchy records from other states.	0	No - lack of suitable habitat for this species within the subject land, no local records.	No
Rhipidura rufifrons	Rufous Fantail	Mar, M	Mainly inhabits wet sclerophyll forests, often in gullies dominated by eucalypts.	0	No - lack of suitable habitat for this species within the subject land, no local records.	No
Rostratula australis	Australian Painted Snipe	E	In NSW most records are from the Murray-Darling Basin. Other recent records include wetlands on the Hawkesbury River and the Clarence and lower Hunter Valleys. Swamps, dams and nearby marshy areas.	0	No - lack of suitable habitat for this species within the subject land, no local records.	No
Stagonopleura guttata	Diamond Firetail	V	Endemic to south-eastern Australia, extending from central Queensland to the Eyre Peninsula in South Australia. Found in grassy eucalypt woodlands, including Box-Gum Woodlands and Snow Gum Eucalyptus pauciflora Woodlands.	0	Unlikely - lack of suitable habitat for this species within the subject land, no local records.	No
Sterna hirundo	Common Tern	Mar, M	Marine, pelagic and coastal. In Australia, they are recorded in all marine zones, but are commonly observed in near-coastal waters, both on ocean beaches, platforms and headlands and in sheltered waters, such as bays, harbours and estuaries with muddy, sandy or rocky shores.	1	Potential -marginal habitat occurs within the subject land, One local record.	Yes

Scientific name	Common Name	EPBC Act Status	Distribution and Habitat	Number of Records within 5 km	Likelihood of Occurrence	Impact Assessment Required
Sternula albifrons	Littler Tern	M	Breeds in spring and summer along east coast from Tasmania to northern Queensland. Prefers sheltering environments near inlets and rivers.	1	Unlikely - lack of suitable habitat for this species within the subject land, no local records.	No
Sternula nereis nereis	Australian Fairy Tern	V	Marine vagrant which rarely visits east coast of Australia.	0	Unlikely - lack of suitable habitat for this species within the subject land, no local records.	No
Symposiachrus trivirgatus	Spectacled Monarch	Mar, M	All sub-species occupy dense vegetation, mainly in rainforest but also in moist or wet sclerophyll forest and occasionally in other densely vegetated habitats such as mangroves, drier forest, woodlands, parks and gardens.	0	Unlikely - lack of suitable habitat for this species within the subject land, no local records.	No
Thalassarche bulleri	Buller's Albatross	V, M, Mar	This species breeds in New Zealand but regularly visits Australian marine waters.	0	Unlikely - lack of suitable habitat for this species within the subject land, no local records.	No
Thalassarche bulleri platei	Northern Buller's Albatross	V, M, Mar	This species is a non-breeding visitor to Australian waters. This species is mostly limited to the Pacific Ocean and Tasman Sea and not the east coast of Australia mainland.	0	Unlikely - lack of suitable habitat for this species within the subject land, no local records.	No
Thalassarche carteri	Indian Yellow-nosed Albatross	V, M, Mar	Marine vagrant	0	Unlikely - lack of suitable habitat for this species within the subject land, no local records.	No

Scientific name	Common Name	EPBC Act Status	Distribution and Habitat	Number of Records within 5 km	Likelihood of Occurrence	Impact Assessment Required
Thalassarche cauta	Shy Albatross	E, M, Mar	Commonly recorded off southeast NSW, particularly between July and November. This species inhabits subantarctic and subtropical marine waters, spending the majority of its time at sea.	0	Unlikely - lack of suitable habitat for this species within the subject land, no local records.	No
Thalassarche eremita	Chatham Albatross	E, M, Mar	Marine vagrant	0	Unlikely - lack of suitable habitat for this species within the subject land, no local records.	No
Thalassarche impavida	Campbell Albatross	V, M, Mar	This species is a non-breeding migrant to Australian waters. Forages in temperate waters.	0	Unlikely - lack of suitable habitat for this species within the subject land, no local records.	No
Thalassarche melanophris	Black-browed Albatross	V, M, Mar	Commonly occurring in southern Australian waters in winter. Breeds on offshore Islands off southern Australia including Heard Is, Macquarie Is and McDonald Is, to name a few. It is a marine specialist foraging for fish, crustaceans and squid in Antarctic, subantarctic and temperate waters.	0	Unlikely - lack of suitable habitat for this species within the subject land, no local records.	No
Thalassarche salvini	Salvin's Albatross	V, M, Mar	The Salvin's Albatross is a non-breeding visitor to Australian waters.	0	Unlikely - lack of suitable habitat for this species within the subject land, no local records.	No
Thalassarche steadi	White-capped Albatross	V, M, Mar	This species breeds predominately in New Zealand. It may forage in marine waters off eastern mainland Australia.	0	Unlikely - lack of suitable habitat for this species within the	No

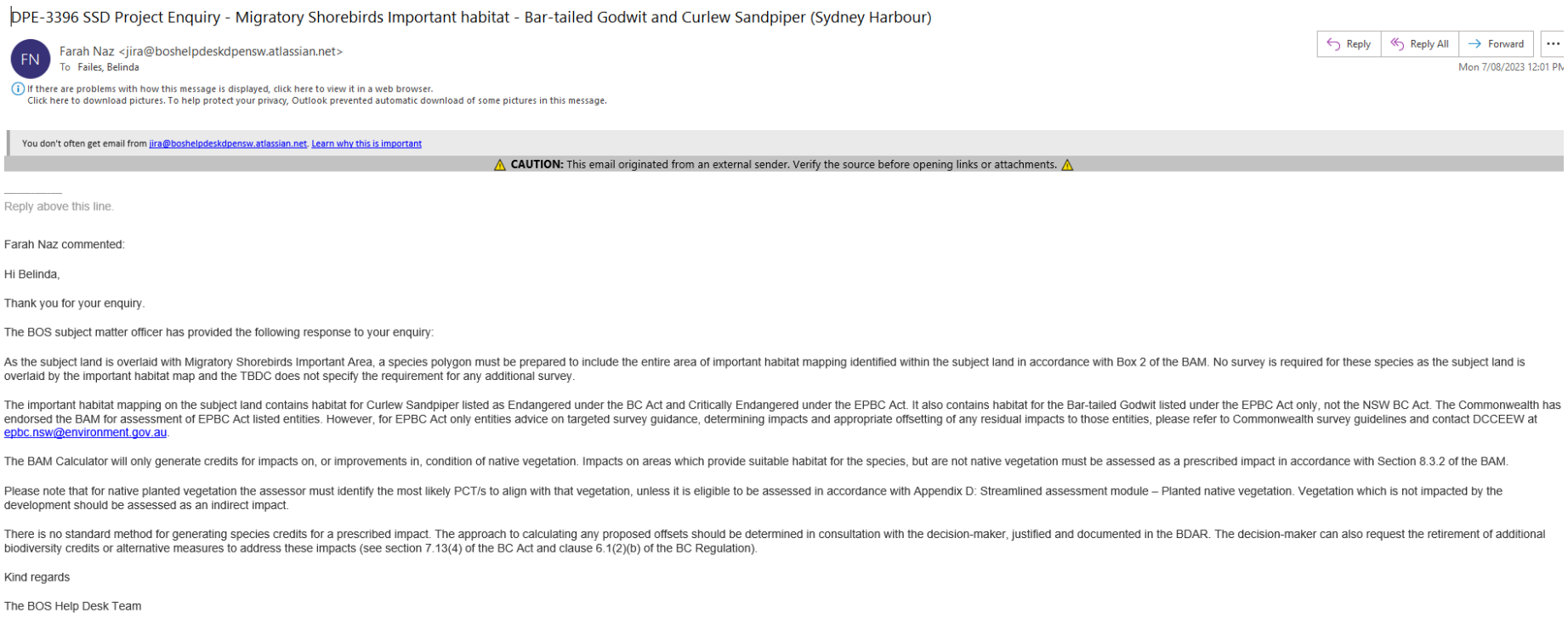
Scientific name	Common Name	EPBC Act Status	Distribution and Habitat	Number of Records within 5 km	Likelihood of Occurrence	Impact Assessment Required
					subject land, no local records.	
Thalasseus bergii	Greater Crested Tern	Mar, M	The species breeds in subtropical coastal parts of the world mainly from the Red Sea across the Indian Ocean to the western Pacific, and Australia, with a significant population on the southern coast of the Mediterranean, on two islands off the coast of Libya.	26	Unlikely - lack of suitable habitat for this species within the subject land.	No
Tringa brevipes	Grey-tailed Tattler	Mar, M	Migratory and winter on muddy and sandy coasts from southeast Asia to Australia.	0	Unlikely - lack of suitable habitat for this species within the subject land, no local records.	No
Tringa stagnatilis	Marsh Sandpiper	Mar, M	Lives in permanent or ephemeral wetlands of varying salinity, including swamps, lagoons, billabongs, saltpans, saltmarshes, estuaries, pools on inundated floodplains, and intertidal mudflats and also regularly at sewage farms and saltworks.	0	Unlikely - no local records.	No

Appendix C: Vegetation plot data

Scientific	Common name	Native / Exotic	Stratum	Cover	Abundance
Acacia longifolia	Sunshine wattle	Native, planted in garden	M	3	4
Acacia spp.	Unknown	Native, planted in garden	M	0.5	3
Angophora costata	Sydney Red Gum	Native sapling planted in garden	M	0.3	3
Anredera cordifolia	Potato Vine	Exotic	G	0.1	3
Bidens pilosa	Cobblers Peg	Exotic	G	0.1	3
Bromus catharticus	Praire Grass	Exotic	G	0.2	10
Callistemon citrinus	Weeping Bottlebrush	Native, planted in garden	M	0.5	2
Celtis sinensis	Celtis	Exotic	M	5	8
Cenchrus clandestinus	Kikuyu Grass	Exotic	G	10	100
Commelina cyanea	Native trad	Native	G	0.1	1
Correa reflexa	-	Native	M	0.3	5
Cupaniopsis anacardioides	Tuckeroo	Native, planted in garden	M	0.2	1
Cynodon dactylon	Couch	Native	G	25	100
Digitaria ciliaris	-	Exotic	G	0.2	10
Echinopogon ovatus	Hedgehog Grass	Native, planted in garden	G	0.1	1
Ehrharta erecta	-	Exotic	G	10	100
Ficus rubiginosa	Port Jackson Fig	Native, self-seeded	U	20	3
Gamochaeta calviceps	Cudweed	Exotic	G	0.1	6
Hypochaeris radicata	Catsear	Exotic	G	0.1	10
Kunzea ambigua	Tickbush	Native, planted in garden	M	0.1	1
Lantana camara	Lantana	Exotic	M	0.3	2
Leptospermum laevigatum	Rough-barked Teatree	Native, planted in garden	M	0.1	1
Melaleuca armillaris	-	Native, planted in garden	M	0.2	2
Melaleuca hypericifolia	-	Native, planted in garden	M	0.2	2

Scientific	Common name	Native / Exotic	Stratum	Cover	Abundance
Melaleuca styphelioides	Prickly-leaf Teatree	Native, planted in garden	M	0.1	1
Microlaena stipoides	Weeping Grass	Native	G	0.1	1
Oxalis corniculata	-	Exotic	G	0.1	10
Parietaria judaica	Asthma Weed	Exotic	G	20	100
Pittosporum undulatum	Sweet Pittosporum	Native, self-seeded	M	5	5
Plantago lanceolata	Lamb's Tongue	Exotic	G	0.2	10
Soliva sessilis	Bindi	Exotic	G	0.1	10
Stellaria media	Chickweed	Exotic	G	0.1	10
Syncarpia glomulifera	Turpentine	Native, planted in garden	M	0.1	1
Syzygium spp.	Lilly-Pilly	Native, planted in garden	M	0.2	1
Tradescantia fluminensis	Trad	Exotic	G	20	500
Trifolium repens	Clover	Exotic	G	0.1	10
Verbena bonariensis	-	Exotic	G	0.1	1

Appendix D: BOS helpdesk response to PCTs and Important Habitat mapping



DPE-3396 SSD Project Enquiry - Migratory Shorebirds Important habitat - Bar-tailed Godwit and Curlew Sandpiper (Sydney Harbour)

FN Farah Naz <jira@boshelpdeskdpensw.atlassian.net>
To Failes, Belinda

Reply | Reply All | Forward | ...
Mon 7/08/2023 12:01 PM

If there are problems with how this message is displayed, click here to view it in a web browser.
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⚠ **CAUTION:** This email originated from an external sender. Verify the source before opening links or attachments. ⚠

Reply above this line.

Farah Naz commented:

Hi Belinda,

Thank you for your enquiry.

The BOS subject matter officer has provided the following response to your enquiry:

As the subject land is overlaid with Migratory Shorebirds Important Area, a species polygon must be prepared to include the entire area of important habitat mapping identified within the subject land in accordance with Box 2 of the BAM. No survey is required for these species as the subject land is overlaid by the important habitat map and the TBDC does not specify the requirement for any additional survey.

The important habitat mapping on the subject land contains habitat for Curlew Sandpiper listed as Endangered under the BC Act and Critically Endangered under the EPBC Act. It also contains habitat for the Bar-tailed Godwit listed under the EPBC Act only, not the NSW BC Act. The Commonwealth has endorsed the BAM for assessment of EPBC Act listed entities. However, for EPBC Act only entities advice on targeted survey guidance, determining impacts and appropriate offsetting of any residual impacts to those entities, please refer to Commonwealth survey guidelines and contact DCCEEW at epbc.nsw@environment.gov.au.

The BAM Calculator will only generate credits for impacts on, or improvements in, condition of native vegetation. Impacts on areas which provide suitable habitat for the species, but are not native vegetation must be assessed as a prescribed impact in accordance with Section 8.3.2 of the BAM.

Please note that for native planted vegetation the assessor must identify the most likely PCT/s to align with that vegetation, unless it is eligible to be assessed in accordance with Appendix D: Streamlined assessment module – Planted native vegetation. Vegetation which is not impacted by the development should be assessed as an indirect impact.

There is no standard method for generating species credits for a prescribed impact. The approach to calculating any proposed offsets should be determined in consultation with the decision-maker, justified and documented in the BDAR. The decision-maker can also request the retirement of additional biodiversity credits or alternative measures to address these impacts (see section 7.13(4) of the BC Act and clause 6.1(2)(b) of the BC Regulation).

Kind regards

The BOS Help Desk Team

Appendix E: Microbat report

Ultrasonic bat call analysis report

Bank Street Park Ecological Assessment, Pyrmont

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DOCUMENT TRACKING

Project Name	Bank Street Park Ecological Assessment, Pyrmont
Project Number	23WOL5380
Project Manager	Belinda Failes
Prepared by	Kylie Lopes
Reviewed by	Dr Kristen Thompson
Approved by	Dr Kristen Thompson
Status	**Final**
Version Number	**V1**
Last saved on	**25 October 2023**

Contents

List of Tables

1. Background

The purpose of this project was to undertake targeted species surveys for 'species credit' insectivorous bats and to analyse ultrasonic bat call data collected to help determine whether a Biodiversity Development Assessment Report (BDAR) or BDAR waiver is required at the new Bank Street Park in Blackwattle Bay Precinct, Pyrmont NSW (the study area).

The following insectivorous bats are species credit species and require targeted surveys in accordance with the BAM 2020:

- *Chalinolobus dwyeri* (Large-eared Pied Bat)
- *Myotis macropus* (Southern Myotis)
- *Miniopterus australis* (Little Bent-winged Bat)
- *Miniopterus orianae oceanensis* (Large Bent-winged Bat)
- *Vespadelus troughtoni* (Eastern Cave Bat).

This survey was undertaken to:

- Identify the insectivorous bat species present at the site.
- Determine the presence of species credit insectivorous bat species.
- Analyse levels of activity of any target species identified.

This report outlines the methods used to undertake ultrasonic recording of insectivorous bat calls and the results of the data analysis.

2. Methods

2.1. Ultrasonic data collected at the study area

Four sites located around the Western Distributor Anzac Bridge in Pyrmont NSW were surveyed passively using Song Meter Mini Bats (Wildlife Acoustics) and Anabat Swifts (Titley Scientific) recording in wave sound (.WAV) file type. Detectors were deployed for four nights each from 4 October to 8 October 2023 inclusive, equating to a total of sixteen detector nights completed for this study (Table 1). The detectors were placed in locations adjacent to the structures of interest (minimum 10 m from buildings) to the north and south of the bridge. The survey effort, detector types and a description of detector locations are summarised in Table 1. Settings for each of the detectors are in Table 2.

A diurnal inspection of the potential roost sites was undertaken during June 2023 to assess potential roost activity (insectivorous bats or evidence of presence - guano/scats and bat fly casings) to help to determine the necessity and best placement of acoustic devices.

Table 1. Location of survey sites and information on data recorded at all sites.

Site ID	GPS location	Date start	Date end	No. detector nights	No. files	Habitat description
SMU08878	-33.867680, 151.187350	4/10/23	8/10/23	4	309	Located on the southern side of the western distributor Anzac bridge. Planted exotic and native vegetation with no hollow bearing trees. Very close to large water source (harbour) with urban roost features (culvert and older style buildings).
BRIS13	-33.869053, 151.187597	4/10/23	8/10/23	4	320	Located on the northern side of the Western Distributor Anzac Bridge. Planted exotic and native vegetation with no hollow bearing trees. Very close to large water source (harbour) with urban roost features (culvert and older style buildings).
SUT03	-33.869737, 151.187195	4/10/23	8/10/23	4	72	Located on the northern side of the Western Distributor Anzac Bridge. Planted exotic and native vegetation with no hollow bearing trees. Very close to large water source (harbour) with urban roost features (culvert and older style buildings).
SUT05	-33.868997, 151.187302	4/10/23	8/10/23	4	35	Located on the northern side of the Western Distributor Anzac Bridge. Planted exotic and native vegetation with no hollow bearing trees. Very close to large water source (harbour) with urban roost features (culvert and older style buildings).
TOTAL	-	-	-	16	736	-

Table 2. Settings for the four detectors deployed.

Site & Device ID	Make and model	Sensitivity / gain	Min. trigger freq. (kHz)	Min. event time (milliseconds)	Trigger window (seconds)	Max. file length (seconds)
SMU08878	Song Meter Mini Bat	12	16	1.5	3	15
BRIS13	Anabat Swift	12	10	2.0	2	10
SUT03	Anabat Swift	16	10	2.0	2	10
SUT05	Anabat Swift	12	10	2.0	2	10

2.2. Call analysis

Calls were analysed in Anabat Insight version 2.0.8-0-g4157d1f (Titley Scientific, 2023). Files were first run through the 'All Bats' filter to separate bat calls from noise files. Files that passed the 'All Bats' filter were processed through a region-specific decision tree which added a species label to files which passed specific parameters. Species were manually verified using the 'Bat calls of New South Wales' regional echolocation guide (Pennay et al., 2004) and the accompanying reference library of calls downloaded from the NSW Department of Environment and Planning website. Bat calls were analysed by Ecologist Kylie Lopes (Ecological Australia, ELA) with a subsample of calls reviewed by Senior Ecologist Dr Kristen Thompson (ELA).

2.2.1. General rules for bat call identification

Bat calls analysis uses species-specific call parameters including call shape, characteristic frequency, initial slope and time between pulses (Reinhold et al., 2001). To ensure reliable and accurate results, the following protocols (adapted from Lloyd et al., 2006) were followed:

- Call sequences not attributed to insectivorous bat calls (e.g. insect buzzes, wind, rain and anthropogenic noise) were dismissed from analysis,
- Recorded calls containing less than three pulses were not analysed and these sequences were labelled as unidentifiable, being too short to confidently determine the identity of the species producing the call (Law et al., 1999),
- Search phase calls were used in the analysis, rather than feeding buzzes or social calls (McKenzie et al., 2002). Feeding buzzes were only identified if there was sufficient search phase pulses before or after. Social calls are not typical of species and provide poor descriptive power and cannot be used for identification purposes.
- For those calls that are useful to identify the species making the call, two categories of confidence were used (Mills et al., 1996):
    - Present: the quality and structure of the call profile is such that the bat species may not be confused with other species,
    - Potentially present: the quality and structure of the call profile is such that the bat species may be confused with other species that produce similar call profiles.
- Call sequences of inferior quality and therefore not able to be identified to any bat species are labelled as unidentifiable but are included in quantification of overall bat activity.

2.2.2. Limitations of call analysis

Many insectivorous bat species produce calls that overlap in call profile parameters and depending on the call quality and type recorded (search phase, feeding buzz, social calls), cannot always be separated. Additionally, weather and climatic conditions affect the detectability of calls and the quality of those calls recorded. Calls were only positively identified to species when the defining characteristics were present and there was no chance of confusion between species with overlapping and / or similar calls. Calls that could not positively be identified to species level due to intermediate characteristics between multiple species were therefore given a species or genus complex.

2.3. Species of interest

Files were analysed for the presence of insectivorous bat species credit species (BAM 2020) shown in Table 3.

These species roost in primarily caves and similar habitat such as rocky overhangs and hollow bearing trees. However most have been known to utilise man-made structures including disused mineshafts, stormwater drains and culverts, bridges and buildings. These species forage in a variety of habitat types and have differing preferences (see Table 3) however all generally forage close to roosting habitat, and several are reliant on the presence of water and waterways.

Some of the target species can be difficult to distinguish definitively from other species by call alone. *Myotis macropus* (Southern Myotis) is rarely able to be positively identified from *Nyctophilus* species. They are often recorded as a species complex due to the call similarity and because they are known to inhabit similar foraging and roosting habitats. Sometimes they can be separated if call recordings are of a very high quality allowing for specific features within *Myotis macropus* calls to be seen (Pennay *et al*. 2004). *Chalinolobus dwyeri* calls may have overlapping characteristic frequency with *Saccolaimus flaviventris* between the 21 kHz – 23 kHz range but calls can easily be distinguished from other species by the combination of the low frequencies and distinct pattern of alternation present in search phase calls.

Miniopterus orianae oceanensis calls may overlap with *Vespadelus regulus* and *Vespadelus vulturnus*. *Miniopterus orianae oceanensis* can be distinguished if the calls have a down sweeping tail, long characteristic section and / or uneven consecutive pulses (Pennay *et al*. 2004). *Vespadelus troughtoni* calls overlap with *Chalinolobus morio* and *Vespadelus vulturnus*. *Vespadelus troughtoni* calls can be separated from *Chalinolobus morio* by having an up-sweeping tail, however *Vespadelus troughtoni* and *Vespadelus vulturnus* calls cannot be separated if both species distributions overlap (Pennay *et al*. 2004).

Table 3. Insectivorous bat species of interest, their conservation status and habitat.

Scientific name	Common name	BC Act status	EPBC Act status	Roost habitat	Foraging habitat
Chalinolobus dwyeri	Large-eared Pied Bat	Vulnerable	Vulnerable	Caves, crevices, mines and overhangs, occasionally disused tunnels and culverts. Commonly uses old Fairy Martin mud nests.	Close to roost habitat, well wooded areas with gullies. Aerial forager below the canopy and edge spaces.
Myotis macropus	Southern Myotis	Vulnerable	Not listed	Close to water in caves, mine shafts, under bridges, culverts and water channels and hollow bearing trees.	Forages over streams, pools and other water bodies.
Miniopterus australis	Little Bent-winged Bat	Vulnerable	Not listed	Caves, tunnels, tree hollows, mines, culverts, stormwater drains, bridges and sometimes buildings.	Forages beneath the canopy of densely vegetated areas.
Miniopterus orianae oceanensis	Large Bent-winged Bat	Vulnerable	Not listed	Primarily caves, will also use mines, storm water tunnels and culverts, buildings and other structures.	Forages in forested areas generally above the canopy. Open and edge space aerial forager.
Vespadelus troughtoni	Eastern Cave Bat	Vulnerable	Not listed	Uses caves, cliff overhangs and mine shafts.	Forages close to roost habitat along forest fringes and open woodland.

2.4. Bat activity

Files were analysed for bat activity across the four sites with a focus on the species of interest. Detectors were deployed for a total of 16 detector nights over four calendar nights so an analysis or comparison between different sites over time or seasons was not possible nor required for this project. Bat activity was determined as the total number of calls for a specified time period (e.g. per night).

2.5. Reporting

This report adheres to the standards outlined by the Australasian Bat Society Inc. for insectivorous bat surveys using bat detectors (Australasian Bat Society, 2006). Species taxonomic list and nomenclature adhere to Armstrong et al. (2020) noting that the common name for *Miniopterus orianae oceanensis* is listed as 'Eastern Bent-winged Bat', whereas the New South Wales Government Office of Environment and Heritage uses the common name 'Large Bent-winged Bat'. This report uses 'eastern bent-winged bat' as per Armstrong *et al*. (2020).

3. Results

A total of 736 files were analysed from four detectors recorded at Blackwattle Bay Precinct, Pyrmont NSW between 4 October 2023 and 8 October 2023, inclusive. Detectors were deployed at an appropriate time of year for these species.

3.1. Species occurrence

Bat species occurrence at all sites is shown in Table 4. No bat calls were identified from SUT03, all files from this site were either anthropogenic or insect noise, or other unidentifiable sounds. The other sites contained a variety of identifiable bat calls including potentially those from three of the species of interest. Call quality was subpar and made many calls indistinguishable from similar species, these are shown in Table 4 as species complexes. Representative calls for the species from this dataset are included in the Appendix.

Table 4. Occurrence of bat species at four sites in the study area. ✓ = species present, P = species potentially present.

Scientific name	SMU08878	SUT03	BRIS13	SUT05
Vespadelus regulus / Vespadelus darlingtoni / Miniopterus orianae oceanensis	✓	-	✓	✓
Myotis macropus / Nyctophilus spp.	✓	-	-	-
Ozimops ridei	✓	-	P	✓
Vespadelus regulus	✓	-	✓	✓
Miniopterus australis	-	-	-	✓

3.2. Bat activity

A total of 19 identifiable calls were recorded across all four detectors (Table 5). Of the 736 files recorded 538 were deemed to be 'noise' and did not pass the 'All Bats' filter. A sample set of these 'noise' files were checked to ensure that the filter was operating correctly and to confirm that no bat calls were being incorrectly removed due to the large proportion of files that did not pass the filter. These files were anthropogenic noise, insects and other non-identifiable sounds, no bat calls were found within the 'noise' files. A total of 198 files passed the 'All Bats' filter and were then sorted by characteristic frequency and given species labels based on these metrics. All files were manually checked and species adjusted and/or removed.

Table 5. Activity (number of calls) for species at each site. *potential call attributed to the species.

Scientific name	SMU08878	SUT03	BRIS13	SUT05
Vespadelus regulus / Vespadelus darlingtoni / Miniopterus orianae oceanensis	1	0	3	4
Myotis macropus / Nyctophilus spp.	1	0	0	0
Ozimops ridei	3	0	1*	2
Vespadelus regulus	1	0	1	1
Miniopterus australis	0	0	0	1

4. Discussion and conclusion

The aim of this project was to undertake targeted species surveys for 'species credit' insectivorous bats to help determine whether a BDAR or BDAR waiver is required at the new Bank Street Park in Blackwattle Bay Precinct, Pyrmont NSW. The call data from four detectors over 16 detector nights (736 files) was analysed to determine the presence of the following insectivorous bat species credit species: *Chalinolobus dwyeri* (Large-eared Pied Bat), *Myotis macropus* (Southern Myotis), *Miniopterus australis* (Little Bent-winged Bat), *Miniopterus orianae oceanensis* (Large Bent-winged Bat) and *Vespadelus troughtoni* (Eastern Cave Bat). This survey was undertaken to identify the insectivorous bat species present at the site, determine the presence of species credit insectivorous bat species and to analyse levels of activity of any target species identified.

It was found that one detector did not record any bat calls (SUT03), the reason for this was unable to be determined as the device settings appeared to be correct and comparable to the other devices. It may be due to the specific positioning of this detector where it picked up only other sounds that prevented it from recording bat calls. Detector SMU08878 was set with its trigger frequency at 16 kHz unlike the others which were set at 12 kHz, this may have had an effect on its ability to pick up on lower frequency species calls however would have been unlikely to affect its ability to detect the target species.

Of the 736 files recorded 538 were deemed to be 'noise' and 198 files passed the 'All Bats' filter and were checked for identifiable bat calls. Of the 198 potential files that passed through the filter only 19 were of a high enough quality that they were able to be identified to a species or species complex. Overall the call recording quality was poor and many potential calls that passed the filter were either deemed to not be bat calls at all or were too poor quality to identify with any certainty. All calls were checked by an additional analyst to ensure that there was no error in judgement due to the large numbers of unidentifiable sound files.

Despite the low numbers of identifiable calls three of the five species of interest were deemed to be present or potentially present within the four sites (see Appendix for call examples of these species). *Miniopterus australis* was positively identified to species level at site SUT05 and *Miniopterus orianae oceanensis* was potentially present at three of the sites but only able to be identified as part of a species complex with *Vespadelus* species due to call quality. This complex was the most active and with the

largest volume of calls. Habitat present within the study area supports the potential presence of both *Miniopterus australis* and *Miniopterus orianae oceanensis* species.

Myotis macropus was potential identified at site SMU08878 within the *Nyctophilus* species / *Myotis macropus* complex. Due to call quality it was unable to be determined which species the call belonged to, however to presence of nearby waterbodies, suitable roosting habitat and knowledge of this species from nearby areas supports its potential presence within the study area.

5. References

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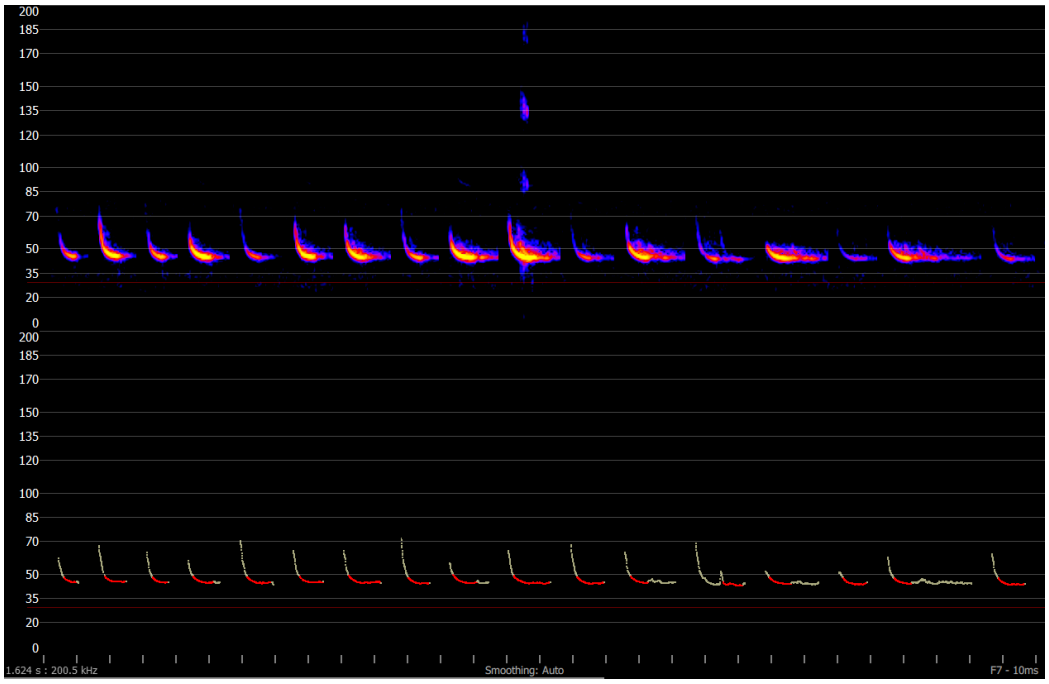
Mills, D. J., Norton, T. W., Parnaby, H. E., Cunningham, R. B., & Nix, H. A. (1996). Designing surveys for microchiropteran bats in complex forest landscapes - a pilot study from south-east Australia. *Forest Ecology and Management*, *85*(1–3), 149–161.

Pennay, M., Law, B., & Reinhold, L. (2004). *Bat calls of New South Wales: Region based guide to the echolocation calls of Microchiropteran bats*.

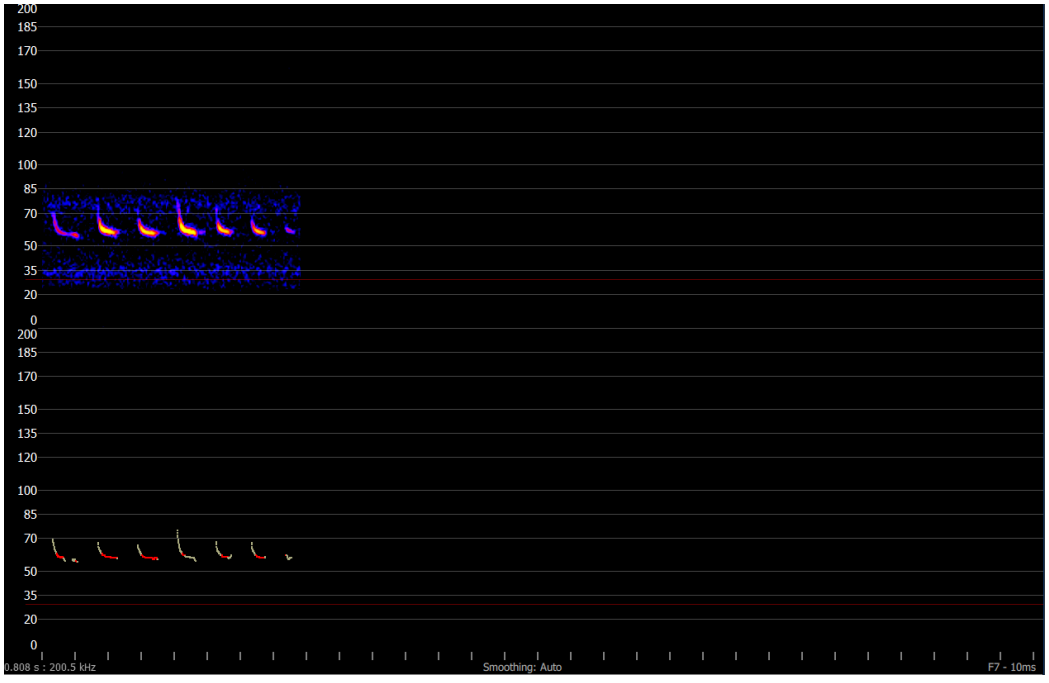
Reinhold, L., Law, B., Ford, G., & Pennay, M. (2001). *Key to the bat calls of south-east Queensland and north-east New South Wales*.

Titley Scientific. (2023). *Anabat Insight* (2.0.7-0-g3e26022).

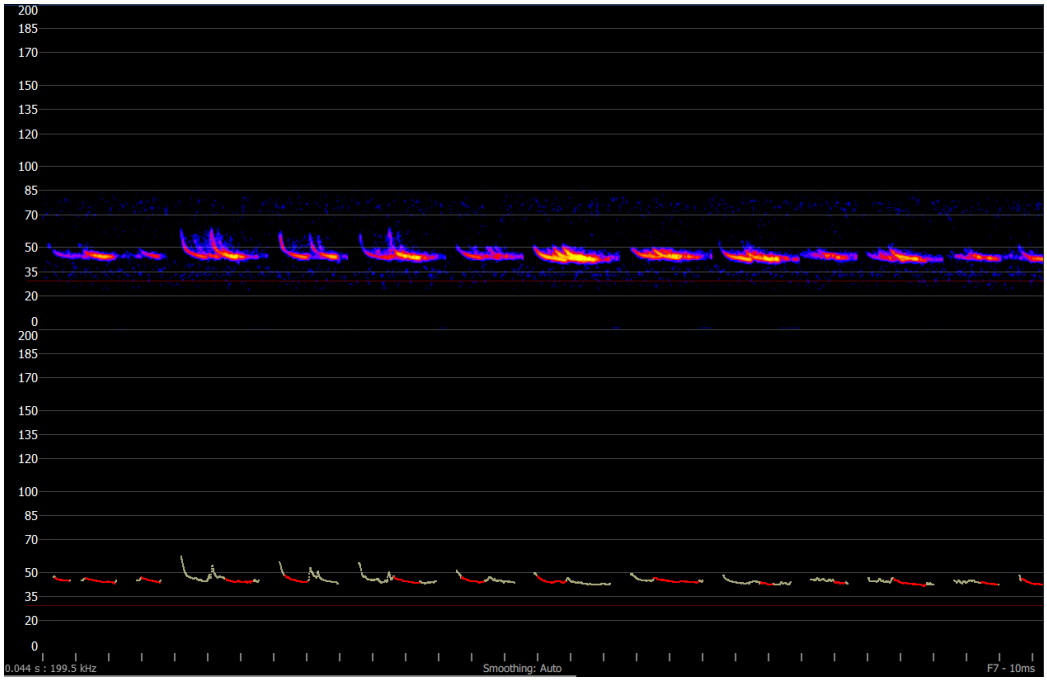
6. Appendix: Example calls from this dataset



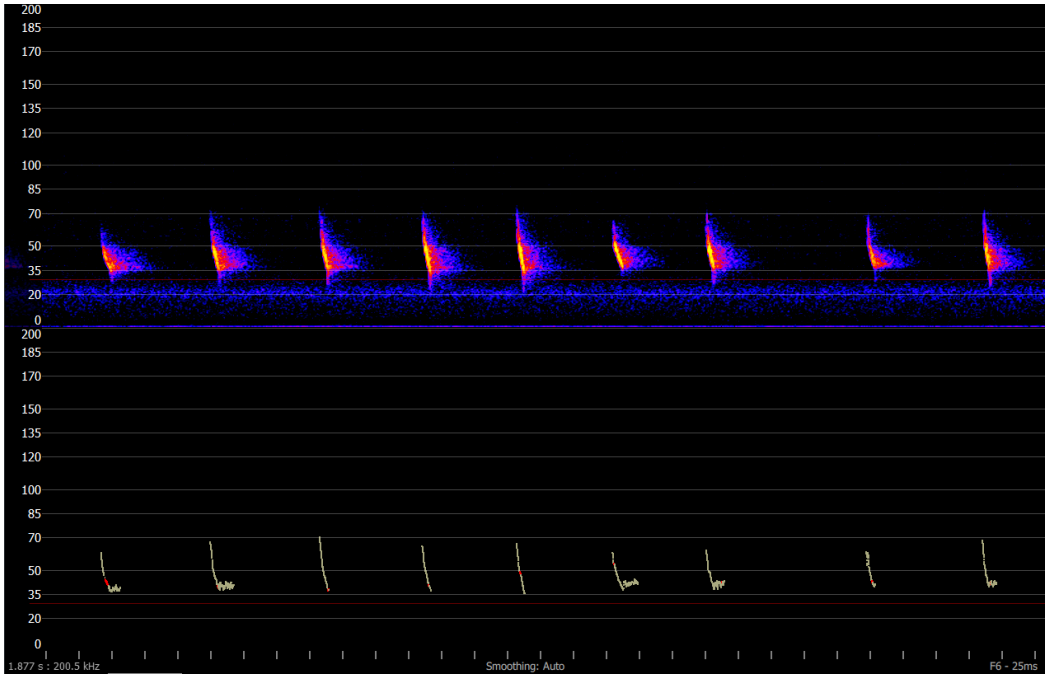
Appendix 1. Example call of *Vespadelus regulus* recorded at SUT05. Top: full spectrum view of the call, bottom: zero crossing view of the call in Anabat Insight version 2.0.7-0-g3e26022. Settings are time compressed, F7 zoom level, time on the x-axis with ticks 10 ms apart and frequency on the y-axis.



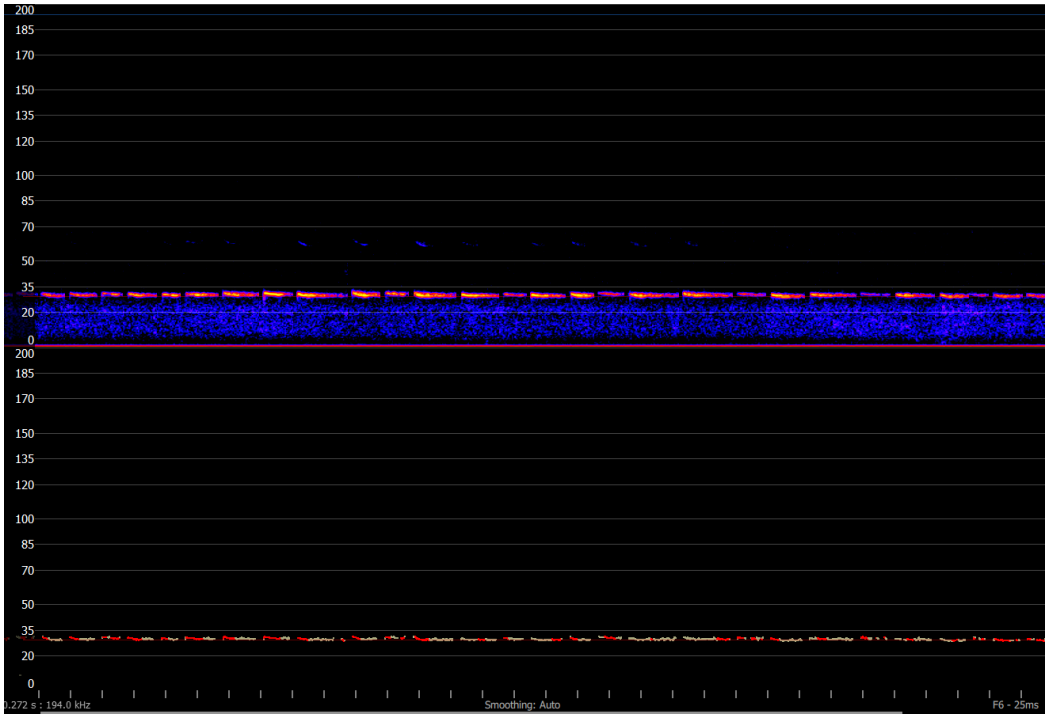
Appendix 2. Example call of *Miniopterus australis* recorded at SUT05. Top: full spectrum view of the call, bottom: zero crossing view of the call in Anabat Insight version 2.0.7-0-g3e26022. Settings are time compressed, F7 zoom level, time on the x-axis with ticks 10 ms apart and frequency on the y-axis.



Appendix 3. Example call of *Vespadelus regulus / Vespadelus darlingtoni / Miniopterus orianae oceanensis* recorded at SUT05. Top: full spectrum view of the call, bottom: zero crossing view of the call in Anabat Insight version 2.0.7-0-g3e26022. Settings are time compressed, F7 zoom level, time on the x-axis with ticks 10 ms apart and frequency on the y-axis.



Appendix 4. Example call of Myotis macropus / Nyctiophilus spp. recorded at SMU08878 Top: full spectrum view of the call, bottom: zero crossing view of the call in Anabat Insight version 2.0.7-0-g3e26022. Settings are time compressed, F6 zoom level, time on the x-axis with ticks 25 ms apart and frequency on the y-axis.



Appendix 5. Example call of *Ozimops ridei* recorded at SMU08878. Top: full spectrum view of the call, bottom: zero crossing view of the call in Anabat Insight version 2.0.7-0-g3e26022. Settings are time compressed, F6 zoom level, time on the x-axis with ticks 25 ms apart and frequency on the y-axis.

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