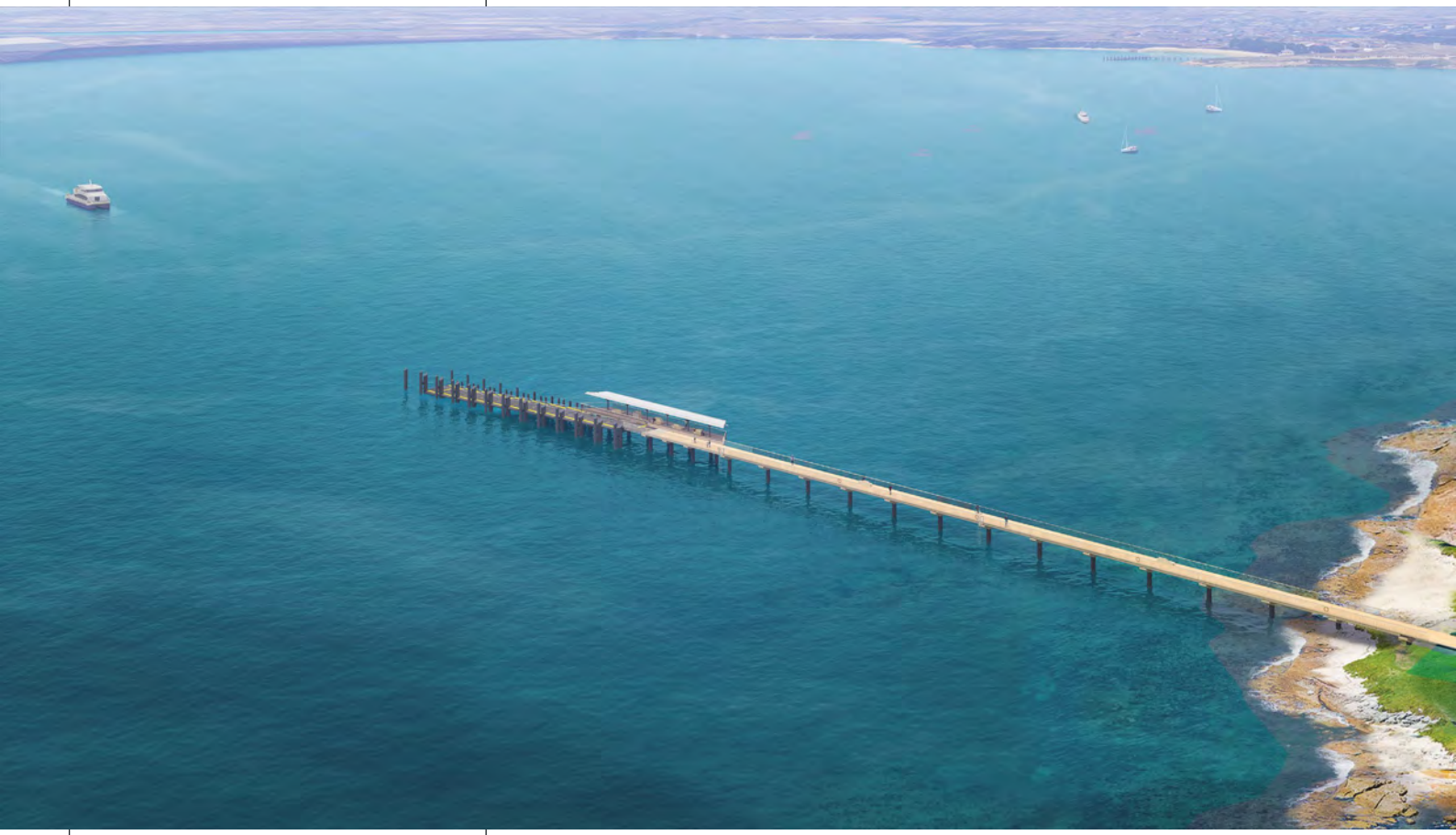
Transport for NSW

Kamay Ferry Wharves

Modification report

Modification to Ministers Condition E4

November 2023



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Acknowledgement of Country

Transport for NSW acknowledges the Bidjigal and Gweagal clans who traditionally occupied Kamay (Botany Bay).

We pay our respects to Elders past and present and celebrate the diversity of Aboriginal peoples and their ongoing cultures and connections to the lands and waters of NSW.

Many of the transport routes we use today – from rail lines, to roads, to water crossings – follow the traditional Songlines, trade routes and ceremonial paths in Country that our nation's First Peoples followed for tens of thousands of years.

Transport for NSW is committed to honouring Aboriginal peoples' cultural and spiritual connections to the lands, waters and seas and their rich contribution to society.

Document review tracking

Draft No.	Date	Comments	Prepared by	Reviewed by
Draft 1	August 2023	First draft	Chris Williams	Con Lambous, Peta Chapman, Assiah Issa and Andrew Dooley
Draft	September 2023	Second draft after internal review	Chris Williams	Con Lambous, Peta Chapman, Assiah Issa and Andrew Dooley
Final	November 2023	Final for submission	Chris Williams	Mark Hatchings

Executive summary

The proposal

Transport for NSW ('Transport') is making a request to modify condition E4 of the State Significant Infrastructure (SSI) approval SSI-10049 for the Kamay Ferry Wharves. Key features of the proposal include amending the terrestrial credit numbers within the existing approval to be consistent with the Biodiversity Development Assessment Report.

The inconsistency is required to be corrected to ensure Transport for NSW can retire its terrestrial credits as required by the Projects conditions of approval

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1. Introduction

1.1 Introduction and background

Transport for NSW (Transport) has made a request to modify condition E4 of the State Significant Infrastructure (SSI) approval SSI-10049 for Kamay Ferry Wharves. This modification request is to provide for amendments to the terrestrial credit numbers within the existing consolidated approval.

The project was approved by the Minister for Planning under Part 5, Division 5.2 of the Environmental Planning and Assessment Act 1979 (EP&A Act) on 21 July 2022.

The project was approved by the Australian Government Minister for the Environment and Water under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) on 17 March 2023 following an assessment via the Bilateral Agreement.

This report outlines details of the proposed modification and why it is needed.

1.2 Need for the modification

As part of the Environmental Impact Statement (EIS) for the project, impacts to terrestrial biodiversity within the development footprint, which includes flora and fauna, were assessed. Through the options assessment and project design development, Transport looked to avoid and minimise impacts to biodiversity where possible. For the impacts to terrestrial biodiversity that can't be avoided (residual impacts), Transport will provide an offset in the form of a payment into the Biodiversity Conservation Fund (BCT) in accordance with Conditions of Approval (CoA) E4(c). This is based on terrestrial offset credit numbers which are determined by the Project's CoA.

Since the issuing of the approval, Transport consulted the Environment and Heritage Group of Department of Planning and Environment on the Construction Biodiversity Management Sub Plan. It was identified that there was an inconsistency with the terrestrial credit numbers in condition E4 and the Biodiversity Development Assessment Report (BDAR) dated 5 April 2022 (see Appendix 1 attached). Department of Planning and Environment has subsequently agreed that the terrestrial credit numbers in the BDAR dated 5 April 2022, which formed part of the Response to Submissions Report, are the correct terrestrial offset credit numbers.

As the BCT would base the application for credits on the credit numbers stated in the CoA, Transport seeks to modify condition E4 to manage this administrative error and to make it consistent with the credit numbers in the BDAR.

Administrative inconsistnecy and referencing

In addition to the modification request for to condition E4, a number of typographical issues and inconsistency with cross reference in conditions and the Definitions table have been identified. This modification would correct these in consistencies and typographical issues.

Further to the typographical and referencing issues, Transport in discussion with DPE have agreed to included a reporting timeframe to condition 106 d.

1.3 Description of the approved project

Transport is currently constructing the Kamay Ferry Wharves in La Perouse and Kurnell. The primary purpose of this infrastructure would be to enable the return of the public ferry service between La Perouse and Kurnell. The wharves would also provide supplementary temporary mooring for non-ferry commercial vessels (such as whale watching vessels) and recreational boating.

The key features of the project include:

- Demolition of the existing viewing platform at Kurnell

- Construction of temporary ancillary works including access roads, compound areas, stockpiles, fencing and temporary building platforms (including a temporary causeway at Kurnell and temporary crane platform at La Perouse)
- Relocation of swing moorings at La Perouse
- Construction of two wharves on piles, one at La Perouse and one at Kurnell that would include:
- A berth for passenger ferries (to cater for ferries between 15 metres to 40 metres in length)
- A multi-user berth for commercial and recreational vessels (to cater for vessels between two metres and 20 metres long)
- Sheltered waiting areas and associated furniture located on the wharves
- Signage and lighting
- Landside paving and landscaping at the entrance to the wharves
- New footpaths connecting the entrance of the wharves to the existing footpaths
- Reconfiguration of existing car parking areas at La Perouse to increase the number of spaces, and associated footpath changes to accommodate these additional car parking spaces
- Bicycle racks near the La Perouse wharf
- Installation of utilities to service the wharves including power and water.

Construction started in July 2023 and is due to be completed by late 2024. Construction of both wharves is taking place at the same time.

A more detailed description of the project is found in Chapter 5, Project description of the Kamay Ferry Wharves EIS prepared by Transport for NSW in July 2021.

Figures 1-1 shows the approved project in its regional context. Figure 1-2 and 1-3 provides an overview of the key features of the approved project.

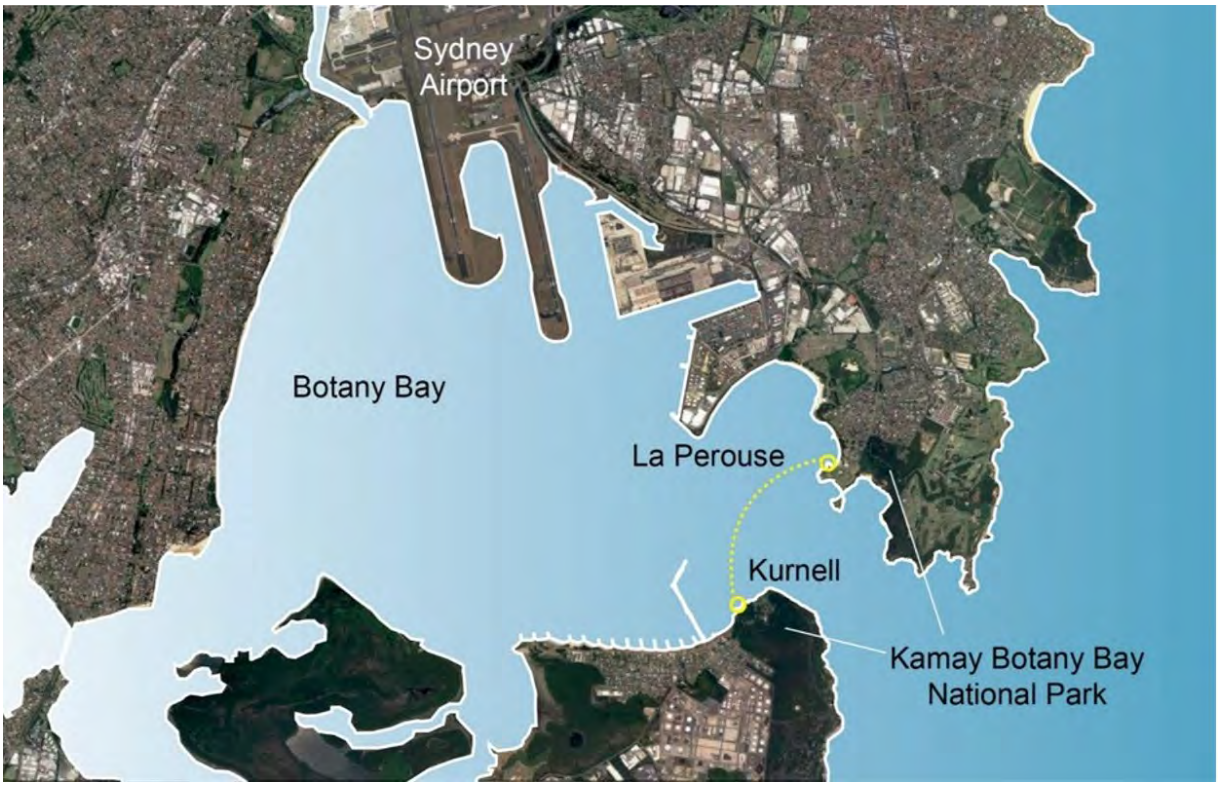

Figure 1-1: Project location

Figure 1-2: Construction boundary and key features – La Perousen

Figure 1-3: Construction boundary and key features - Kurnell

2. Statutory context

In early 2020, Transport formed the opinion that the project may significantly impact on key heritage and biodiversity values in Botany Bay under NSW legislation. Transport sought approval from the Minister of Planning in accordance with Division 5.2 of the NSW EP&A Act. This meant the project was classified State Significant Infrastructure in accordance with Clause 14 and Schedule 3 of State Environmental Planning Policy (State and Regional Development) 2011. The project was determined by the NSW Minister for Planning on the 21 July 2022.

Transport also identified that the project may significantly impact on various matters (values) that are of national environment significance (MNES). It therefore referred the project to the Australian Government Department of Environment in October 2020 under the provisions of the EPBC Act. The Department's Secretary decided that the project should be controlled under the EPBC Act in January 2021. This is because of its potentially significant impact on nationally significant heritage places and some Commonwealth listed threatened species and communities in Botany Bay. In accordance with the bilateral agreement between NSW Government and Commonwealth Government, a single EIS was prepared to assess the significance of the project's potential impacts.

The project was determined by the Australian Minister for Environment on the 17 March 2023.

3. Description of the modification

3.1 Proposed change to conditions of approval

The proposed modification would require a change to Table 1 of the Minister's Condition E4 to make it consistent with the BDAR dated 5 April 2022.

Table 3-1 illustrates the existing Table 1 and Table 3-2 below describes the administrative modification required to the Infrastructure Approval.Design criteria

Table 3-1: Approved Minister's Condition E4 – Table 1 Ecosystem Credits

Credit class	Relevant matter	Habitat required	Direct impact (ha)	Number of credits
Ecosystem	1823 Coastal headland cliffline scrub	-	0.009	0
	661 Coastal sand littoral forest	Kurnell Dune Forest in the Sutherland Shire and City of Rockdale	0.03	4
	772 Coastal foredune wattle scrub	-	0.024	0

Table 3-2: Proposed modification to the Minister's Condition E4 – Table 1 Ecosystem Credit (based on the BDAR date 5 April 2022)

Credit class	Relevant matter	Habitat required	Direct impact (ha)	Number of credits
Ecosystem	1823 Coastal headland cliffline scrub	-	0.009	1
	661 Coastal sand littoral forest	Kurnell Dune Forest in the Sutherland Shire and City of Rockdale	0.03	5
	772 Coastal foredune wattle scrub	-	0.024	1

3.2 Assessment of impact

The proposed modification would not result in any additional impacts to the environment or community but would allow Transport to secure the increased credits as originally described in the BDAR.

The BDAR provided in this modification is a copy of the report that was submitted as part of the Kamay Ferry Wharves Project application and formed part of the approval. The BDAR has been provided for reference purposes only to ensure the correct credit numbers have been included in this modification.

Terms and acronyms used in this REF

Table 3-3 Terms and acronyms used in this modification

Term / Acronym	Description
BCT	Biodiversity Conservation Trust
BDAR	Biodiversity Development Assessment Report
CoA	Conditions of Approval
EBPC Act	*Commonwealth Environment Protection and Biodiversity Conservation Act 1999*
EIS	Environmental Impact Statement
EP&A Act	*Environmental Planning and Assessment Act 1979*
MNES	Matters of National Environmental Significance
SSI	State Significant Infrastructure
Transport	Transport for New South Wales

Appendix A – Biodiversity Development Assessment Report

(For reference only)

Transport for NSW

Kamay Ferry Wharves Project

Biodiversity Development Assessment Report

KFW01-ARUP-BPW-EO-RPT-000001

Final | 5 April 2022

Job number 273023-00

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Document verification

ARUP

Job title		Kamay Ferry Wharves Project		**Job number** 273023-00	
Document title		Biodiversity Development Assessment Report		**File reference** KFW01-ARUP-BPW-EO-RPT-000001	
Document ref		KFW01-ARUP-BPW-EO-RPT-000001			
Revision	**Date**	**Filename**	KFW01-ARUP-BPW-EO-RPT-000001.docx		
Draft A	21 August 2020	**Description**	First Draft		
			Prepared by	Checked by	Approved by
		Name	Chani Wheeler	Matt Davis	Alice Smith
		Signature			
01	01 Dec 2020	**Filename**	Biodiversity Development Assessment Report.docx		
		Description	Updated with latest concept design		
			Prepared by	Checked by	Approved by
		Name	Matt Davis	Bronte Linkhorn	Chris Fay
		Signature			
02	31 Mar 2021	**Filename**	Biodiversity Development Assessment Report.docx		
		Description	Update with revised concept to remove carpark and retain trees.		
			Prepared by	Checked by	Approved by
		Name	Matt Davis	Bronte Linkhorn	Chris Fay
		Signature			
Final	01 October 2021	**Filename**	Biodiversity Development Assessment Report.docx		
		Description	Updated for Response to Submissions Report		
			Prepared by	Checked by	Approved by
		Name	Stephen Bloomfield	Chani Wheeler	Bronte Linkhorn
		Signature			
			Issue Document verification with document		✓

Document Verification

Job title		Kamay Ferry Wharves Project			**Job number** 273023-00
Document title		Biodiversity Development Assessment Report			**File reference**
Document ref		KFW01-ARUP-BPW-EO-RPT-000001			
Revision	**Date**	**Filename**	Biodiversity Development Assessment Report.docx		
Final	9 March 2022	**Description**	Final revision of BDAR		
			Prepared by	Checked by	Approved by
		Name	Stephen Bloomfield	Grace Lambeth	Alice Smith
		Signature			
Final	5 April 2022	**Filename**	Biodiversity Development Assessment Report.docx		
		Description	Final revision of BDAR		
			Prepared by	Checked by	Approved by
		Name	Alice Smith	Grace Lambeth	Alice Smith
		Signature			
		Filename			
		Description			
			Prepared by	Checked by	Approved by
		Name			
		Signature			
		Filename			
		Description			
			Prepared by	Checked by	Approved by
		Name			
		Signature			
				Issue Document Verification with Document	✓

Declaration This Biodiversity Development Assessment Report has been prepared on the basis of the requirements of (and information provided under) the Biodiversity Assessment Method as certified by:	Stephen Bloomfield (BAAS 18054)	5 April 2022
		

Executive summary

Transport for New South Wales is seeking approval to reinstate the ferry wharves at La Perouse and Kurnell in Botany Bay under Division 5.2 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). The project would include two new wharves (one at La Perouse and one at Kurnell) and installation of utilities to service the wharves.

This Biodiversity Development Assessment Report (BDAR) has been prepared to address the Secretary's Environmental Assessment Requirements (SEARs) for the project. The BDAR was originally prepared in accordance with the requirements of the NSW Biodiversity Assessment Method (BAM) 2017 (OEH, 2017). Based on correspondence with DPIE, the sections of this updated version of the BDAR that relate specifically to indirect and prescribed impacts have been prepared in accordance with BAM 2020 (DPIE, 2020a).

This BDAR includes the assessment of impacts to terrestrial biodiversity within the development footprint. Impacts to marine vegetation, marine mammals and wandering seabirds are not addressed under the BAM. An assessment of these issues has been carried out in EIS Appendix H, Marine biodiversity assessment to address requirements of the project under the *Fisheries Management Act 1994* (FM Act).

An assessment of landscape features and site context was undertaken for the study area, which included the development footprint plus a 1500m buffer. The following landscape features were identified:

- The study area is located entirely within the Sydney Basin Interim Biogeographic Regionalisation for Australia (IBRA) bioregion and the Pittwater IBRA subregion.
- Three NSW landscapes are located within the study area, with the Sydney – Newcastle Barriers and Beaches (Snb) landscape dominating.
- Rivers and streams- the Botany Bay estuary occurs within the development site, including La Perouse in the north and Kurnell to the south. No other rivers or streams are situated within the site.
- Wetlands: NSW wetlands and coastal wetlands are mapped within the study area. The Towra Point Nature Reserve Ramsar site is located approximately 1km to the southwest of the site.
- Vegetation within the study area is fairly contiguous and offers connectivity for fauna.
- Karst, caves, crevices, cliffs and areas of geological significance- likely present within the study area.
- Mapped biodiversity values- protected riparian lands.

Surveys for native vegetation were carried out over three days from 24 March to 26 March 2020 for the field survey extent. The field survey extent included 21.88ha of land within and adjacent to the development site, at La Perouse and Kurnell. Approximately 9.71ha of native vegetation was identified within the

survey extent comprising seven plant community types with varying levels of disturbance and condition. Vegetation at Kurnell was heavily disturbed and largely comprised planted or regrowth vegetation. Lands surveyed at La Perouse largely comprise maintained lawns and landscaped gardens.

The Kurnell site and surrounds supported a range of habitats for fauna including historically disturbed modified wet and sclerophyll forests, numerous hollow-bearing trees and logs, riparian vegetation, a rocky shoreline and thin sandy foreshore. Given its connectivity to the Kamay Botany Bay National Park, an array of animals are likely to utilise the site, particularly the woodland east of Cape Solander Road. Fauna habitats at La Perouse were limited to some fragmented patches of modified coastal heathland, a rocky shoreline, sandstone cliffs and rock outcropping with small overhangs and crevices present. Habitats within the *development footprint* are considerably degraded supporting modified and/ or disturbed vegetation and lacking important habitat constraints for candidate threatened species. A habitat suitability assessment was carried out for predicted species. The assessment identified nine candidate species credit species requiring targeted survey including eight threatened fauna and one threatened flora species.

Survey for candidate threatened species was also carried out from 24 March to 26 March 2020 for the field survey extent. Survey methods for fauna included:

- Opportunistic bird surveys and habitat assessment
- Acoustic echolocation call detection for microchiropteran bat species
- Frog surveys, including call playback and spotlighting, targeting Green and Golden Bell Frog and Wallum Froglet
- Spotlighting for nocturnal arboreal fauna.

No threatened flora were identified within the development footprint. One threatened flora species (Magenta Lilly Pilly *Syzygium paniculatum*) was identified immediately adjacent to proposed works at Kurnell. Approximately 70 individuals are estimated to occur. Suitable habitat for Leafless Tongue Orchid was also identified at Kurnell. The presence of this cryptic species could not be confirmed as field surveys did not coincide with flowering periods. No suitable habitat for other potentially occurring threatened flora species was identified.

Six threatened fauna species were recorded during field surveys, including five at Kurnell and one at La Perouse. Presence was also assumed for two additional fauna that could not be discounted based on the survey design employed.

Confirmed Matters of National Environmental Significance (MNES) relevant to the project include:

- Four listed vulnerable threatened species: Magenta Lilly Pilly, Leafless Tongue Orchid, Grey-headed Flying-fox and Large-eared Pied Bat
    - The project is not likely to result in any direct or indirect impacts to Magenta Lilly Pilly or Leafless Tongue Orchid. Impacts to the Grey-headed Flying-fox species are limited to a loss of 0.05ha of suitable foraging habitat. Similarly, 0.04ha of potential foraging habitat for Large-eared Pied Bat will be impacted. No breeding habitat for these

fauna will be impacted. The impacts are not likely to result in any significant impacts to the species.

- Migratory species – one migratory bird (Crested Tern [*Thalasseus bergii*]) was recorded at La Perouse and 16 others are considered likely to have a transient presence within the site given the proximity of Towra Point Nature Reserve. However, the site supports only marginal habitats for migratory birds given the thin linear nature of sandy foreshore at Kurnell, small area of rock platform and high amounts of existing foot traffic. As such, the site is not considered significant for these species particularly given the extent of more suitable habitats within the surrounds.

Opportunities to avoid and minimise impacts to biodiversity were considered during the early stages of the project through the options assessment and design development. Residual biodiversity impacts associated with the project include:

- Clearing of 0.05ha of native vegetation
- Clearing of 0.02ha of Kurnell Dune Forest in the Sutherland Shire and City of Rockdale TEC
- Impacts to 0.04ha of potential foraging habitat for Large-eared Pied Bat
- Impacts to 0.02ha of potential foraging habitat for Eastern Cave Bat
- Impacts to 0.021ha of potential foraging/breeding habitat for Australian Pied Oystercatcher (*Haematopus longirostris*) (0.001ha assessed as a prescribed impact to rocky habitat)
- Impacts to 0.06ha of potential foraging/breeding habitat for Sooty Oystercatcher (*Haematopus fuliginosus*) (assessed as a prescribed impact to rocky habitat).

Potential indirect impacts associated with the project include:

- Habitat disturbance from noise and light
- Disturbance from weeds and pathogens.

Potential prescribed impacts (as listed in Section 6.1 of the BC Regulation) are limited to:

- Impacts to rocks and other geological features of significance
- Impacts to habitat connectivity
- Impacts to water quality, water bodies and hydrological processes
- Impacts associated with vehicle strikes.

Mitigation measures proposed to address these impacts include:

- Preparing and implementing a Biodiversity Management Plan
- Pre-construction check for flora and fauna within the development footprint

- Exploring further opportunities to further minimise impacts to threatened ecological communities and species, critical habitat and native vegetation during the detailed design phase
- Construction site induction
- Unexpected threatened species finds procedure
- Exploring opportunities during detailed design to minimise disturbance of foreshore and forested habitats as a result of light spill.

Project impacts will trigger offset requirements under the Biodiversity Offsets Scheme. No impacts are considered to constitute potential Serious and Irreversible Impacts (SAII). A total of seven ecosystem credits and 10 species credits are required to address the residual impacts associated with the project. Of the 10 species credits, two species credits have been calculated to compensate for the prescribed impact to the rocky habitat.

Contents

Appendices

1 Introduction

1.1 Project overview

Transport for New South Wales (Transport for NSW) is seeking approval to reinstate the ferry wharves at La Perouse and Kurnell in Botany Bay (the Proposal) under Division 5.2 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) as State significant infrastructure (the project). The project would allow for an alternative connection between La Perouse and Kurnell rather than by road. The primary purpose of this infrastructure would be to operate a public ferry service for the use of visitors to the area and by the local community for cultural and recreational purposes, as well as for commuting. It would also provide supplementary temporary mooring for tourism-related commercial vessels and recreational boating.

1.1.1 Project features

Transport for New South Wales (Transport for NSW) is seeking approval to reinstate the ferry wharves at La Perouse and Kurnell in Botany Bay (the project) under Division 5.2 of the Environmental Planning and Assessment Act 1979 (EP&A Act) as State significant infrastructure. The project would allow for an alternative connection between La Perouse and Kurnell rather than by road. The primary purpose of this infrastructure would be to operate a public ferry service to service visitors to the area and by the local community for cultural and recreational purposes. It would also provide supplementary temporary mooring for tourism-related commercial vessels and recreational boating.

The project provides opportunities for significant cultural and economic benefits to the local Aboriginal community by providing improved access to culturally significant sites. It is also expected to deliver benefits and opportunities to wider communities on either side of Botany Bay such as investment opportunities in a ferry service and other new visitor/tourist experiences.

Key features of the project include:

- Two new wharves, one at La Perouse and one at Kurnell that would include:
- Berth for ferries (to accommodate vessels up to 40m long)
- Berth for recreational and commercial vessels (to accommodate vessels up to 20m long).
- Sheltered waiting areas and associated furniture
- Additional space within waiting areas to accommodate other users such as fishing and those using recreational vessels
- Signage and lighting
- Landside paving, access ramps, seating and landscaping at the entrance to the wharves

- Reconfiguration of existing car parking areas at La Perouse to increase the number of spaces (including provision of accessible parking and kiss-and-ride bays)
- Reconfiguration of footpaths around the new car parking areas at La Perouse
- Provision for bike racks at La Perouse
- Installation of utilities to service the wharves.

The total construction period is anticipated to take up to 13 months, starting in early 2022. The construction of the two wharves will occur at the same time with landside and waterside works occurring simultaneously.

A concept design has been developed for the project, which forms the basis of this assessment. This BDAR supports the Environmental Impact Statement (EIS) prepared for the project.

Figure 1-1 shows the key design features of the project.


La Perouse
Kurnell
Legend
Car park design (La Perouse)
Wharf design
Construction boundary
Proposed power alignment
Proposed water alignment
Figure Title
Project overview
Figure No 1-1
Metres
0 30 60 90 120

1.1.2 Construction activities and development footprint

Construction of the project will be carried out in stages and incorporating activities as detailed in **Table 1-1**.

Table 1-1: Construction staging and associated activities

Stage	Activities
Stage 1: Early works and site establishment	• Security and fencing • Setting up site offices and access • Demolishing of the existing Kurnell viewing platform • Establishing temporary causeway at Kurnell
Stage 2: Main construction	• Piling • Wharf construction • Car parking reconfiguration at La Perouse • Earthworks for car parking and landscaping • Installation of wharf furniture • Earthworks and installation of utilities
Stage 3: site demobilisation	• Removal of temporary work areas

The total construction period is anticipated to take up to 13 months, starting in 2022.

The development footprint used for the assessment of impacts in this BDAR includes areas of permanent and temporary impact to terrestrial biodiversity features subject to assessment under the BAM. Areas of temporary impact include:

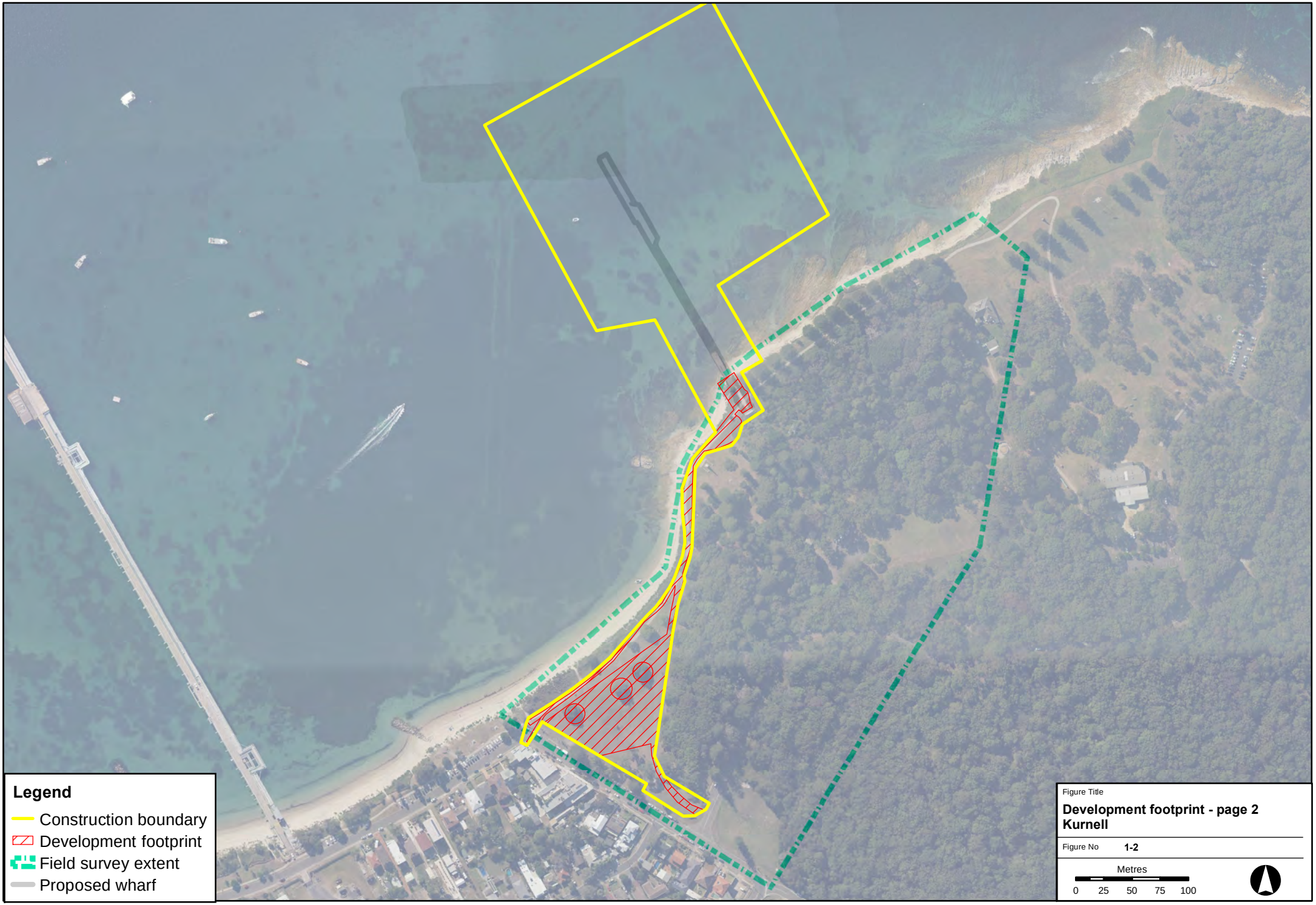
- Trenching for utilities installation;
- Site compound and storage areas;
- Construction access roads; and
- Crane platforms.

Areas of permanent impact to terrestrial areas include landside ferry wharf facilities.

These works will be carried out wholly within the development footprint as shown in **Figure 1-2**.

For the purpose of this BDAR, while temporary and permanent impacts are described, the total area combining the two has been used for assessment purposes.


Legend
Construction boundary
Development footprint
Propsoed wharf
Field survey extent
Figure Title
Development footprint - page 1
La Perouse
Figure No 1-2
Metres
0 10 20 30 40


Legend
Construction boundary
Development footprint
Field survey extent
Proposed wharf
Figure Title
Development footprint - page 2
Kurnell
Figure No 1-2
Metres
0 25 50 75 100

1.2 Purpose of this report

This Biodiversity Development Assessment Report (BDAR) has been prepared to address the Secretary's Environmental Assessment Requirements (SEARs) for the Kamay Ferry Wharf Project Upgrade for the purpose of seeking approval under Division 5.2 of the EP&A Act.

Table 1-1 identifies the SEARs which are relevant to this technical assessment.

Table 1-1: SEARs for terrestrial biodiversity

SEARs relevant to this technical report	Where addressed in this technical report
1. Assessment of Key Issues* Key issue impacts are assessed objectively and thoroughly to provide confidence that the project will be constructed and operated within acceptable levels of impact. * Key issues are nominated by the Proponent in the SSI project application and by the Department in the SEARs. Key issues need to be reviewed throughout the preparation of the EIS to ensure any new key issues that emerge are captured. The key issues identified in this document are not exhaustive but are key issues common to most SSI projects.	
1. The level of assessment of likely impacts must be proportionate to the significance of, or degree of impact on, the issue, within the context of the project location and the surrounding environment. The level of assessment must be commensurate to the degree of impact and sufficient to ensure that the Department and other government agencies are able to understand and assess impacts.	All impacts relevant under the BAM are assessed within Section 6.2 of this document.
2. For each key issue the Proponent must: (a) describe the biophysical, social and economic environment, as far as it is relevant to that issue, including baseline data that is reflective of current guidelines where relevant; (b) describe the legislative and policy context, as far as it is relevant to the issue; (c) identify, describe and quantify (if possible) the impacts associated with the issue, including the likelihood and consequence (including worst case scenario) of the impact (comprehensive risk assessment), the impact (comprehensive risk assessment), the impacts of concurrent activities within the project and cumulative impacts; (d) demonstrate how potential impacts have been avoided (through design, or construction or operation methodologies); (e) detail how likely impacts that have not been avoided through design will be minimised, and the predicted effectiveness of these measures (against performance criteria where relevant); and detail how any residual impacts will be managed or offset, and the approach and effectiveness of these measures.	Section 2,3 and 4 of this document. Section 1.3 Section 6.2 Section 6.1 Section 6.3 and Section 8
3. Where multiple reasonable and feasible options to avoid or minimise impacts are available, they must be identified and considered, and the proposed measure justified taking into account the public interest.	Assessment of options for the development was carried out, as detailed in Section 6.1 of this document
2. Biodiversity	

SEARs relevant to this technical report	Where addressed in this technical report
The project design considers all feasible measures to avoid and minimise impacts on terrestrial and aquatic biodiversity. Offsets and/or supplementary measures are assured which are equivalent to any residual impacts of project construction and operation.	
1. Biodiversity impacts in accordance with s7.9 of the *Biodiversity Conservation Act 2016* (BC Act) and the Biodiversity Assessment Method (BAM), and be documented in a Biodiversity Development Assessment Report (BDAR).	Section 6.2
2. The BDAR must include information in the form detailed in s6.12 of the BC Act, cl6.8 of the *Biodiversity Conservation Regulation 2017* and the BAM.	This BDAR addresses the requirements as set out.
3. The BDAR must be submitted with all digital spatial data associated with the survey and assessment as per Appendix 11 of the BAM.	Spatial data will be submitted with this BDAR
4. 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 under s6.10 of the BC Act.	Accredited assessors involved in the preparation of this document are listed in Section 1.3.2.
5. 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 BAM.	Section 6 and Section 8 of this document
6. The BDAR must include details of the measures proposed to address offset obligations.	Section 8
7. The BDAR must include an assessment of biodiversity values not covered by the BAM. This includes: (a) a threatened aquatic species assessment (Part 7A *Fisheries Management Act 1994*) to address whether there are likely to be any significant impact on listed threatened species, populations or ecological communities under the *Fisheries Management Act 1994* (FM Act); and	This is assessed in the EIS Appendix H Marine biodiversity assessment
(b) impacts to marine mammals and wandering sea birds including but not be limited to potential injury, entrapment and damage to habitat.	This is assessed in the EIS Appendix H Marine Biodiversity Assessment Report
8. Water-based construction and vessel operation impacts on aquatic biodiversity, including: (a) disturbance to Posidonia australis populations and other seabed grasses (including from dredging, and propeller wash, anchoring, turbidity and sedimentation from vessel operations);	This is assessed in the EIS Appendix H Marine Biodiversity Assessment Report
(b) the nature and impact of underwater noise generating activities; and	This is assessed in the EIS Appendix H Marine Biodiversity Assessment Report
(c) proposed specific sound exposure and peak impulsive and continuous noise criteria for identified noise sensitive fauna.	This is assessed in the EIS Appendix H Marine Biodiversity Assessment Report

SEARs relevant to this technical report	Where addressed in this technical report
9. Identify whether the project, or any component of the project, would be classified as a Key Threatening Process (KTP) in accordance with the listings in the BC Act, FM Act and the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).	Section 6.2 of this document
5. Environmentally Sensitive Lands and Processes The project is designed, constructed and operated to avoid or minimise impacts on protected and sensitive lands. The project is designed, constructed and operated to avoid or minimise future exposure to coastal hazards and processes.	
1. Environmentally sensitive land and processes (and the impact of processes on the project) including, but not limited to: (d) protected areas (including land and water) managed by Environment, Energy and Science Group (EESG) and/or Regions, Industry, Agriculture & Resources, (RIAR) of DPIE under the *National Parks and Wildlife Act 1974* and the *Marine Estate Management Act 2014*;	Section 6.1 of this document and This is assessed in the EIS Appendix H Marine Biodiversity Assessment Report
(g) land or waters identified as Critical Habitat under the FM Act or EPBC Act or areas of outstanding biodiversity value under the BC Act; and	Section 5 of this document and Appendix H Marine Biodiversity Assessment Report
(h) biodiversity stewardship sites, private conservation lands and other lands identified as offsets.	No such lands are known to occur within the vicinity of the development site based on a review of publicly available registers and mapping
Agency SEARs	
Environment Energy and Science Group (EES) (DPIE)	
4. Biodiversity impacts related to the proposed development are to be assessed in accordance with Section 7.9 of the Biodiversity Conservation Act 2016 and the Biodiversity Assessment Method and documented in a Biodiversity Development Assessment Report (BDAR). The BDAR must include information in the form detailed in the Biodiversity Conservation Act 2016 (s6.12), *Biodiversity Conservation Regulation 2017* (s6.8) and Biodiversity Assessment Method, including an assessment of the impacts of the project (including an assessment of impacts prescribed by the regulations).	This BDAR addresses the requirements as set out.
5. 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.	Section 6 and Section 8 of this document
6. The BDAR must include details of the measures proposed to address the offset obligation as follows: • The total number and classes of biodiversity credits required to be retired for the development/project; • The number and classes of like-for-like biodiversity credits proposed to be retired;	Section 8 of this document

SEARs relevant to this technical report	Where addressed in this technical report
• The number and classes of biodiversity credits proposed to be retired in accordance with the variation rules; • Any proposal to fund a biodiversity conservation action; • Any proposal to conduct ecological rehabilitation (if a mining project); • Any proposal to make a payment to the Biodiversity Conservation Fund. • 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.	
7. The BDAR must be submitted with all spatial data associated with the survey and assessment as per Appendix 11 of the BAM.	Spatial data will be submitted with this BDAR
8. 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 under s6.10 of the Biodiversity Conservation Act 2016.	Accredited assessors involved in the preparation of this document are listed in Section 1.3.2.
9. The EIS must map the following features relevant to water and soils including: (a) Acid sulfate soils (Class 1, 2, 3 or 4 on the Acid Sulfate Soil Planning Map). (b) Rivers, streams, wetlands, estuaries (as described in s4.2 of the Biodiversity Assessment Method). (c) Wetlands as described in s4.2 of the Biodiversity Assessment Method. (d) Groundwater. (e) Groundwater dependent ecosystems (f) Proposed intake and discharge locations	Section 2 and 3.4 of this document, EIS Appendix H Marine biodiversity assessment and EIS Appendix S Surface water assessment
The EIS must assess the impact of the development on hydrology, including: (a) Water balance including quantity, quality and source. (b) Effects to downstream rivers, wetlands, estuaries, marine waters and floodplain areas. (c) Effects to downstream water-dependent fauna and flora including groundwater dependent ecosystems. (d) Impacts to natural processes and functions within rivers, wetlands, estuaries and floodplains that affect river system and landscape health such as nutrient flow, aquatic connectivity and access to habitat for spawning and refuge (e.g. river benches). (e) Changes to environmental water availability, both regulated/licensed and unregulated/rules-based sources of such water. (f) Mitigating effects of proposed stormwater and wastewater management during and after construction on hydrological attributes such as volumes, flow rates, management methods and re-use options. (g) Identification of proposed monitoring of hydrological attributes.	Section 6.2 of this document, Appendix H Marine Biodiversity Assessment Report and EIS Appendix S Surface water assessment
Additional EES recommendation	

SEARs relevant to this technical report	Where addressed in this technical report
3. The proposed location of construction, laydown, access and other supporting infrastructure sites and details how these will be managed to avoid and minimise impacts to the natural and cultural values of Kamay Botany Bay National Park	Section 1.1.2 and Table 6-4
7. The BDAR must include an assessment for biodiversity matters not assessed under the BAM, including marine mammals and wandering sea birds. The assessment must be undertaken as per the "marine biodiversity assessment", described in section 4.5.3 of the Kamay Ferry Wharves State Significant Infrastructure Scoping Report (Transport for NSW, May 2020). The Industry Guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species (Commonwealth Department of the Environment and Energy, EPBC Act Policy Statement 3.21) may be used as a guide in this assessment. The assessment must include, but not limited to, potential injury, entrapment and damage to habitat.	EIS Appendix H Marine Biodiversity Assessment Report
Environment Protection Authority	
The Proponent must: (a) state the ambient NSW Water Quality Objectives (NSW WQO) and environmental values for the receiving waters relevant to the project, including the indicators and associated trigger values or criteria for the identified environmental values; (b) identify and estimate the quality and quantity of all pollutants that may be introduced into the water cycle by source and discharge point and describe the nature and degree of impact that any discharge(s) may have on the receiving environment, including consideration of all pollutants that pose a risk of non-trivial harm to human health and the environment; (c) identify the rainfall event that any water quality protection measures will be designed to cope with; (d) assess the significance of any identified impacts including consideration of the relevant ambient water quality outcomes; (e) demonstrate how construction and operation of the project will, to the extent that the project can influence, ensure that: − where the NSW WQOs for receiving waters are currently being met they will continue to be protected; and − where the NSW WQOs are not currently being met, activities will work toward their achievement over time; (f) justify, if required, why the WQOs cannot be maintained or achieved over time; (g) demonstrate that all practical measures to avoid or minimise water pollution and protect human health and the environment from harm are investigated and implemented; (h) identify sensitive receiving environments (which may include estuarine and marine waters downstream) and develop a strategy to avoid or minimise impacts on these environments; (i) identify proposed monitoring locations, monitoring frequency and indicators of surface and groundwater quality; (j) consider turbidity curtains around the immediate works site that contain any plume strictly within the work site area to limit the impacts on the surrounding water quality and environs;	EIS Appendix H Marine Biodiversity Assessment Report and EIS Appendix S Surface water assessment

SEARs relevant to this technical report	Where addressed in this technical report
(k) provide a water quality monitoring plan which also identifies the thresholds which would result in ceasing activities; and (l) consider the impact of sediment plumes associated with the operation of the facility on water quality (e.g. proximity of propellers to the substrate and proximity to sensitive environs).	
The Proponent must: (a) assess the impact of the project on acid sulfate soils (including impacts of acidic runoff offsite) in accordance with the current guidelines (b) characterise contaminated sediments and pore water within the proposal area, including the assessment of the volume of sediment materials to be dredged, potential for mobilisation of contaminated sediment and pore water (c) describe the manner sediment and any contaminated sediments will be dredged and/or excavated (d) assess the impacts on soil and land resources (including erosion risk or hazard). Particular attention must be given to soil erosion and sediment and contaminant transport consistent with the practices and principles in the current guidelines. (e) identify appropriate mitigation and management measures to safeguard the environment and people during construction and operation (f) identify potential risk to human health, aquaculture activities, seagrasses or the environment; (g) sampling and characterisation of the distribution of contamination should take into account the National Assessment Guidelines for Dredging 2009.	EIS Appendix H Marine Biodiversity Assessment Report and EIS Appendix S Surface water assessment

1.3 Policy and planning context

1.3.1 *Environment Protection and Biodiversity Conservation Act 1999* (Cth)

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) applies to those actions which are likely to have a significant impact on matters of national environmental significance (MNES). An EPBC Act Referral is triggered by undertaking an action that will have or is likely to have a significant impact on MNES or other protected matters. MNES that may be triggered as a result of the project include listed threatened species and ecological communities, migratory species and Ramsar wetlands.

An assessment of project impacts to MNES associated with terrestrial environments is presented in Section 5 of this document. The assessment was carried out in accordance with the *Matters of National Environmental Significance Significant impact guidelines 1.1* (Commonwealth of Australia 2013) and indicates the project is not likely to result in any significant impacts to relevant matters within and adjacent to the development footprint.

Project impacts to MNES associated with marine environments are presented in the EIS Appendix H Marine biodiversity assessment.

1.3.2 *Biodiversity Conservation Act 2016* (NSW)

The *Biodiversity Conservation Act 2016* (BC Act) and *Biodiversity Conservation Regulation 2017* (BC Regulation) were introduced in 2017 to replace the *Threatened Species Conservation Act 1995* and those parts of the *National Parks and Wildlife Act 1974* that provide authorisation to undertaken activities that would otherwise be an offence. The BC Act provides a framework for the assessment of biodiversity and the implementation of the Biodiversity Offset Scheme (BOS) in NSW. The NSW Biodiversity Assessment Method (BAM) supports the implementation of the BOS and establishes a consistent approach to assessing biodiversity values on lands within NSW.

Under the BC Act, impacts to biodiversity, including those associated with land clearing and development, must be assessed by an accredited person to determine project requirements for entry into the BOS. Entry into the BOS may be triggered where areas of mapped biodiversity value will be impacted, where land clearing exceeds area thresholds or where impacts to threatened species or ecological communities are likely to be significant. A project may also be refused where it is likely to result in serious or irreversible impacts to biodiversity, as defined by the BC Act.

This document has been prepared and reviewed by the following accredited biodiversity assessors in accordance with the BAM:

- Chani Wheeler (BAAS19077)
- Stephen Bloomfield (BAAS18054)

- Matt Davis (BAAS 18090).

This BDAR addresses requirements for the project under the BC Act including the assessment of impacts to biodiversity and any offsets required to address residual significant impacts associated with the project.

1.4 Application of the Biodiversity Assessment Method

1.4.1 BDAR footprints and study areas

This Biodiversity Assessment Report (BDAR) adopts terminologies from the NSW Biodiversity Assessment Method (BAM) (OEH, 2017; DPIE, 2020a[1]) to describe the project and the footprints relevant to the assessment. For clarity, these are shown in **Figure 1-2** and are described further here.

Lands subject to the proposed development application include the *development site*, as shown in **Figure 1-2**. The *development footprint* includes all lands subject to direct impacts, due to permanent and temporary works, as a result of the project (**Figure 1-2**).

Lands subject to biodiversity field survey extended beyond the development site; referred to herein as the *field survey extent*. This broader area was investigated to inform opportunities for avoiding and minimising impacts associated with the project and to confirm any relevant indirect impacts in relation to the Kamay Botany Bay National Park. The term *study area* is used when referencing the landscape assessment area, defined as a 1,500m buffer from the development site.

1.4.2 Matters relevant under the BAM

This BDAR has been prepared in accordance with the requirements of the NSW BAM (OEH, 2017; DPIE, 2020a). The BAM provides a framework for the assessment of the following biodiversity impacts relevant to the project:

- Clearing of native vegetation
- Impacts to threatened species and their habitats
- Impacts prescribed under clause 6.1 of the BC Regulation.

The following matters relevant to the project are not assessed under the BAM:

- Impacts to exotic vegetation, where it does not provide habitat for threatened species.
- Impacts to marine vegetation and habitats, where it is not associated with the following Plant Community Types (PCTs) within the Saline Wetlands formation:

[1] BAM 2020 has been used when preparing section 6.2.2 (indirect impacts) and 6.2.3 (prescribed impacts) of this BDAR.

- Mangrove swamps
- Saltmarshes
- Inland saline lakes

- Impacts to marine mammals and wandering seabirds.

An assessment of matters relevant to the project that are not addressed under the BAM is presented in the EIS Appendix H Marine biodiversity assessment where necessary to address requirements under the FM Act as stated in the SEARs.

1.4.3 BDAR assessment approach

The methodology applied as a part of the assessment is detailed within relevant sections of this document in accordance with OEH (2017) and DPIE (2020). Briefly, the approach implemented included:

- Establishing the study area to be used for the BDAR which included a 1500m buffer surrounding the development site.
- Establishing the existing environment and biodiversity values through a desktop review of publicly available spatial datasets and documentation and site assessments to confirm habitat suitability for potentially occurring threatened species and ecological communities.
- Undertaking onsite targeted surveys to confirm the presence or absence of candidate threatened species.
- Documenting measures implemented to avoid and minimise impacts to biodiversity as a result of the project.
- Assessing the residual impacts of the project on existing biodiversity values.
- Developing mitigation measures including biodiversity offsetting.

1.5 Sources of information

A desktop review of publicly available spatial datasets and documentation was completed to gather existing information on biodiversity values for the study area. Information sources for the review included:

- EPBC Act Protected Matters Search Tool (PMST) search results for a 10 km radius to the study area (accessed June 2020)
- NSW BioNet database results for a 10 km radius to the study area (DPIE, 2020b)
- Commonwealth Species Profiles and Threats (SPRAT) database for relevant species (DAWE, 2020b)
- Interim Biogeographic Regionalisation for Australia (IBRA) mapping (DEWNR, 2015)
- NSW Mitchell Landscapes mapping, version 3.1 (DPIE, 2016)

- NSW Key Fish Habitat mapping (DPI Fisheries, 2007)
- Groundwater Dependent Ecosystem Atlas (BOM, 2020)
- NSW Threatened Biodiversity Data Collection for relevant species (formerly known as the Threatened Species Profiles database) (OEH, 2020)
- The Native Vegetation of the Sydney Metropolitan Area (OEH, 2016)
- Sutherland Shire Vegetation Communities Map, 2011 VIS_ID 4198. (DPIE, 2020d)
- NSW Wetlands mapping (DECCW, 2010)
- SEPP (Coastal Management) 2018 Coastal Wetlands mapping (DPIE, 2018)
- Ramsar Wetlands of NSW (DPIE, 2012)
- Biodiversity Values Map and Threshold Tool (DPIE, 2020bc)
- Biodiversity Offsets and Agreement Management System and BAM calculator
- Aerial imagery used in the assessment of native vegetation cover is from the official NSW GIS data base, accessed on 1/10/21.

Relevant published literature as referenced in Section 9 of this report.

2 Landscape Features

An assessment of landscape features and site context was undertaken for the landscape features study area, which is defined as the development footprint plus a 1500m buffer.

The Botany Bay estuary dominates central parts of the study area and separates the development footprint, with La Perouse headland to the north and the Kurnell peninsula to the south. Lands within and surrounding La Perouse are dominated by residential and industrial land uses. Lands adjacent to Kurnell largely support conservation with some industrial and residential land uses also supported. Kamay Botany Bay National Park is located at the entrance to Botany Bay, including headlands to the north and south. Towra Point Nature Reserve is situated to the southwest.

2.1 Identified features

Relevant landscape features identified for the study area are shown in the Location Map provided in **Figure 2-1** and detailed below.

2.1.1 IBRA bioregions and subregions

The study area is located entirely within the Sydney Basin Interim Biogeographic Regionalisation for Australia (IBRA) bioregion and the Pittwater IBRA subregion.

2.1.2 NSW landscape regions (Mitchell Landscapes)

The study area occurs across three NSW landscape regions (Mitchell 2002), including:

- Port Jackson Basin (Poj)
- Sydney – Newcastle Barriers and Beaches (Snb)
- Woronora Plateau (Wpp).

Port Jackson Basin covers approximately 197.25ha (12%) of the study area including lands at the La Perouse headland. The landscape comprises sandstone slopes and cliffs from 0 to 80m elevation and 10 to 50m local relief. Uniform or gradational sandy soils support forest and woodland of Sydney peppermint *Eucalyptus piperita*, Smooth-barked Apple *Angophora costata*, Red Bloodwood *Corymbia gummifera* and Blackbutt *Eucalyptus pilularis*. Sheltered gullies contain some Turpentine *Syncarpia glomulifera,* Coachwood *Ceratopetalum apetalum* and Water Gum *Tristaniopsis laurina*. Estuarine sands were originally dominated by saltmarsh but have been taken over by Grey Mangrove *Avicennia marina* in the past century.

Sydney – Newcastle Barriers and Beaches occurs within 627.94ha (38%) of the study area, generally occupying areas of more extensive high dunes often located on top of the headlands from 0 to 30m elevation with cliff top dunes sometimes as

high as 90m above sea level. The landscape supports a distinct zonation of vegetation and increasing soil development from the beach to the inland dunes. Spinifex *Spinifex hirsutus*, Spiky Mat-rush *Lomandra longifolia*, Coastal Wattle *Acacia longifolia* ssp. *spohorae* and Coast Tea-tree *Leptospermum laevigatum* colonise frontal dunes in which there is little soil development. Coast Banksia *Banksia integrifolia* and Old Man Banksia *Banksia serrata* are found on the second dunes merging with more complex forest containing Blackbutt, Red Bloodwood, Grass Trees *Xamthorrhoea sp.* and numerous understorey shrubs on deep sands that have an organic rich A horizon, a bleached A2 horizon and the initial development of weak iron or organic pans in the sandy subsoil. Freshwater sedge swamps saline lagoons may occur depending on level of tidal flushing, often surrounded by Broad-leaved Tea-tree *Melalueca quinquenervia* and Swamp Oak *Casuarina glauca*. Given its dominance in the study area this NSW landscape is likely to be subject to the area of greatest impact. As such, this NSW landscape has been used in the BAM Calculator.

The Woronora Plateau landscape covers approximately 138.93ha (8%) of the study area at the Kurnell Peninsula. The landscape supports an extensive plateau developed on Triassic quartz sandstone from 400m to 500m elevation and some steep sided deep valleys up to 100m local relief. Deep uniform sands or texture-contrast soils characterise slopes with deep uniform grey or white organic sands dominating swampy valley floors. Rock outcrop is also common on ridgelines and in creeks. Vegetation along ridges generally comprises woodland with a shrubby understorey of Silvertop Ash *Eucalyptus sieberi*, Sydney Peppermit, Old Man Banksia and Smooth-barked Apple. Shrublands of Heath Banksia *Banksia ericifolia*, Hairpin Banksia *Banksia spinulosa*, Dagger Hakea *Hakea teretifolia*, She-oak *Allocasuaina sp*. and Soft Geebung *Persoonia mollis* generally occur on slopes and hanging swamps in saturated organic sands.

The remaining 42% of the study area consists of marine environment to which no NSW landscape applies.

2.1.3 Rivers and streams

The study area is located within the Botany Bay catchment. The catchment supports the Georges and Cook Rivers with lower reaches dominated by the Botany Bay estuary.

The Botany Bay estuary occurs within the development site, including La Perouse in the north and Kurnell to the south. No other rivers or streams are situated within the site. Although several first order ephemeral streams are located immediately to the east of the development site at Kurnell and further to the south.

Rivers and streams are shown in **Figure 2-1** for the study area along with associated riparian buffers, determined in accordance with Appendix 3 of the BAM (OEH, 2017).

2.1.4 Wetlands

Review of the NSW Wetlands spatial layer (DECCW, 2010) indicates two mapped wetlands are located within the study area: Towra Point Nature Reserve

Ramsar site (approximately 1km to the southwest of the site) and the Botany Bay oceanic embayment.

Review of the Coastal Wetlands spatial layer (DPIE, 2018) suggests additional wetlands are located to the south of the development site at Kurnell. These include Marton Park and vegetation adjacent to Reserve Road. A small wetland is also mapped at Henry Head.

2.1.5 Connectivity features

Biodiversity corridors are landscape connections between larger areas of fauna habitat. They are critical for maintaining ecological processes including fauna dispersal and the continuation of viable populations. Biodiversity corridors may include stepping stones, such as discontinuous areas of habitat, paddock trees, wetlands or roadside vegetation or continuous linear strips of vegetation such as riparian corridors or ridgelines.

Vegetation within and surrounding the development site at Kurnell is fairly contiguous, offering connectivity for terrestrial fauna south around the Kurnell Peninsula within Kamay Botany Bay National Park. Marton Park Wetland is located approximately 500m southwest of the development site and offers stepping-stone connectivity for highly mobile fauna west to Towra Point Nature Reserve. To the north, urban development dominates the areas of Phillip Bay and Port Botany. Vegetation associated with Kamay Botany Bay National Park supports habitat connectivity around the headland at La Perouse with some stepping-stone connectivity to the north through the NSW and St Michael's Golf Clubs.

2.1.6 Karst, caves, crevices, cliffs and areas of geological significance

Kamay Botany Bay National Park supports Hawkesbury sandstone cliffs along the La Perouse headland and Kurnell Peninsula. These cliffs extend into the development site at La Perouse with steeper, more exposed formations occurring further east toward the bay entrance and nearby coastline to the Pacific Ocean. These formations have the potential to support crevices, karst, caves and overhangs offering potential roost habitat for a number of cave-dwelling microbat species. Caves are likely to be present at Cape Solander and Tabbagi Gap situated at Kurnell and Little Bay located north of La Perouse. There is also the potential for sea caves in the area.

Review of DECCW (2011) indicates historical surveys completed within Kamay Botany Bay National Park did not identify microbat maternity roosts within these features. However, non-maternity roosts for microbat species including Large Bent-winged Bat *Miniopterus orianae oceanensis* were confirmed within gunnery tunnels located at Henry Head and Cape Banks (DECCW, 2011).

2.1.7 Biodiversity values map

Within the development site, foreshore areas at Kurnell and sandstone slopes and cliffs at La Perouse are mapped as protected riparian lands under the Biodiversity Values Map and Thresholds Tool (DPIE, 2020c) (**Figure 2-1**).

According to clause 7.1 of the BC Regulation, impacts to mapped biodiversity values are likely to trigger project requirements under the NSW BOS.

Legend

- Study Area (1,500m buffer)
- Cliffs, crevices and likely caves
- National Park Lands
- Streams
- NSW Wetlands
- Botany Bay Estuary
- Riparian Lands
- Coastal SEPP 2018 Wetlands
- Native Vegetation Cover
- Biodiversity Values Map (DPIE, 2020)

NSW Landscapes

- Port Jackson Basin
- Sydney - Newcastle Barriers and Beaches
- Woronora Plateau

Figure Title

Location map

Figure No **2-1**

Metres

0 240 480 720 960

2.2 Site context

Site context considerations include the assessment of native vegetation cover and patch size, in accordance with Section 4.3 of the BAM (OEH, 2017). These assessments were undertaken as follows:

- Existing vegetation mapping available for the region was clipped to the study area. These included the following spatial layers:
  - The Native Vegetation of the Sydney Metropolitan Area (OEH, 2016)
  - Sutherland Shire Vegetation Communities Map, 2011 VIS_ID 4198. (DPIE, 2020d).
- The clipped spatial layers were combined with ground-truthed vegetation mapping prepared for the development site.
- Based on advice from DPIE (received 4 August 2020), mapped seagrass meadows (PCT1913) were removed from the assessment as they do not meet the definition of native vegetation under the BC Act.

The results of the assessment are provided in the following sections.

2.2.1 Native vegetation cover

The study area supports approximately 534.08ha (28%) of native vegetation, as summarised in Table 1. Native vegetation cover is shown for each site in **Figure 2-2**.

Table 1: Native vegetation cover

Native vegetation extent (ha)	Study area extent (ha)	% study area	Native vegetation cover class
438.10	1639.27	27%	10-30%

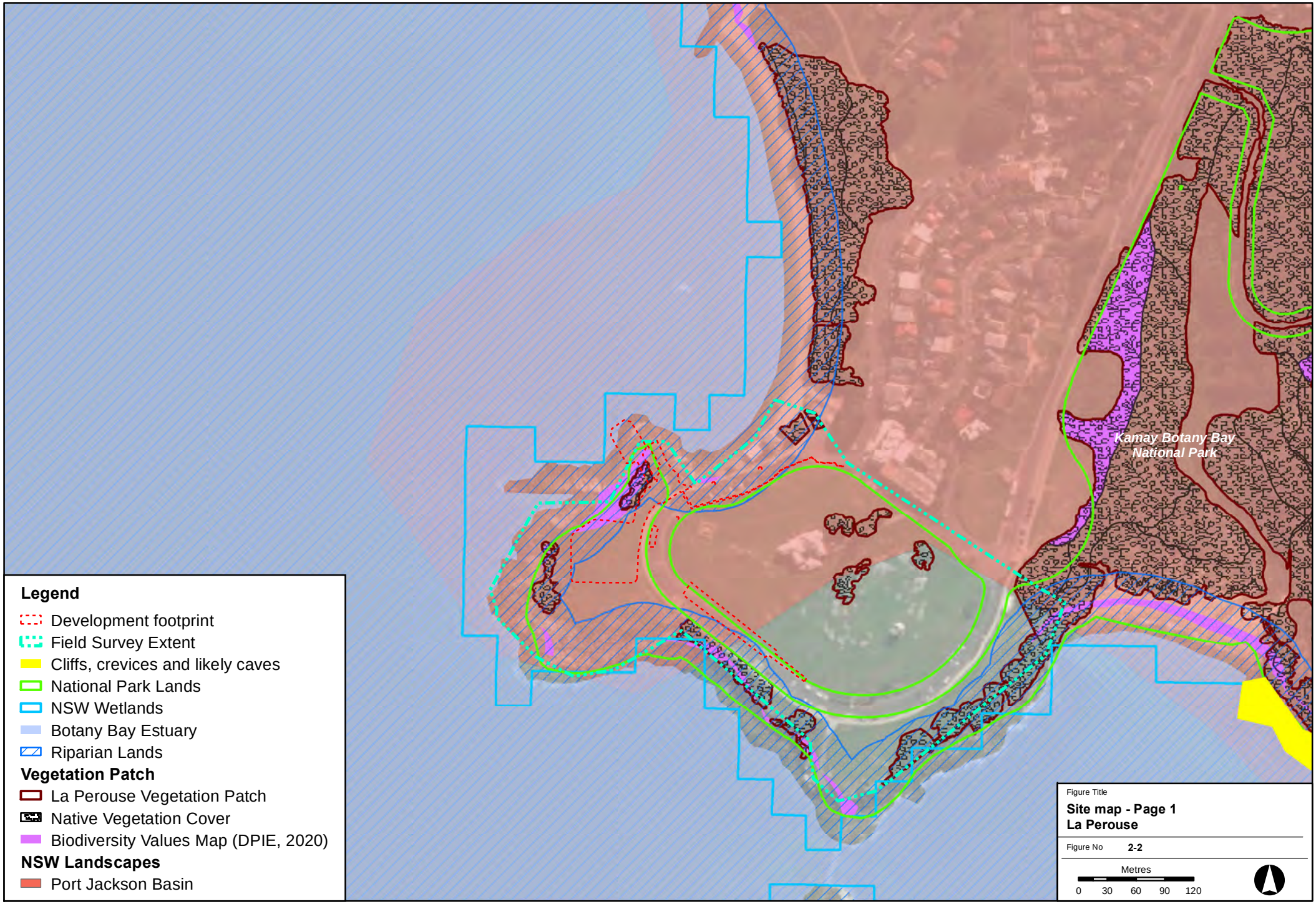
2.2.2 Patch size

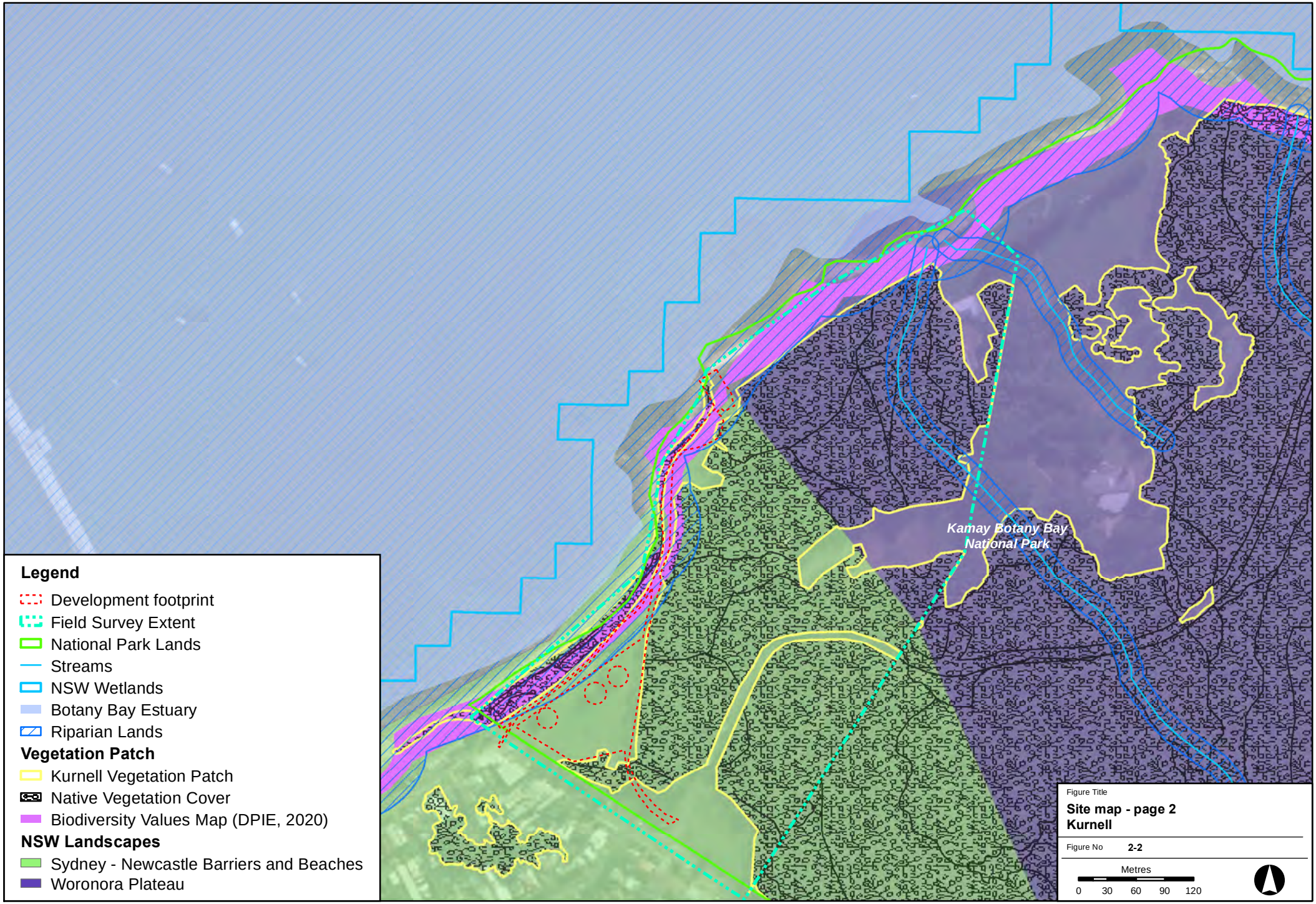
Vegetation patches and associated patch size classes are detailed in Table 2 for the study area. In accordance with the definition of patch size provided in the BAM (OEH, 2017), vegetation zones within the development site occurring less than 100 m apart were assigned to the same patch.

Two large patches were identified: including one at Kurnell and another at La Perouse (**Figure 2-2**). Vegetation at Marton Park Wetland and further to the southwest occurred more than 350m from nearby vegetation and was not assigned to the patch at Kurnell. Similarly to the north, vegetation at Bare Island was not included, occurring more than 160m from adjacent vegetation at La Perouse.

Table 2: Vegetation patches within the study area

Patch name	Patch size (ha)	Patch size class
Kurnell	152.47	≥100
La Perouse	103.44	≥100


Kamay Botany Bay
National Park
Legend
Development footprint
Field Survey Extent
Cliffs, crevices and likely caves
National Park Lands
NSW Wetlands
Botany Bay Estuary
Riparian Lands
Vegetation Patch
La Perouse Vegetation Patch
Native Vegetation Cover
Biodiversity Values Map (DPIE, 2020)
NSW Landscapes
Port Jackson Basin
Figure Title
Site map - Page 1
La Perouse
Figure No 2-2
Metres
0 30 60 90 120


Kamay Botany Bay National Park
Legend
Development footprint
Field Survey Extent
National Park Lands
Streams
NSW Wetlands
Botany Bay Estuary
Riparian Lands
Vegetation Patch
Kurnell Vegetation Patch
Native Vegetation Cover
Biodiversity Values Map (DPIE, 2020)
NSW Landscapes
Sydney - Newcastle Barriers and Beaches
Woronora Plateau
Figure Title
Site map - page 2
Kurnell
Figure No 2-2
Metres
0 30 60 90 120

3 Native vegetation

3.1 Methodology

3.1.1 Data gathering

Existing spatial datasets and documentation relevant to terrestrial vegetation communities within the study area was gathered to inform plant community mapping and requirements for more targeted field surveys. Relevant information sources for the review are outlined in Section 1.5 of this document.

3.1.2 Vegetation surveys

Vegetation surveys were carried out for the field survey extent, as shown in **Figure 3-1.**

Plant community delineation and the mapping of vegetation zones involved review and field validation of OEH (2016) and Sutherland Shire (DPIE, 2020d) mapped vegetation communities, by means of the following:

- Random Data Points involving the rapid survey of site-based vegetation to obtain a broad description including dominant species present within each strata and signs of disturbance such as clearing, fire or weed invasion.
- Walked meanders carried out in accordance with the DPIE's working draft Threatened Biodiversity Survey and Assessment – Guidelines for Developments and Activities (Department of Environment and Conservation, 2004) to assist with identifying vegetation zone boundaries.

Based on the results of site ground-truthing, vegetation communities were aligned with PCTs in the BioNet Vegetation Classification database (DPIE, 2020b) or discarded where relevant (i.e. exotic vegetation). Vegetation zones were established for each combination of vegetation type and condition and minimum requirements for targeted survey determined in accordance with the BAM (OEH, 2017) (Table 3).

Given the disturbance history of the site and numerous plantings of exotic and non-endemic species, some vegetated portions of the site did not strictly meet the definition of a PCT in the BioNet Vegetation Classification (DPIE, 2020b). Where this occurred, the vegetation was allocated to the PCT to which it most closely aligned, in accordance with section 5.3.1.6 of the BAM. This involved a review of floristics, landscape position, landform, site aspect and lithology to classify each vegetation zone within the field survey extent.

Table 3: Vegetation zones and targeted survey requirements for the field survey extent

Vegetation zone	Vegetation zone description	PCT best fit	Vegetation zone area (ha)	Minimum plot requirements	No. plots surveyed
VZ1	Bangalay / Tallowwood Forest	661 Bangalay - Smooth-barked Apple - Swamp Mahogany low open forest of southern Sydney, Sydney Basin Bioregion	0.77	1	1
VZ2	Bangalay / Smooth-barked Apple Forest	1778 Smooth-barked Apple - Coast Banksia / Cheese Tree open forest on sandstone slopes on the foreshores of the drowned river valleys of Sydney	2.48	2	2
VZ3	Planted/ Remnant: Native_Non-endemic	661 Bangalay - Smooth-barked Apple - Swamp Mahogany low open forest of southern Sydney, Sydney Basin Bioregion	1.27	1	1

Vegetation zone	Vegetation zone description	PCT best fit	Vegetation zone area (ha)	Minimum plot requirements	No. plots surveyed
VZ4	Tuckeroo / Coast Banksia Forest	661 Bangalay - Smooth-barked Apple - Swamp Mahogany low open forest of southern Sydney, Sydney Basin Bioregion	0.9	1	1
VZ5	Swamp Paperbark Forest	1832 Tuckeroo - Lilly Pilly - Cheese Tree littoral rainforest on sand dunes in the Sydney basin	0.99	1	1
VZ6	Spinifex Grassland	1204 Spinifex beach strand grassland, Sydney Basin Bioregion and South East Corner Bioregion	0.12	1	1
VZ7	Coastal Wattle Scrub	772 Coast Banksia - Coastal Wattle dune scrub of the Sydney Basin Bioregion and South East Corner Bioregion	0.06	1	1

Vegetation zone	Vegetation zone description	PCT best fit	Vegetation zone area (ha)	Minimum plot requirements	No. plots surveyed
VZ8	Bangalay x Blue Gum / Plum Pine / Crabapple Forest	661 Bangalay - Smooth-barked Apple - Swamp Mahogany low open forest of southern Sydney, Sydney Basin Bioregion	0.68	1	1
VZ9	Swamp Oak Forest	1232 - Swamp Oak floodplain swamp forest, Sydney Basin Bioregion and South East Corner Bioregion	0.11	1	1
VZ10	Bangalay forest above cleared grassland	661 Bangalay - Smooth-barked Apple - Swamp Mahogany low open forest of southern Sydney, Sydney Basin Bioregion	0.30	1	1
VZ11	Tallowwood Forest	661 Bangalay - Smooth-barked Apple - Swamp Mahogany low open forest of southern Sydney, Sydney Basin Bioregion	0.63	1	1

Vegetation zone	Vegetation zone description	PCT best fit	Vegetation zone area (ha)	Minimum plot requirements	No. plots surveyed
VZ12	Coastal Wattle Scrub - Derived[2]	772 Coast Banksia - Coast Wattle dune scrub of the Sydney Basin Bioregion and South East Corner Bioregion	0.31	1	1
VZ13	Pine / Australian Teak / White Beech Open Forest	661 Bangalay - Smooth-barked Apple - Swamp Mahogany low open forest of southern Sydney, Sydney Basin Bioregion	0.34	1	1
VZ14	Coast Banksia Scrub	772 Coast Banksia - Coast Wattle dune scrub of the Sydney Basin Bioregion and South East Corner Bioregion	0.09	1	1
VZ15	Coastal Wattle Scrub	1823 Bracelet Honey-myrtle - Heath-leaved Banksia - Scrub She-oak coastal cliffline scrub in the Sydney basin	0.62	1	1

[2] Derived is a name given to describe the highly disturbed variant of PCT772. It does not have the same meaning as provided in the BAM (OEH, 2017) as this PCT does not typically occur as a derived community (DPIE, 2020a).

Vegetation zone	Vegetation zone description	PCT best fit	Vegetation zone area (ha)	Minimum plot requirements	No. plots surveyed
VZ16	Coastal Wattle Scrub (revegetation area)	1823 Bracelet Honey-myrtle - Heath-leaved Banksia - Scrub She-oak coastal cliffline scrub in the Sydney basin	0.04	1	0
VZ17	Cleared grassland	NA	4.81	0	3 (composition only)

Vegetation composition plots were carried out in accordance with the BAM (OEH, 2017) and included a total of 16 plots, as shown in **Figure 3-1**. Given the small size or shape of some of the vegetation zones, the dimensions of some plots were altered as follows:

- Plot 7 - 80m x 5m (as this plot is within the Spinfex Grassland PCT (1204), only composition and structure values are required to be obtained [OEH, 2017]. Hence, a plot area of 400m² was adopted.)
- Plot 8 - 100m x 10m
- Plot 15 - 100m x 10m
- Plot 19 - 100m x 10m.

Plot data was imported into the BAM Calculator to generate a vegetation integrity score for each vegetation zone in accordance with the BAM.

In addition to the above, four flora composition plots (20m x 20m [i.e. 400m²]) were undertaken within areas of cleared grassland to illustrate the introduced nature of this vegetation type. This plot data was not added to the BAM Calculator as cleared grasslands were not considered to align with a native PCT.

3.2 Vegetation communities

Approximately 9.71ha of native vegetation was identified within the field survey extent comprising seven PCTs with varying levels of disturbance and condition (**Figure 3-1**). Approximately 8.96ha of this vegetation occurred at Kurnell, within the Kamay Botany Bay National Park boundary.

Vegetation within the field survey extent at Kurnell is heavily disturbed, largely comprising planted or regrowth vegetation. Wet sclerophyll forest dominates lands immediately adjacent to the development site with a small patch of Littoral Rainforest further to the east. Cleared grasslands dominate the development

footprint with a large number of planted non-endemic pines (*Araucaria spp.*) throughout the foreshore and hind dune areas.

Lands surveyed at La Perouse largely comprise maintained lawns and landscaped gardens. Approximately 0.75ha of native vegetation is present, restricted to small isolated patches of planted/ remnant scrub subject to high levels of weed invasion.

Table 4 identifies vegetation zones, condition, extent and TEC status for the subject lands. Table 4 also includes the vegetation integrity score for each vegetation zone, as calculated by the BAM Calculator. The floristic composition and structure of each PCT is detailed in the following sections. A detailed flora schedule is provided in Appendix A.

Table 4: Vegetation zones and integrity scores

Vegetation Zone description	PCT best fit	Condition	TEC status (BC Act/ EPBC Act)*	Vegetation integrity score	Extent (ha)
VZ1 Bangalay / Tallowwood Forest	661 Bangalay - Smooth-barked Apple - Swamp Mahogany low open forest of southern Sydney, Sydney Basin Bioregion	Low	BC Act: EEC Kurnell Dune Forest	51.5	0.77
VZ2 Bangalay/ Smooth-barked Apple Forest	1778 Smooth-barked Apple - Coast Banksia / Cheese Tree open forest on sandstone slopes on the foreshores of the drowned river valleys of Sydney	Moderate	-	40.2	2.48
VZ3 Planted/ Remnant: Native_Non-endemic	661 Bangalay - Smooth-barked Apple - Swamp Mahogany low open forest of southern Sydney, Sydney Basin Bioregion	Low	BC Act: EEC Kurnell Dune Forest	16.1	1.27
VZ4 Tuckeroo / Coast Banksia Forest	661 Bangalay - Smooth-barked Apple - Swamp Mahogany low open forest of southern Sydney, Sydney Basin Bioregion	Low	BC Act: EEC Kurnell Dune Forest	50.5	0.9
VZ5 Swamp Paperbark Forest	1832 Tuckeroo - Lilly Pilly - Cheese Tree littoral rainforest on sand dunes in the Sydney basin	Low	BC Act: EEC Littoral Rainforest	64.4	0.99

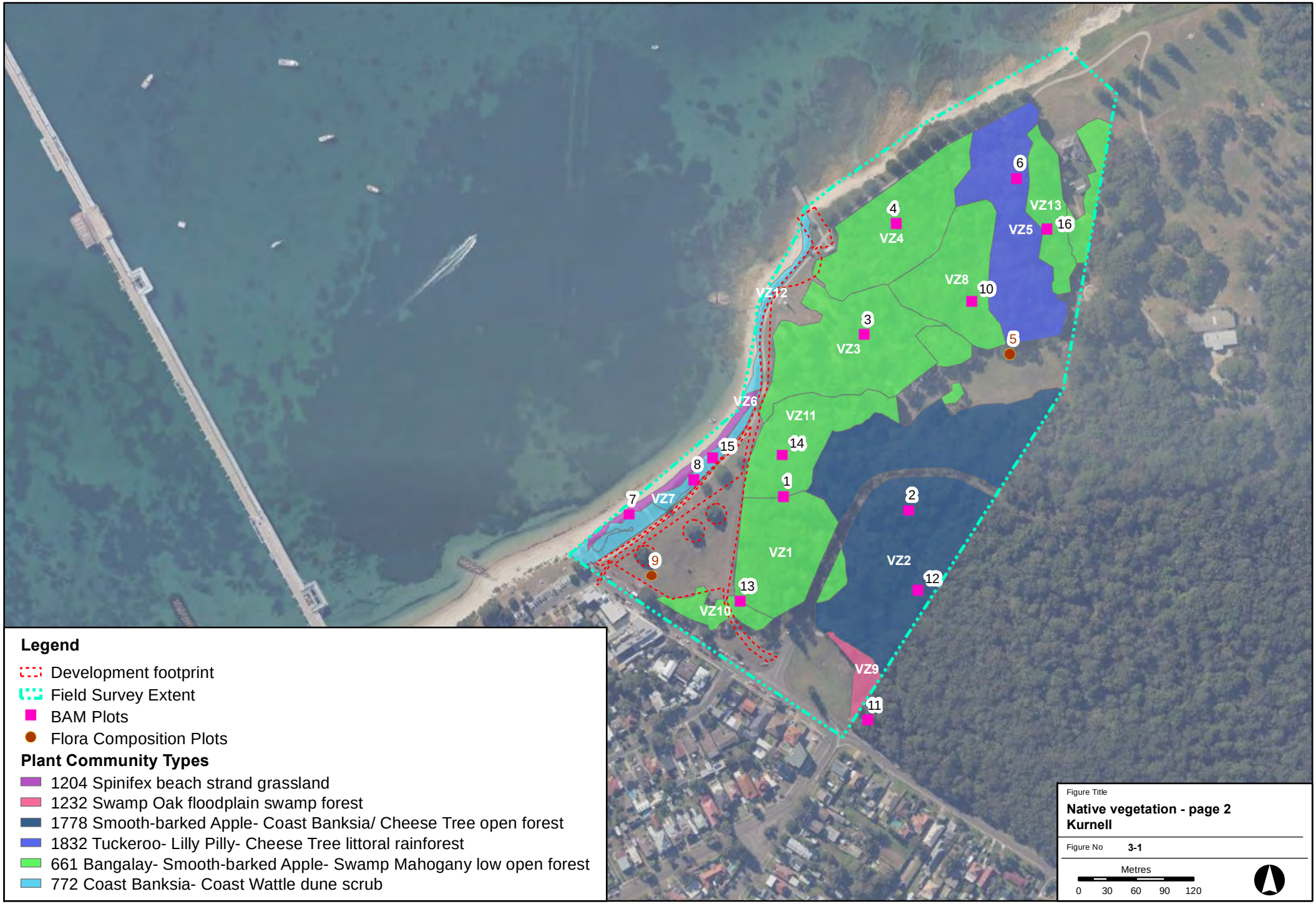
Vegetation Zone description	PCT best fit	Condition	TEC status (BC Act/ EPBC Act)*	Vegetation integrity score	Extent (ha)
VZ6 Spinifex Grassland	1204 Spinifex beach strand grassland, Sydney Basin Bioregion and South East Corner Bioregion	Moderate	-	32.1	0.12
VZ7 Coastal Wattle Scrub	772 Coast Banksia - Coastal Wattle dune scrub of the Sydney Basin Bioregion and South East Corner Bioregion	Low	-	8.8	0.06
VZ8 Bangalay x Blue Gum/ Plum Pine/ Crabapple Forest	661 Bangalay - Smooth-barked Apple - Swamp Mahogany low open forest of southern Sydney, Sydney Basin Bioregion	Low	BC Act: EEC Kurnell Dune Forest	58.3	0.68
VZ9 Swamp Oak Forest	1232 - Swamp Oak floodplain swamp forest, Sydney Basin Bioregion and South East Corner Bioregion	Low	BC Act: EEC Swamp Oak Floodplain Forest	52.6	0.11
VZ10 Bangalay forest above cleared grassland	661 Bangalay - Smooth-barked Apple - Swamp Mahogany low open forest of southern Sydney, Sydney Basin Bioregion	Low	BC Act: EEC Kurnell Dune Forest	15.7	0.30
VZ11 Tallowwood Forest	661 Bangalay - Smooth-barked Apple - Swamp Mahogany low open forest of southern Sydney, Sydney Basin Bioregion	Low	BC Act: EEC Kurnell Dune Forest	41.7	0.63
VZ12 Coastal Wattle Scrub-Derived[3]	772 Coast Banksia - Coast Wattle dune scrub of the Sydney Basin Bioregion and South East Corner Bioregion	Low	-	0.8	0.31

[3] Derived is a name given to describe the highly disturbance variant of PCT772. It does not have the same meaning as provided in the BAM (OEH, 2017) as this PCT does not typically occur as a derived community (DPIE, 2020a).

Vegetation Zone description	PCT best fit	Condition	TEC status (BC Act/ EPBC Act)*	Vegetation integrity score	Extent (ha)
VZ13 Pine/ Australian Teak/ White Beech Open Forest	661 Bangalay - Smooth-barked Apple - Swamp Mahogany low open forest of southern Sydney, Sydney Basin Bioregion	Low	BC Act: EEC Kurnell Dune Forest	47.7	0.34
VZ14 Coast Banksia Scrub	772 Coast Banksia - Coast Wattle dune scrub of the Sydney Basin Bioregion and South East Corner Bioregion	Low	-	22.6	0.09
VZ15 Coastal Wattle Scrub	1823 Bracelet Honey-myrtle - Heath-leaved Banksia - Scrub She-oak coastal cliffline scrub in the Sydney basin	Low	-	4.9	0.62
VZ16 Coastal Wattle Scrub (revegetation area)		Low	-	NA	0.04
VZ17 Cleared grassland	NA	-	-	-	4.81

* Table codes- EEC: Endangered Ecological Community


4
1
2
VZ14
VZ16
3
VZ15
Legend
Development footprint
Field Survey Extent
BAM Plots
Flora Composition Plots
Plant Community Types
1823 Bracelet Honey-myrtle- Heath-leaved Banksia Scrub She-oak coastline cliffline scrub
772 Coast Banksia- Coast Wattle dune scrub
Figure Title
Native vegetation - page 1
La Perouse
Figure No 3-1
Metres
0 20 40 60 80


VZ1
VZ2
VZ3
VZ4
VZ5
VZ6
VZ7
VZ8
VZ9
VZ10
VZ11
VZ12
VZ13
1
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8
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15
16
Legend
Development footprint
Field Survey Extent
BAM Plots
Flora Composition Plots
Plant Community Types
1204 Spinifex beach strand grassland
1232 Swamp Oak floodplain swamp forest
1778 Smooth-barked Apple- Coast Banksia/ Cheese Tree open forest
1832 Tuckeroo- Lilly Pilly- Cheese Tree littoral rainforest
661 Bangalay- Smooth-barked Apple- Swamp Mahogany low open forest
772 Coast Banksia- Coast Wattle dune scrub
Figure Title
Native vegetation - page 2
Kurnell
Figure No 3-1
Metres
0 30 60 90 120

PCT 661 Bangalay – Smooth-barked Apple – Swamp Mahogany low open forest of southern Sydney, Sydney Basin Bioregion

Vegetation formation: Wet Sclerophyll Forests (Shrubby sub-formation)

Vegetation class: North Coast Wet Sclerophyll Forests

Conservation status:

- EPBC Act: Not listed.
- BC Act: This PCT is a component of Kurnell Dune Forest in the Sutherland Shire and City of Rockdale, listed as endangered under the BC Act.

Regional extent: 68% cleared

Extent within subject lands: Approximately 4.89ha of this PCT was recorded at Kurnell, dominating much of the site including central and eastern areas.

Vegetation zones and condition:

- **VZ1: Bangalay / Tallowwood Forest – Low condition:** This vegetation zone is of low condition due to high levels of weed invasion and modified floristic composition. Vegetation structure was generally good. Plot 1 was completed in this zone.
- **VZ3: Planted/ remnant: Native_Non-endemic- Low condition:** This vegetation zone supported poor vegetative structure and floristics generally comprising planted/ remnant trees over a maintained understorey. Plot 3 was completed in this zone.
- **VZ4: Tuckeroo/ Coast Banksia – Low condition:** This vegetation zone supported a diverse shrub layer however the ground layer was subject to high levels of weed invasion; largely Asparagus Fern and Panic Veldt Grass. Plot 4 was completed in this zone.
- **VZ8: Bangalay x Blue Gum/ Plum Pine/ Crabapple Forest- Low condition:** This vegetation community supports a modified structure and floristic composition with a high proportion of weeds in the ground layer. Plot 10 was completed in this zone.
- **VZ10: Bangalay forest above cleared grassland- Low condition:** This vegetation zone supports a poor vegetation structure and floristics due to apparently high levels of habitat fragmentation and proximity to cleared lands. Vegetation is limited to an open canopy of Bangalay over a maintained understorey. Plot 13 was completed in this zone.
- **VZ11: Tallowwood Forest- Low condition:** This vegetation zone is subject to considerable weed invasion within the ground layer and supports modified floristics due to the presence of Tallowwood within the canopy. Plot 14 was completed in this zone.
- **VZ13: Pine/ Australian Teak/ White Beech open forest- Low condition:** This vegetation zone is considerably fragmented and supports poor/ modified

floristics and structure with a high proportion of weeds in the ground layer: exotic Buffalo Grass, Asparagus Fern, Panic Veldt Grass. The canopy comprises planted Pines *Araucaria spp*. and rainforest trees such as Bennett's Ash and White Beech. Bangalay and Port Jackson Fig also occur infrequently. Plot 16 was completed in this zone.

Description:

This vegetation community supports an open canopy generally dominated by Bangalay *Eucalyptus botryoides*. Other canopy species observed included Sydney Blue Gum *Eucalyptus saligna*, Tallowwood *Eucalyptus microcorys*, Smooth-barked Apple *Angophora costata*, Turpentine *Syncarpia glomulifera, Araucaria spp.,* Bennet's Ash *Flindersia bennettiana* (non-endemic)*,* White Beech *Gmelina leichhardtii* and occasional Port Jackson Fig *Ficus rubiginosa*.

Some vegetation zones support a scattered to mid-dense subcanopy comprising species such as Tuckeroo *Cupaniopsis anacardioides,* Coast Banksia *Banksia integrifolia*, Sweet Pittosporum *Pittosporum undulatum,* Plum Pine *Podocarpus elatus,* Celery Wood *Polyscias elegans,* Magenta lilly Pilly *Syzygium paniculatum,* Cabbage Palm *Livistona australis* and rare Flintwood *Scolopia braunii.*

A shrub layer was generally observed comprising species such as Sweet Pittosporum, Coffee Bush *Breynia oblongifolia*, Tuckeroo, Large Mock-olive *Notelaea longifolia*, Hairy Clerodendrum *Clerodendrum tomentosum* with occasional Tree Broom-heath *Monotoca elliptica*. Celery Wood, Magenta Lilly Pilly, Blueberry Ash and Rough-fruit Pittosporum *Pittosporum revolutum* were observed in some areas with the introduced Lady-of-the-night *Cestrum nocturnum* also common.

The groundcover was largely dominated by the exotic Asparagus Fern *Asparagus aethiopicus*, Panic Veldt Grass *Ehrharta erecta* and Buffalo Grass *Stenophrum secundatum*. Introduced species such as Wandering Jew *Tradescantia fluminensis* and Cobbler's Pegs *Bidens pilosa* were also present to a lesser degree. Common native species included Spiny-headed Mat-rush *Lomandra longifolia*, Native Grape *Cayratia clematidea*, Native Wandering Jew *Commelina cyanea*, Blue Flax-lily *Dianella caerulea* var. *producta* and Kidney Weed *Dichindra repens.* Knobby Club-rush *Ficinia nodosa*, Creeping Beard Grass *Oplismenus imbecillis*, Blady Grass *Imperata cylindrica*, Wombat Berry *Eustrephus latifolius* and Snake Vine *Stephania japonica* also occur less frequently.

Photograph 3-1: Low condition Bangalay – Smooth-barked Apple – Swamp Mahogany low open forest within plot 14 at Kurnell

PCT 1778 Smooth-barked Apple – Coast Banksia / Cheese Tree open forest on sandstone slopes on the foreshores of the drowned river valleys of Sydney

Vegetation formation: Dry Sclerophyll Forests

Vegetation class: Sydney Coastal Dry Sclerophyll Forests

Conservation status:

- EPBC Act: Not listed.
- BC Act: Not listed

Regional extent: 90% cleared

Extent within subject lands: Approximately 2.48ha of this PCT was recorded at Kurnell within south-eastern parts of the site.

Vegetation zones and condition:

- **VZ2: Bangalay/ Smooth-barked Apple forest- Moderate condition:** This vegetation zone is in a moderate to good condition depending on its distance from the adjacent road (Cape Solander Drive) and cleared areas. High threat weeds including African Olive *Olea europaea* subsp. *cuspidata* and Asparagus Fern dominate edge environments. Plot 2 and plot 12 were completed in this zone.

Description:

This vegetation community supports an open canopy of Bangalay and Smooth-barked Apple with occasional Kauri Pine *Agathis robusta* observed. A mid-dense understorey was present comprising Large Mock-olive, Sweet Pittosporum, Tree Broom-heath, Blueberry Ash, Tick Bush *Kunzea ambigua*, Prickly-leaved Paperbark *Melaleuca nodosa*, Coast Banksia and Cabbage Palm. Tuckeroo was also present in very low numbers.

The ground layer was dominated by Spiny-headed Mat-rush, Blue Flax-lily, Bracken *Pteridium esculentum* and Sweet Sarsparilla *Smilax glyciphylla* with a localised patch of Giant Water Vine *Cissus hypoglauca* to the south-west, immediately east of Cape Solander Drive. Milk Vine *Marsdenia rostrata* also occurs to a lesser extent and Asparagus Fern is also prevalent within disturbed edges.

Photograph 3-2: Moderate condition Smooth-barked Apple – Coast Banksia / Cheese Tree open forest within plot 2 at Kurnell

PCT 772 Coast Banksia – Coastal Wattle dune scrub of the Sydney Basin Bioregion and South East Corner Bioregion

Vegetation formation: Heathlands

Vegetation class: Sydney Coastal Heathlands

Conservation status:

- EPBC Act: Not listed.
- BC Act: Not listed

Regional extent: 65% cleared

Extent within subject lands: Approximately 0.37ha of this PCT was recorded within a long linear strip along the beach at Kurnell.

Vegetation zones and condition:

- **VZ7: Coastal Wattle Scrub- Low condition:** This vegetation zone is in low condition due to fragmentation, a lack of structure and poor species composition. Various introduced grasses, herbs and forbs are present within the ground layer. Plot 8 was completed within this zone.
- **VZ12: Coastal Wattle Scrub- derived[4]- Low condition:** This vegetation zone is in low condition due to fragmentation, poor vegetation structure and floristics. It is similar to VZ7 but lacking a shrub or tree layer and with a higher proportion weeds. Plot 15 was completed within this zone.
- **VZ14: Coast Banksia Scrub- Low condition:** This vegetation zone is in low condition due to fragmentation, poor vegetation structure and floristics. This zone supported a small tree layer of Coast Banksia, Swamp Oak *Casuarina glauca* and Bracelet Honey-myrtle *Melaleuca armillaris* with occasional Coast Teatree. An open shrub layer of Tuckeroo and Bitou Bush was also present. Plot 18 was completed within this zone.

Description:

This vegetation community comprises a small tree layer of Coastal Wattle and Coast Banksia present amongst a very dense ground layer dominated by exotic species such as Largeleaf Pennywort *Hydrocotyle bonariensis*, Buffalo Grass, Sea Rocket *Cakile maritima*, Kikuyu Grass *Cenchrus clandestinus* and Cobbler's Pegs. Pampas lily-of-the-valley *Salpichroa origanifolia* and Rambling Dock *Acetosa sagittate* were also observed at La Perouse. Native species included Couch Grass and Knobby Club-rush, with Hairy Spinifex *Spinifex sericeus*, Salt Couch *Sporobolus virginicus* and Pigface *Carpobrotus glaucescens* occurring less frequently.

[4] Derived is a name given to describe the highly disturbance variant of PCT772. It does not have the same meaning as provided in the BAM (OEH, 2017) as this PCT does not typically occur as a derived community (DPIE, 2020a).

High threat weeds within this PCT include Kikuyu Grass, Coastal Gazania *Gazania rigens*, Coastal Morning Glory *Ipomoea cairica*, Panic Veldtgrass, Rambling Dock, Cobbler's Pegs, Buffalo Grass. None of these species are listed as priority weeds under the NSW Biosecurity Act 2015 for the Greater Sydney region (DPI, 2020).

Photograph 3-3: Low condition Coast Banksia- Coastal Wattle dune scrub within plot 8 at Kurnell

PCT 1204 Spinifex beach strand grassland, Sydney Basin Bioregion and South East Corner Bioregion

Vegetation formation: Grasslands

Vegetation class: Maritime Grasslands

Conservation status:

- EPBC Act: Not listed.
- BC Act: Not listed

Regional extent: 38% cleared

Extent within subject lands: Approximately 0.12ha of this PCT was recorded within a linear strip along the beach at Kurnell.

Vegetation zones and condition:

- VZ6: Spinifex Grassland- Moderate condition: This vegetation zone was in moderate condition supporting some fragmentation and modified floristic structure. Plot 7 was completed within this zone.

Description:

An open ground layer was observed dominated by Hairy Spinifex and Couch Grass with Largeleaf Pennywort and Sea Rocket also prominent. Buffalo Grass, Cobbler's Pegs and Pigface also occurred less frequently.

High Threat Weeds recorded within this PCT include Cobbler's Pegs, Buffalo Grass and Bitou Bush *Chrysanthemoides monilifera* subsp. *rotundata.* Of these, Bitou Bush is listed as a priority weed under the NSW Biosecurity Act 2015 for the Greater Sydney region (DPI, 2020).

Photograph 3-4: Moderate condition Spinifex grassland within plot 7 at Kurnell

PCT 1232 Swamp Oak floodplain swamp forest, Sydney Basin Bioregion and South east Corner Bioregion

Vegetation formation: Forested Wetlands

Vegetation class: Coastal Swamp Forests

Conservation status:

- EPBC Act: This PCT did not meet condition thresholds for the Coastal Swamp Oak (*Casuarina glauca*) Forest of the New South Wales and South East Queensland ecological community, listed as endangered under the EPBC Act.
- BC Act: This PCT is a component of Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregion, listed as endangered under the BC Act.

Regional extent:

Extent within subject lands: Approximately 0.11ha of this PCT was recorded at Kurnell within the southeast part of the site.

Vegetation zones and condition:

- **VZ9: Swamp Oak Forest- Low condition:** This vegetation zones supports poor condition due to its fragmented nature, small size, proximity to adjacent cleared areas and a poor floristic structure. Plot 11 was completed within this zone.

Description:

This vegetation community supported a canopy of Swamp Oak with a sparse cover of Coffee Bush and Sweet Pittosporum present in the understorey.

The ground layer comprised a dense layer of predominantly exotic species such as Buffalo Grass, Japanese Honeysuckle *Lonicera japonica*, Asparagus Fern and Largeleaf Pennywort. Although native Bracken was also common. Other natives including Creeping Beard Grass, Couch Grass and native Wondering Jew were also observed.

High Threat Weeds recorded within this PCT include Paspalum *Paspalum dilatatum*, Panic Veldtgrass, African Olive, Lantana *Lantana camara*, Buffalo Grass, Asparagus Fern, Japanese Honeysuckle, Camphor Laurel *Cinnamomum camphora*, Moth Vine *Araujia sericifer* and Kikuyu Grass. Of these, African Olive, Lantana, Camphor Laurel, Moth Vine, Kikuyu Grass and Panic Veldtgrass are listed as priority weeds under the NSW *Biosecurity Act 2015* for the Greater Sydney region (DPI, 2020).

Photograph 3-5: Low condition Swamp Oak floodplain swamp forest within plot 11 at Kurnell

PCT 1832 Tuckeroo – Lilly Pilly – Cheese Tree littoral rainforest on sand dunes in the Sydney basin

Vegetation formation: Rainforest

Vegetation class: Littoral Rainforests

Conservation status:

- EPBC Act: This PCT did not meet condition thresholds for t Littoral Rainforests and Coastal Vine Thickets of Eastern Australia, listed as critically endangered under the EPBC Act.
- BC Act: This PCT is a component of Littoral Rainforest in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions, listed as endangered under the BC Act.

Regional extent: 80% cleared

Extent within subject lands: Approximately 0.99 ha of this PCT was recorded in the north-eastern portion of the Kurnell site.

Vegetation zones and condition:

- **VZ5: Swamp Paperbark Forest- Low condition**: This vegetation zone was in low to moderate condition, subject to fragmentation, small in size and lacking characteristic species. Plot 6 was completed within this zone.

Description:

This vegetation community supported a tall closed canopy of Swamp Paperbark *Melaleuca quinquinervia*, Magenta lilly Pilly, Port Jackson Fig and Black Bean *Castanospermum australe*, with White Beech occurring less frequently on the fringes. An open mid-storey of Cabbage Palm and Bangalow Palm *Archontophoenix cunninghamiana* was recorded with the understorey dominated by Cabbage Palm, Sweet Pittosporum and Rough-fruit Pittosporum.

The ground layer was dominated by dense patches of introduced Fishbone Fern *Nephrolepis cordifolia* and Asparagus Fern. Native Grape was also present.

High threat weeds recorded within this PCT include Ochna *Ochna serrulata*, Coastal Morning Glory and Asparagus Fern. Asparagus Fern is listed as a priority weed under the NSW Biosecurity Act 2015 for the Greater Sydney region (DPI, 2020).

Photograph 3-6: Low condition Tuckeroo – Lilly Pilly – Cheese Tree littoral rainforest within plot 6 at Kurnell

PCT 1823 Bracelet Honey-myrtle – Heath-leaved Banksia – Scrub She-oak coastal cliffline scrub in the Sydney basin

Vegetation formation: Heathlands

Vegetation class: Sydney Coastal Heaths

Conservation status:

- EPBC Act: Not listed.
- BC Act: Not listed

Regional extent: 39% cleared

Extent within subject lands: Approximately 0.66ha of this PCT was recorded at La Perouse along the cliff top associated with sandstone outcropping.

Vegetation zones and condition:

- **VZ15: Coastal Wattle Scrub- Low condition:** This vegetation zone was in low condition due to its fragmented nature and high levels of weed disturbance. Plot 19 was completed within this zone.
- **VZ16: Coastal Wattle Scrub (revegetation area)- Low condition:** This vegetation zone has been previously cleared and is now undergoing active restoration. A plot was not completed in this zone due to the sensitivity of site and the directive put in place by the NSW National Parks and Wildlife Service.

Description:

This vegetation community supported a low shrub layer of Coastal Wattle and Bitou Bush, the latter being the dominant species. Pigface was recorded in the ground layer.

High threat weeds recorded within this PCT include Panic Veldt Grass, Bitou Bush and Kikuyu Grass. Bitou Bush is listed as a priority weed under the NSW Biosecurity Act 2015 for the Greater Sydney region (DPI, 2020).

Photograph 3-7: Low condition Bracelet Honey-myrtle – Heath-leaved Banksia – Scrub She-oak coastal cliffline scrub within plot 19 at La Perouse

Cleared grassland (PCT: NA)

This vegetation community is not associated with a PCT.

Vegetation formation: NA

Vegetation class: NA

Conservation status:

- EPBC Act: Not listed.
- BC Act: Not listed

Regional extent: NA

Extent within subject lands: Approximately 4.81ha of cleared lands within the development site supported this vegetation community

Vegetation zones and condition:

- **VZ17: Cleared grassland.** This vegetation zone supports little to no resilience give the dominance of weed species and absence of structural layers. Plots 5, 17 and 20 were completed within this vegetation zone.

Description:

A canopy or shrub layer was generally with some planted Norfolk Island Pines, Tuckeroos and other landscaped species scattered throughout. The ground layer is dense and dominated by Couch with exotic Buffalo Grass and Kikuyu Grass also present Other exotic species including Catsear *Hypochaeris radicata*, Cape Dandelion *Arctotheca calendula* and *Plantago spp* were also present.

High Threat Weeds recorded within this PCT include Paspalum, Buffalo Grass and Kikuyu Grass. Neither of these plants are listed as a priority weed under the NSW Biosecurity Act 2015 for the Greater Sydney region (DPI 2020).

While Couch occupies a large proportion of the grassland, this species is widely cultivated and not considered a good indicator of any particular PCT.

Photograph 3-8: Cleared grassland at La Perouse (plot 20)

3.3 Threatened ecological communities

Threatened ecological communities (TECs) located within or adjacent to the development footprint at the Kurnell site are identified in **Table 3-1**.

There were no TECs recorded at the La Perouse site. While the Eastern Suburbs Banksia Scrub TEC (EPBC Act – Endangered; BC Act – Critically Endangered) is mapped as occurring 40 m to the north-east of the study area at La Perouse, none of the PCTs recorded align with this TEC. As such, Eastern Suburbs Banksia Scrub TEC does not occur within the study area. This TEC is not considered any further within this BDAR.

Kurnell Dune Forest in the Sutherland Shire and City of Rockdale was identified within foreshore and hind dune areas at Kurnell (**Figure 3-2**).

Littoral Rainforest in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions was located within the north-eastern portion of Kurnell, associated with Cooks Stream (**Figure 3-2**). Assessment against condition thresholds and key diagnostic criteria for the community (TSSC, 2008) indicates the TEC does not meet requirements for listing under the EPBC Act. More specifically the patch did not meet the following thresholds:

- At least 25% native plant species diversity characteristic of the community.
- At least 30% canopy cover of one rainforest canopy species characteristic of the community.

Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregion was associated with a very small patch of Swamp Oak forest in the south-east corner of Kurnell. Assessment against condition thresholds and key diagnostic criteria for the community (TSSC, 2016) indicates the patch is less than the minimum 0.5ha size for listing under the EPBC Act.

Table 3-1: Threatened ecological communities

TEC	PCT	Conservation status*		Regional extent	
		EPBC	BC	Estimate extent remaining (ha)	Estimate % cleared
Kurnell Dune Forest in the Sutherland Shire and City of Rockdale	PCT 661	-	E	273	68%
Littoral Rainforest in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	PCT 1832	-	E	185	80%
Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregion	PCT 1232	-	E	2400	95%

3.4 Groundwater dependent ecosystems

Review of the Groundwater Dependent Ecosystem (GDE) Atlas (BOM, 2020) indicates the potential for GDEs within proximity to the development footprint (**Figure 3-3**). These are identified as Coastal Sand Forest.

There is likely to be some surface expression of groundwater within proximity to the development site in association with Hawksbury Sandstone. Despite this, GDEs are unlikely to occur within the development footprint.

Legend

- Field Survey Extent
- Kurnell Dune Forest

Threatened Ecological Communities (BC Act)

- Swamp Oak Forest
- Littoral Rainforest

Figure Title

Threatened ecological communities

Figure No **3-2**

Metres

0 30 60 90 120

Legend

- Field Survey Extent
- Potential Groundwater Dependent Ecosystems

Figure Title

Potential groundwater dependent ecosystems

Figure No **3-3**

Metres

0 30 60 90 120

4 Threatened species

4.1 Identifying habitat suitability for threatened species

A preliminary assessment was undertaken using the BAM Calculator to identify threatened flora and fauna species with potential to occur within the study area. Ground-truthed PCTs were entered into the BAM Calculator including maximum values for native vegetation cover, patch size and vegetation integrity.

The suitability of habitat in the study area was assessed according to the steps outlined in BAM Section 6.4- *Steps for identifying habitat suitability for threatened species* (OEH, 2017) (Appendix B). A summary of the assessment results is presented in the following sections and form the basis for removal of species from the assessment where relevant.

4.1.1 Ecosystem credit species

Under the BAM (OEH, 2017; DPIE, 2020a), threatened species with a likelihood of occurrence that can be predicted by vegetation surrogates and landscape features or for which targeted survey has a low probability of detection are identified as ecosystem credits species. **Table 4-1** identifies ecosystem credit species predicted for the development footprint. Species presence is assumed for all predicted ecosystem credit species.

Table 4-1: Ecosystem credit species relevant to the assessment

Scientific name	Common name	EPBC Act status	BC Act status	Bionet records within 3km of the site	Habitat suitability	Species relevant to the assessment
Birds						
Botaurus poiciloptilus	Australasia Bittern	E	E	Two records prior to 1985 within 1km of the Kurnell site	Assumed present	Yes
Rostratula australis	Australian Painted Snipe	E	E	No	Assumed present	Yes
Ninox connivens	Barking Owl		V	No	Assumed present	Yes
Esacus magnirostris	Beach Stone-curlew		CE	No	Assumed present	Yes
Ixobrychus flavicollis	Black Bittern		V	No	Assumed present	Yes
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)		V	No	Assumed present	Yes
Stagonopleura guttata	Diamond Firetail		V	No	Assumed present	Yes
Artamus cyanopterus cyanopterus	Dusky Woodswallow		V	Two records prior to 2010 within 1km of Kurnell	Assumed present	Yes
Pandion cristatus	Eastern Osprey		V	Yes	Assumed present	Yes
Callocephalon fimbriatum	Gang-gang Cockatoo		V	One record from 2012	Assumed present	Yes
Calyptorhynchus lathami	Glossy Black-cockatoo		V	One record from 1990	Assumed present	Yes
Hieraaetus morphnoides	Little Eagle		V	No	Assumed present	Yes
Glossopsitta pusilla	Little Lorikeet		V	One record from 2012	Assumed present	Yes

Scientific name	Common name	EPBC Act status	BC Act status	Bionet records within 3km of the site	Habitat suitability	Species relevant to the assessment
				within 1.5km of La Perouse		
Sternula albifrons	Little Tern			Yes	Assumed present	Yes
Tyto novaehollandiae	Masked Owl		V	No	Assumed present	Yes
Ninox strenua	Powerful Owl		V	No	Assumed present	Yes
Anthochaera phrygia	Regent Honeyeater	CE	CE	No	Assumed present	Yes
Circus assimilis	Spotted Harrier		V	No	Assumed present	Yes
Lophoictinia isura	Square-tailed Kite		V	No	Assumed present	Yes
Ptilinopus superbus	Superb Fruit-Dove		V	One record from 2012 approx 3km north of La Perouse	Assumed present	Yes
Lathamus discolor	Swift Parrot	CE	E	No	Assumed present	Yes
Xenus cinereus	Terek Sandpiper	M	V	Yes	Assumed present	Yes
Neophema pulchella	Turquoise Parrot		V	No	Assumed present	Yes
Daphoenositta chrysoptera	Varied Sittella		V	Only one record from 1943 approx 1.5km south of Kurnell	Assumed present	Yes
Haliaeetus leucogaster	White-bellied Sea-eagle	M	V	Yes	Assumed present	Yes
Mammals						
Micronomus norfolkensis	Eastern Coastal Free-tailed Bat		V	No	Assumed present	Yes
Pteropus poliocephalus	Grey-headed Flying-fox	V	V	Yes	Assumed present	Yes
Miniopterus orianae oceanensis	Large Bent-winged Bat		V	Yes	Assumed present	Yes

Scientific name	Common name	EPBC Act status	BC Act status	Bionet records within 3km of the site	Habitat suitability	Species relevant to the assessment
Miniopterus australis	Little Bent-winged Bat		V	Yes	Assumed present	Yes
Dasyurus maculatus	Spotted-tailed Quoll	E	V	No	Assumed present	Yes
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat		V	One record at Kurnell in 2000	Assumed present	Yes
Reptiles						
Varanus rosenbergi	Resenberg's Goanna		V	No	Assumed present	Yes

Table codes: E- Endangered, V- Vulnerable, C – Critical, CE- Critically Endangered, M- Marine/ Migratory.

4.1.2 Species credit species

Under the BAM (OEH, 2017; DPIE, 2020a), threatened species with a likelihood of occurrence that cannot be confidently predicted by vegetation surrogates and landscape features but can be reliably detected by targeted survey are identified as species credit species.

Table 4-2 identifies species credit species predicted for the development footprint and an assessment of habitat suitability. The assessment indicates 10 species have a likelihood to occur within the development footprint and require targeted survey.

Table 4-2: Potential species credit species and assignment of candidate status

Scientific name	Common name	Credit class	EPBC Act	BC Act	Bionet records within 3km of site	Habitat suitability	Candidate species requiring targeted survey
Birds							
Ninox connivens	Barking Owl	Species/ Ecosystem		V	No	Species not heard or observed. No sign of nesting or roosting beneath potential habitat trees within the field survey extent. No suitable habitat trees present within the development site. Species considered absent due to degraded habitat.	No
Esacus magnirostris	Beach Stone-curlew	Species/ Ecosystem		CE	No	Foreshore areas offer marginal habitat only. Beach <1m wide and subject to high amounts of foot traffic.	No
Pandion cristatus	Eastern Osprey	Species / Ecosystem		V	Yes	Suitable foraging habitat present. No Ospreys, or their typical nests were observed. Species is considered absent.	No
Callocephalon fimbriatum	Gang-gang Cockatoo	Species / Ecosystem		V	One record from 2012	Species not heard or observed. No suitable habitat trees present within development footprint.	No
Calyptorhynchus lathami	Glossy Black-cockatoo	Species/ Ecosystem		V	One record from 1990	Species not heard or observed. No suitable habitat trees present within development footprint.	No
Hieraaetus morphnoides	Little Eagle	Species/ Ecosystem		V	No	Site contains potential foraging habitat. Unlikely breeding habitat due to absence of nesting activity or typical nests.	No
Sternula albifrons	Little Tern	Species/ Ecosystem			Yes	Foreshore habitats are marginal; <1m wide and subject to high amounts of foot traffic.	No
Tyto novaehollandiae	Masked Owl	Species/ Ecosystem		V	No	Species not heard or observed. No sign of nesting or roosting beneath potential habitat trees within the field survey extent. No suitable	No

Scientific name	Common name	Credit class	EPBC Act	BC Act	Bionet records within 3km of site	Habitat suitability	Candidate species requiring targeted survey
						habitat trees present within the development site. Species considered absent due to degraded habitat.	
Ninox strenua	Powerful Owl	Species/ Ecosystem		V	No	Species not heard or observed. No sign of nesting or roosting beneath potential habitat trees within the field survey extent. No suitable habitat trees present within the development site. Species considered absent due to degraded habitat.	No
Anthochaera phrygia	Regent Honeyeater	Species/ Ecosystem	CE	CE	No	Site is not identified on the important habitat map for Regent Honeyeater. Species considered absent due to lack of suitable habitat.	No
Lophoictinia isura	Square-tailed Kite	Species/ Ecosystem		V	No	No stick nests were observed within or adjacent to the development footprint. Potential foraging habitat present.	No
Lathamus discolor	Swift Parrot	Species/ Ecosystem	CE	E	No	Site is not identified on the important habitat map for Swift Parrot.. No suitable habitat occurs within the study area.	No
Xenus cinereus	Terek Sandpiper	Species/ Ecosystem	M	V	Yes	Marginal habitat subject to high disturbance	No
Haliaeetus leucogaster	White-bellied Sea-eagle	Species/ Ecosystem		V	Yes	Suitable foraging habitat present. Unlikely breeding habitat due to absence of nesting activity.	No
Burhinus grallarius	Bush Stone-curlew	Species		E	No	There are no records for this species in the area. No Bush Stone-curlews were observed or heard calling during the survey. The species is considered absent.	No

Scientific name	Common name	Credit class	EPBC Act	BC Act	Bionet records within 3km of site	Habitat suitability	Candidate species requiring targeted survey
Haematopus longirostris	Australian Pied Oystercatcher	Species		E	Yes	Recorded during field survey. Suitable habitat within rocky shoreline and beach areas within and adjacent to the development area.	Yes
Eudyptula minor - endangered population	Little Penguin in the Manly Point Area	Species		E	Yes	Site located more than 18km south of known population. Species considered absent.	No

Scientific name	Common name	Credit class	EPBC Act	BC Act	Bionet records within 3km of site	Habitat suitability	Candidate species requiring targeted survey
Mammals							
Pteropus poliocephalus	Grey-headed Flying-fox	Species/ Ecosystem	V	V	Yes	Suitable foraging habitat present. No camps present within the site. Species recorded during field survey.	No
Miniopterus orianae oceanensis	Large Bent-winged Bat	Species/ Ecosystem		V	Yes	Site contains suitable foraging habitat. No habitat features suspected to be used for breeding were identified on site	No (however species targeted during microbat survey)
Miniopterus australis	Little Bent-winged Bat	Species/ Ecosystem		V	Yes	Site contains suitable foraging habitat. No habitat features suspected to be used for breeding were identified on site	No (however species targeted during microbat survey)
Cercartetus nanus	Eastern Pygmy-possum	Species		V	No	Suitable habitat does not occur at the site. The species is considered absent.	No
Isoodon obesulus obesulus	Southern Brown Bandicoot (eastern)	Species	E	E	No	No records exist within the Kamay-Botany Bay National Park. The species is considered absent.	No
Chalinolobus dwyeri	Large -eared Pied Bat	Species	V	V	No	Potential for caves to occur within 2km of site. Suitable foraging habitat present. Species targeted but not recorded.	Yes
Myotis macropus	Southern Myotis	Species		V	Yes	Species targeted but not recorded. Potential habitat present within the site.	Yes
Petaurus norfolcensis	Squirrel Glider	Species		V	No	Suitable habitat does not occur on site. Species considered absent.	No
Vespadelus troughtoni	Eastern Cave Bat	Species		V	No	Potential for caves to occur within 2km of site. Suitable foraging habitat present. Species targeted but not recorded.	Yes

Scientific name	Common name	Credit class	EPBC Act	BC Act	Bionet records within 3km of site	Habitat suitability	Candidate species requiring targeted survey
Phascolarctos cinereus - endangered population	Koala in the Pittwater Local Government Area	Species		E	No	Site is not located within the Pittwater LGA.	No
Perameles nasuta - endangered population	Long-nosed Bandicoot, North Head	Species		E	No	Site located several kilometres to the south of known population. Species considered absent	No
Petaurus norfolcensis - endangered population	Squirrel Glider on Barrenjoey Peninsula, north of Bushrangers Hill	Species		E	No	Site located approximately 36km south of known population. Species considered absent	No
Frogs							
Crinia tinnula	Wallum Froglet	Species		V	Yes	No suitable habitat present at the site. Species targeted but not recorded. Species considered absent.	Yes
Litoria aurea	Green and Golden Bell Frog	Species	V	E	Yes	Species targeted but not recorded. Species considered absent.	Yes
Litoria brevipalmata	Green-thighed Frog	Species		V	No	Suitable habitat does not occur at the site. Species considered absent.	No
Pseudophryne australis	Red-crowned Toadlet	Species		V	No	Suitable habitat does not occur at the site. Species considered absent.	No
Reptiles							
Hoplocephalus bitorquatus	Pale-headed Snake	Species		V	No	Suitable habitat does not occur in the development site. Species considered absent.	No
Plants							
Allocasuarina portuensis	Nielsen Park She-oak	Species		E	No	Suitable habitat does not occur at the site. Species is considered absent.	No

Scientific name	Common name	Credit class	EPBC Act	BC Act	Bionet records within 3km of site	Habitat suitability	Candidate species requiring targeted survey
Caladenia tessellata	Thick Lip Spider Orchid	Species	V	E	No	No suitable habitat present within the development site.	No
Chamaesyce psammogeton	Sand Spurge	Species		E	No	Potential habitat present along foreshore Species targeted but not recorded.	Yes
Cryptostylis hunteriana	Leafless Tongue Orchid	Species	V	V	No	Potential habitat is present in the eastern part of PCT 1778, around Plot 12. The Tartan Tongue Orchid (*Cryptostylis erecta*) was recorded here. Investigations during January, November and/or December may be required to confirm presence/ absence. Species presence assumed.	Yes
Grammitis stenophylla	Narrow-leaf Finger Fern	Species		E	No	Suitable habitat does not occur on site. Species considered absent.	No
Leptospermum deanei	Leptospermum deanei	Species	V	V	No	Not known in the Sutherland Shire or Randwick LGA (DPIE, 2020b). Suitable habitat does not occur at the site. Species considered absent.	No
Melaleuca biconvexa	Biconvex Paperbark	Species	V	V	No	Suitable habitat does not occur in the development site. Species considered absent.	No
Senecio spathulatus	Coast Groundsel	Species		E	Yes	Habitat degraded and marginal for species	No
Syzygium paniculatum	Magenta Lilly Pilly	Species	V	E	Yes	Species recorded. Poor quality habitat within PCT 661 and PCT 1832.	Yes
Thelymitra atronitida	Black-hooded Sun Orchid	Species		CE	Yes	Known population within the Kamay Botany Bay National Park. Potential habitat at La Perouse is considerably degraded. No potential habitat recorded at Kurnell. Species considered asbent.	No
Rhodamnia rubescens	Scrub Turpentine	Species			No	Species not recorded in the area. Habitat within site unsuitable due to historical disturbance and degradation.	No

Scientific name	Common name	Credit class	EPBC Act	BC Act	Bionet records within 3km of site	Habitat suitability	Candidate species requiring targeted survey
Rhodomyrtus psidioides	Native Guava	Species		CE	No	Species not recorded in the area. Habitat within site unsuitable due to historical disturbance and degradation.	No

Table codes: E- Endangered, V- Vulnerable, C – Critical, CE- Critically Endangered, M- Marine/ Migratory.

4.2 Candidate species requiring targeted survey

Candidate species credit species requiring targeted survey include eight threatened fauna species and three threatened flora species.

Table 4-3 presents a summary of field survey methods for candidate species credit species relative to BAM survey requirements.

Table 4-3: Candidate species credit species and survey design employed

Scientific name	Common name	BAM survey period	Survey guidelines	Survey design employed	Survey effort
Haematopus longirostris	Australian Pied Oystercatcher	Year round	N/A	Opportunistic bird surveys and habitat assessment. The species was recorded within the site. As the survey effort did not include two seasons of survey the species is assumed to use the site for its breeding/roosting purposes.	Total 3 hours
Chalinolobus dwyeri	Large -eared Pied Bat	Nov-Jan	Species credit threatened bats and their habitats (OEH, 2018)	Acoustic detection and habitat assessment. The survey period for the species fell outside of the BAM survey window. The site does not support breeding habitat for the species. However, species presence for foraging cannot be discounted based on the presence of cliffs with possible caves/ overhangs within 2km of the site offering potential breeding habitat for the species.	2 detectors for 2 survey nights. Total 4 detector nights/ 7 hours survey effort.
Crinia tinnula	Wallum Froglet	Year round	N/A	Amphibian survey: - diurnal habitat assessment - nocturnal call playback and spotlighting The species was not recorded and is considered absent. No suitable habitat present within development footprint.	3 sites/ day 10 mins/ site. Total 90 mins survey effort.
Litoria aurea	Green and Golden Bell Frog	Nov-Mar	Survey guidelines for Australia's threatened frogs (DEWHA, 2010)	Amphibian survey: - diurnal habitat assessment - nocturnal call playback and spotlighting The survey period for this species fell within the BAM survey window and survey conditions were considered suitable for determining presence/ absence. The species was not recorded and suitable habitat was not observed within the site. The species is considered absent.	4 sites/ day 10 mins/ site. Total 90 mins survey effort.

Scientific name	Common name	BAM survey period	Survey guidelines	Survey design employed	Survey effort
Myotis macropus	Southern Myotis	Oct-Mar	Species credit threatened bats and their habitats (OEH, 2018)	Acoustic detection and habitat assessment. The survey period for this species fell within the BAM survey window. Despite a high density of hollow-bearing trees observed on site, the species was not recorded and is considered absent. No hollow-bearing trees occur within the development footprint.	2 detectors for 2 survey nights. Total 4 detector nights/ 7 hours survey effort.
Syzygium paniculatum	Magenta Lilly Pilly	Apr-June	NA	Due to the relatively small extent of suitable habitat for this species, this species was targeted during BAM plots and field traverses. Where the species was located, more detailed searches were undertaken in the immediate vicinity to obtain an estimate of individuals present.	Total 4 hours
Chamaesyce psammogeton	Sand Spurge	Year round	NA	Due to the relatively small extent of suitable habitat for this species (PCT 1204, Spinifex Grassland) this species was targeted during the BAM plot conducted in PCT 1204 and field traverses. The species was not recorded and is considered absent.	Total 2 hours
Cryptostylis hunteriana	Leafless Tongue Orchid	Nov-Jan	NA	No targeted surveys were carried out for this cryptic species as survey timing did not coincide with flowering. Presence assumed within suitable habitat in field survey extent. No suitable habitat present within development footprint.	NA

Scientific name	Common name	BAM survey period	Survey guidelines	Survey design employed	Survey effort
Vespadelus troughtoni	Eastern Cave Bat	Nov-Jan	Species credit threatened bats and their habitats (OEH, 2018)	Acoustic detection and habitat assessment The survey period for the species fell outside of the BAM survey window. The site does not support breeding habitat for the species. However, species presence for foraging cannot be discounted based on the presence of cliffs with possible caves/ overhangs within 2km of the site offering potential breeding habitat for the species.	2 detectors for 2 survey nights. Total 4 detector nights/ 7 hours survey effort.

4.3 Threatened species survey

4.3.1 Terrestrial flora surveys

Survey for Magenta Lilly Pilly incorporated BAM plots and field traverses carried out from 24 March to 26 March 2020 within suitable habitat identified for the field survey extent at the Kurnell site, as shown in **Figure 4-1**. Once the species was located, more detailed searches were undertaken in the immediate vicinity to obtain an estimate of individuals present.

4.3.2 Terrestrial fauna surveys

Targeted surveys for terrestrial threatened fauna were conducted from 24 March to 26 March 2020 on the Kurnell site only as no suitable habitat for candidate threatened species was identified at La Perouse (other than Sooty Oystercatcher which had already been recorded opportunistically). The level of survey effort is summarised in **Table 4-3** and included the following methods for targeting candidate species:

- Opportunistic bird surveys and habitat assessment including searches for:
  - Stick nests and Flying-fox camps
  - Potential micro-bat breeding habitat (tree hollows suitable for roosting, caves/ crevices housing breeding colonies, man-made habitat features including buildings, drainage structures and bridges).
  - Tree hollows suitable for supporting Masked Owl *Tyto novaehollandiae* breeding.
- Acoustic echolocation call detection for microchiropteran bat species
- Frog surveys targeting Green and Golden Bell Frog and Wallum Froglet including
  - diurnal habitat assessment
  - nocturnal call playback and spotlighting
- Spotlighting for nocturnal arboreal fauna.

Figure 4-2 shows the location of field surveys targeting candidate threatened fauna and a summary of local conditions at the time of survey is provided in **Table 4-4**.

Table 4-4: Survey weather conditions*

Date	Rainfall (mm)	Temperature (°C)	
		Minimum	Maximum
24 March 2020	2.4	17.0	22.9
25 March 2020	0.6	17.8	23.9
26 March 2020	16.4	17.5	21.5

* Daily observations from Sydney Airport weather station (066037) approximately 8km from development site

4.4 Threatened species results

4.4.1 Threatened flora

No threatened flora were identified within the development footprint. One threatened flora species, Magenta Lilly Pilly *Syzygium paniculatum*, was identified immediately adjacent to proposed works at Kurnell (**Table 4-5**). The species was recorded in association with the following vegetation communities:

- Bangalay x Blue Gum/ Plum Pine/ Crabapple Forest (PCT 661)
- Swamp Paperbark Forest (PCT 1832).

Approximately 70 individuals are estimated to occur within the field survey extent at Kurnell. These occur as a dense stand of around 50 individuals, a smaller patch of 14 individuals and some nearby individual trees (**Figure 4-1**). The height of individuals recorded varied from approximately 2-15 m. However, the spacing and pattern of the trees suggests they may have been planted. This is not uncommon in the Sydney Metropolitan area, due to the popularity of the species in ornamental plantings (OEH, 2012).

Field surveys also identified suitable habitat for Leafless Tongue Orchid within Bangalay/ Smooth-barked Apple forest (PCT 1778) at Kurnell (**Figure 4-1**). Field surveys within potential habitats did not coincide with flowering periods for the species. Due to the cryptic nature of the species, presence / absence within the study area could not be confirmed, however the area of mapped habitat for this species is located outside of the development footprint.

No suitable habitat for threatened flora was recorded at La Perouse.

Table 4-5: Threatened flora adjacent to the development footprint

Scientific name	Common name	EPBC Act Status	BC Act Status	Count
Syzygium paniculatum	Magenta Lilly Pilly	V	E	70
Cryptostylis hunteriana	Leafless Tongue-orchid	V	V	NA


Legend
Development footprint
Field Survey Extent
Leafless Tongue Orchid habitat
Magenta Lilly Pilly Polygon (30m)
Magenta Lilly Pilly
Magenta Lilly Pilly
Magenta Lilly Pilly (Patch of 14)
Magenta Lilly Pilly (Patch of 50)
Figure Title
Threatened Flora
Figure No 4-1
Metres
0 30 60 90 120

4.4.2 Threatened fauna

Fauna habitats

This section presents a summary of fauna habitats for the *field survey extent*. Habitats within the *development footprint* are considerably degraded supporting modified and/ or disturbed vegetation and lacking important habitat constraints for candidate threatened species, where relevant.

Kurnell

Fauna habitats at Kurnell have been historically disturbed and consist of modified wet and sclerophyll forests, with open canopies and cleared grasslands. Numerous hollow-bearing trees are present with logs, fallen debris and leaf litter common throughout the site at varying densities.

No rock outcrops, caves (or cave substitutes [i.e. culverts]), crevices or ledges important for the breeding requirements of microbats were identified within the study area.

The native vegetation at the Site provides foraging habitat for numerous flying species as well as arboreal and ground dwelling mammals. Given its connectivity with the expansive Kamay-Botany Bay National Park, an array of common animals are likely to utilise the site, particularly the woodland east of Cape Solander Road.

Riparian vegetation associated with Cooks Stream and forested wetlands associated with PCT 1232 are not considered suitable habitat for threatened frogs.

The rocky shoreline provides foraging habitat for the Australian Pied Oystercatcher (recorded during the field survey).

The remainder of the habitat present is not considered suitable for any of the other species credit species identified as potentially occurring.

La Perouse

Much of La Perouse has been cleared with some fragmented patches of modified heathland remaining. This vegetation offers a very small area of foraging habitat for numerous flying species. Given its connectivity with the Kamay-Botany Bay National Park, arboreal and ground dwelling mammals may utilise the Coast Banksia Scrub, however, the species most likely are those that commonly occur in disturbed environments on the fringe of urban developments (i.e. Common Brushtail Possum *Trichosurus vulpecula*).

Sandstone cliffs and rock outcropping with small overhangs and crevices are present. However, no caves (or cave substitutes [culverts]), important for the breeding requirements of microbats are present.

The rocky portion of the shoreline provides foraging and potential breeding habitat for the Sooty Oystercatcher (recorded during the field survey).

No hollow-bearing trees were recorded within the site, with little to no logs, fallen debris and leaf litter observed. Similarly, no forested wetlands or natural

waterbodies (apart from Botany Bay) occur. The remainder of the habitat present is not considered suitable for any of the other species credit species identified as potentially occurring.


Legend
Development footprint
Field Survey Extent
Echolocation
Frog Survey
Stag watch (footbridge)
Spotlighting Transects
Figure Title
Threatened fauna survey locations
Figure No 4-2
Metres
0 30 60 90 120

Targeted survey results

A total of six threatened fauna species were recorded during field surveys (**Table 4-5**). Five of these were detected at Kurnell and one at La Perouse. Presence was also assumed for two additional fauna that could not be discounted based on the survey design employed (**Table 4-5**). Species polygon requirements for these species are also noted in **Table 4-5**. These are shown in **Figure 4-3**.

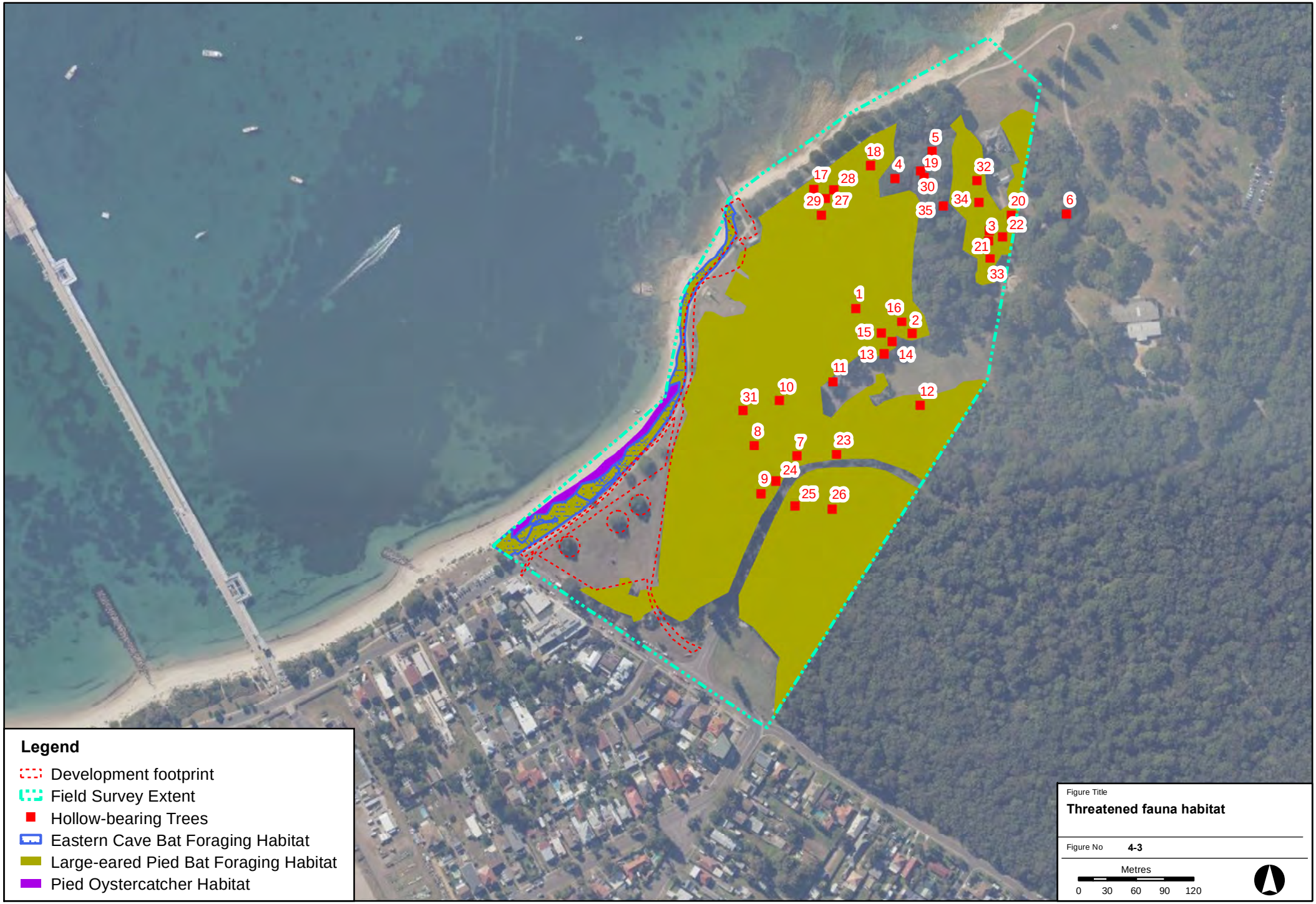
Legend
Development footprint
Field Survey Extent
Hollow-bearing Trees
Eastern Cave Bat Foraging Habitat
Large-eared Pied Bat Foraging Habitat
Pied Oystercatcher Habitat
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
Figure Title
Threatened fauna habitat
Figure No 4-3
Metres
0 30 60 90 120

Table 4-5: Threatened fauna and species habitat polygon requirements

Common name	Scientific name	Status		Credit class	Biodiversity Risk Weighting	Sensitivity to loss	Sensitivity to potential gain	Survey observations	Species habitat polygon requirements
		EPBC Act	BC Act						
Australian Pied Oystercatcher	*Haematopus longirostris*		E	Species	2.00	High	High	Species observed foraging along rocky shoreline at Kurnell	Potential breeding habitat identified within the study area. Species polygon includes PCT habitat associations within the field survey extent situated within 100m of estuarine areas and the ocean, as well as rock platforms and beach areas directly impacted.
Sooty Oystercatcher	*Haematopus fuliginosus*		V	Species	2.00	Moderate	High	Species observed foraging along rocky shoreline at La Perouse	Potential breeding habitat identified within the study area (rock platforms and beach areas). Species polygon includes rock platforms directly impacted within 100m of estuarine areas and the ocean (see Section 6.2.1 for details).
Little Bent-winged Bat	*Miniopterus australis*		V	Species (breeding)/ Ecosystem	3.00	Moderate	High (foraging)–very high (breeding)	Calls detected at Kurnell.	As no suitable breeding or roosting habitat is present within or adjacent to the development footprint, the species

Common name	Scientific name	Status		Credit class	Biodiversity Risk Weighting	Sensitivity to loss	Sensitivity to potential gain	Survey observations	Species habitat polygon requirements
		EPBC Act	BC Act						
									credit component for this species does not apply. Project impacts are addressed through ecosystem credits.

Common name	Scientific name	Status		Credit class	Biodiversity Risk Weighting	Sensitivity to loss	Sensitivity to potential gain	Survey observations	Species habitat polygon requirements
		EPBC Act	BC Act						
Large Bent-winged Bat	*Miniopterus orianae oceanensis*		V	Species (breeding)/ ecosystem	3.00	Moderate	High (foraging)– very high (breeding)	Calls detected at Kurnell.	As no suitable breeding or roosting habitat is present within or adjacent to the development footprint, the species credit component for this species does not apply. Project impacts are addressed through ecosystem credits.
Eastern Coastal Free-tailed Bat	*Micronomus norfolkensis*		V	Ecosystem	N/A	Moderate	High	Calls detected at Kurnell.	This species is an ecosystem credit species. No species polygons are required.
Grey-headed Flying-fox	*Pteropus poliocephalus*	V	V	Species (breeding)/ ecosystem	2.00	Moderate	High	Recorded flying over and foraging within Littoral Rainforest at Kurnell	As no flying-fox camps are present within or adjacent to the development footprint, the species credit component for this species does not apply. Project impacts are addressed through ecosystem credits.
Large-eared Pied Bat	*Chalinolobus dwyeri*	V	V	Species	3.00	Moderate	Very high	Species not recorded. The site does not support breeding habitat for the species. However, species presence for	Potential breeding habitats identified within the study area (approximately 1km from the development footprint) based on topography data and

Common name	Scientific name	Status		Credit class	Biodiversity Risk Weighting	Sensitivity to loss	Sensitivity to potential gain	Survey observations	Species habitat polygon requirements
		EPBC Act	BC Act						
								foraging cannot be discounted based on the presence of karst, cave and cliffs within 2km of the site offering potential breeding habitat for the species.	aerial photo interpretation. Species polygon includes PCT habitat associations within the field survey extent situated within 2km of potential breeding habitat.

Common name	Scientific name	Status		Credit class	Biodiversity Risk Weighting	Sensitivity to loss	Sensitivity to potential gain	Survey observations	Species habitat polygon requirements
		EPBC Act	BC Act						
Eastern Cave Bat	*Vespadelus troughtoni*		V	Species	3.00	Moderate	Very high	The site does not support breeding habitat for the species. However, species presence for foraging cannot be discounted based on the presence of karst, cave and cliffs within 2km of the site offering potential breeding habitat for the species.	Potential breeding habitats identified within the study area (approximately 1km from the development footprint) based on topography data and aerial photo interpretation. Species polygon includes PCT habitat associations within the field survey extent situated within 2km of potential breeding habitat.

5 Matters of National Environmental Significance

This section presents an assessment of likely significant impacts to MNES in accordance with the Commonwealth Significant Impact Guidelines 1.1 (DEE, 2013). Consideration is given to terrestrial matters and the Towra Point Nature Reserve Ramsar site only. MNES associated with marine environments including threatened species and ecological communities, and marine migratory species are addressed in the EIS Appendix H Marine biodiversity assessment.

5.1 Listed Threatened Ecological Communities

A search of the EPBC Act PMST database (accessed 3 June 2020), identified eleven TECs as having a potential to occur within 3 km of the study area (Appendix C). Following the initial classification and mapping of site-based vegetation communities, two EPBC Act listed TECs were identified as having a potential to occur within the site (**Table 5-1**).

Targeted surveys completed within these potential TECs indicated:

- Swamp Oak Floodplain forest (PCT 1232) does not meet the condition thresholds for the endangered Coastal Swamp Oak (*Casuarina glauca*) Forest of NSW and South East Queensland TEC (TSSC, 2016). The patch size was 0.1ha, below the 0.5ha threshold required.
- Tuckeroo - Lilly Pilly - Cheese Tree littoral rainforest (PCT 1832) does not meet condition thresholds for the critically endangered Littoral Rainforest and Coastal Vine Thickets of Eastern Australia TEC (TSSC, 2008). More specifically, the patch did not support:
    - At least 25% native plant species diversity characteristic of the community.
    - At least 30% canopy cover of one rainforest canopy species characteristic of the community.

Based on the field survey results, no EPBC Act listed TECs are located within or adjacent to the development footprint. As such, the project will not result in any significant impacts to EPBC Act listed TECs.

Table 5-1: EPBC Act listed TECs likely to occur in proximity to the development site

EPBC Act TEC name and status	BC Act TEC name and status	Description	Survey results
Endangered Coastal Swamp Oak (*Casuarina glauca*) Forest of NSW and SEQ	Endangered Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	Coastal Swamp Oak Forest is often found in association with other vegetation types such as coastal saltmarsh, mangroves, freshwater wetlands, littoral rainforests or swamp sclerophyll forests in a 'mosaic' of coastal floodplain communities.	The TEC did not meet condition thresholds required for listing under the EPBC Act given the small patch size (i.e. less than the minimum 0.5ha).
Critically Endangered Littoral Rainforest and Coastal Vine Thickets of Eastern Australia	Endangered Littoral Rainforest in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	The ecological community represents a complex of rainforest and coastal vine thickets, including some that are deciduous, on the east coast of Australia.	This TEC does not meet the following relevant condition thresholds: • At least 25% native plant species diversity characteristic of the community. • At least 30% canopy cover of one rainforest canopy species characteristic of the community.


Legend
Development footprint
Field Survey Extent
Leafless Tongue Orchid habitat
Magenta Lilly Pilly Polygon (30m)
Magenta Lilly Pilly
Magenta Lilly Pilly
Magenta Lilly Pilly (Patch of 14)
Magenta Lilly Pilly (Patch of 50)
Figure Title
Relevant MNES associated with terrestrial environments
Figure No 5-1
Metres
0 30 60 90 120

5.2 Listed Threatened Species

5.2.1 Threatened flora

A search of the EPBC Act PMST database (accessed June 2020) identified 18 threatened flora species as having the potential to occur within a 3 km radius of the study area (Appendix C).

Field surveys carried out for the field survey extent at Kurnell confirmed the presence of one threatened plant immediately adjacent to the development footprint: Magenta Lilly Pilly *Syzygium paniculatum.* No other threatened flora were observed during the field surveys. Habitats within the study area are considered marginal for other threatened flora species due to historical land use and high levels of weed invasion. However, some potential habitat for Leafless Tongue Orchid *Cryptostylis hunteriana* was identified to the east of the development site at Kurnell (**Figure 5-1**). The Tartan Tongue Orchid *Cryptostyplis erecta* was recorded within the area; a species known to be commonly associated with Leafless Tongue Orchid occurrence.

Refer to Appendix B for habitat suitability assessment results for all potentially occurring threatened flora.

Table 5-3: EPBC Act listed threatened flora adjacent to the development footprint

Scientific name	Common name	EPBC Act Status	BC Act Status	Count
Syzygium paniculatum	Magenta Lilly Pilly	V	E	70
Cryptostylis hunteriana	Leafless Tongue-orchid	V	V	NA

5.2.2 Threatened fauna

A search of the EPBC Act PMST database (accessed 15 January 2020) identified 64 species (including 38 birds, three fish, two frogs, 12 mammals, six reptiles and three sharks) as having the potential to occur within 3 km of the study area (Appendix C).

Based on the results of habitat assessments and field surveys undertaken for the subject lands, two terrestrial mammal species are likely to occur and six threatened birds may have a transient present within or adjacent to the development site (**Table 5-4**). This was determined in consideration of:

- The presence of records within, or in close proximity, to the study area
- The presence of suitable habitat within the study area (i.e. rocky/ beach foreshore) despite a general lack of suitable habitats within the development footprint
- The movement potential of species, such as the ability of Green and Golden Bell Frog to travel distances of up to 5 km (possibly 10 km) in a night (DAWE, 2020).

Targeted surveys carried out for the study area identified one fauna species listed as Vulnerable under the EPBC Act: Grey-headed Flying-fox *Pteropus poliocephalus*. Despite there being a single Green and Golden Bell Frog record from 1997 present in the north-east of the Kurnell study area, no suitable habitat for the species was recorded within the site. The species was not recorded during call playback, spotlighting or diurnal searches carried out within the study area.

Although Large-eared Pied Bat was not recorded during targeted surveys, presence could not be discounted given the timing of the survey and proximity of the site to cliffs, caves, crevices supporting potential breeding habitats. No suitable breeding habitat for the species was identified within or immediately adjacent to the development footprint. All other EPBC Act listed fauna were not considered likely to occur within the study area due to a lack of suitable habitat.

Table 5-4: Threatened terrestrial fauna likely to occur within proximity to the development site

Species Name	EPBC Act Status	BC Act Status	Likelihood	Habitat description
Mammals				
Pteropus poliocephalus Grey-headed Flying-fox	Vulnerable	Vulnerable	Likely – foraging only	Occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy. There is a known Flying-fox Camp in Kurnell. No roosts were identified within proximity to the development site- foraging habitat only.
Chalinolobus dwyeri Large -eared Pied Bat	Vulnerable	Vulnerable	Possible- foraging only	Roosts in caves (near their entrances), crevices in cliffs, old mine workings and in the disused, bottle-shaped mud nests of the Fairy Martin (*Petrochelidon ariel*), frequenting low to mid-elevation dry open forest and woodland close to these features. Females have been recorded raising young in maternity roosts (c. 20-40 females) from November through to January in roof domes in sandstone caves and overhangs. They remain loyal

Species Name	EPBC Act Status	BC Act Status	Likelihood	Habitat description
				to the same cave over many years. Found in well-timbered areas containing gullies. The relatively short, broad wing combined with the low weight per unit area of wing indicates manoeuvrable flight. This species probably forages for small, flying insects below the forest canopy. Likely to hibernate through the coolest months. It is uncertain whether mating occurs early in winter or in spring. Potential for caves to occur within 2km of development site. Suitable foraging habitat present only. Species targeted but not recorded.
Birds				
Calidris canutus Red Knot	Endangered	-	Transient	Inhabits intertidal mudflats, sandflats and sandy beaches of sheltered coasts, estuaries, bays, inlets, lagoons and harbours. Beach habitat is marginal- only 0-1m wide and subject to high volume of foot traffic.
Calidris ferruginea Curlew Sandpiper	Critically Endangered	Endangered	Transient	Non-breeding habitat only- It generally occupies littoral and estuarine habitats, and in New South Wales is mainly found in intertidal mudflats of sheltered coasts. Migrates to Australia (as well as Africa and Asia) for the non-breeding period, arriving in Australia between August and November, and departing between March and mid-April. Beach habitat is marginal- only 0-1m wide and subject to high volume of foot traffic. No other suitable habitats within the site.
Calidris tenuirostris Great Knot	Critically Endangered	Vulnerable	Transient	Non-breeding habitat only- Occurs within sheltered, coastal habitats containing large, intertidal mudflats or sandflats, including inlets,

Species Name	EPBC Act Status	BC Act Status	Likelihood	Habitat description
				bays, harbours, estuaries and lagoons. Often recorded on sandy beaches with mudflats nearby, sandy spits and islets and sometimes on exposed reefs or rock platforms. Beach habitat is marginal- only 0-1m wide and subject to high volume of foot traffic. No other suitable habitats within the site.
Charadrius mongolus Lesser Sand-plover	Endangered	Vulnerable	Transient	Non-breeding habitat only- Almost entirely coastal in NSW, favouring the beaches of sheltered bays, harbours and estuaries with large intertidal sandflats or mudflats; occasionally occurs on sandy beaches, coral reefs and rock platforms. Beach habitat is marginal- only 0-1m wide and subject to high volume of foot traffic. No other suitable habitats within the site.
Hirundapus caudacutus White-throated Needletail	Vulnerable	-	Transient	Almost exclusively aerial species that feeds on insects. May forage over wooded areas, including open forest and rainforest. Commonly recorded flying above woodland and heathland and occur within grassland, swamps, cleared pasture and plantations. Site within core non-breeding range- marginal foraging habitat present.
Limosa lapponica Bar-tailed Godwit	Vulnerable	-	Transient	Non-breeding habitat only- Found mainly in coastal habitats such as large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays. It is often found around beds of seagrass and sometime in nearby saltmarsh. Beach habitat is marginal- only 0-1m wide and subject to high volume of foot traffic. No other suitable habitats within the site.

5.2.3 Assessment of significance

The project will result in the clearing of only 0.05ha of native vegetation, predominantly comprising edge environments subject to high levels of disturbance and modification. The project is unlikely to have a direct impact on EPBC Act listed vulnerable species.

No breeding habitats for Grey-headed Flying-fox will be impacted. The project impacts are limited to some small-scale clearing of foraging habitat and potential for habitat disturbance from construction noise.

Impacts to potentially occurring Large-eared Pied Bat are limited to the loss of 0.04ha of foraging habitat. No breeding habitats have been confirmed or will be impacted.

No clearing of Magenta Lilly Pilly is proposed and a 30m setback will be maintained to the trees during construction. Proposed works will not occur within the vicinity of potential habitat for Leafless Tongue Orchid and are unlikely to impact the species where it occurs.

Table 5-5 presents the self-assessment for species listed as vulnerable under the EPBC Act that are known or likely to occur within proximity to the development site. These include:

- Magenta Lilly Pilly
- Leafless Tongue Orchid
- Large-eared Pied Bat
- Grey-headed Flying-fox.

The assessment was informed by the following documents:

- National Recovery Plan Magenta Lilly Pilly *Syzygium paniculatum* (OEH, 2012).
- Draft Recovery Plan for the Grey-headed Flying-fox *Pteropus poliocephalus* (DEE, 2017)
- National Recovery Plan for the Large-eared Pied Bat *Chalinolobus dwyeri* (DERM, 2011)
- Species Profile and Threats Database for relevant species (DAWE, 2020).

The results of the assessment indicate the project is unlikely to have a significant impact on these species.

Table 5-5: Impact assessment for species listed as vulnerable under the EPBC Act

Significant impact assessment criteria	Assessment
Lead to a long-term decrease in the size of an important population of a species	**Unlikely** The known total population of **Magenta Lilly Pilly** is estimated to be approximately 1200 plants that are distributed along a 400 kilometre stretch of coastal NSW between Upper Lansdowne in the north to Conjola National Park in the south. The Botany Bay metapopulation is one of five metapopulations and is considered to support a small number of individuals across three subpopulations (OEH, 2012). This includes the Kurnell subpopulation at Kamay Botany Bay National Park. Although there is evidence to suggest Magenta Lilly Pilly within the study area are planted it is also possible that they are a part of the existing Kurnell subpopulation. Despite this, the project will not result in any clearing of Magenta Lilly Pilly or associated habitat and is unlikely to result in a reduction in the size of the Botany Bay population. The bulk of known **Leafless Tongue Orchid** populations occur in NSW, however the total population size is unknown (OEH, 2012). Populations are highly localised and plants are often found singly or as small colonies. The majority of populations of known size are 20 individuals or less. Within the Sutherland LGA there is only 1 record of the species, occurring within Royal National Park. Although the species was not confirmed within the study area, it cannot be discounted due to the presence of suitable habitat. Despite this, proposed works will maintain sufficient setbacks to potential habitat and are unlikely have any impact on the species should it occur within the site. The national population of the **Grey-headed Flying-fox** is spatially structured into colonies however, there are no separate or distinct populations due to the constant genetic exchange and movement between camps throughout the species' entire geographic range. The 2005 national count indicates a population size of approximately 674,000 individuals. No breeding habitat for the species is located within the site. The Kurnell Flying-fox camp is located approximately 2.5km west of the site however this is not listed as Nationally significant. Due to the proximity of the camp, it is likely that the species will frequent the site which provides suitable foraging opportunities including copious blossom and fruit resources. Despite this, impacts associated with the project will be limited to some small-scale (0.05ha) removal of foraging habitat and are considered negligible. As such, works are considered unlikely to result in a reduction in the species population size. In NSW the largest concentrations of **Large-eared Pied Bat** populations appear to be in sandstone escarpments of the Sydney basin and northwest slopes of NSW. Little is known about populations and their size. The project will not impact breeding habitat for the species and will only result in a loss of 0.04ha of potential foraging habitat. This is considered to have a negligible impact on local species populations where it occurs.

Significant impact assessment criteria	Assessment
Reduce the area of occupancy of an important population	**Unlikely** According to OEH (2012) all confirmed naturally occurring populations of Magenta Lilly Pilly are considered important populations. Within the study area, Magenta Lilly Pilly has not been recorded historically and is likely to be planted. Based on this, it is unlikely to be considered an important population. Regardless, the species is estimated to have an area of occupancy of 1.44ha within the study area, incorporating existing trees and a 30m buffer. No reduction in the estimated area of occupancy of the population will occur as a result of the development. There is little guidance regarding important populations of the **Leafless Tongue Orchid** and associated area of occupancy. No populations have been historically recorded within the study area and potential habitat is unlikely to be considered an important population. Approximately 2.48ha of potential habitat for Leafless Tongue Orchid is located within the site. No reduction in the extent or condition of this habitat is anticipated based on the proposed design. **Grey-headed Flying-fox** is highly mobile and widespread throughout its range. Impacts associated with the project will be limited to some small-scale (0.05ha) removal of foraging habitat and are considered negligible. The project is unlikely to significantly reduce the area of occupancy of the species. The **Large-eared Pied Bat** is known from Shoalwater Bay, north of Rockhampton, Qld, south to the vicinity of Ulladulla in NSW. The species has not been historically recorded within Kamay Botany Bay National Park. A loss of 0.04ha of potential foraging habitat is unlikely to result in a significant reduction in the area of occupancy of any potentially occurring populations.
Fragment an existing important population into two or more populations	**Unlikely** No clearing of **Magenta Lilly Pilly** will occur. The species is dispersed by wide-ranging species such as the Grey-headed Flying-fox and White-headed Pigeon with a foraging range of more than 30 km. Works are unlikely to result in any fragmentation of the Botany Bay metapopulation or associated subpopulations. No clearing of potential habitat for **Leafless Tongue Orchid** will occur as a result of the project. Only one record is known for the Sutherland LGA, within Royal National Park. The works are not considered likely to result in the fragmentation of populations of the species. **Grey-headed Flying-fox** is highly mobile and widespread throughout its range. Impacts associated with the project will be limited to some selective removal of vegetation. Although the loss of foraging habitat associated with this is considered negligible and is unlikely to fragment the species population. Potential foraging habitat for **Large-eared Pied Bat** within the study area support high levels of existing fragmentation and disturbance. The project is not likely to result in any increase in fragmentation and is unlikely to fragment populations of this highly mobile species.

Significant impact assessment criteria	Assessment
Adversely affect habitat critical to the survival of a species	**Unlikely** All habitat in which **Magenta Lilly Pilly** occurs is considered critical for the survival of the species (OEH, 2012). Habitat in which the species occurs at Kurnell includes Tuckeroo/ Coast Banksia forest (VZ4), Swamp Paperbark Forest (VZ5) and Bangalay x Blue Gum/ Plum Pine / Crabapple forest (VZ8). Proposed works within this habitat will be limited to the clearing of 0.01ha of the western-most edge of VZ4. This is likely to have a negligible impact on the species. On the Central Coast of NSW, **Leafless Tongue Orchid** populations have been recorded in woodland dominated by Scribbly Gum *Eucalyptus haemastoma*, Brown Stringybark *Eucalyptus capitellata*, Red Bloodwood *Corymbia gummifera* and also associated with Large Tongue Orchid *C. subulata* and the Tartan Tongue Orchid *C. erecta*. Suitable habitat for the species occurs within the Kurnell study area. Proposed works are currently setback sufficiently to potential habitat for the species and are unlikely to result in any impacts. Winter and spring foraging resources are considered to be critical to the survival of the **Grey-headed Flying-fox.** These include vegetation communities that contain *Eucalyptus tereticornis, E. albens, E. crebra, E. fibrosa, E. melliodora, E. paniculata, E. pilularis, E. robusta, E. siderophloia, Banksia integrifolia, Castanospermum australe, Corymbia citriodora citriodora, C. eximia, C. maculata* (south of Nowra, New South Wales), *Grevillea robusta* or *Melaleuca quinquenervia*. These species are present within the site within PCT 1778, PCT 772 and PCT 661. Impacts associated with the project will be limited to some selective removal of foraging habitat and are likely to have a negligible impact on the species. Habitat critical to the survey of **Large-eared Pied Bat** includes Sandstone cliffs and fertile wooded valley habitat within close proximity of each other. Impacted habitats within the development site are not considered fertile wooded valley habitats. Sandstone cliffs within the development footprint do not offer potential breeding habitat for the species. The project is not likely to impact habitat critical for the survival of the species.
Disrupt the breeding cycle of an important population	**Unlikely** No breeding habitat is located within the study area for **Grey-headed Flying-fox** or **Large-eared Pied Bat**. Works associated with the development are unlikely to interrupt important pollination and propagation processes for **Magenta Lilly Pilly** or **Leafless Tongue Orchid.** Works associated with the development are unlikely to disrupt the breeding cycle of any vulnerable species populations.

Significant impact assessment criteria	Assessment
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	**Unlikely** Works are unlikely to result in any disturbance of **Leafless Tongue Orchid** habitat due to sufficient setbacks being maintained. There is a low risk of pathogen introduction during construction, however this will be managed through appropriate construction hygiene protocols. Potential impacts to hydrology and stormwater quality are unlikely given minimal increase in hardstand and pollutant loads for the site. The proposed works will result in the clearing of 0.01ha of **Magenta Lilly Pilly** habitat. No individuals will be impacted. No clearing of **Leafless Tongue Orchid** habitat is proposed. Some selective vegetation removal may be required resulting in loss of 0.05ha of foraging habitat for **Grey-headed Flying-fox** and 0.04ha of potential foraging habitat for **Large-eared Pied Bat**. However this will have a negligible impact on the site and is unlikely to result in any decline.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	**Unlikely** The site is already subject to considerable weed disturbance with 20 high threat weeds recorded within the site. Of these four are listed as priority weeds for the Greater Sydney region (Asparagus Fern, Bitou Bush, Lantana and African Olive). The existing vegetation already supports a diminished structure making it more susceptible to weed invasion and colonisation by pest species and the high levels of foot traffic and public activity make the site a higher risk for these impacts. Works associated with the project are unlikely to significantly increase risks associated with pests and weeds. Construction controls will be implemented to manage potential introduction or spread during construction.
Introduce disease that may cause the species to decline	**Unlikely** The site subject to existing high levels of foot traffic and public activity. Despite this there is some increased risk of introducing pathogens such as Myrtle Rust *Puccinia psidii* and Root Rot *Phytophthora* during construction. This risk will be managed by means of appropriate construction controls and is unlikely to result in the decline of any vulnerable species.
Interfere substantially with the recovery of the species	**Unlikely** Direct clearing of **Magenta Lilly Pilly** is not proposed. There may be some selective removal of vegetation within surrounding habitats to accommodate proposed works. However this is unlikely to have any impact on the species ongoing viability, particularly given a minimum setback of 30m will be maintained. As such, the works are considered unlikely to impact the recovery of the species. Similarly, proposed works will not involve the clearing of suitable habitat for **Leafless Tongue Orchid** and are unlikely to interfere with the recovery of the species. Impacts to foraging habitat for **Grey-headed Flying-fox** and **Large-eared Pied Bat** are considered negligible, particularly given the availability of alternative foraging sites adjacent to the site. The works are considered unlikely to interfere with the recovery of these species.

5.3 Migratory species

Migratory species are also listed as MNES under the EPBC Act. A total of 80 migratory species were identified in the PMST as having a range of potential occurrence that includes the study area, including 22 migratory marine birds, 7 migratory terrestrial species, 21 migratory marine species and 30 wetland migratory species (Appendix C).

Based on the results of the habitat assessment, 16 migratory terrestrial species are likely to have a transient presence within and adjacent to the development site due to the availability of suitable foraging habitats adjacent to the development site (**Table 5-6**). Similarly, the beach area and rocky foreshore offer marginal habitat for some migratory wetland species. In addition, Crested Tern, listed as a migratory species under the EPBC Act was recorded during field surveys at La Perouse. However, habitats within the study area are not considered significant for migratory species given the extent of more suitable sites within the surrounding bay and coastline.

Table 5-6: Migratory species recorded and likely to have a transient presence within the development site

Species name	Common name	EPBC Act status	BC Act status
Calidris canutus	Red Knot	E	
Calidris ferruginea	Curlew Sandpiper	CE	E
Calidris tenuirostris	Great Knot	CE	V
Charadrius mongolus	Lesser Sand Plover	E	V
Hirundapus caudacutus	White-throated Needletail	V	
Limosa lapponica	Bar-tailed Godwit	V	
Cuculus optatus	Oriental Cuckoo	M	
Monarcha melanopsis	Black-faced Monarch	M	
Arenaria interpres	Ruddy Turnstone	M	
Calidris alba	Sanderling	M	
Calidris ruficollis	Red-necked Stint	M	
Charadrius bicinctus	Double-banded Plover	M	
Numenius phaeopus	Whimbrel	M	
Pluvialis fulva	Pacific Golden Plover	M	
Pluvialis squatarola	Grey Plover	M	
Tringa brevipes	Grey-tailed Tattler	M	
Thalasseus bergii	Crested Tern	M	

Nonetheless, **Table 5-7** presents the self-assessment for the 17 species listed as migratory under the EPBC Act that were recorded or are likely to have a transient presence within proximity to the development site (**Table 5-6**).

The results of the assessment indicate the project is unlikely to have a significant impact on these species.

Table 5-7: Impact assessment for species listed as migratory under the EPBC Act

Significant impact assessment criteria	Assessment
Substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species	**Unlikely** The migratory species listed in **Table 5-6** are likely to have a transient presence within and adjacent to the development site due to the availability of suitable foraging habitats present. The beach and rocky foreshore areas offer marginal habitat for some migratory wetland species. Given the extent of more suitable sites within the surrounding bay and coastline, including the Towra Point Nature Reserve Ramsar site, the disturbance of a small marginal area of beach and rocky foreshore habitat is not considered important habitat for any of the migratory species. It is unlikely that the project would result in the substantial modification, destruction or isolation of an area of important habitat for a migratory species.
Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species	**Unlikely** The site is already subject to considerable weed disturbance with 20 high threat weeds recorded within the site. Of these four are listed as priority weeds for the Greater Sydney region (Asparagus Fern, Bitou Bush, Lantana and African Olive). The existing vegetation already supports a diminished structure making it more susceptible to weed invasion and colonisation by pest species and the high levels of foot traffic and public activity make the site a higher risk for these impacts. Works associated with the project are unlikely to significantly increase risks associated with pests and weeds. Construction controls will be implemented to manage potential introduction or spread during construction.
Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species	**Unlikely** While breeding habitat for migratory species cannot be discounted due to lack of survey effort, it is considered unlikely that any migratory species would utilise the impacted areas of habitat within the development site for their breeding purposes. The migratory species listed in **Table 5-6** are, however, likely to have a transient presence within and adjacent to the development site due to the availability of suitable foraging habitats present. The beach and rocky foreshore areas offer marginal habitat for some migratory wetland species. Given the scale and nature of the works associated with the development, it is unlikely that any migratory species' population would be disrupted.

The majority of migratory marine birds and migratory marine species were not considered relevant to terrestrial environments and are instead addressed as a part of Marine biodiversity assessment in the EIS Appendix H.

5.4 Ramsar wetland

Ramsar wetlands are listed as MNES under the EPBC Act (also known as wetlands of international importance). A 'declared Ramsar wetland' is an area that has been designated under Article 2 of the Ramsar Convention or declared by the minister to be a declared Ramsar wetland under section 16 of the EPBC Act.

One Ramsar wetland, Towra Point Nature Reserve, was identified in the PMST as being present within the locality (Appendix C). This Ramsar wetland is present approximately 1km to the southwest of the site.

The Towra Point Nature Reserve Ramsar wetland consists of a variety of habitats and is an important area for bird species, with approximately 200 species recorded in the area, 34 of which are listed under international migratory bird conservation agreements. The state-listed threatened Australian Pied Oystercatcher is known to breed within the Reserve.

The project will not directly impact the Towra Point Nature Reserve Ramsar site; nor is it considered likely that the Reserve will be adversely impacted by the proposed works. Nonetheless, **Table 5-8** presents the self-assessment for the Ramsar wetland listed under the EPBC Act.

The results of the assessment indicate the project is unlikely to have a significant impact on the ecological character of the Towra Point Nature Reserve Ramsar wetland.

Table 5-7: Impact assessment for the Towra Point Nature Reserve Ramsar wetland listed as a wetland of international importance under the EPBC Act

Significant impact assessment criteria	Assessment
areas of the wetland being destroyed or substantially modified	The Towra Point Nature Reserve Ramsar wetland is present approximately 1km to the southwest of the development site. The project will not result in the destruction or substantial modification of any part of the Ramsar wetland.
a substantial and measurable change in the hydrological regime of the wetland, for example, a substantial change to the volume, timing, duration and frequency of ground and surface water flows to and within the wetland	Any impacts to ground and surface water flows are considered to be localised and restricted to the development site and proximate areas (if any). In addition, impacts associated with changes to water quality and ferry wash are considered to be insignificant to the project (refer to Appendix H of the EIS). Given the Towra Point Nature Reserve Ramsar wetland occurs 1km to the southwest of the site, a substantial or measurable change in its hydrological regime is unlikely.
the habitat or lifecycle of native species, including invertebrate fauna and fish species, dependant upon the	No habitats present within the Towra Point Nature Reserve Ramsar wetland would be adversely affected by the proposed works. While the development site provides a small area of potential habitat for species known to frequent the Reserve, the project is unlikely to seriously affect the lifecycle of these species.

Significant impact assessment criteria	Assessment
wetland being seriously affected	
a substantial and measurable change in the water quality of the wetland – for example, a substantial change in the level of salinity, pollutants, or nutrients in the wetland, or water temperature which may adversely impact on biodiversity, ecological integrity, social amenity or human health, or	**Unlikely** The Marine Biodiversity Assessment Report identified that impacts associated with changes to water quality and ferry wash are considered to be insignificant to the project (refer to Appendix H of the EIS). Therefore, a substantial or measurable change in the water quality of the Towra Point Nature Reserve Ramsar wetland is highly unlikely given the Reserve occurs 1km to the southwest of the site. It is also considered that any impacts likely to occur as a result of the project regarding pollutants or nutrients in the water would not exceed, exacerbate or compound the potential adverse impacts already taking place in this portion of Botany Bay; nor would they significantly impact the Towra Point Nature Reserve Ramsar wetland. Biodiversity, ecological integrity, social amenity or human health regarding the Towra Point Nature Reserve Ramsar wetland will not be adversely impacted.
an invasive species that is harmful to the ecological character of the wetland being established (or an existing invasive species being spread) in the wetland.	**Unlikely** The project is unlikely to aid in the establishment or spread of any invasive species that is harmful to the ecological character of the Towra Point Nature Reserve Ramsar wetland.

6 Impact Assessment

Under Section 8 of the BAM (DPIE, 2020a), opportunities to avoid and minimise impacts to biodiversity values must be considered during the project planning and design phase of a project. Section 6.1 outlines proposed measures to avoid and minimise potential direct, indirect and prescribed impacts to biodiversity associated with the project. Section 6.2 presents an assessment of residual impacts associated with the project. Additional mitigation measures proposed are detailed in Section 6.3.

6.1 Avoiding and minimising impacts

6.1.1 Options assessment

During the early stages of the project, a preferred strategic alternative was identified to create waterborne access to Kamay Botany Bay National Park for passenger ferries, tourism related commercial vessels and recreational vessels through the construction of two wharves. The process involved in identification of this preferred strategic alternative is detailed in Chapter 4 of the EIS.

Wharf location options were investigated as a part of the design development and options assessment phase, including three shortlisted locations at La Perouse and three at Kurnell (**Figure 6-1**). A preliminary environmental assessment was carried out to inform site selection in which potential biodiversity impacts were a key consideration. The preferred location proposed for wharves at Kurnell and La Perouse has sought to avoid and minimise impacts to biodiversity as follows:

- Locating the wharves away from sensitive seagrass and rocky reef marine habitats
- Using the location of the previous wharf structure to minimise disturbance of previously undisturbed lands
- Reducing the land-side amenities footprint to avoid potential impacts to native vegetation, threatened species and ecological communities
- Reconfiguring existing car parking areas at La Perouse to maximise space while limiting disturbance
- Re-routing proposed utility connections at Kurnell south along Monument Track to avoid impacts to threatened flora.

Legend

- Study Area (1,500m buffer)
- Wharf location options

Figure Title

Wharf location options considered - page 1, La Perouse

Figure No **6-1**

Metres

0 40 80 120 160

Legend

- Study Area (1,500m buffer)
- Wharf location options

Figure Title

Wharf location options considered - page 2, Kurnell

Figure No **6-1**

Metres

0 40 80 120 160

6.1.2 Design development

The identification and mapping of areas of native vegetation communities, TEC and threatened fauna habitat influence the development of the design and construction footprints at the Kurnell site to minimise direct and indirect impacts.

The footprint for permanent and temporary works at the La Perouse site has been developed to minimise impacts to native vegetation communities as much as possible (**Figure 6-2, Page 1**). There will be no impacts to native vegetation on this site as a result of the placement and construction of permanent infrastructure. The placement of landside facilities for the ferry wharf and the required carparking upgrades at La Perouse are both on areas of land that are composed of exotic and mown grasslands.

Temporary impact associated with construction have also minimised impacts to native vegetation at the La Perouse site as much as possible. The area designated for the construction compound is located to the east of the existing ring road in a large area of exotic-dominated grassland. Areas of services trenching also run along grassed road verges or existing hardstand area. At the La Perouse site, there will be a very small area (0.009ha) of temporary impact to an area of PCT 1823 due to the requirement to locate a temporary crane platform in this area for construction of the wharf. This area will be subject to landscaping works following the removal of the temporary access and platform.

The pedestrian path, construction access, site compounds and services trenching were all designed to minimise impacts to native vegetation and threatened fauna habitats at the Kurnell site (**Figure 6-2, Page 2**). Area of permanent impact to the terrestrial environment include upgrades to the structures and landscaping at the landside wharf infrastructure. These areas make use of existing infrastructure and footprints as much as possible.

Temporary impacts at the Kurnell site include a construction access road, construction compound and trenching for additional services between Captain Cook Drive and the ferry wharf. The construction access road alignment and the construction compound have been located as much as possible in cleared areas dominated by exotic grasses. There is a very small area (0.02ha) of impact to PCT 661 and the Kurnell Dune Forest TEC as a result of the access road alignment. This impact will be limited to the ground layer of exotic grasses and all trees that comprise the canopy of this community will be retained.

Specific design solutions were implemented to minimise impacts to the patch of PCT 661 and Kurnell Dune Forest TEC. Tree survey data was used to amend design and choose alignments that will avoid impacts to individual trees. The design response has included removing carparking and pedestrian paths along Captain Cook Drive to remove direct impacts to the patch of PCT 661 and Kurnell Dune Forest. At Kurnell the construction of the wharves and utilities trenching will result in the direct removal of six isolated trees at Kurnell, including one African Olive *Olea europaea* subsp. *cuspidata* and five juvenile trees near the tie-in of the new wharf structure.

Post-works, restoration would be carried out across the construction areas.


VZ15
Legend
Wharf design
Car park design (La Perouse)
Development footprint
Plant Community Types
1823 Bracelet Honey-myrtle- Heath-leaved Banksia Scrub She-oak coastline cliffline scrub
Figure Title
Design phase minimisation measures
Page 1, La Perouse
Figure No 6-2
Metres
0 10 20 30 40


VZ13
VZ4
VZ5
VZ8
VZ12
VZ3
VZ11
VZ7
VZ6
VZ1
VZ2
VZ10
VZ9
Legend
Wharf design
Proposed power alignment
Proposed water alignment
Access road
Compound
Temporary causeway
Development footprint
Plant Community Types
1204 Spinifex beach strand grassland
1232 Swamp Oak floodplain swamp forest
1778 Smooth-barked Apple- Coast Banksia/ Cheese Tree open forest
1832 Tuckeroo- Lilly Pilly- Cheese Tree littoral rainforest
661 Bangalay- Smooth-barked Apple- Swamp Mahogany low open forest
772 Coast Banksia- Coast Wattle dune scrub
Figure Title
Design phase minimisation measures
Page 2, Kurnell
Figure No 6-2
Metres
0 25 50 75 100

6.2 Assessment of impacts

Table 6-1 details impacts to biodiversity following the implementation of measures to avoid and minimise impacts. A tick has been used to identify where biodiversity impacts are relevant for each project phase. These are discussed further in the following sections.

Table 6-1: Potential impacts to biodiversity

Biodiversity value	Potential impact	Project phase	
		Construction	Operation
Direct impacts			
Native vegetation	Clearing of 0.05ha of native	✓	
Threatened ecological communities	Clearing of 0.02ha of Kurnell Dune Forest TEC.	✓	
Threatened fauna	Impacts to 0.04ha of potential foraging habitat for Large-eared Pied Bat	✓	
	Impacts to 0.024ha of potential foraging habitat for Eastern Cave Bat	✓	
	Impacts to 0.02ha of potential foraging/breeding habitat for Australian Pied Oystercatcher	✓	
Indirect impacts			
Threatened fauna habitat	Habitat disturbance from light and noise	✓	✓
Native vegetation	Disturbance from weeds and pathogens	✓	
Prescribed impacts			
General matters	Impacts to karst, caves, crevices, cliffs, rocks and other geological features of significance[5]	✓	
	Impacts to habitat connectivity		
	Impacts to water quality, water bodies and hydrological processes	✓	
	Impacts associated with vehicle strikes	✓	✓

[5] Impacts to karst, caves, crevices, cliffs, rocks and other geological features of significance incorporates impacts to the Sooty Oystercatcher and partial impact to the Australian Pied Oystercatcher.

6.2.1 Direct impacts

Direct impacts associated with the development are primarily related to the proposed site clearing works. Site clearing of mapped PCTs will be carried out for the development footprint as shown in **Figure 6-3**. The clearing of native vegetation is listed as a Key Threatening Process under Schedule 4 of the BC Act.

Clearing of native vegetation

An area of 0.05ha of native vegetation comprising three PCTs will be impacted as a result of the development. **Table 6-3** identifies the extent of impacts including predicted change in vegetation integrity for vegetation communities within the development footprint.

Native vegetation impacted as a result of the development predominantly comprises edge environments subject to high levels of existing disturbance from weeds and habitat modification.

Impacts to threatened ecological communities

Proposed clearing works will result in a direct loss through permanent and temporary impacts of 0.02ha of Kurnell Dune Forest in the Sutherland Shire and City of Rockdale TEC defined as PCT 661 within the development footprint, as shown in **Figure 6-3**.

The Kurnell Dune Forest in the Sutherland Shire and City of Rockdale TEC is not considered to be at risk of a Serious and Irreversible Impact (SAII) under the BC Act according to BioNet (DPIE, 2020a). Therefore, an SAII assessment under Section 9 of the BAM (DPIE, 2020a) is not required.

Key Threatening Processes

The impact associated with the project, including all direct and indirect impacts, are unlikely to result in a key threatening process or increase the impact of a key threatening process. An assessment of relevant key threatening processes is provided in **Table 6-2**.

Table 6-2: Key Threatening Processes relevant to the project

Key threatening process	Status	Comment
Clearing of native vegetation	BC Act EPBC Act	A total of 0.05ha of native vegetation, including 0.02ha of Kurnell Dune Forest TEC. Clearing works are considered largely negligible given their small scale and are unlikely to result in any increased fragmentation or edge effects.
Invasion and establishment of exotic vines and scramblers	BC Act	The development site is already subject to infestation from exotic vines and scramblers such as the Asparagus Fern and Moth Vine. Construction works may increase the risk of weed spread, however this would be managed through the implementation of construction hygiene measures.

Key threatening process	Status	Comment
Invasion of native plant communities by Bitou Bush and Boneseed	BC Act	The development site is already subject to infestation from Bitou Bush, particularly within the coastal scrub at La Perouse. Construction works may increase the risk of weed spread, however this would be managed through the implementation of construction hygiene measures.
Invasion of native plant communities by African Olive Olea europaea subsp. Cuspidata	BC Act	There is an existing infestation of African Olive within PCT 1778 at Kurnell. Construction works are unlikely to pose a risk of spread of this species as the works are located away from areas of infestation.
Invasion, establishment and spread of Lantana	BC Act	There is an existing Lantana infestation at both La Perouse and Kurnell. Construction works may increase the risk of weed spread, however this would be managed through the implementation of construction hygiene measures.
Predation by the European Red Fox	BC Act EPBC Act	The development site is likely to be visited by European Red Fox. Proposed lighting of foreshore areas may result in increased predator activity, particularly of shorebirds such as the Australian Pied Oystercatcher and Sooty Oystercatcher. Predator control is carried out regularly within the Kamay Botany Bay National Park, however sensitive permanent lighting design will be considered during detailed design to minimise light spill and reduce the risk of predation.
Predation and hybridisation by feral dogs	BC Act	The development site is likely to be visited by feral dogs. Proposed lighting of foreshore areas may result in increased predator activity by feral dogs as described above for European Red Fox.
Predation by feral cats	BC Act EPBC Act	The development site is likely to be visited by feral cats. Proposed lighting of foreshore areas may result in increased predator activity by feral cats as described above for European Red Fox.


Legend
Wharf design
Construction boundary
Development footprint
PCT impacts
1823 Honey-myrtle- Banksia-She-oak coastal cliffline scrub
Figure Title
Native vegetation impacts - page 1
La Perouse
Figure No 6-3
Metres
0 10 20 30 40


Legend
Wharf design
Development footprint
Construction boundary
PCT impacts
661 Bangalay- Smooth-barked Apple- Swamp Mahogany low open forest
772 Banksia-Wattle dune scrub
Figure Title
Native vegetation impacts - page 2
Kurnell
Figure No 6-3
Metres
0 10 20 30 40

Table 6-3: Impacts to native vegetation

PCT	Vegetation zone/ Condition	TEC	Total impact (ha)	Current vegetation integrity score	Future vegetation integrity score	Regional extent	
						Estimate extent remaining*	Estimate % cleared**
1823	VZ 15 / Low	-	0.009	4.9	0	290	39%
661	VZ 1 / Low	Kurnell Dune Forest in the Sutherland Shire and City of Rockdale	0.00003	51.5	0	273	68%
	VZ 10 / Low		0.009	13.8	0		
	VZ 3 / Low		0.0006	15.3	0		
	VZ 4 / Low		0.007	50.5	0		
	VZ 11 / Low		0.003	41.7	0		
772	VZ 12 / Low	-	0.024	0.8	0	3100	65%
TOTAL			**0.05**				

* Estimated from mapped extant vegetation: full range.
** Percent of pre-European extent cleared.

Impacts to habitat for species credit species

Project impacts to likely species credit species are outlined in **Table 6-4.** These impacts are to be addressed through species credits. Two of the species listed in Table 6-4, Large-eared Pied Bat and Eastern Cave Bat, are considered at risk of SAII should breeding habitat be present within the area impacted by the project. Given no breeding habitat for these species is present an SAII assessment under Section 9 of the BAM (DPIE, 2020a) is not required.

Impacts to Large-eared Pied Bat habitat is shown on **Figure 6-4**. Potential foraging habitat for this species consists of predominantly small areas of temporary disturbance associated with construction footprint.

As the vegetation impacted is not located within 100m of breeding habitat for Large-eared Pied Bat, it is considered to be foraging habitat only.

Mapped habitat for Eastern Cave Bat consists of foraging habitat only, in areas of coastal dune scrub (**Figure 6-5**). There are no potential breeding roosts within 100m of the development footprint.

In consultation with the BioNet Threatened Biodiversity Data Collection (TBDC) database, mapped habitat for the Australian Pied Oystercatcher in the development footprint includes coastal dune scrub (PCT 772), rock platforms (PCT 99993) and dune/shoreline (PCT 99994) areas while Sooty Oystercatcher consists of rock platforms (PCT 99993) and dune/shoreline (PCT 99994) (**Figure 6-6**). The Oystercatchers would utilise this habitat for foraging and, potentially, breeding purposes.

For the purposes of the BAM only those PCTs included within the BioNet Vegetation Classification database can be offset using the BAM Calculator. PCT 99993 and PCT 99994 are not included in these sources. As such, quantification of directly impacted habitat to be offset for the Australian Pied Oystercatcher includes PCT 772.

Impacts to PCT 99993 and PCT 99994 being used as foraging, and potential breeding, habitat for the Australian Pied Oystercatcher and Sooty Oystercatcher will be assessed under prescribed impacts (Section 6.2.3).

Table 6-4: Impacts to species credit species

Common name	Credit class	EPBC Act status	BC Act status	Total impact (ha)
Large -eared Pied Bat	Species (foraging)	V	V	0.04
Eastern Cave Bat	Species (foraging)	Not listed	V	0.02
Australian Pied Oystercatcher	Species (breeding/foraging)	Not listed	E	0.02 (direct) 0.001 (prescribed)
Sooty Oystercatcher	Species (breeding/foraging)	Not listed	V	0.06 (prescribed)


Legend
Wharf design
Construction boundary
Development footprint
Large-eared Pied Bat impacts
Figure Title
Large-eared Pied Bat habitat impacts
Figure No 6-4
Metres
0 10 20 30 40


Legend
Wharf design
Development footprint
Construction boundary
Eastern Cave Bat impacts
Figure Title
Eastern Cave Bat habitat impacts
Figure No 6-5
Metres
0 10 20 30 40


Legend
Wharf design
Development footprint
Construction boundary
Pied Oystercatcher impacts
Figure Title
Pied Oystercatcher habitat impacts
Figure No 6-6
Metres
0 10 20 30 40

6.2.2 Indirect impacts

Potential indirect impacts associated with the construction and operation of the project are detailed within this section. Following the implementation of appropriate management measures as detailed in Section 6.3, it is unlikely that these will result in any significant impacts to biodiversity beyond the footprint.

Habitat disturbance from noise and light

Vegetation and fauna habitats adjacent to the development footprint are likely to be subject to increased disturbance from noise and light during construction of the project. However, this will managed as much as practicable through the implementation of construction management measures (Section 6.3).

Permanent lighting associated with the proposed wharves and connecting footpaths is likely to result in some increased illumination of adjacent foreshore and forested habitat areas. Foreshore areas offer only marginal habitat for threatened species and are not considered to support any breeding activities. Despite this, there is potential for increased predation of shorebirds, including Australian Pied Oystercatcher and Sooty Oystercatcher, as increased illumination within foreshore areas may make them more visible when roosting overnight within the site. It is understood that periodic feral predator control is undertaken within Kamay Botany Bay National Park and this activity may minimise the risks to shorebirds associated with this potential impact.

Proposed permanent lighting has the potential to have both positive and negative effects on microbat species known or likely to frequent the development site. Increased insect activity associated with the proposed lighting has the potential to increase foraging opportunities for some microbat species. However, increased illumination within forested habitats is likely to reduce habitat suitability for many species; particularly slow-flying microbat species. A number of lighting strategies are recommended for consideration as a part of the detailed design and should be incorporated where practicable to minimise any impacts associated with the project.

Disturbance from weeds and pathogens

The site is located in an urban area and is already subject to high levels of foot traffic and existing disturbance. Despite this, there is the potential for the introduction and spread of weeds and pathogens during construction as a result of machinery movements, increased foot traffic and landscaping activities.

High threat weed species confirmed for the site include are identified in Section 3.2. Risks associated with weed introduction and spread are to be managed through the implementation of appropriate construction management measures as detailed in Section 6.3.

The introduction of pathogens, including Root Rot *Phytophthora cinnamomic* and Myrtle Rust *Austropuccinia psidii*, may pose a considerable risk to threatened flora within the site. Other native vegetation communities may also be impacted where appropriate hygiene measures are not implemented during construction.

Site hygiene measures are to be implemented to minimise any potential for pathogen introduction to the site.

Given the existing levels of site disturbance, the proposed ferry operations are not likely to result in any increased risk of weed or pathogen disturbance. Similarly, proposed site clearing works are minimal and are unlikely to result in any significant increase in edge effects.

Impacts to tree protection zones or structural root zones

The placement of permanent infrastructure and construction activities within tree protection zones and structural root zones has the potential to impact on tree condition and health, such that the tree may decline. This can include through interference with root zones, as a result of earthworks or soil compaction. Some trees may be able to withstand a level of impact within the root zone, provided impacts are minimised and managed through recommendations provided by a consulting arborist.

6.2.3 Prescribed impacts

Prescribed impacts are listed in Section 6.1 of the BC Regulation. Likely prescribed impacts associated with the development are discussed further below.

The following features do not occur within the development footprint or are not considered to provide habitat for threatened species or ecological communities:

- Human made structures
- Non-native vegetation.

Similarly, the following prescribed impacts are not considered relevant to the project:

- Impacts on movement of threatened species that maintains their lifecycle.
- Impacts of wind turbine strikes on protected animals.

6.2.3.1 Prescribed impacts of the development

Impacts to karst, caves, crevices, cliffs, rocks and other geological features of significance

The rocky habitat along the foreshore is considered to be foraging and potential breeding habitat for the Australian Pied Oystercatcher and Sooty Oystercatcher. The development footprint generally avoids the rocky habitat, however, a small portion is included in the development footprint: 0.001 ha at Kurnell and 0.06 ha at La Perouse. Given the large amount of similar habitat in the vicinity of the proposed development, the impact to 0.061 ha of rocky habitat is considered negligible. Nevertheless, the impact of the development on rocks has been assessed with regard to the Australian Pied Oystercatcher and Sooty Oystercatcher in accordance with Section 8.3 of the BAM (DPIE, 2020a).

Impacts to Australian Pied Oystercatcher

Thirteen Australian Pied Oystercatcher individuals were recorded foraging at two locations adjacent to the development footprint at Kurnell. The Australian Pied Oystercatcher occurs and breeds around coastlines of mainland Australia and Tasmania, favouring intertidal flats of inlets and bays, open beaches and sandbanks (DPIE 2019, DPIE 2022. It forages on exposed sand, mud and rock at low tide, for molluscs, worms, crabs and small fish (DPIE 2022). There is 0.001 ha of rocky habitat within the development footprint and it is likely that this area would be utilised as foraging habitat by the Australian Pied Oystercatcher.

The Australian Pied Oystercatcher nests on the ground just above the high tide mark (DPIE 2019), where it makes shallow scrapes in the sand, often amongst seaweed, shells and small stones (DPIE 2022). A pair typically reuses a nest site over many years and will rarely shift its territory (DPIE 2019). Given this information, it is unlikely that the rocky habitat within the development footprint would be utilised by the Australian Pied Oystercatcher for breeding purposes.

The construction works associated with the project are expected to last for around 13 months.

The removal of 0.001 ha of foraging, and potential breeding, habitat for the Australian Pied Oystercatcher is not considered to have an adverse impact on this species. A large amount of similar habitat is present in close proximity to the development footprint, as well as along the foreshore areas within the locality. The Australian Pied Oystercatcher's local population is unlikely to be impacted as a result of the project. Similarly, no adverse impact to this species' population at a bioregional or state scale is likely.

Impacts to Sooty Oystercatcher

Two Sooty Oystercatcher individuals were recorded foraging adjacent to the development footprint at La Perouse. The Sooty Oystercatcher is strictly coastal, usually within 50 m of the ocean. It prefers rocky shores, but will be seen on coral reefs or sandy beaches near mudflats (Hansen et al. 2014; Harrison et al. 2010). The diet of a Sooty Oystercatcher can typically be found on rocky shores and comprises variety of molluscs, crustaceans, sea urchins, terrestrial insect larvae and occasionally fish. There is 0.06 ha of rocky habitat within the development footprint and it is likely that this area would be utilised as foraging habitat by the Sooty Oystercatcher.

Sooty Oystercatchers are known to predominantly breed on offshore islands, among rocky substrates and on reefs that are in close proximity to the mainland (Wooding 2019; NSW Scientific Committee 2008). Additionally, cover appears to positively affect breeding success, chicks that were able to remain hidden while parents were away had a higher fledgling success (Hansen et al. 2014). Wooding (2019) noted that over the past ten years, only three mainland nests have been reported on the far south coast of NSW, it is unclear whether these nests are an anomaly or a response by first-time breeders to a scarcity of traditional breeding territory. Given this information, it is unlikely that the rocky habitat within the development footprint would be utilised by the Sooty Oystercatcher for breeding. However, as targeted surveys were not undertaken during the breeding season, the

rocky habitat present in the development footprint cannot be disqualified as breeding habitat.

The construction works associated with the project are expected to last for around 13 months.

The removal of 0.06 ha of foraging, and potential breeding, habitat for the Sooty Oystercatcher is not considered to have an adverse impact on this species. A large amount of similar habitat is present in close proximity to the development footprint, as well as along the foreshore areas within the locality. The Sooty Oystercatcher's local population is unlikely to be impacted as a result of the project. Similarly, no adverse impact to this species' population at a bioregional or state scale is likely.

Impacts to habitat connectivity

The development footprint generally avoids large contiguous habitat areas within the development site and is predominantly located within existing cleared grasslands and foreshore areas. Proposed vegetation clearing is minimal and consists largely of edge environments subject to high levels of disturbance and/ or habitat modification. Impacts to habitat connectivity as a result of project are considered negligible.

Impacts to water quality, water bodies and hydrological processes

Proposed pavement works will involve a minimal increase in hardstand area. The proposed operations are unlikely to result in any significant increase in pollutant loads and no additional stormwater management treatment is proposed. Similarly, no significant change in hydrology is anticipated with minimal earthworks proposed.

Wharf construction will take place in the Botany Bay estuary. Pile driving activities associated with wharf construction are likely to result in some localised increases in turbidity levels. This is discussed further in the EIS Appendix H Marine biodiversity assessment including the identification of appropriate mitigation measures to minimise impacts.

Impacts associated with vehicle strikes

There may be some increased risk of fauna injury or mortality during construction through collision with construction vehicles and machinery. However, this will be managed through the installation of temporary construction fencing and the implementation of fauna management procedures.

Ferry operations are likely to pose a risk to marine fauna by means of boat strike within the Ferry Swept Path. These impacts are discussed further in the EIS Appendix H Marine biodiversity assessment including the identification of appropriate mitigation measures to minimise impacts.


Legend
Wharf design
Development footprint
Construction boundary
Pied Oystercatcher impacts
Figure Title
Pied Oystercatcher habitat impacts (prescribed)
Figure No 6-7
Metres
0 7 14 21 28


Legend
Wharf design
Development footprint
Construction boundary
Sooty Oystercatcher impacts
Figure Title
Sooty Oystercatcher habitat impacts (prescribed)
Figure No 6-8
Metres
0 10 20 30 40

6.3 Mitigating and managing impacts

Table 6-5: Environmental management measures for terrestrial biodiversity impacts

Impacts	Mitigation	Responsibility	Timing
Risks to native flora and fauna during construction	**Biodiversity Management Plan** A Biodiversity Management Plan will be prepared and implemented as part of the CEMP. It will address terrestrial and aquatic matters and include, but not necessarily be limited to: a) Plans for the construction site and adjoining area showing native vegetation, flora and fauna habitat, threatened species and endangered ecological communities b) Plans showing areas to be cleared and areas to be protected, including exclusion zones and protected habitat features (eg. hollow-bearing trees), and areas for rehabilitation or re-establishment of native vegetation c) Requirements set out in the Roads and Traffic Authority (RTA) *Landscape Guideline* d) Procedures addressing relevant matters specified in the *Biodiversity Guidelines - Protecting and managing biodiversity on RTA projects* including but not limited to: • Pre-clearing, including the outcomes of final flora and fauna species checks, establishment of exclusion zones and on-ground identification of specific habitat features to be retained (such as hollow-bearing trees) • Vegetation clearing and bushrock removal, including staged habitat removal and any specified seasonal limits on clearing activities • Fauna handling and unexpected threatened species finds • Rehabilitation, revegetation, re-use of soils, woody debris and bushrock, and other habitat management actions • Weed and pathogen management. *e)* Procedures addressing relevant matters specified in the NSW DPI (Fisheries) *Policy and guidelines for fish habitat conservation and management* f) Monitoring during construction and post-construction	Transport for NSW / Contractor	Pre-construction / Detailed design

Impacts	Mitigation	Responsibility	Timing
	g) Adaptive management measures to be applied if monitoring indicates unexpected adverse impacts.		
Risks to native flora and fauna during construction	**Pre-construction check** A pre-construction check of native flora and fauna species and habitat will be conducted in accordance with the Biodiversity Guidelines - Protecting and managing biodiversity on RTA projects. Biodiversity management measures identified during the pre-construction check will be incorporated into the CEMP Biodiversity Management Plan.	Contractor	Pre-construction
Risks to native flora and fauna during construction	**Detailed design** Measures to further avoid and minimise the construction footprint and native vegetation or habitat removal will be considered during the detailed design stage and implemented where practicable and feasible. Measures to avoid and minimise impacts should be prioritised in the following order: a) Critical habitat b) Threatened species, endangered ecological communities or their habitat c) Native vegetation and habitat supporting flora and fauna connectivity and/or that supports other environmental objectives such as protecting water quality, hydrology or erosion and sediment controls d) Native vegetation of higher quality condition Other native vegetation	Transport for NSW	Detailed design
Protect native flora and fauna, minimise edge effects and avoid inadvertent impacts	**Site induction** All personnel working on site will receive training to ensure awareness of requirements of the Flora and Fauna Management Plan and relevant statutory responsibilities. Site-specific training will be given to personnel when working in the vicinity of areas of identified biodiversity value that are to be protected.	Contractor	Construction
Protect native flora and fauna and avoid inadvertent impacts	**Unexpected threatened species** Consistent with the Biodiversity Guidelines - Protecting and managing biodiversity on RTA projects, and any specific requirements of the approved Flora and Fauna Management Plan, an unexpected finds procedure will be implemented in the event that a threatened species or	Contractor	Construction

Impacts	Mitigation	Responsibility	Timing
	ecological community that had not been identified and assessed by the EIS is unexpectedly encountered during the construction process.		
Habitat disturbance from light	As a part of the detailed design, opportunities to minimise disturbance of foreshore and forested habitats as a result of light spill are to be fully explored. This would include the following: a) Minimising the number of proposed permanent lights and optimising their locations where possible so as to provide maximum setbacks to adjacent habitats b) Where lights cannot be avoided, use of lower impact globes, directional shields, timers, sensors or motion detectors.	Transport for NSW	Detailed design
Indirect impacts to retained trees through construction activities and placement of permanent infrastructure	A consulting arborist is to carry out an assessment of all trees that are proposed for retention in accordance with Australian Standard 4970: Protection of Trees on Development Sites. The arborist is to provide a report with recommendations on the viable retention of all native trees within mapped PCTs, and include recommendations for amending design or using alternate construction methods to reduce any impacts on retained trees.	Transport for NSW	Detailed design \ construction

7 Impact summary

7.1 Assessment of serious and irreversible impacts

An impact is to be regarded as SAII if it is likely to contribute significantly to the risk of a threatened species or ecological community becoming extinct. Principles for determining potential SAIIs are identified in clause 6.7 of the BC Regulation with thresholds assigned to SAII entities within BioNet. The project will not impact upon any SAII entities.

7.2 Impacts requiring offsets under the Biodiversity Assessment Method

In accordance with Section 6.3 of the BC Act, to the following values are subject to assessment and offset under the BOS:

- Clearing of native vegetation
- Impacts to threatened species and their habitats
- Impacts that are prescribed under the regulations.

A summary of relevant impacts associated with the project is presented in **Table 7-1.**

Table 7-1: Summary of impacts subject to assessment and offset under the BOS

Relevant matter	Details	Total impact (ha)
Native vegetation communities	Direct loss of native vegetation communities associated with site clearing	0.05
Threatened ecological communities	Direct loss of Kurnell Dune Forest in the Sutherland Shire and City of Rockdale TEC	0.02
Karst, caves, crevices, cliffs, rocks and other geological features of significance	Prescribed impact to rocky habitat	0.061
Habitat for threatened species	Direct loss of potential foraging habitat for Large-eared Pied Bat	0.04
	Direct loss of potential foraging habitat for Eastern Cave Bat	0.02
	Direct loss of potential foraging/breeding habitat for Australian Pied Oystercatcher	0.001
	Direct loss of potential foraging/breeding habitat for Sooty Oystercatcher	0.06

Offset thresholds for the BOS are detailed in Section 7.1 of the BC Regulation. These are assessed in relation to the project below and include:

- The clearing of native vegetation that exceeds the area-based thresholds for the relevant minimum lot size.
- The clearing of native vegetation, or prescribed impacts to biodiversity within land included on the Biodiversity Values Map.

Table 7-2 details lot sizes relevant to each development site. Proposed works within the Kamay Botany Bay National Park at Kurnell do not occur within a mapped lot. As such the National Park boundary was adopted to inform the lot size. In accordance with clause 7.2(3)(c) of the BC Regulation, the smallest lot size (i.e. <1ha) was adopted as the minimum lot size for the assessment. Clearing impacts associated with the project will exceed the 0.25ha threshold for the minimum lot size.

Table 7-2: Size of lots within the development site

Development site	Lot number	Plan number	Land title	Lot size (ha)
Kurnell	NA		Crown	397.14
La Perouse	DP1026891	7045	Crown	0.04
		7044	Crown	0.03
		7043	Crown	0.02
	DP915424	1	Freehold	7.04
	DP824002	5254	Crown	0.02
		5255	Crown	0.01
		5253	Crown	0.01
		5256	Crown	0.002
	DP752015	1081	Crown	0.03
		5113	Crown	0.04
		5086	Freehold	0.20
	DP862586	1	Crown	0.02
	DP934156	1	Freehold	0.12
	DP776343	1	Freehold	0.15
		2	Freehold	0.27

An area of land mapped on the Biodiversity Values Map within the development footprint will be directly impacted as a result of proposed site clearing works. As a result, the project will trigger entry into the BOS.

Under Section 7.3 of the BC Act, offsets may also be required for a development where it is likely to have a significant effect on threatened species or ecological communities, or their habitats. An assessment against Section 7.3 of the BC Act is provided in **Table 7-3** for biodiversity matters relevant to the project. The results of the assessment indicate the project is not likely to result in any significant impacts to these matters.

Table 7-3: Test for determining likely significant impacts to threatened species or ecological communities or their habitats

Relevant matter	Significance criteria	Assessment results
Threatened species	The proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction	**Unlikely** The project involves the clearing of 0.05ha of native vegetation. No species credit species were confirmed for the site. Although the Australian Pied Oystercatcher and Sooty Oystercatcher were recorded during the survey and presence of this species breeding habitat assumed (given survey effort did not include two seasons of survey), the proposed works are unlikely to impact breeding where it occurs due to small disturbance footprint and high levels of existing disturbance at the site. No breeding habitat was identified for Large-eared Pied Bat or Eastern Cave Bat within the site.
Endangered or critically endangered ecological community	The proposed development or activity is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction	**Unlikely** Existing vegetation and habitats onsite are subject to high levels of existing disturbance and modification. Regardless, minimal clearing impacts will result from the development. The clearing of 0.02ha of TEC is unlikely to result in any likely increased risk of extinction for the community.
	The proposed development or activity is likely to substantially or adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction	**Unlikely** Existing vegetation and habitats onsite are subject to high levels of existing disturbance and modification. Regardless, the project will only impact 0.02ha of TEC comprising predominantly edge environments. This is unlikely to result in any significant modification of TEC composition and is unlikely to increase the risk of extinction for the community.
Habitat for threatened species or ecological community	• The extent to which habitat is likely to be removed or modified as a result of the proposed development or activity; and • Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity; and • The importance of the habitats to be removed, modified, fragmented or isolated to the long-term survival of the	**Unlikely** The project involves the clearing of only 0.05ha of native vegetation. Habitats are subject to high levels of existing disturbance and modification and are not considered critical habitat for species credit species. These habitats are subject to existing fragmentation and with no further fragmentation likely as a result of the development. No species credit species were confirmed for the site. Although the Australian Pied Oystercatcher was recorded during the survey and presence of this species breeding habitat assumed (given survey effort did not include two seasons of survey), the proposed works are unlikely to impact the species where it occurs due to small disturbance footprint and high levels of existing disturbance at the site.

Relevant matter	Significance criteria	Assessment results
	species or ecological community in the locality	No breeding habitat was identified for Large-eared Pied Bat or Eastern Cave Bat within the site. Although the species were not identified during targeted surveys, presence of foraging habitats have been assumed due to potential for breeding habitats in proximity to the site. However, the proposed clearing works and associated loss of foraging habitats are not likely to significantly impact the species.
Declared areas of outstanding biodiversity value	The proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly)	**Unlikely** No mapped areas of outstanding biodiversity value occur within or adjacent to the development footprint.
Key threatening processes	The proposed development or activity is or is part of a key threatening process (KTP) or is likely to increase the impact on a key threatening process	**Unlikely** The clearing of native vegetation is a key threatened process. However, proposed clearing works are unlikely to significantly impact any species credit species and are likely to have only a negligible impact on biodiversity.

8 Biodiversity credit report

According to the BAM (OEH, 2017; DPIE, 2020a), ecosystem credits measure the offset requirement for impacts on TECs, threatened species habitat for species that can be reliably predicted to occur with a PCT and other PCTs generally. Species credits measure the offset requirement for impacts on individual threatened species or their area of habitat. Ecosystem credits and species credits are together referred to as 'biodiversity credits'.

Biodiversity credits necessary to address residual impacts associated with the development are detailed below. **Table 8-1** presents an estimate of ecosystem credits and **Table 8-2** presents an estimate of species credit requirements. A Biodiversity Credit Report was generated for the project using the BAM Calculator (Appendix D). The minimum area that was able to be entered into the BAM Calculator was 0.01ha, so the total area of impact used to generate credit requirements in the BAM Calculator outputs in Appendix D are greater than the area of actual impact.

Table 8-1: Ecosystem credits requirements

Credit class	PCT	Associated TEC	Direct impacts (ha)	Estimated number of credits
Ecosystem	1823 Coastal headland cliffline scrub	-	0.009	1
	661 Coastal sand littoral forest	Kurnell Dune Forest in the Sutherland Shire and City of Rockdale	0.03	5
	772 Coastal foredune wattle scrub	-	0.024	1
Total				7

Table 8-2: Species credits requirements

Credit class	Relevant matter	Habitat impacted	Direct impacts (ha)	Number of credits
Species	Large -eared Pied Bat	Potential foraging	0.04	6
	Eastern Cave Bat	Potential foraging	0.02	1
	Australian Pied Oystercatcher	Potential foraging/breeding	0.02	2
	Sooty Oystercatcher	Potential foraging/breeding	n/a	1
Total				10

It is noted that the impact area and credit requirement in **Table 8-2** will not match the BAM Calculator outputs in Appendix D. In accordance with section 10.1.2.5 of BAM 2020, credit requirements of less than one are to be rounded up to one. While the workings are not provided in the credit report, an impact on biodiversity cannot require zero credit obligation. Therefore, a single credit has been applied to PCT772 Coastal foredune wattle scrub (VZ12), PCT 1823 Coastal headland cliffline scrub (VZ15) and PCT661 Coastal sand littoral forest (VZ10). As per **Table 8-3**, an additional credit has been applied to the Pied Oystercatcher, while a single credit has been applied to the Sooty Oystercatcher.

Regarding prescribed impacts, the BAM does not calculate biodiversity credits to offset such impacts. While mitigation measures are proposed it is considered appropriate to compensate for the impact to the rocky habitat by means of species credits. These species credits can be calculated using Equation 2 in BAM (DPIE, 2020a):

No. of species credits required = (the condition of habitat x area) x BRW x 0.25

where:

condition = vegetation integrity score of vegetation zone

area = are of habitat to be impacted

BRW = the biodiversity risk weighting for the species as set out in the TBDC

In accordance with section 8.6(2) of the BAM (DPIE, 2020a), and based on correspondence with DPIE, the vegetation integrity score of the nearest PCT has been applied to the equation when calculating the offset requirement for the prescribed impacts (refer to **Table 8-3**). Regarding the Australian Pied Oystercatcher at Kurnell, the vegetation integrity score for PCT 772 has been used, while for the Sooty Oystercatcher at La Perouse, the vegetation integrity score for PCT 1823 site has been used.

Table 8-3: Prescribed impact credits requirements

Species	Condition	Associated PCT	Area of impact (ha)	BRW	Calculation output	Estimated number of credits
Australian Pied Oystercatcher	0.8	772	0.001	2	0.0004	1
Sooty Oystercatcher	4.9	1823	0.06	2	0.147	1
Total						2

The credit(s) calculated to offset the prescribed impact to rocky habitat is additional to the baseline credits detailed in the credit report (Appendix D).

9 References

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Appendix A

Flora and fauna schedule

A1 Flora schedule

Family	Species	Common Name
Aizoaceae	*Carpobrotus glaucescens*	Pigface
Aizoaceae	*Tetragonia tetragonioides*	New Zealand Spinach
Apiaceae	*Hydrocotyle bonariensis**	
Apiaceae	*Hydrocotyle laxiflora*	Stinking Pennywort
Apocynaceae	*Araujia sericifera**	Moth Vine
Apocynaceae	*Marsdenia rostrata*	Milk Vine
Apocynaceae	*Marsdenia spp.*	
Apocynaceae	*Parsonsia straminea*	Common Silkpod
Araliaceae	*Astrotricha spp.*	
Araliaceae	*Polyscias elegans*	Celery Wood
Araliaceae	*Polyscias sambucifolia*	Elderberry Panax
Araliaceae	*Schefflera actinophylla**	Umbrella Tree
Araucariaceae	*Agathis robusta**	Queensland Kauri
Araucariaceae	*Araucaria bidwillii*	Bunya Pine
Araucariaceae	*Araucaria cunninghamii*	Hoop Pine
Araucariaceae	*Araucaria heterophylla**	Norfolk Island Pine
Arecaceae	*Archontophoenix cunninghamiana*	Bangalow Palm
Arecaceae	*Livistona australis*	Cabbage Palm
Arecaceae	*Phoenix canariensis**	Canary Island Date Palm
Asparagaceae	*Asparagus aethiopicus**	Asparagus Fern
Asteliaceae	*Cordyline petiolaris*	Broad-leaved Palm Lily
Asteraceae	*Arctotheca calendula**	Capeweed
Asteraceae	*Bidens pilosa**	Cobbler's Pegs
Asteraceae	*Chrysanthemoides monilifera subsp. rotundata**	Bitou Bush
Asteraceae	*Conyza bonariensis**	Flaxleaf Fleabane
Asteraceae	*Gamochaeta calviceps**	Cudweed
Asteraceae	*Gazania rigens**	
Asteraceae	*Hypochaeris radicata**	Catsear
Asteraceae	*Soliva sessilis**	Bindyi
Asteraceae	*Sonchus oleraceus**	Common Sowthistle
Brassicaceae	*Brassica rapa**	
Brassicaceae	*Cakile maritima**	Sea Rocket
Brassicaceae	*Capsella bursa-pastoris**	Shepherd's Purse
Brassicaceae	*Lepidium sp.**	Field Cress

Family	Species	Common Name
Caprifoliaceae	*Lonicera japonica**	Japanese Honeysuckle
Caryophyllaceae	*Paronychia brasiliana**	Chilean Whitlow Wort, Brazilian Whitlow
Casuarinaceae	*Casuarina glauca*	Swamp Oak
Commelinaceae	*Commelina cyanea*	Native Wandering Jew
Commelinaceae	*Tradescantia fluminensis**	Wandering Jew
Convolvulaceae	*Dichondra repens*	Kidney Weed
Convolvulaceae	*Ipomoea cairica**	
Cunoniaceae	*Schizomeria ovata*	Crabapple
Cyperaceae	*Ficinia nodosa*	Knobby Club-rush
Davalliaceae	*Nephrolepis cordifolia*	Fishbone Fern
Dennstaedtiaceae	*Pteridium esculentum*	Bracken
Elaeocarpaceae	*Elaeocarpus reticulatus*	Blueberry Ash
Ericaceae	*Monotoca elliptica*	Tree Broom-heath
Ericaceae	*Monotoca scoparia*	
Euphorbiaceae	*Euphorbia peplus**	Petty Spurge
Fabaceae (Caesalpinioideae)	*Senna pendula var. glabrata**	
Fabaceae (Faboideae)	*Castanospermum australe*	Black Bean
Fabaceae (Faboideae)	*Desmodium rhytidophyllum*	
Fabaceae (Faboideae)	*Erythrina sp.**	Coral Tree
Fabaceae (Faboideae)	*Glycine clandestina*	Twining glycine
Fabaceae (Faboideae)	*Hardenbergia violacea*	False Sarsaparilla
Fabaceae (Faboideae)	*Medicago sativa**	Lucerne
Fabaceae (Faboideae)	*Trifolium repens**	White Clover
Fabaceae (Mimosoideae)	*Acacia implexa*	Hickory Wattle
Fabaceae (Mimosoideae)	*Acacia longifolia subsp. longifolia*	Sydney Golden Wattle
Fabaceae (Mimosoideae)	*Acacia longifolia subsp. sophorae*	Coastal Wattle
Fabaceae (Mimosoideae)	*Acacia ulicifolia*	Prickly Moses
Iridaceae	*Watsonia bulbillifera**	
Juncaceae	*Juncus spp.*	A Rush
Lamiaceae	*Clerodendrum tomentosum*	Hairy Clerodendrum
Lamiaceae	*Gmelina leichhardtii*	White Beech
Lomandraceae	*Lomandra longifolia*	Spiny-headed Mat-rush
Luzuriagaceae	*Eustrephus latifolius*	Wombat Berry
Luzuriagaceae	*Geitonoplesium cymosum*	Scrambling Lily
Malvaceae	*Lagunaria patersonia*	Norfolk Island Hibiscus
Menispermaceae	*Sarcopetalum harveyanum*	Pearl Vine

Family	Species	Common Name
Menispermaceae	*Stephania japonica*	Snake vine
Moraceae	*Ficus rubiginosa*	Port Jackson Fig
Moraceae	*Maclura cochinchinensis*	Cockspur Thorn
Myrtaceae	*Angophora costata*	Sydney Red Gum
Myrtaceae	*Eucalyptus botryoides*	Bangalay
Myrtaceae	*Eucalyptus botryoides <--> saligna*	
Myrtaceae	*Eucalyptus haemastoma*	Broad-leaved Scribbly Gum
Myrtaceae	*Eucalyptus microcorys*	Tallowwood
Myrtaceae	*Eucalyptus spp.*	
Myrtaceae	*Kunzea ambigua*	Tick Bush
Myrtaceae	*Leptospermum laevigatum*	Coast Teatree
Myrtaceae	*Lophostemon confertus*	Brush Box
Myrtaceae	*Melaleuca armillaris subsp. armillaris*	Bracelet Honey-myrtle
Myrtaceae	*Melaleuca nodosa*	
Myrtaceae	*Melaleuca quinquenervia*	Broad-leaved Paperbark
Myrtaceae	*Syncarpia glomulifera*	Turpentine
Myrtaceae	*Syzygium paniculatum*	Magenta Lilly Pilly
Ochnaceae	*Ochna serrulata**	Mickey Mouse Plant
Oleaceae	*Notelaea longifolia*	Large Mock-olive
Oleaceae	*Notelaea spp.*	
Oleaceae	*Olea europaea subsp. cuspidata**	African Olive
Orchidaceae	*Cryptostylis erecta*	Tartan Tongue Orchid
Oxalidaceae	*Oxalis debilis var. corymbosa**	
Oxalidaceae	*Oxalis spp.*	
Phormiaceae	*Dianella caerulea*	Blue Flax-lily
Phormiaceae	*Dianella caerulea var. producta*	
Phyllanthaceae	*Breynia oblongifolia*	Coffee Bush
Phyllanthaceae	*Glochidion ferdinandi*	Cheese Tree
Pittosporaceae	*Pittosporum revolutum*	Rough Fruit Pittosporum
Pittosporaceae	*Pittosporum undulatum*	Sweet Pittosporum
Plantaginaceae	*Plantago coronopus**	Buck's-horn Plaintain
Plantaginaceae	*Plantago lanceolata**	Lamb's Tongues
Poaceae	*Axonopus fissifolius**	Narrow-leafed Carpet Grass
Poaceae	*Cenchrus clandestinus**	Kikuyu Grass
Poaceae	*Cynodon dactylon*	Common Couch
Poaceae	*Digitaria didactyla*	Queensland Blue Couch

Family	Species	Common Name
Poaceae	*Digitaria spp.**	A Finger Grass
Poaceae	*Ehrharta erecta**	Panic Veldtgrass
Poaceae	*Eleusine indica**	Crowsfoot Grass
Poaceae	*Eleusine tristachya**	Goose Grass
Poaceae	*Entolasia marginata*	Bordered Panic
Poaceae	*Eragrostis spp.**	A Lovegrass
Poaceae	*Imperata cylindrica*	Blady Grass
Poaceae	*Lolium perenne**	Perennial Ryegrass
Poaceae	*Microlaena stipoides*	Weeping Grass
Poaceae	*Oplismenus aemulus*	
Poaceae	*Oplismenus imbecillis*	
Poaceae	*Paspalum dilatatum**	Paspalum
Poaceae	*Paspalum vaginatum*	Salt-water Couch
Poaceae	*Poa affinis*	
Poaceae	*Spinifex sericeus*	Hairy Spinifex
Poaceae	*Sporobolus africanus**	Parramatta Grass
Poaceae	*Sporobolus spp.**	Rat's Tail Couch
Poaceae	*Sporobolus virginicus*	
Poaceae	*Stenotaphrum secundatum**	Buffalo Grass
Poaceae	*Themeda triandra*	
Podocarpaceae	*Podocarpus elatus*	Plum Pine
Polygonaceae	*Acetosa sagittata**	Rambling Dock
Polygonaceae	*Rumex crispus**	Curled Dock
Polygonaceae	*Rumex spp.**	Dock
Portulacaceae	*Portulaca oleracea*	Pigweed
Proteaceae	*Banksia integrifolia*	Coast Banksia
Proteaceae	*Banksia serrata*	Old-man Banksia
Proteaceae	*Grevillea robusta*	Silky Oak
Proteaceae	*Stenocarpus sinuatus*	Firewheel Tree
Rubiaceae	*Pomax umbellata*	Pomax
Rutaceae	*Flindersia bennettiana*	Bennett's Ash
Rutaceae	*Zieria smithii*	Sandfly Zieria
Salicaceae	*Scolopia braunii*	Flintwood
Sapindaceae	*Cupaniopsis anacardioides*	Tuckeroo
Sapindaceae	*Dodonaea triquetra*	Large-leaf Hop-bush
Smilacaceae	*Smilax glyciphylla*	Sweet Sarsparilla
Solanaceae	*Cestrum nocturnum**	Lady-of-the-night

Family	Species	Common Name
Solanaceae	*Salpichroa origanifolia**	Pampas Lily-of-the-valley
Solanaceae	*Solanum nigrum**	Black-berry Nightshade
Sterculiaceae	*Brachychiton acerifolius*	Illawarra Flame Tree
Urticaceae	*Parietaria judaica**	Pellitory
Verbenaceae	*Lantana camara**	Lantana
Vitaceae	*Cayratia clematidea*	Native Grape
Vitaceae	*Cissus hypoglauca*	Giant Water Vine
Xanthorrhoeaceae	*Xanthorrhoea spp.*	
Zamiaceae	*Macrozamia communis*	Burrawang

A2 Fauna schedule

Common Name	Scientific Name	Observation Type	Easting	Northing	Kurnell	La Perouse
BIRDS						
Australian Magpie	*Gymnorhina tibicen*	Observed			✓	
Australian Raven	*Corvus coronoides*	Observed			✓	
Australian White Ibis	*Threskiornis moluccus*	Observed			✓	
Common Myna *	*Acridotheres tristis*	Observed				✓
Crested Pigeon	*Ocyphaps lophotes*	Observed			✓	
Crested Tern	*Thalasseus bergii*	Observed				✓
Grey Butcherbird	*Cracticus torquatus*	Heard call			✓	
Laughing Kookaburra	*Dacelo novaeguineae*	Heard call			✓	
Masked Lapwing	*Vanellus miles*	Heard call			✓	
Noisy Miner	*Manorina melanocephala*	Observed			✓	
Pelican	*Pelecanus conspicillatus*	Observed			✓	
Pied Cormorant	*Phalacrocorax varius*	Observed			✓	✓
Pied Currawong	*Strepera graculina*	Observed			✓	
Australian Pied Oystercatcher	*Haematopus longirostris*	Observed	335339	6235793	✓	
Rainbow Lorikeet	*Trichoglossus moluccanus*	Heard call			✓	
Red Wattlebird	*Anthochaera carunculata*	Heard call			✓	✓
Rock Dove *	*Columba livia*	Observed				✓
Silver Gull	*Chroicocephalus novaehollandiae*	Observed			✓	
Sooty Oystercatcher	*Haematopus fuliginosus*	Observed	336410	6237728		✓
Spotted Dove *	*Spilopelia chinensis*	Heard call				✓
Spotted Pardalote	*Pardalotus punctatus*	Heard call			✓	
Sulphur-crested Cockatoo	*Cacatua galerita*	Observed			✓	
Superb Fairy Wren	*Malurus cyaneus*	Heard call			✓	

Common Name	Scientific Name	Observation Type	Easting	Northing	Kurnell	La Perouse
Welcome Swallow	*Hirundo neoxena*	Observed				✓
White-faced Heron	*Egretta novaehollandiae*	Observed			✓	
Willy Wagtail	*Rhipidura leucophrys*	Observed				✓
Yellow-tailed Black Cockatoo	*Calyptorhynchus funereus*	Heard call			✓	
MAMMALS					✓	
Gould's Wattled Bat	*Chalinolobus gouldii*	Echolocation detector			✓	
Chocolate Wattled Bat	*Chalinolobus morio*	Echolocation detector			✓	
Little Bentwinged-bat	*Miniopterus australis*	Echolocation detector			✓	
Large Bent-winged Bat	*Miniopterus orianae oceanensis*	Echolocation detector			✓	
East-coast Free-tailed Bat	*Mormopterus norfolkensis*	Echolocation detector			✓	
(possible)^						
	Nyctophilus sp.	Echolocation detector			✓	
Eastern Forest Bat (probable)^^	*Vespadelus pumilus*	Echolocation detector (Probable)			✓	
Little Forest Bat	*Vespadelus vulturnus*	Echolocation detector			✓	
	Vespadelus spp.	Echolocation detector			✓	
Grey-headed Flying-fox	*Pteropus poliocephalus*	Observed			✓	
Common Brushtail Possum	*Trichosurus vulpecula*	Observed			✓	
AMPHIBIANS					✓	
Common Eastern Froglet	*Crinia signifera*	Heard call			✓	
Brown-striped Frog	*Limnodynastes peronii*	Heard call			✓	

* Denotes introduced species.
^ Calls can be confused with other species where their ranges overlap and/or quality of calls is poor.
^^ Likely species, however some confusion with other species that exhibit similar characteristics and overlap in range.

Appendix B

Habitat suitability assessment

B1

Species name	Common name	Credit Class	EPBC Act status	BC Act status	Geographic constraints	Associated with PCT on site	Veg cover required	Patch size required	Requires further assessment	Habitat constraints	Suitable habitat	Habitat assessment	BioNet records within 3km of site	Likelihood of occurrence	Candidate species
Botaurus poiciloptilus	Australasia Bittern	Ecosystem	E	E	None listed	Yes	Relictual ≤10%	<5ha	Yes	Brackish or freshwater wetlands	Favours permanent freshwater wetlands with tall, dense vegetation, particularly bullrushes (Typha spp.) and spikerushes (Eleocharis spp.). Breeding occurs in summer from October to January	Assumed present	Two records prior to 1985 within 1km of the Kurnell site	Low	No
Rostratula australis	Australian Painted Snipe	Ecosystem	E	E	None listed	Yes	Relictual ≤10%	<5ha	Yes	None listed	Prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber. Nests on the ground amongst tall vegetation, such as grasses, tussocks or reeds. The nest consists of a scrape in the ground, lined with grasses and leaves. Breeding is often in response to local conditions; generally occurs from September to December. Incubation and care of young is all undertaken by the male only.	Assumed present	No	Low	No

Species name	Common name	Credit Class	EPBC Act status	BC Act status	Geographic constraints	Associated with PCT on site	Veg cover required	Patch size required	Requires further assessment	Habitat constraints	Suitable habitat	Habitat assessment	BioNet records within 3km of site	Likelihood of occurrence	Candidate species
											Forages nocturnally on mud-flats and in shallow water. Feeds on worms, molluscs, insects and some plant-matter.				
Ninox connivens	Barking Owl	Species/ Ecosystem		V	None listed	Yes	Fragmented 11-30%	25-100ha	Yes	Living or dead trees with hollows greater than 20 cm diameter and greater than 4m above the ground.	Inhabits woodland and open forest, including fragmented remnants and partly cleared farmland. It is flexible in its habitat use, and hunting can extend in to closed forest and more open areas. Sometimes able to successfully breed along timbered watercourses in heavily cleared habitats (e.g. western NSW) due to the higher density of prey found on these fertile riparian soils.	Species not heard or observed. No sign of nesting or roosting beneath potential habitat trees. Species considered absent due to degraded habitat	No	Low	No
Esacus magnirostris	Beach Stone-curlew	Species/ Ecosystem		CE	None listed	Yes	Relictual ≤10%	<5ha	Yes	Breeding: None listed Foraging: As per mapped areas (contact OEH for maps)	Beach Stone-curlews are found exclusively along the coast, on a wide range of beaches, islands, reefs and in estuaries, and may often be seen at the edges of or near mangroves. They forage in the intertidal zone of beaches and estuaries, on islands, flats, banks and spits of sand, mud, gravel or rock, and among mangroves. Beach Stone-curlews breed above the littoral zone, at the backs of beaches, or on sandbanks	Foreshore areas offer marginal habitat only. Beach <1m wide and subject to high amounts of foot traffic.	No	Low	No

Species name	Common name	Credit Class	EPBC Act status	BC Act status	Geographic constraints	Associated with PCT on site	Veg cover required	Patch size required	Requires further assessment	Habitat constraints	Suitable habitat	Habitat assessment	BioNet records within 3km of site	Likelihood of occurrence	Candidate species
											and islands, among low vegetation of grass, scattered shrubs or low trees; also among open mangroves. In NSW, clutches have been recorded from early October to late March, but elsewhere in temperate Australia, breeding has been recorded from September. Their nests are just a shallow scrape in sand or gravel, above the tidal zone at the backs of beaches, or on sandbanks and islands or among open mangroves.				
Ixobrychus flavicollis	Black Bittern	Ecosystem		V	None listed	Yes	Fragmented 11-30%	<5ha	Yes	Land within 40 m of freshwater and estuarine wetlands, in areas of permanent water and dense vegetation	Inhabits both terrestrial and estuarine wetlands, generally in areas of permanent water and dense vegetation. Where permanent water is present, the species may occur in flooded grassland, forest, woodland, rainforest and mangroves. During the day, roosts in trees or on the ground amongst dense reeds. When disturbed, freezes in a characteristic bittern posture (stretched tall, bill pointing up, so that shape and streaked pattern blend with upright stems of reeds), or will fly up to a	Assumed present	No	Low	No

Species name	Common name	Credit Class	EPBC Act status	BC Act status	Geographic constraints	Associated with PCT on site	Veg cover required	Patch size required	Requires further assessment	Habitat constraints	Suitable habitat	Habitat assessment	BioNet records within 3km of site	Likelihood of occurrence	Candidate species
											branch or flush for cover where it will freeze again.				
Melithreptus gularis gularis	Black-chinned Honeyeater (eastern subspecies)			V	None listed	Yes	Fragmented 11-30%	5-24ha	Yes	None listed	Occupies mostly upper levels of drier open forests or woodlands dominated by box and ironbark eucalypts, especially Mugga Ironbark (Eucalyptus sideroxylon), White Box (E. albens), Inland Grey Box (E. microcarpa), Yellow Box (E. melliodora), Blakely's Red Gum (E. blakelyi) and Forest Red Gum (E. tereticornis). Also inhabits open forests of smooth-barked gums, stringybarks, ironbarks, river sheoaks (nesting habitat) and tea-trees. Feeding territories are large making the species locally nomadic. Recent studies have found that the Black-chinned Honeyeater tends to occur in the largest woodland patches in the landscape as birds forage over large home ranges of at least 5 hectares. The nest is placed high in the crown of a tree, in the uppermost lateral branches, hidden by foliage. It is a compact, suspended, cup-shaped nest.	Suitable foraging habitat	No	Low	No

Species name	Common name	Credit Class	EPBC Act status	BC Act status	Geographic constraints	Associated with PCT on site	Veg cover required	Patch size required	Requires further assessment	Habitat constraints	Suitable habitat	Habitat assessment	BioNet records within 3km of site	Likelihood of occurrence	Candidate species
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	Ecosystem		V	None listed	Yes	Relictual ≤10%	<5ha	Yes	None listed	Found in eucalypt woodlands (including Box-Gum Woodland) and dry open forest of the inland slopes and plains inland of the Great Dividing Range; mainly inhabits woodlands dominated by stringybarks or other rough-barked eucalypts, usually with an open grassy understorey, sometimes with one or more shrub species; also found in mallee and River Red Gum (Eucalyptus camaldulensis) Forest bordering wetlands with an open understorey of acacias, saltbush, lignum, cumbungi and grasses; usually not found in woodlands with a dense shrub layer; fallen timber is an important habitat component for foraging; also recorded, though less commonly, in similar woodland habitats on the coastal ranges and plains.	Assumed present	No	Moderate	No
Stagonopleura guttata	Diamond Firetail	Ecosystem		V	None listed	Yes	Relictual ≤10%	<5ha	Yes	None listed	Found in grassy eucalypt woodlands, including Box-Gum Woodlands and Snow Gum Eucalyptus pauciflora Woodlands. Also occurs in open forest, mallee, Natural Temperate Grassland, and in	Assumed present	No	Low	No

Species name	Common name	Credit Class	EPBC Act status	BC Act status	Geographic constraints	Associated with PCT on site	Veg cover required	Patch size required	Requires further assessment	Habitat constraints	Suitable habitat	Habitat assessment	BioNet records within 3km of site	Likelihood of occurrence	Candidate species
											secondary grassland derived from other communities. Often found in riparian areas (rivers and creeks), and sometimes in lightly wooded farmland.				
Artamus cyanopterus cyanopterus	Dusky Woodswallow	Ecosystem		V	None listed	Yes	Relictual ≤10%	<5ha	Yes	None listed	Primarily inhabit dry, open eucalypt forests and woodlands, including mallee associations, with an open or sparse understorey of eucalypt saplings, acacias and other shrubs, and ground-cover of grasses or sedges and fallen woody debris. It has also been recorded in shrublands, heathlands and very occasionally in moist forest or rainforest. Also found in farmland, usually at the edges of forest or woodland. Nest is an open, cup-shape, made of twigs, grass, fibrous rootlets and occasionally casuarina needles, and may be lined with grass, rootlets or infrequently horsehair, occasionally unlined. Nest sites vary greatly, but generally occur in shrubs or low trees, living or dead, horizontal or upright forks in branches, spouts, hollow stumps or logs, behind loose bark or in a hollow in	Assumed present	Two records prior to 2010 within 1km of Kurnell	Moderate	No

Species name	Common name	Credit Class	EPBC Act status	BC Act status	Geographic constraints	Associated with PCT on site	Veg cover required	Patch size required	Requires further assessment	Habitat constraints	Suitable habitat	Habitat assessment	BioNet records within 3km of site	Likelihood of occurrence	Candidate species
											the top of a wooden fence post. Nest sites may be exposed or well concealed by foliage.				
Micronomus norfolkensis	Eastern Coastal Free-tailed Bat	Ecosystem		V	None listed	Yes	Relictual ≤10%	<5ha	Yes	None listed	Occur in dry sclerophyll forest, woodland, swamp forests and mangrove forests east of the Great Dividing Range. Roost maily in tree hollows but will also roost under bark or in man-made structures. Usually solitary but also recorded roosting communally, probably insectivorous.	Assumed present	No	Moderate	No
Pandion cristatus	Eastern Osprey	Species/ Ecosystem		V	None listed	Yes	Relictual ≤10%	<5ha	Yes	Breeding: Presence of stick-nests in living and dead trees (>15m) or artificial structures within 100m of a floodplain for nesting	Favour coastal areas, especially the mouths of large rivers, lagoons and lakes. Fish over open water.	Suitable foraging habitat present. No Ospreys, or their typical nests were observed. Species is considered absent.	Yes	Moderate	No
Callocephalon fimbriatum	Gang-gang Cockatoo	Species/ Ecosystem		V	None listed	Yes	Fragmented 11-30%	<5ha	Yes	Foraging: No constraints listed Breeding: Requires Eucalyptus species with	Tall mountain forests and woodlands in spring and summer. In autumn and winter, the species often moves to lower altitudes in drier more open eucalypt forests and woodlands,	No suitable habitat trees present within development footprint.. No Gang-gang Cockatoos were	One record from 2012	Moderate	No

Species name	Common name	Credit Class	EPBC Act status	BC Act status	Geographic constraints	Associated with PCT on site	Veg cover required	Patch size required	Requires further assessment	Habitat constraints	Suitable habitat	Habitat assessment	BioNet records within 3km of site	Likelihood of occurrence	Candidate species
										hollows >9cm diameter	particularly box-gum and box-ironbark assemblages, or in dry forest in coastal areas and often found in urban areas. May also occur in sub-alpine Snow Gum (Eucalyptus pauciflora) woodland and occasionally in temperate rainforests.	detected during the field survey. The species is not considered to breed within the site.			
Calyptorhynchus lathami	Glossy Black-cockatoo	Species/ Ecosystem		V	None listed	Yes	Relictual ≤10%	<5ha	Yes	Foraging: Allocasuarina and Casuarina species Breeding: Requires hollows > 15cm and more than 5m above the ground	Open forest and woodlands of the coast and the Great Dividing Range where stands of sheoak occur. Black Sheoak (Allocasuarina littoralis) and Forest Sheoak (A. torulosa) are important foods.	No suitable habitat trees present within development footprint.. No Glossy Black-cockatoos were detected during the field survey. The species is not considered to breed within the site. Species targeted but not recorded.	One record from 1990	Moderate	No
Pteropus poliocephalus	Grey-headed Flying-fox	Species/ Ecosystem	V	V	None listed	Yes	Relictual ≤10%	<5ha	Yes	Foraging: None listed Breeding: presence of camps	Utilised vegetation communities including rainforests, open forests, closed and open woodlands. Also feeds on commercial fruit crops and on introduced tree species in urban areas.	Suitable foraging habitat present. No camps present within the site. Species recorded.	Yes	High	No
Phascolarctos cinereus	Koala	Species/ Ecosystem	V	V	None listed	No	Relictual ≤10%	<5ha	Yes	Breeding: Areas identified via	Naturally inhabit a range of temperate, sub-tropical and tropical forest, woodland	Suitable habitat does not occur at the site.	No	Low	No

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										survey as important habitat (defined by the density of koalas and quality of habitat) Foraging: None listed	and semi-arid communities dominated by Eucalypt species.				
Miniopterus orianae oceanensis	Large Bent-winged Bat	Species/ Ecosystem		V	None listed	Yes	Relictual ≤10%	<5ha	Yes	Cave, tunnel, mine, culvert or other structure known or suspected to be used for breeding including species records with microhabitat code "IC - in cave;" observation type code "E nest-roost;" with numbers of individuals >500	Caves are the primary roosting habitat, but also use derelict mines, storm-water tunnels, buildings and other man-made structures. Maternity caves have very specific temperature and humidity regimes. Hunt in forested areas, catching moths and other flying insects above the tree tops.	Site contains suitable foraging habitat. No habitat features suspected to be used for breeding were identified on site	Yes	High	No
Miniopterus australis	Little Bent-winged Bat	Species/ Ecosystem		V	None listed	Yes	Relictual ≤10%	<5ha	Yes	Breeding: Cave, tunnel, mine, culvert or other structure known or	Moist eucalypt forest, rainforest, vine thicket, wet and dry sclerophyll forest, Melaleuca swamps, dense coastal forests and banksia scrub.	Site contains suitable foraging habitat. No habitat features suspected to be used for breeding	Yes	High	No

Species name	Common name	Credit Class	EPBC Act status	BC Act status	Geographic constraints	Associated with PCT on site	Veg cover required	Patch size required	Requires further assessment	Habitat constraints	Suitable habitat	Habitat assessment	BioNet records within 3km of site	Likelihood of occurrence	Candidate species
										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.		were identified on site			
Hieraaetus morphnoides	Little Eagle	Species/ Ecosystem		V	None listed	Yes	Fragmented 11-30%	<5ha	Yes	Foraging: No constraints listed Breeding: Nest trees - live (occasionally dead) large old trees within vegetation	Open eucalypt forest, woodland or open woodland. Sheoak or Acacia woodlands and riparian woodlands of interior NSW are also used.	Site contains potential foraging habitat. No habitat features suspected to be used for breeding were identified on site	No	Low	No
Glossopsitta pusilla	Little Lorikeet	Ecosystem		V	None listed	Yes	Relictual ≤10%	<5ha	Yes	None listed	Forages primarily in the canopy of open Eucalyptus forest and woodland, yet also finds food in Angophora, Melaleuca and other tree	Assumed present	One record from 2012 within 1.5km	Moderate	No

Species name	Common name	Credit Class	EPBC Act status	BC Act status	Geographic constraints	Associated with PCT on site	Veg cover required	Patch size required	Requires further assessment	Habitat constraints	Suitable habitat	Habitat assessment	BioNet records within 3km of site	Likelihood of occurrence	Candidate species
											species. Riparian habitats are particularly used, due to higher soil fertility and hence greater productivity. Roosts in treetops, often distant from feeding areas.		of La Perouse		
Sternula albifrons	Little Tern	Species/ Ecosystem			None listed	Yes	Relictual ≤10%	<5ha	Yes	Breeding: None listed Foraging: as per mapped areas.	Almost exclusively coastal, preferring sheltered environments; however may occur several kilometres from the sea in harbours, inlets and rivers (with occasional offshore islands or coral cay records). Nests in small, scattered colonies in low dunes or on sandy beaches just above high tide mark near estuary mouths or adjacent to coastal lakes and islands. The nest is a scrape in the sand, which may be lined with shell grit, seaweed or small pebbles. Both parents incubate up to three well-camouflaged eggs for up to 22 days, aggressively defending the nest against intruders until the young fledge at 17 - 19 days. Often seen feeding in flocks, foraging for small fish, crustaceans, insects, worms and molluscs by plunging in the shallow	Foreshore habitats are marginal; <1m wide and subject to high amounts of foot traffic.	Yes	High	No

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											water of channels and estuaries, and in the surf on beaches, or skipping over the water surface with a swallow-like flight.				
Tyto novaehollandiae	Masked Owl	Species/ Ecosystem		V	None listed	Yes	Fragmented 11-30%	<5ha	Yes	Breeding: Living or dead trees with hollows greater than 20cm diameter. Foraging: None listed	Lives in dry eucalypt forests and woodlands from sea level to 1100 m. A forest owl, but often hunts along the edges of forests, including roadsides. The typical diet consists of tree-dwelling and ground mammals, especially rats. Pairs have a large home-range of 500 to 1000 hectares. Roosts and breeds in moist eucalypt forested gullies, using large tree hollows or sometimes caves for nesting.	Species not heard or observed. No sign of nesting or roosting beneath potential habitat trees. Species considered absent due to degraded habitat.	No	Low	No
Ninox strenua	Powerful Owl	Species/ Ecosystem		V	None listed	Yes	Fragmented 11-30%	<5ha	Yes	Breeding: Living or dead trees with hollows greater than 20cm diameter. Foraging: None listed	The Powerful Owl inhabits a range of vegetation types, from woodland and open sclerophyll forest to tall open wet forest and rainforest. The Powerful Owl requires large tracts of forest or woodland habitat but can occur in fragmented landscapes as well. The species breeds and hunts in open or closed sclerophyll	Species not heard or observed. No sign of nesting or roosting beneath potential habitat trees. Species considered absent due to degraded habitat.	No	Low	No

Species name	Common name	Credit Class	EPBC Act status	BC Act status	Geographic constraints	Associated with PCT on site	Veg cover required	Patch size required	Requires further assessment	Habitat constraints	Suitable habitat	Habitat assessment	BioNet records within 3km of site	Likelihood of occurrence	Candidate species
											forest or woodlands and occasionally hunts in open habitats. It roosts by day in dense vegetation comprising species such as Turpentine Syncarpia glomulifera, Black She-oak Allocasuarina littoralis, Blackwood Acacia melanoxylon, Rough-barked Apple Angophora floribunda, Cherry Ballart Exocarpus cupressiformis and a number of eucalypt species. The main prey items are medium-sized arboreal marsupials, particularly the Greater Glider, Common Ringtail Possum and Sugar Glider. There may be marked regional differences in the prey taken by Powerful Owls. For example in southern NSW, Ringtail Possum make up the bulk of prey in the lowland or coastal habitat. At higher elevations, such as the tableland forests, the Greater Glider may constitute almost all of the prey for a pair of Powerful Owls. Flying-foxes are important prey in some areas; birds comprise about 10-50% of the diet				

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											depending on the availability of preferred mammals. As most prey species require hollows and a shrub layer, these are important habitat components for the owl. Pairs of Powerful Owls demonstrate high fidelity to a large territory, the size of which varies with habitat quality and thus prey densities. In good habitats a mere 400 can support a pair; where hollow trees and prey have been depleted the owls need up to 4000 ha. Powerful Owls nest in large tree hollows (at least 0.5 m deep), in large eucalypts (diameter at breast height of 80-240 cm) that are at least 150 years old. While the female and young are in the nest hollow the male Powerful Owl roosts nearby (10-200 m) guarding them, often choosing a dense "grove" of trees that provide concealment from other birds that harass him. Powerful Owls are monogamous and mate for life. Nesting occurs from late autumn to mid-winter, but is slightly earlier in				

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											north-eastern NSW (late summer - mid autumn). Clutches consist of two dull white eggs and incubation lasts approximately 38 days.				
Anthochaera phrygia	Regent Honeyeater	Species/ Ecosystem	CE	CE	None listed	Yes	Relictual ≤10%	<5ha	Yes	Breeding: Mapped important areas Foraging: None listed	Most commonly associated with box-ironbark eucalypt woodland and dry sclerophyl forests, but also inhabits riparian vegetation and lowland coastal forest.	Site is not identified on the important habitat map for Regent Honeyeater. No suitable habitat occurs within the study area.	No	Low	No
Varanus rosenbergi	Resenberg's Goanna	Ecosystem		V	None listed	Yes	Fragmented 11-30%	5-24ha	Yes	None listed	Found in heath, open forest and woodland. Associated with termites, the mounds of which this species nests in; termite mounds are a critical habitat component. Individuals require large areas of habitat. Feeds on carrion, birds, eggs, reptiles and small mammals. Shelters in hollow logs, rock crevices and in burrows, which they may dig for themselves, or they may use other species' burrows, such as rabbit warrens. Runs along the ground when pursued (as opposed to the Lace Monitor, which	Assumed present	No	Low	No

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											climbs trees). Lays up to 14 eggs in a termite mound; the hatchlings dig themselves out of the mounds. Generally slow moving; on the tablelands likely only to be seen on the hottest days				
Circus assimilis	Spotted Harrier	Ecosystem		V	None listed	Yes	Fragmented 11-30%	<5ha	Yes	None listed	Occurs in grassy open woodland including Acacia and mallee remnants, inland riparian woodland, grassland and shrub steppe. It is found most commonly in native grassland, but also occurs in agricultural land, foraging over open habitats including edges of inland wetlands. Builds a stick nest in a tree and lays eggs in spring (or sometimes autumn), with young remaining in the nest for several months. Preys on terrestrial mammals (eg bandicoots, bettongs, and rodents), birds and reptile, occasionally insects and rarely carrion.	Assumed present	No	Low	No
Dasyurus maculatus	Spotted-tailed Quoll	Ecosystem	E	V		Yes	Relictual ≤10%	<5ha	Yes	None listed	Recorded across a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to	Assumed present	No	Low	No

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											the coastline. Individual animals use hollow-bearing trees, fallen logs, small caves, rock outcrops and rocky-cliff faces as den sites. Mostly nocturnal, although will hunt during the day; spends most of the time on the ground, although also an excellent climber and will hunt possums and gliders in tree hollows and prey on roosting birds. Use communal 'latrine sites', often on flat rocks among boulder fields, rocky cliff-faces or along rocky stream beds or banks. Such sites may be visited by multiple individuals and can be recognised by the accumulation of the sometimes characteristic 'twisty-shaped' faeces deposited by animals. A generalist predator with a preference for medium-sized (500g-5kg) mammals. Consumes a variety of prey, including gliders, possums, small wallabies, rats, birds, bandicoots, rabbits, reptiles and insects. Also eats carrion and takes domestic fowl.				

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											Females occupy home ranges of 200-500 hectares, while males occupy very large home ranges from 500 to over 4000 hectares. Are known to traverse their home ranges along densely vegetated creeklines. Average litter size is five; both sexes mature at about one year of age. Life expectancy in the wild is about 3-4 years.				
Lophoictinia isura	Square-tailed Kite	Species/ Ecosystem		V		Yes	Fragmented 11-30%	<5ha	Yes	Breeding: Nest trees- live large old trees within suitable vegetation AND the presence of a male and female; or female with nesting material; or an individual on a large stick nest in the top half of the tree canopy.	Found in a variety of timbered habitats including dry woodlands and open forests. Shows a particular preference for timbered watercourses. In arid north-western NSW, has been observed in stony country with a ground cover of chenopods and grasses, open acacia scrub and patches of low open eucalypt woodland. Is a specialist hunter of passerines, especially honeyeaters, and most particularly nestlings, and insects in the tree canopy, picking most prey items from the outer foliage. Appears to occupy large hunting ranges of more than 100km2. Breeding is from July to	Potential foraging habitat present.	No	Low	No

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											February, with nest sites generally located along or near watercourses, in a fork or on large horizontal limbs.				
Ptilinopus superbus	Superb Fruit-Dove	Ecosystem		V		Yes	Relictual ≤10%	<5ha	Yes	None listed	Inhabits rainforest and similar closed forests where it forages high in the canopy, eating the fruits of many tree species such as figs and palms. It may also forage in eucalypt or acacia woodland where there are fruit-bearing trees. Part of the population is migratory or nomadic. There are records of single birds flying into lighted windows and lighthouses, indicating that birds travel at night. At least some of the population, particularly young birds, moves south through Sydney, especially in autumn. Breeding takes place from September to January. The nest is a structure of fine interlocked forked twigs, giving a stronger structure than its flimsy appearance would suggest, and is usually 5-30 metres up in rainforest and rainforest edge tree and shrub species. The male incubates the	Assumed present	One record from 2012 approx 3km north of La Perouse	Low	No

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											single egg by day, the female incubates at night.				
Lathamus discolor	Swift Parrot	Species/ Ecosystem	CE	E		Yes	Relictual ≤10%	<5ha	Yes	Breeding: As per mapped areas	Migrates to the Australian south-east mainland between February and October. On the mainland they occur in areas where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations. Favoured feed trees include winter flowering species such as Swamp Mahogany Eucalyptus robusta, Spotted Gum Corymbia maculata, Red Bloodwood C. gummifera, Forest Red Gum E. tereticornis, Mugga Ironbark E. sideroxylon, and White Box E. albens. Commonly used lerp infested trees include Inland Grey Box E. microcarpa, Grey Box E. moluccana, Blackbutt E. pilularis, and Yellow Box E. melliodora. Return to some foraging sites on a cyclic basis depending on food availability. Following winter they return to Tasmania where they breed from September	Site is not identified on the important habitat map for Swift Parrot.. No suitable habitat occurs within the study area.	No	Low	No

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											to January, nesting in old trees with hollows and feeding in forests dominated by Tasmanian Blue Gum Eucalyptus globulus.				
Xenus cinereus	Terek Sandpiper	Species/ Ecosystem	M	V		Yes	Relictual ≤10%	<5ha	Yes	Foraging: As per mapped areas	Non-breeding only: Forages in the open, on soft wet intertidal mudflats or in sheltered estuaries, embayments, harbours or lagoons. Roost in or among mangroves, birds may perch in branches or roots up to 2 m from the ground, or beneath them in the shade on hot days	Marginal habitat subject to high disturbance	Yes	Low	No
Neophema pulchella	Turquoise Parrot	Ecosystem		V		Yes	Fragmented 11-30%	<5ha	Yes	None listed	Lives on the edges of eucalypt woodland adjoining clearings, timbered ridges and creeks in farmland. Usually seen in pairs or small, possibly family, groups and have also been reported in flocks of up to thirty individuals. Prefers to feed in the shade of a tree and spends most of the day on the ground searching for the seeds or grasses and herbaceous plants, or browsing on vegetable matter. Forages quietly and may be quite tolerant of	Assumed present	No	Low	No

Species name	Common name	Credit Class	EPBC Act status	BC Act status	Geographic constraints	Associated with PCT on site	Veg cover required	Patch size required	Requires further assessment	Habitat constraints	Suitable habitat	Habitat assessment	BioNet records within 3km of site	Likelihood of occurrence	Candidate species
											disturbance. However, if flushed it will fly to a nearby tree and then return to the ground to browse as soon as the danger has passed. Nests in tree hollows, logs or posts, from August to December. It lays four or five white, rounded eggs on a nest of decayed wood dust.				
Daphoenositta chrysoptera	Varied Sittella	Ecosystem		V		Yes	Fragmented 11-30%	<5ha	Yes	None listed	Inhabits eucalypt forests and woodlands, especially those containing rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland. Feeds on arthropods gleaned from crevices in rough or decorticating bark, dead branches, standing dead trees and small branches and twigs in the tree canopy. Builds a cup-shaped nest of plant fibres and cobwebs in an upright tree fork high in the living tree canopy, and often re-uses the same fork or tree in successive years. Generation length is estimated to be 5 years.	Assumed present	Only one record from 1943 approx 1.5km south of Kurnell	Low	No
Haliaeetus leucogaster	White-bellied Sea-eagle	Species/ Ecosystem	Ma	V		Yes	Relictual ≤10%	<5ha	Yes	Breeding: Living or	Habitats are characterised by the presence of large	Suitable foraging habitat present.	Yes	High	No

Species name	Common name	Credit Class	EPBC Act status	BC Act status	Geographic constraints	Associated with PCT on site	Veg cover required	Patch size required	Requires further assessment	Habitat constraints	Suitable habitat	Habitat assessment	BioNet records within 3km of site	Likelihood of occurrence	Candidate species
										dead mature trees within suitable vegetation within 1km of a rivers, lakes, large dams or creeks, wetlands and coastlines AND the presence of a large stick nest within tree canopy; or an adult with nest material; or adults observed duetting within breeding period. Foraging: Within 1km of a rivers, lakes, large dams or creeks, wetlands and coastlines.	areas of open water including larger rivers, swamps, lakes, and the sea. Breeding habitat consists of mature tall open forest, open forest, tall woodland, and swamp sclerophyll forest close to foraging habitat. Nest trees are typically large emergent eucalypts and often have emergent dead branches or large dead trees nearby which are used as 'guard roosts'. Nests are large structures built from sticks and lined with leaves or grass.	Unlikely breeding habitat due to absence of nesting activity.			
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	Ecosystem		V		Yes	Fragmented 11-30%	<5ha	Yes	None listed	Roosts singly or in groups of up to six, in tree hollows and buildings; in treeless areas they are known to	Assumed present	One record at	Moderate	No

Species name	Common name	Credit Class	EPBC Act status	BC Act status	Geographic constraints	Associated with PCT on site	Veg cover required	Patch size required	Requires further assessment	Habitat constraints	Suitable habitat	Habitat assessment	BioNet records within 3km of site	Likelihood of occurrence	Candidate species
											utilise mammal burrows. When foraging for insects, flies high and fast over the forest canopy, but lower in more open country. Forages in most habitats across its very wide range, with and without trees; appears to defend an aerial territory. Breeding has been recorded from December to mid-March, when a single young is born. Seasonal movements are unknown; there is speculation about a migration to southern Australia in late summer and autumn.		Kurnell in 2000		
Allocasuarina portuensis	Nielsen Park She-oak	Species		E	East of Gladesville bridge, within 5km of Sydney Harbour foreshore	Yes			No	None listed	The original habitat is tall closed woodland. Canopy species include: Ficus rubiginosa, Angophora costata, Elaeocarpus reticulatus and Gloichidion ferdinandi with a shrub layer of Pittosporum revolutum, Kunzea ambigua and Monotoca elliptica. The original habitat occurs above a sandstone shelf approximately 20 m above the harbour. The shallow sandy soils are highly siliceous, coarsely textured	Suitable habitat does not occur at the site. The species is considered absent.	No	Low	No

Species name	Common name	Credit Class	EPBC Act status	BC Act status	Geographic constraints	Associated with PCT on site	Veg cover required	Patch size required	Requires further assessment	Habitat constraints	Suitable habitat	Habitat assessment	BioNet records within 3km of site	Likelihood of occurrence	Candidate species
											and devoid of a soil profile. The plantings have occurred on similar soils. Flowering occurs throughout the winter months (April-August), though many of the in situ plantings have also been observed to flower during January and March. The species is probably wind pollinated. Species in the Casuarinaceae are generally obligate seed regenerators. Most species are killed by fire, although some species can resprout. It is most conservative to assume that it is killed by fire unless otherwise shown. Reproductive success is dependent on the availability of pollen. Life span is greater than 10 years, and possibly up to 30 years.				
Burhinus grallarius	Bush Stone-curlew	Species		E		Yes	Fragmented 11-30%	<5ha	Yes	Fallen/ standing dead timber including logs	Inhabits open forests and woodlands with a sparse grassy groundlayer and fallen timber. Largely nocturnal, being especially active on moonlit nights. Feed on insects and small vertebrates, such as frogs,	There are no records for this species in the area. No Bush Stone-curlews were observed or heard calling during the survey. The	No	Low	No

Species name	Common name	Credit Class	EPBC Act status	BC Act status	Geographic constraints	Associated with PCT on site	Veg cover required	Patch size required	Requires further assessment	Habitat constraints	Suitable habitat	Habitat assessment	BioNet records within 3km of site	Likelihood of occurrence	Candidate species
											lizards and snakes. Nest on the ground in a scrape or small bare patch. Two eggs are laid in spring and early summer.	species is considered absent.			
Caladenia tessellata	Thick Lip Spider Orchid	Species	V	E		Yes			Yes	None listed	Generally found in grassy sclerophyll woodland on clay loam or sandy soils, though the population near Braidwood is in low woodland with stony soil. The single leaf regrows each year. Flowers appear between September and November (but apparently generally late September or early October in extant southern populations)	No suitable habitat within the site	No	Low	No
Haematopus longirostris	Australian Pied Oystercatcher	Species		E		Yes	Relictual <10%	<5ha	Yes	Within 100m of estuarine areas and the ocean	Favours intertidal flats of inlets and bays, open beaches and sandbanks. Forages on exposed sand, mud and rock at low tide, for molluscs, worms, crabs and small fish. The chisel-like bill is used to pry open or break into shells of oysters and other shellfish. Nests mostly on coastal or estuarine beaches although occasionally they use saltmarsh or grassy areas. Nests are shallow scrapes in sand above the high tide mark, often amongst	Recorded during field survey. Suitable habitat within rocky shoreline and beach areas at Kurnell.	Yes	High	Yes

Species name	Common name	Credit Class	EPBC Act status	BC Act status	Geographic constraints	Associated with PCT on site	Veg cover required	Patch size required	Requires further assessment	Habitat constraints	Suitable habitat	Habitat assessment	BioNet records within 3km of site	Likelihood of occurrence	Candidate species
											seaweed, shells and small stones. Two to three eggs are laid between August and January. The female is the primary incubator and the young leave the nest within several days.				
Cercartetus nanus	Eastern Pygmy-possum	Species		V		Yes	Fragmented 11-30%	<5ha	Yes	None listed	Found in a broad range of habitats from rainforest through sclerophyll (including Box-Ironbark) forest and woodland to heath, but in most areas woodlands and heath appear to be preferred, except in north-eastern NSW where they are most frequently encountered in rainforest. Feeds largely on nectar and pollen collected from banksias, eucalypts and bottlebrushes; an important pollinator of heathland plants such as banksias; soft fruits are eaten when flowers are unavailable. Also feeds on insects throughout the year; this feed source may be more important in habitats where flowers are less abundant such as wet forests. Shelters in tree hollows, rotten stumps, holes in the ground, abandoned bird-	Suitable habitat does not occur at the site. The species is considered absent.	No	Low	No

Species name	Common name	Credit Class	EPBC Act status	BC Act status	Geographic constraints	Associated with PCT on site	Veg cover required	Patch size required	Requires further assessment	Habitat constraints	Suitable habitat	Habitat assessment	BioNet records within 3km of site	Likelihood of occurrence	Candidate species
											nests, Ringtail Possum (Pseudocheirus peregrinus) dreys or thickets of vegetation, (e.g. grass-tree skirts); nest-building appears to be restricted to breeding females; tree hollows are favoured but spherical nests have been found under the bark of eucalypts and in shredded bark in tree forks. Appear to be mainly solitary, each individual using several nests, with males having non-exclusive home-ranges of about 0.68 hectares and females about 0.35 hectares. Young can be born whenever food sources are available, however most births occur between late spring and early autumn. Agile climbers, but can be caught on the ground in traps, pitfalls or postholes; generally nocturnal. Frequently spends time in torpor especially in winter, with body curled, ears folded and internal temperature close to the surroundings.				
Isoodon obesulus obesulus	Southern Brown	Species	E	E		Yes	Fragmented 11-30%	<5ha	Yes	Requires dense ground cover in a	Southern Brown Bandicoots are largely crepuscular (active mainly	No records exist within the Kamay-Botany	No	Low	No

Species name	Common name	Credit Class	EPBC Act status	BC Act status	Geographic constraints	Associated with PCT on site	Veg cover required	Patch size required	Requires further assessment	Habitat constraints	Suitable habitat	Habitat assessment	BioNet records within 3km of site	Likelihood of occurrence	Candidate species
	Bandicoot (eastern)									variety of habitats.	after dusk and/or before dawn). They are generally only found in heath or open forest with a heathy understorey on sandy or friable soils. They feed on a variety of ground-dwelling invertebrates and the fruit-bodies of hypogeous (underground-fruiting) fungi. Their searches for food often create distinctive conical holes in the soil. Males have a home range of approximately 5-20 hectares whilst females forage over smaller areas of about 2-3 hectares. Nest during the day in a shallow depression in the ground covered by leaf litter, grass or other plant material. Nests may be located under Grass trees Xanthorrhoea spp., blackberry bushes and other shrubs, or in rabbit burrows. The upper surface of the nest may be mixed with earth to waterproof the inside of the nest. Mating occurs any time of the year, usually following heavy rain. Two or three litters of 2-4 young may be produced annually. The	Bay National Park. The species is considered absent.			

Species name	Common name	Credit Class	EPBC Act status	BC Act status	Geographic constraints	Associated with PCT on site	Veg cover required	Patch size required	Requires further assessment	Habitat constraints	Suitable habitat	Habitat assessment	BioNet records within 3km of site	Likelihood of occurrence	Candidate species
											gestation period of 11-12 days is the shortest known of any marsupial while young remarkably become independent around 60 days after being born.				
Chalinolobus dwyeri	Large -eared Pied Bat	Species	V	V		Yes	Fragmented 11-30%	<5ha	Yes	Within two kilometres of rocky areas containing caves, overhangs, escarpments, outcrops, or crevices, or within two kilometres of old mines or tunnels.	Roosts in caves (near their entrances), crevices in cliffs, old mine workings and in the disused, bottle-shaped mud nests of the Fairy Martin (Petrochelidon ariel), frequenting low to mid-elevation dry open forest and woodland close to these features. Females have been recorded raising young in maternity roosts (c. 20-40 females) from November through to January in roof domes in sandstone caves and overhangs. They remain loyal to the same cave over many years. Found in well-timbered areas containing gullies. The relatively short, broad wing combined with the low weight per unit area of wing indicates manoeuvrable flight. This species probably forages for small, flying insects below the forest canopy. Likely to hibernate through	Potential for caves to occur within 2km of site. Suitable foraging habitat present. Species targeted but not recorded.	No	Low	Yes

Species name	Common name	Credit Class	EPBC Act status	BC Act status	Geographic constraints	Associated with PCT on site	Veg cover required	Patch size required	Requires further assessment	Habitat constraints	Suitable habitat	Habitat assessment	BioNet records within 3km of site	Likelihood of occurrence	Candidate species
											the coolest months. It is uncertain whether mating occurs early in winter or in spring.				
Chamaesyce psammogeton	Sand Spurge	Species		E		Yes			Yes	None listed	Grows on fore-dunes, pebbly strandlines and exposed headlands, often with Spinifex (Spinifex sericeus) and Prickly Couch (Zoysia macrantha) Flowering recorded in spring and summer. Sand Spurge seeds float, so some dispersal between beaches may occur. Longevity of the species is approximately 5 – 30 years with a primary juvenile period of less than 1 year. Plant growth occurs in spring and summer.	Potential habitat present along foreshore..	No	Moderate	Yes
Crinia tinnula	Wallum Froglet	Species		V		Yes	Relictual <10%	<5ha	Yes	None listed	Wallum Froglets are found in a wide range of habitats, usually associated with acidic swamps on coastal sand plains. They typically occur in sedgelands and wet heathlands. They can also be found along drainage lines within other vegetation communities and disturbed areas, and occasionally in swamp sclerophyll forests. The species breeds in swamps with permanent	No suitable habitat within the site. Species targeted but not recorded. Species considered absent	Yes	Moderate	Yes

Species name	Common name	Credit Class	EPBC Act status	BC Act status	Geographic constraints	Associated with PCT on site	Veg cover required	Patch size required	Requires further assessment	Habitat constraints	Suitable habitat	Habitat assessment	BioNet records within 3km of site	Likelihood of occurrence	Candidate species
											water as well as shallow ephemeral pools and drainage ditches. Breeding is thought to peak in the colder months, but can occur throughout the year following rain. Eggs of 1.1-1.2mm are deposited in water with a pH of <6 and tadpoles take 2-6 months to develop into frogs. Wallum Froglets shelter under leaf litter, vegetation, other debris or in burrows of other species. Shelter sites are wet or very damp and often located near the water's edge. Males may call throughout the year and at any time of day, peaking following rain.				
Grammitis stenophylla	Narrow-leaf Finger Fern	Species		E		Yes			Yes	None listed	Moist places, usually near streams, on rocks or in trees, in rainforest and moist eucalypt forest.	Suitable habitat does not occur on site. Species considered absent.	No	Low	No
Hoplocephalus bitorquatus	Pale-headed Snake	Species		V		Yes	Fragmented 11-30%	<5ha	Yes	None listed	The Pale-headed Snake is a highly cryptic species that can spend weeks at a time hidden in tree hollows. Found mainly in dry eucalypt forests and woodlands, cypress forest and occasionally in rainforest or moist eucalypt forest.	Suitable habitat does not occur on site. Species considered absent.	No	Low	No

Species name	Common name	Credit Class	EPBC Act status	BC Act status	Geographic constraints	Associated with PCT on site	Veg cover required	Patch size required	Requires further assessment	Habitat constraints	Suitable habitat	Habitat assessment	BioNet records within 3km of site	Likelihood of occurrence	Candidate species
											In drier environments, it appears to favour habitats close to riparian areas. Shelter during the day between loose bark and tree-trunks, or in hollow trunks and limbs of dead trees. The main prey is tree frogs although lizards and small mammals are also taken. The Pale-headed Snake is relatively unusual amongst elapid snakes in that it is well adapted to climbing trees.				
Leptospermum deanei	Leptospermum deanei	Species	V	V		Yes			Yes	Waterbodies or within 100m of freshwater or estuarine streams	Woodland on lower hill slopes or near creeks. Sandy alluvial soil or sand over sandstone. Occurs in Riparian Scrub - e.g. Tristaniopsis laurina, Baechea myrtifolia; Woodland - e.g. Eucalyptus haemstoma; and Open Forest - e.g. Angophora costata, Leptospermum trinervium, Banksia ericifolia. Flowers October-November. Probably killed by fire.	Not known in the Sutherland Shire or Randwick LGA (DPIE, 2020b). Suitable habitat does not occur at the site. Species considered absent.	No	Low	No
Litoria aurea	Green and Golden Bell Frog	Species	V	E		Yes	Relictual <10%	<5ha	Yes	Within 1km of semi-permanent/ ephemeral	Inhabits marshes, dams and stream-sides, particularly those containing bullrushes (Typha spp.) or spikerushes	Species targeted but not recorded. Species	Yes	Moderate	Yes

Species name	Common name	Credit Class	EPBC Act status	BC Act status	Geographic constraints	Associated with PCT on site	Veg cover required	Patch size required	Requires further assessment	Habitat constraints	Suitable habitat	Habitat assessment	BioNet records within 3km of site	Likelihood of occurrence	Candidate species
										wet areas, swamps or waterbodies	(Eleocharis spp.). Optimum habitat includes water-bodies that are unshaded, free of predatory fish such as Plague Minnow (Gambusia holbrooki), have a grassy area nearby and diurnal sheltering sites available. Some sites, particularly in the Greater Sydney region occur in highly disturbed areas. The species is active by day and usually breeds in summer when conditions are warm and wet. Males call while floating in water and females produce a raft of eggs that initially float before settling to the bottom, often amongst vegetation. Tadpoles feed on algae and other plant-matter; adults eat mainly insects, but also other frogs. Preyed upon by various wading birds and snakes.	considered absent			
Litoria brevipalmata	Green-thighed Frog	Species		V		Yes	Relictual <10%	<5ha	Yes	None listed	Green-thighed Frogs occur in a range of habitats from rainforest and moist eucalypt forest to dry eucalypt forest and heath, typically in areas where surface water gathers after rain. It prefers wetter	Suitable habitat does not occur on site. Species considered absent.	No	Low	No

Species name	Common name	Credit Class	EPBC Act status	BC Act status	Geographic constraints	Associated with PCT on site	Veg cover required	Patch size required	Requires further assessment	Habitat constraints	Suitable habitat	Habitat assessment	BioNet records within 3km of site	Likelihood of occurrence	Candidate species
											forests in the south of its range, but extends into drier forests in northern NSW and southern Queensland. Breeding occurs following heavy rainfall from spring to autumn, with larger temporary pools and flooded areas preferred. Frogs may aggregate around breeding sites and eggs are laid in loose clumps among waterplants, including water weeds. The larvae are free swimming. The frogs are thought to forage in leaf-litter.				
Melaleuca biconvexa	Biconvex Paperbark	Species	V	V		Yes			Yes	None listed	Biconvex Paperbark generally grows in damp places, often near streams or low-lying areas on alluvial soils of low slopes or sheltered aspects. Flowering occurs over just 3-4 weeks in September and October. Resprouts following fire.	Suitable habitat does not occur on site. Species considered absent.	No	Low	No
Myotis macropus	Southern Myotis	Species		V		Yes	Relictual <10%	<5ha	Yes	Hollow bearing trees within 200 m of riparian zone; Bridges, caves or artificial	Generally roost in groups of 10 - 15 close to water in caves, mine shafts, hollow-bearing trees, storm water channels, buildings, under bridges and in dense foliage. Forage over streams and	Species targeted but not recorded. Suitable habitat present within the site	Yes	High	Yes

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										structures within 200 m of riparian zone; Rivers, creeks, billabongs, lagoons, dams and other waterbodies on or within 200m of the site.	pools catching insects and small fish by raking their feet across the water surface. In NSW females have one young each year usually in November or December.				
Petaurus norfolcensis	Squirrel Glider	Species		V		Yes	Relictual <10%	<5ha	Yes	Relies on large old trees with hollows for breeding and nesting. These trees are also critical for movement and typically need to be closely-connected (i.e. no more than 50 m apart).	Inhabits mature or old growth Box, Box-Ironbark woodlands and River Red Gum forest west of the Great Dividing Range and Blackbutt-Bloodwood forest with heath understorey in coastal areas. Prefers mixed species stands with a shrub or Acacia midstorey. Live in family groups of a single adult male one or more adult females and offspring. Require abundant tree hollows for refuge and nest sites. Diet varies seasonally and consists of Acacia gum, eucalypt sap, nectar, honeydew and manna, with	Suitable habitat does not occur on site. Species considered absent.	No	Low	No

Species name	Common name	Credit Class	EPBC Act status	BC Act status	Geographic constraints	Associated with PCT on site	Veg cover required	Patch size required	Requires further assessment	Habitat constraints	Suitable habitat	Habitat assessment	BioNet records within 3km of site	Likelihood of occurrence	Candidate species
											invertebrates and pollen providing protein.				
Pseudophryne australis	Red-crowned Toadlet	Species		V		Yes	Fragmented 11-30%	<5ha	Yes	None listed	Occurs in open forests, mostly on Hawkesbury and Narrabeen Sandstones. Inhabits periodically wet drainage lines below sandstone ridges that often have shale lenses or cappings. Shelters under rocks and amongst masses of dense vegetation or thick piles of leaf litter. Breeding congregations occur in dense vegetation and debris beside ephemeral creeks and gutters. Red-crowned Toadlets have not been recorded breeding in waters that are even mildly polluted or with a pH outside the range 5.5 to 6.5. Eggs are laid in moist leaf litter, from where they are washed by heavy rain; a large proportion of the development of the tadpoles takes place in the egg. Disperses outside the breeding period, when they are found under rocks and logs on sandstone ridges and forage amongst leaf-litter.	Suitable habitat does not occur at the site. Species considered absent	No	Low	No

Species name	Common name	Credit Class	EPBC Act status	BC Act status	Geographic constraints	Associated with PCT on site	Veg cover required	Patch size required	Requires further assessment	Habitat constraints	Suitable habitat	Habitat assessment	BioNet records within 3km of site	Likelihood of occurrence	Candidate species
											Red-crowned Toadlets are quite a localised species that appear to be largely restricted to the immediate vicinity of suitable breeding habitat. Red-crowned Toadlets are usually found as small colonies scattered along ridges coinciding with the positions of suitable refuges near breeding sites. Due to this tendency for discrete populations to concentrate at particular sites, a relatively small localised disturbance may have a significant impact on a local population if it occurs on a favoured breeding or refuge site.				
Senecio spathulatus	Coast Groundsel	Species		E		Yes			Yes	Headlands within 500 m of the coast	Frontal dunes	Habitat degraded and marginal for species	Yes	Low	No
Syzygium paniculatum	Magenta Lilly Pilly	Species	V	E	Found only in NSW, in a narrow, linear coastal strip from Upper Lansdowne to Conjola State Forest.	Yes			Yes	None listed	On the south coast the Magenta Lilly Pilly occurs on grey soils over sandstone, restricted mainly to remnant stands of littoral (coastal) rainforest. On the central coast Magenta Lilly Pilly occurs on gravels, sands, silts and clays in riverside gallery rainforests and remnant	Species recorded. Poor quality habitat within PCT 661 and PCT 1832.	Yes	High	Yes

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											littoral rainforest communities.				
Vespadelus troughtoni	Eastern Cave Bat	Species		V		Yes	Fragmented 11-30%	5-24ha	Yes	Within two kilometres of rocky areas containing caves, overhangs, escarpments, outcrops, crevices or boulder piles, or within two kilometres of old mines, tunnels, old buildings or sheds."	Very little is known about the biology of this uncommon species. A cave-roosting species that is usually found in dry open forest and woodland, near cliffs or rocky overhangs; has been recorded roosting in disused mine workings, occasionally in colonies of up to 500 individuals. Occasionally found along cliff-lines in wet eucalypt forest and rainforest. Little is understood of its feeding or breeding requirements or behaviour.	Potential for caves to occur within 2km of site. Suitable foraging habitat present. Species targeted but not recorded.	No	Moderate	Yes
Thelymitra atronitida	Black-hooded Sun Orchid	Species		CE		Yes			Yes	None listed	At Cape Solander this species is recorded from shallow black peaty soil in coastal heath on sandstone. It is possible that the two coastal populations of Cape Solander and north-eastern Victoria may be distinct from the ecologically different Bago population. In the Bago area it is recorded as occurring in open forest with a heathy understorey on well-drained sand or clay-loam soils.	Known population within Kamay Botany Bay National Park. No suitable habitat within the development footprint	Yes	Low	No

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Phascolarctos cinereus - endangered population	Koala in the Pittwater Local Government Area	Species		E	Within the Pittwater Local Government Area	No	Fragmented 11-30%	25-100ha	No	None listed	Inhabits eucalypt forests and woodlands. Habitat suitability is influenced by the: size and species of trees present, soil nutrients, climate, rainfall and the size and disturbance history of the habitat patches. The Grey Gum (Eucalyptus punctata) is the most important food tree for this species in Pittwater. Other favoured food trees are the Scribbly Gum (E. haemastoma), Swamp Mahogany (E. robusta) and Snappy Gum (E. racemosa). Generally koalas can be expected to feed to a limited extent on all species of Eucalyptus, Corymbia and Angophora that they encounter in Pittwater. Key likely habitats within Pittwater Council are: Swamp Mahogany Forest, ecotone between Spotted Gum Forest & Hawkesbury Sandstone Open-Forest, Northern form of Coastal Sandstone Woodland at Whale Beach, Red Bloodwood - Scribbly Gum Woodland, Bilgola Plateau Forest and the Grey Ironbark - Grey Gum form	Site is not located within the Pittwater LGA.	No	Low	No

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											of the Newport Bangalay Woodland.				
Eudyptula minor - endangered population	Little Penguin in the Manly Point Area	Species		E	On and near the shoreline from Cannae Point generally northward to the point near the intersection of Stuart Street and Oyama Cove Avenue, and extending 100 metres offshore from that shoreline	Yes	Relictual <10%	<5ha	No	None listed	Only known breeding population on the mainland in NSW. A range of nest sites are utilised by the penguins at Manly including under rocks on the foreshore, under seaside houses and structures, such as stairs, in wood piles and under overhanging vegetation including lantana and under coral tree roots.	Site located more than 18km south of known population. Species considered absent	Yes	Low	No
Perameles nasuta - endangered population	Long-nosed Bandicoot, North Head	Species		E	Restricted to North Head in the Manly Local Government Area.	Yes	Relictual <10%	<5ha	No	None listed	Essentially a solitary animal that occupies a variety of habitats on North Head. Forages mainly at or after dusk, digging for invertebrates, fungi and tubers. The conical holes it leaves in the soil are often seen at the interface of naturally vegetated and areas of open grass around the Quarantine Station,	Site located several km to the south of known population. Species considered absent	No	Low	No

Species name	Common name	Credit Class	EPBC Act status	BC Act status	Geographic constraints	Associated with PCT on site	Veg cover required	Patch size required	Requires further assessment	Habitat constraints	Suitable habitat	Habitat assessment	BioNet records within 3km of site	Likelihood of occurrence	Candidate species
											former Defence Lands and Saint Patrick's Estate. Shelters during the day in a well-concealed nest based on a shallow hole lined with leaves and grass, sometimes under debris, sometimes hidden with soil and with the entrance closed for greater concealment.				
Petaurus norfolcensis - endangered population	Squirrel Glider on Barrenjoey Peninsula, north of Bushrangers Hill	Species		E	Within the Pittwater Local Government Area on the Barrenjoey Peninsula, north of Bushrangers Hill.	Yes	Fragmented 11-30%	25-100ha	No	None listed	NSW: occurs on the coast in a range of habitats including low scrubby eucalypt woodlands and banksia thickets to tall, wet eucalypt forests bordering on rainforest . The availability of a year-round supply of carbohydrates (nectar, sap, gum, and honeydew) appears to be an important habitat feature. In NSW, this corresponds to a high diversity of tree and shrub species, including a high nectar producing species and one or more winter flowering species. In Pittwater, important food sources are likely to be the winter flowering Coast Banksia (Banksia integrifolia) and Spotted Gum (Corymbia maculata) and the summer flowering	Site located approximately 36km south of known population. Species considered absent	No	Low	No

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											Old Man Banksia (B. serrata) and Grey Ironbark (Eucalyptus paniculata). Other likely food sources include Angophora costata, Banksia spinulosa, Corymbia gummifera, Eucalyptus botryoides, E. punctata, E. robusta, Melaleuca quinquernervia, mistletoes and Xanthorrhoea species. This animal will gouge and lick incisions on the trunks and main branches of Eucalyptus, Corymbia and Angophora trees to feed on sap and on Acacia trees and shrubs to feed on gum, especially when nectar is in short supply. Tree hollows are an important habitat feature providing den sites for raising young. Hollows can be found in trees of the following genera Eucalyptus, Corymbia and Angophora. Other species such as Melaleuca quinquenervia can also provide suitable hollows. A family group consists of 2-9 individuals, one male and at least two adult females and their dependent offspring, which shelter by day and breed in				

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											leaf lined nests in tree hollows. Litter size is one to two and the young remain in the pouch for about 70 days, after which they stay in the nest for another 30 days, and are weaned at four months. Births may occur throughout the year, usually with peak in winter. Most females exhibit the capacity to raise two litters per year. Young gliders disperse at a mean age of 12.5 months.				
Rhodamnia rubescens	Scrub Turpentine	Species				Yes			Yes	None listed	Found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest usually on volcanic and sedimentary soils. This species is characterised as highly to extremely susceptible to infection by Myrtle Rust. Myrtle Rust affects all plant parts.	Species not recorded in the area. Habitat within site unsuitable due to degradation.	No	Low	No
Rhodomyrtus psidioides	Native Guava	Species		CE		Yes			Yes	None listed	Pioneer species found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest often near creeks and drainage lines. This species is characterised being	Species not recorded in the area. Habitat within site unsuitable due to degradation.	No	Low	No

Species name	Common name	Credit Class	EPBC Act status	BC Act status	Geographic constraints	Associated with PCT on site	Veg cover required	Patch size required	Requires further assessment	Habitat constraints	Suitable habitat	Habitat assessment	BioNet records within 3km of site	Likelihood of occurrence	Candidate species
											extremely susceptible to infection by Myrtle Rust. Myrtle Rust affects all plant parts.				
Cryptostylis hunteriana	Leafless Tongue Orchid	Species	V	V		No			No	None listed	Does not appear to have well defined habitat preferences and is known from a range of communities, including swamp-heath and woodland. The larger populations typically occur in woodland dominated by Scribbly Gum (Eucalyptus sclerophylla), Silvertop Ash (E. sieberi), Red Bloodwood (Corymbia gummifera) and Black Sheoak (Allocasuarina littoralis); appears to prefer open areas in the understorey of this community and is often found in association with the Large Tongue Orchid (C. subulata) and the Tartan Tongue Orchid (C. erecta). Little is known about the ecology of the species; being leafless it is expected to have limited photosynthetic capability and probably depends upon a fungal associate to meet its nutritional requirements	Potential habitat is present in the eastern part of PCT 1778, around Plot 12. The Tartan Tongue Orchid (Cryptostylis erecta) was recorded here. Investigations during January, November and/or December may be required to confirm presence/ absence. Species presence assumed.	No	Moderate	Yes

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											from either living or dead organic material. In addition to reproducing from seed, it is also capable of vegetative reproduction and thus forms colonies which can become more or less permanent at a site. On the Central Coast of NSW, populations have been recorded in woodland dominated by Scribbly Gum (Eucalyptus haemastoma), Brown Stringybark (Eucalyptus capitellata), Red Bloodwood (Corymbia gummifera) and also associated with Large Tongue Orchid (C. subulata) and the Tartan Tongue Orchid (C. erecta).				
Calidris canutus	Red Knot	Species	E			Yes	Relictual <10%	<5ha	Yes	Breeding: none listed Foraging: as per mapped areas	Inhabits intertidal mudflats, sandflats and sandy beaches of sheltered coasts, estuaries, bays, inlets, lagoons and harbours.	Beach habitat is marginal- only 0-1m wide and subject to high volume of foot traffic.	Yes	Transient	No
Calidris ferruginea	Curlew Sandpiper	Species/ Ecosystem	CE	E		No	Relictual <10%	<5ha	No	Breeding: none listed Foraging: as per mapped areas	Non-breeding habitat only- It generally occupies littoral and estuarine habitats, and in New South Wales is mainly found in intertidal mudflats of sheltered coasts. Migrates to Australia (as well as	Beach habitat is marginal- only 0-1m wide and subject to high volume of foot traffic. No other suitable habitats	Yes	Transient	No

Species name	Common name	Credit Class	EPBC Act status	BC Act status	Geographic constraints	Associated with PCT on site	Veg cover required	Patch size required	Requires further assessment	Habitat constraints	Suitable habitat	Habitat assessment	BioNet records within 3km of site	Likelihood of occurrence	Candidate species
											Africa and Asia) for the non-breeding period, arriving in Australia between August and November, and departing between March and mid-April.	within the study area.			
Calidris tenuirostris	Great Knot	Species/ Ecosystem	CE	V		No	Relictual <10%	<5ha	No	Breeding: none listed Foraging: as per mapped areas	Non-breeding habitat only- Occurs within sheltered, coastal habitats containing large, intertidal mudflats or sandflats, including inlets, bays, harbours, estuaries and lagoons. Often recorded on sandy beaches with mudflats nearby, sandy spits and islets and sometimes on exposed reefs or rock platforms.	Beach habitat is marginal- only 0-1m wide and subject to high volume of foot traffic. No other suitable habitats within the study area.	Yes	Transient	No
Charadrius leschenaultii	Greater Sand Plover	Species/ Ecosystem	V	V		No	Relictual <10%	<5ha		Breeding: none listed Foraging: as per mapped areas	Non-breeding habitat only- Almost entirely restricted to coastal areas in NSW, occurring mainly on sheltered sandy, shelly or muddy beaches or estuaries with large intertidal mudflats or sandbanks.	Beach habitat is marginal- only 0-1m wide and subject to high volume of foot traffic.	No	Low	No
Charadrius mongolus	Lesser Sand Plover	Species/ Ecosystem	E	V		No	Relictual <10%	<5ha	No	Breeding: none listed Foraging: as per mapped areas	Non-breeding habitat only- Almost entirely coastal in NSW, favouring the beaches of sheltered bays, harbours and estuaries with large intertidal sandflats or mudflats; occasionally occurs on sandy beaches,	Beach habitat is marginal- only 0-1m wide and subject to high volume of foot traffic.	Yes	Transient	No

Species name	Common name	Credit Class	EPBC Act status	BC Act status	Geographic constraints	Associated with PCT on site	Veg cover required	Patch size required	Requires further assessment	Habitat constraints	Suitable habitat	Habitat assessment	BioNet records within 3km of site	Likelihood of occurrence	Candidate species
											coral reefs and rock platforms.				
Dasyornis brachypterus	Eastern Bristlebird	Species	E	E		Yes	Intact >70% natural habitat retained	5-24ha	No	None listed	Habitat for central and southern populations is characterised by dense, low vegetation including heath and open woodland with a heathy understorey. In northern NSW the habitat occurs in open forest with dense tussocky grass understorey and sparse mid-storey near rainforest ecotone; all of these vegetation types are fire prone.	No suitable habitat within the development footprint	No	Low	No
Grantiella picta	Painted Honeyeater	Ecosystem	V			No	Fragmented 11-30%	<5ha	No	Mistletoes present at a density of greater than five mistletoes per hectare	Inhabits Boree/ Weeping Myall (*Acacia pendula)*, Brigalow (*A. harpophylla*) and Box-Gum Woodlands and Box-Ironbark Forests. A specialist feeder on the fruits of mistletoes growing on woodland eucalypts and acacias. Prefers mistletoes of the genus Amyema.	No suitable habitat within the development footprint	No	Low	No
Hirundapus caudacutus	White-throated Needletail	Species	V			No listed PCT associations			Yes	None listed	Almost exclusively aerial species that feeds on insects. May forage over wooded areas, including open forest and rainforest. Commonly recorded flying above woodland and heathland and occur within grassland, swamps, cleared pasture and plantations.	Study area within core non-breeding range. Marginal foraging habitat.	Yes	Transient	No

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Limosa lapponica	Bar-tailed Godwit	Species/ Ecosystem	V			Yes	Relictual <10%	<5ha	Yes	Breeding: none listed Foraging: as per mapped areas	Non-breeding habitat only- Found mainly in coastal habitats such as large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays. It is often found around beds of seagrass and sometime in nearby saltmarsh.	Beach habitat is marginal- only 0-1m wide and subject to high volume of foot traffic. No other suitable habitats within the study area.	Yes	Transient	No
Limosa lapponica menzbieri	Northern Siberian Bar-tailed Godwit	Species	CE			No listed PCT associations				None listed	Non-breeding habitat only- Winters mainly in coastal habitats such as large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays.	Beach habitat is marginal- only 0-1m wide and subject to high volume of foot traffic. No other suitable habitats within the development footprint.	No	Low	No
Neophema chrysogaster	Orange-bellied Parrot	Species	CE	E		Yes	Variegated (31-70% habitat retained	<5ha	No	None listed	Non-breeding habitat only- Winters on the southeast coast of Australia within a variety of habitats including salt marshes, coastal dunes, pastures, shrub lands, estuaries, islands, beaches and moorlands generally within 10km of the coast. Feeds exclusively on seeds and fruits from sedges and salt-tolerant coastal salt marsh plants.	Known vagrant in NSW. No suitable habitat within the development footprint. Site subject to habitat degradation and lacks sufficient foraging resources.	No	Low	No

Species name	Common name	Credit Class	EPBC Act status	BC Act status	Geographic constraints	Associated with PCT on site	Veg cover required	Patch size required	Requires further assessment	Habitat constraints	Suitable habitat	Habitat assessment	BioNet records within 3km of site	Likelihood of occurrence	Candidate species
Numenius madagascariensis	Eastern Curlew	Species/ Ecosystem	CE			Yes	Relictual <10%	<5ha	Yes	Breeding: none listed Foraging: as per mapped areas	The Eastern Curlew is found on intertidal mudflats and sandflats, often with beds of seagrass, on sheltered coasts, especially estuaries, mangrove swamps, bays, harbours and lagoons.	No suitable habitat within the development footprint	No	Low	No
Pachyptila turtur subantarctica	Fairy Prion (southern)	NA	V								The fairy prion (southern) breeds on Macquarie Island and a number of other subantarctic islands outside of Australia. Species may feed/ forage along the Southern Australian waters	No suitable habitat within the development footprint	No	Low	No
Sternula nereis nereis	Australian Fairy Tern	Species	V			No	Variegated (31-70% habitat retained	>100ha	No	None listed	Nests on sheltered sandy beaches, spits and banks above the high tide line and below vegetation. The subspecies has been found in embayments of a variety of habitats including offshore, estuarine or lacustrine (lake) islands, wetlands and mainland coastline	Beach habitat is marginal- only 0-1m wide and subject to high volume of foot traffic. No other suitable habitats within the study area.	No	Low	No
Thinornis rubricollis	Hooded Plover	Species/ Ecosystem	V	E		Yes	Relictual <10%	<5ha	Yes	Breeding: none listed Foraging: as per mapped areas	Hooded Plovers prefer sandy ocean beaches, especially those that are broad and flat, with a wide wave-wash zone for feeding, much beachcast seaweed, and backed by sparsely vegetated sand-dunes for shelter and nesting. Occasionally	Beach habitat is marginal- only 0-1m wide and subject to high volume of foot traffic. No other suitable habitats within the study area.	No	Low	No

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											Hooded Plovers are found on tidal bays and estuaries, rock platforms and rocky or sand-covered reefs near sandy beaches, and small beaches in lines of cliffs. They regularly use near-coastal saline and freshwater lakes and lagoons, often with saltmarsh.				
Heleioporus australiacus	Giant Burrowing Frog	Species	V	V		Yes	Variegated (31-70% habitat retained	5-24ha	No	None listed	Found in heath, woodland and open dry sclerophyll forest on a variety of soils except clays and within proximity to breeding sites. Shelters under soil surface and leaf litter. Eggs are laid in burrows or under vegetation in small pools and are washed into larger pools in ponds or ponded areas of the creekline after rains. Species is dependent on hanging swamps on the top of sandstone plateaus and deeply dissected gullies that occur as erosion features in the Sydney Basin.	No suitable habitat within the study area.	No	Low	No
Petauroides volans	Greater Glider	NA	V			No listed PCT associations	Variegated (31-70% habitat retained	5-24ha	No	Hollow bearing trees	Favours forests with a diversity of eucalypt species, due to seasonal variation in its preferred tree species.	Large number of tree hollows but habitats generally unsuitable due to dominance of coastal swamps	No	Low	No

Species name	Common name	Credit Class	EPBC Act status	BC Act status	Geographic constraints	Associated with PCT on site	Veg cover required	Patch size required	Requires further assessment	Habitat constraints	Suitable habitat	Habitat assessment	BioNet records within 3km of site	Likelihood of occurrence	Candidate species
												and rainforest communities.			
Hoplocephalus bungaroides	Broad-headed Snake	Species/ Ecosystem	V	E		Yes	Variegated (31-70% habitat retained	5-24ha	No	Breeding: Rocky areas including escapments, outcrops and pogodas within the Sydney Sandstone geologies Foraging: None listed	Shelters in rock crevices and under flat sandstone rocks on exposed cliff edges during autumn, winter and spring. Moves from the sandstone rocks to shelters in cervices or hollows in large trees within 500m of escarpments in summer.	Marginal habitat at La Perouse associated with sandstone cliffs and rock outcropping with small overhangs and crevices present.	No	Low	No
Cuculus optatus	Oriental Cuckoo	NA	M								Non-breeding habitat only: monsoonal rainforest, vine thickets, wet sclerophyll forest or open Casuarina, Acacia or Eucalyptus woodlands. Frequently at edges or ecotones between habitat types. Riparian forest is favoured habitat in the Kimberley region.	Study area within core non-breeding range of the species. Suitable habitats within site.	No	Transient	No
Monarcha melanopsis	Black-faced Monarch	NA	M								Wet forest specialist, found mainly in rainforest and wet sclerophyll forest, especially in sheltered gullies and slopes with a dense understorey of ferns and/or shrubs.	Some marginal habitat within the study area at Kurnell- although generally modified and disturbed and lacks dense understorey required for shelter.	Yes	Transient	No

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Symposiachrus trivirgatus	Spectacled Monarch	NA	M								Dense vegetation, mainly in rainforest but also in moist forest or wet sclerophyll and occasionally in other dense vegetation such as mangroves, drier forest and woodlands.	No suitable habitat within the study area	No	Low	No
Motacilla flava	Yellow Wagtail	NA	M								Non-breeding habitat only: mostly well watered open grasslands and the fringes of wetlands. Roosts in mangroves and other dense vegetation.	No suitable habitat within the study area	No	Low	No
Myiagra cyanoleuca	Satin Flycatcher	NA	M								Eucalypt forest and woodlands, at high elevations when breeding. They are particularly common in tall wet sclerophyll forest, often in gullies or along water courses. In woodlands they prefer open, grassy woodland types. During migration, habitat preferences expand, with the species recorded in most wooded habitats except rainforests. Wintering birds in northern Qld will use rainforest - gallery forests interfaces, and birds have been recorded wintering in mangroves and paperbark swamps.	No suitable habitat within the study area	No	Low	No

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Rhipidura rufifrons	Rufous Fantail	NA	M								Moist, dense habitats, including mangroves, rainforest, riparian forests and thickets, and wet eucalypt forests with a dense understorey. When on passage a wider range of habitats are used including dry eucalypt forests and woodlands and Brigalow shrublands.	Study area within core range. Marginal habitat within the study area due to lack of dense understorey. Marginal habitats do not meet area thresholds for important habitat (i.e.750ha)	No	Low	No
Actitis hypoleucos	Common Sandpiper	NA	M								Non-breeding habitat only- 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.	No suitable habitat within the study area.	Yes	Low	No
Arenaria interpres	Ruddy Turnstone	NA	M								Non-breeding habitat only: coastal regions with exposed rock coast lines or coral reefs. It also lives near platforms and shelves, often with shallow tidal pools and rocky, shingle or gravel beaches. It can, however, be found on sand, coral or shell beaches, shoals, cays and dry ridges of sand or coral.	Some rocky coastline at La Perouse. Beach habitat is marginal- only 0-1m wide and subject to high volume of foot traffic.	Yes	Transient	No

Species name	Common name	Credit Class	EPBC Act status	BC Act status	Geographic constraints	Associated with PCT on site	Veg cover required	Patch size required	Requires further assessment	Habitat constraints	Suitable habitat	Habitat assessment	BioNet records within 3km of site	Likelihood of occurrence	Candidate species
Calidris acuminata	Sharp-tailed Sandpiper	NA	M								Prefers muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation. This includes lagoons, swamps, lakes and pools near the coast, and dams, waterholes, soaks, bore drains and bore swamps, saltpans and hypersaline saltlakes inland.	No suitable habitat within the study area.	Yes	Low	No
Calidris alba	Sanderling	Species/ Ecosystem	M			No	Relictual <10%	<5ha	No	Foraging: None listed Breeding: As per mapped areas	Found on open sandy beaches exposed to open sea-swell, and also on exposed sandbars and spits, and shingle banks, where they forage in the wave-wash zone and amongst rotting seaweed. Sanderlings also occur on beaches that may contain wave-washed rocky outcrops.	Beach habitat is marginal- only 0-1m wide and subject to high volume of foot traffic.	Yes	Transient	No
Calidris melanotos	Pectoral Sandpiper	NA	M								Non-breeding habitat only: 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.	No suitable habitat within the study area.	Yes	Low	No

Species name	Common name	Credit Class	EPBC Act status	BC Act status	Geographic constraints	Associated with PCT on site	Veg cover required	Patch size required	Requires further assessment	Habitat constraints	Suitable habitat	Habitat assessment	BioNet records within 3km of site	Likelihood of occurrence	Candidate species
Calidris ruficollis	Red-necked Stint	NA	M								Non-breeding habitat only: coastal areas, including in sheltered inlets, bays, lagoons and estuaries with intertidal mudflats, often near spits, islets and banks and, sometimes, on protected sandy or coralline shores.	Beach habitat is marginal- only 0-1m wide and subject to high volume of foot traffic.	Yes	Transient	No
Calidris subminuta	Long-toed Stint	NA	M								Non-breeding habitat only: Summer visitor to Australia but uncommon to the east. Prefer shallow freshwater or brackish wetlands including lakes, swamps, river floodplains, streams, lagoons and sewage ponds. The species is also fond of areas of muddy shoreline, growths of short grass, weeds, sedges, low or floating aquatic vegetation, reeds, rushes and occasionally stunted samphire.	No suitable habitat within the study area	No	Low	No
Charadrius bicinctus	Double-banded Plover	NA	M								Non-breeding habitat only- Found on littoral, estuarine and fresh or saline terrestrial wetlands and also saltmarsh, grasslands and pasture. It occurs on muddy, sandy, shingled or sometimes rocky beaches, bays and inlets, harbours and margins of fresh or saline terrestrial wetlands	Some rocky coastline at La Perouse. Beach habitat is marginal- only 0-1m wide and subject to high volume of foot traffic.	Yes	Transient	No

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											such as lakes, lagoons and swamps, shallow estuaries and rivers.				
Charadrius veredus	Oriental Plover	NA	M								Non-breeding only: estuarine mudflats and sandbanks, on sandy or rocky ocean beaches or nearby reefs, or in near-coastal grasslands.	Some rocky coastline at La Perouse. Beach habitat is marginal- only 0-1m wide and subject to high volume of foot traffic.	No- one record from 1982	Low	No
Gallinago hardwickii	Latham's Snipe	NA	M								Non-breeding only: inhabit open, freshwater wetlands with low, dense vegetation (e.g. swamps, flooded grasslands or heathlands, around bogs and other water bodies)	No suitable habitat within the study area	Yes	Low	No
Gallinago megala	Swinhoe's Snipe	NA	M								Non-breeding only: Found in dense clumps of grass and rushes round the edges of fresh and brackish wetlands. This includes swamps, billabongs, river pools, small streams and sewage ponds.	No suitable habitat within the study area	No	Low	No
Gallinago stenura	Pin-tailed Snipe	NA	M								Non-breeding only: Found on edges of shallow freshwater swamps, ponds and lakes with emergent, sparse to dense cover of grass/sedge or other vegetation.	No suitable habitat within the study area	No	Low	No

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Limicola falcinellus	Broad-billed Sandpiper	Species/ Ecosystem	M	V		No	Relictual <10%	<5ha	No	Foraging: None listed Breeding: As per mapped areas	Non-breeding habitat only- Favour sheltered parts of the coast such as estuarine sandflats and mudflats, harbours, embayments, lagoons, saltmarshes and reefs as feeding and roosting habitat.	Beach habitat is marginal- only 0-1m wide and subject to high volume of foot traffic. No other suitable habitats within the study area.	No - several records prior to 1985	Low	No
Numenius minutus	Little Curlew	NA	M								Non-breeding only: Found feeding in short, dry grassland and sedgeland, including dry floodplains and blacksoil plains, which have scattered, shallow freshwater pools or areas seasonally inundated. Open woodlands with a grassy or burnt understorey, dry saltmarshes, coastal swamps, mudflats or sandflats of estuaries or beaches on sheltered coasts, mown lawns, gardens, recreational areas, ovals, racecourses and verges of roads and airstrips are also used	Beach habitat is marginal- only 0-1m wide and subject to high volume of foot traffic. No other suitable habitats within the study area.	No	Low	No
Numenius phaeopus	Whimbrel	NA	M								Non-breeding only: 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. It is	Some rocky coastline at La Perouse. Beach habitat is marginal- only 0-1m wide and subject to high	Yes	Transient	No

Species name	Common name	Credit Class	EPBC Act status	BC Act status	Geographic constraints	Associated with PCT on site	Veg cover required	Patch size required	Requires further assessment	Habitat constraints	Suitable habitat	Habitat assessment	BioNet records within 3km of site	Likelihood of occurrence	Candidate species
											occasionally found on sandy or rocky beaches, on coral or rocky islets, or on intertidal reefs and platforms.	volume of foot traffic.			
Pluvialis fulva	Pacific Golden Plover	NA	M								Non-breeding only: 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.	Beach habitat is marginal- only 0-1m wide and subject to high volume of foot traffic. No other suitable habitats within the study area.	Yes	Transient	No
Pluvialis squatarola	Grey Plover	NA	M								Non-breeding only: Inhabit sheltered embayments, estuaries and lagoons with mudflats and sandflats, and occasionally on rocky coasts with wave-cut platforms or reef-flats, or on reefs within muddy lagoons. They also occur around terrestrial wetlands such as near-coastal lakes and swamps, or salt-lakes.	Some rocky coastline at La Perouse. Beach habitat is marginal- only 0-1m wide and subject to high volume of foot traffic.	Yes	Transient	No
Tringa brevipes	Grey-tailed Tattler	NA	M								Often found on sheltered coasts with reefs and rock platforms or with intertidal mudflats. It can also be found at intertidal rocky, coral or stony reefs as well as platforms and islets that are exposed at low tide. It has been found around	Some rocky coastline at La Perouse. Beach habitat is marginal- only 0-1m wide and subject to high volume of foot traffic.	Yes	Transient	No

Species name	Common name	Credit Class	EPBC Act status	BC Act status	Geographic constraints	Associated with PCT on site	Veg cover required	Patch size required	Requires further assessment	Habitat constraints	Suitable habitat	Habitat assessment	BioNet records within 3km of site	Likelihood of occurrence	Candidate species
											shores of rock, shingle, gravel or shells and also on intertidal mudflats in embayments, estuaries and coastal lagoons, especially fringed with mangroves.				
Tringa incana	Wandering Tattler	NA	M								Non-breeding only: Found on rocky coasts with reefs and platforms, points, spits, piers, offshore islands and shingle beaches or beds. It is occasionally seen on coral reefs or beaches, and tends to avoid mudflats.	Some rocky coastline at La Perouse. Beach habitat is marginal- only 0-1m wide and subject to high volume of foot traffic.	No	Low	No
Tringa nebularia	Common Greenshank	NA	M								Non-breeding only: Habitats include embayments, harbours, river estuaries, deltas and lagoons and are recorded less often in round tidal pools, rock-flats and rock platforms. The species uses both permanent and ephemeral terrestrial wetlands, including swamps, lakes, dams, rivers, creeks, billabongs, waterholes and inundated floodplains, claypans and saltflats.	Some rocky coastline at La Perouse. Beach habitat is marginal- only 0-1m wide and subject to high volume of foot traffic.	No	Low	No

Appendix C

EPBC Act PMST Search Results

Australian Government
Department of the Environment and Energy

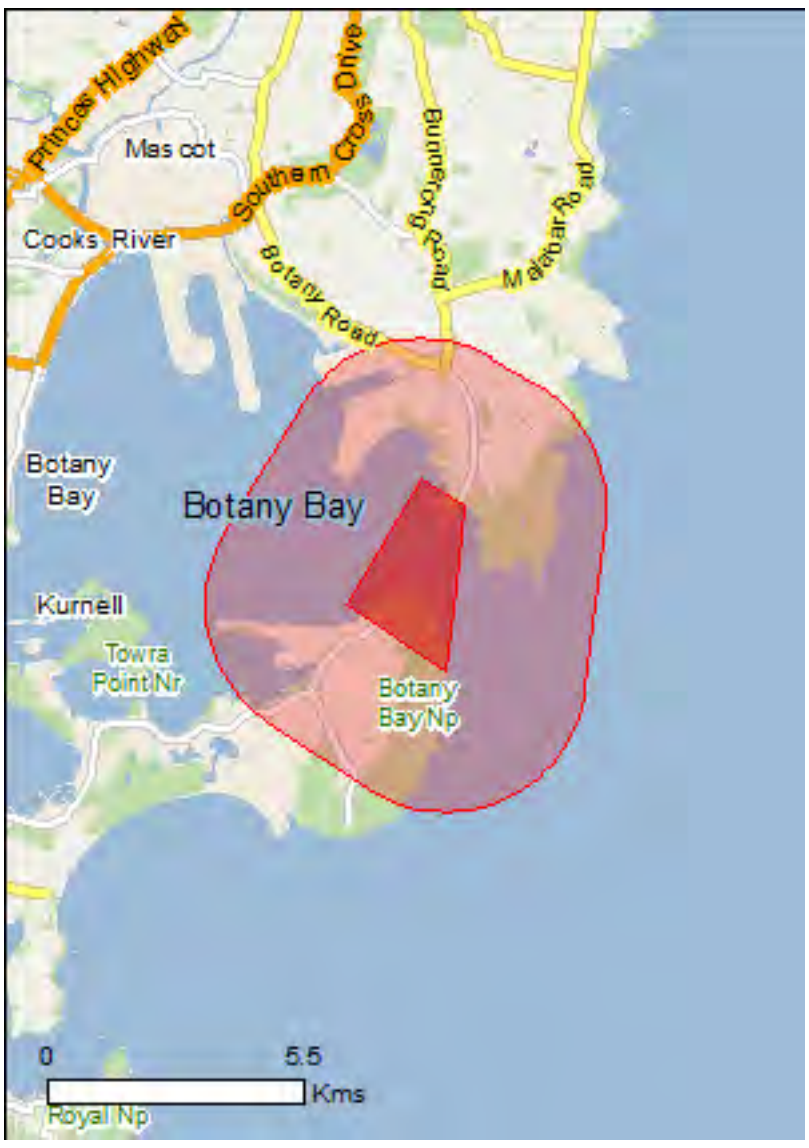
EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

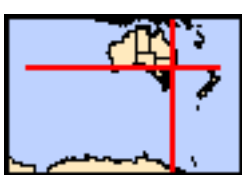
Report created: 03/06/20 12:59:23



This map may contain data which are ©Commonwealth of Australia (Geoscience Australia), ©PSMA 2010

Coordinates

Buffer: 3.0Km



Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	2
Wetlands of International Importance:	1
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	5
Listed Threatened Species:	75
Listed Migratory Species:	80

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	8
Commonwealth Heritage Places:	1
Listed Marine Species:	103
Whales and Other Cetaceans:	16
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	2
Regional Forest Agreements:	None
Invasive Species:	49
Nationally Important Wetlands:	1
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

National Heritage Properties		[Resource Information]
Name	State	Status
Historic		
Kamay Botany Bay: botanical collection sites	NSW	Listed place
Kurnell Peninsula Headland	NSW	Listed place

Wetlands of International Importance (Ramsar)	[Resource Information]
Name	Proximity
Towra point nature reserve	Within Ramsar site

Listed Threatened Ecological Communities		[Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Name	Status	Type of Presence
Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community	Endangered	Community likely to occur within area
Coastal Upland Swamps in the Sydney Basin Bioregion	Endangered	Community likely to occur within area
Eastern Suburbs Banksia Scrub of the Sydney Region	Endangered	Community known to occur within area
Posidonia australis seagrass meadows of the Manning-Hawkesbury ecoregion	Endangered	Community likely to occur within area
Subtropical and Temperate Coastal Saltmarsh	Vulnerable	Community likely to occur within area

Listed Threatened Species		[Resource Information]
Name	Status	Type of Presence
Birds		
Anthochaera phrygia Regent Honeyeater [82338]	Critically Endangered	Foraging, feeding or related behaviour likely to occur within area
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Foraging, feeding or related behaviour known to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Foraging, feeding or related behaviour known

Name	Status	Type of Presence
		to occur within area
Dasyornis brachypterus Eastern Bristlebird [533]	Endangered	Species or species habitat likely to occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea antipodensis gibsoni Gibson's Albatross [82270]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Fregetta grallaria grallaria White-bellied Storm-Petrel (Tasman Sea), White-bellied Storm-Petrel (Australasian) [64438]	Vulnerable	Species or species habitat likely to occur within area
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat may occur within area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat known to occur within area
Limosa lapponica baueri Bar-tailed Godwit (baueri), Western Alaskan Bar-tailed Godwit [86380]	Vulnerable	Species or species habitat known to occur within area
Limosa lapponica menzbieri Northern Siberian Bar-tailed Godwit, Bar-tailed Godwit (menzbieri) [86432]	Critically Endangered	Species or species habitat may occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Neophema chrysogaster Orange-bellied Parrot [747]	Critically Endangered	Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Pachyptila turtur subantarctica Fairy Prion (southern) [64445]	Vulnerable	Species or species habitat known to occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area

Name	Status	Type of Presence
Pterodroma leucoptera leucoptera Gould's Petrel, Australian Gould's Petrel [26033]	Endangered	Species or species habitat may occur within area
Pterodroma neglecta neglecta Kermadec Petrel (western) [64450]	Vulnerable	Foraging, feeding or related behaviour may occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat known to occur within area
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Species or species habitat known to occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area
Thalassarche bulleri platei Northern Buller's Albatross, Pacific Albatross [82273]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta cauta Shy Albatross [82345]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche cauta steadi White-capped Albatross [82344]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thinornis rubricollis rubricollis Hooded Plover (eastern) [66726]	Vulnerable	Species or species habitat likely to occur within area
Fish		
Epinephelus daemelii Black Rockcod, Black Cod, Saddled Rockcod [68449]	Vulnerable	Species or species habitat likely to occur within area
Macquaria australasica Macquarie Perch [66632]	Endangered	Species or species habitat may occur within area
Prototroctes maraena Australian Grayling [26179]	Vulnerable	Species or species habitat likely to occur within area
Frogs		
Heleioporus australiacus Giant Burrowing Frog [1973]	Vulnerable	Species or species habitat may occur within area
Litoria aurea Green and Golden Bell Frog [1870]	Vulnerable	Species or species habitat known to occur

Name	Status	Type of Presence within area
Mammals		
[Balaenoptera borealis](#) Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
[Balaenoptera musculus](#) Blue Whale [36]	Endangered	Species or species habitat may occur within area
[Balaenoptera physalus](#) Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
[Chalinolobus dwyeri](#) Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat likely to occur within area
[Dasyurus maculatus maculatus (SE mainland population)](#) Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat likely to occur within area
[Eubalaena australis](#) Southern Right Whale [40]	Endangered	Species or species habitat known to occur within area
[Isoodon obesulus obesulus](#) Southern Brown Bandicoot (eastern), Southern Brown Bandicoot (south-eastern) [68050]	Endangered	Species or species habitat likely to occur within area
[Megaptera novaeangliae](#) Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
[Petauroides volans](#) Greater Glider [254]	Vulnerable	Species or species habitat likely to occur within area
[Phascolarctos cinereus (combined populations of Qld, NSW and the ACT)](#) Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Vulnerable	Species or species habitat may occur within area
[Pseudomys novaehollandiae](#) New Holland Mouse, Pookila [96]	Vulnerable	Species or species habitat may occur within area
[Pteropus poliocephalus](#) Grey-headed Flying-fox [186]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Plants		
[Acacia terminalis subsp. terminalis MS](#) Sunshine Wattle (Sydney region) [88882]	Endangered	Species or species habitat known to occur within area
[Caladenia tessellata](#) Thick-lipped Spider-orchid, Daddy Long-legs [2119]	Vulnerable	Species or species habitat likely to occur within area
[Cryptostylis hunteriana](#) Leafless Tongue-orchid [19533]	Vulnerable	Species or species habitat likely to occur within area
[Eucalyptus camfieldii](#) Camfield's Stringybark [15460]	Vulnerable	Species or species habitat may occur within area
[Genoplesium baueri](#) Yellow Gnat-orchid [7528]	Endangered	Species or species habitat may occur within area
[Melaleuca biconvexa](#) Biconvex Paperbark [5583]	Vulnerable	Species or species

Name	Status	Type of Presence
		habitat may occur within area
Persicaria elatior Knotweed, Tall Knotweed [5831]	Vulnerable	Species or species habitat may occur within area
Persoonia hirsuta Hairy Geebung, Hairy Persoonia [19006]	Endangered	Species or species habitat may occur within area
Pterostylis sp. Botany Bay (A.Bishop J221/1-13) Botany Bay Bearded Greenhood, Botany Bay Bearded Orchid [64965]	Endangered	Species or species habitat likely to occur within area
Syzygium paniculatum Magenta Lilly Pilly, Magenta Cherry, Daguba, Scrub Cherry, Creek Lilly Pilly, Brush Cherry [20307]	Vulnerable	Species or species habitat known to occur within area
Thesium australe Austral Toadflax, Toadflax [15202]	Vulnerable	Species or species habitat may occur within area
Reptiles		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Breeding likely to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Hoplocephalus bungaroides Broad-headed Snake [1182]	Vulnerable	Species or species habitat may occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Sharks		
Carcharias taurus (east coast population) Grey Nurse Shark (east coast population) [68751]	Critically Endangered	Species or species habitat known to occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area

Listed Migratory Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Migratory Marine Birds		
Anous stolidus Common Noddy [825]		Species or species habitat likely to occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area

Name	Threatened	Type of Presence
Ardenna carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Foraging, feeding or related behaviour likely to occur within area
Ardenna grisea Sooty Shearwater [82651]		Species or species habitat likely to occur within area
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat known to occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat likely to occur within area
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat may occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
Sternula albifrons Little Tern [82849]		Breeding likely to occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta Shy Albatross [89224]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or

Name	Threatened	Type of Presence
		related behaviour likely to occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Migratory Marine Species		
Balaena glacialis australis Southern Right Whale [75529]	Endangered*	Species or species habitat known to occur within area
Balaenoptera borealis Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat may occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Caperea marginata Pygmy Right Whale [39]		Foraging, feeding or related behaviour may occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Breeding likely to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
Dugong dugon Dugong [28]		Species or species habitat may occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat may occur within area
Lamna nasus Porbeagle, Mackerel Shark [83288]		Species or species habitat likely to occur within area
Manta alfredi Reef Manta Ray, Coastal Manta Ray, Inshore Manta Ray, Prince Alfred's Ray, Resident Manta Ray [84994]		Species or species habitat may occur within area
Manta birostris Giant Manta Ray, Chevron Manta Ray, Pacific Manta Ray, Pelagic Manta Ray, Oceanic Manta Ray [84995]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur

Name	Threatened	Type of Presence
		within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat likely to occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area
Sousa chinensis Indo-Pacific Humpback Dolphin [50]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Cuculus optatus Oriental Cuckoo, Horsfield's Cuckoo [86651]		Species or species habitat may occur within area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area
Monarcha trivirgatus Spectacled Monarch [610]		Species or species habitat may occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat known to occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat likely to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Arenaria interpres Ruddy Turnstone [872]		Foraging, feeding or related behaviour known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Foraging, feeding or related behaviour known to occur within area
Calidris alba Sanderling [875]		Foraging, feeding or related behaviour known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species

Name	Threatened	Type of Presence
		habitat may occur within area
[Calidris ruficollis](#) Red-necked Stint [860]		Foraging, feeding or related behaviour known to occur within area
[Calidris subminuta](#) Long-toed Stint [861]		Foraging, feeding or related behaviour known to occur within area
[Calidris tenuirostris](#) Great Knot [862]	Critically Endangered	Foraging, feeding or related behaviour known to occur within area
[Charadrius bicinctus](#) Double-banded Plover [895]		Foraging, feeding or related behaviour known to occur within area
[Charadrius leschenaultii](#) Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
[Charadrius mongolus](#) Lesser Sand Plover, Mongolian Plover [879]	Endangered	Foraging, feeding or related behaviour known to occur within area
[Charadrius veredus](#) Oriental Plover, Oriental Dotterel [882]		Foraging, feeding or related behaviour known to occur within area
[Gallinago hardwickii](#) Latham's Snipe, Japanese Snipe [863]		Foraging, feeding or related behaviour may occur within area
[Gallinago megala](#) Swinhoe's Snipe [864]		Foraging, feeding or related behaviour likely to occur within area
[Gallinago stenura](#) Pin-tailed Snipe [841]		Foraging, feeding or related behaviour likely to occur within area
[Limicola falcinellus](#) Broad-billed Sandpiper [842]		Foraging, feeding or related behaviour known to occur within area
[Limosa lapponica](#) Bar-tailed Godwit [844]		Species or species habitat known to occur within area
[Limosa limosa](#) Black-tailed Godwit [845]		Foraging, feeding or related behaviour known to occur within area
[Numenius madagascariensis](#) Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
[Numenius minutus](#) Little Curlew, Little Whimbrel [848]		Foraging, feeding or related behaviour likely to occur within area
[Numenius phaeopus](#) Whimbrel [849]		Foraging, feeding or related behaviour known to occur within area
[Pandion haliaetus](#) Osprey [952]		Species or species habitat known to occur within area
[Pluvialis fulva](#) Pacific Golden Plover [25545]		Foraging, feeding or related behaviour known

Name	Threatened	Type of Presence
		to occur within area
Pluvialis squatarola Grey Plover [865]		Foraging, feeding or related behaviour known to occur within area
Tringa brevipes Grey-tailed Tattler [851]		Foraging, feeding or related behaviour known to occur within area
Tringa incana Wandering Tattler [831]		Foraging, feeding or related behaviour known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area
Xenus cinereus Terek Sandpiper [59300]		Foraging, feeding or related behaviour known to occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land [Resource Information]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Name
Commonwealth Land -
Commonwealth Land - Airservices Australia
Commonwealth Land - Australian & Overseas Telecommunications Corporation
Commonwealth Land - Australian Postal Commission
Commonwealth Land - Australian Telecommunications Commission
Commonwealth Land - Defence Housing Authority
Commonwealth Land - Defence Service Homes Corporation
Commonwealth Land - Director of War Service Homes

Commonwealth Heritage Places [Resource Information]

Name	State	Status
Historic		
Cape Baily Lighthouse	NSW	Listed place

Listed Marine Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Anous stolidus Common Noddy [825]		Species or species habitat likely to occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Species or species habitat known to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Arenaria interpres Ruddy Turnstone [872]		Foraging, feeding or

Name	Threatened	Type of Presence
		related behaviour known to occur within area
[Calidris acuminata](#) Sharp-tailed Sandpiper [874]		Foraging, feeding or related behaviour known to occur within area
[Calidris alba](#) Sanderling [875]		Foraging, feeding or related behaviour known to occur within area
[Calidris canutus](#) Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
[Calidris ferruginea](#) Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
[Calidris melanotos](#) Pectoral Sandpiper [858]		Species or species habitat may occur within area
[Calidris ruficollis](#) Red-necked Stint [860]		Foraging, feeding or related behaviour known to occur within area
[Calidris subminuta](#) Long-toed Stint [861]		Foraging, feeding or related behaviour known to occur within area
[Calidris tenuirostris](#) Great Knot [862]	Critically Endangered	Foraging, feeding or related behaviour known to occur within area
[Calonectris leucomelas](#) Streaked Shearwater [1077]		Species or species habitat known to occur within area
[Catharacta skua](#) Great Skua [59472]		Species or species habitat may occur within area
[Charadrius bicinctus](#) Double-banded Plover [895]		Foraging, feeding or related behaviour known to occur within area
[Charadrius leschenaultii](#) Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
[Charadrius mongolus](#) Lesser Sand Plover, Mongolian Plover [879]	Endangered	Foraging, feeding or related behaviour known to occur within area
[Charadrius ruficapillus](#) Red-capped Plover [881]		Foraging, feeding or related behaviour known to occur within area
[Charadrius veredus](#) Oriental Plover, Oriental Dotterel [882]		Foraging, feeding or related behaviour known to occur within area
[Diomedea antipodensis](#) Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
[Diomedea epomophora](#) Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
[Diomedea exulans](#) Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely

Name	Threatened	Type of Presence
		to occur within area
Diomedea gibsoni Gibson's Albatross [64466]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat likely to occur within area
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat may occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Foraging, feeding or related behaviour may occur within area
Gallinago megala Swinhoe's Snipe [864]		Foraging, feeding or related behaviour likely to occur within area
Gallinago stenura Pin-tailed Snipe [841]		Foraging, feeding or related behaviour likely to occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area
Heteroscelus brevipes Grey-tailed Tattler [59311]		Foraging, feeding or related behaviour known to occur within area
Heteroscelus incanus Wandering Tattler [59547]		Foraging, feeding or related behaviour known to occur within area
Himantopus himantopus Pied Stilt, Black-winged Stilt [870]		Foraging, feeding or related behaviour known to occur within area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat known to occur within area
Limicola falcinellus Broad-billed Sandpiper [842]		Foraging, feeding or related behaviour known to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Limosa limosa Black-tailed Godwit [845]		Foraging, feeding or related behaviour known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area

Name	Threatened	Type of Presence
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area
Monarcha trivirgatus Spectacled Monarch [610]		Species or species habitat may occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat known to occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat likely to occur within area
Neophema chrysogaster Orange-bellied Parrot [747]	Critically Endangered	Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Numenius minutus Little Curlew, Little Whimbrel [848]		Foraging, feeding or related behaviour likely to occur within area
Numenius phaeopus Whimbrel [849]		Foraging, feeding or related behaviour known to occur within area
Pachyptila turtur Fairy Prion [1066]		Species or species habitat known to occur within area
Pandion haliaetus Osprey [952]		Species or species habitat known to occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
Pluvialis fulva Pacific Golden Plover [25545]		Foraging, feeding or related behaviour known to occur within area
Pluvialis squatarola Grey Plover [865]		Foraging, feeding or related behaviour known to occur within area
Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [1043]		Foraging, feeding or related behaviour likely to occur within area
Puffinus griseus Sooty Shearwater [1024]		Species or species habitat likely to occur within area
Recurvirostra novaehollandiae Red-necked Avocet [871]		Foraging, feeding or related behaviour known to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area

Name	Threatened	Type of Presence
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat known to occur within area
Sterna albifrons Little Tern [813]		Breeding likely to occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta Shy Albatross [89224]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche sp. nov. Pacific Albatross [66511]	Vulnerable*	Species or species habitat may occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Thinornis rubricollis rubricollis Hooded Plover (eastern) [66726]	Vulnerable	Species or species habitat likely to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area
Xenus cinereus Terek Sandpiper [59300]		Foraging, feeding or related behaviour known to occur within area
Fish		
Acentronura tentaculata Shortpouch Pygmy Pipehorse [66187]		Species or species habitat may occur within area
Festucalex cinctus Girdled Pipefish [66214]		Species or species habitat may occur within area
Filicampus tigris Tiger Pipefish [66217]		Species or species habitat may occur within area
Heraldia nocturna Upside-down Pipefish, Eastern Upside-down Pipefish, Eastern Upside-down Pipefish [66227]		Species or species habitat may occur within area
Hippichthys penicillus Beady Pipefish, Steep-nosed Pipefish [66231]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Hippocampus abdominalis Big-belly Seahorse, Eastern Potbelly Seahorse, New Zealand Potbelly Seahorse [66233]		Species or species habitat may occur within area
Hippocampus whitei White's Seahorse, Crowned Seahorse, Sydney Seahorse [66240]		Species or species habitat known to occur within area
Histiogamphelus briggsii Crested Pipefish, Briggs' Crested Pipefish, Briggs' Pipefish [66242]		Species or species habitat may occur within area
Lissocampus runa Javelin Pipefish [66251]		Species or species habitat may occur within area
Maroubra perserrata Sawtooth Pipefish [66252]		Species or species habitat may occur within area
Notiocampus ruber Red Pipefish [66265]		Species or species habitat may occur within area
Phyllopteryx taeniolatus Common Seadragon, Weedy Seadragon [66268]		Species or species habitat may occur within area
Solegnathus spinosissimus Spiny Pipehorse, Australian Spiny Pipehorse [66275]		Species or species habitat may occur within area
Solenostomus cyanopterus Robust Ghostpipefish, Blue-finned Ghost Pipefish, [66183]		Species or species habitat may occur within area
Solenostomus paradoxus Ornate Ghostpipefish, Harlequin Ghost Pipefish, Ornate Ghost Pipefish [66184]		Species or species habitat may occur within area
Stigmatopora argus Spotted Pipefish, Gulf Pipefish, Peacock Pipefish [66276]		Species or species habitat may occur within area
Stigmatopora nigra Widebody Pipefish, Wide-bodied Pipefish, Black Pipefish [66277]		Species or species habitat may occur within area
Syngnathoides biaculeatus Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area
Trachyrhamphus bicoarctatus Bentstick Pipefish, Bend Stick Pipefish, Short-tailed Pipefish [66280]		Species or species habitat may occur within area
Urocampus carinirostris Hairy Pipefish [66282]		Species or species habitat may occur within area
Vanacampus margaritifer Mother-of-pearl Pipefish [66283]		Species or species habitat may occur within area
Mammals		
Arctocephalus forsteri Long-nosed Fur-seal, New Zealand Fur-seal [20]		Species or species habitat may occur within area
Arctocephalus pusillus Australian Fur-seal, Australo-African Fur-seal [21]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Dugong dugon		
Dugong [28]		Species or species habitat may occur within area
Reptiles		
Caretta caretta		
Loggerhead Turtle [1763]	Endangered	Breeding likely to occur within area
Chelonia mydas		
Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Dermochelys coriacea		
Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
Eretmochelys imbricata		
Hawksbill Turtle [1766]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Natator depressus		
Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Pelamis platurus		
Yellow-bellied Seasnake [1091]		Species or species habitat may occur within area

Whales and other Cetaceans		[Resource Information]
Name	Status	Type of Presence
Mammals		
Balaenoptera acutorostrata		
Minke Whale [33]		Species or species habitat may occur within area
Balaenoptera borealis		
Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Balaenoptera edeni		
Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus		
Blue Whale [36]	Endangered	Species or species habitat may occur within area
Balaenoptera physalus		
Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Caperea marginata		
Pygmy Right Whale [39]		Foraging, feeding or related behaviour may occur within area
Delphinus delphis		
Common Dophin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
Eubalaena australis		
Southern Right Whale [40]	Endangered	Species or species habitat known to occur within area
Grampus griseus		
Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
Lagenorhynchus obscurus		
Dusky Dolphin [43]		Species or species habitat may occur within area

Name	Status	Type of Presence
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat likely to occur within area
Sousa chinensis Indo-Pacific Humpback Dolphin [50]		Species or species habitat likely to occur within area
Stenella attenuata Spotted Dolphin, Pantropical Spotted Dolphin [51]		Species or species habitat may occur within area
Tursiops aduncus Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area

Extra Information

State and Territory Reserves	[Resource Information]
Name	State
Kamay Botany Bay	NSW
Towra Point	NSW

Invasive Species	[Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status	Type of Presence
Birds		
Acridotheres tristis Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
Alauda arvensis Skylark [656]		Species or species habitat likely to occur within area
Anas platyrhynchos Mallard [974]		Species or species habitat likely to occur within area
Carduelis carduelis European Goldfinch [403]		Species or species habitat likely to occur within area
Carduelis chloris European Greenfinch [404]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Lonchura punctulata Nutmeg Mannikin [399]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Passer montanus Eurasian Tree Sparrow [406]		Species or species habitat likely to occur within area
Pycnonotus jocosus Red-whiskered Bulbul [631]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Turdus merula Common Blackbird, Eurasian Blackbird [596]		Species or species habitat likely to occur within area
Frogs		
Rhinella marina Cane Toad [83218]		Species or species habitat known to occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Feral deer Feral deer species in Australia [85733]		Species or species habitat likely to occur within area
Lepus capensis Brown Hare [127]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus norvegicus Brown Rat, Norway Rat [83]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Alternanthera philoxeroides Alligator Weed [11620]		Species or species

Name	Status	Type of Presence
		habitat likely to occur within area
Anredera cordifolia Madeira Vine, Jalap, Lamb's-tail, Mignonette Vine, Anredera, Gulf Madeiravine, Heartleaf Madeiravine, Potato Vine [2643]		Species or species habitat likely to occur within area
Asparagus aethiopicus Asparagus Fern, Ground Asparagus, Basket Fern, Sprengi's Fern, Bushy Asparagus, Emerald Asparagus [62425]		Species or species habitat likely to occur within area
Asparagus asparagoides Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
Asparagus plumosus Climbing Asparagus-fern [48993]		Species or species habitat likely to occur within area
Asparagus scandens Asparagus Fern, Climbing Asparagus Fern [23255]		Species or species habitat likely to occur within area
Cabomba caroliniana Cabomba, Fanwort, Carolina Watershield, Fish Grass, Washington Grass, Watershield, Carolina Fanwort, Common Cabomba [5171]		Species or species habitat likely to occur within area
Chrysanthemoides monilifera Bitou Bush, Boneseed [18983]		Species or species habitat may occur within area
Chrysanthemoides monilifera subsp. monilifera Boneseed [16905]		Species or species habitat likely to occur within area
Chrysanthemoides monilifera subsp. rotundata Bitou Bush [16332]		Species or species habitat likely to occur within area
Cytisus scoparius Broom, English Broom, Scotch Broom, Common Broom, Scottish Broom, Spanish Broom [5934]		Species or species habitat likely to occur within area
Dolichandra unguis-cati Cat's Claw Vine, Yellow Trumpet Vine, Cat's Claw Creeper, Funnel Creeper [85119]		Species or species habitat likely to occur within area
Eichhornia crassipes Water Hyacinth, Water Orchid, Nile Lily [13466]		Species or species habitat likely to occur within area
Genista linifolia Flax-leaved Broom, Mediterranean Broom, Flax Broom [2800]		Species or species habitat likely to occur within area
Genista monspessulana Montpellier Broom, Cape Broom, Canary Broom, Common Broom, French Broom, Soft Broom [20126]		Species or species habitat likely to occur within area
Genista sp. X Genista monspessulana Broom [67538]		Species or species habitat may occur within area
Lantana camara Lantana, Common Lantana, Kamara Lantana, Large-leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892]		Species or species habitat likely to occur within area
Lycium ferocissimum African Boxthorn, Boxthorn [19235]		Species or species habitat likely to occur within area
Opuntia spp. Prickly Pears [82753]		Species or species

Name	Status	Type of Presence
		habitat likely to occur within area
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Sagittaria platyphylla Delta Arrowhead, Arrowhead, Slender Arrowhead [68483]		Species or species habitat likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area
Salvinia molesta Salvinia, Giant Salvinia, Aquarium Watermoss, Kariba Weed [13665]		Species or species habitat likely to occur within area
Senecio madagascariensis Fireweed, Madagascar Ragwort, Madagascar Groundsel [2624]		Species or species habitat likely to occur within area

Nationally Important Wetlands	[Resource Information]
Name	State
Towra Point Estuarine Wetlands	NSW

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-34.004474 151.211641,-33.984478 151.226061,-33.988677 151.234644,-34.015075 151.230868,-34.004474 151.211641

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

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Appendix D

Biodiversity Credit Report

BAM Credit Summary Report

Proposal Details

Assessment Id
00021154/BAAS18054/20/00021155

Proposal Name
Kamay Ferry Wharves Project

BAM data last updated *
24/11/2021

Assessor Name
Stephen Bloomfield

Report Created
25/02/2022

BAM Data version *
50

Assessor Number
BAAS18054

BAM Case Status
Finalised

Date Finalised
25/02/2022

Assessment Revision
5

Assessment Type
Major Projects

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

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

Zone	Vegetation zone name	TEC name	Current Vegetation integrity score	Change in Vegetation integrity (loss / gain)	Area (ha)	Sensitivity to loss (Justification)	Species sensitivity to gain class	BC Act Listing status	EPBC Act listing status	Biodiversity risk weighting	Potential SAII	Ecosystem credits
Coastal foredune wattle scrub												
6	772_VZ12_Low	Not a TEC	0.8	0.8	0.02	PCT Cleared - 65%	High Sensitivity to Potential Gain			1.75		0
											Subtotal	**0**

Coastal headland cliffline scrub												
7	1823_VZ15_Low	Not a TEC	4.9	4.9	0.01	PCT Cleared - 39%	High Sensitivity to Potential Gain			1.50		0
											Subtotal	**0**
Coastal sand littoral forest												
1	661_VZ1_Low	Kurnell Dune Forest in the Sutherland Shire and City of Rockdale	51.5	51.5	0.01	PCT Cleared - 68%	High Sensitivity to Potential Gain	Endangered Ecological Community	Not Listed	2.00		1
2	661_VZ3_Low	Kurnell Dune Forest in the Sutherland Shire and City of Rockdale	15.3	15.3	0.01	PCT Cleared - 68%	High Sensitivity to Potential Gain	Endangered Ecological Community	Not Listed	2.00		1
3	661_VZ4_Low	Kurnell Dune Forest in the Sutherland Shire and City of Rockdale	50.5	50.5	0.01	PCT Cleared - 68%	High Sensitivity to Potential Gain	Endangered Ecological Community	Not Listed	2.00		1
4	661_VZ10_Low	Kurnell Dune Forest in the Sutherland Shire and City of Rockdale	13.8	13.8	0.01	PCT Cleared - 68%	High Sensitivity to Potential Gain	Endangered Ecological Community	Not Listed	2.00		0

5	661_VZ11_Low	Kurnell Dune Forest in the Sutherland Shire and City of Rockdale	41.7	41.7	0.01	PCT Cleared - 68%	High Sensitivity to Potential Gain	Endangered Ecological Community	Not Listed	2.00	1
										Subtotal	**4**
										Total	**4**

Species credits for threatened species

Vegetation zone name	Habitat condition (Vegetation Integrity)	Change in habitat condition	Area (ha)/Count (no. individuals)	Sensitivity to loss (Justification)	Sensitivity to gain (Justification)	BC Act Listing status	EPBC Act listing status	Potential SAII	Species credits
Chalinolobus dwyeri / Large-eared Pied Bat (Fauna)									
661_VZ1_Low	51.5	51.5	0.01			Vulnerable	Vulnerable	True	1
661_VZ3_Low	15.3	15.3	0.01			Vulnerable	Vulnerable	True	1
661_VZ4_Low	50.5	50.5	0.01			Vulnerable	Vulnerable	True	1
661_VZ10_Low	13.8	13.8	0.01			Vulnerable	Vulnerable	True	1
661_VZ11_Low	41.7	41.7	0.01			Vulnerable	Vulnerable	True	1
772_VZ12_Low	0.8	0.8	0.02			Vulnerable	Vulnerable	True	1
								Subtotal	**6**
Haematopus longirostris / Pied Oystercatcher (Fauna)									
772_VZ12_Low	0.8	0.8	0.02			Endangered	Not Listed	False	1
								Subtotal	**1**

Vespadelus troughtoni / Eastern Cave Bat (Fauna)									
772_VZ12_Low	0.8	0.8	0.02			Vulnerable	Not Listed	True	1
								Subtotal	**1**

BAM Candidate Species Report

Proposal Details

Assessment Id 00021154/BAAS18054/20/00021155	Proposal Name Kamay Ferry Wharves Project	BAM data last updated * 24/11/2021
Assessor Name Stephen Bloomfield	Report Created 25/02/2022	BAM Data version * 50
Assessor Number BAAS18054	Assessment Type Major Projects	BAM Case Status Finalised
Assessment Revision 5	Date Finalised 25/02/2022	

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

List of Species Requiring Survey

Name	Presence	Survey Months
Chalinolobus dwyeri Large-eared Pied Bat	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Chamaesyce psammogeton Sand Spurge	No (surveyed)	☐ Jan ☐ Feb ☑ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Crinia tinnula Wallum Froglet	No (surveyed)	☐ Jan ☐ Feb ☑ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?

Haematopus longirostris Pied Oystercatcher	Yes (surveyed)	☐ Jan ☐ Feb ☑ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Litoria aurea Green and Golden Bell Frog	No (surveyed)	☐ Jan ☐ Feb ☑ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Myotis macropus Southern Myotis	No (surveyed)	☐ Jan ☐ Feb ☑ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Syzygium paniculatum Magenta Lilly Pilly	No (surveyed) *Survey months are outside of the months specified in Bionet.	☐ Jan ☐ Feb ☑ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☑ Survey month outside the specified months?
Vespadelus troughtoni Eastern Cave Bat	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?

Threatened species Manually Added

None added

Threatened species assessed as not on site

Refer to BAR for detailed justification

BAM Candidate Species Report

Common name	Scientific name	Justification in the BAM-C
Barking Owl	Ninox connivens	Habitat degraded
Biconvex Paperbark	Melaleuca biconvexa	Habitat degraded
Black-hooded Sun Orchid	Thelymitra atronitida	Habitat degraded
Bush Stone-curlew	Burhinus grallarius	Refer to BAR
Coast Groundsel	Senecio spathulatus	Habitat degraded
Eastern Osprey	Pandion cristatus	Refer to BAR
Eastern Pygmy-possum	Cercartetus nanus	Refer to BAR
Gang-gang Cockatoo	Callocephalon fimbriatum	Habitat constraints
Glossy Black-Cockatoo	Calyptorhynchus lathami	Habitat constraints
Green-thighed Frog	Litoria brevipalmata	Refer to BAR
Grey-headed Flying-fox	Pteropus poliocephalus	Habitat constraints
Koala	Phascolarctos cinereus	Habitat constraints
Large Bent-winged Bat	Miniopterus orianae oceanensis	Habitat constraints
Little Bent-winged Bat	Miniopterus australis	Habitat constraints
Little Eagle	Hieraaetus morphnoides	Refer to BAR
Long-nosed Bandicoot, North Head	Perameles nasuta - endangered population	Refer to BAR
Maroubra Woodland Snail	Meridolum maryae	Refer to BAR
Masked Owl	Tyto novaehollandiae	Refer to BAR
Native Guava	Rhodomyrtus psidioides	Habitat degraded
Pale-headed Snake	Hoplocephalus bitorquatus	Refer to BAR
Powerful Owl	Ninox strenua	Habitat degraded
Regent Honeyeater	Anthochaera phrygia	Habitat constraints
Scrub Turpentine	Rhodamnia rubescens	Habitat degraded
Southern Brown Bandicoot (eastern)	Isoodon obesulus obesulus	Refer to BAR
Square-tailed Kite	Lophoictinia isura	Refer to BAR
Squirrel Glider	Petaurus norfolcensis	Habitat degraded
Swift Parrot	Lathamus discolor	Refer to BAR

Thick Lip Spider Orchid	Caladenia tessellata	Habitat degraded
White-bellied Sea-Eagle	Haliaeetus leucogaster	Refer to BAR

BAM Predicted Species Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00021154/BAAS18054/20/00021155	Kamay Ferry Wharves Project	24/11/2021
Assessor Name	Report Created	BAM Data version *
Stephen Bloomfield	25/02/2022	50
Assessor Number	Assessment Type	BAM Case Status
BAAS18054	Major Projects	Finalised
Assessment Revision		Date Finalised
5		25/02/2022

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Threatened species reliably predicted to utilise the site. No surveys are required for these species. Ecosystem credits apply to these species.

Common Name	Scientific Name	Vegetation Types(s)
Barking Owl	Ninox connivens	772-Coastal foredune wattle scrub
Black Bittern	Ixobrychus flavicollis	661-Coastal sand littoral forest
Black-chinned Honeyeater (eastern subspecies)	Melithreptus gularis gularis	772-Coastal foredune wattle scrub
Brown Treecreeper (eastern subspecies)	Climacteris picumnus victoriae	772-Coastal foredune wattle scrub
Diamond Firetail	Stagonopleura guttata	772-Coastal foredune wattle scrub
Dusky Woodswallow	Artamus cyanopterus cyanopterus	661-Coastal sand littoral forest
		772-Coastal foredune wattle scrub
		1823-Coastal headland cliffline scrub
Eastern Coastal Free-tailed Bat	Micronomus norfolkensis	661-Coastal sand littoral forest
		772-Coastal foredune wattle scrub
		1823-Coastal headland cliffline scrub
Eastern Osprey	Pandion cristatus	661-Coastal sand littoral forest
		772-Coastal foredune wattle scrub
Gang-gang Cockatoo	Callocephalon fimbriatum	661-Coastal sand littoral forest

Grey-headed Flying-fox	Pteropus poliocephalus	661-Coastal sand littoral forest
		772-Coastal foredune wattle scrub
		1823-Coastal headland cliffline scrub
Koala	Phascolarctos cinereus	661-Coastal sand littoral forest
Large Bent-winged Bat	Miniopterus orianae oceanensis	661-Coastal sand littoral forest
		772-Coastal foredune wattle scrub
		1823-Coastal headland cliffline scrub
Little Bent-winged Bat	Miniopterus australis	661-Coastal sand littoral forest
		772-Coastal foredune wattle scrub
Little Eagle	Hieraaetus morphnoides	661-Coastal sand littoral forest
		772-Coastal foredune wattle scrub
		1823-Coastal headland cliffline scrub
Little Lorikeet	Glossopsitta pusilla	661-Coastal sand littoral forest
		772-Coastal foredune wattle scrub
		1823-Coastal headland cliffline scrub
Masked Owl	Tyto novaehollandiae	661-Coastal sand littoral forest
		772-Coastal foredune wattle scrub
New Holland Mouse	Pseudomys novaehollandiae	772-Coastal foredune wattle scrub
		1823-Coastal headland cliffline scrub
Powerful Owl	Ninox strenua	661-Coastal sand littoral forest
		772-Coastal foredune wattle scrub
Regent Honeyeater	Anthochaera phrygia	661-Coastal sand littoral forest
		772-Coastal foredune wattle scrub
		1823-Coastal headland cliffline scrub
Rosenberg's Goanna	Varanus rosenbergi	661-Coastal sand littoral forest
		1823-Coastal headland cliffline scrub
Spotted Harrier	Circus assimilis	1823-Coastal headland cliffline scrub
Spotted-tailed Quoll	Dasyurus maculatus	1823-Coastal headland cliffline scrub
Square-tailed Kite	Lophoictinia isura	772-Coastal foredune wattle scrub
Superb Fruit-Dove	Ptilinopus superbus	661-Coastal sand littoral forest
Swift Parrot	Lathamus discolor	661-Coastal sand littoral forest
		772-Coastal foredune wattle scrub
		1823-Coastal headland cliffline scrub
Turquoise Parrot	Neophema pulchella	1823-Coastal headland cliffline scrub

Varied Sittella	Daphoenositta chrysoptera	661-Coastal sand littoral forest
		772-Coastal foredune wattle scrub
White-bellied Sea-Eagle	Haliaeetus leucogaster	772-Coastal foredune wattle scrub
		1823-Coastal headland cliffline scrub
White-throated Needletail	Hirundapus caudacutus	661-Coastal sand littoral forest
		772-Coastal foredune wattle scrub
		1823-Coastal headland cliffline scrub
Yellow-bellied Sheathtail-bat	Saccolaimus flaviventris	661-Coastal sand littoral forest
		772-Coastal foredune wattle scrub

Threatened species Manually Added

None added

Threatened species assessed as not within the vegetation zone(s) for the PCT(s)

Common Name	Scientific Name	Plant Community Type(s)
Glossy Black-Cockatoo	Calyptorhynchus lathami	661-Coastal sand littoral forest
		772-Coastal foredune wattle scrub
Spotted Harrier	Circus assimilis	772-Coastal foredune wattle scrub
Spotted-tailed Quoll	Dasyurus maculatus	661-Coastal sand littoral forest
		772-Coastal foredune wattle scrub

Threatened species assessed as not within the vegetation zone(s) for the PCT(s)

Refer to BAR for detailed justification

Common Name	Scientific Name	Justification in the BAM-C
Glossy Black-Cockatoo	Calyptorhynchus lathami	Habitat constraints

BAM Vegetation Zones Report

Proposal Details

Assessment Id
00021154/BAAS18054/20/00021155

Assessment name
Kamay Ferry Wharves Project

BAM data last updated *
24/11/2021

Assessor Name
Stephen Bloomfield

Report Created
25/02/2022

BAM Data version *
50

Assessor Number
BAAS18054

Assessment Type
Major Projects

BAM Case Status
Finalised

Assessment Revision
5

Date Finalised
25/02/2022

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Vegetation Zones

#	Name	PCT	Condition	Area	Minimum number of plots	Management zones
1	661_VZ1_Low	661-Coastal sand littoral forest	VZ1_Low	0.01	1	
2	661_VZ3_Low	661-Coastal sand littoral forest	VZ3_Low	0.01	1	

3	661_VZ4_Low	661-Coastal sand littoral forest	VZ4_Low	0.01	1	
4	661_VZ10_Low	661-Coastal sand littoral forest	VZ10_Low	0.01	1	
5	661_VZ11_Low	661-Coastal sand littoral forest	VZ11_Low	0.01	1	
6	772_VZ12_Low	772-Coastal foredune wattle scrub	VZ12_Low	0.02	1	
7	1823_VZ15_Low	1823-Coastal headland cliffline scrub	VZ15_Low	0.01	1	

BAM Biodiversity Credit Report (Like for like)

Proposal Details

Assessment Id
00021154/BAAS18054/20/00021155

Proposal Name
Kamay Ferry Wharves Project

BAM data last updated *
24/11/2021

Assessor Name
Stephen Bloomfield

Assessor Number
BAAS18054

BAM Data version *
50

Proponent Names
Chris Williams

Report Created
25/02/2022

BAM Case Status
Finalised

Assessment Revision
5

Assessment Type
Major Projects

Date Finalised
25/02/2022

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Potential Serious and Irreversible Impacts

Name of threatened ecological community	Listing status	Name of Plant Community Type/ID
Nil		

Species
Chalinolobus dwyeri / Large-eared Pied Bat
Vespadelus troughtoni / Eastern Cave Bat

Additional Information for Approval

BAM Biodiversity Credit Report (Like for like)

PCT Outside Ibra Added

None added

PCTs With Customized Benchmarks

PCT
No Changes

Predicted Threatened Species Not On Site

Name
Calyptorhynchus lathami / Glossy Black-Cockatoo

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

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	HBT Cr	No HBT Cr	Total credits to be retired
661-Coastal sand littoral forest	Kurnell Dune Forest in the Sutherland Shire and City of Rockdale	0.1	3	1	4
772-Coastal foredune wattle scrub	Not a TEC	0.0	0	0	0
1823-Coastal headland cliffline scrub	Not a TEC	0.0	0	0	0

661-Coastal sand littoral forest

Like-for-like credit retirement options

Name of offset trading group	Trading group	Zone	HBT	Credits	IBRA region

Kurnell Dune Forest in the Sutherland Shire and City of Rockdale This includes PCT's: 661, 1536	-	661_VZ1_Low	Yes	1	Pittwater, Cumberland, Sydney Cataract, Wyong and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Kurnell Dune Forest in the Sutherland Shire and City of Rockdale This includes PCT's: 661, 1536	-	661_VZ3_Low	No	1	Pittwater, Cumberland, Sydney Cataract, Wyong and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Kurnell Dune Forest in the Sutherland Shire and City of Rockdale This includes PCT's: 661, 1536	-	661_VZ4_Low	Yes	1	Pittwater, Cumberland, Sydney Cataract, Wyong and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Kurnell Dune Forest in the Sutherland Shire and City of Rockdale This includes PCT's: 661, 1536	-	661_VZ10_Low	No	0	Pittwater, Cumberland, Sydney Cataract, Wyong and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

	Kurnell Dune Forest in the Sutherland Shire and City of Rockdale This includes PCT's: 661, 1536	-	661_VZ11_Low	Yes	1	Pittwater, Cumberland, Sydney Cataract, Wyong and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
772-Coastal foredune wattle scrub	**Like-for-like credit retirement options**					
	Class	Trading group	Zone	HBT	Credits	IBRA region
	Sydney Coastal Heaths This includes PCT's: 772, 1822	Sydney Coastal Heaths >=50% and <70%	772_VZ12_Low	No	0	Pittwater, Cumberland, Sydney Cataract, Wyong and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
1823-Coastal headland cliffline scrub	**Like-for-like credit retirement options**					
	Class	Trading group	Zone	HBT	Credits	IBRA region

	Sydney Coastal Heaths This includes PCT's: 772, 881, 882, 1134, 1143, 1641, 1822, 1823, 1824, 1826	Sydney Coastal Heaths <50%	1823_VZ15_Low	No	0	Pittwater, Cumberland, Sydney Cataract, Wyong and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Species Credit Summary

Species	Vegetation Zone/s	Area / Count	Credits
Chalinolobus dwyeri / Large-eared Pied Bat	**661_VZ1_Low, 661_VZ3_Low, 661_VZ4_Low, 661_VZ10_Low, 661_VZ11_Low, 772_VZ12_Low**	0.1	6.00
Haematopus longirostris / Pied Oystercatcher	**772_VZ12_Low**	0.0	1.00
Vespadelus troughtoni / Eastern Cave Bat	**772_VZ12_Low**	0.0	1.00

Credit Retirement Options

Like-for-like credit retirement options

	Spp	IBRA subregion
Chalinolobus dwyeri / Large-eared Pied Bat	**Chalinolobus dwyeri /** Large-eared Pied Bat	Any in NSW

Haematopus longirostris / Pied Oystercatcher	Spp	IBRA subregion
	Haematopus longirostris / Pied Oystercatcher	Any in NSW
Vespadelus troughtoni / Eastern Cave Bat	Spp	IBRA subregion
	Vespadelus troughtoni / Eastern Cave Bat	Any in NSW

BAM Biodiversity Credit Report (Variations)

Proposal Details

Assessment Id
00021154/BAAS18054/20/00021155

Proposal Name
Kamay Ferry Wharves Project

BAM data last updated *
24/11/2021

Assessor Name
Stephen Bloomfield

Assessor Number
BAAS18054

BAM Data version *
50

Proponent Name(s)
Chris Williams

Report Created
25/02/2022

BAM Case Status
Finalised

Assessment Revision
5

Assessment Type
Major Projects

Date Finalised
25/02/2022

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Potential Serious and Irreversible Impacts

Name of threatened ecological community	Listing status	Name of Plant Community Type/ID
Nil		

Species
Chalinolobus dwyeri / Large-eared Pied Bat
Vespadelus troughtoni / Eastern Cave Bat

Additional Information for Approval

PCT Outside Ibra Added

None added

BAM Biodiversity Credit Report (Variations)

PCTs With Customized Benchmarks

PCT
No Changes

Predicted Threatened Species Not On Site

Name
Calyptorhynchus lathami / Glossy Black-Cockatoo

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

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	HBT Cr	No HBT Cr	Total credits to be retired
661-Coastal sand littoral forest	Kurnell Dune Forest in the Sutherland Shire and City of Rockdale	0.1	3	1	4.00
772-Coastal foredune wattle scrub	Not a TEC	0.0	0	0	0.00
1823-Coastal headland cliffline scrub	Not a TEC	0.0	0	0	0.00

661-Coastal sand littoral forest

Like-for-like credit retirement options

Class	Trading group	Zone	HBT	Credits	IBRA region
Kurnell Dune Forest in the Sutherland Shire and City of Rockdale This includes PCT's: 661, 1536	-	661_VZ1_Low	Yes	1	Pittwater,Cumberland, Sydney Cataract, Wyong and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Kurnell Dune Forest in the Sutherland Shire and City of Rockdale This includes PCT's: 661, 1536	-	661_VZ3_Low	No	1	Pittwater,Cumberland, Sydney Cataract, Wyong and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Kurnell Dune Forest in the Sutherland Shire and City of Rockdale This includes PCT's: 661, 1536	-	661_VZ4_Low	Yes	1	Pittwater,Cumberland, Sydney Cataract, Wyong and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Kurnell Dune Forest in the Sutherland Shire and City of Rockdale This includes PCT's: 661, 1536	-	661_VZ10_Low	No	0	Pittwater,Cumberland, Sydney Cataract, Wyong and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Kurnell Dune Forest in the Sutherland Shire and City of Rockdale This includes PCT's: 661, 1536	-	661_VZ11_Low	Yes	1	Pittwater,Cumberland, Sydney Cataract, Wyong and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Variation options

Formation	Trading group	Zone	HBT	Credits	IBRA region

	Wet Sclerophyll Forests (Shrubby sub-formation)	Tier 3 or higher threat status	661_VZ1_Low	Yes (including artificial)	1	IBRA Region: Sydney Basin, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Wet Sclerophyll Forests (Shrubby sub-formation)	Tier 3 or higher threat status	661_VZ3_Low	No	1	IBRA Region: Sydney Basin, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Wet Sclerophyll Forests (Shrubby sub-formation)	Tier 3 or higher threat status	661_VZ4_Low	Yes (including artificial)	1	IBRA Region: Sydney Basin, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Wet Sclerophyll Forests (Shrubby sub-formation)	Tier 3 or higher threat status	661_VZ10_Low	No	0	IBRA Region: Sydney Basin, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Wet Sclerophyll Forests (Shrubby sub-formation)	Tier 3 or higher threat status	661_VZ11_Low	Yes (including artificial)	1	IBRA Region: Sydney Basin, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

772-Coastal foredune wattle scrub	**Like-for-like credit retirement options**					
	Class	Trading group	Zone	HBT	Credits	IBRA region

	Sydney Coastal Heaths This includes PCT's: 772, 1822	Sydney Coastal Heaths >=50% and <70%	772_VZ12_ Low	No	0	Pittwater,Cumberland, Sydney Cataract, Wyong and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Variation options					
	Formation	Trading group	Zone	HBT	Credits	IBRA region
	Heathlands	Tier 3 or higher threat status	772_VZ12_ Low	No	0	IBRA Region: Sydney Basin, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
1823-Coastal headland cliffline scrub	**Like-for-like credit retirement options**					
	Class	Trading group	Zone	HBT	Credits	IBRA region
	Sydney Coastal Heaths This includes PCT's: 772, 881, 882, 1134, 1143, 1641, 1822, 1823, 1824, 1826	Sydney Coastal Heaths <50%	1823_VZ15 _Low	No	0	Pittwater,Cumberland, Sydney Cataract, Wyong and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Variation options					
	Formation	Trading group	Zone	HBT	Credits	IBRA region
	Heathlands	Tier 4 or higher threat status	1823_VZ15 _Low	No	0	IBRA Region: Sydney Basin, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

BAM Biodiversity Credit Report (Variations)

Species Credit Summary

Species	Vegetation Zone/s	Area / Count	Credits
Chalinolobus dwyeri / Large-eared Pied Bat	**661_VZ1_Low, 661_VZ3_Low, 661_VZ4_Low, 661_VZ10_Low, 661_VZ11_Low, 772_VZ12_Low**	0.1	6.00
Haematopus longirostris / Pied Oystercatcher	**772_VZ12_Low**	0.0	1.00
Vespadelus troughtoni / Eastern Cave Bat	**772_VZ12_Low**	0.0	1.00

Credit Retirement Options

Like-for-like options

Chalinolobus dwyeri/ Large-eared Pied Bat	Spp	IBRA region	
	Chalinolobus dwyeri/Large-eared Pied Bat	Any in NSW	
	Variation options		
	Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region
	Fauna	Vulnerable	Pittwater, Cumberland, Sydney Cataract, Wyong and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Haematopus longirostris/ Pied Oystercatcher	Spp	IBRA region	
	Haematopus longirostris/Pied Oystercatcher	Any in NSW	

Haematopus longirostris/ Pied Oystercatcher	**Variation options**		
	Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region
	Fauna	Endangered	Pittwater, Cumberland, Sydney Cataract, Wyong and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Vespadelus troughtoni/ Eastern Cave Bat	Spp	IBRA region	
	Vespadelus troughtoni/Eastern Cave Bat	Any in NSW	
	Variation options		
	Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region
	Fauna	Vulnerable	Pittwater, Cumberland, Sydney Cataract, Wyong and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Biodiversity payment summary report

Assessment Id	Payment data version	Assessment Revision	Report created
00021154/BAAS18054/20/00021155		5	25/02/2022

Assessor Name	Assessor Number	Proposal Name	BAM Case Status
Stephen Bloomfield	BAAS18054	Kamay Ferry Wharves Project	Finalised

Assessment Type	Date Finalised
Major Projects	25/02/2022

PCT list

Price calculated	PCT common name	Credits
Yes	**661 -** Coastal sand littoral forest	4
Yes	**772 -** Coastal foredune wattle scrub	0
Yes	**1823 -** Coastal headland cliffline scrub	0

Species list

Price calculated	Species	Credits
Yes	***Chalinolobus dwyeri*** (Large-eared Pied Bat)	6
Yes	***Haematopus longirostris*** (Pied Oystercatcher)	1
Yes	***Vespadelus troughtoni*** (Eastern Cave Bat)	1

Biodiversity payment summary report

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

IBRA sub region	PCT common name	Threat status	Offset trading group	Risk premium	Administrative cost	Methodology adjustment factor	Price per credit	No. of ecosystem credits	Final credits price
Pittwater	**661 -** Coastal sand littoral forest	Yes	Kurnell Dune Forest in the Sutherland Shire and City of Rockdale	18.67%	$112.46	1.3841	$3,448.93	4	$13,795.70
Pittwater	**772 -** Coastal foredune wattle scrub	No	Sydney Coastal Heaths >=50% and <70%	20.69%	$554.44	2.2887	$ 17,283.13	0	$0.00
Pittwater	**1823 -** Coastal headland cliffline scrub	No	Sydney Coastal Heaths <50%	20.69%	$318.19	1.2437	$9,918.77	0	$0.00

Subtotal (excl. GST)	**$13,795.70**
GST	**$1,379.57**
Total ecosystem credits (incl. GST)	**$15,175.27**

Species credits for threatened species

Biodiversity payment summary report

Species profile ID	Species	Threat status	Price per credit	Risk premium	Administrative cost	No. of species credits	Final credits price
10157	***Chalinolobus dwyeri*** (Large-eared Pied Bat)	Vulnerable	$741.31	20.6900%	$80.00	6	$5,848.12
10386	***Haematopus longirostris*** (Pied Oystercatcher)	Endangered	$309.97	20.6900%	$80.00	1	$454.10
10829	***Vespadelus troughtoni*** (Eastern Cave Bat)	Vulnerable	$741.31	20.6900%	$80.00	1	$974.69

Subtotal (excl. GST)	**$7,276.91**
GST	**$727.69**
Total species credits (incl. GST)	**$8,004.60**
Grand total	**$23,179.87**

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