Ecological Assessment for Bundian Way Node 1

MARCH 2022

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CONTENTS

EXECUTIVE SUMMARY

Proposed Works

The activity involves construction of Node 1 of the Bundian Way walking trail. The trail begins at Jigamy Farm on the southern side of Pamula Lake, follows the coastline of Twofold Bay through Eden, and ends at Fisheries Beach in Edrom. It spans a distance of 34km and will link together a number of existing trails, while also creating or formalising new sections of trail. New trail infrastructure including staircases, bridges, foot bridges, rest stops, way finding and signage will also be constructed.

The trail passes through various land tenures including National Park, Council land, Crown land and private land. Most of the project will be assessed as a Part 5 activity under the NSW *Planning and Assessment Act 1979.* Sections of the trail and the proposed Fisheries Beach campground that require a Development Application are assessed separately to this report.

Survey Results

A site survey was carried out in December 2021 and included vegetation surveys, habitat assessments and fauna surveys. Additional threatened flora surveys were carried out in February 2022.

Habitat types across the study area are variable and include open forest, shrubland, wetlands, beaches and estuaries. Seven threatened fauna species were found during surveys and consisted of five bird species and two microbats. All species are listed under the NSW BC Act, with one species, the Eastern Curlew, listed under the EPBC Act. A total of 19 threatened fauna species were found to have potential to occur within the site.

Vegetation communities across the study area largely comprise Dry and Wet Sclerophyll Open Forest. Areas of shrubland, heathland and saline wetlands also occur in localised areas. No threatened flora species were detected in the study area. One community within the site qualifies as a Threatened Ecological Community under the *BC Act* and the *EPBC Act* comprising Coastal Saltmarsh.

A range of common species were detected during surveys comprising 36 birds, 6 amphibians, 18 mammals and 4 reptiles.

Impact of the Proposal

The works generally be low impact, and vegetation removal will be avoided to the greatest extent possible by utilising existing tracks and designing the trail to go around mature trees. There will be some vegetation removal required for new trail sections, and this is generally limited to groundcover, shrubs and occasional small trees as described in Section 5.4 of this report.

There is potential for the works to result in indirect impacts on adjoining vegetation or faunal species utilising the site both during construction and operation of the walking trail. These include erosion and sedimentation, weed invasion, biosecurity risks, edge effects and increased noise at the time of construction. Specific mitigation measures are recommended to reduce the potential for indirect impacts.

Statutory Assessment Summary

State

Koala Habitat Protection SEPP 2021: Assessment of the proposal as per the Koala Habitat Protection SEPP is not required for Part 5 assessments.

Coastal Management SEPP 2018: There are several significant Coastal Wetlands within different portions of the subject site. The largest wetlands occur at Lake Curalo and the mouth of Towamba River. The trail will not pass through any coastal wetland but will occur within proximity zones around the Towamba River mouth. Consideration of potential indirect impacts has been discussed in Section 5.6 of his report.

Biodiversity Conservation Act and Regulation: The Biodiversity Offset Scheme (BOS) is an optional assessment pathway for Part 5 activities. The proponent has elected not to 'opt in' to the Biodiversity Offset Scheme. The recorded and potentially occurring species have been assessed as per the Test of Significance. This has determined that the proposal will not result in a significant effect on listed species or ecological communities, or their habitats.

Fisheries Management Act 1994: No species or ecological communities listed under the FM Act were recorded on site or are considered potential occurrences. No statutory assessment is required.

Federal

Assessment under the EPBC Act Matters of National Environmental Significance (MNES) determined that the impact of the proposal on MNES was unlikely to be significant. Hence referral to Department of Agriculture, Water and the Environment (DAWE) for approval is not required.

1. INTRODUCTION

1.1 Site Description

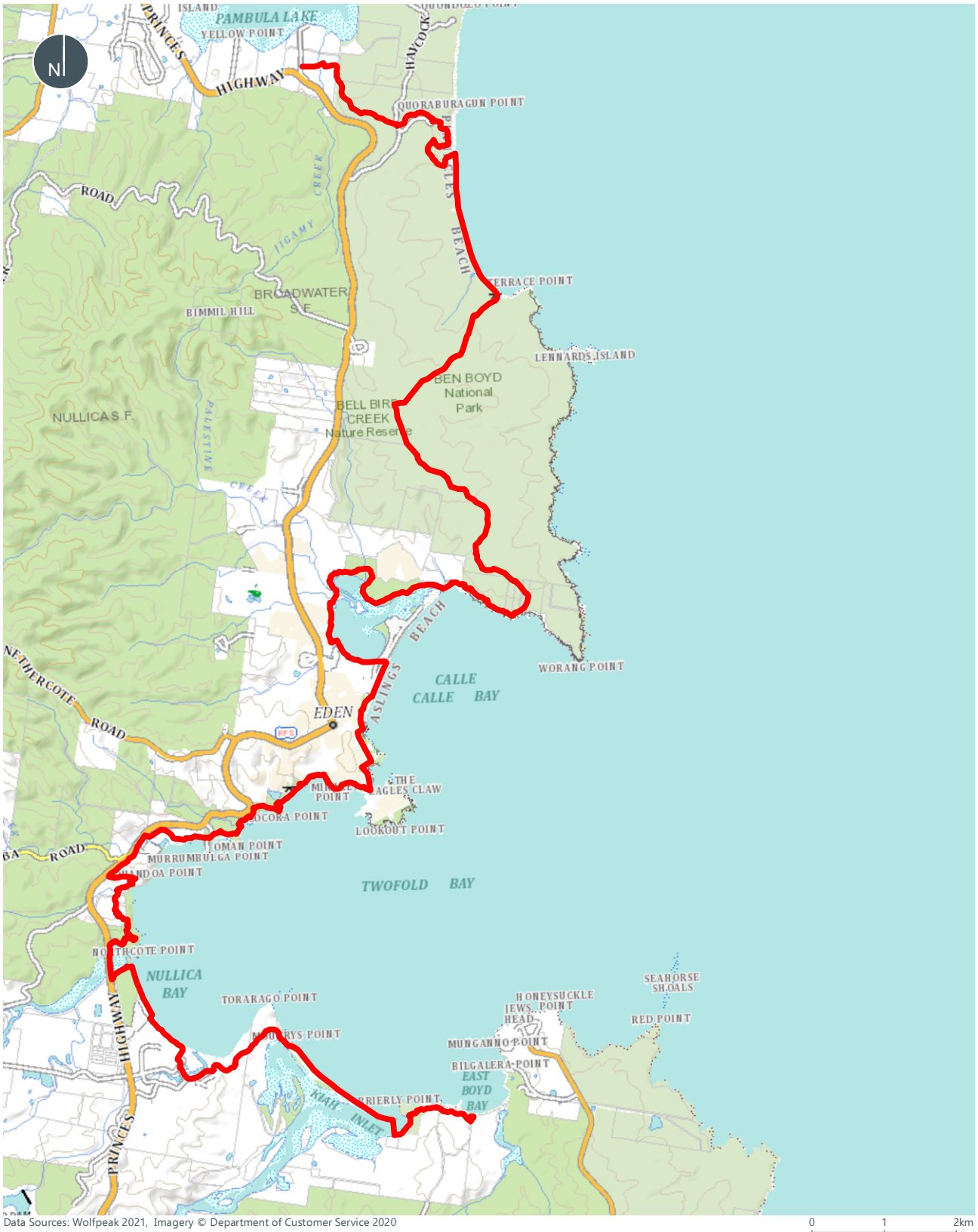
The subject site is described as Node 1 of the Bundian Way, comprising 34km of proposed hiking track. The site is located in Twofold Bay on the far South Coast region of NSW, between Pambula and Edrom. This section of coastline lies within the South East Corner Bioregion, forming part of the Towamba catchment.

The track begins at Jigamy Farm on the southern side of Pamula Lake, follows the coastline of Twofold Bay through Eden, and ends at Fisheries Beach in Edrom. The track passes through a number of different land tenures, including National Parks, Bega Valley Shire Council land, crown managed land, private properties and residential areas through Eden which hare collectively assessed in this report.

The location of the subject site is shown in Figure 1.

Table 1: Impact areas assessed in this report

Impact section	Distance	Responsible authority / land tenure
Area 1: Jigamy Farm to Haycock Road	2.2km	Twofold Aboriginal Council (Jigamy Farm) National Parks and Wildlife Service
Area 2: The Pinnacles, Ben Boyd NP	0.75km	National Parks and Wildlife Service
Area 3: North Head Track cliff line, Ben Boyd NP	1.5km	National Parks and Wildlife Service
Area 4: Curalo Lagoon entrance	0.3km	Bega Valley Shire Council Managed Crown Land
Area 5: Victoria Terrace to Cattle Bay, Eden	0.5km	Bega Valley Shire Council Managed Crown Land Freehold Land
Area 6: Shadrach's Bridge	0.3km	Crown waterway – Shadrachs Easement Big 4 Caravan Park
Area 7: Northcote Point and Nullica River	0.7km	Bega Valley Shire Council Managed Crown Land Crown reserve / Council managed road reserve
Area 8: Moutrys Point	0.15km	Crown land Boydtown Pastoral
Area 9: Davidson Whaling Station to Fisheries Beach	0.85km	Eden Local Aboriginal Land Council NPWS Estate: Davidson Whaling Station



Data Sources: Wolfpeak 2021, Imagery © Department of Customer Service 2020

0 1 2km

GDA2020 MGA Zone 56 1:79,206 @ A4

Legend

Bundian Way Trail

Figure 1 | Locality

1.2 Key Definitions

The following definitions are used in this report.

Table 2: Key definitions

Term	Definition
Subject Site	Refers to the Bundian Way Node 1 trail.
Activity Footprint/impact area	Refers to the area of direct impacts on vegetation and habitat associated with the proposal. Nine impact/disturbance area sections are defined and assessed.
Study Area	Includes the subject site (trail) plus 10 metres either side.
Locality	The Locality is specified as a 10 km polygon around the subject site.

2. ACTIVITY SCOPE

The activity involves the construction of Node 1 of the Bundian Way on the south coast of NSW. This will comprise track construction and installation of associated infrastructure including steps, footbridges, viewing platforms and interpretive signage.

The trail will utilise existing sections of trail or roads which cover approximately 30% of its 34km length. The remaining trail will require new walking track to be constructed on existing informal or poorly defined bush tracks or in areas where no track currently exists. This report focuses on areas where new tracks will be constructed and will require vegetation and habitat removal. The description of work required and extent of habitat affected for each area of new trial are detailed further in the following sections. Maps of these new trail sections are provided in Figures 2 to 8.

Laydown areas for track construction works will also be required. These will be located in existing cleared areas where possible and are unlikely to require vegetation removal.

2.1.1 Jigamy Farm to Haycock Road

This section comprises informal bush track leading from Jigamy Farm up a gentle forested slope into Ben Boyd National Park, where no formal trail is present. Some areas are overgrown with dense undergrowth. Works here will involve:

- Removal of groundcover and occasional shrubs and undergrowth
- Track establishment

2.1.2 The Pinnacles, Ben Boyd NP

An existing well-maintained track occurs as a loop around The Pinnacles, beginning at the carpark. Track will need to be established from Haycock Road to the carpark, and from the southern side of

the established loop to skirt around The Pinnacles and access Ben Boyd beach. The works comprise the following:

- Removal of groundcover and occasional shrubs and undergrowth
- Track establishment
- Install stairs to access Ben Boyd Beach

2.1.3 North Head Track cliff line, Ben Boyd NP

The route through Ben Boyd NP follows the North Head track which is well established and will not require any works. The last section along the southern cliff line comprises an informal bush track that will need to be formalised. This will involve:

- Removal of several Coastal Tea Tree shrubs
- Removal of groundcover and occasional shrubs
- Track widening and formalisation
- Access stairway down to Aslings Beach

2.1.4 Lake Curalo

The track accesses Lake Curalo from Aslings Beach. A boardwalk and crushed granite track circumnavigates Lake Curalo. Wooden platforms are proposed to connect the track from Aslings Beach to Lake Curalo over a series of rock platforms. Works will comprise:

- Installation of 3 timber boardwalk sections onto rock platform
- Possible removal of overhanging tree limbs

2.1.5 Victoria Terrace to Cattle Bay, Eden

From Lake Curalo, the track goes along Aslings beach and residential streets in Eden. A small section around Snug Cove to Victoria Terrace has been developed by the Eden Local Aboriginal Land Council (Whale Dreaming Track), which includes viewing platforms and interpretive signage. A new section of track needs to be established at the end of this section from Victoria Terrace to Cattle Bay. This largely passes behind houses and below the road. Works required here involves:

- Removal of shrubs and occasional small trees in bushland adjacent to Victoria terrace
- Removal of groundcover in footprint of new track
- Installation of stairs down to Cattle Bay

2.1.6 Shadrachs Bridge

Existing tracks occurs from Cattle Bay to just before the approach to Shadrachs Bridge. From here, the following works will be required:

- Minor vegetation removal on northern side of Shadrachs Bridge

- Track establishment along the northern bank of Shadrachs Creek to the bridge
- Construction of footbridge attached to existing concrete bridge
- Construction of platform/landing and stairs on southern side of Shadrachs Bridge
- Track establishment from southern end of the bridge to clearing opposite Big4 Caravan Park which will require removal of shrubs, small trees and limb pruning.

2.1.7 Nullica River

An old track through open forest with occasional marker posts winds behind the Princes Highway from Quandoa Point to Nullica River. Works here involve:

- Formalising existing track
- Minor extent of groundcover and shrub removal in track footprint
- New track to be established on the northern approach to the bridge over Nullica River (with existing pedestrian bridge)

2.1.8 Ben Boyd Parade to Moutreys Point

The trail meanders through Boydtown along the beach and streets, ending at Ben Boyd Parade. From here the route enters Boyd Pastoral land and follows an existing road towards Moutrys Point. Elevated platforms are proposed to be installed over rocks to the access Whale Beach sandspit. Works here involve:

- Possible removal of groundcover in areas where new track is needed
- Construction of platforms over rocks

2.1.9 Davidson Whaling Station to Fisheries Beach

From the canoe landing site on the Towamba River bank, existing tracks are followed past Davidson Whaling Station to Boyd Road. From here a rough track follows the headland before descending to Fisheries Beach and the proposed campground. Works here involve:

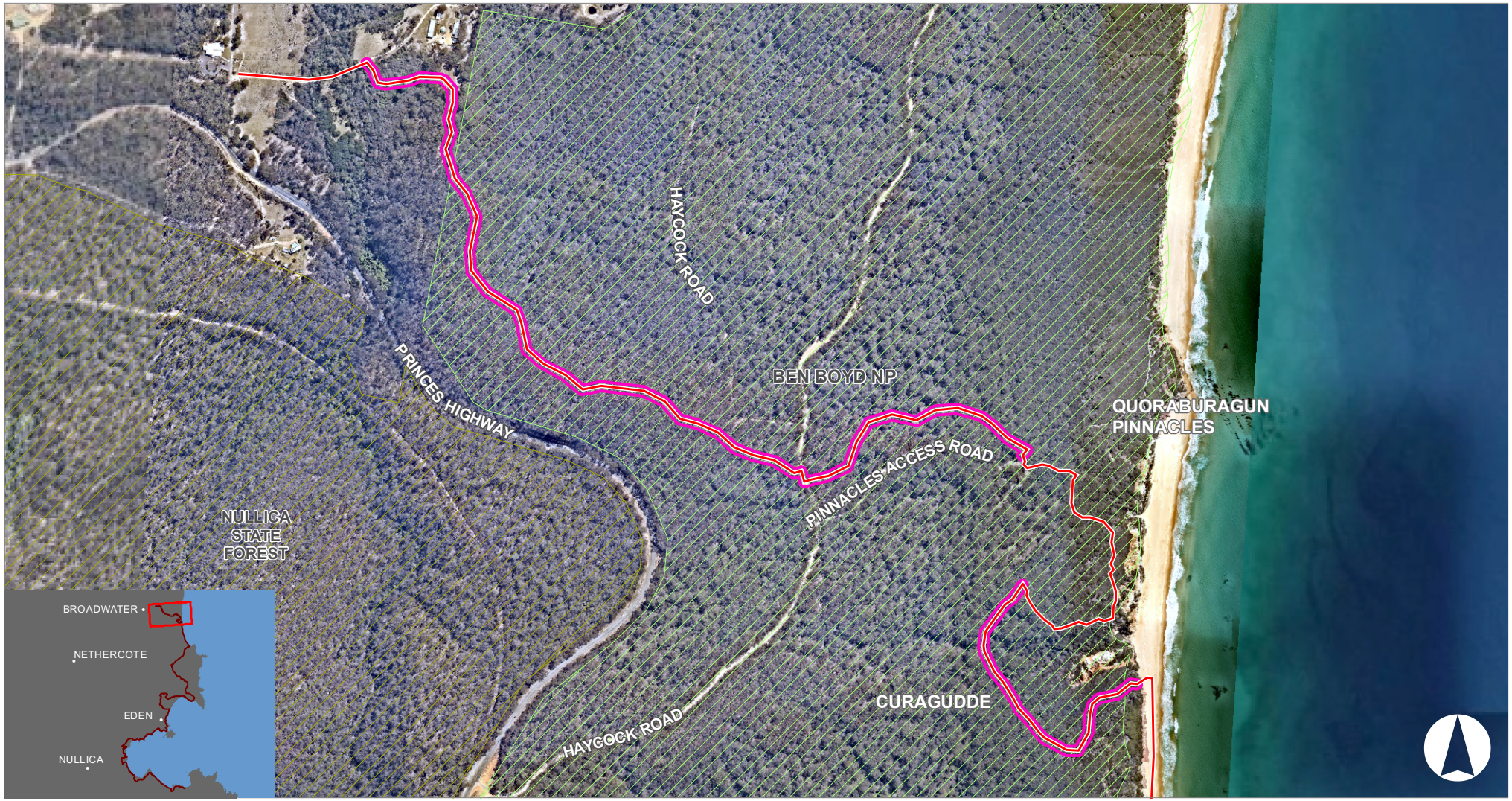
- Removal of groundcover and occasional shrubs and undergrowth
- Track establishment
- Installation of staircase down to Fisheries Beach campground

Photo 1: Ben Boyd Beach

Photo 2: The Pinnacles

Photo 3: Looking south to Cattle Bay

Photo 4: Final section of Node 1 trail near Fisheries Beach



Data Sources: Wolfpeak 2021, Imagery Nearmaps,

0 250 500m

GDA2020 MGA Zone 55 1:12,500 @ A4

Legend

- Bundian Way Trail
- Disturbance Areas
- National Park
- State forest

Figure 2 | Disturbance Area 1 and 2

Data Sources: Wolfpeak 2021, Imagery Nearmaps,

0 250 500m

GDA2020 MGA Zone 55 1:8,000 @ A4

Legend

Bundian Way Trail

National Park

Disturbance Areas

Figure 3 | Disturbance Area 3 and 4

Data Sources: Wolfpeak 2021, Imagery Nearmaps,

0 250 500m

GDA2020 MGA Zone 55 1:4,000 @ A4

Legend

- Bundian Way Trail
- Disturbance Areas

Figure 4 | Disturbance Area 5

Data Sources: Wolfpeak 2021, Imagery Nearmaps,

0 250 500m

GDA2020 MGA Zone 55 1:3,000 @ A4

Legend

- Bundian Way Trail
- Disturbance Areas

Figure 5 | Disturbance Area 6

Data Sources: Wolfpeak 2021, Imagery Nearmaps,

0 250 500m

GDA2020 MGA Zone 55 1:6,000 @ A4

Legend

- Bundian Way Trail
- Disturbance Areas
- State forest

Figure 6 | Disturbance Area 7

Data Sources: Wolfpeak 2021, Imagery Nearmaps,

0 250 500m

GDA2020 MGA Zone 55 1:8,000 @ A4

Legend

Bundian Way Trail

Disturbance Areas

Figure 7 | Disturbance Area 8

Data Sources: Wolfpeak 2021, Imagery Nearmaps,

0 250 500m

GDA2020 MGA Zone 55 1:5,000 @ A4

Legend

Bundian Way Trail

Historic Site

Disturbance Areas

Figure 8 | Disturbance Area 9

3. LEGISLATIVE CONTEXT

3.1 Commonwealth

3.1.1 Environment Protection and Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is Australia's central piece of environmental legislation. It provides the legal framework to manage and protect, nationally important flora, fauna, ecological communities and heritage places.

The objectives of the EPBC Act are to:

- Provide streamlined national environmental assessment and approvals process;
- Provide for the protection of the environment, especially matters of national environmental significance;
- Control international movement of plants and animals;
- Promote ecologically sustainable development through the conservation and ecologically sustainable use of natural resources;
- Recognise the role of the Indigenous people in the conservation and ecologically sustainable use of Australia's biodiversity; and
- Promote the use of indigenous people's knowledge of biodiversity with the involvement of, and in cooperation with, the owners of the knowledge.

This Act necessitates approval for any action that will have, or is likely to have, a significant impact on Matters of National Environmental Significance (MNES).

The MNES recognised under the EPBC Act that act as a trigger for the Commonwealth assessment and approval process include:

- world heritage properties;
- national heritage places;
- RAMSAR wetlands of international importance;
- listed threatened species and communities;
- listed migratory species;
- nuclear actions, including uranium mining;
- the Commonwealth marine environment;
- the Great Barrier Reef Marine Park; and
- a water resource in relation to coal seam gas development and large coal mining development.

3.2 New South Wales

3.2.1 Environmental Planning and Assessment Act 1979

The *Environmental Planning and Assessment Act 1979* (E&PA Act) sets out the planning laws for NSW. There are nine planning pathways for development assessment and approval and these include Part 4 (Development Assessment) and Part 5 (Environmental assessment).

The EP&A Act is accompanied by a range of Environmental Planning Instruments (EPIs) which include:

1) State Environmental Planning Policies (SEPP),
2) Regional Environmental Plans (REP),and
3) Local Environmental Plans (LEP)

3.2.2 State Environmental Planning Policy (Coastal Management) 2018

State Environmental Planning Policy (Coastal Management) 2018 (the Coastal SEPP) came into force on 3 April 2018. It was established as an integrated and co-ordinated approach to land-use planning in coastal zones. It repeals the *State Environmental Planning Policy No 14 – Coastal* Wetlands, *State Environmental Planning Policy No 26 – Littoral Rainforests* and the *State Environmental Planning Policy No 71 – Coastal Protection*.

The SEPP aims to be consistent with the objects of the *Coastal Management Act 2016*. It achieves this by:

1) Managing development in the coastal zone and protecting the environmental assets of the coast.
2) Establishing a framework for land use planning to aid decision-making in the coastal zone.
3) Mapping the 4 coastal management areas that comprise the NSW coastal zone.

3.2.3 Biodiversity Conservation Act and Regulation

The Biodiversity Conservation Act 2016 (BC Act) was passed by the NSW Parliament on 17th November 2016 and commenced on 25th August 2017. This piece of legislation replaced the *Threatened Species Conservation Act 1995*, *The Nature Conservation Trust Act 2001* and parts of the *National Parks and Wildlife Act 1974.*

The supporting Biodiversity Conservation Regulation was enacted on 25th August 2017.

The Biodiversity Conservation Act lists species and ecological communities in NSW that are either:

- Vulnerable

- Endangered
- Critically Endangered
- Extinct in the Wild

The BC Act also lists Threatening processes, Areas of Outstanding Biodiversity Value and provides an impact assessment framework for assessing impacts on threatened entities.

The Act sets out the Biodiversity Offset Scheme (BOS) to assess impacts on threatened biodiversity. The BOS is a mandatory assessment pathway for Part 4 developments which impact an area of vegetation exceeding a threshold, impact a mapped area of biodiversity values, or are deemed to result in a significant impact on biodiversity.

Part 5 developments and activities under the *Environmental Planning & Assessment Act 1979* are not required to enter into the Biodiversity Offset Scheme (BOS), as this is an optional assessment pathway.

Developments or activities which do not enter into the BOS are to be assessed as per the Test of Significance which is prescribed in Part 7, Division 1, Section 7.2 of the Act.

3.2.4 Fisheries Management Act 1994

The objects of the FM Act include the following:

- to conserve fish stocks and key fish habitats, and
- to conserve threatened species, populations and ecological communities of fish and marine vegetation, and
- to promote ecologically sustainable development, including the conservation of biological diversity, and, consistently with those objects
- to promote viable commercial fishing and aquaculture industries, and
- to promote quality recreational fishing opportunities, and
- to appropriately share fisheries resources between the users of those resources, and
- to provide social and economic benefits for the wider community of New South Wales, and
- to recognise the spiritual, social and customary significance to Aboriginal persons of fisheries resources and to protect, and promote the continuation of, Aboriginal cultural fishing.

The FM Act lists threatened fish species and aquatic ecological communities as well as critical habitat listings and key threatening processes. Section 221ZV of the Act prescribes a guideline to assess if a proposed development or activity likely to significantly affect threatened species, population or ecological community.

4. NATURAL VALUES ASSESSMENT

4.1 Desktop Analysis

4.1.1 Data Accessed

A desktop study was carried out prior to the field survey to gather relevant information and data. The following databases and Geographic Information System (GIS) layers were searched/obtained:

- Department of Agriculture, Water and Environment Protected Matters Search Tool (DAWE 2022).
- NSW BioNet records (DPIE 2022a).
- NSW Threatened Biodiversity Data Collection (DPIE 2022b).
- Coastal Management SEPP Map Viewer (DPIE 2022).
- State Vegetation Type Map
- Australian Soil Classification (ASC) soil type map of NSW (DPIE 2020)
- Coastal Quaternary Geology –South Coast of NSW digital data layer (Troedson & Hashimoto 2008).

The following literature was reviewed:

- Ben Boyd National Park and Bellbird Creek Nature Reserve Plan of Management (DPIE 2021)
- Report On The Post-Fire Vegetation Of Fisheries Flat (J. Miles 2021)

4.1.2 Desktop Search Results

The following table lists the threatened flora and fauna species identified in database and literature searches. The search area consists of a 10km radius around the subject site.

Table 3: Locally recorded threatened species

Common Name	Scientific Name	BC Act	EPBC Act	Source
Flora				
Merimbula Star-hair	*Astrotricha sp. Wallagaraugh*	E		Bionet
Narrow-leafed Wilsonia	*Wilsonia backhousei*	V	-	Bionet
Oval-leafed Pseudanthus	*Pseudanthus ovalifolius*	E	-	Bionet
David's Westringia	*Westringia davidii*	V	V	Bionet
Leafless Tongue Orchid	*Cryptostylis hunteriana*	V	V	Bionet
Rhyolite Midge Orchid	*Genoplesium rhyoliticum*	E	E	Bionet
Bodalla Pomaderris	*Pomaderris bodalla*	V	-	Bionet

Common Name	Scientific Name	BC Act	EPBC Act	Source
Ralston's Leionema	*Leionema ralstonii*	V	V	Bionet
Shapely Zieria	*Zieria formosa*	E	E	Bionet
Hidden Violet	*Viola cleistogamoides*	E	-	Bionet
Amphibians				
Green and Golden Bell Frog	*Litoria aurea*	E	V	Bionet
Giant Burrowing Frog	*Heleioporus australiacus*	V	V	Bionet
Birds				
Regent Honeyeater	*Anthochaera phrygia*	CE	CE	Bionet
Dusky Woodswallow	*Artamus cyanopterus cyanopterus*	V	-	Bionet
Glossy Black Cockatoo	*Calyptorhynchus lathami*	V	-	Bionet
Shy Albatross	*Thalassarche cauta*	V	V	Bionet
Campbell Albatross	*Thalassarche impavida*	P	V	Bionet
Little Lorikeet	*Glossopsitta pusilla*	V	-	Bionet
White-bellied Sea Eagle	*Haliaeetus leucogaster*	V	M	Bionet
White-throated Needletail	*Hirundapus caudacutus*	-	V	Bionet
Black-browed Albatross	*Thalassarche melanophris*	V	V	Bionet
Black Bittern	*Ixobrychus flavicollis*	V	-	Bionet
Square-tailed Kite	*Lophoictinia isura*	V	-	Bionet
Powerful Owl	*Ninox strenua*	V	-	Bionet
Eastern Osprey	*Pandion cristatus*	V	-	Bionet
Masked Owl	*Tyto novaehollandiae*	V	-	Bionet
Sooty Owl	*Tyto tenebricosa*	V	-	Bionet
Gang-gang Cockatoo	*Callocephalon fimbriatum*	V	-	Bionet
Eastern Curlew	*Numenius madagascariensis*	P	CE	Bionet
Black-tailed Godwit	*Limosa limosa*	V	-	Bionet
Bar-tailed Godwit (baueri)	*Limosa lapponica baueri*	P	V	Bionet
Little Eagle	*Hieraaetus morphnoides*	V	-	Bionet
Eastern Hooded Dotterel	*Thinornis cucullatus cucullatus*	E	V	Bionet
Curlew Sandpiper	*Calidris ferruginea*	E	CE	Bionet
Little Tern	*Sternula albifrons*	E	-	Bionet
Beach Stone-curlew	*Esacus magnirostris*	E	-	Bionet
Sooty Oystercatcher	*Haematopus fuliginosus*	V	-	Bionet
Pied Oystercatcher	*Haematopus longirostris*	E	-	Bionet

Common Name	Scientific Name	BC Act	EPBC Act	Source
Eastern Ground Parrot	*Pezoporus wallicus wallicus*	V		
Swift Parrot	*Lathamus discolor*	E	CE	Bionet
Barking Owl	*Ninox connivens*	V	-	Bionet
Brown Treecreeper (eastern subspecies)	*Climacteris picumnus victoriae*	V	-	Bionet
White-fronted Chat	*Epthianura albifrons*	V	-	Bionet
Varied Sittella	*Daphoenositta chrysoptera*	V	-	Bionet
Scarlet Robin	*Petroica boodang*	V	-	Bionet
Flame Robin	*Petroica phoenicea*	V	-	Bionet
Mammals				
Spotted-Tailed Quoll	*Dasyurus maculatus*	V	E	Bionet
Grey-headed Flying-fox	*Pteropus poliocephalus*	V	V	Bionet
Little Bentwing Bat	*Miniopterus australis*	V	-	Bionet
Large Bentwing Bat	*Miniopterus orianae oceanensis*	V	-	Bionet
Yellow-bellied Glider	*Petaurus australis*	V	-	Bionet
Squirrel Glider	*Petaurus norfolcensis*	V	-	Bionet
Greater Glider	*Petauroides volans*	-	V	Bionet
Brush-tailed Phascogale	*Phascogale tapoatafa*	V	-	Bionet
Koala	*Phascolarctos cinereus*	V	V	Bionet
Eastern Coastal Free-tailed Bat	*Micronomus norfolkensis*	V	-	Bionet
Southern Myotis	*Myotis macropus*	V	-	Bionet
Greater Broad-nosed Bat	*Scoteanax rueppellii*	V	-	Bionet
Long-nosed Potoroo	*Potorous tridactylus*	V	V	Bionet
Common Blossom-bat	*Syconycteris australis*	V	-	Bionet
Eastern Long-eared Bat	*Nyctophilus bifax*	V	-	Bionet
Golden-tipped Bat	*Phoniscus papuensis*	V	-	Bionet
Eastern False Pipistrelle	*Falsistrellus tasmaniensis*	V	-	Bionet
Yellow-bellied Sheathtail-bat	*Saccolaimus flaviventris*	V	-	Bionet
Eastern Pygmy-possum	*Cercartetus nanus*	V	-	Bionet
Southern Brown Bandicoot (eastern)	*Isoodon obesulus obesulus*	E	E	Bionet
White-footed Dunnart	*Sminthopsis leucopus*	V	-	Bionet
Key: Critically Endangered (CE), Endangered (E), Vulnerable (V), Migratory (M).				

4.1.3 Matters of National Environmental Significance

The results of the MNES search are provided below. The search was undertaken using a ten-kilometre search radius from the subject site. See Appendix 4 for the full report.

Table 4: MNES Search results

Category	Result	Description
National Heritage Places	None	-
Wetlands of International Importance	None	-
Great Barrier Reef Marine Park	None	-
Commonwealth Marine Area	1	EEZ and Territorial Sea
Listed Threatened Ecological Communities	4	Four listed threatened ecological communities are listed as likely to occur within the locality.
Listed Threatened Species	78	Species or species habitat is known/likely/may occur within the locality.
Listed Migratory Species	53	Migratory wetland, terrestrial and marine species or species habitat is known/likely/may occur within the locality.
Other matters protected by the EPBC Act		
Commonwealth Land	2	Refer to full report in Appendix 4
Commonwealth Heritage Places	None	Refer to full report in Appendix 4
Listed Marine Species	82	Species or species habitat is known/likely/may occur within the locality.
Whales and other Cetaceans	14	Species or species habitat is known/likely/may occur within the locality.
Critical Habitats	None	-
Commonwealth Reserves - Terrestrial	None	-
Commonwealth Reserves - Marine	None	-

4.2 Landscape Values

4.2.1 Drainage Features

Given the site of the study area, there are a large number of drainage lines and aquatic features identified. For the purpose of this report, the focus will largely be on the more significant rivers and outlets which not only are found within the subject site, but they are crossed and traversed, and provide a feature of the Bundian Way walking track. These comprise Shadrach's Creek, Nullica River and Towamba River, in order from north to south.

Shadrachs Creek is a fourth order stream which crosses the Bundian Way near Quarantine Bay, just to the south of Eden. It is approximately 20m wide and will be traversed via a pedestrian footbridge that will be affixed to the existing road bridge.

Nullica River occurs further south, just north of Boydtown, and is a fourth order stream approximately 130m in width at the bridge. A footbridge already exists for this crossing. Lastly, Towamba River is a fourth order stream crossing at the very southern section of the Bundian Way. It is approximately 140m wide from the end of the spit and mainland, and will be traversed using kayaks and canoes.

A number of small creeks, both permanent and ephemeral, also pass through the subject site.

4.2.2 Coastal Wetlands

There are several significant wetlands within different portions of the subject site. The largest wetlands occur at Lake Curalo and the mouth of Towamba River. These wetlands are listed as Coastal Wetlands under the Coastal Management SEPP 2018 and are shown in Figure 9 and 10. The trail does not pass through any mapped Coastal Wetlands.

4.2.3 Topography

The study area features a varied topography which ranges in elevation from sea level to approximately 140m. The Bundian Way follows the coastline closely for the majority of its length, with part of the northern section tending more inland along North Head in Ben Boyd National Park and towards Jigamy Farm. The track passes through a mix of low-lying coastal plains and beaches, gentle spurs and ridgelines, and steep cliffs along headlands.

4.2.4 Soils and Geology

Soil types within the project site vary with location. Kurosols are the dominant soil type. The coastal beach areas are sandy and comprise Rudosols and Podosols, with low lying wetland areas comprising Hydrosols. Kandosols line the headland along the northern section of Ben Boyd National Park.

In terms of bedrock geology, the project site is underlain by three predominant bedrock types; Late Devonian Merimbula Groups units (Ben Boyd and Worange Point Formations), Early Ordovician Abercrombie Formation and Pleistocene Alluvial Sediments. The beaches and estuaries are generally underlain by Holocone Estuarine Fluvial and Coastal deposits.

Alluvial soils occur in gullies, river flats, coastal zones and low-lying areas throughout the project site. Along the coast these compromise Coastal Barriers of marine sand. Estuarine areas are underlain by Estuarine Plain formations consisting of backswamps, tidal delta flats and in-channel bars. Moving upstream, alluvial floodplains, terraces and levees occur along the creeks and their tributaries. This mapping is shown in Figures 11 and 12.

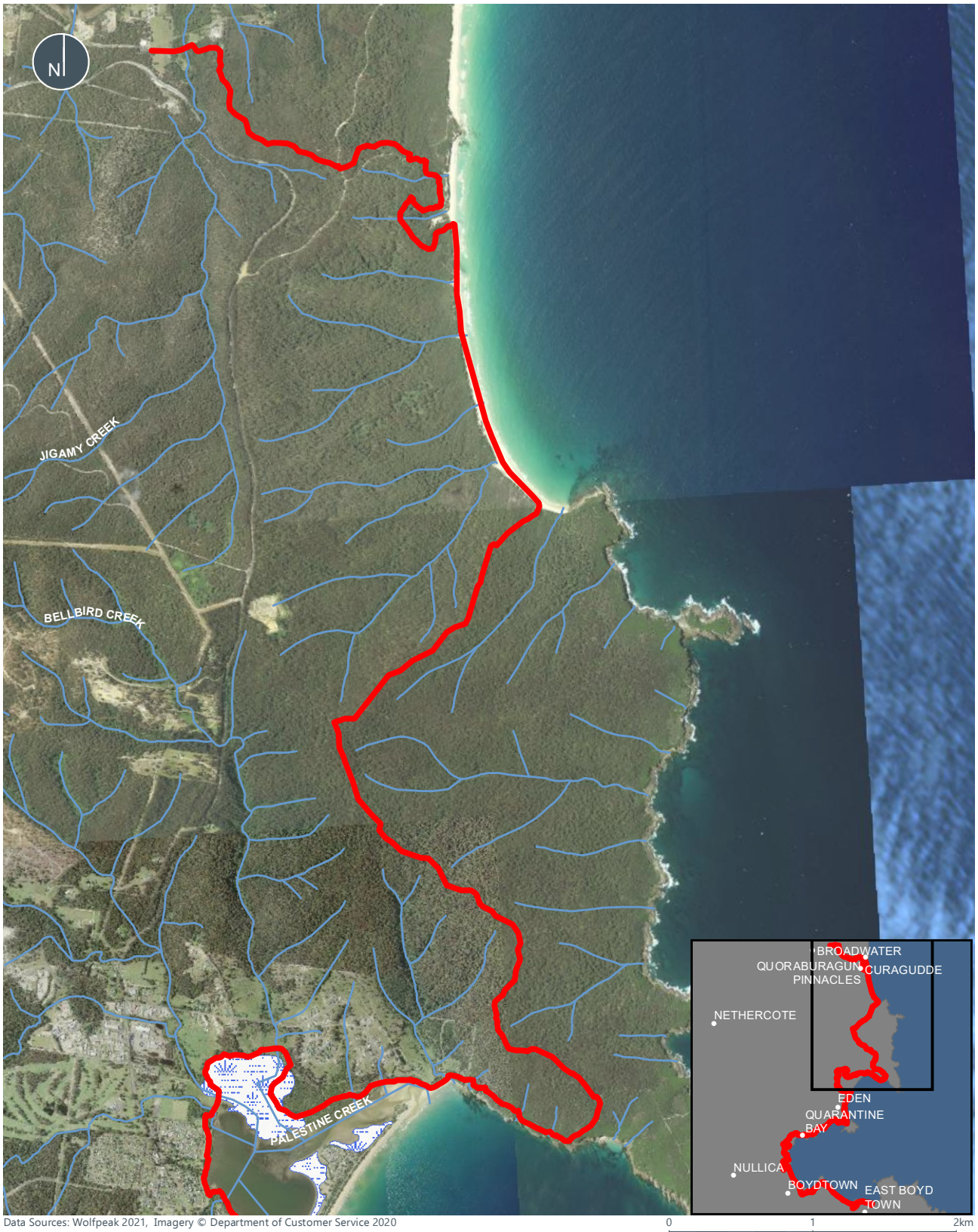


Figure 9 | Drainage Features and Wetlands (North)

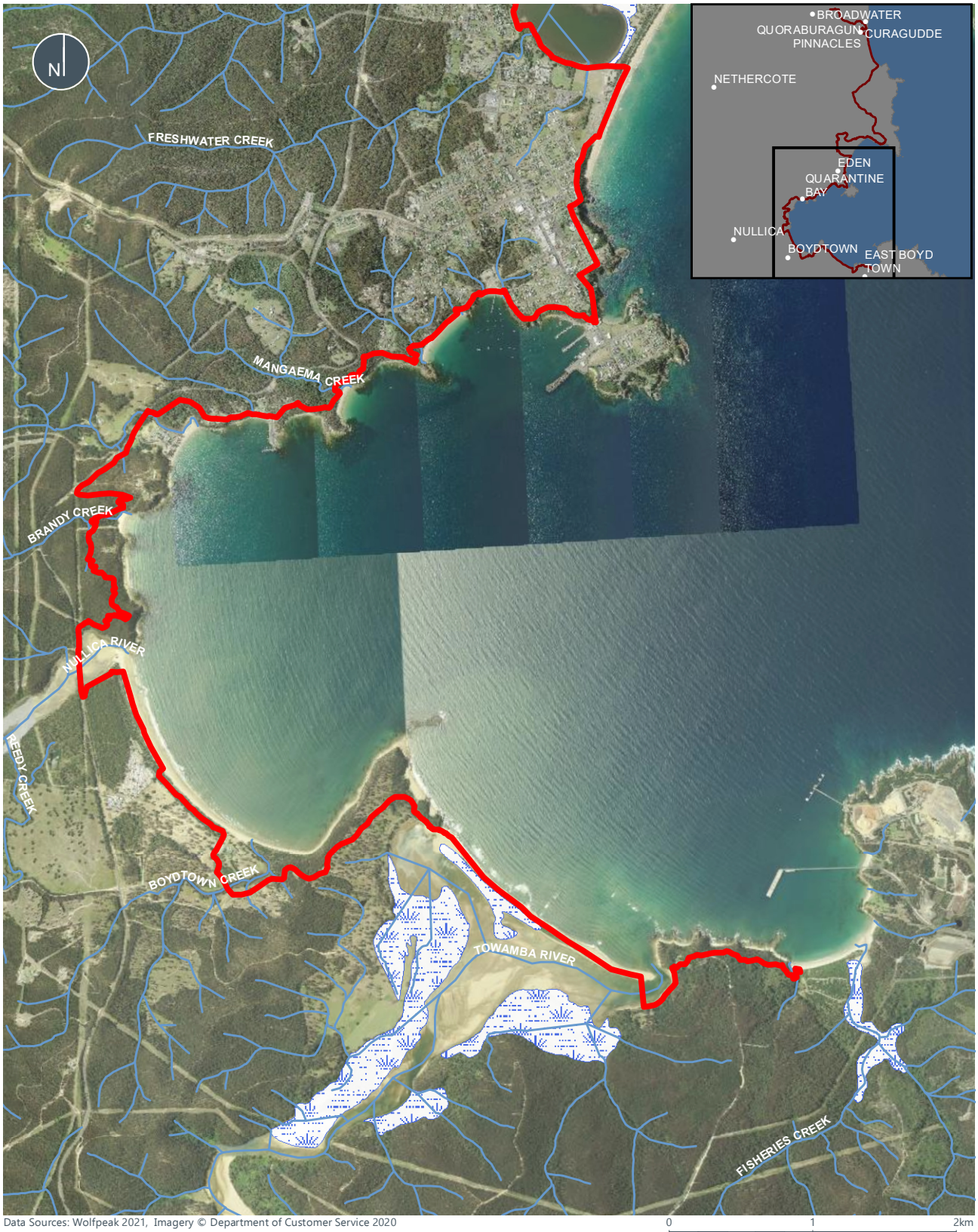


Figure 10 | Drainage Features and Wetlands (South)

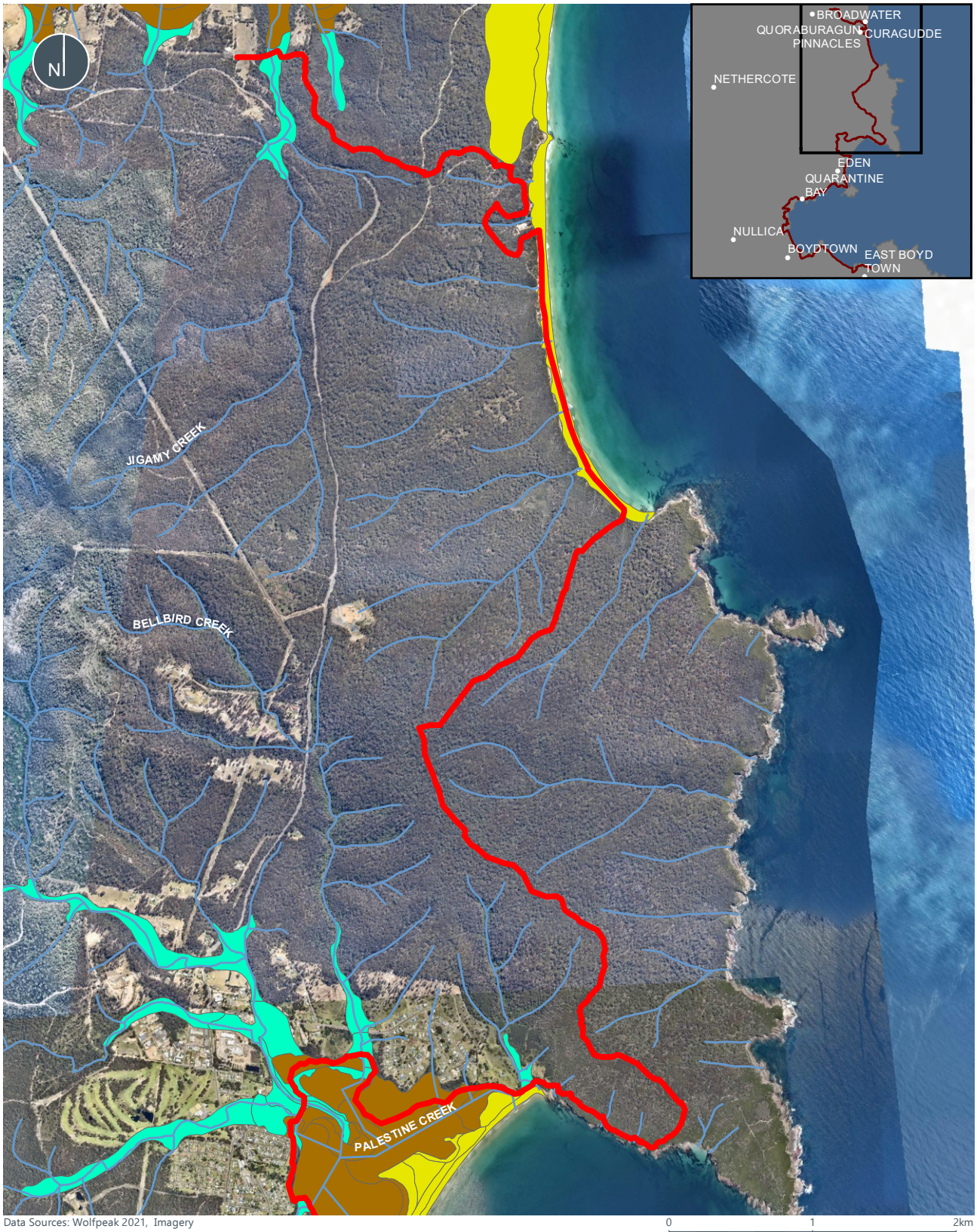


Figure 11 | Coastal Quaternary Geology (North)

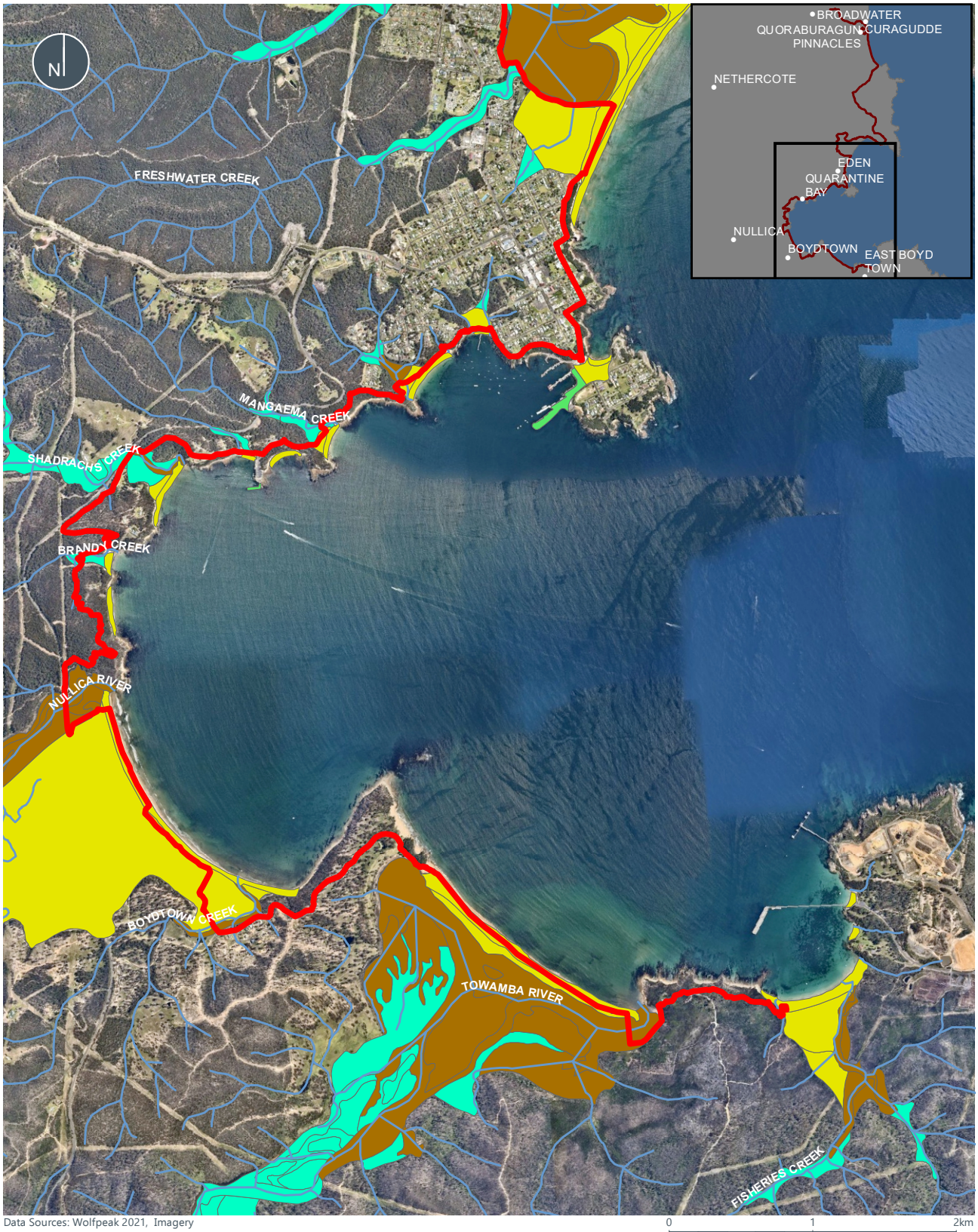


Figure 12 | Coastal Quaternary Geology (South)

4.3 Ecological Values

4.3.1 Flora Survey Methods

The flora survey consisted of the following:

- Desktop identification of vegetation communities across the whole subject site
- Vegetation survey plots and site descriptions within proposed disturbance areas and comparison to existing mapping.
- Searches for threatened species listed under the *Biodiversity Conservation Act 2016* (*BC Act*) *and Environment Protection and Biodiversity Conservation Act 1999* (*EPBC Act*)
- Identification of any Endangered Ecological Communities listed under the *BC Act*, and *EPBC Act*.

4.3.1.1 Vegetation Classification and Mapping

Existing vegetation community mapping for the subject site was initially reviewed. The South Coast Biometric Vegetation Map (DPIE 2014) and pre-release State Vegetation Type Map (SVTM) for the East Coast were used.

The field survey was undertaken by WolfPeak ecologists from 29th November to 3rd December 2021. The field survey involved rapid vegetation plots and collation of a species list within proposed disturbance areas, identification of vegetation types to Plant Community Type (PCT) classification) and assessment of vegetation condition. Table 5 identifies the location of vegetation plots and the location is shown in Figure 13.

Table 5: Flora survey plots

ID	Location	Survey date	Survey time	Vegetation Formation
1	South of Davidson Whaling Station	30/11/2021	12:01	Dry Sclerophyll Forest (Shrubby subformation)
2	Adjacent to Shadrachs Creek	30/11/2021	16:14	Wet Sclerophyll Forests (Shrubby subformation)
3	Pinnacles new trail section	1/12/2021	10:28	Dry Sclerophyll Forest (Shrubby subformation)
4	Adjacent to Haycock rd	1/12/2021	15:26	Dry Sclerophyll Forest (Shrubby subformation)
5	South of cattle bay	2/12/2021	11:40	Wet Sclerophyll Forests (Shrubby subformation)
6	Terrace Beach track BBNP	3/12/2021	9:39	Dry Sclerophyll Forest (Shrubby subformation)
7	The Pinnacles	3/12/2021	10:57	Heathlands
8	Victoria Terrace	3/12/2021	13:02	Heathlands

ID	Location	Survey date	Survey time	Vegetation Formation
9	North head track on headland	3/12/2021	14:56	Dry Sclerophyll Forest (Shrubby subformation)

4.3.1.2 Endangered Ecological Community Identification

The subject site was assessed for the occurrence of State and Federal listed Endangered Ecological Communities. Identification of EECs was based on the EPBC SPRAT profiles and NSW Final Determination listings.

4.3.1.3 Threatened Flora Species

Searches for threatened plants were undertaken across the disturbance areas where new track will be constructed. The searches were undertaken by consultant Botanist James Schlunke in February 2022. Further information is provided in the Threatened Flora and EEC report in Appendix 2.

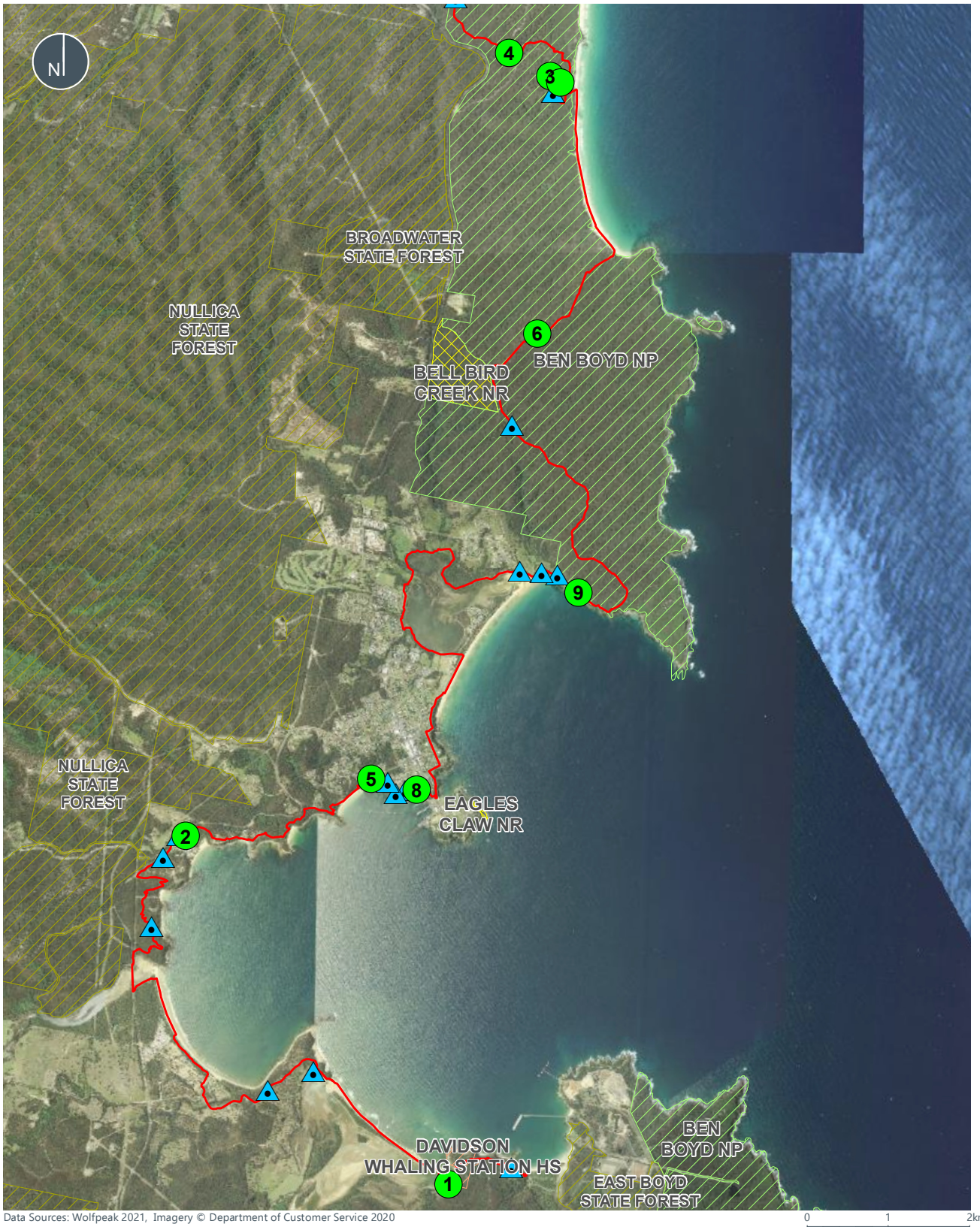


Figure 13 | Location of Vegetation Surveys

4.3.2 Fauna Survey Methods

In consideration of the potentially occurring fauna species in the study area, the following fauna survey methods were utilised:

- Qualitative and quantitate habitat evaluation
- Secondary evidence survey
- Diurnal bird survey
- Microbat call recording and analysis
- Spotlighting and torch searches
- PIR Cameras
- Hollow-bearing tree survey

These methods are detailed in the following sections. The fauna survey was undertaken over five days from 29th November – 3rd December 2021.

4.3.2.1 Habitat Evaluation

Habitats on and adjacent to the subject site were defined and assessed according to parameters such as:

- Structural and floristic characteristics of the vegetation
- Degree and extent of disturbance
- Size and abundance of tree hollows and fallen timber
- Surface rocks and outcrops
- Vegetation connectivity
- Presence of mistletoe, nectar, gum, seed and sap sources.

4.3.2.2 Secondary Evidence Searches

Habitat searches involved inspection and assessment of potentially suitable habits for potentially occurring threatened species: Searches generally involved:

- Inspection under fallen timber, rocks and debris
- Inspection of dense vegetation and leaf litter for frogs and reptiles
- Inspection of trees for Koalas and claw markings
- Searches for Glider sap incisions
- Searches for nests and dreys
- Searches for scats, owl regurgitation pellets, tracks and feeding signs
- Searches under bridges for signs of roosting microbats

4.3.2.3 Diurnal Bird Survey

Bird surveys consisted of five dedicated 30-minute bird surveys over four days and opportunistic surveys during other activities. Surveys were undertaken at Jigamy Farm, the Pinnacles, Victoria Terrace in Eden, Nullica Mouth Road and Fisheries Flat (Figure 14). All birds detected during the dedicated surveys and opportunistically were recorded.

4.3.2.4 Spotlighting and Torch Searches

Spotlighting searches were undertaken across the study area over three nights from 1-3 December. Spotlighting was undertaken for two hours each night via driving transects and on foot. Spotlighting was undertaken along North Head Track, Haycock Road and the Pinnacles Walking track in Ben Boyd National Park; and along the Lake Curalo walkway.

4.3.2.5 PIR Cameras

Five Reconyx Hyperfire and five Scoutguard Passive Infrared (PIR) trial cameras was set across the study area, primarily in areas where new sections of trail are required. The cameras were set for four nights and were attached to a tree facing a clearing or trail approximately 50cm off the ground. Six were baited with a mix of peanut butter, honey and rolled oats, two were baited with cat food to target Quolls and feral species and two were not baited. The location of PIR cameras is shown in Figure 14.

4.3.2.6 Microbat Call Recording and Analysis

An Anabat Swift unit (Titley Electronics) was set in the study area for four nights. For two nights it was set on a bank facing Shadrach's Creek near the bridge. For the remaining two nights it was set facing the boardwalk at Lake Curalo. The location of the Anabat is shown in Figure 14.

4.3.3 Survey Limitations

Given the limited timeframe of the site survey, it can only provide a snapshot of the full species assemblages that may be present on the site throughout the year. Some species only occur in particular seasons or climatic conditions and the detection of such species is recognised as a limitation.

The survey was undertaken in early Summer which a period of high fauna activity. Winter migrants such as the Swift Parrot and Regent Honeyeater would not be present. Heavy rains occurred prior to the survey period which may have increased amphibian activity.

Limitations on the detection of threatened flora species is discussed in the flora report in Appendix 2.

To counter any limitations, qualitative and quantitative habitat evaluation was used as well as a standard ecological field survey to assess the site's significance to threatened species.

4.3.4 Weather Conditions

Weather conditions during the survey were generally fine and sunny. Significant rainfall preceded the field survey. The nearest weather station (Tombong) recorded 134.2mm for the month of November and the highest daily rainfall total was 31.6mm on the 13th of November. In December, a

monthly total of 100.4mm was recorded, and the highest daily was 52.6mm on the 9th of December. Employing the Bombala station on Therry Street, The Bureau of Meteorology recorded a maximum temperature of 29°C and minimum temperature of 7.1°C over the survey period.

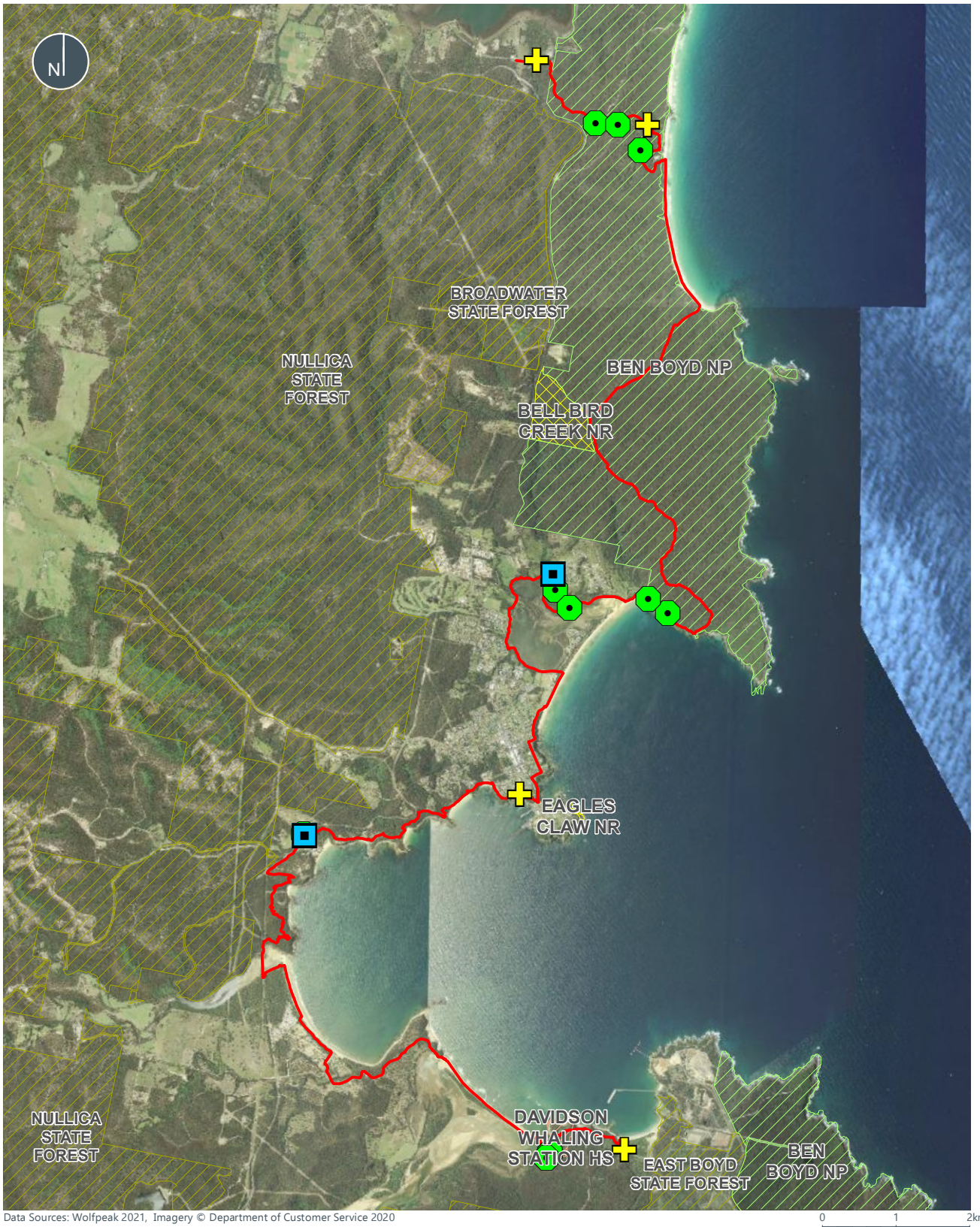


Figure 14 | Location of Fauna Surveys

4.3.5 Flora Survey Results

4.3.5.1 Vegetation Communities

Existing mapping shows that several vegetation formations occur across the subject site comprising Wet Sclerophyll Forest, Dry Sclerophyll Forest, Grassy Woodlands, Forested Wetlands, Saline Wetlands and Heathlands. Biometric Vegetation mapping shows 16 distinct vegetation communities across the site. These communities have been aligned with the best matching NSW Plant Community Type (PCT) in Table 6 below. Existing broad scale Vegetation community mapping across the study area is provided in Figures 15 to 18.

Table 6: Mapped vegetation communities within the study area

Mapped Biometric	Equivalent PCT	Formation	Landscape Position
SR512	**PCT 659:** Bangalay - Old-man Banksia open forest on coastal sands, Sydney Basin and South East Corner	Dry Sclerophyll Forests (Shrubby subformation)	Coastal areas on the Central and South Coasts
SR531	**PCT 772:** Coast Banksia - Coast Wattle dune scrub, Sydney Basin and South East Corner	Dry Sclerophyll Forests (Shrubby subformation)	Coastal sand mass frontal dunes and beach ridges
SR533	**PCT 777:** Coast Grey Box - Mountain Grey Gum - stringybark moist shrubby open forest in coastal gullies, southern South East Corner	Wet Sclerophyll Forests (Grassy subformation)	Steep gullies on the coastal range mainly between Merimbula and Narooma
SR544	**PCT 834:** Forest Red Gum - Rough-barked Apple - White Stringybark grassy woodlands on hills in dry valleys, southern South East Corner	Grassy Woodlands	Undulating terrain in the drier parts of the Araluen, Bega and Towamba valleys, usually on granitic substrates
SR559	**PCT 891:** Ironbark - Woollybutt - White Stringybark open forest on coastal hills, South East Corner	Dry Sclerophyll Forests (Shrubby subformation)	Steep slopes and on the coastal foothills
SR575	**PCT 920:** Mangrove forest in estuaries of the Sydney Basin and South East Corner	Saline Wetlands	Mudflats in rivers, coves and estuaries
SR583	**PCT 948:** Mountain Grey Gum ferny tall moist forest on coastal ranges, southern South East Corner	Wet Sclerophyll Forests (Shrubby subformation)	Widespread in gullies and moist sheltered slopes
SR596	**PCT 1084:** Red Bloodwood - Silvertop Ash - White Stringybark heathy open forest on coastal foothills, southern South East Corner	Dry Sclerophyll Forests (Shrubby subformation)	Low ridges and dry slopes in the coastal foothills and plains on metasediments or Tertiary alluvium

Mapped Biometric	Equivalent PCT	Formation	Landscape Position
SR608	**PCT 1108:** River Peppermint - Rough-barked Apple - River Oak herb/grass riparian forest of coastal lowlands, southern Sydney Basin and South East Corner	Forested Wetlands	Sandy alluvial flats, floodplain margins and riverine corridors
SR612	**PCT 1119:** Rough-barked Apple shrubby open forest on gully flats, southern South East Corner	Wet Sclerophyll Forests (Shrubby subformation)	Gully flats on Tertiary alluvium, Holocene sands or deep colluvial sandy soils
SR614	**PCT 1126:** Saltmarsh in estuaries of the Sydney Basin and South East Corner	Saline Wetlands	These marshes form plains that adjoin open water and mangroves
SR617	**PCT 1141:** Scrub She-oak - Swamp Banksia coastal lowland heath, southern South East Corner	Heathlands	Gentle slopes on coastal deposits of Tertiary alluvium and recent sands
SR623	**PCT 1149:** Silvertop Ash - Blue-leaved Stringybark shrubby open forest on hinterland hills, far southern South East Corner	Dry Sclerophyll Forests (Shrubby subformation)	Coastal mountain ridges, dry slopes and coastal plateaux on metasediments
SR630	**PCT 1157:** Silvertop Ash - Rough-barked Apple shrubby open forest on the hinterland hills, far southern South Eastern Corner	Dry Sclerophyll Forests (Shrubby subformation)	Coastal mountain ridges and coastal plateaux
SR651	**PCT 1236:** Swamp Paperbark - Swamp Oak tall shrubland on estuarine flats, Sydney Basin and South East Corner	Forested Wetlands	Coastal estuarine flats and margins of lagoons
SR672	**PCT 1337:** Yellow Stringybark - Mountain Grey Gum moist shrubby open forest on coastal ranges, southern South East Corner	Wet Sclerophyll Forests (Shrubby subformation)	Gullies and steep moist sheltered slopes, predominantly on metasediments of the coastal ranges

Figure 17 | Vegetation Mapping C

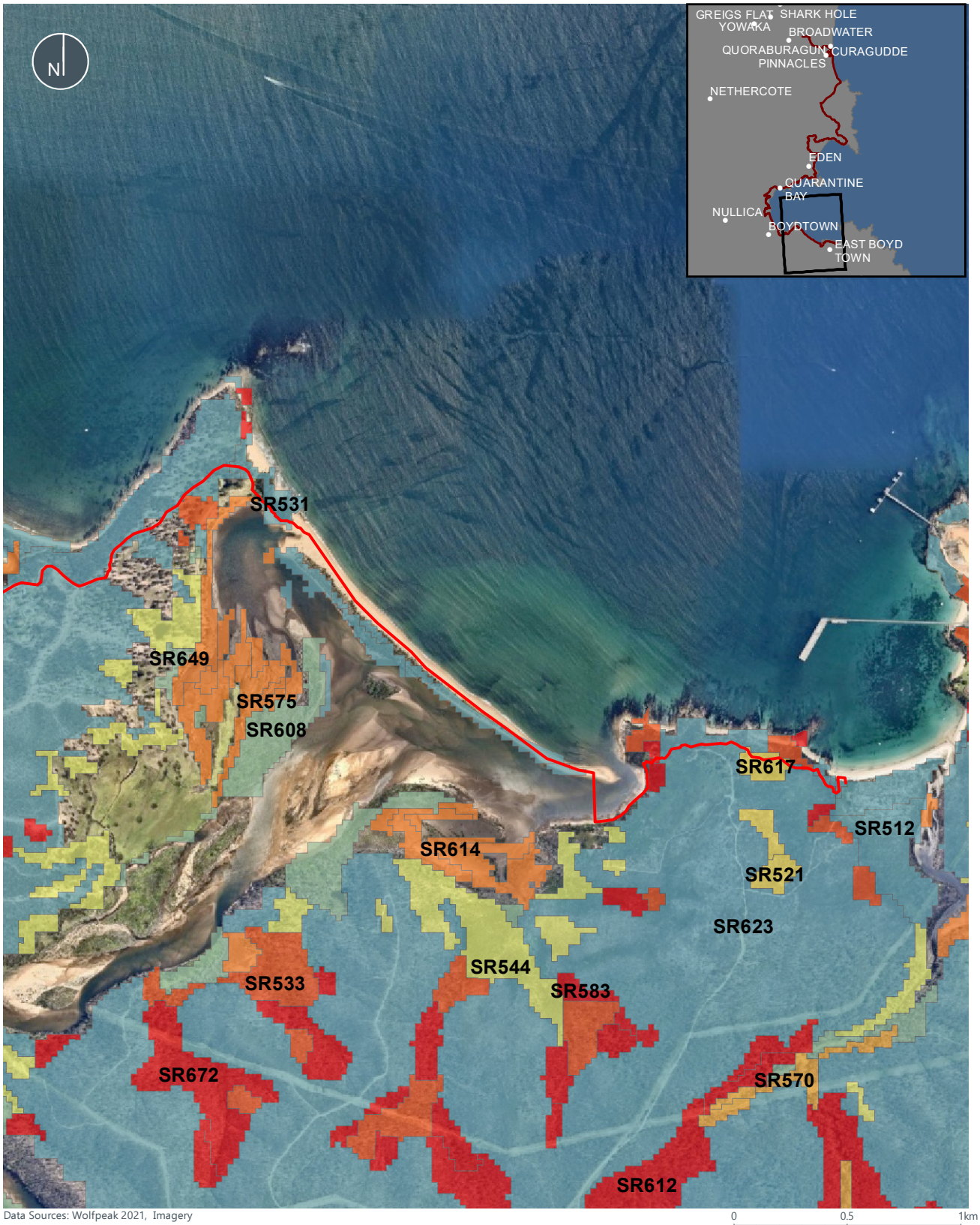
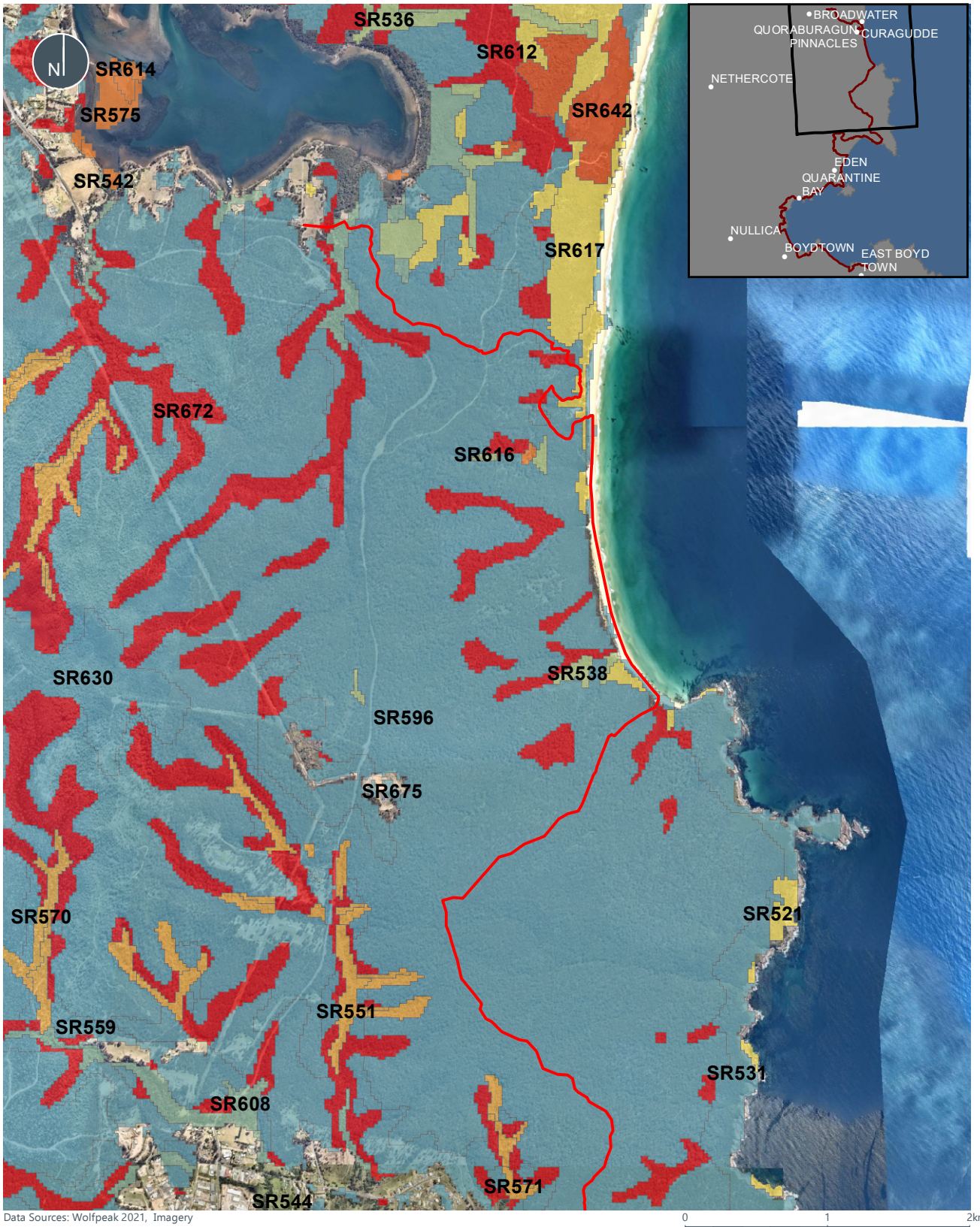


Figure 18 | Vegetation Mapping D



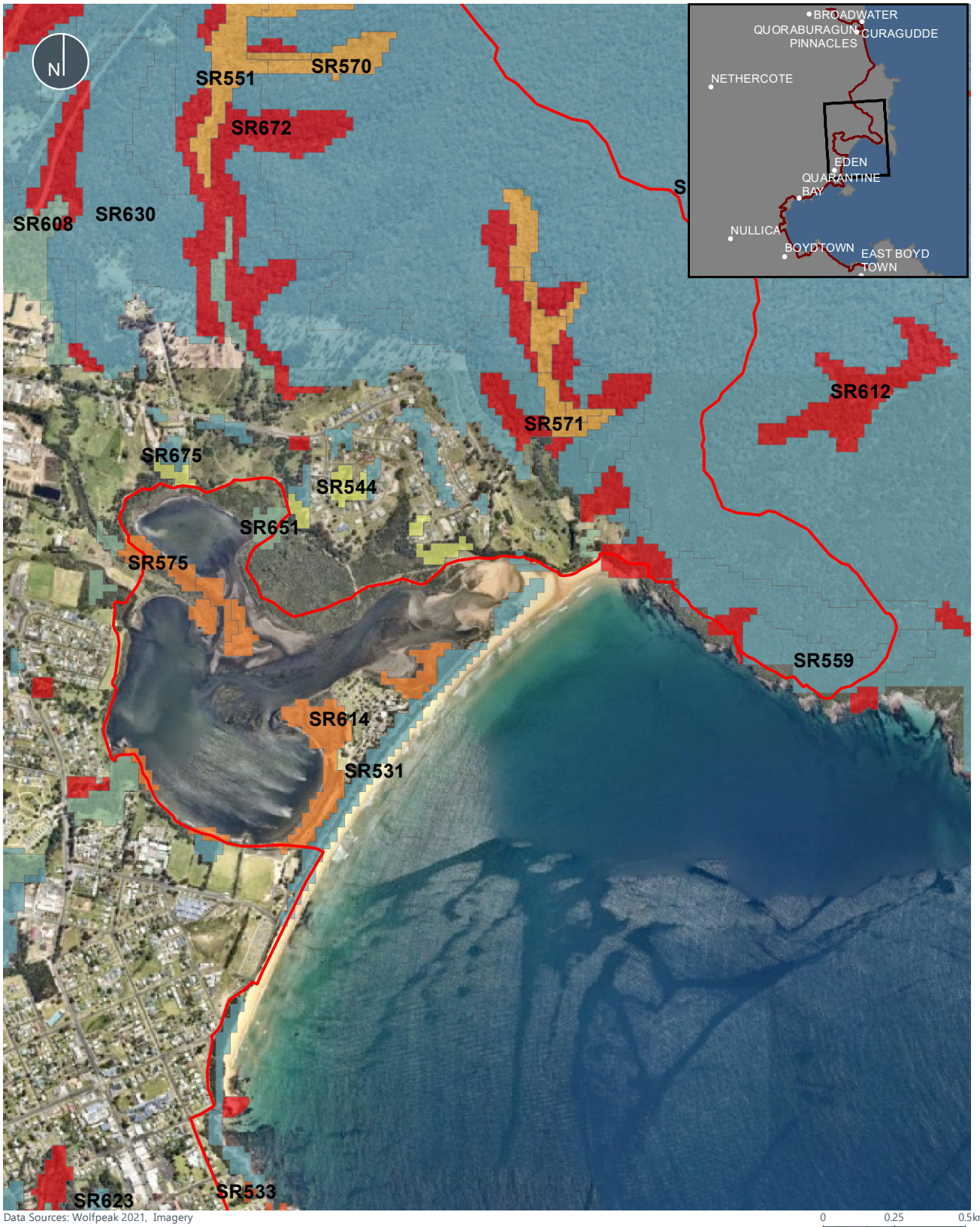
Legend

- Bundian Way Trail

Formation

- Dry Sclerophyll Forests (Shrubby subformation)
- Forested Wetlands
- Freshwater Wetlands
- Grassy Woodlands
- Heathlands
- Rainforests
- Saline Wetlands
- Wet Sclerophyll Forests (Grassy subformation)
- Wet Sclerophyll Forests (Shrubby subformation)

Figure 15 | Vegetation Mapping (North)



Data Sources: Wolfpeak 2021, Imagery

0 0.25 0.5km

GDA2020 MGA Zone 55 1:20,000 @ A4

Legend

- Bundian Way Trail

Formation

- Dry Sclerophyll Forests (Shrubby subformation)
- Forested Wetlands
- Grassy Woodlands
- Rainforests
- Saline Wetlands
- Wet Sclerophyll Forests (Grassy subformation)
- Wet Sclerophyll Forests (Shrubby subformation)

Figure 16 | Vegetation Mapping B

4.3.5.2 Vegetation Community Site Observations

Vegetation along the route was generally in good condition, however large sections were in a post fire recovery stage from the early 2020 bushfires. Some weed invasion was noted in the more disturbed areas near towns and roadsides.

A description of the vegetation present at the areas of new track/vegetation disturbance are provided in the following sections from north to south. Photos of the vegetation are provided following the description.

4.3.5.2.1 Haycock Road, Ben Boyd NP

The vegetation in the northern section of Ben Boyd National Park comprises a remnant sclerophyll forest community. Forest to the west of Haycock Road is recovering from the 2020 bushfires, with little understory and groundcover present. The community changes further to the east, with a more intact understorey of Banksia and bracken present. This is described in the following table.

Table 7: Vegetation community site description 4

NSW Plant Community Type (PCT)	**PCT 1084:** Red Bloodwood - Silvertop Ash - White Stringybark heathy open forest on coastal foothills, southern South East Corner
Biometric Type	**SR596**
EEC Status	Not an EEC
Condition	Moderate to good. Some areas are bushfire affected and regenerating. Weed cover is low.
Description	**Canopy:** *Structure and Species*: Comprises a layer of Silvertop Ash *(Eucalyptus sieberi)* and Red Bloodwood (*Corymbia gummifera)* ranging in height from 20-27 metres with a cover of approximately 40%. **Understory:** *Structure and Species:* A sparse understorey is present on the western side comprising Black She-Oak *(Allocasuarina littoralis)* and Red Bloodwood. On the eastern side the understorey is dominated by Old-man Banksia (*Banksia serrata)* with Black She-Oak also present. Height ranges from 8-12m with a cover of approximately 15% on the western side and 40% on the eastern side. **Shrub layer:** *Structure and Species*: The shrub layer is very sparse (5% cover), comprising *Persoonia sp.* and Hairpin Banksia *(Banksia spinulosa)*. Height ranges from 2-4m. **Ground layer:** *Structure and Species*: The groundcover is dominated by Bracken *(Pteridium esculentum)* with Spiny-Headed Mat-rush *(Lomandra longifolia)* also present. Approximate cover is 50%.

Photo 5: Post fire vegetation on western side of Haycock Road

Photo 6: Banksia dominated community on the eastern side of Haycock Road

4.3.5.2.2 The Pinnacles – new trail section

The vegetation present at the new trail section around the Pinnacles in Ben Boyd National Park is in good condition, comprising remnant forest with little disturbance. This is described in the following table.

Table 8: Vegetation community site description 3

NSW Plant Community Type (PCT)	**PCT 1084:** Red Bloodwood - Silvertop Ash - White Stringybark heathy open forest on coastal foothills, southern South East Corner
Bionetric Type	**SR596**
EEC Status	Not an EEC
Condition	This community comprises remnant forest in good condition with few signs of disturbance. Radiata Pine are common in some areas as a result of former forestry operations.
Description	**Canopy:** *Structure and Species*: Comprises Blackbutt (*Eucalyptus pilularis),* Red Bloodwood *(Corymbia gummifera)* and Radiata Pine (*Pinus radiata),* ranging in height from 20-28 metres with a cover of approximately 40%. **Understory:** *Structure and Species:* Comprises a mix of Coastal Cypress (*Callitris columellaris),* Black She-Oak and Radiata Pine. Height ranges from 14-18 metres with a cover of approximately 30%. **Shrub layer:** *Structure and Species*: The shrub layer is sparse (10% cover) and comprises Sweet Pittosporum (*Pittosporum undulatum)*, *Acacia sp*. and *Correa sp*. Height ranges from 4-8m. **Ground layer:** *Structure and Species*: The ground layer consists of grasses and sedges with dense leaf litter. Species recorded in this layer include *Lepidosperma sp., Poa sp*., Ivy-leaved Violet *(Viola hederacea)* and Australian Basket Grass (*Oplismenus aemulus).* Cover is approximately 60%.

Photo 7: New trail section at the Pinnacles

4.3.5.2.3 The Pinnacles – access to Ben Boyd Beach

The community present on the rocky slope down to the beach comprises low-lying, thick heath scrub in good condition. This is described in the following table.

The threatened flora and EEC report (Appendix 2) also identified a small patch of wet heath in this section of the trail which is a regionally rare community. See appendix 2 for detail.

Table 9: Vegetation community site description 7

NSW Plant Community Type (PCT)	**PCT 772:** Coast Banksia - Coast Wattle dune scrub, Sydney Basin and South East Corner **PCT 1141:** Scrub She-oak - Swamp Banksia coastal lowland heath, southern South East Corner
Biometric Type	**SR617**
EEC Status	Not an EEC
Condition	This community comprises thick coastal scrub in good condition. No weeds were identified.
Description	**Canopy:** *Structure and Species*: A very dense, low layer comprising Bracelet Honey-myrtle (M*elaleuca armillaris subsp armillaris),* Black She-Oak (*Allocasuarina littoralis)* and *Banksia spp.* Height ranges from 3-6m with 70% cover. **Understory:**

	Absent. **Shrub layer:** *Structure and Species*: The shrub layer is fairly sparse and includes Coastal Rosemary (*Westringia fruticosa), Lasiopetalum spp. and Epacris spp*. Height ranges from 0.3-1.5m with a cover of 20%. **Ground layer:** *Structure and Species*: The ground layer is sparse, consisting of a range of species including Purple Fan-flower (S*caevola ramosissima),* Germander Raspwort (G*onocarpus teucrioides)* and Zig-Zag Bog-rush (*Schoenus brevifolius).*

Photo 8: Heathland community

4.3.5.2.4 Victoria Terrace Eden

The vegetation adjacent to Victoria Terrace is in a highly disturbed state with high weed content and rubbish from the roadside.

Table 10: Vegetation community site description 8

NSW Plant Community Type (PCT)	**PCT 659:** Bangalay - Old-man Banksia open forest on coastal sands, Sydney Basin and South East Corner **PCT 1337:** Yellow Stringybark - Mountain Grey Gum moist shrubby open forest on coastal ranges, southern South East Corner
Biometric Type	**SR512** **SR672**
EEC Status	Not an EEC
Condition	Moderate poor condition. Some areas represent regrowth and have a high weed content.
Description	**Canopy:** *Structure and Species*: The eastern end comprises a dense layer of Bracelet Honey-myrtle and Sweet Pittosporum, with occasional Black She-Oak. It then changes to Coast Banksia, Melaleucas and scattered Eucalypts including Woolybutt and Mountain Grey Gum. Ranges in height from 13-18 metres with a cover of approximately 50%. **Understory:** *Structure and Species:* The main species in this layer is Sweet Pittosporum with some Green Wattle present. Height ranges from 6-10m with 25% cover. **Shrub layer:** Absent. **Ground layer:** *Structure and Species*: Groundcover is sparse, with a mix of native grasses, vines and weeds. Species include Panic Veldtgrass (*Ehrharta erecta),* Cape Ivy (*Delairea odorata)* and Australian Bearded Grass (*Oplismenus imbecillis).* Weed content is high around Victoria Terrace, with large patches of Acetosa, Cape Ivy, Nasturtium, Climbing Asparagus, Small-leaved Privet, Blackberry, Mustard and Compass Plant.

Photo 9: Vegetation adjacent to Victoria Terrace

4.3.5.2.5 Cattle Bay Road, Eden

Vegetation near Cattle Bay Road comprises open forest dominated by Silvertop Ash, Woolybutt and Bloodwood. It is in reasonably good condition with an intact canopy and shrub layer featuring a range of flowering shrub species. There is some erosion present from exiting informal tracks. Weed cover is low.

Table 11: Vegetation community site description 5

NSW Plant Community Type (PCT)	**PCT 772:** Coast Banksia - Coast Wattle dune scrub, Sydney Basin and South East Corner **PCT 777:** Coast Grey Box - Mountain Grey Gum - stringybark moist shrubby open forest in coastal gullies, southern South East Corner
Biometric Type	**SR672** **SR531**
EEC Status	Not an EEC
Condition	Moderate to good condition. Remnant vegetation present and low weed cover.
Description	**Canopy:** *Structure and Species*: The canopy layer is dominated by Silvertop Ash, Pink Bloodwood and Woollybutt. Height ranges from 15-23m and 30% cover. **Understory:**

	Structure and Species: The main species in this layer are Sweet Pittosporum, Coast Banksia, Black She-Oak and Bracelet Honey Myrtle. Height ranges from 4-12m. **Shrub layer:** A range of flowering shrubs are present including Notched Bush Pea, Lance Heath and Fringed Wattle. Height ranges from 0.5-3m. **Ground layer:** *Structure and Species*: Groundcover is sparse, with a mix of native grasses and herbs. Dominant species are Bracken, Spiny Matrush and Tussock Grass. Height is to 0.8m and cover is approximately 50%.

Photo 10: Open forest vegetation near Cattle Bay Road

4.3.5.2.6 Pedestrian Bridge at Shadrachs Creek

The vegetation near Shadrachs Creek is in moderately good condition with some weeds present. It has a sheltered aspect, and the understorey is very dense in places. The vegetation is described in the following table.

Table 12: Vegetation community site description 2

NSW Plant Community Type (PCT)	**PCT 948:** Mountain Grey Gum ferny tall moist forest on coastal ranges, southern South East Corner **PCT 1108:** River Peppermint - Rough-barked Apple - River Oak herb/grass riparian forest of coastal lowlands, southern Sydney Basin and South East Corner
Biometric Type	**SR583** **SR608**
EEC Status	Not and EEC
Condition	Moderate to good condition. Some areas have high weed invasion.
Description	**Canopy:** *Structure and Species*: The canopy comprises a mix of eucalypt species including Monkey Gum (*Eucalyptus cypellocarpa),* Woollybutt (*Eucalyptus longifolia),* Coast Grey Box (*Eucalyptus bosistoana)* and River Peppermint (*Eucalyptus elata).* Height ranges from 20-30 metres and cover is approximately 30%. **Understory:** *Structure and Species:* A well-developed understorey is present. Dominant species are Bracelet Honey-myrtle (*Melaleuca armillaris subsp armillaris),* Green Wattle (*Acacia irrorate)* and Sweet Pittosporum (*Pittosporum undulatum).* Height ranges in height from approximately 8-13 metres with a cover of approximately 20-40%. **Shrub layer:** *Structure and Species*: The shrub layer is moderately dense (40% cover) and is dominated by Sweet Pittosporum, *Senecio sp.,* Hop Goodenia (*Goodenia ovata)* and *Cassina sp.* Height ranges from 1-4 metres. **Ground layer:** *Structure and Species*: Groundcover is dense, and species recorded in this layer include Weeping Grass (*Microlaena stipoides),* Kangaroo Grass *(Themeda triandra), Gahnia sp.,* Blackberry and Bearded Oats (*Avena barbata).* Cover is approximately 60%.

Photo 11: Approach to Shadrachs Creek from the north

Photo 12: Southern side of Shadrachs Creek Bridge

4.3.5.2.7 Towamba River Crossing Landing Site

The vegetation on the banks of the Towamba River near Davidson's Whaling Station consists of Dry Sclerophyll Forest. The community is recovering post fire, with dense regrowth wattle dominating the understorey. This is described in the following table.

Table 13: Vegetation community site description 1

NSW Plant Community Type (PCT)	**PCT 1149**: Silvertop Ash - Blue-leaved Stringybark shrubby open forest on hinterland hills, far southern South East Corner.
Biometric Type	**SR623**
EEC Status	Not an EEC
Condition	This community is recovering from recent bushfires, with regrowth wattles and Cassinia sp. forming a dense shrub layer. Low weed cover.
Description	**Canopy:** *Structure and Species*: Comprises a mix of eucalypt species including Silvertop Ash and Woollybutt. Height ranges from 18-25 metres and cover is approximately 25%. **Understory:** *Structure and Species:* A dense later of small trees is present comprising Green Wattle (*Acacia irrorata*), Sticky Hop-bush (*Dodonaea viscosa)* and Cherry Ballart

NSW Plant Community Type (PCT)	**PCT 1149**: Silvertop Ash - Blue-leaved Stringybark shrubby open forest on hinterland hills, far southern South East Corner.
	(*Exocarpos cupressiformis),* and ranges in height from approximately 4-12 metres with a cover of approximately 40%. **Shrub layer:** *Structure and Species*: An open shrub layer present. Native species recorded in this layer include Green Wattle, *Cassinia sp*. and juvenile Black She-Oak (*Allocasuarina littoralis*). Height ranges from 0.5 – 1.5m with a cover of approximately 25%. **Ground layer:** *Structure and Species*: The ground layer comprises a mix of native grasses, herbs, and weeds. Dominant species include Weeping Grass (M*icrolaena stipoides),* Kidney Weed (*Dichondra repens)* and Flaxleaf Fleabane (*Conyza bonariensis),* with an approximate cover of 75%.

Photo 13: Vegetation at landing site

4.3.5.3 Endangered Ecological Communities

4.3.5.3.1 Biodiversity Conservation Act 2016

The Southeast NSW Native Vegetation Classification and Mapping shows six listed EECs are mapped within the study area consisting of:

- River-flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions
- Swamp sclerophyll forest on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions
- Freshwater wetlands on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions
- Bangalay Sand Forest in the Sydney Basin and South East Corner Bioregions
- Lowland Grassy Woodland in the South East Corner Bioregion
- Coastal Saltmarsh in the NSW North Coast, Sydney Basin and South East Corner Bioregions

Of these, Coastal Saltmarsh EEC has been confirmed to be present. Small patches of this community were recorded at Lake Curalo, Moutrys Point and Towamba River. The locations is shown in Figure 19. Further details and locations are provided in the Threatened Flora and EEC report in Appendix 2. No area of Coastal Saltmarsh will require removal, however indirect impacts are possible. Significance assessments have been undertaken in Section 5.5.

4.3.5.3.2 EPBC Act

Site surveys have confirmed the EPBC Act listed Threatened Ecological Community *Subtropical and Temperate Coastal Saltmarsh* within the study area. Details are provided in Appendix 2.

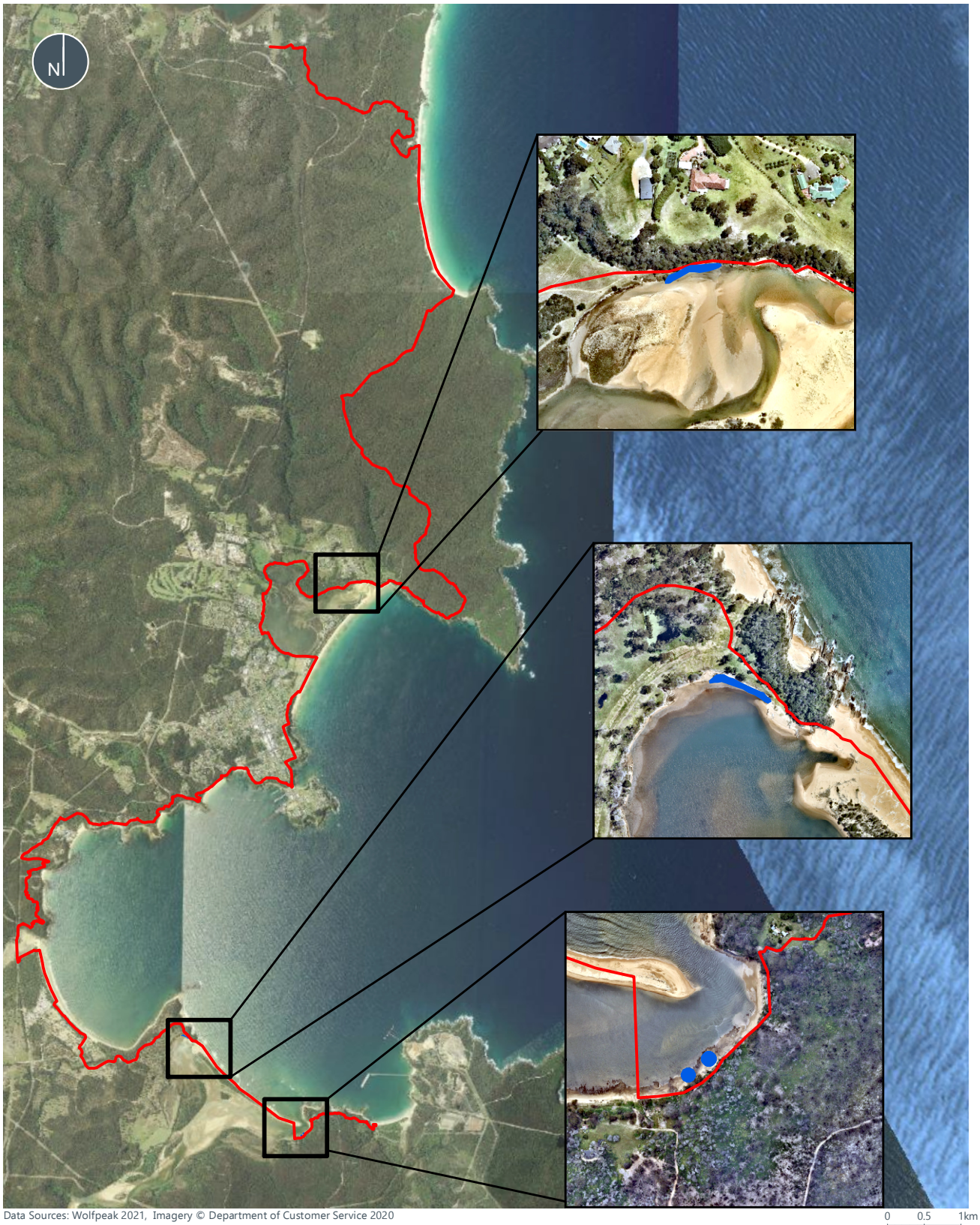


Figure 19 | Endangered Ecological Communities

4.3.5.4 Groundwater Dependant Ecosystems

The Groundwater Dependent Ecosystems Atlas (BOM 2022) has identified that the subject site has a low to high probability of terrestrial GDEs. Low potential GDEs are the most widespread and consist of dry sclerophyll forest. High potential GDEs are located in the south and east of the subject site and comprise Paperbark Swamp Forests.

Low potential GDEs are most widespread along the coastline and consist of the following vegetation types:

- Coastal dry scrub forest
- Coastal Foothills Dry Shrub Forest

Moderate potential GDEs are slightly more inland and include large portions in North Head BBNP. Following vegetation types:

- Southeast Lowland Dry Shrub Forest
- Hinterland Wet Shrub Forest
- Hinterland Wet Fern Forest

High potential GDEs comprise small patches at Nullica River, Lake Curlo, Moutrys Point and Towamba river mouth. Following vegetation types:

- South Coast River Flat Forest, Lake Curalo
- Estuarine mangrove forest
- Coastal Scrub & Beach Strand, North Head/Moutreys
- Coastal Lowland Heath
- Coastal Sand Forest – Nullica River
- Floodplain Wetlands – Nullica River
- South Coast River Flat Forest – Towamba

The works associated with the Bundian Way construction are unlikely to have any impact on GDEs, as no water will be extracted, and local hydrology is unlikely to be affected.

4.3.5.5 Threatened Flora

The threatened flora surveys carried out by WolfPeak in December 2021 and Axis Ecological in January-February 2022 did not detect any threatened flora species. There are a number of locally recorded threatened flora in the locality. Only one threatened flora species has been previously recorded in the study area which comprises the Oval Leaf Pseudanthus. The record on Terrance Beach Track in Ben Boyd NP is from 1978 and considered outdated.

4.3.6 Fauna and Habitat Survey Results

4.3.6.1 Habitat Features of the Study Area

The study area contains a range of habitat features including freshwater and estuarine aquatic habitat, hollow logs, rocky outcrops, hollow-bearing trees, nectar, gum and sap sources, preferred Koala food trees and Allocasuarinas The bridge over Shadrachs creek contains gaps that could potentially be used by microbats for roosting, however none were seen during the survey.

The following table summarises the key survey findings for habitat within the disturbance areas

Table 14: Habitat constraints/opportunities for threatened species

	Site Values								
Habitat Features	**Jigamy Farm to Haycock Road**	**The Pinnacles**	**North Head**	**Curalo Lagoon entrance**	**Victoria Terrace – Cattle Bay Road**	**Shadrachs Creek**	**Northcote Point and Nullica River**	**Moutrys Point**	**Davidson Whaling Station to Fisheries Beach**
Aquatic Habitat	Yes – Jigamy Creek	Absent	Absent	Yes – Estuarine habitats	Absent	Yes – Estuarine habitats of Shadrachs Creek	Yes – Estuarine habitats of Nullica River	Absent	Yes - Estuarine habitats of Towamba River
Logs and debris	Occasional	Common	Occasional	Absent	Occasional	Occasional	Occasional	Uncommon	Uncommon
Hollows	Occasional	Uncommon	Occasional	Absent	Occasional	Uncommon	Uncommon	Occasional	Uncommon
Flowering trees	Common	Common	Common	Absent	Common	Common	Common	Common	Common
Sap sources	Common	Occasional	Occasional	Absent	Occasional	Occasional	Common	Occasional	Occasional

	Site Values								
Habitat Features	**Jigamy Farm to Haycock Road**	**The Pinnacles**	**North Head**	**Curalo Lagoon entrance**	**Victoria Terrace – Cattle Bay Road**	**Shadrachs Creek**	**Northcote Point and Nullica River**	**Moutrys Point**	**Davidson Whaling Station to Fisheries Beach**
Primary preferred Koala browse species	Occasional	Occasional	Uncommon	Absent	Uncommon	Occasional	Occasional	Occasional	Uncommon
Allocasuarina	Occasional	Occasional	Uncommon	Absent	Occasional	Uncommon	Common	Occasional	Occasional
Fruiting species	Occasional	Occasional	Uncommon	Absent	Uncommon	Occasional	Uncommon	Uncommon	Occasional
Caves, cliffs, overhangs, culverts, bridges	Absent	Some small overhangs in gully around Pinnacles	Small cliffs/rocky slopes down to beach with rock crevices.	Absent	Absent	Shadrachs Bridge has the potential to provide roosts to microbats, with small gaps present between concrete girders.	Bridge over Nullica River has low microbat roosting potential	Absent	Absent

Photo 14: Riverbank at landing site on Towamba River

Photo 15: Habitat logs and bushrock at North Head

Photo 16: Large bloodwoods with sap incisions and hollows on North Head track

Photo 17: Gaps between concrete slabs on underside of Shadrachs Bridge

Photo 18: Logs and snags in Shadrachs creek

4.3.6.2 Observed and Detected Fauna

Fauna surveys across the study area recorded a total of 36 birds, 6 amphibians, 18 mammals and 4 reptiles. The main fauna species detected during the survey consisted of common bird species including Golden Whistler, Red Wattlebird, Wonga Pigeon, Eastern Whipbird, Spotted Pardalote and Yellow-tailed Black-Cockatoo. Several Lace Monitors, Blue Tongue Lizard and skinks were the only reptile species observed.

Several amphibian species were heard calling during spotlighting surveys near Lake Curalo including Spotted Marsh Frog, Eastern Banjo Frog and Bleating Tree Frog. Mammal species detected included the Common Wombat, Brushtail and Ringtail Possums, and an Antechinus species.

Seven threatened fauna species were recorded during the survey and are discussed in further detail in Section 4.3.6.3.

The following table provides a list of the fauna species recorded during the survey and the methos of detection.

Table 15: Fauna species recorded

Common Name	Scientific Name	Method of Detection
Birds		
Australian Magpie	*Gymnorhina tibicen*	Vis
Australian Wood Duck	*Chenonetta jubata*	Vis
Bell Miner	Manorina melanophrys	HC
Black-faced Cuckoo-shrike	*Coracina novaehollandiae*	HC
^Eastern Curlew	***^Numenius madagascariensis***	Vis
Eastern Whipbird	*Psophodes olivaceus*	HC
Golden Whistler	*Pachycephala pectoralis*	HC
Glossy Black-Cockatoo	***Calyptorhynchus lathami***	FS
Grey Fantail	*Rhipidura albiscapa*	HC
Laughing Kookaburra	*Dacelo novaeguineae*	HC
Lewin's Honeyeater	*Meliphaga lewinii*	HC
Little Lorikeet	***Glossopsitta pusilla***	Vis
Pied Cormorant	*Phalacrocorax varius*	HC
Pied Currawong	*Strepera graculina*	HC
Pied Oystercatcher	*Haematopus longirostris*	Vis
Rainbow Lorikeet	*Trichoglossus haematodus*	Vis, HC
Red Wattlebird	*Anthochaera carunculata*	HC
Red-browed Finch	*Neochmia temporalis*	Vis
Rufous Whistler	*Pachycephala rufiventris*	HC
Sacred Kingfisher	*Todiramphus sanctus*	Vis, HC
Satin Bowerbird	*Ptilonorhynchus violaceus*	HC
Silvereye	*Zosterops lateralis*	HC
Spotted Pardalote	*Pardalotus punctatus*	HC
Striated Thornbill	*Acanthiza lineata*	Vis
Superb Fairy-wren	*Malurus cyaneus*	HC
Torresian Crow	*Corvus orru*	HC
Welcome Swallow	*Hirundo neoxena*	HC
Whistling Kite	*Haliastur sphenurus*	HC
White-bellied Sea Eagle	***Haliaeetus leucogaster***	Vis
White-browed Scrubwren	*Sericornis frontalis*	HC

Common Name	Scientific Name	Method of Detection
White-cheeked Honeyeater	*Phylidonyris niger*	Vis, HC
White-throated Treecreeper	*Cormobates leucophaea*	HC
Willie Wagtail	*Rhipidura leucophrys*	HC
Wonga Pigeon	*Leucosarcia melanoleuca*	Vis
Yellow-faced Honeyeater	*Caligavis chrysops*	HC
Yellow-tailed Black-Cockatoo	*Zanda funereus*	HC
Amphibians		
Bleating Tree Frog	*Litoria dentata*	HC
Common Eastern Froglet	*Crinia signifera*	HC
Eastern Banjo Frog	*Limnodynastes dumerilii*	HC
Peron's Tree Frog	*Litoria peronii*	HC
Spotted Marsh Frog	*Limnodynastes tasmaniensis*	HC
Tyler's Toadlet	*Uperoleia tyleri*	HC
Mammals		
Eastern Grey Kangaroo	*Macropus giganteus*	Vis
Swamp Wallaby	*Wallabia bicolor*	Cam
Common Wombat	*Vombatus ursinus*	Vis, Cam
Brushtail Possum	*Trichosurus vulpecula*	Vis, Cam
Ringtail Possum	*Pseudocheirus peregrinus*	Vis
Unidentified Antechinus	*Antechinus sp.*	Vis, Cam
Long-nosed Bandicoot	*Perameles nasuta*	Cam
Deer*	*Cervus elaphus*	Cam
European Rabbit*	*Oryctolagus cuniculus*	Vis, Cam
Fox*	*Vulpes vulpes*	Tracks, burrow
White-striped Free-tailed Bat	*Austronomus australis*	Ana
Gould's Wattled Bat	*Chalinolobus gouldi*	Ana
Chocolate Wattled Bat	*Chalinolobus morio*	Ana
Eastern coastal Free-tailed Bat	***Micronomus norfolkensis***	Ana
Ride's Free-tailed Bat	*Ozimops ridei*	Ana
Eastern Horseshoe Bat	*Rhinolophus megaphyllus*	Ana
Greater Broad-nosed Bat	***Scroteanax rueppelli***	Ana
Little Forest Bat	*Vespadelus vulturnus*	Ana
Reptiles		
Lace Monitor	*Varanus varius*	Vis

Common Name	Scientific Name	Method of Detection
Garden Skink	*Lampropholis guichenoti*	Vis
Water Skink	*Eulamprus tympanum*	Vis
Eastern Blue-tongue	*Tiliqua scincoides scincoides*	Vis
Key: Vulnerable under BC Act (bold), Critically Endangered under EPBC Act (^), Introduced species (*) Observation Key: PIR Camera (Cam), Drey (Dr), Heard Calling (HC), Feeding Signs (FS), Scats (SC), Visual Observation (Vis), Anabat analysis (Ana).		

Photo 19: Brushtail Possum

Photo 20: Common Wombat

Photo 21: Long-nosed Bandicoot

Photo 22: Antechinus species

Photo 23: Feral Deer near Davidson Whaling station

Photo 24: Swamp Wallaby

4.3.6.3 Threatened Fauna

Seven threatened fauna species were detected during field surveys; the Eastern Curlew, Glossy Black-Cockatoo (feeding signs), Little Lorikeet, Pied Oystercatcher, White-bellied Sea Eagle, Greater Broad-nosed Bat and Eastern coastal Free-tailed Bat.

A brief description of the sighting details is provided below, and these species are assessed for potential impacts in the Five Part Test. Locations of these species are shown in Figure 20.

Eastern Curlew

A group of ten individuals were observed resting on the eastern edge of Lake Curalo, near the sandspit (Photo 25). The location is shown in Figure 20 and 21. This is in close proximity to the site where a boardwalk is proposed to be installed over the rock platforms. There are additional Bionet recordings of Eastern Curlews near Davidson Whaling Station in the south. Other potential habitats for this and other threatened shorebird species occur at the mouths of other rivers in the study area (Shadrachs Creek, Nullica River, Towamba River).

This species is sensitive to disturbance when in Australia and must conserve energy for its annual migration to China and Siberia. Excessive flying and moving when it is resting can deplete its energy reserves and jeopardise its migration. It was noted that dogs and human presence are current threats to this species at Lake Curalo, however increased human presence and people walking dogs along the trail may increase impacts on this species.

Photo 25: Eastern Curlews (in background)

Glossy Black Cockatoo

Crushed *Allocasuarina* cones indicative of Glossy Black Cockatoo feeding were detected in multiple locations along the route. One patch was observed on the northern side of Shadrachs Bridge in a dense patch of Forest Oak, and another observed on the northern side of Nullica River in open woodland. Bionet records show many sightings of Glossy Black Cockatoos along the whole route.

Little Lorikeet

A small flock of Little Lorikeets were heard calling in Jigamy Farm at the northern end of the route. They were detected in a row of Swamp Mahogany. Areas of open forest with flowering Eucalyptus in the study area provide potential foraging habitat for this species.

Pied Oystercatcher

One Pied Oystercatcher was observed in the river mouth of Nullica River. There are numerous Bionet recordings of Pied Oystercatchers along the entire length of the route, generally on beaches and estuarine lagoons which provide ideal habitat for this species.

White-bellied Sea Eagle

White-bellied Sea Eagles were observed at the mouth of the Towamba River and Nullica River during the field survey. No nests were observed in the study area. The beaches and coastal estuaries offer extensive areas of foraging habitat for this species.

Eastern coastal Free-tailed Bat

The Eastern Free-tailed Bat was detected via Anabat call analysis from Shadrach's Creek on 30th November and 1st December. The study area provides extensive areas of potential foraging habitat for this species and potential roosting hollows are also common. This species would be unlikely to roost under the bridge at Shadrach's creek. Further details on Microbats are provided in the Microbat call report in Appendix 3.

Greater Broad-nosed Bat

The Greater Broad-nosed Bat was detected via Anabat call analysis from Shadrach's Creek and Curalo Lagoon on the first three nights of the survey. The study area provides extensive areas of potential foraging habitat for this species and potential roosting hollows are also common. This species would be unlikely to roost under the bridge at Shadrach's creek.

Figure 20 | Location of Theatened Fauna

Figure 21 | Location of Eastern Curlew

4.3.6.4 Estuarine Habitat Evaluation

The study area features two large river systems comprising the Towamba River and Nullica River, along with several other smaller creeks. These systems provide a range of estuarine habitat features including sand and mud flats, mangroves, rocky foreshores and seagrass.

The following table summarises the survey findings for habitat within the study area and the constraints/opportunities the habitat provides for fauna.

Table 16: Estuarine and aquatic habitat evaluation

Habitat Attribute/Type	Site/Study Area	Ecological Values
Mangroves	Small patches of mangroves are present in the southern half of the study area – lining Nullica River upstream of the bridge, and within the mouth of Towamba River.	Some nursery/foraging habitat for species associated with this habitat on site. Offers generic fish nursery habitat.
Rocky foreshores and artificial structures	Rocky foreshores occur sporadically along the coastline. No major rocky foreshores occur within the disturbance areas though two small rock platforms in Lake Curalo and Moutreys Point will have boardwalks installed over them.	Oysters and other shellfish present. Suitable habitat for the Pied and Sooty Oystercatcher.
Open water	Open water occurs at Lake Curalo and in the rivers and creeks within the study area. The Pacific Ocean also occurs within close proximity to the trail in some places.	Unsuitable for medium to large cetaceans. Large fish (eg. sharks >2m) could enter Towamba River and Nullica River. Common estuarine fish were noted in average abundance. Unsuitable for threatened sharks such as Great White. Known foraging habitat for White-bellied Sea Eagle and Eastern Osprey.
Sand banks and mud banks	Intertidal sandbanks occur at all estuarine waterways, with extensive areas at the mouth of the Towamba River. Mudbanks are present in areas of the Towamba River mouth and Kiah Inlet. Subtidal benthos is largely bear with interspersed patches of tufts of seagrass, depending on depth.	Sand and mud banks provide foraging and resting habitats for threatened waterbirds and waders including Eastern Curlew and Oystercatchers.
Seagrass	No significant areas of seagrass were noted in the study area. Small patches are likely to occur in the major river systems.	Important nursery and resident habitat for a range of juvenile and adult fish and invertebrates. Foraging habitat for common fish.

Habitat Attribute/Type	Site/Study Area	Ecological Values
Saltmarsh	Small areas of saltmarsh are present at Moutrey's Point in the Towamba River Mouth and around Lake Curalo.	Good potential nursery habitat for invertebrates. Provides foraging habitat for waders and other shorebirds.

Photo 26: Curalo Lagoon at location of proposed raised platform

Photo 27: Saltmarsh and sandflats near Moutrys Point

Photo 28: Quarantine Bay

4.3.7 Fisheries Assessment

This section specifically focuses on habitat and organisms associated with the Fisheries Management Act 1994 (FM Act) and Fisheries Management (Amendments) Act 1997. The study area for this assessment is the estuarine and aquatic habitats along the route.

4.3.7.1 Waterway Definition and Description

Several significant waterways and waterbodies cross the proposed route along this section of the Bundian Way; Towamba River (4th order stream), Boydtown Creek (3rd order stream), Nullica River (4th order stream), Shadrachs Creek (4th order stream) and Lake Curalo (forming from Palestine Creek, 4th order stream).

Within the study area, these waterways are subject to tidal influence and are estuarine in nature. Some, including Lake Curalo would also qualify as Intermittently Closed or Open Lakes and Lagoons (ICOLLs).

As per the *Policy and Guidelines and Fish Habitat Conservation and Management* (NSW DPI 2013), these waterways all qualify as Class 1 (Major key fish habitat) waterways for fish passage.

These rivers and creeks generally have a sandy and rocky substrate with variable depths depending on tide.

4.3.7.2 Aquatic Vegetation

Aquatic vegetation within the study area comprises estuarine macrophytes (seagrasses, saltmarsh and mangroves) within the river estuaries. NSW Department of Primary Industries has compiled mapping of aquatic macrophytes. A summary of this mapping relevant to the study area is provided below and mapping is provided in Figure 22.

Lake Curalo has the highest macrophyte content, comprising large areas of *Zostera* and *Halophila* seagrass species (20ha), as well as saltmarsh communities. These are largely located within the main section of the lagoon and not near the mouth in vicinity of the proposed platform works.

Towamba River mouth contains scattered patches of *Zostera* seagrass, saltmarsh and mangroves. A large patch of *Zostera* seagrass occurs 170m from the trail. Both Shadrachs Creek and Nullica River have small patches of *Zostera* seagrass. All species are relatively common in NSW.

There are no relevant threatened aquatic vegetation species or EECs listed under *Fisheries Management Act 1994*.

Mangroves, seagrass and saltmarsh are protected under the FM Act. None of these communities will require disturbance to construct the trail.

4.3.7.3 Key Fish Habitat

The five main rivers and creeks described within the study area qualify as Key Fish Habitat under the FM Act.

Based on the definitions provided in *Policy and Guidelines and Fish Habitat Conservation and Management* (NSW DPI 2013), the rivers would be defined as Type 1 Habitat (highly sensitive key fish habitat), due to the presence of *Zostera* species of seagrass beds >5m^2 in area, coastal saltmarsh >5m^2 in area, SEPP coastal wetlands, and lagoons subject to natural opening and closing regimes.

The threatened species Australian Grayling has a mapped distribution in the Towamba River; however its extent ends 3.75km upstream from the river mouth.

4.3.7.4 Potential Occurrence Assessment

Aquatic species listed under the Fisheries Management Act have been evaluated for their potential to occur on the site. No threatened aquatic species have potential to occur within the site or activity footprint.

Curalo Lagoon, Nullica River, Towamba River and Fisheries Creek

149°55'0"E

37°5'0"S

Curalo Lagoon

Eden

Shadrachs Creek

Twofold Bay

Nullica River

Boydtown

Boydtown Creek

Towamba River

Fisheries Creek

Curalo Lagoon
Air photo date: November 2003
Field survey: May 2004

Shadrachs Creek
Air photo date: November 2003
Field survey: May 2004

Nullica River
Air photo date: November 2003
Field survey: May 2004

Twofold Bay
Air photo date: November 2003
Field survey: May 2004

Boydtown Creek
Air photo date: November 2003
Field survey: May 2004

Towamba River
Air photo date: November 2003
Field survey: May 2004

Fisheries Creek
Air photo date: November 2003
Field survey: May 2004

149°55'0"E

Legend

- Posidonia
- Posidonia/Zostera
- Posidonia/Halophila
- Posidonia/Zostera/Halophila
- Posidonia/Halophila/Ruppia
- Posidonia/Ruppia
- Zostera
- Zostera/Halophila
- Zostera/Halophila/Ruppia
- Zostera/Ruppia
- Halophila
- Halophila/Ruppia
- Ruppia
- Saltmarsh
- Mangrove/Saltmarsh
- Mangrove

Not all habitats may be present in this map.

N

0 0.5 1
Kilometres

NSW GOVERNMENT Industry & Investment

NSW

5. IMPACT ASSESSMENT

5.1 Avoidance and Minimisation

Avoidance principles have been considered in the implementation of Node 1 of the Bundian Way. This consideration has significantly reduced the amount of vegetation and habitat that is required to be removed or modified.

An initial route selection process was followed to which focused on selecting a route that would result in minimal vegetation removal. Criteria used for the track selection included:

- Avoid removal of mature trees and hollow-bearing trees
- Minimise removal of shrubs and saplings
- Avoid hollow log removal
- Avoid coastal wetlands and sensitive coastal areas
- Avoid impacting Endangered Ecological Communities

Using these criteria, the new sections of trail have been gradually identified and mapped with flagging tape as well as digitally. As a result, vegetation removal will be greatly minimised, and the flexible nature of the track means this will be achievable for most of its length. For areas where vegetation removal is required, this will be largely restricted to understorey trees, shrubs, and groundcover. Overhanging limbs will be pruned in some locations to avoid the need to remove entire trees.

5.2 Minimisation

A range of environmental safeguards will be implemented to minimise direct and indirect impacts. These measures are described in the following section.

5.3 Mitigation Measures

5.3.1 Construction Phase

5.3.1.1 Contractor Briefing

The project ecologist is to undertake a pre-work contractor briefing prior to commencement of any clearing or construction works. The briefing will ensure contractors are aware of the ecologically sensitive areas on site and required mitigation measures.

5.3.1.2 General Clearing Measures and Exclusion Zones

Trees and shrubs that are required to be removed should be clearly marked with flagging tape or spray paint. Site induction is to specify that no vegetation removal is to occur beyond what has been marked. Construction materials are to be stored and laid down in cleared areas outside the retained vegetation. Vegetation removal and earthworks is to avoid damage to root zones of adjoining retained trees.

Habitat features and sensitive areas in close proximity to clearing footprints are to be identified and marked on site so as to avoid any inadvertent damage or encroachment. This includes large trees, aquatic and riparian habitat, Coastal Saltmarsh EEC and Allocasuarinas.

5.3.1.3 Ecologically Sensitive Area Protection

Areas of high conservation value are known to occur throughout the study area. These are mapped areas of Coastal Wetland, Coastal Saltmarsh EEC and threatened fauna habitat, particularly the identified shorebird resting and foraging areas. In locations where these high conservation value entities occur within or adjacent to the Activity Footprint, protection areas and buffers should be established where no works will be permitted.

Other sensitive areas provide foraging habitat for threatened species. In these areas, the construction footprint is to be minimised as much as possible and exclusion zones established to avoid potential impacts on adjoining vegetation and habitat. Hollow-bearing trees, Koala food trees and large trees (>30cm trunk diameter) are to be avoided.

5.3.1.4 Shorebird Habitat Measures

Endangered Eastern Curlews were found resting at Lake Curalo in close proximity to the Bundian Way trail and where platforms will be installed on the edge of the Lake. Mitigation measures will be required during construction and operation or the trail to minimise disturbance.

If construction occurs during the time when this species is present in the region, an exclusion zone must be established. Construction personnel must avoid moving through the identified resting locations and minimise noise.

5.3.1.5 Pre-clearing Survey

The following ameliorative measures should be carried out prior to and during clearing works on the site.

1. The clearing extent and any individual trees to be removed are to be inspected for fauna by a qualified ecologist or environmental officer immediately prior to commencement of any vegetation removal involving machinery and/or tree-felling. The ecologist is to identify and flag any habitat features which may contain fauna and trees which contain nests or dreys.
2. If a Koala is present in an area subject to vegetation removal/modification, works must be suspended until the Koala moves along on its own volition. If the Koala is located in a position that a 50 metre buffer may be established, works may proceed outside this buffer. In this event, the ecologist is to remain on site to monitor the Koala for signs of distress. If the ecologist determines that the Koala is in distress, works must be suspended within this area until a larger buffer is created or the Koala moves along on its own volition.
3. The ecologist is to remain on site to supervise removal of any flagged habitat features and manage any fauna interactions. Other than Koalas, any detected fauna is to be relocated off-site. Any bird nest considered active is to be removed in a manner that allows retrieval of eggs/young, and these are to be taken into care by FAWNA.

5.3.1.6 Ground Habitat Relocation

It is recommended that ground based hollow logs and woody debris within the construction footprint are relocated into adjoining habitat. This should be undertaken under the direction of an ecologist or environmental officer.

5.3.1.7 Hygiene Protocols

Management measures to avoid and minimise the spread of amphibian chytrid fungus, plant pathogens and weeds will be required. The DPIE document *Hygiene Guidelines: Protocols to protect priority biodiversity areas in NSW from Phytopthora cinnamomi, amphibian chytrid fungus and invasive plants* (DPIE 2020) provides measures that should be followed on site to reduce the risk of introducing pathogens.

Recommended measures required prior to entering work site or moving to new areas are:

- Check personnel, clothing, footwear, backpacks and equipment for soil, plant material/propagules and other debris.
- Remove all soil, plant material and other debris using a hard brush and (if required) clean water.
- Ensure hands, clothing, footwear, and equipment are dry before proceeding.
- Ensure plant and machinery is thoroughly cleaned inside and out before entering the site or moving between different areas. Use 70% alcohol wipes or a spray bottle to apply disinfectant to the interior of vehicle. Spray the exterior with disinfectant or hand pressure sprayer. Allow the disinfectant to remain in contact with the surface for at least 30 seconds before rinsing with clean water.

5.3.1.8 Microbat Inspection of Shadrachs Bridge

Shadrachs Bridge has potential for Microbat roosting. Prior to works commencing to affix the footbridge, a qualified ecologist is to thoroughly inspect potential roosting crevices underneath the bridge to determine if any microbats are present. If none are found, bridge removal works can proceed without any further measures.

If any are found, they are to be left undisturbed and measures must be taken to minimise disturbance during works, e.g. construction during non-breeding season.

5.3.1.9 Sedimentation and Erosion Controls

Standard soil and sedimentation control measures will be required throughout construction works to ensure that habitats on the site and in the study area, as well as any downstream aquatic habitats are not substantially affected by erosion and sedimentation.

5.3.1.10 Weed Control

Disturbance of the sites soils during vegetation removal and construction has potential to encourage weed invasion. Hence, it is recommended that:

- Disturbance of vegetation and soils on the site should be limited to the areas of the proposed work and should not extend into adjacent vegetation;

- To assist in reducing the spread of exotic species, all vehicles and machinery are to be inspected for the presence of weeds prior to entering the site;
- Invasive Biosecurity Act listed weeds within the activity footprint are appropriately treated and collected prior to clearing and are disposed of within a landfill facility; and
- Any new weed infestations that arise within the works area during construction are to be treated and removed.

5.3.2 Operational Phase

5.3.2.1 Shorebird Habitat

Prior to the trail being established and operational, educational signage must be installed on the vicinity of the Eastern Curlew resting area at Lake Curalo to make the public aware of the importance of the shorebird habitats and to minimise disturbance. Dogs must be kept on leashes in this area and signage is to identify this requirement. Similar signage is also recommended to be installed at Moutrys Point and Whale Beach.

5.3.2.2 Signage, Awareness and Education

To minimise potential impacts of vegetation trampling, litter and weeds by trail users, educational signage is to be provided at several locations along the trial, including at the trail head at Jigamy Farm. Signage is to include the following information:

- Walkers must stick to the trail and not wander off track
- All rubbish must be carried out and disposed of at designated areas
- Shoes and camping gear must be inspected for weed seeds and thoroughly cleaned prior to using the trail
- All flora and fauna are protected and not to be disturbed

An information package may also be prepared and provided to trail users who book the trial.

5.3.2.3 Track Maintenance

Track maintenance needs to be conducted on a regular basis to remove fallen trees and other obstructions. High traffic areas along the trail that become muddy should be monitored and treated when necessary. This will discourage informal track making and trampling of adjoining vegetation. Track maintenance is to also include control of any new weed infestations adjacent to the trail.

5.3.3 Mitigation Measure Summary

A summary of the recommended mitigation measures for the project are provided in the following table.

Table 17: Mitigation measure summary

Mitigation Measure	Timing	Responsibility
Construction Phase		
Contractor Briefing	Prior to construction	Ecologist or Environmental Officer
Clearing Management and tree protection	Prior to/during construction	Construction contractor
Sensitive Area Protection	Prior to/during construction	Construction contractor
Shorebird habitat protection	Prior to/during construction	Construction contractor
Pre-clearing Survey	Prior to vegetation removal	Ecologist or Environmental Officer
Ground Habitat relocation	During construction	Construction contractor/Ecologist
Hygiene Protocols	During construction	Construction contractor
Bridge Inspection	Prior to any works om Shadrach's Bridge	Ecologist or Environmental Officer
Erosion and sedimentation control	During construction	Construction contractor
Weed control	Throughout construction phase	Construction contractor
Operational Phase		
Shorebird Habitat Awareness	Prior to operation of trail	Construction contractor
Signage and Education	Ongoing	Project Manager
Track Maintenance	Ongoing	Track maintenance team

5.4 Impact Assessment

Due to the nature of the project, impacts will be assessed twofold; impacts resulting from construction of the trail and facilities, and operational impacts resulting from the use of the trail once opened.

5.4.1 Construction impacts

5.4.1.1 Direct impacts

Construction impacts are limited to localised disturbance areas along the route, primarily involving the installation of small-scale infrastructure and vegetation removal for trail establishment and/or widening. Large trees, hollow-bearing trees and other habitat features will be avoided, and the main vegetation impacted will be dead trees, understorey trees/shrubs and groundcover.

The following table details the impact sites along Node 1 of the Bundian Way from North to South. See photos following.

Table 18: Construction impact sites

Impact Site	Description	Impact
Disturbance Area 1: Jigamy Farm to Haycock Road	Informal track from Jigamy Farm to be formalised. New track through open forest to Haycock Road to be established.	Removal of occasional shrub undergrowth to re-establish existing track from Jigamy Farm. Removal of groundcover through open forest to Haycock Road.
Disturbance Area 2: The Pinnacles	New track from Pinnacles Loop Walk to skirt around the Pinnacles. Access to Ben Boyd Beach.	The first section starting from the existing Pinnacles Loop Walk will be situated to avoid trees and will only require sparse groundcover removal. Large habitat logs are abundant in this area and will be avoided wherever possible, however some may be impacted and require relocation. The second section will pass through thick heath scrub down to the beach, requiring removal of some small trees and shrubs for distance of approximately 20 metres.
Disturbance Area 3: North Head Track cliff line	Widen/clear existing track along the cliff line. New track to access Aslings Beach.	Minimum vegetation removal is required for this section, as the track can be located around trees following an existing informal track. The rough track leading down to Aslings Beach will require formalisation. Several Coastal Teatree, dead trees and small shrubs will require removal.
Disturbance Area 4: Lake Curalo Platforms	Install platform/boardwalk over rocks on north-eastern edge of Lake Curalo to join with existing Lake Curalo Boardwalk.	Trimming of overhanging limbs may be required. Occasional *Juncus sp.* may require removal. No aquatic vegetation is present. Tracks runs very close to patch of Coastal Saltmarsh EEC which must be protected.
Disturbance Area 5: Victoria Terrace to Cattle Bay, Eden	New track to be created below Victoria Terrace along headland to Cattle Bay.	Removal of shrubs and dead trees within coastal scrub will be required for below Victoria Terrace. A rough existing track occurs along the headland to Cattle Bay, which will require trimming and removal of some shrubs and groundcover.
Disturbance Area 6:	Clearing of old track approaching	

Impact Site	Description	Impact
Shadrachs Bridge	Shadrachs Creek (northern side). Construction of pedestrian bridge on existing road bridge, create new track on southern end along batter.	An old, very overgrown track occurs to the north of Shadrachs Creek which will require clearing of undergrowth. Once the track hits the creek, a new section of track will be required following the bank west to the bridge. This is quite densely vegetated, and several understorey trees (*Melaleuca, Pittosporum)* and shrubs will require removal. Some vegetation removal will be required to construct the new footbridge that will cantilever off the existing road bridge. A small landing and stairs are proposed for the southern side, and a new track will need to be cleared below the road batter which will remove several small trees and shrubs.
Disturbance Area 7: Northcote Point and Nullica River	Clearing of old track approaching Nullica River, and new track approaching northern end of bridge.	An old track through open forest will need to be formalised, requiring removal of some shrubs and groundcover, however this will be minimal. The approach along Princes Highway to the bridge (northern side) is densely vegetated and will require shrub removal and pruning to create a track within a narrow corridor.
Disturbance Area 8: Moutrys Point	New section from Ben Boyd Parade to Moutreys Point Install platforms/boardwalk over rocks to access beach spit.	From the end of Ben Boyd Parade, existing tracks through open woodland and grassland will be used. Small areas of groundcover may require removal here, depending on the condition of the existing track. No vegetation removal will be required for platform installation. Track is to be located above Coastal Saltmarsh community on the water's edge to avoid any disturbance.
Disturbance Area 9: Davidson Whaling Station to Fisheries Beach	Formalise old track from Boyd Rd along headland towards Fisheries Beach. Access down to Fisheries Beach Campground.	The section along the headland will require the removal of regrowth wattles from the existing overgrown trail. Monir vegetation removal will also be required to formalise access down the slope to Fisheries Beach, with possible installation of steps down to the beach.

Photo 29: Existing informal track at North Head

Photo 30: Existing informal track south of Cattle Bay

Photo 31: Location of proposed platform over rock at Moutrys Point

5.4.1.2 Indirect impacts

The following indirect impacts may be associated with the construction phase of the project:

Weed invasion

Weeds are currently present throughout the study area, varying in cover with location (i.e. higher prevalence near roadsides, lower prevalence in National Parks). Construction of the hiking track may create new opportunities for weed invasion through the creation of bare ground, a new edge along the track and increased light penetration.

Maritime Stresses

The creation of new track through coastal vegetation communities (e.g. coastal heath) for beach access may increase the exposure of those communities to maritime stresses such shear force winds and salt deposition. Wind funnelling may occur if the track is orientated east-west, causing degradation to the more sensitive vegetation that would otherwise be protected. This impact can be minimised if the track is designed in a zig-zag manner.

Injury/mortality during clearing

The potential risk of fauna injury and/or mortality during vegetation removal is low given clearing will be limited and done by hand, and pre-clear surveys and clearing monitoring will be implemented. Furthermore, hollow-bearing trees and other habitat features will be avoided wherever possible.

Noise and vibration

Fauna in the study area are likely to have some tolerance to anthropogenic noise, especially near urban areas. During the development's establishment, noise would be highest during construction, but limited to daytime hence would only impact diurnal birds and mammals. Vibration may occur during some bridge works; thus bridges need to be checked for roosting microbats prior construction. Post-development, noise levels are expected to return to levels which occurred prior to construction.

5.4.2 Operational impacts

Operational impacts are those related to the use of the track by hikers once the track has been opened to the public. Unlike construction impacts, these are likely to be ongoing and will need to be continuously managed. High use of the track during peak seasons can exacerbate these impacts.

Weed Invasion

Weeds can be introduced and/or spread via hikers with contaminated footwear. This is particularly prevalent as sections of the track go through residential areas, adjoining to backyards and stormwater runoffs, and weeds can be picked up by hikers and spread to more pristine areas such as Ben Boyd National Park.

Creation of informal tracks and vegetation trampling

Vegetation trampling can be caused by hikers avoiding obstacles such as mud, fallen trees etc., creating informal paths through surrounding bushland. This can lead to habitat degradation, facilitate weed invasion and generally exacerbate impacts.

Disturbing shorebirds

Numerous shorebird species, including threatened species, are present within the study area and utilise the beaches, estuaries and sandspits for resting (migratory species in particular) and/or breeding. An increase in people walking these sections could disturb them leading to fatigue or disrupted foraging. An increase in dogs being walked by trail users could also result in further disturbance to these species. Mitigation measures are required.

Feral Fauna Species

The construction of new tracks may facilitate the ingress of feral fauna such as deer, cats and foxes. Tracks are currently present throughout the study area however, thus the impact is unlikely to be substantial.

5.5 Tests of Significance

5.5.1 Biodiversity Conservation Act 2016 Test of Significance

5.5.1.1 Assessment Pathway

Under the NSW *Biodiversity Conservation Act 2016* and *Biodiversity Conservation Regulation 2017*, Part 5 developments under the *Environmental Planning & Assessment Act 1979* are not

required to enter into the Biodiversity Offset Scheme (BOS) as this is an optional assessment pathway.

The proponent has elected not to enter into the BOS and a test of significance has been carried out to assess the potential impacts of the proposal on threatened species and ecological communities.

The Test of Significance is prescribed in Part 7, Division 1, Section 7.2 of the *Biodiversity Conservation Act 2016*. The purpose of the Test of Significance is to determine whether a proposed development or activity is likely to significantly affect threatened species or ecological communities, or their habitats.

The Test of Significance has been prepared in consideration of the *Threatened Species Test of Significance Guidelines* (OEH 2018).

5.5.1.2 Entities to be Assessed

The following species were recorded during the field survey and automatically require assessment:

- Little Lorikeet
- Glossy Black Cockatoo
- Pied Oystercatcher
- White-bellied Sea Eagle
- Eastern Coastal Free-tailed Bat
- Greater Broad-nosed Bat

Coastal Saltmarsh EEC was recorded and requires assessment.

The potential occurrence assessments in Appendix 1 have determined that the following species are considered to be potentially occurring in the site and are subject to the Test of Significance:

- Giant Burrowing Frog
- Dusky Woodswallow
- Varied Sittella
- Little Lorikeet
- White-fronted Chat
- Scarlet Robin
- Gang-gang Cockatoo
- Square-tailed Kite
- Powerful Owl
- Masked Owl
- Barking Owl
- Sooty Owl
- White-footed Dunnart
- Eastern Pygmy Possum
- Yellow-bellied Glider
- Grey-headed Flying Fox
- Large Bent-wing Bat
- Southern Myotis
- Eastern False Pipistrelle

5.5.1.3 Responses

a) In the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,

The proposal is to create the first node of the Bundian Way from Jigamy Farm on Pambula Lake to Fisheries Beach on the far south coast of NSW. This comprises 34km of walking track, some of which already exists in varying forms (from informal bush tracks to maintained boardwalks), whilst other sections will require new track to be built. Associated infrastructure and campgrounds are also proposed. Track establishment will not involve significant tree removal, as it will be located to avoid trees and other habitat features wherever possible. Vegetation to be removed will therefore primarily consist of dead trees, small understorey trees, shrubs and groundcover.

The impact of the proposal is addressed separately for different species or groups as follows:

Highly mobile/large range species – Powerful Owl, Masked Owl, Sooty Owl, Barking Owl, Square-tailed Kite, White-bellied Sea Eagle, Eastern Osprey, Grey-headed Flying Fox, Little Lorikeet, Glossy Black Cockatoo, Gang-gang Cockatoo, Varied Sittella, Dusky Woodswallow

For the mobile and wide-ranging subject species, construction of the trail and minor vegetation removal would be unlikely to have any adverse impacts. The extent of potential foraging habitat removed is insignificant relative to the extensive ranges and foraging requirements of these species. No known nest sites for the bird species would be removed and the vegetation affected by the proposal would generally be unsuitable for nesting or roosting. There are no known Flying Fox camps in the study area that could potentially be disturbed and the vegetation in the study area would only offer potential foraging habitat.

Feeding signs of the Glossy Black Cockatoo were recorded in the study area during the survey, and open forest habitats in the study area offer extensive areas of suitable habitat. The possible removal of *Allocasuarinas* or *Callitris* trees may reduce foraging habitat for these Cockatoo species by an extremely minor extent. In the context of these species home ranges and the extent of habitat remaining in the study area post works, the potential removal of a handful of feed trees would be unlikely to affect their foraging success or disrupt breeding.

No habitat will be removed or modified for the White-bellied Sea Eagle and Eastern Osprey and no nesting sites were found in close proximity to the trail.

Given the above, the proposal would be unlikely to result in a decline of the local population of any of the subject species.

Giant Burrowing Frog

This species has potential to forage and breed in the first and second order creeks within the study area. Numerous Bionet records occur in the northern section of Ben Boyd National Park some distance from the trail. A local population of this species would be expected to extend well beyond the study area, as there is considerable potential habitat within the surrounding area.

Potential impacts on the breeding cycle of this species will be minimal as no work will be undertaken in freshwater aquatic habitats. Erosion and sedimentation measures will also be implemented to minimise impacts on nearby aquatic habitats. Given this, the proposal is highly

unlikely to place a viable population at risk of extinction.

Hollow-obligate Mammals – Yellow-bellied Glider

While not detected during the survey, this species may occur in forested areas adjoining the subject site and range over many hectares of forest. As such, the vegetation to be impacted would at most comprise a very minor extent of potential foraging habitat that is unlikely to affect their foraging success or movement patterns. No hollow-bearing trees will require removal, hence potential denning or breeding habitat will not be affected.

Indirect impacts associated with the proposal which may affect the subject species include edge effects and disturbances during clearing and construction works. While some of these impacts already pose a threat to the subject species, ameliorative measures will be required to ensure impacts are minimised.

In summary, the works would be unlikely to place a local population of the Yellow-bellied Glider at risk of extinction.

Small home range species – Eastern Pygmy Possum, White-footed Dunnart

These species have higher potential to be adversely impacted by track construction as it breaks continuity of cover and may provide access for predators. However, given that the track width will be narrow, largely follows existing trials, and can be located to avoid denser sections of groundcover habitat, the trail would not lead to fragmentation of habitat or create a barrier. Extensive areas of suitable habitat occur in the National Parks within the study area which will continue to offer habitat and refuge for these species. As a result, the proposal is unlikely to have an adverse impact on a local population's lifecycle.

Shorebirds – White-fronted Chat, Pied Oystercatcher, Sooty Oystercatcher

The subject shorebird species are known or likely to occur along the beach and estuarine habitats in the study area, especially around the Towamba and Nullica River mouths. No foraging habitat for these species will be affected by the proposal and indirect impacts during construction and operation of the trail are expected to be minor. Educational signage to raise awareness of sensitive shorebird habitats is recommended to be installed at Lake Curalo and Moutrys Point. This will assist in reducing potential disturbance of shorebirds using these habitats during operation of the trail. Oher potential indirect impacts as a result of the trail establishment and use are expected to be minor and would be unlikely to pose a threat to these highly mobile species.

Microchiropteran bats

The Eastern Coastal Free-tail Bat and Greater Broad-nosed Bat were recorded during the survey via Anabat call detection. The Southern Myotis has high potential to forage along the creeks in the subject site and study area as a small part of its local range. Similarly, the study site offers potential foraging habitat for the other microbats. The small amount of habitat loss associated with the proposal would not impact their foraging success or affect potential breeding habitats.

The two large bridges on the route may offer potential roosting habitat for microbats. The proposal will involve some works on Shadrachs Bridge, where a footbridge will be affixed to the existing structure. Visual inspection of the bridge underside will be necessary before any works commence to determine whether any roosting colonies are present. Construction works will be temporary

however, and no roosting habitat will be lost as a result. Therefore the works will only affect a minute portion of available foraging habitat that is unlikely to result in any detectable impacts.

b) In the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:

(i) Is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

(ii) Is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

The subject site has small areas of EEC comprising Coastal Saltmarsh. This was recorded at Lake Curalo, Moutrys Point and Towamba River. More extensive areas of this EEC occurs offsite throughout the study area and beyond. Therefore, the patches record on site would only represent a small portion of its local extent. The Coastal Saltmarsh EEC will not be directly impacted by construction of the trail, however it is at risk of trampling by trail users given its close proximity to the trail. Recommendations to reduce this risk have been provided including establishing protection zones and educational awareness signage to minimise the risk of inadvertent impacts.

There is a low risk of indirect impacts such as erosion and sedimentation, edge effects and weed invasion. These risks are considered to be mitigable through the mitigation measures for the project including erosion and sedimentation controls, track maintenance and weed control.

As a result, the EEC is unlikely to be at risk of significant impact.

c) In relation to the habitat of a threatened species or ecological community:

i. The extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and

Habitat to be removed comprises small and localised patches of understorey trees, shrubs and/or groundcover habitat and trimming of limbs to allow for track establishment and widening. This only represents a small portion of the habitat available to the subject species in the subject site and study area and is unlikely to be of any key importance to threatened species. No hollow bearing trees or other potential breeding habitat would be directly affected.

ii) 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 works would have minimal impact on connectivity as only minor clearing will occur to create the walking track. Natural gaps within vegetation will be utilised to minimise new barriers being created, and the track will be narrow enough that connectivity for terrestrial fauna species will not be affected. Thus, there is no likelihood that an area of habitat will become fragmented or isolated.

iii) The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality.

The study area and National Parks in the region include habitat that is of local, regional and national significance for its conservation value.

The proposal however has no significant impact on these values due to its limited construction requirements and mitigation measures proposed. The habitat affected for track construction would not be important for the long0term survival of any of the subject species.

d) Whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),

The proposed development will not directly or indirectly affect an area of outstanding biodiversity value.

e) Whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.

A Key Threatening Process (KTP) is defined as a process that threatens, or may have the capability to threaten, the survival or evolutionary development of species, populations or ecological communities.

The following table lists the relevant KTP's listed under the BC Act and whether the proposed activity is recognised a threatening process.

Table 19: Key threatening processes

KTP	Extent/manner which proposal affects KTP	Mitigable?
Clearing of native vegetation	Loss of native vegetation for sections of new trail establishment and small-scale infrastructure.	No, however vegetation removal will be minimised as much as practicable.
Entanglement in, or ingestion of anthropogenic debris in marine and estuarine environments	Currently present. Risk of increasing due to higher trail use and potential waste from users.	Yes – education and awareness.
Herbivory and environmental degradation caused by feral deer	Currently present. Risk of facilitating spread through track making.	Monitoring of feral species may be undertaken by track maintenance crews.
Infection of frogs by amphibian chytrid causing the disease chytridiomycosis	Potential risk of introducing amphibian chytrid fungus.	Yes – hygiene protocols recommended.
Invasion and establishment of exotic vines and scramblers	Currently present. Risk of spread in disturbance areas	Weed control recommended to reduce potential for spread.
Invasion of native plant communities by exotic perennial grasses	Currently present. Risk of spread in disturbance areas	Weed control recommended to reduce potential for spread.
Invasion of native plant communities by bitou bush & boneseed	Currently present. Risk of spread in disturbance areas	Weed control recommended to reduce potential for spread.
Invasion, establishment and spread of Lantana (Lantana camara L. sens. Lat)	Currently present. Risk of spread in disturbance areas	Weed control recommended to reduce potential for spread.

KTP	Extent/manner which proposal affects KTP	Mitigable?
Removal of dead wood and dead trees	Some removal for track establishment.	No, however will be avoided and minimised as much as practicable.

5.5.2 EPBC Act Matters of National Environmental Significance Assessment

5.5.2.1 Assessment Summary

The provisions of the EPBC Act require determination of whether the proposal has, will or is likely to have a significant impact on a Matter of National Environmental Significance (MNES). These matters are listed and addressed in summary as follows:

Table 20: MNES Assessment summary

Category	Relevance	Significant Impact Likely?
World Heritage Properties	The site is not listed as a World Heritage area	N/A
National Heritage Places	The site is not listed as a National Heritage Place	N/A
Wetlands of International Importance	The site does not contain nationally important wetlands	N/A
Great Barrier Reef Marine Park	The proposal does not affect the Great Barrier Reef Marine Park.	N/A
Commonwealth Marine Environment (CME)	The site adjoins a CME comprising the EEZ and territorial sea.	The proposal will not have any impact on the marine environment.
Listed Threatened Ecological Communities	One TEC occur within the subject site.	No TEC is likely to be significantly affected by the proposal.
Listed Threatened Species	The Eastern Curlew was record during the field survey. The Grey-headed Flying Fox and Giant Burrowing Frog are considered potential occurrences in the study area.	No threatened species is likely to be significantly affected by the proposal as assessed below.
Listed Migratory Species	Several migratory birds are considered potential occurrences in the subject site.	No Migratory species is likely to be significantly affected by the proposal.

Category	Relevance	Significant Impact Likely?
Nuclear Actions	The proposal is not a nuclear action	N/A
A water resource, in relation to coal seam gas development and large coal mining development	The proposal is not a mining development.	N/A

5.5.2.2 Protected Species Assessments

The following EPBC Listed threatened species was recorded on site and requires assessment:

- Eastern Curlew

The following EPBC listed threatened species are considered to potentially occur on the site:

- Grey-headed Flying Fox
- Giant Burrowing Frog

An assessment of significance of the proposal on these species is provided in the following section.

5.5.2.2.1 Assessment of Significance

Significant Impact Criteria

Table 21: Significant impact assessment

Significant Impact Criteria	Details
a) Lead to a long-term decrease in the size of an important population of a species	Giant Burrowing Frog No Giant Burrowing frogs were identified during the field surveys. Eight records occur in Ben Boyd NP; however, these are 1.5km away from the track. Furthermore, only limited track constriction will be conducted in this section of the park due to use of existing trails thus this local population is unlikely to be adversely impacted. The track passes through potential favoured habitat (heath, woodland, open forest), however due to the nature of the proposed work and minimal impact required, the proposal is unlikely to lead to a long-term decrease of frog populations. Grey-headed Flying Fox The proposal will require the removal of small shrubs and trees from an area of potential foraging habitat. This would not have any detectable impacts on this species given their extensive range and foraging requirements. The proposal will thus not lead to a long-term decrease in the size of an important population. Eastern Curlew The Eastern Curlew was observed during field surveys at Lake Curalo. Work in this area will comprise the installation of platforms over the rocks on the edge of the lagoon. Potential habitat also occurs at Moutrys Point on the edge of the Towamba River where a similar platform is proposed. This could disturb the local population using the area for resting via noise and increased human presence. Impacts could be minimised by timing the works to occur whilst the

Significant Impact Criteria	Details
	birds are absent. Exclusion zones are also recommended to be established during construction so contractors avoid these habitats. The increased use of the track by the public could lead to ongoing disturbances, especially if there is an increase in dog walking along the trail. Mitigation measures are recommended to reduce the risk of disturbance to this species during operation of the trail which include educational signage and awareness. No other works along beaches or sand flats are proposed, thus shorebird populations utilising other parts of the study area will not be impacted.
b) Reduce the area of occupancy of an important population	For the Giant Burrowing Frog, the minor scale and temporary nature of the works is unlikely to reduce the area of occupancy. For the Grey-headed Flying Fox, the minor loss of foraging habitat in the works footprint is insignificant relative to the area of occupancy which is measured in terms of hundreds of thousands of hectares. Consequently, the proposal would not reduce the area of occupancy of an important population. The proposal will not reduce the area of occupancy of the Eastern Curlew.
c) Fragment an existing important population into two or more populations	A population of the subject frog species is unlikely to be fragmented given the small extent of the works footprint and the re-establishment of similar conditions post construction. The Grey-headed Flying Fox and Eastern Curlew are highly mobile and known to be capable of crossing human-modified habitat. The proposal will offer no barrier to movement. Thus, it will not fragment an existing population.
d) Adversely affect habitat critical to the survival of a species	The vegetation on site that will be impacted by the works is not considered critical habitat for the subject species due to it small extent and limited habitat features. Post-development, the remainder of the site and other habitats in the locality will retain the potential to support these species, hence helping support the viability of the local populations.
e) Disrupt the breeding cycle of an important population	The habitat in the site to be removed or modified does not represent potential breeding habitat for the subject species. The removal of this habitat would hence not be capable of disrupting the breeding cycle.
f) Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The degree of possible vegetation loss imposed by the works is not significant enough to affect a local population of the subject species to the point that it could cause a decline of the species.
g) Result in invasive species, that are harmful (by competition, modification of habitat, or predation) to a Vulnerable species,	No new invasive species are likely to be introduced as a direct result of the proposal. There is potential for further spread of weeds in disturbance areas, hence weed control measures are recommended to reduce this risk.

Significant Impact Criteria	Details
becoming established in the Vulnerable species' habitat	
h) Introduce a disease that may cause a species to decline	Amphibian Chytrid disease could pose a risk to the Giant Burrowing Frogs if introduced. Hygiene measures will be required to reduce this risk.
i) Interferes substantially with the recovery of the species	The proposal will result in the removal of a relatively minute area of habitat for the subject species that is not significant enough to interfere with their recovery.
Resulting Impact	**No significant impact**

The above assessment has determined that the proposal is not considered likely to have a significant impact on these species. Referral to the Department of Agriculture, Water and the Environment is not required for these species.

5.5.2.3 Migratory Species

The Eastern Curlew was the only migratory bird species recorded during the survey. The habitats present across the site provide potential habitat for other listed migratory species such as the White-throated Needletail, Little Tern, Satin Flycatcher, Common Sandpiper and Bar-tailed Godwit. These species are collectively assessed below.

The guidelines to assessment of significance to this Matter, define an action as likely to have a significant impact on a migratory species, if it will:

a) Substantially modify (including fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat of the migratory species, or;

b) Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat of the migratory species, or;

c) Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of the species.

An important area of habitat is:

1) Habitat used by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species, or:

2) Habitat utilised by a migratory species which is at the limit of the species range, or;

3) Habitat within an area where the species is declining

5.5.2.3.1 Assessment of Significance

Table 22: Migratory species assessment of significance

Significant Impact Criteria	Details
a) Substantially modify (including fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat of the migratory species, or;	The proposed activity will displace a minor area of terrestrial vegetation, resulting in a reduction in the local area of potential habitat. However, the small areas to be altered would not represent substantial modification of such habitat which is abundant elsewhere in the locality.
b) Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat of the migratory species, or;	An invasive species is one that may become established in the habitat and harm the migratory species by direct competition, modification of habitat, or predation. No such invasive species is to be introduced by the proposal.
c) Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of the species	Pats of the study area may be important habitat for migratory species and their lifecycles. This includes Lake Curalo, Nullica River and Towamba River, as well as open beaches. No direct impact will occur to these environments. Use of the trail may lead to some localised disturbance of shorebird foraging and resting habitat from noise and increased human presence; however this is an existing threat across most of the study area. Only small areas of shorebird habitat will be affected, and birds could easily relocate to nearby undisturbed areas if needed. Educational signage and exclusion zones will be established to minimise potential disturbances to shorebird habitat where it occurs in close proximity to the trail. Given the above it is considered unlikely that construction and operation of the trail would seriously disrupt the breeding cycle of migratory species.
Resulting Impact	**No significant impact**

The above assessment has determined that the proposal is not considered likely to have a significant impact on Migratory species. Referral to the Department of Agriculture, Water and the Environment is not required for these species.

5.5.2.4 Threatened Ecological Communities

The following federally listed TEC occurs within the site:

- Subtropical and Temperate Coastal Saltmarsh

An assessment of significance for this TEC is provided in the following section.

5.5.2.4.1 Assessment of Significance

Table 23: TEC significant impact assessment

Significant Impact Criteria	Details
d) Reduce the extent of an ecological community.	Construction of the trail does not require the removal of any Coastal Saltmarsh TEC. In locations where it was recorded there is either an existing trail or new trail will be located outside the community. The community will be protected with a protection zone during construction. Potential impacts during operation such as trampling will be mitigated with educational signage and track The proposed action thus is not likely to reduce their extent.
e) Fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines.	No area of TEC will be removed, and the proposed activity will not fragment the TEC on site.
f) Adversely affect habitat critical to the survival of an ecological community.	The proposal does not affect any habitat critical to the survival of the TEC.
g) Modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns.	No risk of impact as no area of TEC will be directly impacted and possible indirect impacts including sedimentation and weed control can be managed via the mitigation measures proposed. No change in drainage patterns is anticipated as a result of the walking trail.
h) Cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for	The proposal is unlikely to lead to species composition changes in the community as the current management regime will remain unchanged. Use of the walking trial is unlikely to lead to changes in species composition, provided trampling or indirect impacts are managed through educational signage and protection zones.

Significant Impact Criteria	Details
example through regular burning or flora or fauna harvesting.	
i) Cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to: • **assisting invasive species, that are harmful to the listed ecological community, to become established, or** • **causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community, or**	The proposal does not involve chemicals which may harm the TEC directly or indirectly. Walkers could possibly spread weed seed along the trail; however this can be managed by regular trial maintenance and education.
j) Interfere with the recovery of an ecological community.	The proposal has minimal potential to impact the recovery of the TEC given it will not be directly impacted, and potential indirect impacts can be managed.
Resulting Impact	**No significant impact**

The above assessment has determined that the proposal is not considered likely to have a significant impact on Coastal Saltmarsh TEC. Referral to the Department of Agriculture, Water and the Environment is not required for this community.

5.6 Coastal Management SEPP

State Environmental Planning Policy (Coastal Management) 2018 (the Coastal SEPP) came into force on 03 April 2018. It was established as an integrated and co-ordinated approach to land-use planning in coastal zones. It repeals the State Environmental Planning Policy No 14 – Coastal Wetlands, State Environmental Planning Policy No 26 – Littoral Rainforests and the State Environmental Planning Policy No 71 – Coastal Protection.

The SEPP aims to be consistent with the objects of the Coastal Management Act 2016. It achieves this by:

1. Managing development in the coastal zone and protecting the environmental assets of the coast.
2. Establishing a framework for land use planning to aid decision-making in the coastal zone.
3. Mapping the 4 coastal management areas that comprise the NSW coastal zone.

Mapped Coastal Wetland occurs in two locations along the proposed route; one patch on Lake Curalo in Eden, and the other at the Towamba River mouth near Davidson Whaling Station in the south. Figures 9 and 10 maps the location of these Coastal Wetlands in relation to the proposed route of the Bundian Way.

One section of the route falls within the proximity zone of the Coastal Wetland. For developments within the proximity zone, the Coastal Management SEPP states that a consent authority must not grant development consent unless they are satisfied that the proposed development will not significantly impact on:

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

An assessment of the development proposal against these matters is provided below.

5.6.1 Coastal Wetlands Assessment

Lake Curalo:

Existing track already occurs around Lake Curalo as part of the Lake Curalo Boardwalk. No construction will occur within the mapped Coastal Wetland or 100m proximity zone, with the proposed platforms located 230 metres from the edge of the proximity zone. Thus the works will not have a direct or indirect impact on these Mapped Coastal Wetlands.

Towamba River Mouth:

A portion of the route along the sandspit from Moutreys Point to Davidson Whaling Station (2.2 km in length) is mapped as Proximity Area for Coastal Wetlands. Given that the proposed route exclusively traverses the beach and does not pass through any vegetation and given the track in this section will not require any construction works or track building, this route placement will have minimal, if any, impact upon the adjacent coastal wetland.

5.7 Fisheries Management Act Assessment of Significance

Section 221ZV of the Fisheries Management Act requires an assessment of significance to determine if a development or activity is likely to significantly affect threatened species, populations or ecological communities listed under the FM Act 1994.

As discussed in Section 4.3.7 of this report, there are no aquatic ecological communities or populations that are relevant to this proposal. The Australian Grayling occurs in the Towamba River, however its extent is mapped 3km upstream of the estuary where works are proposed, thus is considered to be an unlikely occurrence. Therefore, an assessment of significance is not required.

6. CONCLUSION

This report has assessed the Bundian Way walking trial running over 34km from Jigamy Farm to Fisheries Beach. The works include track construction, signage, boardwalks and stairways. Existing tracks and clearings will be utilised where possible. Only minor vegetation removal will be required at a few locations where no track currently exists and will be limited to small trees, shrubs and groundcover. Indirect impacts during construction may include noise, vibration and weed invasion. Potential operational impacts of the trail have been assessed and include vegetation trampling, shorebird disturbance, weed invasion and feral species ingress.

The field surveys in December 2021 detected seven threatened fauna species. No threatened flora species were identified, however one Endangered Ecological Community comprising Coastal Saltmarsh was recorded within the subject site. Ecologically sensitive areas within the subject site have been identified and consist of Endangered Ecological Communities, threatened plants, Coastal Wetlands, riparian areas and aquatic habitat, and habitat resources for threatened species.

A total of 19 threatened fauna species were identified as potential occurrences within the site. No threatened aquatic species were recorded or considered to be potential occurrences.

Assessment of the recorded and potentially occurring species concluded they were unlikely to be significantly impacted by the proposal due to their ecology, the minor impacts associated with the works and the mitigation measures proposed. Hence neither a referral to the DAWE or a Biodiversity Development Assessment Report/Species Impact Statement is required.

A number of mitigation measures have been developed to reduce the impacts of the proposal on flora, fauna and ecological communities. These include pre-clearing surveys, exclusion zones for sensitive areas, ground habitat relocation weed control.

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Appendix 1: Potential Occurrence Assessment

A1.1 Flora

Table 24: Potential occurrence assessment – flora

Species	BC Act	EPBC Act	No. of Records	Link to Profile	Likelihood of Occurrence	Significance Assessment Required?
Merimbula Star-hair *Astrotricha sp.Wallagaraugh*	E	-	3	https://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=20053	The species has a highly restricted and fragmented distribution with only three known localities. It is located in undisturbed bushland but predominantly in disturbed roadside habitat. Parts of the study area provide potential habitat, however there are no nearby record and it was not found during the survey. Unlikely to occur.	No
Narrow-leafed Wilsonia *Wilsonia backhousei*	V	-	2	https://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=10838	This species has a widespread distribution along the NSW coastal areas, occurring largely on the margins of saltmarshes. It flowers in spring and summer with a single white flower. The site has some areas of potential habitat for this species in saltmarsh habitats. Considered unlikely to occur as not found despite targeted searches.	No
Oval-leafed Pseudanthus *Pseudanthus ovalifolius*	E	-	1	https://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=10682	This species has a single recording in the Ben Boyd national park (Eden) which does form part of the project site. It is typically found near coastal dry sclerophyll forest growing in sandy soil. Only single local record in locality from 1978 and not located since despite targeted searches. Unlikely to occur.	No
David's Westringia *Westringia davidii*	V	V	10	https://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=10835	David's Westringia is endemic to rocky outcrops above 250 m in elevation in the coastal ranges to the west of Eden and Pambula in NSW. The species is largely restricted to shallow organic loam soils fringing rocky outcrops. Site does not have correct habitat requirements or geology for this species. Unlikely to occur.	No

Species	BC Act	EPBC Act	No. of Records	Link to Profile	Likelihood of Occurrence	Significance Assessment Required?
Leafless Tongue Orchid *Cryptostylis hunteriana*	V	V	1	https://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=10187	The species does not appear to have well defined habitat preferences and is known from a range of communities, including swamp-heath and woodland. Open forest habitats provide generic potential habitat., however not found during survey and no records occur in close proximity. Unlikely to occur.	No
Rhyolite Midge Orchid *Genoplesium rhyoliticum*	E	E	57	https://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=10342	The Rhyolite Midge Orchid is endemic to a narrow strip of NSW south coast. Known from only six sites, it is expected that new populations of the Rhyolite Midge Orchid may be found when sites with appropriate habitat are surveyed during the restricted time when the species is in flower. Site does not have correct habitat requirements or geology for this species. Unlikely to occur.	No
Bodalla Pomaderris *Pomaderris bodalla*	V	-	4	https://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=20031	Bodalla Pomaderris is endemic to NSW and is currently known to occur on the south coast between Bodalla and Merimbula. On the south coast *Pomaderris bodalla* occurs in moist open forest along sheltered gullies or along stream banks. Small gullies within the study area provide potential habitat for this species, however it was not found despite targeted survey. Very low to unlikely chance of occurrence.	No
Ralston's Leionema *Leionema ralstonii*	V	V	53	https://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=10873	The species is largely confined to dry, rocky habitats. It is most likely to be found in dry shrub communities but can also occur in open forest. The species is slow growing, relatively long-lived and possesses an ability to withstand prolonged drought conditions. Site does not have correct habitat requirements or geology for this species. Unlikely to occur.	No
Shapely Zieria *Zieria formosa*	E	E	12	https://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=10855	Only a single population of Shapely Zieria is known. It occupies an area of about 1 hectare on private land located about 5 km west of Pambula on the NSW far south coast. The population occurs on the north-east aspect of an upper, moderately steep slope of a 'break-	No

Species	BC Act	EPBC Act	No. of Records	Link to Profile	Likelihood of Occurrence	Significance Assessment Required?
					away' area above a small valley. Site does not have correct habitat requirements or geology for this species. Unlikely to occur.	
Hidden Violet *Viola cleistogamoides*	E	-	17	https://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=10830	This species occupies a variety of situations, often in wet sandy coastal heaths and has also been found inland in heathland, woodland with a heathy understorey and grassy forests. Only know from tow localities outside the study area and not found during the survey. Very low to unlikely chance of occurrence.	No

A1.2 Fauna

Table 25: Potential Occurrence Assessment - fauna

Species	BC Act	EPBC Act	No. of Records	Link to Profile	Likelihood of Occurrence	Significance Assessment Required?
Amphibia						
Green and Golden Bell Frog *Litoria aurea*	E	V	7	https://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=10483	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. Unlikely to occur on site due to lack of suitable habitat.	No
Giant Burrowing Frog *Heleioporus australiacus*	V	V	36	https://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=10398	This species requires loose bark, vines or hollow trunk limbs for shelter. The hollow limbs of fallen trees within the subject site may provide a potential habitat for this species. Numerous records in BBNP and Nullica State Forest. Fair chance of occurring on site.	**Yes**
Aves						

Species	BC Act	EPBC Act	No. of Records	Link to Profile	Likelihood of Occurrence	Significance Assessment Required?
Regent Honeyeater *Anthochaera phrygia*	CE	CE	3	https://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=10841	The species inhabits dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests of River Oak. Study area may contain localised areas of suitable habitat, however sparse local records and no recent sightings. Unlikely to occur.	No
Dusky Woodswallow *Artamus cyanopterus cyanopterus*	V	-	19	https://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=20303	This typically woodland species is very occasionally found in moist forest or rainforest. Site contains generic foraging habitat. Low to fair chance of occurrence.	**Yes**
Australasian Bittern *Botaurus poiciloptilus*	E	E	1	https://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=10105	This species occurs in freshwater wetlands with tall, dense vegetation. Lake Curalo may provide areas of potential habitat, however sparse local records and unlikely to be affected by walking trial.	No
Curlew Sandpiper *Calidris ferruginea*	E	CE	1	https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=20166	In NSW this species is mainly found in intertidal mudflats of sheltered coasts, as well as non-tidal swamps, lakes and lagoons. Some areas of potential habitat occur, however only single local record. Unlikely to occur.	No
Gang-gang Cockatoo *Callocephalon fimbriatum*	V	-	85	https://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=10975	The Gang-gang Cockatoo is distributed from southern Victoria through south- and central-eastern New South Wales. Favours old growth forest and woodland attributes for nesting and roosting. Generally found in tall mountain forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. Site has areas of potential foraging habitat, especially in Ben Boyd National Park. Low to fair chance of occurrence.	**Yes**
Brown Treecreeper (eastern subspecies) *Climacteris picumnus victoriae*	V	-	1	https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10171	This species is found in eucalypt woodlands and dry open forest. Fallen timber is an important component for foraging. Some areas may comprise suitable habitat but only single local record. Unlikely to occur.	No

Species	BC Act	EPBC Act	No. of Records	Link to Profile	Likelihood of Occurrence	Significance Assessment Required?
Beach Stone-curlew *Esacus magnirostris*	E	-	2	https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10280	This coastal species occurs on beaches and at the edges of or near mangroves. Parts of the site have suitable habitat, however sparse local records and unlikely to be affected by trail if present.	No
Little Lorikeet *Glossopsitta pusilla*	V	-	17	https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=20111	This species usually occurs in riparian habitats and forages in the canopy of open eucalypt forest and woodland. Site contains suitable foraging habitat, moderate chance of occurrence.	**Yes**
White-fronted Chat *Epthianura albifrons*	V	-	3	https://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=20143	Species is found across the southern half of Australia, mostly in temperate to arid climates and predominantly in saltmarsh vegetation but also in open grasslands and sometimes in low shrubs bordering wetland areas. Estuarine and wetland habitats in the study area provide potential habitat for this species. Low chance of occurrence.	**Yes**
Varied Sittella *Daphoenositta chrysoptera*	V	-	11	http://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=20135	This species forages in trees with rough bark or on dead trees. It is known to occur in a range of vegetation types excluding deserts and grassland. Site contains suitable foraging and nesting habitat, fair potential to occur.	**Yes**
Sooty Oystercatcher *Haematopus fuliginosus*	V	-	13	https://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=10385	This species occurs on rocky headlands, beaches and muddy estuaries. Estuarine and beach areas provide suitable habitat. High chance of occurrence.	**Yes**
Little Eagle *Hieraaetus morphnoides*	V	-	7	https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=20131	This species forages in forest and woodland communities that contain an abundance of prey resources. Site habitat likely to be too dense for this species. Sparse local records. Unlikely to occur.	No
White-throated Needletail *Hirundapus caudacutus*	-	V	9	https://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=682	This migratory aerial species most commonly occur over wooded areas including open forest and rainforest. Potential to forage over the site as part of a larger foraging range, however the works would have no consequence on this species given that is an aerial forager.	No

Species	BC Act	EPBC Act	No. of Records	Link to Profile	Likelihood of Occurrence	Significance Assessment Required?
Black-tailed Godwit *Limosa limosa*	V	-	2	https://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=10479	Primarily a coastal species, usually found in sheltered bays, estuaries, and lagoons with large intertidal mudflats and/or sandflats. Roosts and loafs on low banks of mud, sand and shell bars. Fair chance of occurrence in study area as fly-over, however works would be of little consequence to this species.	No
Swift Parrot *Lathamus discolor*	E	CE	1	https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10455	On the mainland they occur in areas where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations. Sparse local records, unlikely to occur on site given presence of higher quality habitats in the locality.	No
Square-tailed Kite *Lophoictinia isura*	V	-	6	https://www.environment.nsw.gov.au/ThreatenedSpeciesApp/profile.aspx?id=10495	This species is commonly found in open forests and woodlands. Large stick nests are constructed in forks of living trees. Recorded in locality, hence at least fair chance of occurrence as part of a larger foraging range.	**Yes**
Barking Owl *Ninox connivens*	V	-	6	https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10561	This species is flexible in its habitat use, though generally inhabits woodland and open forest. Sparse local records. Potential habitat occurs in study area, low potential to occur.	**Yes**
Powerful Owl *Ninox strenua*	V	-	146	http://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10562	This species occurs in sclerophyll forests and requires an abundance and diversity of prey species. There is some potential to forage over the site as part of a larger range. Fair chance of occurrence.	**Yes**
Eastern Osprey *Pandion cristatus*	V	-	5	https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10585	This species is found in habitats with large, open bodies of water, including large rivers, oceans, and lakes. Breeding habitat for this species typically involves nests in large emergent eucalypts and are always in close proximity to foraging habitat. Estuarine areas in the study area offer high quality potential foraging habitat. High chance of occurrence.	**Yes**

Species	BC Act	EPBC Act	No. of Records	Link to Profile	Likelihood of Occurrence	Significance Assessment Required?
Scarlet Robin *Petroica boodang*	V	-	24	https://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=20133	This species inhabits eucalypt forests, rainforests and rocky areas up to 950 in altitude (DPIE 2020b). This species requires loose bark, vines or hollow trunk limbs for shelter. Open forest habitats in the study area offer potential habitat. Fair chance of occurrence.	**Yes**
Flame Robin *Petroica phoenicea*	V	-	1	https://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=20129	This species is only known to occur in three disjunct areas of south-east Australia, the nearest to the subject site being south of the Central Coast (DPIE 2020b). The subject site is outside of the known geographical distribution for this species. Unlikely to occur.	No
Eastern Ground Parrot *Pezoporus wallicus wallicus*	V	-	12	https://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=10608	Small numbers are recorded at Morton and Ben Boyd NP and other areas on the south coast. Occurs in high rainfall coastal and near coastal low heathlands and sedgelands. Heathland areas near the Pinnacles offers suitable habitat, however these areas will be unaffected by the trail.	No
Eastern Hooded Dotterel *Thinornis cucullatus cucullatus*	CE	V	18	https://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=10803	In south-eastern Australia Hooded Plovers prefer sandy ocean beaches, especially those that are broad and flat, with a wide wave-wash zone for feeding, much beach cast seaweed, and backed by sparsely vegetated sand-dunes for shelter and nesting. Estuarine areas and beaches offer potential habitat. Moderate chance of occurring in the study area, however the works would be unlikely to impact this species.	No
Masked Owl *Tyto novaehollandiae*	V	-	23	https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10820	This species occurs in dry eucalypt forests and woodlands with a sparse understory. It requires tree hollows for nesting and an abundance and diversity of prey species. There is some potential to forage over the site as part of a larger range. Fair chance of occurrence.	**Yes**
Sooty Owl *Tyto tenebricosa*	V	-	34	http://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10821	A rainforest species which requires very large tree-hollows to roost/nest. There is some potential to forage over the site as part of a larger range. Fair chance of occurrence.	**Yes**

Species	BC Act	EPBC Act	No. of Records	Link to Profile	Likelihood of Occurrence	Significance Assessment Required?
Mammalia						
Eastern Pygmy-possum *Cercartetus nanus*	V	-	62	https://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=10155	Found in a broad range of habitats from rainforest through sclerophyll forest and woodland to heath, but in most areas woodlands and heath appear to be preferred. Shelters in tree hollows, rotten stumps, holes in the ground, abandoned bird-nests, Ringtail Possum dreys or thickets of vegetation. Many records in BBNP, and some habitats in the study area would provide potential habitat. Fair chance of occurrence.	**Yes**
Spotted-Tailed Quoll *Dasyurus maculatus*	V	E	8	http://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10207	This species prefers forest habitats with dense vegetation. They require forest with suitable den sites such as rock crevices, caves, hollow logs, burrows and tree hollows. Site may offer potential habitat, however there are only old and outdated records in the locality, and potential breeding habitat is uncommon. Low to unlikely potential to occur.	No
Eastern False Pipistrelle *Falsistrellus tasmaniensis*	V	-	6	https://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=10331	Species prefers moist habitats, with trees taller than 20 m. Generally roosts in eucalypt hollows, but has also been found under loose bark on trees or in buildings. Site has potential habitat, fair chance of occurrence.	**Yes**
Southern Brown Bandicoot (eastern) *Isoodon obesulus obesulus*	E	E	72	https://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=10439	The Southern Brown Bandicoot has a patchy distribution, but It is found in south-eastern NSW. They are generally only found in heath or open forest with a heathy understorey on sandy or friable soils. Some habitats in BBNP in the study area contain suitable habitat, however population appears to be located several km south of the study area. Not recorded despite targeted surveys. Very low to unlikely chance of occurrence.	No
Southern Myotis *Myotis macropus*	V	-	9	https://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=10549	This species requires tree hollows, caves, tunnels or dense foliage for roosting. Forages along creek lines. Study area contains suitable foraging and roosting	**Yes**

Species	BC Act	EPBC Act	No. of Records	Link to Profile	Likelihood of Occurrence	Significance Assessment Required?
					habitat. Not detected during surveys but considered fair chance of occurrence.	
Golden-tipped Bat *Phoniscus papuensis*	V	-	7	https://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=10444	Species is found in rainforest and adjacent wet and dry sclerophyll forest up to 1000m. Also recorded in tall open forest, Casuarina-dominated riparian forest and coastal Melaleuca forests. Records occur further west several kilometres from the site. Unlikely to occur.	No
Large Bentwing Bat *Miniopterus schreibersii oceanensis*	V	-	63	http://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10534	Eastern Bentwing-bats occur along the east and north-west coasts of Australia. Caves are the primary roosting habitat, but also use derelict mines, storm-water tunnels, buildings and other man-made structures. Site has potential habitat and this species has a moderate chance of occurrence.	**Yes**
Yellow-bellied Glider *Petaurus australis*	V	-	432	https://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=10601	This species occurs in tall mature eucalypt forest generally in areas with high rainfall and nutrient rich soils. Forest type preferences vary with latitude and elevation; mixed coastal forests to dry escarpment forests in the north; moist coastal gullies and creek flats to tall montane forests in the south. Most records occur further inland in state forests, however a new near-coastal records also occur. Some open forest habitat sin the study area may offers potential foraging and breeding habitat. Low potential to occur.	**Yes**
Greater Glider *Petauroides volans*	-	V	52	http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=254	The Greater Glider is largely restricted to eucalypt forests and woodlands, favouring forests with a diversity of eucalypt species, due to seasonal variation in its preferred tree species. This species requires hollow-bearing trees for denning and breeding. Site offers some areas of potential foraging habitat, however the best habitats in the locality and most of the	No

Species	BC Act	EPBC Act	No. of Records	Link to Profile	Likelihood of Occurrence	Significance Assessment Required?
					local records occur further inland in large tracts of forest. Unlikely chance of occurrence.	
Brush-tailed Phascogale *Phascogale tapoatafa*	V	-	1	https://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=10613	This species prefers dry sclerophyll forests with sparse groundcover however is commonly found in paddock trees and roadside vegetation in rural areas. It is known to nest in tree hollows. Only single local record from 1988. Unlikely to occur.	No
Koala *Phascolarctos cinereus*	V	E	29	https://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=10616	The Koala inhabits eucalypt woodlands and forests. Sparse local records, no recent records in study area with most recent being from 1994. Likely to be adversely affected by recent bushfires. Very low to unlikely chance of occurrence.	No
Long-nosed Potoroo *Potorous tridactylus*	V	V	49	http://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10662	This species requires a dense understory and groundcover for refuge whilst feeding. Some habitats in BBNP in the study area contain suitable habitat, however population appears to be located several km south of the study area. Not recorded despite targeted surveys. Very low to unlikely chance of occurrence.	No
Yellow-bellied Sheathtail-bat *Saccolaimus flaviventris*	V	-	1	https://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=10741	The Yellow-bellied Sheathtail-bat is a wide-ranging species found across northern and eastern Australia. Forages in most habitats across its very wide range, with and without trees, seasonal movements are unknown; there is speculation about a migration to southern Australia in late summer and autumn. Only single local record, unlikely to occur.	No
White-footed Dunnart *Sminthopsis leucopus*	V	-	8	https://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=10758	The White-footed Dunnart is found in a range of different habitats across its distribution, including coastal dune vegetation, coastal forest, tussock grassland and sedgeland, heathland, woodland, and forest. Potential to occur across project site.	**Yes**

Species	BC Act	EPBC Act	No. of Records	Link to Profile	Likelihood of Occurrence	Significance Assessment Required?
					Habitats in BBNP are suitable for this species and local records occur within 2km of the study area. Low chance of occurrence and likely to be a small and localised population and would have been severely impacted by bushfires.	
Grey-headed Flying Fox *Pteropus poliocephalus*	V	V	43	http://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10697	A nomadic species which is dependent on winter flowering eucalypts. Potential foraging resource for this species however no breeding or roosting camps for this species were located within the subject site. High potential to occur foraging as part of larger range.	**Yes**
Key: Critically Endangered (CE), Endangered (E), Vulnerable (V), Migratory (M).						

Appendix 2: Threatened flora and EEC report

Survey for threatened flora and threatened ecological communities - Bundian Way between Jigamy Farm to Fisheries Beach

Report for Wolfpeak Environmental Services.

Prepared by Dr James Schlunke, Principal Botanist/Ecologist

Axis Ecological Services

Final report prepared 7th March 2022

1. Background

The Bundian Way is an ancient track joining Turemulerrer (Twofold Bay) and Targangal (Mount Kosciuszko). The Bundian Way is currently in development to become a connected walking track, starting with a section between Jigamy Farm near Pambula Lake and Fisheries Beach, in the south of Twofold Bay. Axis Ecological Services was engaged by WolfPeak Environmental Services to undertake an assessment of threatened flora and threatened ecological communities within a number of smaller sections along this route, where modification of native vegetation is required to establish the track.

2. Methodology

2.1 Track sections

Eleven discrete sections of the Bundian Way between Jigamy Farm and Fisheries Beach requiring modification of vegetation were assessed for the presence of threatened flora species and threatened ecological communities. These sections (referred to collectively as the 'study area') were:

(i) Jigamy to Pinnacles carpark
(ii) The Pinnacles
(iii) North Head track
(iv) Lake Curalo outlet
(v) Victoria Terrace
(vi) Cattle Bay Road
(vii) Shadrachs Creek
(viii) Northcote Point
(ix) Moutrys Point
(x) Canoe Shed and track to Whaling Station
(xi) Fisheries Beach to Whaling Station

The Jigamy Farm to Fisheries Beach section of the Bundian Way is shown in **Figure 2.1** below.

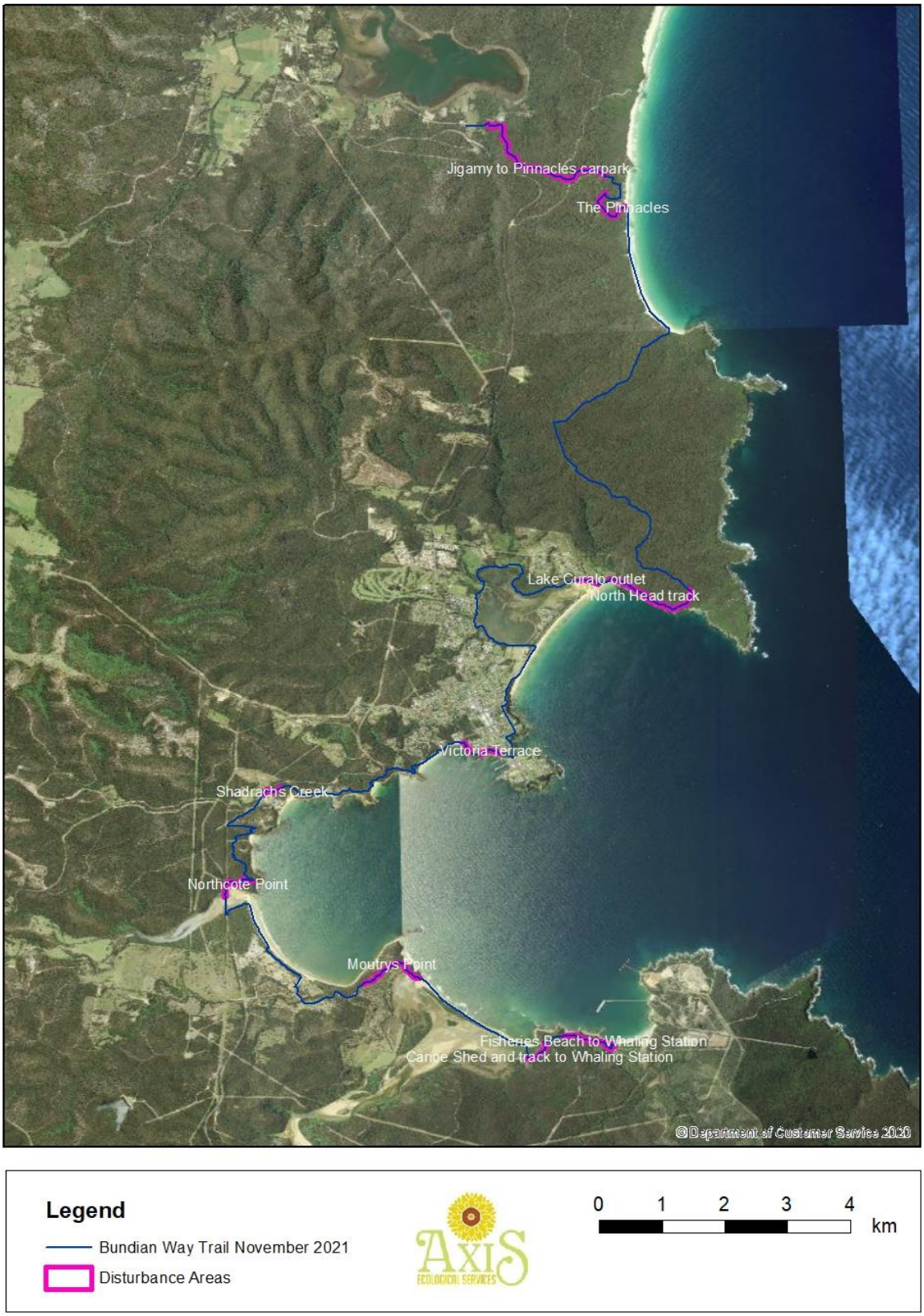


Figure 2.1. Study area showing entire track section (blue) and disturbance areas (pink).

2.2 Candidate threatened flora species

Eleven threatened flora species have been recorded within 10km of the study area. These species are listed in Table 2.1 below.

Table 2.1. Candidate threatened flora species recorded within 10km of the study area.

Family	Scientific name	In flowering time?	NSW status	Commonwealth status
Araliaceae	*Astrotricha* sp. *Wallagaraugh*	*No*	E1	
Convolvulaceae	*Wilsonia backhousei*	*Yes*	V	
Euphorbiaceae	*Pseudanthus ovalifolius*	*No*	E1	
Lamiaceae	*Westringia davidii*	*Yes*	V	V
Orchidaceae	*Cryptostylis hunteriana*	*No*	V	V
Orchidaceae	*Genoplesium rhyoliticum*	*No*	E1	E
Orchidaceae	*Pterostylis alpina*	*No*	V	
Rhamnaceae	*Pomaderris bodalla*	*Possibly*	V	
Rutaceae	*Leionema ralstonii*	*No*	V	V
Rutaceae	*Zieria formosa*	*No*	E4A	E
Violaceae	*Viola cleistogamoides*	*No*	E1	

While all species listed above have been recorded within 10km of the study area and are therefore considered to potentially occur, several species listed have highly specific habitat associations which are not present along the Bundian Way track alignment. Specifically, David's Westringia (*Westringia davidii*), Rhyolite Midge Orchid (*Genoplesium rhyoliticum*), Ralston's Leionema (*Leionema ralstonii*) and Shapely Zieria (*Zieria formosa*) are all associated with rhyolite rocky outcrops west of Pambula and Eden. While outlying occurrences of these species are possible, these species are deemed unlikely to occur within the study area.

The Oval-leafed Pseudanthus (*Pseudanthus ovalifolia*) has been recorded only once within NSW, at a site close to the Bundian Way alignment in Ben Boyd National Park in 1978. This location is between Pinnacles and North Head Track, where the Bundian Way follows an existing track and was therefore not surveyed in the current study. This species is considered to potentially occur in the study area based on proximity to the existing historical record, though previous attempts to relocate the species have been unsuccessful.

The Merimbula Star-hair (*Astrotricha* sp. *Wallagaraugh*) is known from two disjunct populations including one north from Merimbula. While no records of the species occur within the vicinity of the track alignment, the species is known to occur in forests dominated by Blackbutt (*Eucalyptus pilularis*), Red Bloodwood (*Corymbia gummifera*) and Black She-oak (*Allocasuarina littoralis*) on moderate to deep sandy soils similar to that present within the northern extent of the study area around Jigamy Farm and The Pinnacles.

The Hidden Violet (*Viola cleistogamoides*) is a small forb known to occur in mostly coastal wet heath but also dry forests and woodlands on skeletal soils. It is known from two localities near to the study area, and is a very small, cryptic species which would not have been flowering during the survey period. This species is considered to potentially occur in the study area.

Narrow-leafed Wilsonia (*Wilsonia backhousei*) is a small perennial shrub that forms low mats on the margins of lakes and saltmarshes. It is known from Pambula Lake to the north of the study area, however several small sections of the trail cross potential habitat within the study area.

The Bodalla Pomaderris (*Pomaderris bodalla*) is a tall shrub growing in wet gullies north from Merimbula. While the study area is south of the known distribution of the species, the track alignment crosses a number of small gullies potentially suitable for the species. It is therefore considered to potentially occur within the study area.

The Alpine Greenhood (*Pterostylis alpina*) is an orchid normally associated with montane forests, however an isolated outlying record of the species occurs approximately 9.5km south of the study area. While this record could potentially be explained by a case of mis-identification, the species is considered to have a low, but non-zero chance of occurring within the study area. The species would not have been flowering and would therefore not have been detectable during the surveys.

The Leafless Tongue Orchid (*Cryptostylis hunteriana*) is distributed in a range of coastal forest and woodland communities along the coast of New South Wales. While this species has some potential to occur within the study area and would not have been flowering during the survey time, this species was previously surveyed for in the study are by Wolfpeak ecologists during the flowering period.

2.3 Candidate threatened ecological communities

Eight threatened ecological communities are known to occur or are predicted to occur around the study area. These communities are listed in Table 2.2 below.

Table 2.2. Candidate threatened ecological communities predicted to potentially occur within the study area.

Name	NSW status	Commonwealth status
Bangalay Sand Forest in the Sydney Basin and South East Corner Bioregions	Endangered	
Coastal Saltmarsh in the NSW North Coast, Sydney Basin and South East Corner Bioregions	Endangered	Vulnerable
Freshwater wetlands on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions	Endangered	
Littoral Rainforest in the NSW North Coast, Sydney Basin and South East Corner Bioregions	Endangered	Critically Endangered
Lowland Grassy Woodland in the South East Corner Bioregion	Endangered	Critically Endangered
River-flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions	Endangered	Critically Endangered
Swamp oak floodplain forest of the NSW North Coast, Sydney Basin and South East Corner bioregions	Endangered	Endangered
Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions	Endangered	

2.4 Survey methodology

Surveys were conducted on the 21st January (Lake Curalo Outlet, North Head Track), 2nd February (Jigamy to Pinnacles carpark, The Pinnacles), 9th February (Fisheries Beach to Whaling Station, Moutrys Bay, Canoe Track) and 22nd February (Northcote Point, Shadrachs Creek, Victoria Terrace, Cattle Bay Road) in 2022. Proposed track sections were traversed by botanist Dr James Schlunke along

the proposed alignment, with a buffer of approximately 10m each side of the track. The alignment was identified based on on-site track markers, or from the provided alignment shapefile dated November 2021 when no markers were present.

3. Results

3.1 Jigamy Farm to Pinnacles carpark and The Pinnacles

3.1.1 Threatened flora

No threatened flora species were detected in the Jigamy and Pinnacles sections during the surveys. Habitats present included mainly tall *Eucalyptus pilularis* - *Corymbia gummifera* forests on deep sands, which is potentially suitable for *Astrotricha* sp. *Wallagaraugh* and *Cryptostylis hunteriana*, though neither species were detected. A small area of wet heathland vegetation was found (see 3.1.2 below), which is potentially suitable habitat for *Viola cleistogamoides*. Habitat suitability for candidate threatened flora species is summarised in Table 3.1 below.

A species thought to potentially be the NSW Endangered Tangled Bedstraw (*Galium australe*) was found during surveys of the Pinnacles track section, and preliminary surveys of distribution and abundances were carried out in the field. A specimen and photographs were forwarded to David Albrecht (Australian National Herbarium, Canberra) and was subsequently determined by Ian Thompson (Royal Botanic Gardens, Melbourne) to be *Galium binifolium* subsp. *binifolium*. While G. australe is known to occur within Nadgee Nature Reserve to the south of the study area, specimens of this species similar to those found in these surveys have previously been incorrectly identified as *Galium australe*, though they differ in some minor characteristics.

Figure 3.1. An individual of *Galium binifolium* subsp. *binifolium* showing similarities to the endangered Tangled Bedstraw (*Galium australe*) found to the west of The Pinnacles along the track alignment.

Track markers along the track from Jigamy Farm to Haycock Road differed to the provided track shapefile in a number of locations. Precedence was given to searching along the marked track rather than the shapefile track, though in most cases both sections were searched (Figure 3.2, below).

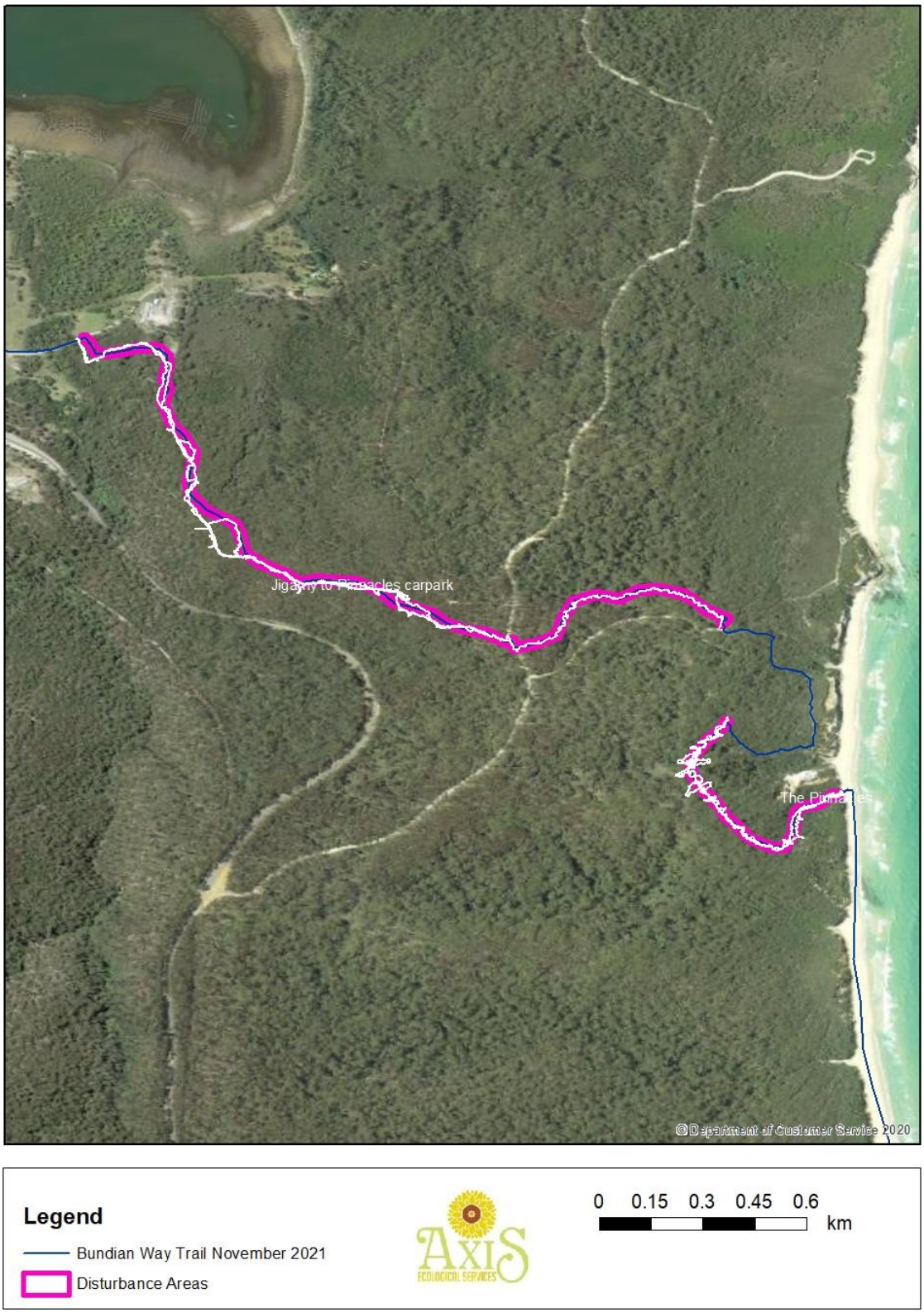


Figure 3.2. Survey tracks for the Jigamy Farm Pinnacles carpark and The Pinnacles track sections.

Table 3.1. Summary of habitat availability and detectability of threatened flora species within the Jigamy to Pinnacles sections.

Scientific name	Potential habitat present	Detectable	Recorded
Astrotricha sp. *Wallagaraugh*	*Yes*	*Yes*	No
Wilsonia backhousei	*No*	*Yes*	No
Pseudanthus ovalifolius	*Yes*	*Yes*	No
Westringia davidii	*No*	*Yes*	No
Cryptostylis hunteriana	*Yes*	*No*	No
Genoplesium rhyoliticum	*No*	*No*	No
Pterostylis alpina	*Possibly*	*No*	No
Pomaderris bodalla	*Yes*	*Yes*	No
Leionema ralstonii	*No*	*Yes*	No
Zieria formosa	*No*	*Yes*	No
Viola cleistogamoides	*Yes*	*Yes*	No

3.1.2 Threatened ecological communities

No threatened ecological communities were detected along the Jigamy to Pinnacles carpark and The Pinnacles sections. A section of ecologically sensitive and regionally rare wet heath vegetation was found in the section south of The Pinnacles, which should be avoided if possible. The location of this small wet heath section is shown in Figure 3.4 below.

Figure 3.3. Wet heathland vegetation on the Pinnacles track section featuring a range of locally uncommon species.

Figure 3.4. Wet heathland vegetation on the Pinnacles section featuring a range of locally uncommon species.

3.2 Lake Curalo Outlet and North Head track

3.2.1 Threatened flora

No threatened flora species were found in the Lake Curalo Outlet and North Head Track sections during the surveys. The Lake Curalo Outlet section supported small areas of suitable habitat for *Wilsonia backhousei* in the form of Coastal Saltmarsh vegetation (see below), however these areas were exhaustively searched and the species was not detected. Other vegetation present included dense stands of *Melaleuca armillaris* subsp. *armillaris* dense low forest with emergent Eucalypts including Coast Grey Box (*Eucalyptus bosistoana*) (Figure 3.5 below).

Figure 3.5. Dense coastal vegetation dominated by *Melaleuca armillaris* subsp. *armillaris* on the North Head Track section.

Table 3.2. Summary of habitat availability and detectability of threatened flora species within the Lake Curalo Outlet and North Head Track sections.

Scientific name	Potential habitat present	Detectable	Recorded
Astrotricha sp. *Wallagaraugh*	*Yes*	*Yes*	No
Wilsonia backhousei	*Yes*	*Yes*	No
Pseudanthus ovalifolius	*Yes*	*Yes*	No
Westringia davidii	*No*	*Yes*	No
Cryptostylis hunteriana	*No*	*No*	No
Genoplesium rhyoliticum	*No*	*No*	No
Pterostylis alpina	*Possibly*	*No*	No
Pomaderris bodalla	*Yes*	*Yes*	No
Leionema ralstonii	*No*	*Yes*	No
Zieria formosa	*No*	*Yes*	No
Viola cleistogamoides	*Yes*	*Yes*	No

3.2.2 Threatened ecological communities

A small section of Coastal Saltmarsh in the NSW North Coast, Sydney Basin and South East Corner bioregions threatened ecological community (TEC) was found in the western end of the Lake Curalo Outlet track section. This vegetation was a narrow strip of only 1-2m wide adjacent to the existing narrow track, however it included five of the total ten characteristic species listed under the Final Determination of the TEC. These characteristic species were creeping brookweed (*Samolus repens*), *Ficinia nodosa*, Sea Rush (*Juncus kraussii*), Samphire (*Sarcocornia quinqueflora*) and Sand couch (*Sporobolus virginicus*). A number of small Honey Bracelet Myrtle (*Melaleuca armillaris* subsp. *armillaris*) were also present in this section. This patch is shown in Figure 3.6 and Figure 3.8 below. While an existing informal track already exists in this section, efforts to avoid further impacts on Coastal Saltmarsh TEC should be taken.

Figure 3.6. A small section of Coastal Saltmarsh TEC lining the existing narrow track within the Lake Curalo Outlet section.

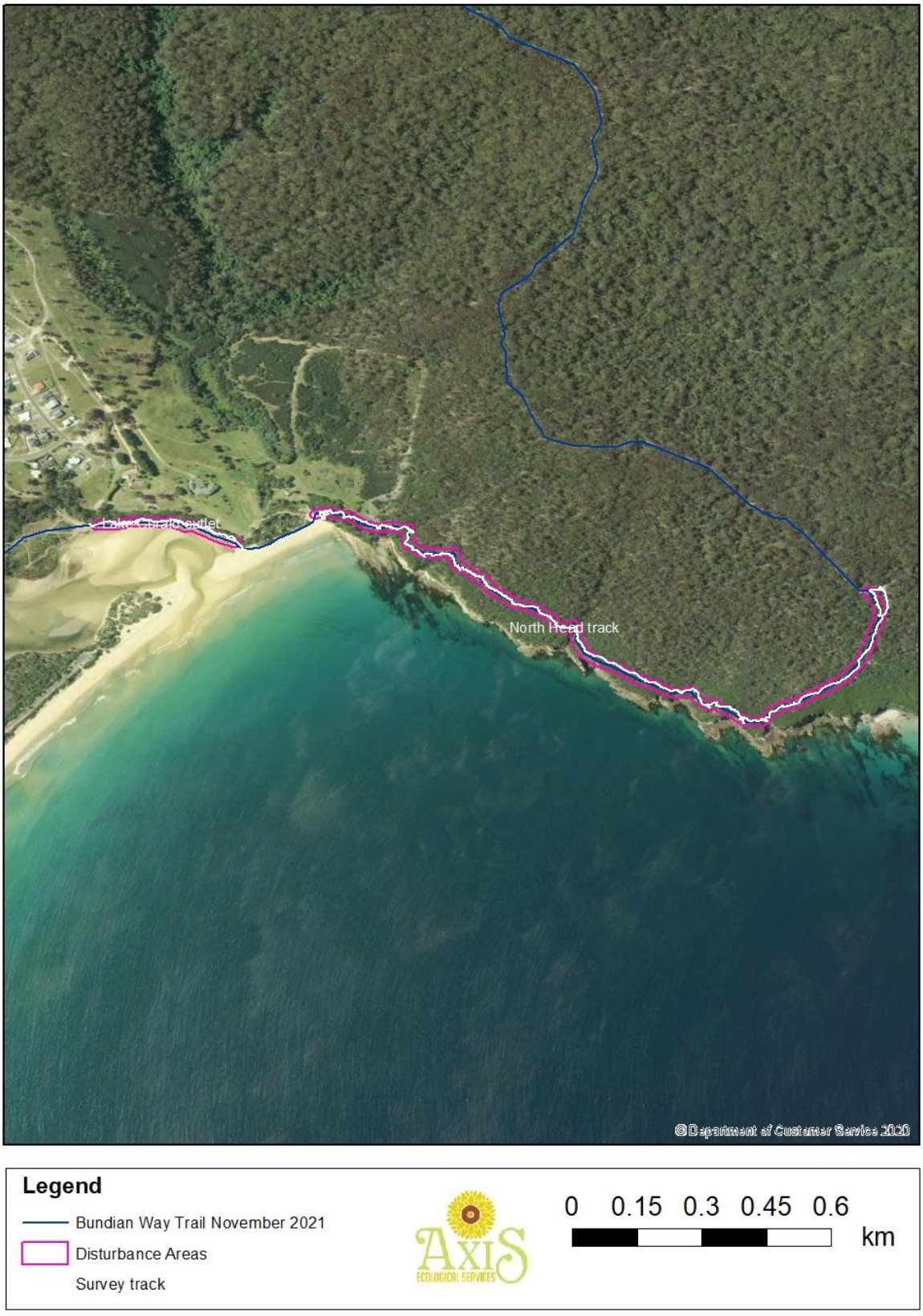


Figure 3.7. Survey tracks for the Lake Curalo and North Head Track sections.

Figure 3.8. Location of Coastal Saltmarsh TEC at the western end of Lake Curalo Outlet.

3.3 Victoria Terrace and Cattle Bay Road

3.3.1 Threatened flora

No threatened flora species were detected in the Victoria Terrace and Cattle Bay sections during the survey. Vegetation across the Victoria Terrace section was moderately to highly disturbed vegetation dominated by a low canopy of Honey Bracelet Myrtle (*Melaleuca armillaris* subsp. *armillaris*), Black She-oak (*Allocasuarina littoralis*) and *Banksia integrifolia*. The Cattle Bay section was predominantly open forest dominated by Silvertop Ash (*Eucalyptus sieberii*) with a moderately dense shrubby mid-storey. The marked track diverged significantly from the shapefile track in the Victoria Terrace section, with some preliminary track clearing already carried out at the time of survey. Habitats present were generally unsuitable for any of the candidate threatened flora species.

Table 3.3. Summary of habitat availability and detectability of threatened flora species within the Victoria Terrace and Cattle Bay Road sections.

Scientific name	Potential habitat present	Detectable	Recorded
Astrotricha sp. *Wallagaraugh*	*No*	*Yes*	No
Wilsonia backhousei	*No*	*Yes*	No
Pseudanthus ovalifolius	*Possibly*	*Yes*	No
Westringia davidii	*No*	*Yes*	No
Cryptostylis hunteriana	*No*	*No*	No
Genoplesium rhyoliticum	*No*	*No*	No
Pterostylis alpina	*No*	*No*	No
Pomaderris bodalla	*No*	*Yes*	No
Leionema ralstonii	*No*	*Yes*	No
Zieria formosa	*No*	*Yes*	No
Viola cleistogamoides	*No*	*Yes*	No

3.3.2 Threatened ecological communities

No threatened ecological communities were found in the Victoria Terrace and Cattle Bay Road sections.

Figure 3.9. Survey tracks within the Victoria Terrace and Cattle Bay Road sections.

3.4 Northcote Point and Shadrachs Creek

3.4.1 Threatened flora

No threatened flora species were recorded in the Northcote Point or Shadrachs Creek sections. Some wet sclerophyll forest habitat that potentially suitable habitat for *Pomaderris bodalla* was found in the Shadrachs Creek section (see below), though the species was not detected in the surveys.

Table 3.4. Summary of habitat availability and detectability of threatened flora species within Northcote Point and Shadrachs Creek sections.

Scientific name	Potential habitat present	Detectable	Recorded
Astrotricha sp. *Wallagaraugh*	*No*	*Yes*	No
Wilsonia backhousei	*No*	*Yes*	No
Pseudanthus ovalifolius	*Possibly*	*Yes*	No
Westringia davidii	*No*	*Yes*	No
Cryptostylis hunteriana	*No*	*No*	No
Genoplesium rhyoliticum	*No*	*No*	No
Pterostylis alpina	*No*	*No*	No
Pomaderris bodalla	*Yes*	*Yes*	No
Leionema ralstonii	*No*	*Yes*	No
Zieria formosa	*No*	*Yes*	No
Viola cleistogamoides	*No*	*Yes*	No

3.4.2 Threatened ecological communities

No threatened ecological communities were found in the Northcote Point and Shadrachs Creek sections. A section of wetter forest dominated by Coast Grey Box (*Eucalyptus bosistoana*) featuring a number of rainforest species characteristic of the Littoral Rainforest TEC was present at the Shadrachs Creek section, on the northern side of Shadrachs Creek. While this vegetation showed some affinities to Littoral Rainforest TEC, this vegetation most closely conformed to Plant Community Type (PCT) 777 Coast Grey Box - Mountain Grey Gum - stringybark moist shrubby open forest in coastal gullies, southern South East Corner Bioregion, which is not associated with the Littoral Rainforest TEC. In addition to this, the Littoral Rainforest TEC is defined as occurring north from Bega, meaning that all of the study area is outside of the defined occurrence of the TEC.

Figure 3.10. Wet sclerophyll vegetation conforming to PCT 777 in the Shadrachs Creek section.

Figure 3.11. Survey tracks within the Northcote Point and Shadrachs Creek sections.

3.5 Moutrys Point, Canoe shed to Whaling Station, and Fisheries Beach to Whaling Station

3.5.1 Threatened flora

No threatened flora species were detected in the Moutrys or Whaling Station sections during the survey.

Vegetation at the Canoe shed to Whaling Station and Fisheries Beach to Whaling Station was recently burned in the 2019-2020 bushfires, and currently features dense ground and mid-storey regrowth of various shrubs and climbers. For this reason, detectability of many of the threatened species was low during the surveys. While detectability was low in these sections, the vegetation present provides only marginally suitable or unsuitable habitat for candidate threatened species. Detectability of threatened species in the Moutrys Point section was good.

Table 3.5. Summary of habitat availability and detectability of threatened flora species within Moutrys Point, Canoe shed to Whaling Station, and Fisheries Beach to Whaling Station sections.

Scientific name	Potential habitat present	Detectable	Recorded
Astrotricha sp. *Wallagaraugh*	*No*	*Possibly*	No
Wilsonia backhousei	*Yes*	*Possibly*	No
Pseudanthus ovalifolius	*Possibly*	*Possibly*	No
Westringia davidii	*No*	*Possibly*	No
Cryptostylis hunteriana	*Possibly*	*No*	No
Genoplesium rhyoliticum	*No*	*No*	No
Pterostylis alpina	*No*	*No*	No
Pomaderris bodalla	*No*	*Possibly*	No
Leionema ralstonii	*No*	*Possibly*	No
Zieria formosa	*No*	*Possibly*	No
Viola cleistogamoides	*Yes*	*Yes*	No

3.5.2 Threatened ecological communities

Occurrences of Coastal Saltmarsh in the NSW North Coast, Sydney Basin and South East Corner bioregions TEC were found in both the Moutrys Point and Canoe Shed to Whaling Station sections, along the fringes of Towamba River. In both sections the extent of the TEC is small and composition is limited to mainly Samphire (*Sarcocornia quinqueflora*) and Sand couch (*Sporobolus virginicus*). At the Moutrys Bay section, the existing track (a small road) does not cross the TEC and impacts on the TEC should be completely avoidable (see Figure 3.14 and Figure 3.15). At the Canoe Shed to Whaling Station section, the extent is limited to two small sections on the beach and impacts should be avoidable.

Figure 3.12. Dense post-fire regrowth of shrubs and climbers limiting threatened flora detectability in the Fisheries Beach to Whaling Station section.

Figure 3.13. Survey tracks within the Moutrys Point, Canoe shed to Whaling Station, and Fisheries Beach to Whaling Station sections

Figure 3.14. Coastal Saltmarsh TEC adjacent to the Moutrys Point track section.

Figure 3.15. Coastal Saltmarsh TEC extent at the Moutrys Point section.

Figure 3.16. Very small, patchy occurrences of Coastal Saltmarsh TEC along the Canoe Shed and Track to Whaling Station section.

Figure 3.17. Coastal Saltmarsh TEC extent at the Canoe Shed and Track to Whaling Station section.

4. Discussion

4.1 Survey limitations

While no threatened species were recorded in the current surveys, timing and conditions of the survey were not ideal for detection of all species.

Three threatened orchid species were recorded within 10km of the study area. Of the three candidate threatened orchid species, only the Leafless Tongue Orchid (*Cryptostylis hunteriana)* has any realistic chance of occurring within the study area based on available habitats. This species would not have been flowering (and therefore not positively identifiable) during the current surveys, however earlier surveys for the species were conducted by Wolfpeak Environmental Surveys. The Rhyolite Midge Orchid (*Genoplesium rhyoliticum*) also would not have been detectable during the surveys, however it is unlikely to occur within the study area due to the very specific habitat requirements (Rhyolitic rocky outcrops). Specific habitat requirements for the Alpine Greenhood (*Pterostylis alpina*) are uncertain – within the normal range of the species it occurs within montane forests and woodlands, however habitat conditions at the local occurrence of the species (a single record in East Boyd State Forest from 2008) are unknown. The scarcity of local records and distance from the nearest section of the Bundian Way (around 9.5km) indicates that the likelihood of it occurring within the study area is very low.

All remaining candidate threatened flora species would have been detectable during the survey period, at least in a non-reproductive state. While detectability was hindered by dense shrubby regrowth at the Canoe Shed to Whaling Station and Fisheries Beach to Whaling Station sections, the overall likelihood of any candidate species occurring within the woodland and forest vegetation present is low. However, any substantial alteration to the track route could result in impacts on threatened species not accounted for in the current survey. As stated above, the provided track shapefile differed from on-ground track markers in a number of sections. Where discrepancies were encountered, the on-ground markers and/or on-site advice from project managers was considered the most accurate however in many cases both alternative tracks were searched.

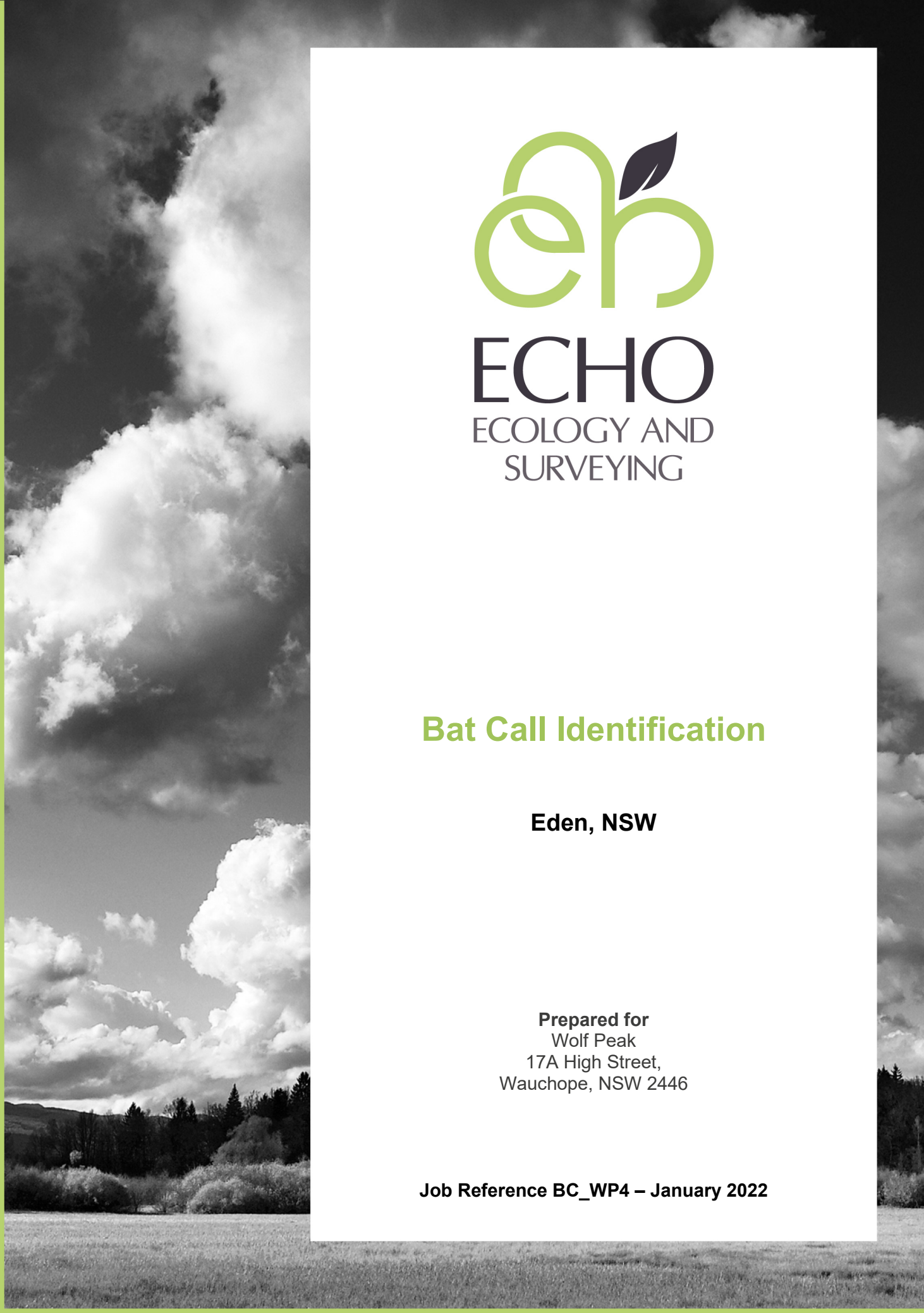
There are no seasonal or conditional limitations on detectability of the candidate threatened ecological communities. However, TECs could be impacted in the event of a substantial alteration to the track location could not accounted for in the current survey.

4.2 Conclusions

As stated above, no threatened flora species were detected in the survey. While detectability of several of the species was limited due to survey timing and conditions, the overall likelihood of unforeseen impacts on threatened flora is considered to be low. Any further alteration of the track alignment however could result in impacts on threatened flora species.

The Coastal Saltmarsh TEC was recorded at three locations during the survey. The extent of the TEC is very limited in the study area and further impacts should be avoidable. An additional section of (non-threatened but locally rare) wet coastal heath was found in the Pinnacles track section, which could potentially be avoided by a minor alteration to the track route and/or engineering of the track to minimise impacts.

Appendix 3: Bat Call Report



ECHO
ECOLOGY AND SURVEYING

Bat Call Identification

Eden, NSW

Prepared for
Wolf Peak
17A High Street,
Wauchope, NSW 2446

Job Reference BC_WP4 – January 2022

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This report has been prepared to document the analysis of digital ultrasonic bat echolocation calls received from a third party. The data was not collected by the author and as such no responsibility is taken for the quality of data collection or for the suitability of its subsequent use.

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1.0 INTRODUCTION

This report has been commissioned by Wolf Peak to analyse bat echolocation call data collected from Bundian Way Eden, NSW. Data was provided electronically to the author. This report documents the methods involved in analysing bat call data and the results obtained only.

2.0 METHODS

2.1 Call Identification

The identification of bat echolocation calls recorded during surveys was undertaken using Anabat Insight (Titley Electronics, Version 2.0.1) software and a noise filter was applied (EE_Allbats.als, ZC – auto, Smoothness - 4). The identification of calls was undertaken with reference to Pennay et al. (2004) and through the comparison of recorded reference calls from south-eastern NSW. Reference calls were obtained from the NSW database and from the authors personal collection.

A list of potentially occurring echolocating bat species for the region (approximately 50 – 100 km radius) was obtained from the Australasian Bat Society – Bat Map (https://www.ausbats.org.au/batmap.html) and was used to constrain the identification of bat calls.

Each call sequence ('pass') was assigned to one of five categories, according to the confidence with which an identification could be made, being:

- Definite - Pass identified to species level and could not be confused with another species
- Probable - Pass identified to species level and there is a low chance of confusion with another species
- Possible - Pass identified to species level but short duration or poor quality of the pass increases the chance of confusion with another species
- Species group - Pass could not be identified to species level and could belong to one of two or more species. Occurs more frequently when passes are short or of poor quality

- Unknown - Either background 'noise' files or passes by bats which are too short and/or of poor quality to confidently identify.

Call sequences that were less than three pulses in length were not analysed and were assigned to 'Unknown' and only search phase calls were analysed. Furthermore, some species are difficult to differentiate using bat call analysis due to overlapping call frequencies and similar shape of plotted calls and in these cases calls were assigned to species groups.

The total number of passes (call sequences) per unit per night was tallied to give an index of activity.

Nomenclature follows the Australian Faunal Directory (https://biodiversity.org.au/afd; downloaded 15 June 2020).

The echolocation call characteristics used to differentiate species for the region and the identification potential for each species are described in Appendix A.

2.2 Log file review

We reviewed the log files for each night of recording and have summarised the detector settings, recording duration and any errors. This may be used to confirm survey effort, the use of correct detector settings and may help diagnose missing data.

2.3 Limitations

The identification of bat species from echolocation calls in many Australian regions is not straightforward. Our reference call libraries tend to be relatively small, some species vary their call frequency with region and bat behaviour may also influence call shapes and frequencies. Additional factors may add to the level of uncertainty of species identification from echolocation calls such as short call sequences, high levels of noise and missing echolocation pulses. Some species share overlapping echolocation call characteristics and some overlap so much that we are unable to differentiate between species with our current knowledge.

To assist with the interpretation of our results within this context of uncertainty, we provide a qualitative indication of the confidence of bat call identification by assigning confidence levels (Definite, Probable, Possible and Species Groups). We have also provided a list of the general identification potential for each species potentially occurring within your sample region (Appendix A). For a more complete species inventory, bat call recording should be combined with other survey methods such as trapping.

It should be noted that the activity levels recorded at different sites may not be readily able to be compared. Activity levels should not be compared among species as different species have different detectability due to factors such as call loudness, foraging strategy and call identifying features. Activity comparisons among sites are dependent on many variables which need to be carefully controlled during data collection and statistically analysed. Influential variables include wind, rain, temperature, duration of recording, season, detector and microphone sensitivity, detector placement, weather protection devices etc.

The bat call identification results presented in this report should be interpreted with these limitations in mind and in many cases trapping and habitat assessment should also be undertaken in conjunction with bat call recording.

3.0 RESULTS

Calls were recorded in full spectrum format using an Anabat Swift bat detector (Titley Scientific).

A total of 3,311 call sequences were recorded, of which 2,123 call sequences were able to be analysed (ie were not 'noise' files or bat calls of short length). Of the bat calls, 495 call sequences (23 %) were able to be confidently identified (those classified as either definite or probable identifications) to species level (Table 3-1). Species recorded confidently within the site include:

- *Austronomus australis* (White-striped Free-tailed Bat)
- *Chalinolobus gouldii* (Gould's Wattled Bat)
- *Chalinolobus morio* (Chocolate Wattled Bat)
- *Micronomus norfolkensis* (Eastern coastal Free-tailed Bat)
- *Ozimops ridei* (Ride's Free-tailed Bat)
- *Rhinolophus megaphyllus* (Eastern Horseshoe Bat)
- *Scoteanax rueppellii* (Greater Broad-nosed Bat)
- *Vespadelus vulturnus* (Little Forest Bat)

Additionally, the following bat species potentially occurred within the site, but could not be confidently identified (those calls classified as possible or as a species group):

- *Falsistrellus tasmaniensis* (Eastern Falsistrelle)
- *Miniopterus orianae oceanensis* (Eastern Bent-winged Bat)
- *Myotis macropus* (Large-footed Myotis)
- *Nyctophilus geoffroyi* (Lesser long-eared bat)
- *Nyctophilus gouldi* (Gould's long-eared bat)
- *Scotorepens orion* (Eastern Broad-nosed Bat)
- *Vespadelus darlingtoni* (Large Forest Bat)

- *Vespadelus regulus* (Southern Forest Bat)
- *Vespadelus troughtoni* (Eastern cave bat)

It should be noted that additional bat species may be present within the site but were not recorded by the detectors (or are difficult to identify by bat call) and habitat assessment should be used in conjunction with these results to determine the likelihood of occurrence of other bat species.

Table 3-1 below summarises the results of the bat call analysis.

3.1 Log file review

The log file review indicated that detectors were mostly set for entire nights and functioning correctly. However, the detector ran out of batteries on the final night (3/12/2021) resulting in a partial night of recording only. Full details are provided in Appendix B.

Table 3-1: Results of bat call analysis (number of passes per site per night)

Key: V – Vulnerable; E – Endangered; X – listed as. For species group identifications where one or more of the species are listed as threatened, the species initials that are listed as threatened have been entered into the EPBC Act, BC Act, Species Credit, Ecosystem Credit and/or SAII columns

CONFIDENCE	IDENTIFICATION	EPBC ACT	BC ACT	SPECIES CREDIT	ECOSY STEM CREDIT	SAII	30/11/2021	1/12/2021	2/12/2021	3/12/2021
DEFINITE	*Austronomus australis*	-	-	-	-	-	-	1	1	-
	Chalinolobus gouldii	-	-	-	-	-	1	7	-	3
	Chalinolobus morio	-	-	-	-	-	11	3	-	-
	Micronomus norfolkensis	-	V	-	X	-	1	4	-	-
	Ozimops ridei	-	-	-	-	-	33	76	-	-
	Rhinolophus megaphyllus	-	-	-	-	-	-	-	1	-
	Vespadelus vulturnus	-	-	-	-	-	61	61	16	2
PROBABLE	*Austronomus australis*	-	-	-	-	-	1	1	-	-
	Chalinolobus gouldii	-	-	-	-	-	16	44	1	5
	Chalinolobus morio	-	-	-	-	-	13	2	-	-
	Micronomus norfolkensis	-	V	-	X	-	3	16	-	-

CONFIDENCE	IDENTIFICATION	EPBC ACT	BC ACT	SPECIES CREDIT	ECOSY STEM CREDIT	SAII	30/11/2021	1/12/2021	2/12/2021	3/12/2021
	Ozimops ridei	-	-	-	-	-	20	20	2	-
	Scoteanax rueppellii	-	V	-	X	-	7	19	8	-
	Vespadelus vulturnus	-	-	-	-	-	20	13	2	-
POSSIBLE	*Chalinolobus gouldii*	-	-	-	-	-	2	5	-	-
	Chalinolobus morio	-	-	-	-	-	-	-	-	1
	Micronomus norfolkensis	-	V	-	X	-	6	-	-	-
	Scoteanax rueppellii	-	V	-	X	-	1	2	2	-
SPECIES GROUPS	*Chalinolobus gouldii / Micronomus norfolkensis*	-	Mn	-	Mn	-	1	-	-	-
	Chalinolobus gouldii / Micronomus norfolkensis / Ozimops ridei	-	Mn	-	Mn	-	12	23	2	-
	Chalinolobus gouldii / Ozimops ridei	-	-	-	-	-	61	81	22	10
	Chalinolobus morio / Miniopterus orianae oceanensis	-	Moo	Moo	Moo	Moo	1	-	-	-
	Chalinolobus morio / Miniopterus orianae oceanensis / Vespadelus vulturnus	-	Moo	Moo	Moo	Moo	52	33	11	-
	Chalinolobus morio / Vespadelus vulturnus	-	-	-	-	-	146	50	8	3

CONFIDENCE	IDENTIFICATION	EPBC ACT	BC ACT	SPECIES CREDIT	ECOSY STEM CREDIT	SAII	30/11/2021	1/12/2021	2/12/2021	3/12/2021
	Falsistrellus tasmaniensis / Scotorepens orion	-	Ft	-	Ft	-	2	-	-	-
	Falsistrellus tasmaniensis / Scotorepens orion / Scoteanax rueppellii	-	Ft Sr	-	Ft Sr	-	25	44	28	-
	Falsistrellus tasmaniensis / Vespadelus darlingtoni	-	Ft	-	Ft	-	59	163	4	-
	Micronomus norfolkensis / Ozimops ridei	-	Mn	-	Mn	-	18	61	-	-
	Miniopterus orianae oceanensis / Vespadelus darlingtoni / Vespadelus regulus	-	Moo	Moo	Moo	Moo	5	-	-	-
	Miniopterus orianae oceanensis / Vespadelus darlingtoni / Vespadelus regulus / Vespadelus vulturnus	-	Moo	Moo	Moo	Moo	2	-	-	-
	Miniopterus orianae oceanensis / Vespadelus regulus	-	Moo	Moo	Moo	Moo	3	-	-	-
	Miniopterus orianae oceanensis / Vespadelus regulus / Vespadelus vulturnus	-	Moo	Moo	Moo	Moo	100	142	82	7
	Miniopterus orianae oceanensis / Vespadelus vulturnus	-	Moo	Moo	Moo	Moo	1	2	-	-
	Myotis macropus / Nyctophilus geoffroyi / Nyctophilus gouldi	-	Mm	Mm	-	-	36	27	8	9
	Vespadelus darlingtoni / Vespadelus regulus	-	-	-	-	-	14	159	15	-
	Vespadelus regulus / Vespadelus vulturnus	-	-	-	-	-	24	13	40	-

CONFIDENCE	IDENTIFICATION	EPBC ACT	BC ACT	SPECIES CREDIT	ECOSY STEM CREDIT	SAII	30/11/2021	1/12/2021	2/12/2021	3/12/2021
UNKNOWN	Unknown	-	-	-	-	-	77	90	19	4
	'Noise' files	-	-	-	-	-	337	232	269	160
TOTAL							**1172**	**1394**	**541**	**204**

4.0 SAMPLE CALLS

A sample of the calls actually identified from the site for each species is given below.

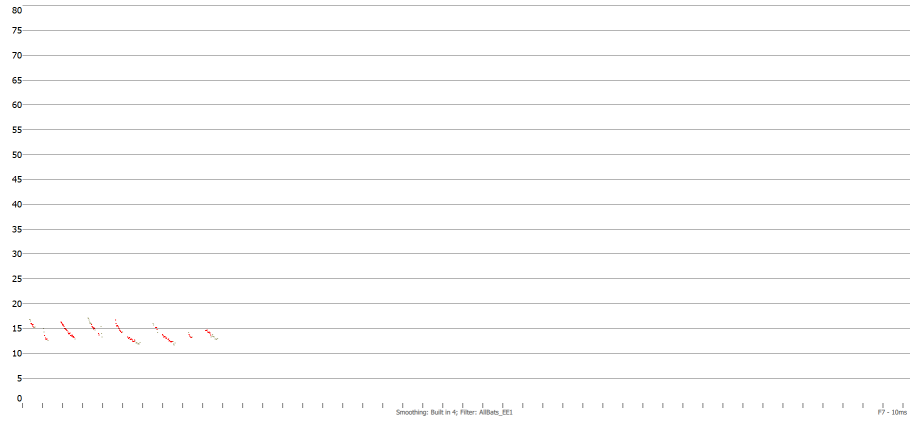

Figure 4-1: *Austronomus australis* definite call

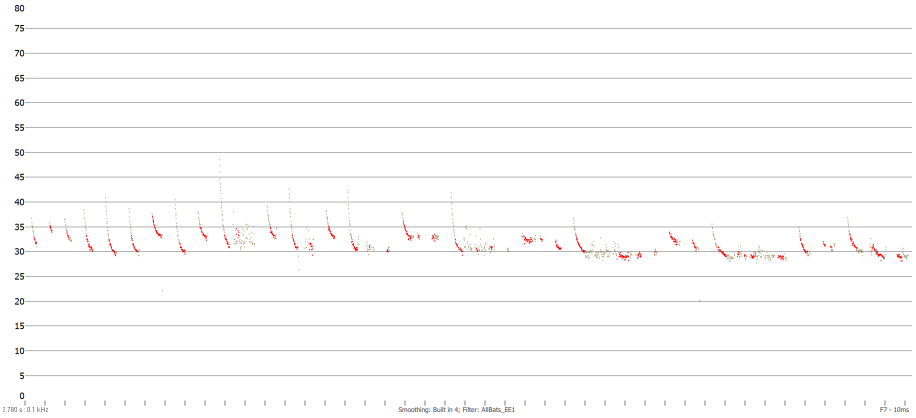

Figure 4-2: *Chalinolobus gouldii* definite call

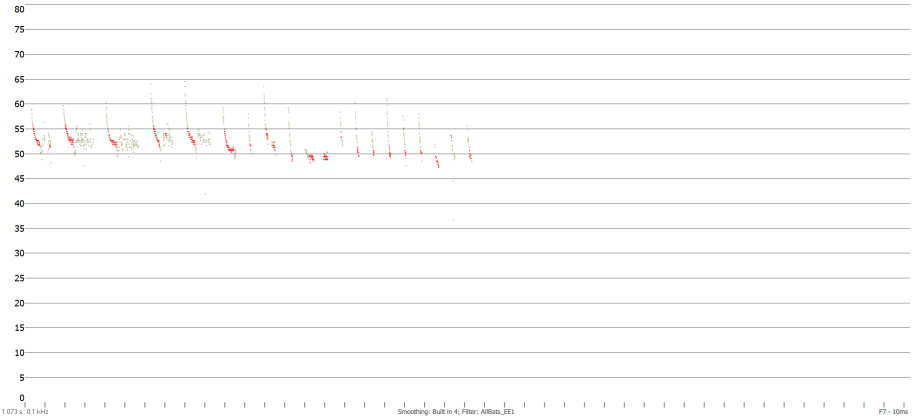

Figure 4-3: *Chalinolobus morio* definite call

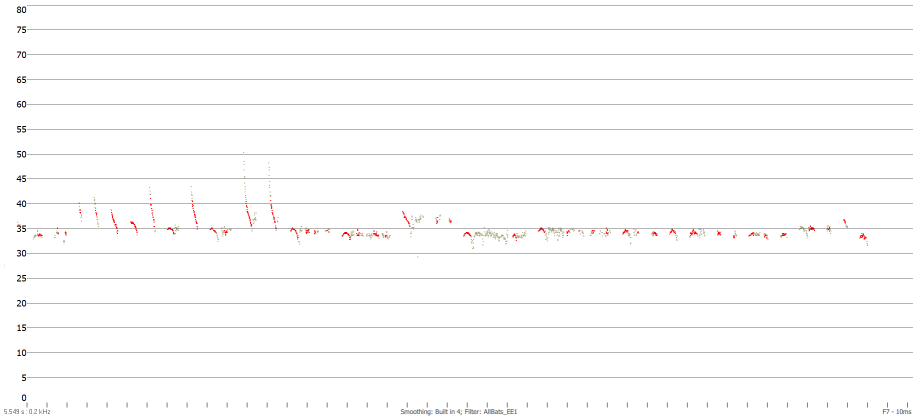

Figure 4-4: *Micronomus norfolkensis* definite call

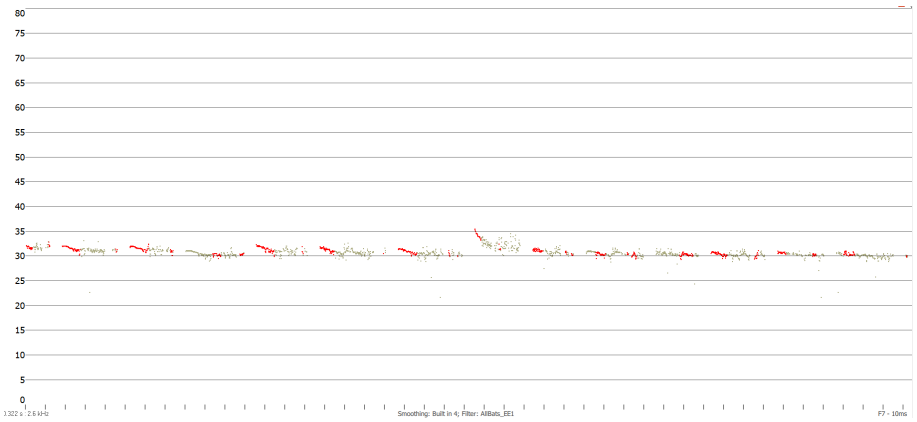

Figure 4-5: *Ozimops ridei* definite call

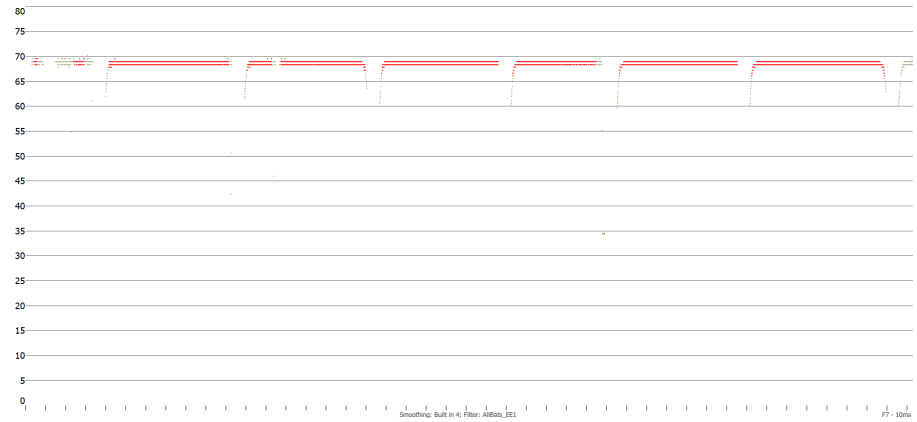

Figure 4-6: *Rhinolophus megaphyllus* definite call

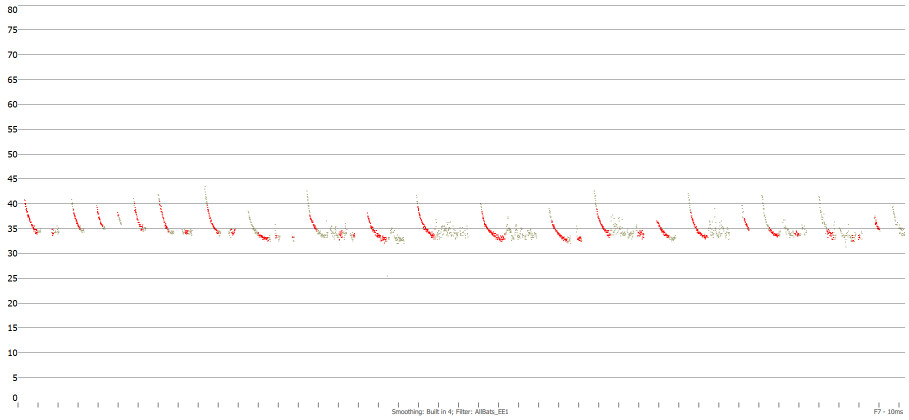

Figure 4-7: *Scoteanax rueppellii* probable call

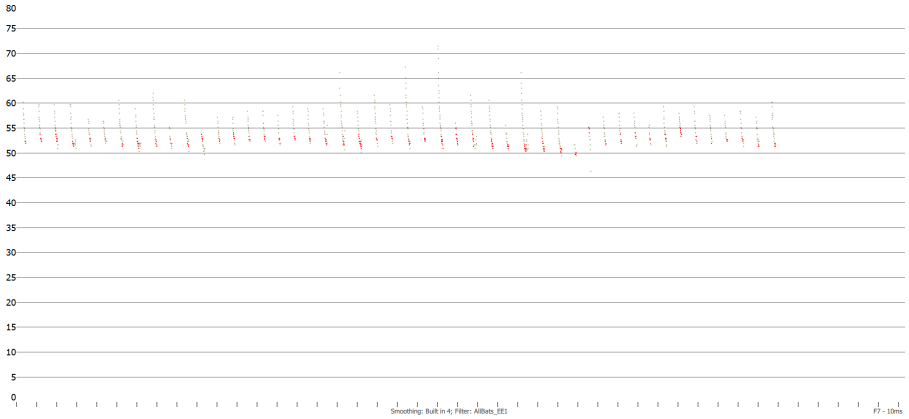

Figure 4-8: *Vespadelus vulturnus* definite call

5.0 REFERENCES

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APPENDIX A SPECIES IDENTIFICATION CONFIDENCE AND CHARACTERISTICS – SOUTH COAST

Table A1: Identification confidence and characteristics of bat echolocation calls from the South coast region

Scientific Name	Common Name	Identification Potential	Identification characteristics
Austronomus australis	White-striped Free-tailed Bat	High	Good quality calls unlikely to be confused. However, partial calls may be confused with social calls of other bat species and insects.
Chalinolobus dwyeri	Large-eared Pied Bat	High	Calls may overlap with *Saccolaimus flaviventris*. However, good quality call sequences are unlikely to be confused due to small pulse shape and alternating pulses in *Chalinolobus dwyeri*.
Chalinolobus gouldii	Gould's Wattled Bat	Mod - High	Overlaps with *Ozimops ridei, Micronomus norfolkensis* and *Scoteanax rueppellii*. In good quality recordings, differentiated from *Mormopterus* spp. by curved pulses and from *Scoteanax rueppellii* by alternating pulse frequencies.
Chalinolobus morio	Chocolate Wattled Bat	Mod - High	Overlaps with *Vespadelus vulturnus* and possibly with *Miniopterus orianae oceanensis* in some areas. Differentiated from *Vespadelus* spp. by the presence of down-sweeping tails on pulses and generally little doppler effect that is typically displayed by *Vespadelus* spp. Not differentiated from *Miniopterus orianae oceanensis* where they overlap in characteristic frequency.
Falsistrellus tasmaniensis	Eastern Falsistrelle	Low	Overlaps in characteristic frequency with *Scotorepens orion, Scoteanax rueppellii* and *Vespadelus darlingtoni*. *Falsistrellus tasmaniensis* is most frequently recorded from more elevated locations in the region. However, some records exist from coastal lowlands and so included it in our species groups in coastal areas as a precautionary measure. We do not distinguish *Falsistrellus tasmaniensis* from *Scotorepens orion* or *Vespadelus darlingtoni* where they overlap in frequency due to overlapping call characteristics.

Scientific Name	Common Name	Identification Potential	Identification characteristics
Micronomus norfolkensis	Eastern coastal Free-tailed Bat	Mod	Overlaps in characteristic frequency with *Ozimops ridei*, *Chalinolobus gouldii* and *Scoteanax rueppellii*. Differentiated from *Chalinolobus gouldii* and *Scoteanax rueppellii* by long call sequences with mostly flat pulse shapes. Differentiated from *Ozimops ridei* in long call sequences where pulses alternated, often with a downward sloping tail.
Miniopterus orianae oceanensis	Eastern Bent-winged Bat	Low – Mod	Overlaps in characteristic frequency with *Vespadelus darlingtoni, Vespadelus regulus, Vespadelus vulturnus* and possibly with *Chalinolobus morio*. Differentiated from *Vespadelus* spp. by characteristic one-phase 'stepped' feeding buzz (if present) and generally little doppler effect (that is typically displayed by *Vespadelus* spp.). Not differentiated from *Chalinolobus morio* where they overlap in characteristic frequency.
Myotis macropus	Large-footed Myotis	Low - Mod	Overlaps in call features with *Nyctophilus* spp. Differentiated from *Nyctophilus* spp. in good quality call sequences with pulse intervals < 75 ms, initial slope > 400 OPS and often with a central kink and varying slopes among pulses.
Ozimops ridei	Ride's Free-tailed Bat	Mod	Overlaps in characteristic frequency with *Micronomus norfolkensis* and *Chalinolobus gouldii*. Differentiated from *Chalinolobus gouldii* by long call sequences with mostly flat pulse shapes. Differentiated from *Micronomus norfolkensis* by long call sequences with little pulse alternation.
Nyctophilus geoffroyi	Lesser long-eared bat	Low	Overlaps in call features with *Nyctophilus gouldi* and *Myotis macropus*. Differentiated from *Myotis macropus* by pulse intervals > 95 ms and an initial slope of < 300 OPS. However, *Nyctophilus geoffroyi* and *Nyctophilus gouldi* are unable to be differentiated from each other.
Nyctophilus gouldi	Gould's long-eared bat	Low	Overlaps in call features with *Nyctophilus geoffroyi* and *Myotis macropus*. Differentiated from *Myotis macropus* by pulse intervals > 95 ms and an initial slope of < 300 OPS. However, *Nyctophilus geoffroyi* and *Nyctophilus gouldi* are unable to be differentiated from each other.
Phoniscus papuensis	Golden-tipped Bat	Low	Has a very quiet call that is not often recorded by bat detectors.

Scientific Name	Common Name	Identification Potential	Identification characteristics
Rhinolophus megaphyllus	Eastern Horseshoe Bat	High	Long duration, flat calls at characteristic frequency of 66 – 70kHz, unlikely to be confused with any other species.
Saccolaimus flaviventris	Yellow-bellied Sheath-tailed Bat	Mod - High	Calls may overlap with *Chalinolobus dwyeri*. However, good quality call sequences are unlikely to be confused due to *Chalinolobus dwyeri* having small pulse shape and alternating pulses. The harmonics of *Saccolaimus flaviventris* assist identification in full spectrum (.WAV) recordings. The characteristic frequency of the fundamental (first harmonic) is 10-12 kHz, the second (loudest harmonic) is 20-25kHz and the third harmonic 30-35kHz.
Scoteanax rueppellii	Greater Broad-nosed Bat	Low – Mod	Overlaps in characteristic frequency with *Chalinolobus gouldii*, *Micronomus norfolkensis*, *Scotorepens orion* and *Falsistrellus tasmaniensis*. Differentiated from *Micronomus norfolkensis* in long call sequences with mostly curved pulse shapes. Differentiated from *Chalinolobus gouldii* only in long call sequences with no alternating pulse frequencies. Differentiated from *Scotorepens orion* and *Falsistrellus tasmaniensis* by long pre-characteristic sections. Usually only identified at a probable confidence level.
Scotorepens orion	Eastern Broad-nosed Bat	Low	Overlaps in characteristic frequency with *Falsistrellus tasmaniensis* and *Scoteanax rueppellii*. *Falsistrellus tasmaniensis* is most frequently recorded from more elevated locations in the region. However, some records exist from coastal lowlands and so included it in our species groups in coastal areas as a precautionary measure. We do not distinguish *Falsistrellus tasmaniensis* from *Scotorepens orion* where they overlap in frequency due to overlapping call characteristics.
Vespadelus darlingtoni	Large Forest Bat	Low	Overlaps in characteristic frequency with *Falsistrellus tasmaniensis* and V*espadelus regulus*. Unable to be differentiated where they overlap in characteristic frequency.
Vespadelus regulus	Southern Forest Bat	Mod	Overlaps in characteristic frequency with *Vespadelus darlingtoni* and *Miniopterus orianae oceanensis*. Differentiated from *Miniopterus orianae oceanensis* by a two-phase feeding buzz (where present) or by substantial doppler effect (typically displayed by *Vespadelus* spp.). Differentiated from *Vespadelus darlingtoni* only where they do not overlap in characteristic frequency.

Scientific Name	Common Name	Identification Potential	Identification characteristics
Vespadelus vulturnus	Little Forest Bat	Mod - High	Overlaps in characteristic frequency with *Chalinolobus morio*. Differentiated from *Chalinolobus morio* in long call sequences with few down-sweeping tails on pulses and by the doppler effect that is typically displayed by *Vespadelus* spp.

APPENDIX B LOG FILE REVIEW

Table B1: Log file review results

Folder	Log file name	Unit Type	Set to Record?	Setting Mode	Data Division	Sensitivity	Firmware	GPS	Entire Night?	Errors?	Comments
2021-11-30\	log 2021-11-30.csv	Anabat Swift	Yes	Night	500ksps WAVE	16	1.6	-37.07575 149.87529	Yes	None	Firmware outdated recommend updating
2021-12-01\	log 2021-12-01.csv	Anabat Swift	Yes	Night	500ksps WAVE	16	1.6	-37.07592 149.87446	Yes	None	Firmware outdated recommend updating
2021-12-02\	log 2021-12-02.csv	Anabat Swift	Yes	Night	500ksps WAVE	16	1.6	-37.04319 149.91135	Yes	None	Firmware outdated recommend updating
2021-12-03\	log 2021-12-03.csv	Anabat Swift	Yes	Night	500ksps WAVE	16	1.6	-37.05392 149.90363	No	None	Recording stopped at 20:26 Firmware outdated recommend updating

Appendix 4: EPBC Act Protected Matters Report

Australian Government

Department of Agriculture, Water and the Environment

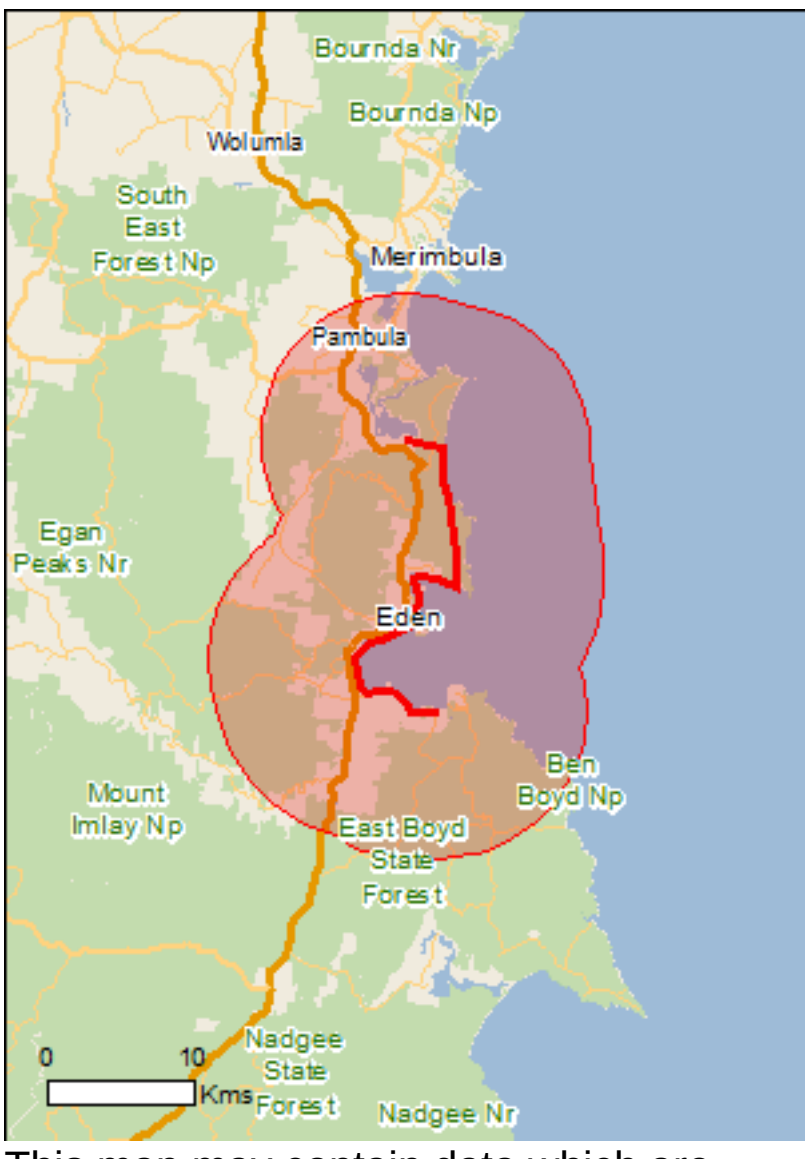
EPBC Act Protected Matters Report

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.

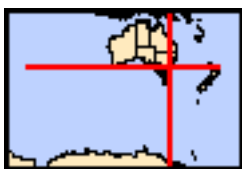
Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

Report created: 11/11/21 16:41:36



Coordinates

Buffer: 10.0Km



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:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	1
Listed Threatened Ecological Communities:	4
Listed Threatened Species:	78
Listed Migratory Species:	53

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:	2
Commonwealth Heritage Places:	None
Listed Marine Species:	82
Whales and Other Cetaceans:	14
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:	7
Regional Forest Agreements:	1
Invasive Species:	40
Nationally Important Wetlands:	3
Key Ecological Features (Marine)	1

Details

Matters of National Environmental Significance

Commonwealth Marine Area [Resource Information]

Approval is required for a proposed activity that is located within the Commonwealth Marine Area which has, will have, or is likely to have a significant impact on the environment. Approval may be required for a proposed action taken outside the Commonwealth Marine Area but which has, may have or is likely to have a significant impact on the environment in the Commonwealth Marine Area. Generally the Commonwealth Marine Area stretches from three nautical miles to two hundred nautical miles from the coast.

Name
EEZ and Territorial Sea

Marine Regions [Resource Information]

If you are planning to undertake action in an area in or close to the Commonwealth Marine Area, and a marine bioregional plan has been prepared for the Commonwealth Marine Area in that area, the marine bioregional plan may inform your decision as to whether to refer your proposed action under the EPBC Act.

Name
South-east

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
Littoral Rainforest and Coastal Vine Thickets of Eastern Australia	Critically Endangered	Community likely to occur within area
Lowland Grassy Woodland in the South East Corner Bioregion	Critically Endangered	Community likely to occur within area
River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria	Critically 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	Species or species habitat known 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
Dasyornis brachypterus Eastern Bristlebird [533]	Endangered	Species or species habitat known to occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or

Name	Status	Type of Presence
		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
[Falco hypoleucos](#) Grey Falcon [929]	Vulnerable	Species or species habitat 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 likely to occur within area
[Halobaena caerulea](#) Blue Petrel [1059]	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](#) Nunivak Bar-tailed Godwit, Western Alaskan Bar-tailed Godwit [86380]	Vulnerable	Species or species habitat 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
[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
[Pterodroma leucoptera leucoptera](#) Gould's Petrel, Australian Gould's Petrel [26033]	Endangered	Species or species habitat may occur within

Name	Status	Type of Presence
		area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat likely 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	Foraging, feeding or related behaviour likely to occur within area
Thalassarche bulleri platei Northern Buller's Albatross, Pacific Albatross [82273]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche cauta Shy Albatross [89224]	Endangered	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 steadi White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thinornis cucullatus cucullatus Eastern Hooded Plover, Eastern Hooded Plover [90381]	Vulnerable	Species or species habitat known to occur within area
Fish		
Epinephelus daemelii Black Rockcod, Black Cod, Saddled Rockcod [68449]	Vulnerable	Species or species habitat may occur within area
Prototroctes maraena Australian Grayling [26179]	Vulnerable	Species or species habitat known to occur within area
Frogs		
Heleioporus australiacus Giant Burrowing Frog [1973]	Vulnerable	Species or species habitat known to occur within area
Litoria aurea Green and Golden Bell Frog [1870]	Vulnerable	Species or species habitat known to occur within area
Mixophyes balbus Stuttering Frog, Southern Barred Frog (in Victoria) [1942]	Vulnerable	Species or species habitat may occur within area
Mammals		
Balaenoptera borealis Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area

Name	Status	Type of Presence
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour 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 known to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Petauroides volans Greater Glider [254]	Vulnerable	Species or species habitat likely to occur within area
Petrogale penicillata Brush-tailed Rock-wallaby [225]	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 likely to occur within area
Potorous tridactylus tridactylus Long-nosed Potoroo (SE Mainland) [66645]	Vulnerable	Species or species habitat known to occur within area
Pseudomys fumeus Smoky Mouse, Konoom [88]	Endangered	Species or species habitat known to occur within area
Pteropus poliocephalus Grey-headed Flying-fox [186]	Vulnerable	Roosting known to occur within area
Plants		
Acacia constablei Narrabarba Wattle [10798]	Vulnerable	Species or species habitat may occur within area
Amphibromus fluitans River Swamp Wallaby-grass, Floating Swamp Wallaby-grass [19215]	Vulnerable	Species or species habitat likely to occur within area
Caladenia tessellata Thick-lipped Spider-orchid, Daddy Long-legs [2119]	Vulnerable	Species or species habitat likely to occur within area
Correa baeuerlenii Chef's Cap [17007]	Vulnerable	Species or species habitat may occur within area
Cryptostylis hunteriana Leafless Tongue-orchid [19533]	Vulnerable	Species or species habitat known to occur within area
Genoplesium rhyoliticum Pambula Midge-orchid [55116]	Endangered	Species or species habitat known to occur within area

Name	Status	Type of Presence
Glycine latrobeana Clover Glycine, Purple Clover [13910]	Vulnerable	Species or species habitat may occur within area
Leionema ralstonii [64926]	Vulnerable	Species or species habitat known to occur within area
Persicaria elatior Knotweed, Tall Knotweed [5831]	Vulnerable	Species or species habitat likely to occur within area
Pomaderris cotoneaster Cotoneaster Pomaderris [2043]	Endangered	Species or species habitat may occur within area
Pomaderris parrisiae Parris' Pomaderris [22119]	Vulnerable	Species or species habitat likely to occur within area
Pterostylis chlorogramma Green-striped Greenhood [56510]	Vulnerable	Species or species habitat may occur within area
Thesium australe Austral Toadflax, Toadflax [15202]	Vulnerable	Species or species habitat likely to occur within area
Westringia davidii [19079]	Vulnerable	Species or species habitat likely to occur within area
Xerochrysum palustre Swamp Everlasting, Swamp Paper Daisy [76215]	Vulnerable	Species or species habitat may occur within area
Zieria formosa Shapely Zieria [56733]	Endangered	Species or species habitat likely to occur within area
Zieria parrisiae Parris's Zieria [56735]	Critically Endangered	Species or species habitat known to 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	Breeding likely to occur within area
Sharks		
Carcharias taurus (east coast population) Grey Nurse Shark (east coast population) [68751]	Critically Endangered	Species or species habitat likely to occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area

Name	Status	Type of Presence
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		
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
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
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
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]		Species or species habitat may occur within area
Thalassarche bulleri		
Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche cauta		
Shy Albatross [89224]	Endangered	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

Name	Threatened	Type of Presence
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or 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 likely to 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 likely to occur within area
Carcharhinus longimanus Oceanic Whitetip Shark [84108]		Species or species habitat 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
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
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding likely to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species

Name	Threatened	Type of Presence
		habitat likely to occur within area
[Rhincodon typus](#) Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area
Migratory Terrestrial Species		
[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
[Myiagra cyanoleuca](#) Satin Flycatcher [612]		Species or species habitat known 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
[Calidris acuminata](#) Sharp-tailed Sandpiper [874]		Species or species habitat likely 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
[Gallinago hardwickii](#) Latham's Snipe, Japanese Snipe [863]		Species or species habitat likely to 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
[Limosa lapponica](#) Bar-tailed Godwit [844]		Species or species habitat 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
[Pandion haliaetus](#) Osprey [952]		Species or species habitat known to occur within area

Name	Threatened	Type of Presence
[Tringa nebularia](#)		
Common Greenshank, Greenshank [832]		Species or species habitat likely 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 - Australian Telecommunications Commission

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
[Apus pacificus](#)		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
[Ardea ibis](#)		
Cattle Egret [59542]		Species or species habitat may occur within area
[Calidris acuminata](#)		
Sharp-tailed Sandpiper [874]		Species or species habitat likely 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
[Catharacta skua](#)		
Great Skua [59472]		Species or species habitat may occur within area
[Diomedea antipodensis](#)		
Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or

Name	Threatened	Type of Presence
		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 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
[Gallinago hardwickii](#) Latham's Snipe, Japanese Snipe [863]		Species or species habitat likely to 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
[Halobaena caerulea](#) Blue Petrel [1059]	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](#) Bar-tailed Godwit [844]		Species or species habitat 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
[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
[Myiagra cyanoleuca](#) Satin Flycatcher [612]		Species or species habitat known to occur within area
[Neophema chrysogaster](#) Orange-bellied Parrot [747]	Critically Endangered	Species or species habitat may occur within

Name	Threatened	Type of Presence
		area
Neophema chrysostoma Blue-winged Parrot [726]		Species or species habitat likely 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
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
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
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat likely to occur within area
Sterna albifrons Little Tern [813]		Species or species habitat may occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche cauta Shy Albatross [89224]	Endangered	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*	Foraging, feeding or related behaviour likely to occur within area

Name	Threatened	Type of Presence
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thinornis rubricollis Hooded Plover [59510]		Species or species habitat known to occur within area
Thinornis rubricollis rubricollis Hooded Plover (eastern) [66726]	Vulnerable*	Species or species habitat known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area
Fish		
Heraldia nocturna Upside-down Pipefish, Eastern Upside-down Pipefish, Eastern Upside-down Pipefish [66227]		Species or species habitat may occur within area
Hippocampus abdominalis Big-belly Seahorse, Eastern Potbelly Seahorse, New Zealand Potbelly Seahorse [66233]		Species or species habitat may occur within area
Hippocampus breviceps Short-head Seahorse, Short-snouted Seahorse [66235]		Species or species habitat may occur within area
Hippocampus minotaur Bullneck Seahorse [66705]		Species or species habitat may occur within area
Histiogamphelus briggsii Crested Pipefish, Briggs' Crested Pipefish, Briggs' Pipefish [66242]		Species or species habitat may occur within area
Histiogamphelus cristatus Rhino Pipefish, Macleay's Crested Pipefish, Ring-back Pipefish [66243]		Species or species habitat may occur within area
Hypselognathus rostratus Knifesnout Pipefish, Knife-snouted Pipefish [66245]		Species or species habitat may occur within area
Kaupus costatus Deepbody Pipefish, Deep-bodied Pipefish [66246]		Species or species habitat may occur within area
Kimblaeus bassensis Trawl Pipefish, Bass Strait Pipefish [66247]		Species or species habitat may occur within area
Leptoichthys fistularius Brushtail Pipefish [66248]		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
Mitotichthys semistriatus Halfbanded Pipefish [66261]		Species or species habitat may occur within area
Mitotichthys tuckeri Tucker's Pipefish [66262]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
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 robustus Robust Pipehorse, Robust Spiny Pipehorse [66274]		Species or species habitat may occur within area
Solegnathus spinosissimus Spiny Pipehorse, Australian Spiny Pipehorse [66275]		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
Stipecampus cristatus Ringback Pipefish, Ring-backed Pipefish [66278]		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
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
Vanacampus phillipi Port Phillip Pipefish [66284]		Species or species habitat may occur within area
Vanacampus poecilolaemus Longsnout Pipefish, Australian Long-snout Pipefish, Long-snouted Pipefish [66285]		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
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

Name	Threatened	Type of Presence
Natator depressus		
Flatback Turtle [59257]	Vulnerable	Breeding likely to 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 likely to 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 likely to occur within area
Delphinus delphis		
Common Dolphin, 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
Megaptera novaeangliae		
Humpback Whale [38]	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
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
Bell Bird Creek	NSW
Ben Boyd	NSW
Eagles Claw	NSW
Eden Region	NSW
Forestry Management Areas in Eden (FMZ2)	NSW
Nethercote Falls	NSW
South East Forest	NSW

Regional Forest Agreements [Resource Information]

Note that all areas with completed RFAs have been included.

Name	State
Eden RFA	New South Wales

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
Passer domesticus House Sparrow [405]		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
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
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
Sus scrofa Pig [6]		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		
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
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

Name	Status	Type of Presence
Genista monspessulana Montpellier Broom, Cape Broom, Canary Broom, Common Broom, French Broom, Soft Broom [20126]		Species or species habitat likely to 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
Nassella neesiana Chilean Needle grass [67699]		Species or species habitat likely to occur within area
Nassella trichotoma Serrated Tussock, Yass River Tussock, Yass Tussock, Nassella Tussock (NZ) [18884]		Species or species habitat likely to occur within area
Opuntia spp. Prickly Pears [82753]		Species or species 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
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
Ulex europaeus Gorse, Furze [7693]		Species or species habitat likely to occur within area

Nationally Important Wetlands [Resource Information]

Name	State
Merimbula Lake	NSW
Pambula Estuarine Wetlands	NSW
Twofold Bay	NSW

Key Ecological Features (Marine) [Resource Information]

Key Ecological Features are the parts of the marine ecosystem that are considered to be important for the biodiversity or ecosystem functioning and integrity of the Commonwealth Marine Area.

Name	Region
Upwelling East of Eden	South-east

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

-36.978152 149.903232,-36.983089 149.926577,-37.00009 149.925891,-37.005848 149.929324,-37.035452 149.934474,-37.05025 149.934474,-37.047236 149.922458,-37.045318 149.911815,-37.046414 149.907008,-37.05573 149.910785,-37.059292 149.910785,-37.065593 149.908038,-37.068607 149.907351,-37.076824 149.887095,-37.078194 149.880916,-37.082029 149.876452,-37.086685 149.870959,-37.099282 149.875422,-37.102842 149.879542,-37.102294 149.886409,-37.101746 149.894648,-37.109139 149.903918,-37.112698 149.906321,-37.112972 149.916964,-37.112425 149.924174

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-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
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-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
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-Other groups and individuals

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

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