Prepared for Bega Valley Shire Council

Final

Aquatic Ecology Assessment – Merimbula Boardwalk Upgrade

Bega Valley Shire Council, Merimbula, NSW

November 2024

Project Number: 22-669

Document verification

Project Title:	Merimbula Aquatic Ecology Assessment
Project Number:	22-669
Project File Name:	22-669 Merimbula Aquatic Ecology Assessment Report Final V1.3

Revision	Date	Prepared by	Approved by
Final V1.0	20/06/2024	Maddie Robertson Christoph Braun	Rebecca Phyland
Final V1.1	09/07/2024	Maddie Robertson	Adam Folkers
Final V1.2	27/09/2024	Maddie Robertson Bishal Ghimire Christoph Braun	Christoph Braun
Final V1.3	18/11/2024	Maddie Robertson	Christoph Braun

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Acronyms and Abbreviations

AOBV	Areas of Outstanding Biodiversity Value
BC Act	*Biodiversity Conservation Act 2016* No 63
BDAR	Biodiversity Development Assessment Report
BVSC	Bega Valley Shire Council
BIA	Biologically Important Areas
CAMBA	China-Australia Migratory Bird Agreement
DA	Development Approval
DPI	Department of Primary Industries
EAC	East Australian Current
EEC	Endangered Ecological Communities
EP&A Act	*Environmental Planning & Assessment Act 1979*
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
FM Act	*Fisheries Management Act 1994* No 38
JAMBA	Japan-Australia Migratory Bird Agreement
KEF	Key Ecological Feature
KFH	Key Fish Habitat
LGA	Local Government Area
MEM Act	*Marine Estate Management Act 2014*
ML	Megalitre
MNES	Matters of National Environmental Significance
ROKAMBA	Republic of Korea-Australia Migratory Bird Agreement
SEE	Statement of Environmental Effects
SEED	Sharing and Enabling Environmental Data
SEPP	State Environmental Planning Policies
TEC	Threatened Ecological Communities

Executive Summary

This Aquatic Ecology Assessment report outlines the desktop analysis and field survey results conducted for the proposed upgrade of the Merimbula Boardwalk in Merimbula Lake by Bega Valley Shire Council. The study aimed to confirm the type and class of habitat of Merimbula Lake, the presence or absence of protected species such as Syngnathiformes (seahorses, seadragons, pipefish, pipehorses, ghost pipefish and seamoths), assess the composition and extent of seagrass and other macrophyte communities, and to make observations of the aquatic environment to support the development approval of the proposed project.

Merimbula Lake was identified as a Type 1 - Highly Sensitive Key Fish Habitat and Class 1 - Major Key Fish Habitat as part of the desktop study, meaning it is a marine or estuarine waterway with significant presence of the seagrasses Strapweed *Posidonia australis*, Eelgrass *Zostera* sp. (*Zostera capricorni* and *Zostera muelleri*) and Paddleweed *Halophila ovalis*, as well as significant areas of coastal saltmarsh. This was confirmed during the field observations by point intercept transects and observations made during snorkelling surveys and site walk-throughs.

A Commonwealth Protected Matters report identified several Matters of National Environmental Significance (MNES) with the potential to occur within a 10km radius of the study area, including one Commonwealth Marine Area, five listed Threatened Ecological Communities, 97 listed Threatened Species, and 57 Migratory Species. Additionally, “Other Protected Matters” under the EPBC Act were found within the development footprint or 10km buffer, including three Commonwealth Lands, 87 Listed Marine Species, and 14 Whales and Other Cetaceans. The likelihood of occurrence of the relevant fish, shark, marine reptile and mammal species, however, was identified as unlikely due to the lack of suitable habitat in the development footprint or construction buffer zone. No protected or threatened listed species including Syngnathiformes, were observed during the field surveys, hence the likelihood of any impact associated with the proposed works was classified as low or negligible.

During walk-throughs of the boardwalk, areas with extensive saltmarsh and mangrove vegetation were observed. The intertidal shoreline underneath and adjacent to the existing boardwalk was observed as providing habitat for a variety of crabs, and rocky sections of the shoreline are colonised by oysters, snails and encrusting benthic invertebrates. Seagrasses and algae were observed as present in the shallow water over sandy and muddy substrate, which is cyclically exposed for a significant period time during the tidal phases.

A snorkel transect was conducted at high tide starting at the eastern boat ramp and running parallel to the shore towards the west in an area previously identified as potential suitable habitat for protected species including Syngnathiformes. Observations included common fish species and crustaceans, shallow sandy and rocky habitats and isolated areas of oyster reef. Seagrass was more prevalent in deeper water near the boat ramp. Seagrass included Eelgrass *Zostera* sp., Paddleweed *H. ovalis* and Strapweed *P. australis*, with the latter being restricted to the deeper water near the boat ramp. Seagrass cover was sparser towards the western end of the snorkel transect with bare sand and mud habitat becoming more widespread. Notable species observed included the invasive Light-bulb Ascidian *Clavelina lepadiformis*, colonising structures such as the wooden jetty, sliprails and rocks.

The abundance and species composition of seagrasses was assessed through a total of 14 transects that ran perpendicular from the shore for a distance of 10–20 m with quadrats placed at 2 m intervals. Overall, the average seagrass cover across all transects was below 10%, with seagrass cover for individual transects ranging between 0–34%. Individual quadrats recorded up to 80% cover. The highest seagrass cover was recorded at the eastern end near the boat ramp, where the only two transects that recorded Strapweed *P. australis* in relatively deep water were located. Eelgrass and Paddleweed dominated the remaining transects in the boardwalk area. Eelgrass was the most common seagrass, followed by Paddleweed, often occurring together in mixed communities. Four transects had no seagrass cover. These were located in areas with bare sand and shallow water at the central and western sections of the boardwalk.

In order to maximise chances of detecting Syngnathiformes which include many cryptic species, five baited stationary fish plot surveys were conducted near significant habitats and structures at the eastern end of the boardwalk. GoPro cameras were used to record high-definition footage for up to an hour at each location. In total, 20 species of fish were identified across all plots, with no Syngnathiformes observed in any of the surveys. The fish community was characterised by species common in the area and was dominated by small, schooling species such as Glassfish and Hardyheads, as well as larger species such as Luderick and Trevally. Cryptic species recorded included Gobies and Blennies that were not observed during the snorkel transect and demonstrate the usefulness of this survey method. Larger species observed included Tarwhine, Snapper and Smooth Stingrays. The diversity and abundance of fish species recorded during this survey indicate a healthy ecosystem, its presence in part due to the added habitat and shelter provided by the existing man-made structures in Merimbula Lake.

The potential impacts of the proposed boardwalk upgrades include minor direct impacts to the identified aquatic habitat and fauna within the development footprint due to the temporary removal of existing structures. This will result in the loss of the sessile community of encrusting organisms, sponges, and macroalgae that have colonised these structures over time, before recolonisation of the new structures would begin. The invasive Light-bulb Ascidian could potentially spread due to disturbance caused by the removal of existing structures and the use of a barge to access parts of the development footprint.

Recommendations to minimise these impacts include limiting disturbance associated with the removal and replacement of existing structures, reducing the time between removal and replacement of structures, and limiting the number of barge movements in the intertidal area. It is also recommended to limit the potential to spread invasive species such as Light-bulb Ascidians *Clavelina lepadiformis* by disposing of old structures in a suitable way) and not re-using material that has the potential to be colonised by invasive species in other locations.

Potential impacts to aquatic flora include damage to seagrasses, macroalgae, mangroves, and saltmarsh due to human-related disturbances as a result of the boardwalk construction. Recommendations to limit these impacts include:

- Correct and safe disposal of existing boardwalk materials and other construction waste
- Avoidance of walking through, or any compaction of, seagrass and macroalgae at low tide
- Minimisation of barge movements in the intertidal area in order to avoid direct contact with macroalgae and seagrass, including utilisation of areas with minimal or no seagrass cover for barge mooring, and limiting of any barge movements to high tide periods only.

Potential impacts and recommendations for mangroves and saltmarsh are outlined in the terrestrial report (BDAR).

1. Introduction

1.1. Background

This Aquatic Ecology Assessment report is part of a Statement of Environmental Effects (SEE) that provides the supporting information for the DA seeking consent for additions, alterations and upgrades to the existing Merimbula Boardwalk, located in Merimbula NSW within the Bega Valley Shire Council (BVSC) Local Government Area (LGA).

The existing boardwalk is in need of repair; with some sections having subsided resulting in a cambered walkway and other sections showing instability (noticeable movement) during use.

The Merimbula Boardwalk Upgrade has been identified as an opportunity to improve the quality of recreational infrastructure in the area. The existing boardwalk is frequented by both locals and tourists and is valued for the scenic attraction the walk provides. It can receive high impacts from events with high foot traffic such as organised running events. In combination, these works are expected to improve the site for use as an outdoor recreation facility and continue to attract recreational tourism within the area.

1.2. Project description

The current boardwalk was originally built by Green Corp trainees in 1997 (BVSC, 2024). Since then, sections of the boardwalk have been replaced or substantially repaired over a number of years. The boardwalk is approximately 1.7km in length, comprised of timber planks on timber pylons. Concrete and gravel sections occur on land. Carparks are present at either end of the boardwalk. Toilet facilities are located at the western carpark, as well as a cafe and boat hire business. There are several paths that connect with the boardwalk from side streets, which are generally narrow informal ‘bush’ tracks.

The proposed upgrades to the boardwalk, associated paths and carparking areas would provide for inclusive community use by improving safety and access. The aim of the proposed boardwalk upgrade is to improve general use and options for recreation, safety, and environmental outcomes. This includes the connecting side tracks joining the boardwalk from Otway Close, Kiama Place, Imlay Street and Terry Place.

NGH understands that the proposed boardwalk upgrades comprise the following:

- Set up laydown areas and undertake early works including installation of environmental controls and minor vegetation clearing and trimming.
- Removal of existing boardwalk decking and timber pylons.
- Installation of new pylons in differing positions to old pylons due to spacing change.
- Installation of new boardwalk structure using timber or fibreglass reinforced polymer constructed wider than old structure from 1.5m to 2.5m wide, with some alterations and additions to fishing/seating/viewing platforms and water access areas (e.g. jetties).
- Upgraded path and gravel areas to 2.5m wide as needed using local materials where possible.
- Install local Merimbula Split Stone Mine and Nullica Rock walls.
- Access, drainage and surface improvements to the existing car park at the eastern end and carpark reconfiguration at the midway point near the sewer pump station.
- Installation of furniture, lighting and Interpretative signage
- Revegetation where required and removal of environmental controls.

1.3. Project location

The locality is characterised by residential and low-density settlement, coastal waterways, public parks, state forests, and national parks.

The Merimbula Boardwalk is located along the northern edge of Merimbula Lake (Figure 1-1). The path provides access between Market Street bridge (the eastern extent of the boardwalk) and Lakewood Drive Top Lake carpark at (the western extent of the boardwalk). The project location is partly within the lake, on the lake edge, and on public and private land. The boardwalk is a popular walk valued by tourists and the local community.

Merimbula Lake is classified as a wave dominated barrier estuary with an open entrance and an average depth of 2.6m (OEH, 2018) and has been mapped as Key Fish Habitat – Southern Rivers (NSW DPI, 2013). Oyster leases are present within the lake including areas directly adjacent to the boardwalk.

Figure 1-1 Boardwalk location in proximity to Merimbula CBD and local features (Source: NGH, 2024).

1.4. Scope of works

The Aquatic Ecology Assessment comprises a desktop analysis and aquatic field surveys. In the desktop analysis, a review of available background information and mapping was completed. This information was used to determine the type and condition of aquatic habitat in Merimbula Lake and the study area specifically. Identification of aquatic threatened species, populations and threatened communities in the background assessment provided insight regarding occurrence likelihood during the aquatic field surveys. A range of aquatic field surveys using transects and stationary surveys in the study area were conducted to:

- Confirm the absence or presence of protected Syngnathiformes (seahorses, seadragons, pipefish, pipehorses, ghost pipefish and seamoths).
- Confirm the presence, absence and extent of seagrass and other macrophyte communities and the characteristics of the benthic habitat.
- Record sightings of aquatic fauna defined as ‘Fish’ under the Fisheries Management Act 1994.

For this report, the study area was defined as the immediate area surrounding the existing boardwalk and proposed structures within a 10m buffer.

Areas containing marine vegetation such as mangroves or saltmarsh within the aquatic field surveys were recorded as present or absent in this study and are considered out of scope, as they are described in the BDAR.

2. Methods - Aquatic Ecology

This Aquatic Ecology Assessment comprised of a desktop assessment, including background data reviews and likelihood of occurrence analysis, in addition to aquatic field surveys undertaken from the 7-9th of May 2024. Methods for each assessment are described below.

2.1. Desktop analysis

A review of aquatic ecological data was undertaken for the proposed Merimbula Boardwalk upgrade and in preparation for the aquatic field surveys. The desktop analysis addresses both Commonwealth and NSW state legislation and guidelines, providing key information for potential impacts of the boardwalk upgrade on aquatic environment and biodiversity.

In the desktop analysis, several search tools and databases were utilised to carry out investigations for species presence/absence and likelihood of occurrence for protected or threatened species under various legislation. Relevant legislation for this Aquatic Ecology Assessment report includes the *Environment Protection and Biodiversity Conservation Act 1999, Biodiversity Conservation Act 2016*, and *Fisheries Management Act 1994.* Applicable information was extracted from the following key resources:

- BioNet Atlas
- EPBC Act Protected Matters Search Tool
- DPI Fisheries Spatial Data Tool
- Atlas of Living Australia
- Mapping the Habitats of NSW estuaries (Creese et al., 2009)
- Policy and guidelines for fish habitat conservation and management (DPI, 2013).

Preliminary desktop analysis included a background data review and assessment of the likelihood of occurrence and impact (see Appendix A), guiding the aquatic field surveys.

2.1.1. Background Data Review

Background searches consisted of data review from a range of sources to provide information for the study area and surrounds, including:

- Merimbula Lake general description and habitat types
  - Marine Regions/Bioregions
  - Water quality
  - Key ecological features
  - Waterway ‘class’ and key fish habitat ‘type’ (NSW Fisheries Policy and Guidelines, 2013)
  - Key fish habitat (KFH) under the *Fisheries Management Act 1994* (FM Act)
- BioNet Atlas records
- Atlas of Living Australia records
- Matters of National Environmental Significance (MNES) under the *Environmental Protection and Biodiversity Conservation Act 1999*
- Marine protected areas under the *Marine Estate Management Act 2014* (MEM Act)
- Critical habitats and areas of outstanding biodiversity value (AOBVs) under the EPBC Act, BC Act and FM Act
- Threatened and protected marine and migratory species listed under the EPBC Act, BC Act and FM Act.

QGIS was utilised to visualise and spatially represent species presence/absence and to create the habitat table prior to the aquatic field surveys. The following were input as layers in QGIS from the DPI Fisheries Spatial Datal Portal:

- NSW Key Fish Habitat (Southern Rivers)
- NSW Estuarine Macrophytes
- NSW Marine Protected Areas
- NSW Oyster Reefs
- NSW Aquaculture Leases.

From the collated data, the waterway 'class' of the study area was then identified, in addition to the 'type' of key fish habitat, as per the Fish Habitat Guidelines (DPI, 2013). Area calculations were completed in QGIS to determine macrophyte areas in the study area with the Key Fish Habitat and Class 1 Waterways.

2.1.2. Likelihood of Occurrence (Habitat evaluation)

Likelihood of occurrence refers to the likelihood of species presence in a defined area. This is displayed in a habitat evaluation containing data from a variety of sources. The Commonwealth Protected Matters Search Tool was utilised to identify protected, vulnerable, endangered and critically endangered species or species habitat listed under the EPBC Act that have the potential to occur at the site, or within the 10km buffer zone immediately surrounding the study area. Under the EPBC Act, this also includes species listed as marine and migratory. The Atlas of Living Australia, BioNet Atlas and DPI Fisheries Spatial Data provided data for records of sightings within the locality. Marine species and migratory species are the focus of this aquatic ecology assessment.

A range of literature referenced in the habitat evaluation (Appendix A) revealed the habitat requirements for each species, which allowed for comparison to the study area to assess both the likelihood of occurrence and the likelihood of impact of the proposed boardwalk upgrade for each species. Field surveys were conducted for a more thorough investigation and to meet the legislative requirements, including potential offset requirements, for the proposed boardwalk upgrade.

2.2. Aquatic field surveys

2.2.1. Site walk-through

The length of the existing boardwalk was surveyed on foot to confirm the marine habitats in the study area with a focus on a broad classification of the benthic habitat. Where diverse or unique habitats were identified, the location was marked using GPS and the area estimated.

2.2.2. Parallel snorkel transect

Aerial imagery showed potential seagrass, seaweed and reef habitat for approximately 375m at the eastern end of the study area. The goal of the parallel transect survey was to incidentally detect mobile fish and marine organisms within habitat, including Syngnathiformes, as defined under the FM Act.

One long parallel transect was conducted 5m off the shoreline at high tide within areas of the potential high-quality habitat. Stopwatches were utilised, in addition to a GPS tracker on one swimmer during the survey. A GoPro Camera was used to record the length of the transect in order to capture species detected during the swim. Times for the start and end of the survey were noted.

Figure 2-1 Proposed parallel snorkel transect path for aquatic field surveys (Source: NGH, 2024).

2.2.3. Point intercept transects

Following the broad classification of the study area, 13 point intercept transects with five 1m^2 quadrats were laid perpendicular to the closest primary landmass at points T1-T13 (Figure 2-2, Figure 2-3 and Figure 2-4). The transect points were representative of different macrohabitats that were either permanently or temporarily submerged in water, extending outward to the lake from the existing boardwalk. Transects included sun exposed deep water, shaded jetty piles in comparatively deeper water, potential seagrass habitat, sandy shallow water, and intertidal-oyster habitat.

Each transect was 10m in length. Five 1m^2 quadrats were laid at 2, 4, 6, 8 & 10m intervals. The bottom left corner of the quadrat was placed at the designated metre mark on the right-hand side of the transect tape. A photograph was taken of every quadrat showing the full quadrat and measuring tape, with a total of 65 photographs captured.

Aquatic flora and fauna species were identified to lowest possible taxonomic classification and relative abundance of each species was recorded. Additional species observed in the general area but not included in the quadrat were noted.

Figure 2-2 Proposed point intercept transects for aquatic field surveys in the eastern section of the boardwalk (Source: NGH, 2024).

Figure 2-3 Proposed point intercept transects for aquatic field surveys in the central section of the boardwalk (Source: NGH, 2024).

Figure 2-4 Proposed point intercept transects for aquatic field surveys in the western section of the boardwalk (Source: NGH, 2024).

2.2.4. Stationary Fish Plots

Five stationary fish plots were undertaken in deeper water around suitable habitat features such as jetty piles and the rock wall at the boat ramp in the study area. This method is suitable to detect mobile cryptic vertebrate species such as Syngnathiformes. Initially four stationary fish plots were planned, but the camera ceased recording halfway through at one location.

A GoPro recording high-definition video on a wide angle was deployed for up to one hour at each of the locations shown in Figure 4-13. Fish species in the videos were identified to the lowest possible taxonomic classification and counted. Screenshots were taken of representative specimens for identification purposes.

2.3. Impact Assessment

Bega Valley Shire Council was engaged with to undertake a brief workshop on field survey findings and to discuss key methods for minimising impacts of the boardwalk upgrade to Class 1/Type 1 marine habitat. In conjunction with the desktop assessment, results from the field survey findings guided NGH's recommendations and potential impacts for the project. Principles in various chapters (3–6) of the NSW Biodiversity Offsets Policy for Major Projects (BOPM) were addressed in the impact assessment and are referenced throughout the desktop results section, in relation to; marine vegetation, fish habitat and foreshore/waterfront works.

Division 12 in Part 7A of the FM Act describes the application of the *Environmental Planning and Assessment Act 1979*. It states that an activity or development is likely to significantly affect threatened species, populations or ecological communities, or their habitats, or it is carried out in critical habitat. The proposed boardwalk upgrade is unlikely to significantly affect any of the listed groups, as stated in the likelihood of impact column in the habitat table (Appendix A). Due to the low likelihood of occurrence and impact for the listed aquatic species, a test of significance and assessment of significance was not required.

3. Desktop Results – Aquatic Ecology

3.1. Merimbula Lake Estuarine Environment

Merimbula Lake is a moderately disturbed estuary, with a catchment area of approximately 37.9km2 and sits on the east coast of Australia, on the far south coast of New South Wales (NSW Department of Environment and Heritage, 2023). Estuaries are coastal water bodies that are dynamic in nature with diverse ecosystems. They are semi-enclosed and have an open connection to the ocean, with fluctuating water levels.

Merimbula Lake has a total volume of 12,923.9 ML, a surface area of 5.6km2 and an average depth of 2.6m. Water quality testing by the NSW Government in 2020-2021 determined that algal abundance, water clarity and overall estuary health were all categorised as excellent (NSW Department of Environment and Heritage, 2023). Merimbula Lake supports a variety of activities including recreation and oyster leasing areas.

Seabeds of estuaries are predominantly sandy or muddy, with soft sediment in shallow depths providing habitat suitability for seagrasses, mangroves and saltmarsh plants (Creese et al, 2009). Merimbula's estuarine, mangrove and saltmarsh ecosystems provide habitat for many marine and migratory species, including birds and mammals. All marine vegetation is protected under the EPBC Act, including seagrasses in Merimbula Lake such as Strapweed *Posidonia australis*.

Merimbula Lake contains areas where sustainable aquaculture takes place. Aquaculture involves farming aquatic organisms such as fish, molluscs, crustaceans and aquatic plants through enhancement of production (DCCEEW, 2015). In Merimbula Lake, aquaculture leases occur on oyster reefs, however only small sections of the oyster reef occur in or near the study area. The oyster reefs and sustainable aquacultures areas have been identified in the maps below (Figure 3-1, Figure 3-2 and Figure 3-3).

Figure 3-1 Oyster industry sustainable aquaculture areas and oyster reefs in and adjacent to the eastern study area (Source: NGH, 2024).

Figure 3-2 Oyster industry sustainable aquaculture areas and oyster reefs in and adjacent to the central study area (Source: NGH, 2024).

Figure 3-3 Oyster industry sustainable aquaculture areas and oyster reefs in and adjacent to the western study area (Source: NGH, 2024).

3.2. Waterway and Key Fish Habitat Classification

Background searches using the tools and resources outlined in section 2.1 were used to identify the waterway 'class' of the study area and the 'type' of key fish habitat present at the site. QGIS layers and area calculations described in section 2.1.1 also contributed to these conclusions.

Based on desktop evidence gathered from the above sources and methods, it was identified that the study area in Merimbula Lake is classed as *Type 1 - Highly Sensitive Key Fish Habitat* (DPI, 2013). Characteristics of this key fish habitat type include:

- *Posidonia australis*
- *Zostera, Heterozostera, Halophila* and *Ruppia* species of seagrass beds >5m^2 in area
- Coastal saltmarsh >5m^2 in area
- Coral communities
- Coastal lakes and lagoons that have a natural opening and closing regime (i.e. are not permanently open or artificially opened or are subject to one off unauthorised openings)
- Marine Park, an aquatic reserve or intertidal protected area
- Coastal wetlands under the Resilience and Hazards SEPP, wetlands recognised under international agreements (e.g. Ramsar, JAMBA, CAMBA, ROKAMBA wetlands), wetlands listed in the Directory of Important Wetlands of Australia
- Freshwater habitats that contain in-stream gravel beds, rocks greater than 500mm in two dimensions, snags greater than 300mm in diameter or 3m in length, or native aquatic plants
- Any known or expected protected or threatened species habitat or area of declared 'critical habitat' under the FM Act.

The study area meets the Type 1 classification. It is a marine or estuarine waterway with significant presence of *P. australis*, in addition to >5m^2 of *Zostera* and *Halophila* species, and >5m^2 of coastal saltmarsh. Merimbula Lake is also listed as a coastal wetland under the Resilience and Hazards SEPP and in the Directory of Important Wetlands of Australia. In addition, protected or threatened species habitat under the FM Act is known in the area. Macrophyte areas were extracted as a data layer from the DPI Fisheries Spatial Data Portal (NSW DPI, 2024). This was layered against the study area in QGIS to calculate macrophyte areas in the study area. Macrophyte presence is explored further with marine protected vegetation in section 3.5.7.

Table 3-1 below lists the area calculations for macrophyte presence in the study area (inclusive of development footprint and 10 m buffer). It is important to note that these calculations do not reflect the exact areas of impact for the project. This will depend on implemented mitigation measures and final construction methodologies practiced.

Table 3-1 Macrophyte areas in the study area

Macrophyte Type	Macrophyte presence (m^2) - Study Area
Mangrove	6,838
Posidonia	227
Saltmarsh	3,930
Zostera	290
Total	**11,285**

Following the classification of the study area as *Type 1 – Highly Sensitive Key Fish Habitat*, it was determined that Merimbula Lake was confirmed as *Class 1 - Major Key Fish Habitat* under the *Fisheries NSW Policy and Guidelines for Fish Habitat Conservation and Management* (DPI, 2013). This classification is used to define waterways for fish passage, providing guidelines and policy for the specific type and class under the *Fisheries Management Act 1994*. Definition of this class type includes a marine or estuarine waterway, or permanently flowing or flooded freshwater waterway, habitat of a threatened or protected fish species or 'critical habitat' (DPI, 2013). This is explored further in section 3.5.6 including mapping of areas containing KFH.

3.2.1. Offset Requirements for Aquatic Biodiversity

Offset requirements for marine vegetation under the FM Act are set out in the Fisheries NSW Policy and Guidelines for Fish Habitat Conservation and Management (2013) and are used to assess the impact of a major project on aquatic biodiversity and determine offset requirements where impacts cannot be avoided (NSW DPI, 2013). Table 3-2 below states the impact areas in square metres for any additional new impact caused by widening the boardwalk from 1.5 m to 2.5 m in width, with a 0.75 m working area on each side.

The project development and study area are classed as Type 1 KFH, as described above in section 3.2. The policy and guidelines require a minimum 2:1 offset for Type 1–3 key fish habitats to help redress both direct and indirect impacts of development.

The area of impact was calculated by overlaying the existing boardwalk with a 4 m wide construction corridor using the NSW DPI estuarine macrophytes layer and calculating the area containing saltmarsh and mangroves impacted by the widening and a 0.75 m working area. The total area of new additional impacts as a result of the boardwalk upgrade is 1,156.54 m^2. This does not include the area under the existing boardwalk structure. The offset requirements for these communities are fully calculated and described under the biodiversity offset methodology in the BDAR.

Seagrass is currently not included in the offset calculation due to the planned mitigation measures of meshed decking over seagrass areas.

Table 3-2 Marine habitat areas of impact in the development footprint and study area

Habitat Type	Area of Impact (m^2)	Reason for Classification
Marine Habitat (Type 1 KFH and Class 1 Waterway)	1,156.54	Habitat meets requirements for Type 1, presence of mangroves and saltmarsh

Sections 204 and 205 of the FM Act and the associated FM Regulations set out provisions to protect marine vegetation (such as saltmarshes, mangroves, seagrass and seaweeds whether alive or dead) from 'harm' on public water land below the astronomical high tide mark or the foreshore of such land. A permit is required from NSW DPI to harm marine vegetation in these areas. 'Harm' under Part 7 of the FM Act means gather, cut, pull up, destroy, poison, dig up, remove, injure, prevent light from reaching or otherwise harm the marine vegetation, or any part of it. Merimbula KFH and protected marine vegetation is explored further in sections 3.5.6 and 3.5.7.

3.2.2. Fish Passage considerations

Merimbula Lake is a Class 1 waterway, however the construction methodologies for the boardwalk upgrade do not include temporary or permanent blockage to fish passage hence offsetting or supplementary measures are not required.

3.3. Marine Regions/Bioregions

Australia's ocean territory has been classified into six marine bioregions. Merimbula Lake is included in the South-east Marine Region. Merimbula is located in the eastern part of the Region, which is strongly influenced by the East Australian Current (EAC). The EAC is up to 500m deep and 100km wide and flows from 2-5 knots depending on the season. This region is recognised as a major marine biogeographic region, with extremely high plant and animal diversity including significant numbers of endemic species.

Marine bioregional plans are in place under the EPBC Act to improve ocean management in Australia, ensuring healthy and productive bioregions. The South-east Marine Bioregion Plan was prepared under Section 176 of the EPBC Act (DCCEEW, 2022).

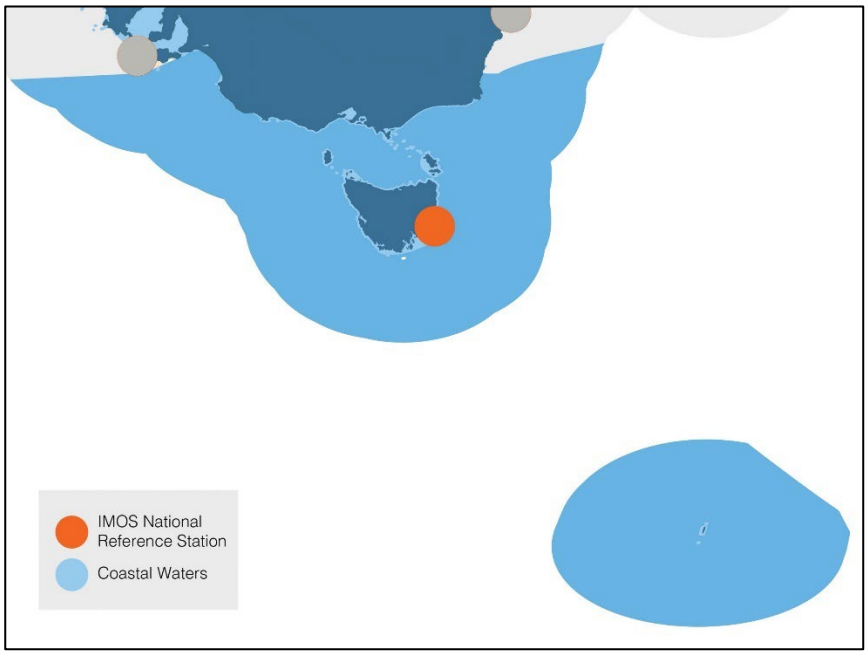


Figure 3-4 South-east Marine Bioregion including IMOS National Reference Stations (Source: Richardson et al., IMOS, 2020).

BVSC has proposed a methodology to reduce construction debris and waste; however, there is potential for water contamination during construction, including pollutants from spills such as fuels and oils and the suspended sediment. The construction's proximity to the oyster farms in Merimbula Lake raises concerns about possible impacts to oyster health. This is primarily due to the degradation of water quality which is critical for oysters as they filter and clean water. According to the *Protection of the Environment Administration Act 1991,* ecologically sustainable development principles are integrated into the NSW Oyster Industry Sustainable Aquaculture Strategy (OISAS) (NSW DPI, 2021). This strategy requires that those responsible for pollution and waste affecting the oyster industry bear the cost of containment, avoidance or abatement. Further impacts and recommendations are outlined further in section 5.

3.4. Matters of National Environmental Significance

Matters of National Environmental Significance (MNES) within a 10km radius of the development footprint were identified in an EPBC Act Protected Matters Report and have the potential to occur (Appendix E generated on April 17, 2024). In this report, it was found that the following MNES occur or have the potential to occur within the development footprint or 10km buffer:

- One Commonwealth Marine Area (in buffer area only)
- Five Listed Threatened Ecological Communities (in feature area)
- 97 Listed Threatened Species (76 in feature area)
- 57 Migratory Species (46 in feature area).

"Other Protected Matters" under the EPBC Act within the development footprint or 10km buffer include:

- Three Commonwealth Lands (in buffer zone only)
- 87 Listed Marine Species (82 in feature area)
- 14 Whales and Other Cetaceans (7 in feature area).

The Threatened Ecological Communities (TECs) are explored further in section 3.6.1. Listed threatened or protected, migratory and marine species, are explored further in the habitat table (Appendix A).

3.5. Protected Areas and Environmentally Sensitive Lands

Merimbula Lake is declared as a Nationally Important Wetland - providing habitat for several marine and migratory species and significant contribution to the nutrient cycle. Wetlands have several functions including:

- Contribution to the nutrient cycle
- Providing nursery areas for juvenile fish
- Providing areas for feeding and spawning in fresh and saltwater fish species.

No declared critical habitat was identified in the development footprint or buffer zone through the EPBC Act Protected Matters Report.

No Areas of Outstanding Biodiversity Value (AOBVs) occur within the development footprint or buffer zone.

3.5.1. Aquatic and Wetland Habitats

Aquatic habitats are comprised of various natural materials and vegetation in many styles (such as reefs) that provide habitat for species to live and shelter in (NSW DPI, 2024). Habitat requirements differ from species to species. Saltmarsh, mangroves and the estuary in Merimbula Lake itself are aquatic habitat included in the study area and development footprint for the boardwalk upgrade.

3.5.2. Coastal Wetlands

Chapter 2 of the State Environmental Planning Policy (SEPP) for Resilience and Hazards in NSW (DPE, 2022) describes the methodology for assessment of development proposals in coastal zones. Coastal zones comprise four management areas:

- Coastal wetlands and littoral rainforests – areas with characteristics of coastal wetlands or littoral rainforests
- Coastal vulnerability – areas susceptible to erosion and tidal inundation
- Coastal environment – areas with coastal features, and marine and estuarine waters
- Coastal use – land next to coastal waters, estuaries, coastal lakes and lagoons.

In conjunction with local planning direction from the NSW Government, these frameworks aim to reduce land use threats to important coastal and marine environmental areas. The project development footprint and study area in Merimbula is a coastal zone containing coastal wetlands under the SEPP (2018).

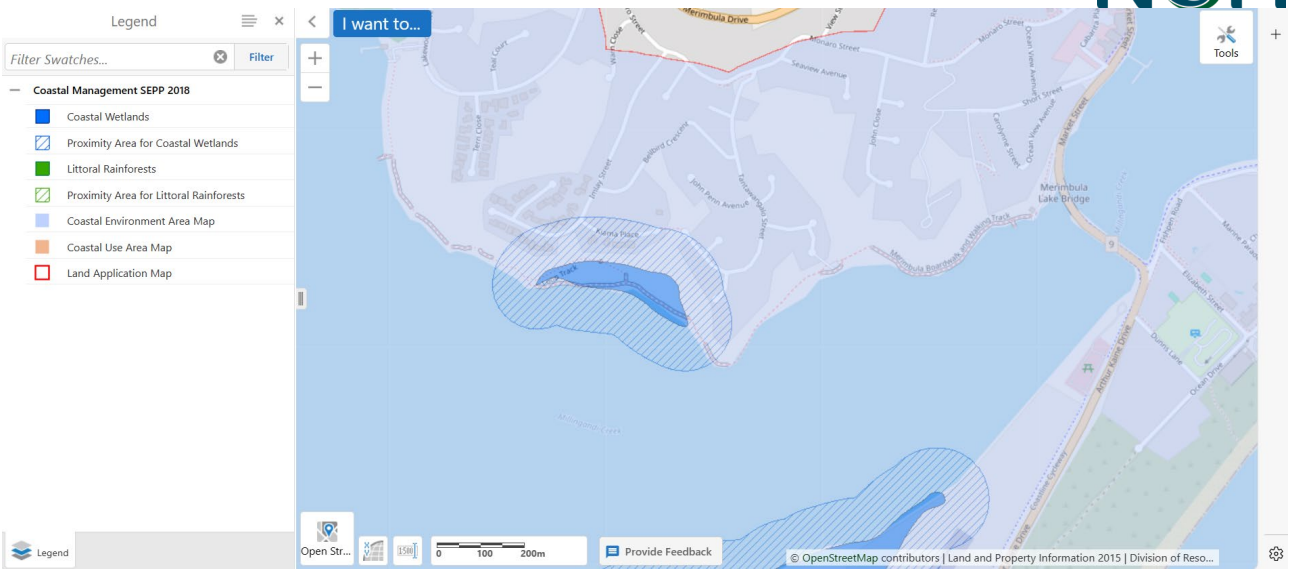


Figure 3-5 Proximity area and coastal wetland zone within the study area (Source: SEED Portal, 2024).

3.5.3. Directory of Important Wetlands

The Directory of Important Wetlands in Australia identifies nationally important wetlands and provides a knowledge base of what defines each wetland, including species presence and cultural significance (DCCEEW, 2021). Merimbula Lake is a nationally important wetland, which requires an EIS on wetland developments under SEPP 14 for coastal wetlands.

3.5.4. Biologically Important Areas

Biologically Important Areas (BIAs) for protected marine species are located within state, Commonwealth, and adjacent waters. BIAs are areas and times used by protected marine species for carrying out critical life functions, such as reproduction, feeding, migration or resting (DCCEEW, 2023). The following marine species were identified through the EPBC Protected Matters search tool as likely to occur in BIAs in the buffer zone for foraging or feeding:

- Indo-Pacific/Spotted Bottlenose Dolphin *Tursiops aduncus*
- Shy Albatross *Thalassarche cauta cauta*
- Grey Nurse Shark *Carcharias tauras.*

3.5.5. Marine Key Ecological Features

A Key Ecological Feature (KEF) is an area or element of the Commonwealth marine environment that has regional importance for biodiversity or ecosystem function. One marine KEF, Upwelling east of Eden, was identified as occurring within the 10km buffer of the development footprint in the EPBC Act Protected Matters Report. This KEF is known for high productivity caused by upwelling, with aggregations of marine life that supports biodiversity and fisheries (DCCEEW, 2015).

3.5.6. Key Fish Habitat

Under the FM Act, KFH includes all marine and estuarine habitats up to the highest astronomical tide level, and most permanent and semi-permanent freshwater habitats. As described in section 3.2, Merimbula Lake is *Type 1 - Highly Sensitive Key Fish Habitat* (DPI, 2013) and *Class 1 - Major Key Fish Habitat* under the *Fisheries NSW Policy and Guidelines for Fish Habitat Conservation and Management* (DPI, 2013).

KFH in the project site and buffer area were identified and mapped using layers from the NSW DPI Fisheries Spatial Data Portal, listed in section 2.1.1.

Figure 3-6 Key fish habitat within the eastern study area and development footprint (Source: NGH, 2024).

Figure 3-7 Key fish habitat within the central study area and development footprint (Source: NGH, 2024).

Figure 3-8 Key fish habitat within the western study area and development footprint (Source: NGH, 2024).

3.5.7. Protected marine vegetation

All marine vegetation including saltmarsh, mangroves, seagrasses and macroalgae is listed as protected under the FM Act and provides an essential role for many species. Legislation prevents the removal of mangroves, seagrasses and seaweeds on public water land and foreshores, unless a permit has been granted by NSW DPI. Extracted layers from NSW DPI Fisheries Spatial Data Portal (NSW DPI, 2024) were input to QGIS to map marine vegetation in or near the project site, and in the buffer zone. Marine vegetation occurring within the study area and in the buffer zone of Merimbula Lake includes expanses of seagrass, primarily Strapweed *P. australis* and Eelgrass *Zostera* sp., mangroves, and saltmarsh.

Mangroves occur along many NSW estuaries, providing habitats for a variety of animals and protecting foreshores from cyclones, storm surges and other wave conditions. Mangroves also maintain water quality by filtering silt and recycling nutrients. Saltmarsh comprises small shrubs and plants with high tolerance to salinity and inundation. They act as a buffer, similar to mangroves. They also provide shelter, food and habitat for fish (NSW DPI, 2024).

Seagrasses are marine plants that occur in sheltered areas or shallow waters, common in areas such as estuaries. Seagrasses grow in soft sediments such as sand or mud, providing habitat and food source. They also assist in reducing erosion and improving water quality. Seagrass leaves may also contain epiphytes including algae and small encrusting animals such as epizoa. Epiphytes and epizoa are food sources for a range of aquatic species and a water filter mechanism (NSW DPI, 2007). Wrack is made up of dead seagrass and algae washed ashore, which provides habitat and food for small invertebrates including crab species recorded from the fieldwork surveys. Seagrass also supports coastal fisheries by providing these ecosystem services.

Macroalgae are aquatic primary producing plants, also known as seaweeds. They can grow in the intertidal and subtidal areas and are an important resource for fish and other invertebrates by providing food, shelter and nurseries for juvenile fish (NSW DPI, 2011).

Figure 3-9 Estuarine macrophytes within the eastern study area and development footprint (Source: NGH, 2024).

Figure 3-10 Estuarine macrophytes within the central study area and development footprint (Source: NGH, 2024).

Figure 3-11 Estuarine macrophytes within the western study area and development footprint (Source: NGH, 2024).

3.5.8. NSW Ecosystem Offset Trading Groups

The Central Resource for Sharing and Enabling Environmental Data in NSW (SEED) Portal was utilised to identify any offsets occurring in the development and study area of the project. The following NSW Ecosystem Offset Trading Groups were identified:

- South East Coastal Ranges; Saltmarshes greater than or equal to 50% and less than 70%
- South East Coastal Ranges; South East Dry Sclerophyll Forests less than 50%
- South East Coastal Ranges; South Coast Wet Sclerophyll Forests less than 50%
- South East Coastal Ranges; Littoral Rainforests less than 50%.

Although the above Ecosystem Offset Trading Groups have been identified as occurring within the study area, they are not considered in this Aquatic Ecology Assessment Report. This information is included in the BDAR.

3.6. Threatened fauna and flora

A likelihood of occurrence assessment was undertaken for potential threatened aquatic species, populations and Endangered Ecological Communities (EECs) using a range of databases including:

- BioNet Atlas
- Atlas of Living Australia
- EPBC Act Protected Matters Search Tool
- NSW Fisheries Spatial Data Portal.

3.6.1. Environment Protection and Biodiversity Conservation Act 1999

The Commonwealth Protected Matters Search Tool, under the *Environment Protection and Biodiversity Act 1999,* was utilised to complete a search within a 10km radius of the development footprint in April 2024. This functional tool identified any threatened and/or protected marine or migratory species with the potential to occur within the study area. A search was conducted in preparation for the aquatic field surveys.

A Commonwealth Protected Matters report was produced from the search tool. The report listed 97 threatened species, 57 migratory species including marine and wetland migratory bird species, and 87 marine species that have the potential to occur within 10km of the site. The full Protected Matters report is provided in Appendix E. The report also captured species listed under the *NSW Biodiversity Conservation Act 2016*.

The Protected Matters report found that Subtropical and Temperate Coastal Saltmarsh also has the potential to occur in the study area, which is listed as Vulnerable under Threatened Ecological Communities in the EPBC Act. Four additional TECs were highlighted for further investigation:

- Littoral Rainforest and Coastal Vine Thickets of Eastern Australia – **Critically Endangered**
- Lowland Grassy Woodland in the South East Corner Bioregion – **Critically Endangered**
- Brogo Vine Forest of the South East Corner Bioregion - **Endangered**
- River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria – **Critically Endangered**

The TECs noted above are included in further detail in the BDAR and are excluded from this Aquatic Ecology Assessment Report.

A likelihood of occurrence assessment was undertaken in the form of a habitat evaluation table (Appendix A), which also considers the potential habitats of threatened and protected species.

3.6.2. Fisheries Management Act 1994

Threatened and protected marine species listed in the FM Act (see marine results in Appendix A) were reviewed to meet the requirements of the Fisheries NSW Policy and Guidelines for Fish Habitat Conservation and Management (NSW DPI, 2013). Marine species, populations and ecological communities that are currently listed as endangered, critically endangered and/or vulnerable (i.e. Schedule 4a and 5) under the FM Act with the potential to occur in the general study area are listed below.

Schedule 4a: Critically Endangered Species and Ecological Communities

- Grey Nurse shark *Carcharius taurus* - critically endangered species.

Schedule 5: Vulnerable Species and Ecological Communities

- White Shark, Great White Shark *Carcharodon carcharias* - vulnerable species
- Black Rockcod, Black Cod *Epinephelus daemelii* - vulnerable species.

Protected Species

- All species of the families 'Syngnathidae', 'Solenostomidae' and 'Pegasidae' (seahorses, sea dragons, pipefishes and pipehorses)
- All species of marine vegetation including mangroves, seagrass, saltmarsh, and seaweeds.

Note: Coastal Saltmarsh is listed as an Endangered Ecological Community (EEC) under the *Threatened Species Conservation Act 1995* (NSW DPI, 2013).

3.7. Likelihood of Occurrence

An evaluation of the occurrence and impact likelihood of threatened marine species in and surrounding the development footprint was undertaken in the form of a habitat table. A habitat evaluation table (Appendix A) draws information on threatened status through the EPBC Protected Matters Search Tool Report, and from other sources, within the project site and 10km buffer. This includes data regarding habitat requirements, records of sightings and protected status of species under various legislation.

The habitat table includes species listed under the EPBC Act, BC Act or FM Act for threatened or protected marine and migratory birds, marine mammals, marine reptiles, cetaceans, fish, and sharks. It is noted that birds listed in the habitat table are marine or migratory but are excluded from the aquatic field survey and have instead been included in the BDAR.

All aquatic species listed in the habitat evaluation table are categorised as low in their likelihood of occurrence and a justification for each species is provided in the corresponding listing. The overall low rating is due to the absence of threatened or protected species observed during the field surveys, in addition to unsuitable habitat in the study area for each species. As a result, potential impacts are also generally unlikely due to the lack of species presence and unsuitable habitat. However, this does not rule out the occurrence of threatened or protected species in the study area entirely. The aquatic field survey results show that it unlikely for these species to occur in the area and based on the industry standard survey methods implemented, no further aquatic surveys are required.

4. Field survey results

The aquatic field surveys were undertaken as described in the methodologies. Surveys were carried out from May 7th-9th 2024 by Christoph Braun (Senior Aquatic Ecologist) and Maddie Robertson (Ecologist). During the initial site visit and walk-through, general observations were made regarding the area and any species of note that were present. Appendix D displays all recorded waypoints during the aquatic field surveys.

4.1. Aquatic ecology assessments

4.1.1. Site walk-through

A walking survey was undertaken on May 7th 2024 at approximately 11:20am – 2pm. General observations were made and noted regarding the area and habitat, taking particular interest in threatened or protected species. Points of interest such as habitats, species observations and changes in proposed construction methods were saved on GPS (Figure 4-6, Figure 4-7, Figure 4-8, Table 4-1). Methods include direct piling, access via existing boardwalk, access and works to be conducted by barge (Fleetwood 2024, Document FWU-V-C-1185-C – Methodology Mark-up LR, provided by BVSC on 3 May 2024). A handheld GoPro video was taken the following day on May 8th 2024 to capture the length of the boardwalk to refer to any observations post-fieldwork, if necessary. A GPS marker point (WP65) was recorded at the start of the boardwalk near the eastern carpark with a 10:47am start time and an end marker point (WP66) at 11:22am.

In the study area, saltmarsh and mangroves were present along both sides of the boardwalk (Figure 4-1, Figure 4-2). Pneumatophores are lateral roots for oxygen intake by mangroves, which had a high presence throughout the study area including underneath the existing boardwalk (NSW DPI, 2013) (McPherson, 2011). General comments from the site walk-through include abundance of saltmarsh plants and mangrove trees including:

- Austral Seablite *Suaeda australis*
- Beaded Samphire *Sarcocornia quinqueflora*
- Shrubby Glasswort *Teticornia arbuscula*
- Grey Mangrove *Avicennia marina*
- River Mangrove *Aegicera corniculatus.*

Further details and recommendations/impacts have been described by NGH in the BDAR assessment rather than in this aquatic assessment.

Figure 4-1 Section of the boardwalk traversing mangrove and saltmarsh vegetation with high density of mangrove pneumatophores (Source: NGH, 2024).

Figure 4-2 Grey Mangroves *A. marina* on either side of the boardwalk (Source: NGH, 2024).

Large sections of the boardwalk are immediately adjacent to the intertidal shoreline and become exposed during the tidal cycle. The shallow sloping bed of the estuary is characterized by areas dominated by bare sand interspersed with exposed rock colonised by oysters, benthic invertebrates and areas of soft substrate and mixed seagrass communities.

Figure 4-3 Section of the boardwalk with mix of rocky, sandy and muddy substrate exposed at low tide (Source: NGH, 2024).

Figure 4-4 Rocky and muddy benthos exposed at low tide near the existing jetty (Source: NGH, 2024).

A variety of crabs were visible during the site walk-through, including high shore and mid shore crabs. Smooth Shore Crabs *Cyclograpsus audouinii,* Semaphore Crabs *Heloecius cordiformis* (Figure 4-5) and light-blue Soldier Crab *Mictyris longicarpus* were noted as present on either side of the boardwalk and underneath the boardwalk. The Smooth Shore Crab inhabits sandy mud sediment in high shore areas, whereas Semaphore Crabs and Soldier Crabs inhabit the areas in between mangroves in muddy/sandy sediment (CMA, n.d.).

Figure 4-5 Semaphore crab *H. cordiformis* on either side of the boardwalk (Source: NGH, 2024).

A range of algae was observed throughout the site walk-through and during the surveys. Species included Neptune's Necklace *Hormosira banksia* and macroalgae *Sargassum* sp. as captured in Table 4-2 (WP54 and WP56).

During the site walk-through, no Syngnathiformes were observed.

Figure 4-6 Points of interest marked in the eastern section of the boardwalk during the site walk-through in the aquatic field surveys (Source: NGH, 2024).

Figure 4-7 Points of interest marked in the central section of the boardwalk during the site walk-through in the aquatic field surveys (Source: NGH, 2024).

Figure 4-8 Points of interest marked in the western section of the boardwalk during the site walk-through in the aquatic field surveys (Source: NGH, 2024).

Table 4-1 Observations made during site walk-through

Waypoint	Latitude	Longitude	Comments
WP0012	-36.8942	149.9088	Market St. (eastern) end. Rocky embankment adjacent to turnaround area of carpark. Oysters on rocks, 2 mangrove seedlings among rocks.
WP0013	-36.8946	149.9083	Start of boardwalk. Sandy + rocky substrate with debris (wrack), Oysters on rock, single mangrove.
WP0014	-36.8947	149.9078	Wooden jetty ~30m west of boat shed, overgrown with oysters, macroalgae present, seagrass in patches and becoming denser in deeper water.
WP0015	-36.8947	149.9073	Shallow sandy, mud flat, crab burrows, mangrove roots, seedlings. Few rocks with oysters. White faced heron x2, seagulls, pelican x1, pied cormorant (shag) x2, pied oystercatcher x1.
WP0016	-36.8953	149.9065	Shallow flat, exposed. Much bare sand, some rocks with oysters & macroalgae.
WP0017	-36.8956	149.9061	Shallow bare flat, wrack and some isolated rocks with oysters. Some *Zostera sp*. ~10-15% cover.
WP0018	-36.8957	149.9055	Small mangrove patch approx. 5m off boardwalk in water, exposed rock and sandy substrate.
WP0019	-36.8956	149.905	Exposed rock, sand and mud. Mangrove roots looking WSW, expansive shallow flat. Pied oystercatchers x4.
WP0020	-36.8954	149.9048	Among mangroves (mature + seedlings). Pneumatophores (PN) throughout. Crabs *H. cordiformis* numerous (2-3/m^2). PN under boardwalk.
WP0021	-36.8951	149.9043	End of boardwalk section. Path among woodland.
WP0022	-36.8953	149.9036	Woodland near carpark. Arum lilies, ferns, she-oaks.
WP0023	-36.8956	149.9034	At carpark. Mangroves, Large amount of macrophytes (Neptune's Necklace, NN) and Strapweed *Posidonia* wrack washed up. Bare sand ~5m from shore.
WP0024	-36.8956	149.9029	Intersection boardwalk/concrete.
WP0025	-36.8957	149.9026	Saltmarsh behind narrow (<5m) mangrove fringe.
WP0026	-36.8963	149.9018	Expansive sandflat. Pied oystercatchers x3, masked plovers x2, great egret x1, several shags
WP0028	-36.8974	149.9008	Beach area. Pied oystercatchers to West in distance, wracked *Halophila sp*., *Zostera sp.* approx. 10m from boardwalk. Sign "Oyster farm 81.8", Black swan x1
WP0030	-36.8975	149.9008	Start of Type 1 section (Fleetwood 2024). Sandy beach substrate. Adjacent to oyster farm.

Waypoint	Latitude	Longitude	Comments
WP0031	-36.8974	149.9001	On boardwalk, mangrove fringe on seaward side. Rocky/sandy substrate some saltmarsh underneath boardwalk. Many crabs *H. cordiformis* near mangroves.
WP0032	-36.8972	149.9001	Western side of point, oyster lease nearby.
WP0033	-36.8971	149.9001	End of section Type 1 on Plan A7 (Fleetwood 2024).
WP0034	-36.8966	149.8996	Sandy beach start of Type 1 section (Fleetwood 2024) leading into mangrove flat.
WP0035	-36.8965	149.8992	Start of type 3 section (Fleetwood 2024). Mangrove mudflat in front (seaward) of saltmarsh, mangroves extend 10-15m from shoreline. High density PN + seedlings. ~ dozen seagulls. 5-10 crab burrows/m^2, white faced heron.
WP0036	-36.896	149.8984	Saltmarsh underneath boardwalk. Tall saltmarsh grass.
WP0037	-36.8959	149.898	Small mangroves, Saltmarsh plants, signs of inundation at tide.
WP0038	-36.8959	149.8969	At Bench in type 3 section (Fleetwood 2024). Sandflat seaside, bare. PN under boardwalk (BW) but hardly any on seaside. Saltmarsh + isolated mangroves.
WP0039	-36.8959	149.8967	Start of type 4 section (Fleetwood 2024). Mangrove + saltmarsh on landside, bare sandflat seaside. Soldier crabs.
WP0040	-36.8959	149.8957	End of type 4 section (Fleetwood 2024).
WP0041	-36.8954	149.8946	Start of short BW section type 1 (Fleetwood 2024). Saltmarsh + mangroves.
WP0042	-36.8952	149.8943	End of short BW section type 1 (Fleetwood 2024).
WP0043	-36.8952	149.8941	Section type 4 (Fleetwood 2024). Saltmarsh + mangroves. Thick PN extending ~20m from shoreline.
WP0044	-36.8951	149.8936	Section where new platform of boardwalk is proposed (Fleetwood 2024). Gap between mangroves + pneumatophores. Oyster lease ~50m from shore. Clumps of Strapweed wrack.
WP0045	-36.8948	149.8931	Mangrove fringe ~15-20m wide, dense PN's, seedlings moderate. Saltmarsh on landside. People fishing on edge of sandflat near oyster lease.
WP0047	-36.8934	149.892	Start of jetty and platform structure, Plan A2 (Fleetwood 2024). Mangrove fringe ~25m wide.
WP0049	-36.8934	149.8917	End of jetty and platform structure. Sandflat off mangrove fringe. Oyster leases.
WP0050	-36.8914	149.892	Western end of boardwalk at Kiosk. Seagrass wrack. Substrate is sand/mudflat.

4.1.2. Parallel snorkel transect

A snorkel transect was undertaken on May 8th 2024 at 8:30am, approximately 5m parallel to the shoreline or in water as shallow as practical, starting at the eastern boat/kayak ramp. High tide on this day as recorded at the Merimbula Lake Bridge was at 9:42am at a level of 1.54m. The maximum tide height at this location is approximately 2.1m (WillyWeather, 2024). The actual snorkel path deviates from the proposed path due to the area closest to the shore being exposed or too shallow (water depth less than 0.3m).

The snorkel transect included structures such as the existing jetty and sliprails near the eastern end of the boardwalk. General observations were made about the sediment type and habitats present. The presence of fish, seagrass, crabs, sponges and macroalgae was noted. Waypoints were taken where such observations were made and significant habitats were present (Figure 4-9, Table 4-2)Table 4-2 Selected observations of habitats, flora and fauna made during the parallel snorkel transect (Source: NGH, 2024).

The habitat in the eastern part of the snorkel transect between the boat ramp and the existing jetty is characterized by relatively deep water up to 3m, with a mixed seagrass community of Eelgrass *Zostera sp*., Paddleweed *H. ovalis* and Strapweed *P. australis* on soft sandy substrate. A Blue Swimmer Crab and a moult of the same species were observed. This area included isolated patches of rocks overgrown with epiphytes and tunicates such as the Light-bulb Ascidian *Clavelina lepadiformis*. This species is a global pest species and has been introduced to Australia via shipping. This species has been recorded previously from Eden and Port Stephens (MPSC, 2022). The area also included isolated stands of *Sargassum* macroalgae. Smooth Toadfish *Tetractenos glaber* and schools of Port Jackson Glassfish *Ambassis jacksoniensis* were observed.

Pylons of the existing jetty west of the boat ramp and the adjacent sliprails were covered with macroalgae, sponges, ascidians and oysters. Several fish species were observed in this area including:

- Port Jackson Glassfish *A. jacksoniensis*
- Luderick *Girella tricuspidate*
- Exquisite Sandgoby *Favonigobius exquisitus*.

To the west of the existing jetty and the sliprails, the water depth decreased to less than 0.5m. The habitat was dominated by bare soft sand with low density Paddleweed *H. ovalis*. On occasion, isolated patches of oysters, rocks and macroalgae stands including Neptune's Necklace *Hormosira banksia* and macroalgae *Sargassum sp.,* as well as isolated areas of denser Paddleweed provided valuable habitat. In these areas, a range of fish were observed including:

- Estuary Glassfish *Ambassis marianus*
- Luderick *Girella tricuspidate*
- Exquisite Sandgobies *Favonigobius exquisitus*
- Smooth Toadfish *Tetractenos glaber*,
- Smooth Stingrays *Bathytoshia brevicaudata*
- Sea Mullet *Mugil cephalus*.

The western end of the snorkel transect (in line with a bench on the boardwalk) was very shallow (<0.5m depth) and characterised by mostly bare sand and low density Paddleweed *H. ovalis* habitat.

During the snorkel transect, no Syngnathiformes were observed.

Figure 4-9 Connected parallel snorkel transect points of interest with proposed path (Source: NGH, 2024).

Table 4-2 Selected observations of habitats, flora and fauna made during the parallel snorkel transect (Source: NGH, 2024).

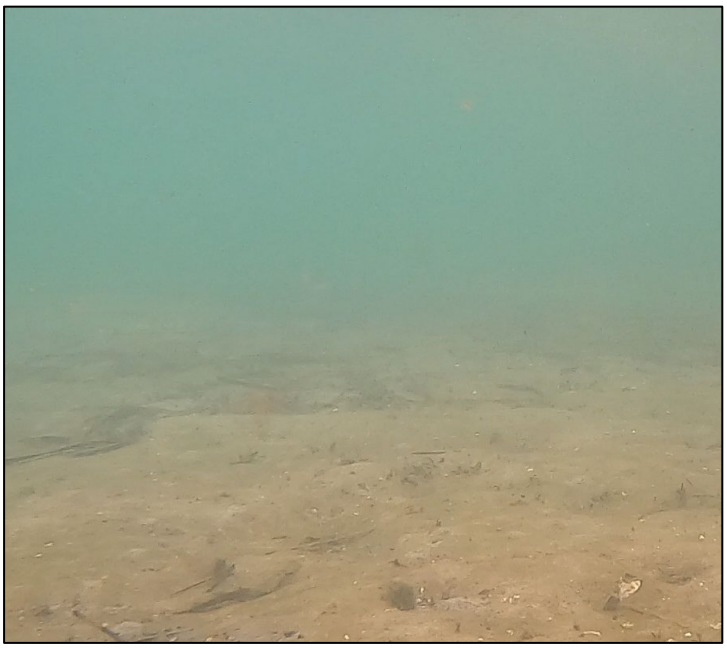
Observation	Description
1 (Map reference WP51)	 Soft sand substrate with medium density Eelgrass *Zostera sp.*, Paddleweed *H. ovalis* and Strapweed *P. australis* in 2-3m of water near the eastern boat ramp.
2 (Map reference WP53)	 Blue Swimmer Crab *P. pelagicus* in medium density seagrass habitat, between the eastern boat ramp and existing jetty. An empty crab shell moult of the same species was observed nearby.

Observation	Description
3 (Map reference WP53)	 Light-bulb Ascidian *C. lepadiformis* among macroalgae on small rocks, in medium density seagrass on soft sandy substrate.
4 (Map reference WP54)	 Smooth Toadfish *T. glaber* over soft sandy substrate and near low density seagrass.

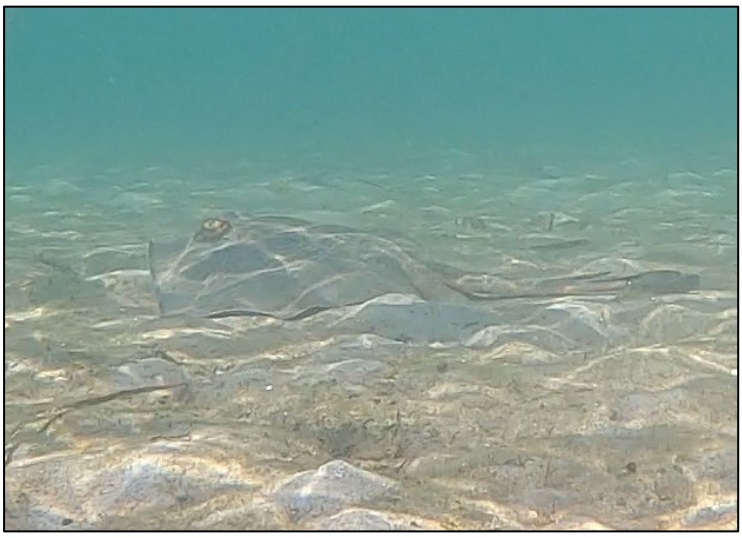
Observation	Description
5 (Map reference WP54)	 Macroalgae *Sargassum sp*. in isolated stands on soft sandy substrate near the jetty.
6 (Map reference WP54)	 Light-bulb Ascidian *C. lepadiformis* among medium density seagrass *H. ovalis* meadow.

Observation	Description
7 (Map reference WP55)	 School of Port Jackson Glassfish *A. jacksoniensis* near macroalgae *Sargassum sp.* and medium density seagrass *H. ovalis*, in water depth <1m.
8 (Map reference WP56)	 Macroalgae, sponge and ascidian growth on pylons of existing jetty west of the boat ramp.

Observation	Description
9 (Map reference WP56)	 Macroalgae *Sargassum sp.*, sponge and ascidian growth on sliprails immediately west of the existing jetty.
10 (Map reference WP56)	 Exquisite Sand Goby *F. exquisitus* on patch of bare sand near sliprail overgrown with encrusting macroalgae and sponges.

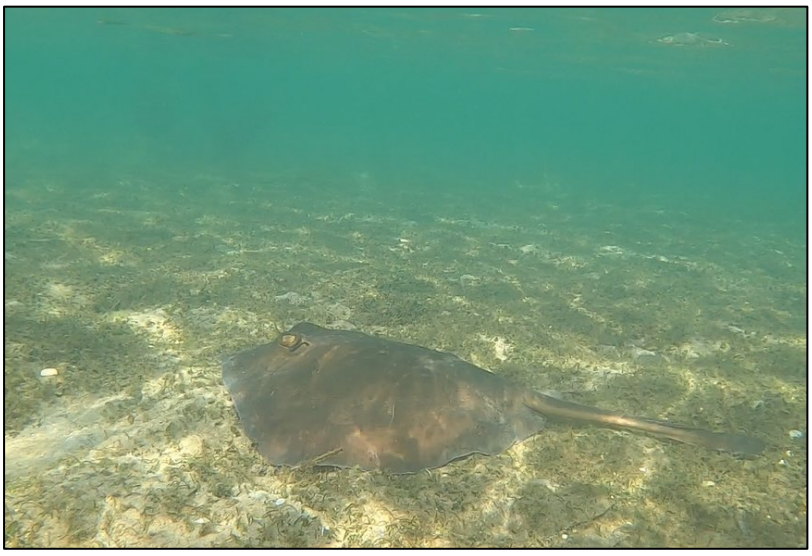
Observation	Description
11 (immediately west of Map reference WP56)	 Bare sand habitat west of the sliprails near the jetty in less than 1m of water depth.
12 (Map reference WP57)	 Low to medium density seagrass habitat of Paddleweed *H. ovalis* and Eelgrass *Zostera sp.* on soft sandy substrate in shallow water of less than 0.5m depth.

Observation	Description
13 (Map reference WP58)	 Isolated patch of oysters with an area of approximately 4m^2 in otherwise bare sand habitat and shallow water less than 0.5m depth. This oyster patch is exposed at lower tides. Port Jackson Glassfish *A. jacksoniensis* are visible in top left of picture. Exquisite Sand Gobies *F. exquisitus* were noted at the edges of the oyster patch.
14 (Map reference WP59)	 Small isolated rocky patches with macroalgae Neptune's Necklace *H. banksia*. Schools of Port Jackson Glassfish *A. jacksoniensis* were observed in the vicinity.

Observation	Description
15 (Map reference WP60)	 Smooth Stingray *B. brevicaudata* with an estimated disc width of 0.8m on bare soft sandy substrate in shallow water (0.5m).
16 (Map reference WP60)	 Small patch of rocky boulders less than 0.5m^2 each in soft sandy substrate with sparse Paddleweed cover *H. ovalis.*

Observation	Description
17 (Map reference WP61)	 Approximately 10m^2 patch of Paddleweed *H. ovalis* among isolated macroalgae *Sargassum sp.*. A school of five Luderick *G. tricuspidata* were observed out of frame of the camera at some distance.
18 (Map reference WP62)	 One of two Smooth Toadfish *T. glaber* observed in shallow water <0.5m over medium Paddleweed habitat *H. ovalis* interspersed with rocky boulders covered in epiphytic growth and macroalgae.

Observation	Description
19 (Map reference WP62)	 Rocky boulders, oyster growth and Neptune's Necklace *H. banksia* adjacent to waypoint WP62 in shallow water <0.5m. A school of Port Jackson Glassfish *A. jacksoniensis* can be seen in the foreground.
20 (Map reference WP63)	 A school of Sea Mullet *M. cephalus* in shallow water ~0.5m swim over soft sandy substrate interspersed with rocky boulders.

Observation	Description
21 (Map reference WP64)	 Smooth Stingray *B. brevicaudata* in shallow water of less than 0.5m depth, with soft sandy substrate and medium density Paddleweed meadow *H. ovalis* at the western end of the snorkel transect.
22 (Map Reference WP64)	 Bare sand and low density Paddleweed *H. ovalis* meadow at the western end of the snorkel transect.

4.1.3. Point-intercept transects

Thirteen transects were laid perpendicular to the closest primary land mass on the shore, from 0m (start) to 10m (end). 1m^2 quadrats were analysed at 2m, 4m, 6m, 8m and 10m for benthic organisms, with a focus on seagrass species and cover. The bottom-left corner of the quadrat was placed at each designated metre mark on the right-hand side of the tape. Additional species that were observed in the general area were also noted. One additional 20m length transect (T14) was placed where a new jetty/platform is planned as part of the Project. Here, quadrats were also assessed at 2m intervals, but ranged from 2-20m to capture the planned dimensions of the new structure. The number of quadrats per transect with any seagrass present, the average and maximum seagrass cover per transect and the relative abundance of the three seagrass species observed during the survey and a brief description of the transect are shown in Table 4-3 and Table 4-4. The transect data is available in Appendix B. Figure 4-10, Figure 4-11 and Figure 4-12 show the proposed transects in comparison to the start and end waypoints recorded during the point intercept transect surveys.

Figure 4-10 Point intercept transect waypoints from aquatic fieldwork surveys with proposed locations in the eastern section of the boardwalk (Source: NGH, 2024).

Figure 4-11 Point intercept transect waypoints from aquatic fieldwork surveys with proposed locations in the central section of the boardwalk (Source: NGH, 2024).

Figure 4-12 Point intercept transect waypoints from aquatic fieldwork surveys with proposed locations in the western section of the boardwalk (Source: NGH, 2024).

In general, the average seagrass cover was below 10%, and ranged from 0 – 34% (Table 4-3), while individual quadrats had up to 80% seagrass cover (Appendix B). Overall, seagrass cover was relatively patchy with many transects showing a high variability of cover across quadrats. Some quadrats and transects contained very low cover, or no cover.

Four species of seagrasses were observed during the survey:

- Strapweed *Posidonia australis*
- Eelgrass *Zostera capricorni, Zostera muelleri*
- Paddleweed *Halophila ovalis.*

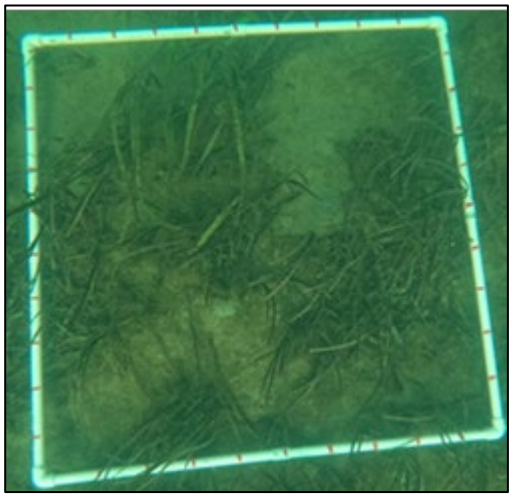
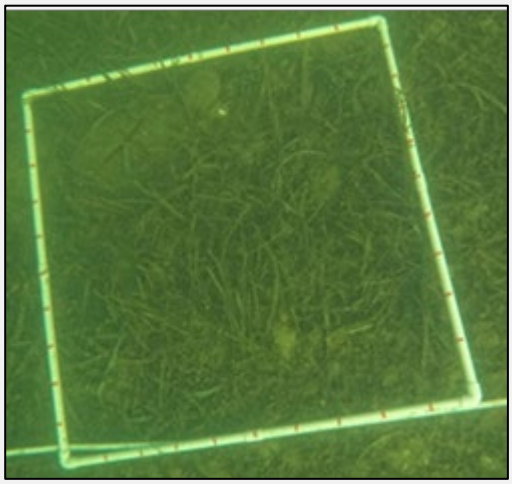
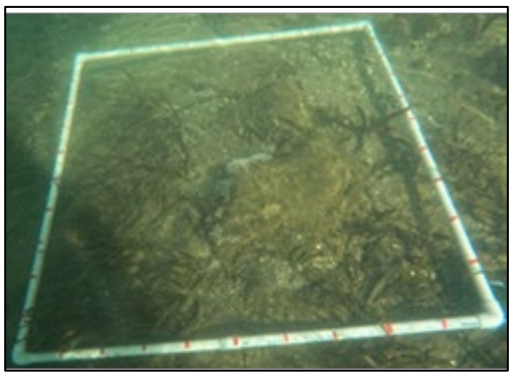
In Table 4-3, seagrass has been grouped into families for relative abundance. Eelgrass *Zostera sp*. was the most common seagrass, present in 10 of 14 transects, followed by Paddleweed *H. ovalis* in 9 of 14 transects. (Table 4-3). Strapweed was only observed in three transects, at the most eastern end of the boardwalk and at the additional transect (Table 4-3) T14, where deeper water was present. Eelgrass and Paddleweed often occurred together in mixed communities.

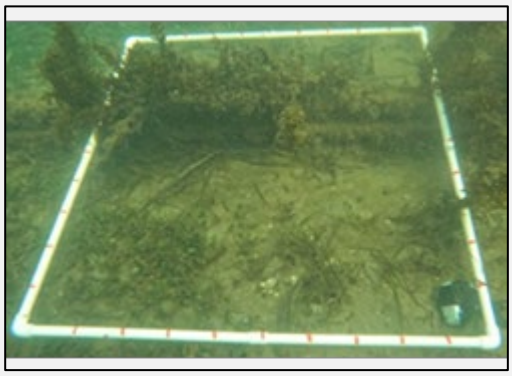
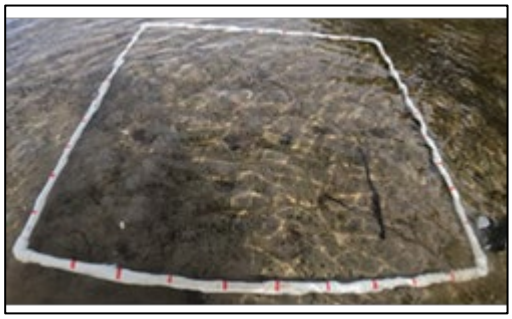
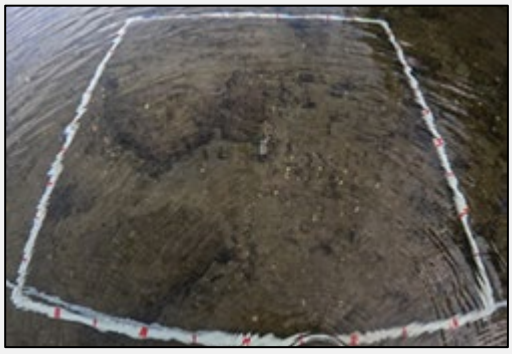
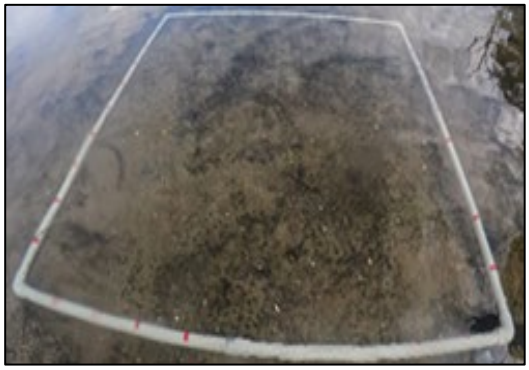
Four transects had no seagrass cover: T8, T9, T11 and T12. In these areas the intertidal zone was usually bare sand, very shallow and exposed during large periods of the tidal cycle.

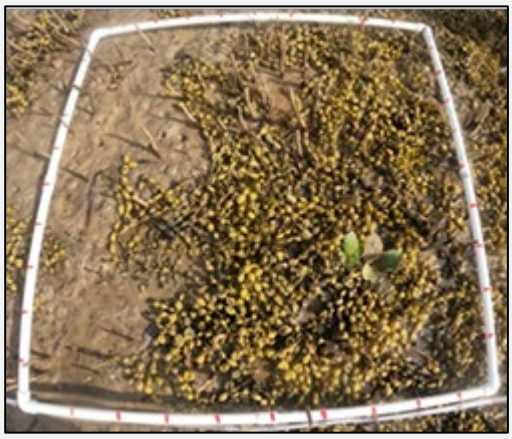
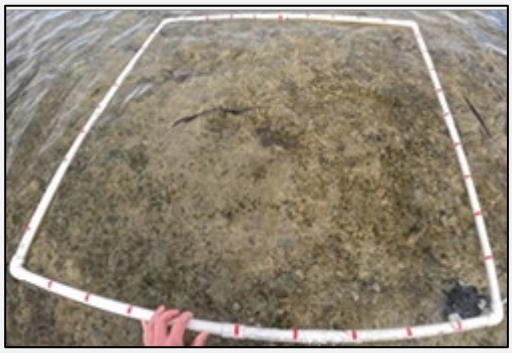
Table 4-3 Seagrass maximum and average cover and relative species abundance along the transects.

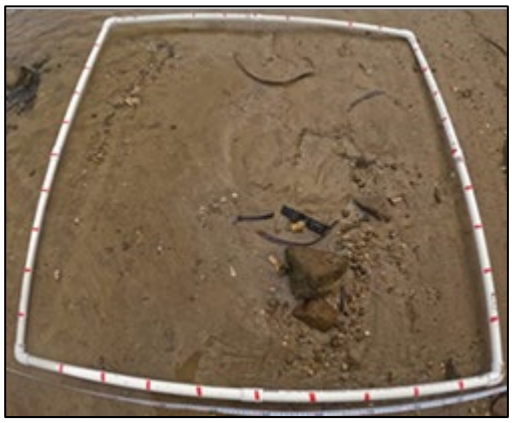
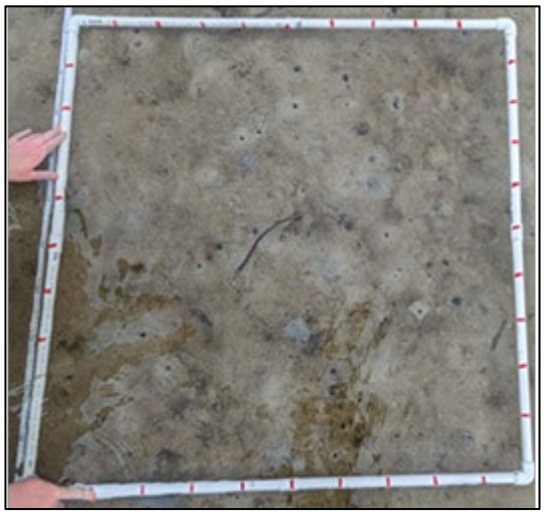
Location	Seagrass presence in number of quadrats	Maximum seagrass cover	Average seagrass cover	Relative abundance		
				Posidonia	Zostera	Halophila
T1	5/5	60	34	0.86	0.11	0.03
T2	3/5	80	18.6	0.015	0.345	0.24
T3	4/5	25	9.4	0	0.54	0.06
T4	3/5	20	8	0	0.21	0.39
T5	3/5	10	4.2	0	0.05	0.55
T6	5/5	10	7	0	0.82	0.18
T7	5/5	25	9.6	0	0.58	0.42
T8	0/5	0	0	0	0	0
T9	0/5	0	0	0	0	0
T10	5/5	50	17.2	0	0.62	0.38
T11	0/5	0	0	0	0	0
T12	0/5	0	0	0	0	0
T13	5/5	3	1.5	0	1	0
T14	6/10	30	8.875	0.18	0.2	0.22

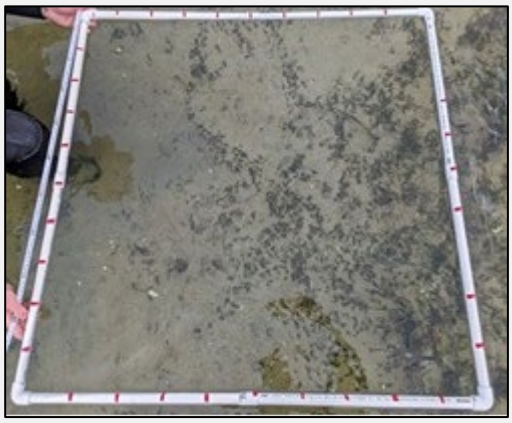
Table 4-4 Point intercept transect descriptions.

Transect #	Observation Summary	Example Photograph
1	Located on the eastern end of the boardwalk near the car park and boat ramp, facing towards bridge. Substrate is sand and rock, some crab holes and ascidians observed. Dominant species of seagrass is Strapweed *P. australis.*	
2	Located on the eastern end of the boardwalk near the car park and boat ramp, facing towards petrol station on opposite shore. Substrate is sand. Some shells and crab burrows observed. Dominant species of seagrass is Strapweed *P. australis.*	
3	Located on the eastern end of the boardwalk near the boat ramp, facing West towards existing jetty. Substrate is mix of rock and sand. Some shells, snails, ascidians and sponges observed as well as wrack and macroalgae. Dominant species of seagrass is Eelgrass *Zostera sp..*	

Transect #	Observation Summary	Example Photograph
4	Located on the eastern end of the boardwalk adjacent to the jetty and sliprails. Substrate is mix of rock and sand with shell and oyster debris. Some shells, snails, ascidians and sponges as well as wrack and macroalgae and crab burrows observed. Seagrass present in deeper sections of transect. Dominant seagrasses are Paddleweed *H. ovalis.* and Eelgrass *Zostera sp..*	
5	Located west of the jetty in shallow intertidal area. Substrate is muddy sand with crab burrows and worm holes present. Seagrass present in deeper sections of transect. Dominant species of seagrass is Paddleweed *H. ovalis.*	
6	Located west of the jetty in shallow intertidal area. Substrate is muddy sand with larger proportion of rocks with epiphytes and shell debris. Some crab burrows and worm holes present. Seagrass present in all sections of transect in low density. Dominant species of seagrass is Eelgrass *Zostera sp..*	
7	Located west of the jetty in shallow intertidal area near existing bench on boardwalk. Substrate is increasingly muddy sand with crab burrows and worm holes present. Bare rock underneath boardwalk. Seagrass present in all sections of transect. Dominant species of seagrasses are Paddleweed *H. ovalis* and Eelgrass *Zostera sp*..	

Transect #	Observation Summary	Example Photograph
8	Located at carpark/pump station in centre of boardwalk in shallow intertidal area, exposed at time of transect. Substrate is sandy mud with crab burrows, pneumatophores, washed up macroalgae. No seagrass present in all sections of transect.	
9	Located west of carpark/pump station in shallow intertidal area, exposed at time of transect. Substrate is sand with crab burrows becoming less abundant towards lake. Strapweed and macroalgae wrack. No seagrass present in all sections of transect.	
10	Located adjacent to Oyster Lease signed “81-8” in shallow intertidal area partially exposed at time of transect. Substrate is sand becoming muddy towards lake with some small rocks. Some snails observed. Seagrass observed in all quadrats, mixed community of Eelgrass dominant in near-shore quadrats and Paddleweed dominant towards lake.	

Transect #	Observation Summary	Example Photograph
11	Located near Oyster Lease signed “81-8” in shallow intertidal area partially exposed at time of transect. Substrate is sand, small rocks and shell debris. Some snails observed. No seagrass observed in transect.	
12	Located in western half of boardwalk near saltmarsh area, in shallow sandy section exposed at time of survey. Substrate is sand, crab burrows and worm holes present. No seagrass observed in transect.	
13	Located at western end of boardwalk near café and boat launch facility and adjacent to existing jetty/observation platform with steps leading into water. Shallow area partially exposed during survey. Substrate is mix of sand and mud, crab burrows present. Low seagrass density in all quadrats of Eelgrass only.	

Transect #	Observation Summary	Example Photograph
14	Additional transect in area of proposed jetty/observation platform. Transect length 20m to cover approximate footprint of proposed structures. Located in western half of boardwalk between T12 and T13, in small beach area with gap in between mangrove trees and pneumatophores. Oyster leases near the shore. Shallow water near shore with deeper channel towards oyster leases. Substrate is sand, with some shell debris, macroalgae and crab burrows present. Seagrass present in intermediate and deeper sections of transect, up to 30% cover. Mixed community of Eelgrass and Paddleweed.	

4.1.4. Stationary fish plots

Five stationary fish plot surveys were undertaken between May 8th to May 9th 2024 on outgoing tides. Two plots (P1, P2) on May 8th 2024 were located at the existing Jetty and the boat ramp (Figure 4-13). Three plots (P3, P4 and P5) were conducted on May 9th 2024 in the same areas as the previous day but at different depths and orientations. All plots were placed near significant habitat and existing structures in depths of 0.5 – 2m. GoPro cameras recording high-definition video on wide angle were attached to PVC pipe weighted with a dive weight. At the end of a second piece of PVC pipe extending 50cm outwards from the weight and in the centre of the camera's field of view a small mesh bag was attached and baited with crushed oysters and snails. Footage was recorded for up to one hour to capture any fish species that were visible in the area. After reviewing the footage, species were identified to the nearest possible taxon, and their relative abundance determined by dividing the number of occurrences per species by the total number of fish observed per plot.

Plots 1 and 4 were located at the wooden jetty near the boat ramp (location 1 in Figure 4-13). The habitat is characterised by the overgrown structure of the jetty (sponges, encrusting algae, ascidians and macroalgae, oysters) and a rocky, overgrown substrate providing habitat for cryptic species such Gobies, Blennies and Scorpionfish. Small schooling species such as Hardyhead and Glassfish seek shelter under near the pylons of the jetty. Deep water habitat (>1m) is present at the end of the jetty towards the channel in Lake Merimbula. The jetty is often used for recreational fishing. A total of 11 species of fish were observed (Table 4-5), including cryptic species such as Blennies, Gobies and Eastern Fortescue which are benthic-associated and well camouflaged. Schooling fish such as Hardyhead, Glassfish and Luderick were in greater abundance than cryptic species.

Plots 2, 3 and 5 were placed at the rock wall and in seagrass meadows at the boat ramp at the eastern end of the boardwalk (location 2 in Figure 4-13). In these plots, habitat is characterised by the rock wall of the boat ramp and walkway, with the rock wall leading towards the bridge and seagrass towards the channel. The substrate and structures are less colonised by sessile organisms compared to the jetty and has a greater proportion of bare sand. Macroalgae, seagrass wrack, and crevices in the rock wall provide shelter for small schooling fish species. In deeper water (Plot 3 and 5; >1.5m), a greater proportion of larger fish such as Mullet, Tarwhine and Trevally were observed compared to the plots at the jetty. At the boat ramp location, 14 species of fish were observed. As with the jetty, the boat ramp is frequented by recreational anglers. Similar to the fish plots located at the jetty, schooling fish such as Glassfish, Luderick and Hardyhead accounted for

a large proportion of the observed fish (Table 4-5). This location also captured a higher number of larger fish such as Snapper, Smooth Stingray, Variable Leatherjacket, Whiting and Sea Mullet. Cryptic species observed at this location included Largemouth Gobies and Halfbridled Blennies.

In total, 20 species of fish were identified from the fish plots, and an additional 2 species were unidentified due to not being clearly visible in the camera frame. Detailed fish plot observations are shown in Appendix C.

No protected fauna (Syngnathiformes) was observed in the stationary fish plots.

Figure 4-13 Stationary fish plot locations during aquatic field surveys (Source: NGH, 2024).

Table 4-5 Fish species recorded during the stationary fish plots and their relative abundance.

Plot #	Species	Common Name	Count	Relative abundance
1 Jetty	*Atherinidae*	Hardyhead	150	0.3112
	Girella tricuspidata	Luderick	82	0.1701
	Coris picta	Comb Wrasse	63	0.1307
	Redigobius macrostoma	Largemouth Goby	40	0.0830
	Centropogon australis	Eastern Fortescue	39	0.0809
	Pseudocaranx georgianus	Silver Trevally	36	0.0747
	Tetractenos glaber	Smooth Toadfish	26	0.0539
	Rhabdosargus sarba	Tarwhine	21	0.0436
	Parablennius intermedius	Horned Blenny	14	0.0290
	Omobranchus anolius	Oyster Blenny	6	0.0124
	Ambassis jacksoniensis	Port Jackson Glassfish	3	0.0062
	Unidentified*	unidentified	2	0.0041
2 Boat Ramp	*Ambassis jacksoniensis*	Port Jackson Glassfish	410	0.7021
	Girella tricuspidata	Luderick	112	0.1918
	Atherinidae	Hardyhead	40	0.0685
	Rhabdosargus sarba	Tarwhine	6	0.0103
	Tetractenos glaber	Smooth Toadfish	6	0.0103
	Ambassis sp.	Glassfish	5	0.0086
	Redigobius macrostoma	Largemouth Goby	5	0.0086
3 Boat Ramp	*Pseudocaranx georgianus*	Silver Trevally	81	0.4525
	Girella tricuspidata	Luderick	52	0.2905
	Mugil cephalus	Sea Mullet	18	0.1006
	Rhabdosargus sarba	Tarwhine	11	0.0615
	Meuschenia trachylepis	Variable Leatherjacket	7	0.0391
	Chrysophrys auratus	Snapper	6	0.0335
	Bathytoshia brevicaudata	Smooth Stingray	2	0.0112

Plot #	Species	Common Name	Count	Relative abundance
	Tetractenos glaber	Smooth Toadfish	1	0.0056
4 Jetty	*Ambassis jacksoniensis*	Port Jackson Glassfish	100	0.9804
	Redigobius macrostoma	Largemouth Goby	2	0.0196
5 Boat Ramp	*Girella tricuspidata*	Luderick	88	0.4378
	Unidentified**	unidentified	40	0.1990
	Atherinidae	Hardyhead	30	0.1493
	Pseudocaranx georgianus	Silver Trevally	28	0.1393
	Arenigobius frenatus	Halfbridled Goby	6	0.0299
	Redigobius macrostoma	Largemouth Goby	4	0.0199
	Tetractenos glaber	Smooth Toadfish	3	0.0149
	Gobiidae	Goby	1	0.0050
	Rhabdosargus sarba	Tarwhine	1	0.0050

* 2 small individuals, too far away from camera to be identified

** school of small-bodied fish, likely Atherinidae or Glassfish, but too far from camera to identify.

5. Potential impacts and recommendations

After gathering information from the desktop analysis, field work data, peer-reviewed resources and additional sources (included in the reference list), NGH has provided descriptions for potential impacts of the proposed boardwalk upgrade to aquatic habitat, fauna and flora in Merimbula Lake, and recommendations for Bega Valley Shire Council going forward.

Impacts and recommendations for aquatic habitat, fauna and flora in Merimbula Lake consider *Policy and Guidelines for Fish Habitat Conservation Management* (2013) legislation. The following policies in Section 3.2.3.2 of the guidelines apply to harming marine vegetation and are relevant to the proposed boardwalk upgrade:

- NSW DPI will generally not allow harm to live marine vegetation by hand, tools, or mechanical methods (such as weed harvesters) except for maintenance clearing of "fouling" algal growth from existing infrastructure (e.g. ocean pool steps, boat ramp surfaces, boat mooring apparatus etc).
- NSW DPI will generally not approve any new developments or activities that will harm TYPE 1 without adequate mitigation and compensation measures in place.
- Where harm to marine vegetation is approved, a management plan will generally be required as a condition of consent, dependent on the scale of the works proposed and the adequacy of the environmental assessment provided with the application.
- NSW DPI will generally not approve developments or activities that do not incorporate foreshore buffer zones of 50-100 m width adjacent to TYPE 1 marine vegetation. Where a buffer zone of at least 50 m is physically unachievable due to land availability constraints, the available buffer width must be maximised to achieve protection of TYPE 1 and 2 marine vegetation (i.e. from edge effects, changes to water quality, flood protection and to allow for climate change adaptation).

NGH has provided recommendations for BVSC based on the above guidelines in consideration of proposed methodologies for the boardwalk upgrade.

5.1. Aquatic habitat and fauna

5.1.1. Potential impacts

None of the threatened or protected shark and fish species (including Syngnathiformes) listed in the habitat evaluation table (Appendix A) were found to occur within the development footprint during the field inspections. Although some of the threatened or protected species have the potential to occur within the 10km buffer zone (including deeper waters), it is considered unlikely that the proposed upgrades to the boardwalk would impact these species directly or indirectly, due to:

- Unsuitable or marginal habitat for the protected species in the development footprint and study area (i.e. depth of water, lack of dense seagrass beds and intertidal rocky reefs in the development footprint or its' buffer that could provide suitable habitat).
- Spatial separation from nearest deeper habitat and rocky reefs that occur near the entrance to Merimbula Lake and the coastal environment.
- The proposed upgrades to the boardwalk are not expected to decrease the population size, areas of occupancy, critical habitat or fragment populations of threatened or protected species known to occur within the 10km buffer zone of the development footprint.

Despite the lack of suitable habitat for and the absence of Syngnathiformes observed during the field survey, the proposed upgrades to the boardwalk have the potential to result in some minor, direct impacts to the identified aquatic habitat and fauna within the development footprint. The development footprint and study area as well as the surrounding areas are characterised by a diverse mix of shallow sandflats, low to medium

density seagrass beds interspersed with areas of bare sand, rock and mud, isolated small rocks colonised with oysters and macrophytes and areas with mangrove habitat. Oysters are animals that clean and filter the surrounding water, in addition to providing habitat and a source of food for some marine organisms. Poor water quality including pollution and sedimentation can reduce the available nutrition and silt over hard bottom habitat that oysters require (NOAA Fisheries, 2022). Accidental oil or fuel spills, in addition to sediment stirring due to movement and transportation, are likely to impact the health of oysters in close proximity to the development footprint.

These impacts would be associated with the temporary removal of existing poles and pylons of the existing boardwalk and the eastern jetty, as well as the impacts to benthic fauna (such as crabs, snails and burrowing invertebrates) during the instalment of the new boardwalk footings. This would result in the loss of the sessile community of encrusting organisms, sponges and macroalgae that have colonised these structures over time, in addition to declines in oyster size and numbers. In turn, the shelter and habitat provided by the existing phylon and pole structures would be temporarily lost and unavailable for the invertebrate and fish community (consisting of common species typical for the NSW South Coast).

Over time, it is expected that the replaced structures are recolonised and a similar habitat and shelter is provided to the fish, plant and invertebrate community by the pylons of the boardwalk and the jetty structures. NGH recommends using mesh decking to allow sunlight to penetrate through to seagrass and substrate beneath the boardwalk. This is important for photosynthesis of seagrass to convert sunlight into energy and will increase the likelihood of recolonisation in the case where seagrasses are damaged during boardwalk construction.

During the field survey, the invasive Light-bulb Ascidian *C. lepadiformis* was found during the snorkel transect on rocky substrate and observed on existing structures such as the eastern jetty and the boat ramp. This species is native to the Atlantic and has been found previously along the NSW coast both to the north and south of Merimbula Lake (MPSC, 2022) and is suspected to have been introduced to Australia via shipping. The removal of existing structures and the use of a barge to access parts of the development footprint could result in the dispersal of adults or larvae and should be avoided to reduce the risk of further spreading this invasive species.

Seagrass meadows provide habitat and shelter for many marine species including fish, seahorses and sea turtles. Seagrass meadows also provide protection for juveniles. Due to the slow recolonisation rate of seagrasses once damaged, it is essential that the recommendations for minimising impacts to seagrass meadows are practiced (UNEP, 2024).

Wrack was abundant in many sections of the study area, particularly on the shore-side of the boardwalk. The wrack mostly consisted of Neptune's Necklace *H. banksia* and Strapweed *P. australis*. Wrack is important for many organisms as a source of food, habitat and shelter (DPI, 2011). Invertebrates such as crabs were observed in wrack in the study area.

5.1.2. Recommendations

In order to limit the direct or indirect impacts associated with the boardwalk upgrades, NGH advises the following:

- Consultation with oyster farmers prior to construction, addressing any potential concerns and providing permit approval if necessary.
- Mitigation measures of construction impacts to oyster farm, including the use of sediment booms.
- Appropriate, safe fuel storage and refill locations for barge and construction vehicles.
- Implementation of an incident response plan for emergencies including spills.
- Limit the disturbance associated with the removal and replacement of existing structures such as pylons and footings, choose the minimal practical footprint or the same footprint and remove sessile organisms such as snails or shells, limpets and crabs before drilling or coring.

- Use decking with mesh to allow sunlight penetration while maintaining boardwalk stability to limit shading to the substrate underneath the boardwalk.
- Limit direct contact with seagrass meadows to reduce the likelihood of damage, in particular with Paddleweed and Eelgrass occurring in closer proximity to the shoreline.
- Limit disturbance and clearing/moving of wrack to reduce impacts to organisms living in or underneath wrack.
- In order to reduce the time that current habitat provided by the boardwalk is unavailable, limit time between removal and replacement of structures and stage the construction process.
- In areas where a barge is proposed to be used to upgrade the boardwalk or deliver materials, the barge should be of the smallest size and shallowest draft as practical to limit the disturbance of the benthos.
- Limit the number of barge movements in the intertidal area and move barge at high tide to minimise disturbance to the benthos.
- Limit the potential to spread invasive species such as Light-bulb Ascidians *C. lepadiformis* by disposing of old structures in a suitable way, and not re-using material that has the potential to be colonised by invasive species or hold parts of invasive species. Limit the disturbance of rocky substrate that is colonised by Light-bulb Ascidians within the development footprint as well as outside the development footprint as identified by the snorkel transect.
- Construction equipment used in the upgrade of the Merimbula Boardwalk should be thoroughly inspected for any remaining benthic material and cleaned and disinfected appropriately to prevent the spread of invasive species into other areas.

5.2. Aquatic flora

5.2.1. Potential impacts

Mangroves, saltmarsh, and seagrasses are protected in NSW under the FM Act. A permit is required from NSW DPI to undertake works or activities where damage or destruction of these plant groups is likely to occur in public water land or the foreshore of public water land up to the Highest Astronomical Tide Level. Damage includes cutting, trimming, removing, pulling up, gathering, shading, or poisoning. A permit is required for both live and dead, or detached material such as wrack (NSW DPI, 2023).

Potential impacts to saltmarsh, mangroves, macroalgae and seagrasses for the boardwalk upgrade include direct and indirect damage through the following activities:

- Removal of piles and old boardwalk structures
- Use of barge to deliver building materials and facilitate construction
- Anchoring or mooring of barge in areas with seagrass
- Use of vehicles and machinery for the construction of the boardwalk and trampling,
- Dumping of rubbish/waste and pollution.

Seagrasses are fragile and can become easily damaged, often by human-related disturbances such as boating or fishing activities, foreshore structures that inhibit sunlight conversion, sediment disturbance and stormwater runoff. Once seagrass meadows are damaged, regrowth and recolonisation is slow (NSW DPI, 2007). Strapweed *P. australis* does not readily recolonise areas where it has been removed or eliminated, which was abundant in many areas of the during the aquatic field surveys including close proximity to the existing Eastern car park. Paddleweed *H. ovalis* and Eelgrass *Zostera sp.* was present throughout the study area, particularly in shallow depths in close proximity to the existing boardwalk. Trampling and sunlight inhibition would be the highest potential impacts to seagrass.

Macroalgae derive all nutrients directly into their tissue from surrounding water, causing them to be at risk of damage due to water pollution (DPI, 2011). Due to the patchy distribution of macroalgae in the study area, it is unlikely that there will be any impacts on species that use macroalgae as a source of food or shelter. Brown algae *Sargassum sp*. and Neptune's Necklace *H. banksia* were noted as sparse during the aquatic

field surveys, with a higher occurrence near the existing jetty, pylons and boat ramp. Impacts to macroalgae would be associated with the removal of existing poles and pylons of the existing boardwalk and the eastern jetty, in addition to water pollution as a result of the construction process.

It was noted during the aquatic field surveys that pneumatophores and several mangrove seedlings were present on either side of the boardwalk and underneath the boardwalk. Particular care should be taken with mangrove seedlings during the construction process, particularly where machinery would occur. Further potential impacts to mangroves and saltmarsh are explored in the terrestrial report (BDAR).

A Part 7 *Fisheries Management Act* permit is required for the Merimbula boardwalk upgrade due to the following activities:

- harming marine vegetation.

A Permit Application will need to be completed by Bega Valley Shire Council with the proposed methodology and details of the project including evaluation of potential impacts, consultation and risk evaluation. It is not evident that any vegetation will be removed through the proposed methodologies, however a permit is required if there is any cutting, trimming, removing, pulling up, gathering or shading of live or dead vegetation, as well as wrack. The maximum penalty for harming marine vegetation without a permit is $220,000 for a Corporation (NSW DPI, 2013).

5.2.2. Recommendations

In order to limit the direct or indirect impacts of aquatic flora associated with the boardwalk upgrade, NGH advises the following:

- Avoid anchoring or mooring boats over seagrass beds and travelling across seagrass at low tide to minimise risk of damage from propellers.
- Utilisation of bunting and/or fencing to minimise impact area during construction, limiting access and preserving undisturbed to saltmarsh areas in particular.
- Since seagrass distribution in the study area is relatively patchy, areas with little or no seagrass cover should be chosen as anchoring points where possible.
- Minimise barge movements in the intertidal area and move barge at high tide only to avoid direct contact with macroalgae and seagrass. This will also reduce the risk of direct disturbance of seagrass and limit the mobilisation of sediment which could smother seagrass in the area.
- Avoid walking and trampling through seagrass and macroalgae – particularly at low tide.
- Consider replacing decking with mesh to allow sunlight penetration for seagrass whilst also maintaining stability in boardwalk.
- Dispose of rubbish, oils, and chemicals in the correct and safe manner as soon as possible after the waste has been created for the health of all marine organisms.
- Since boardwalk upgrades are proposed in areas that are already disturbed, appropriate signage and fencing is recommended to limit expansion of impact areas during construction.

Recommendations for saltmarsh and mangroves are outlined in the BDAR.

6. Conclusion

The Aquatic Ecology Assessment was conducted for the proposed upgrade of the Merimbula Boardwalk in Merimbula Lake by Bega Valley Shire Council. The primary aim of the study was to confirm the type and class of habitat of the study area in Merimbula Lake, assess the presence or absence of protected species, evaluate the composition and extent of seagrass and other macrophyte communities, and make observations of the aquatic environment to support the development approval of the proposed project.

Merimbula Lake was identified as a Type 1 - Highly Sensitive Key Fish Habitat and Class 1 - Major Key Fish Habitat. This classification is significant as it indicates the presence of seagrass species *Posidonia australis*, *Zostera capricorni*, *Zostera muelleri* and *Halophila ovalis*, as well as significant areas of coastal saltmarsh. These findings were confirmed during field observations, which included point intercept transects and observations made during snorkelling surveys and site walk-throughs.

A Commonwealth Protected Matters report identified several Matters of National Environmental Significance (MNES) within a 10km radius of the study area, including one Commonwealth Marine Area, five Listed Threatened Ecological Communities, 97 Listed Threatened Species, and 57 Migratory Species. However, the occurrence of relevant marine species was deemed unlikely due to lack of suitable habitat and no observations of listed species were made during the field survey.

During boardwalk walk-throughs, extensive saltmarsh and mangrove vegetation, various crabs, oysters, snails, and encrusting benthic invertebrates were observed. Seagrasses and algae were present in shallow water over sandy and muddy substrate.

A parallel snorkel transect revealed common fish species and crustaceans, shallow habitats, and isolated oyster reefs. Seagrass was more prevalent in deeper water near the boat ramp including Strapweed, Paddleweed and Eelgrass. No Syngnathiformes were observed

Seagrass abundance and species composition were assessed through 14 transects. Species observed included Strapweed *P. australis*, Eelgrass *Zostera* sp. and Paddleweed *H. ovalis*. Average seagrass cover was below 10%, but individual transects ranged between 0–34%. The highest seagrass cover occurred at the eastern end near the boat ramp.

Five baited stationary fish plot surveys were conducted to detect Syngnathiformes. In total, 20 species of fish were identified, with no Syngnathiformes observed. The fish community was dominated by small, schooling species and larger species such as Luderick and Trevally, which are all common estuary fish in this Merimbula Lake.

Potential impacts of the proposed boardwalk upgrades include minor direct impacts to the aquatic habitat and fauna due to temporary removal of existing structures. This could result in loss of the sessile community and potential spread of the invasive Light-bulb Ascidian *C. lepadiformis*. Recommendations to limit these impacts include limiting disturbance associated with structure removal and replacement, reducing time between removal and replacement, and limiting barge movements. In order to limit the potential spread of invasive species, old structures should be disposed of properly. The use of decking with mesh to allow sunlight penetration while maintaining boardwalk stability should be considered to limit shading to the substrate underneath the boardwalk.

Potential impacts to aquatic flora include damage to seagrasses, mangroves, and saltmarsh due to human disturbances. Recommendations to preserve these include seeking advice from NSW DPI, proper disposal of waste, avoiding machinery movement through saltmarsh areas, and rehabilitating where loss is unavoidable. In order to preserve seagrass and macroalgae, anchoring of construction barges over seagrass beds should be avoided and barge movements minimised.

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Appendix A Habitat evaluation

Table A-2 lists threatened species, populations and ecological communities that have been reported or modelled to occur from within a 10-kilometre radius of the study area obtained from the DPIE BioNet Atlas: (http://www.bionet.nsw.gov.au/) and the Commonwealth EPBC Protect Matters Search Tool (PMST) Protected Matters Search Tool: Interactive Map (awe.gov.au). The table summarises the likelihood of threatened species occurring within the study area based on the habitat requirements of each species. Table A-1 describes the categorisation for likelihood of occurrence and impact.

V = Vulnerable; E = Endangered; CE = Critically Endangered; M = Migratory (EPBC Act)

The likelihood of occurrence is based on presence of habitat, proximity of nearest records and mobility of the species (where relevant). The assessment of potential impact is based on the nature of the proposal, the ecology of the species and its likelihood of occurrence.

Table A-1 Likelihood of occurrence categorisation for assessing threatened and protected species

Likelihood of Occurrence	Reasoning	Likelihood Scale	Probability
Known	Species identified within the site during surveys.	Very High	>75%
Likely	Species known from the area (BioNet records), suitable habitat (such as refugia or foraging habitat) present within the site	High	>50% but <75%
Potential	Species may be known from the area, potential habitat is present within the site	Moderate	>25% but <50%
Unlikely	Few recent historical records, species not known from the area and/or marginal habitat present.	Low	<25%
Nil	Habitat requirements not met for this species within the site.	Nil	0%

Table A-2 Habitat evaluation with likelihood of occurrence and likelihood of impact of the project against threatened and protected species in the study area.

Scientific Name	Common Name	EPBC Act Listing	BC Act Listing	FM Act Listing	Habitat Requirements	Past Records within Locality	Likelihood of Occurrence	Likelihood of Impact
Bird								
Actitis hypoleucos	Common Sandpiper	M	-	-	Shallow, pebbly, muddy or sandy edges of rivers and streams, coastal to far inland; dams, lakes, sewage ponds; margins of tidal rivers; waterways in mangroves or saltmarsh; mudflats; rocky or sandy beaches; causeways, riverside lawns, drains, street gutters (Pizzey, 2012).	0 in development footprint, 2 in 10km buffer (ALA)	**Assessed in terrestrial report (BDAR)**	**Assessed in terrestrial report (BDAR)**
Apus pacificus	Fork-tailed Swift	M	-	-	Aerial, over open country, from semi deserts to coasts, islands, sometimes over forests or cities (Pizzey, 2012).	1 in development footprint, 41 in 10km buffer (ALA) (BioNet)	**Assessed in terrestrial report (BDAR)**	**Assessed in terrestrial report (BDAR)**
Ardenna grisea as *Puffinus griesus*	Sooty Shearwater	V	-	-	The Sooty Shearwater breeds mainly on subtropical and sub-Antarctic islands, as well as on the mainland of New Zealand. In Australian waters, the Sooty Shearwater has been recorded in areas with sea surface-temperatures of 8.7-22.0° C. (DAWE, 2020).	0 in development footprint, 5 in 10km buffer (BioNet)	**Unlikely:** Not observed during aquatic field surveys, 5 records within locality since 1980 and habitat requirements are not consistent with development footprint.	**Negligible:** Species not present on site, no impact to habitat.
Bubulcus ibis as *Ardea ibis*	Cattle Egret	M	-	-	Stock paddocks, pastures, croplands, garbage tips, wetlands, tidal mudflats, drains (Pizzey, 2012).	0 in development footprint, 81 in 10km buffer (ALA)	**Unlikely:** Not observed during aquatic field surveys, 81 records within locality since 1980 and habitat	**Assessed in terrestrial report (BDAR)**

Scientific Name	Common Name	EPBC Act Listing	BC Act Listing	FM Act Listing	Habitat Requirements	Past Records within Locality	Likelihood of Occurrence	Likelihood of Impact
							requirements are not consistent with development footprint.	
Calidris acuminata	Sharp-tailed Sandpiper	V, M	-	-	Tidal mudflats, saltmarshes, mangroves; shallow fresh, brackish or saline inland wetlands; floodwaters, irrigated pasture and crops; sewage ponds and saltfields. They may be attracted to mats of algae and water weed either floating or washed up around terrestrial wetlands, and coastal areas with much beachcast seaweed (Pizzey & Knight, 2012).	0 in development footprint, 108 in 10km buffer (BioNet)	**Assessed in terrestrial report (BDAR)**	**Assessed in terrestrial report (BDAR)**
Calidris canutus	Red Knot	V, M	-	-	Intertidal mudflats, sandflats and sandy beaches of sheltered coasts, estuaries, bays, inlets, lagoons and harbours; sometimes on sandy ocean beaches or shallow pools on exposed wave-cut rock platforms or coral reefs (Higgins & Davies, 1996).	0 in development footprint, 2 in 10km buffer (BioNet)	**Assessed in terrestrial report (BDAR)**	**Assessed in terrestrial report (BDAR)**
Calidris ferruginea	Curlew Sandpiper	CE, M	E	-	Intertidal mudflats in sheltered coastal areas; estuaries, bays, inlets, lagoons, saltmarsh (Higgins & Davies, 1996). They also occur in fresh, brackish or saline wetlands; sewage ponds (Pizzey & Knight, 2012).	0 in development footprint, 73 in 10km buffer (BioNet)	**Assessed in terrestrial report (BDAR)**	**Assessed in terrestrial report (BDAR)**

Scientific Name	Common Name	EPBC Act Listing	BC Act Listing	FM Act Listing	Habitat Requirements	Past Records within Locality	Likelihood of Occurrence	Likelihood of Impact
Calidris melanotos	Pectoral Sandpiper	M	-	-	Prefers shallow fresh waters, often with low grass or other herbage; swamp margins, flooded pastures, sewerage ponds; occasionally tidal areas, saltmarshes (Pizzey, 2012).	0 within 10km	**Assessed in terrestrial report (BDAR)**	**Assessed in terrestrial report (BDAR)**
Charadrius leschenaultii	Greater Sand Plover	V, M	V	-	Wide, sandy or shelly beaches; estuaries, sandpits, tidal mudflats, reefs, sand-clays, mangroves, saltmarsh, dune wilderness, bare paddocks; seldom far inland (Pizzey & Knight, 2012).	0 within 10km	**Assessed in terrestrial report (BDAR)**	**Assessed in terrestrial report (BDAR)**
Diomedea antipodensis	Antipodean Albatross	V	V	-	Marine, pelagic and aerial. Outside breeding season ranges extensively over south Pacific, including to south Australian waters (Pizzey & Knight, 2012).	0 within 10km	**Unlikely:** Not observed during aquatic field surveys, lack of records within locality, limited habitat suitability.	**Negligible:** Species not present on site, no impact to habitat.
Diomedea antipodensis gibsoni	Gibson's Albatross	V	V	-	Marine, pelagic and aerial. Forages in Tasman Sea and south-west Pacific Ocean; often off southern NSW coast (Pizzey & Knight, 2012).	0 in development footprint, 4 in 10km buffer (BioNet)	**Unlikely:** Not observed during aquatic field surveys, 4 records within locality since 1980, limited habitat suitability.	**Negligible:** Species not present on site, no impact to habitat.
Diomedea epomophora	Southern Royal Albatross	V	-	-	Wide, possibly circumpolar distribution when not breeding. Moderately common all months, mostly in Victoria, SE NSW and Tasmania (Pizzey & Knight, 2012).	0 in development footprint, 1 in 10km buffer (ALA)	**Unlikely:** Not observed during aquatic field surveys, 1 record within locality since 1980, very wide habitat range.	**Negligible:** Species not present on site, no impact to habitat.
Diomedea exulans	Wandering Albatross	V	E	-	Breeds at high latitudes in south Indian and south Atlantic Oceans.	0 within 10km	**Unlikely:**	**Negligible:**

Scientific Name	Common Name	EPBC Act Listing	BC Act Listing	FM Act Listing	Habitat Requirements	Past Records within Locality	Likelihood of Occurrence	Likelihood of Impact
					Regular visitor to eastern and southern Australian open ocean and slope waters, less common over shelf (Pizzey & Knight, 2012).		Not observed during aquatic field surveys, lack of records within locality, habitat requirements not met.	Species not present on site, no impact to habitat.
Diomedea sanfordi	Northern Royal Albatross	E	-	-	Breeds NZ, outside breeding period circumpolar in sub-Antarctic and subtropical seas. Regular visitor to offshore waters of southern Australia, mostly May-Sept (Pizzey & Knight, 2012).	0 within 10km	**Unlikely:** Not observed during aquatic field surveys, lack of records within locality, habitat requirements not met.	**Negligible:** Species not present on site, no impact to habitat.
Gallinago hardwickii	Latham's Snipe, Japanese Snipe	V, M	-	-	Freshwater or brackish wetlands, preferring to be close to protective vegetation cover (Pizzey & Knight, 2012). Can occur in saltmarsh, mangrove creeks, bays, beaches and tidal rivers, often during migration (Frith et al., 1977).	0 in development footprint, 15 in 10km buffer (BioNet)	**Assessed in terrestrial report (BDAR)**	**Assessed in terrestrial report (BDAR)**
Gallinago megala	Swinhoe's Snipe	M	-	-	Habitat specific to Australia includes the dense clumps of grass and rushes round the edges of fresh and brackish wetlands. This includes swamps, billabongs, river pools, small streams and sewage ponds. They are also found in drying claypans and inundated plains pitted with crab holes (Higgins & Davies, 1996).	0 within 10km	**Assessed in terrestrial report (BDAR)**	**Assessed in terrestrial report (BDAR)**
Gallinago stenura	Pin-tailed Snipe	M	-	-	Pin-tailed Snipe arrives in Australia, at Pilburra, mainly from late September to the end of March. It	0 within 10km	**Assessed in terrestrial report (BDAR)**	**Assessed in terrestrial report (BDAR)**

Scientific Name	Common Name	EPBC Act Listing	BC Act Listing	FM Act Listing	Habitat Requirements	Past Records within Locality	Likelihood of Occurrence	Likelihood of Impact
					has been recorded in south-west Western Australia in late March. Pin-tailed Snipe occurs most often in or at the edges of shallow freshwater swamps, ponds and lakes with emergent, sparse to dense cover of grass/sedge or other vegetation (Higgins & Davies, 1996).			
Haliaeetus leucogaster	White-bellied Sea-Eagle	M	E	-	Coasts, islands, estuaries, inlets, large rivers, inland lakes, reservoirs (Pizzey, 2012).	0 in development footprint, 329 in 10km buffer (ALA)	**Assessed in terrestrial report (BDAR)**	**Assessed in terrestrial report (BDAR)**
Halobaena caerulea	Blue Petrel	V	-	-	Southern oceans; South Africa, Australia and some areas in South America. Nesting on subantarctic islands (Atlas of Living Australia, 2024)	0 within 10km	**Unlikely:** Not observed during aquatic field surveys, lack of records within locality, habitat requirements not met.	**Negligible:** Species not present on site, no impact to habitat.
Hirundapus caudacutus	White-throated Needletail	V, M	-	-	Aerial over sandy beaches, mudflats, coastal cliffs, ridges and sand dunes (DCCEEW, 2024). Airspace over forests, woodlands, farmlands, plains, lakes, coasts, towns, feeding companies frequency patrol back and forward along favoured hilltops and timbered ranges (Pizzey & Knight, 2012).	0 in development footprint, 4,155 in 10km buffer (BioNet)	**Assessed in terrestrial report (BDAR)**	**Assessed in terrestrial report (BDAR)**

Scientific Name	Common Name	EPBC Act Listing	BC Act Listing	FM Act Listing	Habitat Requirements	Past Records within Locality	Likelihood of Occurrence	Likelihood of Impact
Lathamus discolor	Swift Parrot	CE	E	-	Open grassy woodland, with dead trees, near permanent water and forested hills, coastal heaths, pastures with exotic grasses, weeds, roadsides, orchards (Pizzey & Knight, 2012).	3 within development footprint, 759 within 10km buffer (ALA, BioNet)	**Assessed in terrestrial report (BDAR)**	**Assessed in terrestrial report (BDAR)**
Limosa lapponica	Bar-tailed Godwit	M	-	-	In Australia the Bar-tailed Godwit occurs mostly on coasts but undertakes regular inland passage. It utilises tidal mudflats, estuaries, sewage ponds, shallow river margins, brackish or saline inland lakes, flooded pastures and airfields (Pizzey, 2012)(DAWE, 2020).	3 in development footprint, 3,485 in 10km buffer (ALA) (BioNet)	**Assessed in terrestrial report (BDAR)**	**Assessed in terrestrial report (BDAR)**
Macronectes giganteus	Southern Giant Petrel	E	E	-	Marine, over open seas and inshore waters; favours edge of continental shelf and edge of pack-ice (Pizzey & Knight, 2012).	0 in development footprint, 1 in 10km buffer (BioNet)	**Unlikely:** Not observed during aquatic field surveys, 1 record within locality since 1980, habitat requirements not met.	**Negligible:** Species not present on site, no impact to habitat.
Macronectes halli	Northern Giant Petrel	V	V	-	Wide circumpolar range generally north of Antarctic convergence (Pizzey & Knight, 2012). Occurs on continental shelves, slopes and cold eastern boundary currents in its first 12 months (Marchant & Higgins, 1990).	0 in development footprint, 4 in 10km buffer (ALA)	**Unlikely:** Not observed during aquatic field surveys, 4 records within locality since 1980, habitat requirements not met.	**Negligible:** Species not present on site, no impact to habitat.
Monarcha melanoposis	Black-faced Monarch	M	-	-	Black-faced Monarch is found in rainforests, eucalypt woodlands, coastal scrub and damp gullies. It	0 within 10km	**Assessed in terrestrial report (BDAR)**	**Assessed in terrestrial report (BDAR)**

Scientific Name	Common Name	EPBC Act Listing	BC Act Listing	FM Act Listing	Habitat Requirements	Past Records within Locality	Likelihood of Occurrence	Likelihood of Impact
					may be found in more open woodland when migrating (DAWE, 2020).			
Myiagra cyanoleuca	Satin Flycatcher	M	-	-	Satin Flycatchers inhabit heavily vegetated gullies in eucalypt-dominated forests and taller woodlands, and on migration, occur in coastal forests, woodlands, mangroves and drier woodlands and open forests (DAWE, 2020).	0 within 10km	**Assessed in terrestrial report (BDAR)**	**Assessed in terrestrial report (BDAR)**
Neophema chrysogaster	Orange-bellied Parrot	CE	V	-	Foraging in coastal, sub-coastal and inland areas. Also occurs in semi-arid zones with grassland, shrubland and eucalypt forests within breeding range (DCCEEW, 2023).	0 within 10km	**Assessed in terrestrial report (BDAR)**	**Assessed in terrestrial report (BDAR)**
Neophema chrysostoma	Blue-winged Parrot	V	V	-	Breed on mainland Australia south of the Great Dividing Range in southern Victoria from Port Albert in Gippsland west to Nelson, and sometimes in the far south-east of South Australia, and the north-western, central and eastern parts of Tasmania (Pizzey & Knight, 2012)	0 within 10km	**Assessed in terrestrial report (BDAR)**	**Assessed in terrestrial report (BDAR)**
Numenius madagascariensis	Eastern Curlew	CE, M	-	-	Estuaries, tidal mudflats, sandspits, saltmarshes, mangroves; occasionally fresh or brackish lakes; bare grasslands near water (Pizzey & Knight, 2012).	4 in development footprint,	**Assessed in terrestrial report (BDAR)**	**Assessed in terrestrial report (BDAR)**

Scientific Name	Common Name	EPBC Act Listing	BC Act Listing	FM Act Listing	Habitat Requirements	Past Records within Locality	Likelihood of Occurrence	Likelihood of Impact
						186 in 10km buffer (ALA, BioNet)		
Numenius minutus	Little Curlew, Little Whimbrel	M	-	-	Dry grasslands, floodplains, margins of drying swamps; Tidal mudflats, airfields, playing fields, crops, commercial saltfields, sewage ponds (Pizzey, 2012).	0 within 10km	**Assessed in terrestrial report (BDAR)**	**Assessed in terrestrial report (BDAR)**
Pachyptila turtur	Fairy Prion	V	-	-	Sub-Antarctic seas and islands while breeding, wandering to tropical seas; rarely close inshore except when sheltering from storms (Pizzey, 2012).	0 in development footprint, 4 in 10km buffer (ALA)	**Unlikely:** Not observed during aquatic field surveys, 4 records within locality since 1980, habitat requirements not met.	**Negligible:** Species not present on site, no impact to habitat.
Pandion haliaetus	Osprey	M	-	-	Areas around shallow waters. They are sufficiently tolerant of human settlement, persisting in suburban and sometimes urban environments (BirdLife International, 2024).	0 in development footprint, 38 in 10km buffer (ALA)	**Assessed in terrestrial report (BDAR)**	**Assessed in terrestrial report (BDAR)**
Phoebetria fusca	Sooty Albatross	V	V	-	Breeds sub-Antarctic islands in south Atlantic and south Indian Oceans, dispersing mainly between 60°S and 30°S, with eastern extension to Australian offshore waters, most common in Bass Strait and south of Tasmania (Pizzey & Knight, 2012).	0 within 10km	**Unlikely:** Not observed during aquatic field surveys, lack of records within locality, habitat requirements not met.	**Negligible:** Species not present on site, no impact to habitat.
Pterodoma cervicalis	White-necked Petrel	Marine	-	-	Has a very small range, on two or three very small islands. During the non-breeding season, it occurs	0 within 10km	**Unlikely:** Not observed during aquatic field surveys,	**Negligible:** Species not present on site,

Scientific Name	Common Name	EPBC Act Listing	BC Act Listing	FM Act Listing	Habitat Requirements	Past Records within Locality	Likelihood of Occurrence	Likelihood of Impact
					throughout a large part of the Pacific, but it is only known to breed on Macauley Island in New Zealand's Kermadec Islands and the Australian territory of Norfolk Island and Phillip Island (BirdLife International, 2024).		lack of records within locality, habitat requirements not met.	no impact to habitat.
Rhipidura rufifrons	Rufous Fantail	M	-	-	Occurs in coastal and near coastal districts of northern and eastern Australia. In east and south-east Australia mainly inhabits wet sclerophyll forests, often in gullies with a dense shrubby understorey and often including ferns. They are recorded in a variety of other habitats while on passage (DAWE, 2020).	0 within 10km	**Assessed in terrestrial report (BDAR)**	**Assessed in terrestrial report (BDAR)**
Rostratula australis	Australian Painted Snipe	E	E	-	Well-vegetated shallows and margins of wetlands, dams, sewage ponds; wet pastures, marshy areas, irrigation systems, lignum, tea-tree scrub, open timber (Pizzey & Knight, 2012).	0 within 10km	**Assessed in terrestrial report (BDAR)**	**Assessed in terrestrial report (BDAR)**
Stercorarius antarcticus as *Catharacta skua*	Brown Skua	Marine	-	-	Breeds in the subantarctic and Antarctic zones and moves further north when not breeding, occurring far offshore (eBird, 2024).	0 in development footprint, 5 in 10km buffer (ALA)	**Unlikely:** Not observed during aquatic field surveys, 5 records within locality since 1980, habitat requirements not met.	**Negligible:** Species not present on site, no impact to habitat.
Sterna striata	White-fronted Tern	Marine	-	-	Offshore waters; bays, reefs, islands (Pizzey, 2012).	0 in development	**Unlikely:**	**Negligible:**

Scientific Name	Common Name	EPBC Act Listing	BC Act Listing	FM Act Listing	Habitat Requirements	Past Records within Locality	Likelihood of Occurrence	Likelihood of Impact
						footprint, 25 in 10km buffer (ALA)	Not observed during aquatic field surveys, 25 records within locality since 1980, limited habitat.	Species not present on site, no impact to habitat.
Sternula albifrons as *Sterna albifrons*	Little Tern	Marine	E	-	Coastal waters, bays, inlets, saline or brackish lakes, saltfields, sewerage ponds near coast. Breeds Sept-Jan in single pairs to large colonies on beaches, islands, rock platforms from north of Broome to eastern Victoria/NSW border; much lesser numbers in south (Pizzey, 2012).	0 in development footprint, 413 in 10km buffer (ALA)	**Unlikely:** Not observed during aquatic field surveys, 413 records within locality since 1980, habitat in buffer only.	**Negligible:** Species not present on site, no impact to habitat.
Symposiachrus trivirgatus as *Monarcha trivirgatus*	Spectacled Monarch	M	-	-	Thick understorey in rainforests, wet gullies and waterside vegetation, as well as mangroves (Pizzey & Knight, 2012).	0 within 10km	**Assessed in terrestrial report (BDAR)**	**Assessed in terrestrial report (BDAR)**
Thalassarche bulleri	Buller's Albatross, Pacific Albatross	V	-	-	Buller's Albatross are marine and pelagic, inhabiting subtropical and subantarctic waters of the southern Pacific Ocean (DAWE, 2020).	0 in development footprint, 2 in 10km buffer (ALA)	**Unlikely:** Not observed during aquatic field surveys, 2 records within locality since 1980, habitat requirements not met.	**Negligible:** Species not present on site, no impact to habitat.
Thalassarche bulleri platei	Northern Buller's Albatross	V	-	-	The Pacific Albatross is a marine, pelagic species. It occurs in subtropical and subantarctic waters of the South Pacific Ocean (DAWE, 2020).	0 within 10km	**Unlikely:** Not observed during aquatic field surveys, lack of records within locality, habitat requirements not met.	**Negligible:** Species not present on site, no impact to habitat.

Scientific Name	Common Name	EPBC Act Listing	BC Act Listing	FM Act Listing	Habitat Requirements	Past Records within Locality	Likelihood of Occurrence	Likelihood of Impact
Thalassarche carteri	Indian Yellow-nosed Albatross	V	-	-	In the Australasian region, occupies inshore and offshore waters, particularly where there are calm seas and light winds (DAWE, 2020).	0 in development footprint, 1 in 10km buffer (ALA)	**Unlikely:** Not observed during aquatic field surveys, 1 record within locality since 1980, habitat requirements not met.	**Negligible:** Species not present on site, no impact to habitat.
Thalassarche cauta	Shy Albatross	E	E	-	The only Albatross with Australian breeding stations: on Albatross Rock, Bass Strait. Common all months (but mostly winter) on coasts of Vic, Tas, NSW and SA; uncommon in S.E. Qld and WA to Carnarvon (Pizzey & Knight, 2012).	0 in development footprint, 6 in 10km buffer (BioNet)	**Unlikely:** Not observed during aquatic field surveys, 6 records within locality since 1980, habitat requirements not met.	**Negligible:** Species not present on site, no impact to habitat.
Thalassarche eremita	Chatham Albatross	E	-	-	Less pelagic than many albatrosses, frequently occurring over continental shelf and even close inshore. Breeds on slopes, cliffs and ledges (Pizzey & Knight, 2012.	0 within 10km	**Unlikely:** Not observed during aquatic field surveys, lack of records within locality, habitat requirements not met.	**Negligible:** Species not present on site, no impact to habitat.
Thalassarche impavida	Campbell Albatross, Campbell Black-browed Albatross	V	-	-	Inhabits sub-Antarctic and subtropical waters. The Campbell Albatross breed on Campbell Island (Marchant & Higgins 1990). They make their nests on tussock-covered ledges and terraces of cliffs, slopes and hills, overlooking the sea or valleys, and on the summits of rocky islets (DAWE, 2020).	0 within 10km	**Unlikely:** Not observed during aquatic field surveys, lack of records within locality, habitat requirements not met.	**Negligible:** Species not present on site, no impact to habitat.
Thalassarche melanophris	Black-browed Albatross	V	V	-	Inhabits Antarctic, subantarctic and temperate waters - visits offshore	0 in development	**Unlikely:**	**Negligible:**

Scientific Name	Common Name	EPBC Act Listing	BC Act Listing	FM Act Listing	Habitat Requirements	Past Records within Locality	Likelihood of Occurrence	Likelihood of Impact
					southeast Australia in winter. Circumpolar breeding on many sub-Antarctic islands, including Macquarie and Heard Island. Ranges north to coasts of all southern continents (Pizzey & Knight, 2012).	footprint, 1 in 10km buffer (BioNet)	Not observed during aquatic field surveys, 1 record within locality since 1980, limited habitat.	Species not present on site, no impact to habitat.
Thalassarche salvini	Salvin's Albatross	V	-	-	During the non-breeding season, the species occurs over continental shelves around continents. It occurs both inshore and offshore and enters harbours and bays. Salvin's Albatross is scarce in pelagic waters. Salvin's Albatross nests on level or gently sloping ledges, summits, slopes and caves of rocky islets and stacks, usually in broken terrain with little soil and vegetation (DAWE, 2020).	0 within 10km	**Unlikely:** Not observed during aquatic field surveys, lack of records within locality, habitat requirements not met.	**Negligible:** Species not present on site, no impact to habitat.
Thalassarche steadi	White-capped Albatross	V	-	-	Subantarctic and subtropical waters, thought to be common off the coast of south-east Australia throughout the year. The species has been noted in shelf-waters around breeding islands and over adjacent rises. Breeding colonies occur on islands south of New Zealand and are known to nest on slopes vegetated with tussock and succulents on Auckland Island. During the non-breeding season, birds have been observed over continental shelves around	0 within 10km	**Unlikely:** Not observed during aquatic field surveys, lack of records within locality, habitat requirements not met.	**Negligible:** Species not present on site, no impact to habitat.

Scientific Name	Common Name	EPBC Act Listing	BC Act Listing	FM Act Listing	Habitat Requirements	Past Records within Locality	Likelihood of Occurrence	Likelihood of Impact
					continents. The species occurs both inshore and offshore and enters harbours and bays. The species is scarce in pelagic waters. Birds gather to scavenge at commercial fishing grounds (Pizzey & Knight, 2012; DAWE, 2020).			
Thinornis cucullatus as *Thinornis rubricollis*	Hooded Plover, Hooded Dotterel	Marine	-	-	Broad sandy ocean (and occasionally bay) beaches, with plentiful seaweed and jetsam; adjacent dune wilderness; weedy rock shelves and reefs, occasionally tidal flats (Pizzey, 2012).	0 in development footprint, 114 in 10km buffer (ALA)	**Unlikely:** Not observed during aquatic field surveys, 114 records within locality since 1980, habitat in buffer only.	**Negligible:** Species not present on site, no impact to habitat.
Thinornis cucullatus cucullatus	Eastern Hooded Plover	V	CE	-	Wide beaches backed by sand dunes and large volumes of seaweed and debris. Nesting above the high-water mark on flat beaches, on stony terraces or sparsely vegetated sand dunes (DCCEEW, 2024).	0 in development footprint, 159 in 10km buffer (BioNet)	**Assessed in terrestrial report (BDAR)**	**Assessed in terrestrial report (BDAR)**
Tringa nebularia	Common Greenshank	E, M	-	-	Mudflats, estuaries, saltmarshes, margins of lakes; wetlands, claypans, fresh and saline; commercial saltfields and sewage ponds (Pizzey & Knight, 2012).	0 in development footprint, 21 in 10km buffer (BioNet)	**Assessed in terrestrial report (BDAR)**	**Assessed in terrestrial report (BDAR)**
Fish								
Epinephelus daemelii	Black Cod	V	V	Protected	Caves, gutters and crevices usually to depths of 50 m, although individuals have been collected	0 within 10km	**Unlikely:** Not observed during aquatic field surveys,	**Low:** Species not present on site,

Scientific Name	Common Name	EPBC Act Listing	BC Act Listing	FM Act Listing	Habitat Requirements	Past Records within Locality	Likelihood of Occurrence	Likelihood of Impact
					from below 100 m. Juveniles are found inshore, often in coastal rockpools and estuaries (Bray, 2020).		lack of records within locality and habitat requirements not met.	no impact to habitat.
Heraldia nocturna	Upside-down Pipefish, Eastern Upside-down Pipefish	Marine	-	Protected	Sheltered inshore reefs in harbours, bays and coves; beneath ledges, in holes, crevices and small caves. Depths of 2-30m (Bray & Thompson, 2017).	0 within 10km	**Unlikely:** Not observed during aquatic field surveys, lack of records within locality and habitat requirements not met.	**Negligible:** Species not present on site, no impact to habitat.
Hippocampus abdominalis	Big-belly Seahorse, Eastern Potbelly Seahorse	Marine	-	Protected	Temperate waters; intertidal rockpools, low rocky reefs in shallow estuaries, deep tidal channels and deeper reefs. Cling to seagrasses, sponges and macroalgae (Bray & Thompson, 2018).	0 in development footprint, 21 in 10km buffer (ALA)	**Unlikely:** Not observed during aquatic field surveys, 21 sightings within 10km since 1980 and limited habitat present.	**Low:** Species not present on site, residual impact to habitat minimal.
Hippocampus breviceps	Short-head Seahorse, Short-snouted Seahorse	Marine	-	Protected	Shallow seagrass beds and macroalgae (Cystophora and Sargassum sp.) in bays, estuaries and on sheltered coastal reefs (Bray, 2021).	0 within 10km	**Unlikely:** Not observed during aquatic field surveys, lack of records within locality and limited habitat presence due to patchy seagrass and macroalgae distribution.	**Low:** Species not present on site, residual impact to habitat minimal.
Hippocampus minotaur	Bullneck Seahorse	Marine	-	Protected	Inhabits hard bottom substrates with fine sand on the continental shelf at 64-110m (Bray & Thompson, N.D.).	0 within 10km	**Unlikely:** Not observed during aquatic field surveys, lack of records within locality and habitat requirements not met.	**Negligible:** Species not present on site, no impact to habitat.

Scientific Name	Common Name	EPBC Act Listing	BC Act Listing	FM Act Listing	Habitat Requirements	Past Records within Locality	Likelihood of Occurrence	Likelihood of Impact
Histiogamephelus brigsii	Crested Pipefish, Briggs' Crested Pipefish	Marine	-	Protected	Inhabits inshore sandy areas, singly or in small aggregations, often amongst detached seaweed or along the margins of Posidonia and Zostera seagrass beds, at depths to 30m (Bray & Thompson, 2021).	0 within 10km	**Unlikely:** Not observed during aquatic field surveys, lack of records within locality and limited habitat presence across study area.	**Low:** Species not present on site, residual impact to habitat minimal.
Histiogamephelus cristatus	Rhino Pipefish, Ring-back Pipefish	Marine	-	Protected	Inhabits seagrass beds and adjacent open sandy and rubble areas with patches of seagrass and detritus in estuaries and shallow protected waters, at depths of 1-17m (Bray & Thompson, 2020).	0 within 10km	**Unlikely:** Not observed during aquatic field surveys, lack of records within locality and limited habitat presence in study area.	**Low:** Species not present on site, residual impact to habitat minimal.
Hypeselognathus rostratus	Knife-snouted Pipefish	Marine	-	Protected	Inhabits seagrass beds and adjacent sand flats in coastal bays and estuaries to depths of about 15m. Large adults often occur amongst Posidonia. Juveniles often shelter in Zostera beds and may also be found amongst floating algae and seagrass leaves. (Bray & Thompson, 2018).	0 within 10km	**Unlikely:** Not observed during aquatic field surveys, lack of records within locality and low occupancy of suitable habitat.	**Low:** Species not present on site, residual impact to habitat minimal and during construction.
Kaupus costatus	Deep-bodied Pipefish	Marine	-	Protected	Inhabits sheltered intertidal and shallow areas with algal and seagrass beds, and mangroves, at depths to 10m. The species is most common among the seagrass Zostera (Bray & Thompson, 2021).	0 within 10km	**Unlikely:** Not observed during aquatic field surveys, lack of records within locality and limited habitat presence due to patchy distribution.	**Low:** Species not present on site, residual impact to habitat minimal.

Scientific Name	Common Name	EPBC Act Listing	BC Act Listing	FM Act Listing	Habitat Requirements	Past Records within Locality	Likelihood of Occurrence	Likelihood of Impact
Kimblaeus bassensis	Trawl Pipefish, Bass Strait Pipefish	Marine	-	Protected	Inhabits rubble and shelly substrates on the continental shelf of southern Australia at 10-204m (Thompson & Bray, N.D.).	0 within 10km	**Unlikely:** Not observed during aquatic field surveys, lack of records within locality and habitat requirements not met in study area.	**Negligible:** Species not present on site, no impact to habitat.
Leptoichthys fistulatius	Brushtail Pipefish	Marine	-	Protected	Inhabits inshore sheltered seagrass beds, mainly Zostera, but also Posidonia beds in temperate waters (Bray & Thompson, 2018).	0 within 10km	**Unlikely:** Not observed during aquatic field surveys and limited habitat presence due to patchy seagrass distribution.	**Low:** Species not present on site, residual impact to habitat minimal.
Lissocampus runa	Javelin Pipefish	Marine	-	Protected	Inhabits bay and estuaries, including tidepools, often sheltering amongst seagrass (usually Zostera spp.), in algal beds, and on rubble areas near reefs, at depths to about 20m (Bray & Thompson, 2020).	0 within 10km	**Unlikely:** Not observed during aquatic field surveys, lack of records within locality and limited habitat presence due to patchy seagrass distribution.	**Low:** Species not present on site, residual impact to habitat minimal.
Maroubra perserrata	Sawtooth Pipefish	Marine	-	Protected	Inhabits coastal reefs at depths of 3-25m, sheltering beneath ledges and in caves during day (Bray & Thompson, N.D.).	0 within 10km	**Unlikely:** Not observed during aquatic field surveys, lack of records within locality and habitat requirements not met in study area.	**Low:** Species not present on site, no impact to habitat.
Mitotichthys semistriatus	Halfbanded Pipefish	Marine	-	Protected	Shallow seagrass and eelgrass beds in less than 10 m, preferring tall seagrasses in very protected	0 within 10km	**Unlikely:** Not observed during aquatic field surveys	**Low:** Species not present on site,

Scientific Name	Common Name	EPBC Act Listing	BC Act Listing	FM Act Listing	Habitat Requirements	Past Records within Locality	Likelihood of Occurrence	Likelihood of Impact
					areas, usually just below the intertidal zone. Aggregation in groups (Bray & Thompson, 2021).		and limited habitat on site.	residual impact to habitat minimal.
Mitotichthys tuckeri	Tucker's Pipefish	Marine	-	Protected	Kelp beds and floating Sargassum along the open coast at 9–18m. Occasionally washed ashore during storms (Bray & Thompson, N.D.).	0 within 10km	**Unlikely:** Not observed during aquatic field surveys, lack of records within locality and limited habitat present.	**Low:** Species not present on site, no impact to habitat.
Notiocampus ruber	Red Pipefish	Marine	-	Protected	Rocky reefs, often in crevices, in association with sponges and encrusting and filamentous red algae at depths to 20m (Bray & Thompson, 2020).	0 within 10km	**Unlikely:** Not observed during aquatic field surveys, lack of records within locality and habitat requirements not met in study area.	**Low:** Species not present on site, no impact to habitat.
Phyllopteryx taeniolatus	Common Seadragon, Weedy Seadragon	Marine	-	Protected	Shallow estuaries to deeper offshore reefs, living seagrass beds and on rocky reefs covered in macroalgae, especially kelp beds, in depths of 1-50m. Individuals usually remain within a broad home range (Bray, 2024).	0 in development footprint, 1 in 10km buffer (ALA)	**Unlikely:** Not observed during aquatic field surveys, one record within locality since 1980 and partially met habitat requirements.	**Low:** Species not present on site residual impact to habitat minimal.
Prototroctes maraena	Australian Grayling	V	E	Protected	Diadromous, migrating between rivers and coastal waters during its life cycle. Adults prefer moderate to fast-flowing water in rivers and streams, usually in cool clear waters below altitudes of 200m, although they have been recorded above 1000m in Victoria. They	0 in development footprint, 1 in 10km buffer (ALA)	**Unlikely:** Not observed during aquatic field surveys, one record within locality since 1980 and habitat requirements not met in study area.	**Low:** Species not present on site, no impact to habitat.

Scientific Name	Common Name	EPBC Act Listing	BC Act Listing	FM Act Listing	Habitat Requirements	Past Records within Locality	Likelihood of Occurrence	Likelihood of Impact
					often occur in pools with gravelly substrates, and may form large schools, especially before spawning (Gomon & Bray, 2020).			
Seriolella brama	Blue Warehou	CD	-	Protected	Mostly occur in offshore waters, although juveniles may be found in bays, estuaries and coastal waters. Juveniles (to about 35cm in length) form large schools inshore to feed on plankton near the surface, although they also occur offshore to a depth of 100m. They are often seen in association with jellyfish. Adults usually aggregate near the seafloor in deeper offshore waters, possibly moving into the water column to feed at night, and are commonly found above 200m (Bray, 2021).	0 in development footprint, 2 in 10km buffer (ALA)	**Unlikely:** Not observed during aquatic field surveys, two records within locality since 1980 and limited habitat on site for juveniles.	**Low:** Species not present on site, no impact to habitat.
Solegnathus robustus	Robust Pipehorse, Robust Spiny Pipehorse	Marine	-	Protected	Endemic to temperate waters of South Australia, with a limited distribution from Port Weyland, Spencer Gulf westwards to Flinders Island, in 30-68m. Specimens have occasionally been washed ashore after storms (Bray, N.D.).	0 within 10km	**Unlikely:** Not observed during aquatic field surveys, lack of records within locality and very limited habitat presence.	**Negligible:** Species not present on site, no impact to habitat.
Solegnathus spiniosissimus	Spiny Pipehorse, Australian Spiny Pipehorse	Marine	-	Protected	Muddy, silty, shelly and rubble substrates, and rocky reefs, and may be washed ashore during storms. In the southern part of their range, Spiny pipehorses are found	0 in development footprint, 1 in 10km buffer (ALA)	**Unlikely:** Not observed during aquatic field surveys, one record within locality since 1980 and	**Low:** Species not present on site, residual impact to habitat minimal.

Scientific Name	Common Name	EPBC Act Listing	BC Act Listing	FM Act Listing	Habitat Requirements	Past Records within Locality	Likelihood of Occurrence	Likelihood of Impact
					in relatively shallow waters (Bray, 2022).		limited habitat presence.	
Stigmatopora argus	Spotted Pipefish, Gulf Pipefish, Peacock Pipefish	Marine	-	Protected	Seagrass beds in inshore bays and estuaries, to depths of at least 8m. Individuals are occasionally found among floating Sargassum sp. (Bray, 2021).	0 in development footprint, 14 in 10km buffer (ALA)	**Unlikely:** Not observed during aquatic field surveys, 14 records within locality since 1980 and limited habitat presence due to patchy Sargassum and seagrass distribution.	**Low:** Species not present on site, residual impact to habitat minimal.
Stigmatopora nigra	Wide-bodied Pipefish, Black Pipefish	Marine	-	Protected	Commonly inhabits sheltered seagrass and algal beds from the intertidal to depths of 35m (Bray, 2024).	0 in development footprint, 9 in 10km buffer (ALA)	**Unlikely:** Not observed during aquatic field surveys, 9 records within locality since 1980 and limited habitat presence due to patchy seagrass distribution.	**Low:** Species not present on site, residual impact to habitat minimal.
Stipecampus cristatus	Ring-backed Pipefish	Marine	-	Protected	Prefers sheltered reef and rubble areas, living in sparse algal and seagrass habitats (Amphibolis and Posidonia), often near channels in large estuaries and bays in 3-12m (Bray, N.D.).	0 within 10km	**Unlikely:** Not observed during aquatic field surveys, lack of records within locality and lack of preferred habitat.	**Low:** Species not present on site, potential residual impact to habitat minimal.
Syngnathoides biaculeatus	Double-ended Pipehorse, Alligator Pipefish	Marine	-	Protected	Shallow, protected waters of bays, lagoons and estuaries including mangrove areas, in association with seagrass beds and macroalgae in depths at 0-10m. Juveniles sometimes found clinging to floating algae and plant debris	0 within 10km	**Unlikely:** Not observed during aquatic field surveys, lack of records within locality and limited habitat presence due to patchy distribution.	**Low:** Species not present on site, residual impact to habitat minimal.

Scientific Name	Common Name	EPBC Act Listing	BC Act Listing	FM Act Listing	Habitat Requirements	Past Records within Locality	Likelihood of Occurrence	Likelihood of Impact
					including Sargassum rafts (Bray & Thompson, N.D.).			
Thunnus maccoyii	Southern Bluefin Tuna	CD	E	Protected	Circumglobal in temperate and cold temperate waters of the southern hemisphere, ranging across the Pacific, Indian, Southern and south-eastern Atlantic oceans, mostly between 30°S and 50°S, to almost 60°S (rare in the Eastern Pacific) (Bray & Gomon, 2024).	0 within 10km	**Unlikely:** Not observed during aquatic field surveys, lack of records within locality and habitat requirements not suitable within study area.	**Low:** Species not present on site, no impact to habitat.
Urocampus carinirostris	Hairy Pipefish	Marine	-	Protected	Lower reaches of rivers, sheltered estuaries and shallow reefs in seagrass and algal beds at 0-6m (Bray, 2023).	0 in development footprint, 10 in 10km buffer (ALA)	**Unlikely:** Not observed during aquatic field surveys, 10 records within locality since 1980 and limited habitat presence.	**Low:** Species not present on site, residual impact to habitat minimal.
Vanacampus margaritifer	Mother-of-pearl Pipefish	Marine	-	Protected	Shallow estuarine and coastal waters in seagrass beds (including Heterozostera, Zostera, Posidonia and Halophila), macroalgae (Ecklonia and other brown algae), rocky reef, boulder, rubble, sandy and muddy habitats between 2–15m (Bray & Thompson, 2017).	0 in development footprint, 3 in 10km buffer (ALA)	**Unlikely:** Not observed during aquatic field surveys, 3 records within locality since 1980 and limited habitat presence.	**Low:** Species not present on site, residual impact to habitat minimal.
Vanacampus phillipi	Port Philip Pipefish	Marine	-	Protected	Commonly inhabits seagrass beds (including Halophila, Heterozostera, Posidonia, Ruppia and Zostera) and macroalgae in shallow estuaries, coastal lagoons, and protected bays at depths to 25m (Bray & Thompson, 2021).	0 in development footprint, 5 in 10km buffer (ALA)	**Unlikely:** Not observed during aquatic field surveys, 5 records within locality since 1980 and limited habitat presence.	**Low:** Species not present on site, residual impact to habitat minimal.

Scientific Name	Common Name	EPBC Act Listing	BC Act Listing	FM Act Listing	Habitat Requirements	Past Records within Locality	Likelihood of Occurrence	Likelihood of Impact
Vanacampus poecilolaemus	Long-snouted Pipefish, Australian Long-snouted Pipefish	Marine	-	Protected	Inhabits shallow seagrass and macroalgal beds in estuaries and other quiet, silty, clear-water areas to about 18m (Bray & Thompson, 2018).	0 within 10km	**Unlikely:** Not observed during aquatic field surveys, lack of records within locality and limited habitat presence due to patchy distribution of seagrass and macroalgae.	**Low:** Species not present on site, residual impact to habitat minimal.
Frog								
Heleioporus australiacus	Giant Burrowing Frog	V	V	-	Sandy soil, sandstone ridges, semi-permanent to ephemeral sand or rock-based streams (DCCEEW, 2024).	0 in development footprint, 2 in 10km buffer (ALA)	**Assessed in terrestrial report (BDAR)**	**Assessed in terrestrial report (BDAR)**
Litoria aurea	Green and Golden Bell Frog	V	E	-	Disturbed habitat, breeding in large ephemeral ponds. Various habitats for stages of life (DCCEEW, 2024).	0 in development footprint, 7 in 10km buffer (ALA)	**Assessed in terrestrial report (BDAR)**	**Assessed in terrestrial report (BDAR)**
Litoria raniformis	Southern Bell Frog	V	E	-	Emergent vegetation in still or slow-flowing water bodies such as lagoons, swamps, lakes, ponds and farm dams (DCCEEW, 2024).	0 within 10km	**Assessed in terrestrial report (BDAR)**	**Assessed in terrestrial report (BDAR)**
Litoria watsoni	Southern Heath Frog, Watson's Tree Frog	E	E	-	Moist sites such as tall moist forest. Presence of pools that contain water long enough for tadpoles to metamorphose. Forests, woodlands, bushland and heathland (ALA, 2024).	0 in development footprint, 1 in 10km buffer (ALA)	**Assessed in terrestrial report (BDAR)**	**Assessed in terrestrial report (BDAR)**

Scientific Name	Common Name	EPBC Act Listing	BC Act Listing	FM Act Listing	Habitat Requirements	Past Records within Locality	Likelihood of Occurrence	Likelihood of Impact
Mixophyes balbus	Stuttering Frog	V	E	-	Permanent streams through temperate and sub-tropical rainforest, and wet sclerophyll forest (DCCEEW, 2024).	0 within 10km	**Assessed in terrestrial report (BDAR)**	**Assessed in terrestrial report (BDAR)**
Mammal								
Arctocephalus forsteri	Long-nose Fur-seal	Marine	V	Protected	Rocky coastlines and offshore islands. Preference of beaches with large rocks, smooth rock ledges and reefs close to shore (Landgren, 2013).	0 in development footprint, 2 in 10km buffer (BioNet)	**Unlikely:** Not observed during aquatic field surveys, 2 records within locality since 1980 and habitat requirements not met in study area.	**Negligible:** Species not present on site, no impact to habitat.
Arctocephalus pusillus	Australian Fur-seal	Marine	-	Protected	Rocky parts of islands. Forages areas of the continental shelf (DCCEEW, 2024).	0 in development footprint, 7 in 10km buffer (BioNet)	**Unlikely:** Not observed during aquatic field surveys, 7 records within locality since 1980 and habitat requirements not met in study area.	**Negligible:** Species not present on site, no impact to habitat.
Balaenoptera acutorostrata	Minke Whale	Marine	-	Protected	Rarely venturing more than 169km from the coast but swim far into polar ice fields. Commonly enter estuaries, bays, fjords and lagoons (Fahey, 1999).	0 within 10km	**Unlikely:** Not observed during aquatic field surveys, lack of records within locality and very limited habitat suitability.	**Negligible:** Species not present on site, no impact to habitat.
Balaenoptera borealis	Sei Whale	V	-	Protected	Temperate, cool waters including Australian Antarctic waters for feeding. Migration to tropical and subtropical waters for breeding (DCCEEW, 2024) (Horwood, 1987).	0 within 10km	**Unlikely:** Not observed during aquatic field surveys, lack of records within	**Negligible:** Species not present on site, no impact to habitat.

Scientific Name	Common Name	EPBC Act Listing	BC Act Listing	FM Act Listing	Habitat Requirements	Past Records within Locality	Likelihood of Occurrence	Likelihood of Impact
							locality and very limited habitat suitability.	
Balaenoptera edeni	Bryde's Whale	Marine	-	Protected	In waters between 40° S and 40° N, primarily in temperatures exceeding 16.3 °C (Kato, 2002).	0 in development footprint, 2 in 10km buffer (ALA)	**Unlikely:** Not observed during aquatic field surveys, 2 records within locality since 1980 and habitat requirements not met in study area.	**Negligible:** Species not present on site, no impact to habitat.
Balaenoptera musculus	Blue Whale	E	E	Protected	Variable between subspecies in Australian waters. Migration patterns across the east and west coast (DCCEEW, 2024).	0 in development footprint, 1 in 10km buffer (ALA)	**Unlikely:** Not observed during aquatic field surveys, one record within locality since 1980 and habitat requirements are not met.	**Negligible:** Species not present on site, no impact to habitat.
Balaenoptera phylus	Fin Whale	V	-	Protected	Temperate waters, Arctic and Southern Oceans. Australian Antarctic waters for feeding. Deep ravines with high fish concentration in Southern Ocean (DCCEEW, 2024).	0 within 10km	**Unlikely:** Not observed during aquatic field surveys, lack of records within locality and unsuitable habitat requirements in study area.	**Negligible:** Species not present on site, no impact to habitat.
Caperea marginata	Pygmy Right Whale	Marine	-	Protected	Areas associated with upwellings and high zooplankton abundance (DCCEEW, 2024).	0 in development footprint, 1 in 10km buffer (ALA)	**Unlikely:** Not observed during aquatic field surveys, one record within locality since 1980 and habitat requirements not met within study area.	**Negligible:** Species not present on site, no impact to habitat.

Scientific Name	Common Name	EPBC Act Listing	BC Act Listing	FM Act Listing	Habitat Requirements	Past Records within Locality	Likelihood of Occurrence	Likelihood of Impact
Eubalaena australis	Southern Right Whale	E	-	Protected	Found in deep offshore waters, usually in areas with high productivity. For breeding, they prefer near-shore, shallow depths in Australian waters (DCCEEW, 2024)(Pirzl, 2008).	0 in development footprint, 10 in 10km buffer (BioNet)	**Unlikely:** Not observed during aquatic field surveys, 10 records within locality since 1980 and habitat requirements not met within study area.	**Negligible:** Species not present on site, no impact to habitat.
Grampus griseus	Risso's Dolphin, Grampus	Marine	-	Protected	Warm temperate to tropical waters, ranging between 15–30 °C (DCCEEW, 2024).	0 in development footprint, 2 in 10km buffer (ALA)	**Unlikely:** Not observed during aquatic field surveys, 2 records within locality since 1980 and limited habitat presence.	**Negligible:** Species not present on site, no impact to habitat.
Lagenorhynchus obscurus	Dusky Dolphin	Marine	-	Protected	All records in Australian waters have been in warm sea surface temperatures, likely due to increased prey numbers, yet they mostly occur in temperate and sub-Antarctic waters (Gill et al., 2000).	0 within 10km	**Unlikely:** Not observed during aquatic field surveys, lack of records within locality and unsuitable habitat in study area.	**Negligible:** Species not present on site, no impact to habitat.
Megaptera novaeangliae	Humpback Whale	Marine	-	Protected	East coast population migrates close to Australian coast for breeding, but further offshore for northern migration (DCCEEW, 2024).	0 in development footprint, 73 in 10km buffer (ALA)	**Unlikely:** Not observed during aquatic field surveys, 73 records within locality since 1980 and habitat requirements not suitable in study area.	**Negligible:** Species not present on site, no impact to habitat.
Orcinus orca	Killer Whale, Orca	Marine	-	Protected	In Australia, they occur along continental slope, near seal colonies (DCCEEW, 2024).	0 in development footprint, 6 in 10km buffer (ALA)	**Unlikely:** Not observed during aquatic field surveys, 6 records within locality since 1980 and habitat	**Negligible:** Species not present on site, no impact to habitat.

Scientific Name	Common Name	EPBC Act Listing	BC Act Listing	FM Act Listing	Habitat Requirements	Past Records within Locality	Likelihood of Occurrence	Likelihood of Impact
							requirements not met in study area.	
Tursiops aduncus	Indian Ocean Bottlenose Dolphin	Marine	-	Protected	Inshore areas (bays and estuaries), nearshore, open coast, shallow offshore waters (DCCEEW, 2024).	0 in development footprint, 11 in 10km buffer (ALA)	**Unlikely:** Not observed during aquatic field surveys, 11 records within locality since 1980 and partially met habitat requirements.	**Low:** Species not present on site, barge presence/movements during construction.
Tursiops truncatus s. str.	Bottlenose Dolphin	Marine	-	Protected	Offshore waters in Australia, in tropical and temperate zones. Often associated with several other cetaceans (DCCEEW, 2024).	0 in development footprint, 6 in 10km buffer (ALA)	**Unlikely:** Not observed during aquatic field surveys, 6 records within locality since 1980 and habitat requirements not met in study area.	**Negligible:** Species not present on site, no impact to habitat.
Reptile								
Caretta caretta	Loggerhead Turtle	E	-	Protected	In Australia, Loggerhead Turtles nest on open, sandy beaches. Hatchling to subadult loggerheads occur in the open ocean foraging on planktonic organisms (DCCEEW, 2024).	0 in development footprint, 4 in 10km buffer (ALA)	**Unlikely:** Not observed during aquatic field surveys, 4 records within locality since 1980 and habitat requirements not met in study area.	**Negligible:** Species not present on site, no impact to habitat.
Chelonia mydas	Green Turtle	V	V	Protected	First five to ten years drifting on ocean currents. During this pelagic phase, they are often found in association with drift lines and rafts of Sargassum. Nest, forage and	0 in development footprint, 1 in 10km buffer (BioNet)	**Unlikely:** Not observed during aquatic field surveys, 1 record within locality since 1980 and habitat	**Negligible:** Species not present on site, no impact to habitat.

Scientific Name	Common Name	EPBC Act Listing	BC Act Listing	FM Act Listing	Habitat Requirements	Past Records within Locality	Likelihood of Occurrence	Likelihood of Impact
					migrate across tropical northern Australia (DCCEW, 2024).		requirements not met within study area.	
Dermochelys coriacea	Leatherback Turtle, Leathery Turtle	E	E	Protected	Found in larger bays, rivers and estuaries. (DCCEEW, 2024).	0 within 10km	**Unlikely:** Not observed during aquatic field surveys, lack of records within locality and limited habitat presence.	**Low:** Species not present on site, residual impact to habitat minimal.
Eretmochelys imbricata	Hawksbill Turtle	V	-	Protected	A major part of nesting for the Hawksbill Turtle in Australia occurs at Varanus Island and Rosemary Island in Western Australia, and the northern part of the Great Barrier Reef and Torres Strait in Queensland. There are no known key nesting sites in NSW (DCCEEW, 2024).	0 in development footprint, 2 in 10km buffer (BioNet)	**Unlikely:** Not observed during aquatic field surveys, 2 records within locality since 1980 and limited habitat suitability.	**Negligible:** Species not present on site, no impact to habitat.
Natator depressus	Flatback Turtle	V	-	Protected	The Flatback Turtle does not possess a global distribution and is only found in the tropical waters of northern Australia, Papua New Guinea and Irian Jaya. Species nesting is confined to Australia where four genetic stocks are recognised (DCCEEW, 2024).	0 within 10km	**Unlikely:** Not observed during aquatic field surveys, lack of records within locality and habitat requirements not met in study area.	**Negligible:** Species not present on site, no impact to habitat.
Shark								
Carcharias tauras (east coast pop.)	Grey Nurse Shark (east coast pop.)	CE	CE	CE	Warm temperate inshore waters; rocky reefs and islands, rocky caves. Occasionally in shallows and	0 in development footprint, 3 in	**Unlikely:** Not observed during aquatic field surveys, 3 records within locality	**Negligible:** Species not present on site,

Scientific Name	Common Name	EPBC Act Listing	BC Act Listing	FM Act Listing	Habitat Requirements	Past Records within Locality	Likelihood of Occurrence	Likelihood of Impact
					bays. Critical habitat adjacent to NSW waters (DCCEEW, 2024).	10km buffer (ALA)	since 1980 and habitat requirements not met in study area.	no impact to habitat.
Carcharodon carcharias	Great White Shark	V	V	V	Close inshore around rocky reefs, surf beaches, shallow coastal bays, continental shelf and slopes. Areas with high prey density.	0 in development footprint, 29 in 10km buffer (ALA)	**Unlikely:** Not observed during aquatic field surveys, 29 records within locality since 1980 and habitat requirements not met in study area.	**Low:** Species not present on site, no impact to habitat.
Carcharhinus longimanus	Oceanic Whitetip Shark	Marine	-	Protected	Preference for surface mixed layer in warm waters of 20°C and above. Found in tropical and sub-tropical waters. Open ocean on outer continental shelf (NOAA Fisheries, 2023).	0 within 10km	**Unlikely:** Not observed during aquatic field surveys, lack of records within locality and habitat requirements not met in study area.	**Negligible:** Species not present on site, no impact to habitat.
Galeorhinus galeus	School Shark	CD	-	Protected	Cold and temperate continental waters at a variety of depths from very shallow to far offshore (Compagno, 2005).	0 in development footprint, 1 in 10km buffer (ALA)	**Unlikely:** Not observed during aquatic field surveys, 1 record within locality since 1980 and habitat requirements not met in study area.	**Negligible:** Species not present on site, no impact to habitat.
Lamna nasus	Porbeagle, Mackerel Shark	Marine	-	Protected	Primarily edges of the continental shelf. Typically in surface temperatures of 8-20°C. Utilises water columns diving deeper than 1km depths (Campana & Joyce, 2004).	0 within 10km	**Unlikely:** Not observed during aquatic field surveys, lack of records within locality and habitat requirements not met in study area.	**Negligible:** Species not present on site, no impact to habitat.

Scientific Name	Common Name	EPBC Act Listing	BC Act Listing	FM Act Listing	Habitat Requirements	Past Records within Locality	Likelihood of Occurrence	Likelihood of Impact
Rhincodon typus	Whale Shark	V	-	Protected	Tropical to warm-temperate waters, variety of depths from inshore to mostly far offshore. Moves between sea surface and depth (DCCEEW, 2024).	0 in development footprint, 1 in 10km buffer (ALA)	**Unlikely:** Not observed during aquatic field surveys, 1 record within locality since 1980 and habitat requirements not met in study area.	**Negligible:** Species not present on site, no impact to habitat.

Appendix B Point-intercept transect data

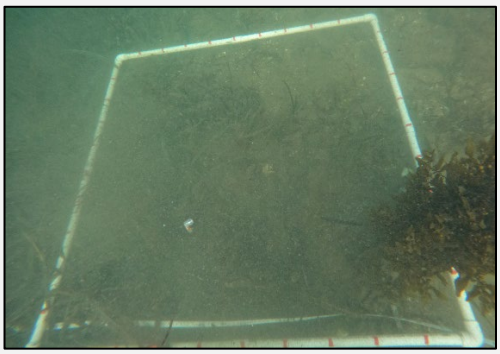
In the below tables the following abbreviations have been used when data was recorded during the point intercept transect surveys:

- P: *Posidonia australis*
- HO: *Halophila ovalis*
- Z: Zostera sp.
- ZC: *Zostera capricorni*
- ZM: *Zostera muelleri*

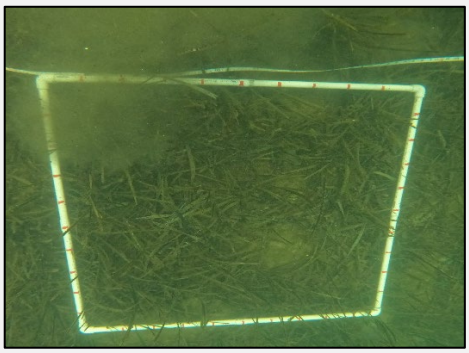
Table B-1 Point intercept data for transect 1

Transect #1				**Date**	**9/05/2024, 9:30**
Start WP	**67**	**Lat/Long**	**-36.89452001**	**149.908385**	
End WP		**Lat/Long**			
Quadrat	**Benthic substrate**	**Seagrass**	**Zostera/Posidonia/Halophila**		
1	20% seagrass, rest sand and rock	Y	80 P / 20 Z, brown algae		
2	60% seagrass, sediment is sand and rock	Y	80 Z / 20 P		
3	50% seagrass	Y	10 Z / 90 P		
4	10% seagrass, a few crab holes	Y	90 P / 10 HO		
5	30% seagrass	Y	90 P / 5 H / 5 Z		
Comments					
At the kayak launch point, facing towards the bridge, some white Ascidians					

2m

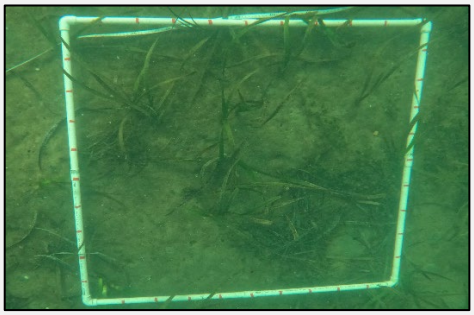


4m



6m

8m

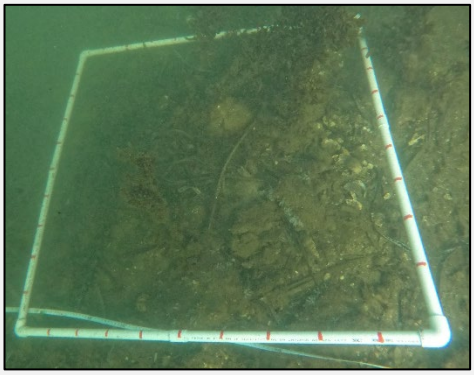


10m

Table B-2 Point intercept data for transect 2

Transect #2				**Date**	**9/05/2024, 9:45**
Start WP	**68**	**Lat/Long**	**-36.89458497**	**149.908362**	
End WP		**Lat/Long**			
Quadrat	**Benthic substrate**	**Seagrass**	**Zostera/Posidonia/Halophila**		
1	Brown algae 5%, oysters 3%, rocky	Y	95 H / 2.5 Z, 2.5 P		
2	80% seagrass	Y	90 Z / 5 H 5 P		
3	10% seagrass, some shells, crab burrows	Y	80 Z / 20 HO		
4	0% seagrass, bare sand, crab burrows	N	-		
5	0% seagrass, bare sand, crab burrows	N	-		
Comments					
At Kayak Launch, facing petrol station opposite.					

2m



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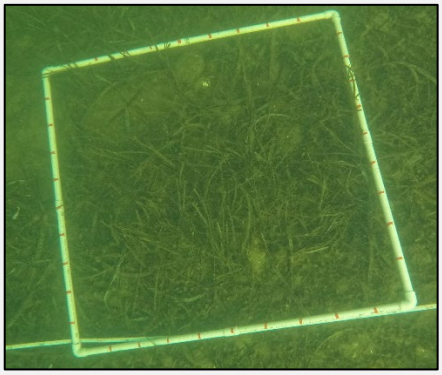
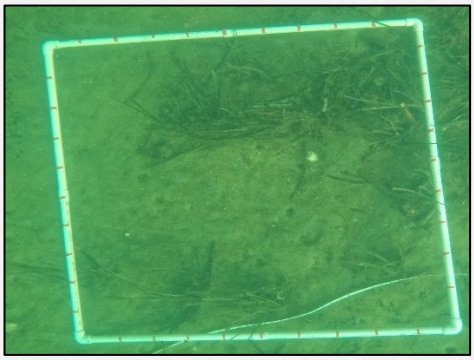
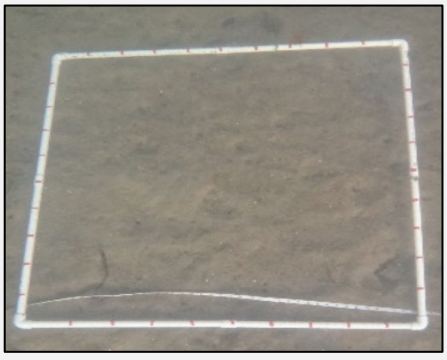


6m



8m



10m

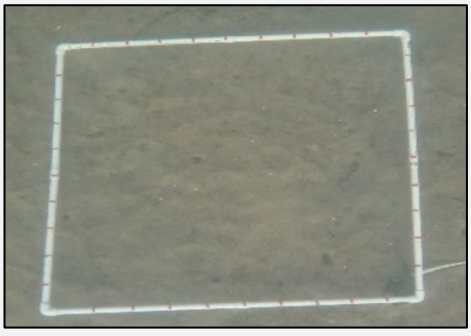
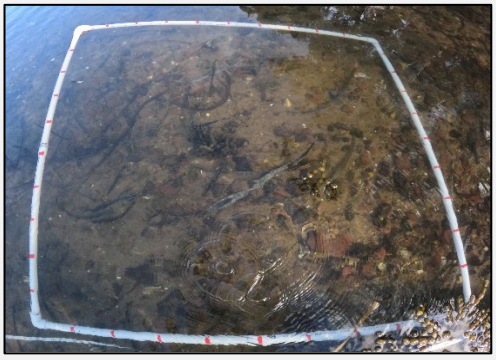


Table B-3 Point intercept data for transect 3

Transect #3				**Date**	**9/05/2024, 10:00**
Start WP	**69**	**Lat/Long**	**-36.894548**	**149.908144**	
End WP		**Lat/Long**			
Quadrat	**Benthic substrate**	**Seagrass**	**Zostera/Posidonia/Halophila**		
1	Rocky/sandy, some snails	N	Posidonia wrack, Neptune's Necklace (NN)		
2	2% seagrass (ZM), rest is bare and rocky	Y	wrack, some snails, NN		
3	25% seagrass	Y	95 ZM small / 5 HO, shells		
4	10% seagrass	Y	some sponge, white ascidians, 80 Z / 20 HO		
5	10% seagrass, Ascidians on rock	Y	95 ZM / 5 HO		
Comments					
–					

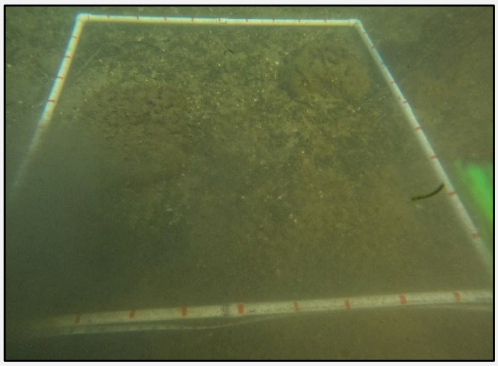
2m



4m

6m

8m



10m

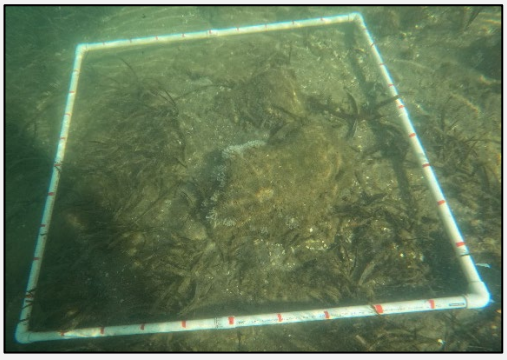


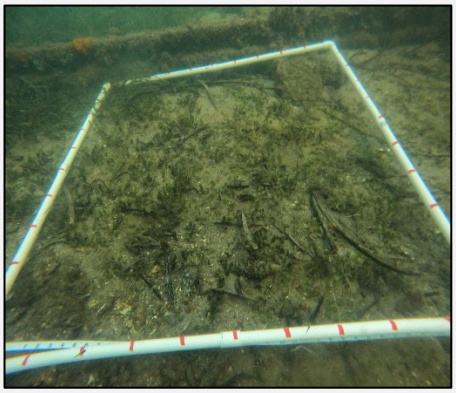
Table B-4 Point intercept data for transect 4

Transect #4				**Date**	**9/05/2024, 10:20**
Start WP	**70**	**Lat/Long**	**-36.89461799**	**149.907761**	
End WP		**Lat/Long**			
Quadrat	**Benthic substrate**	**Seagrass**	**Zostera/Posidonia/Halophila**		
1	sand, rock, oysters, shell debris	N	-		
2	same as #1	N	wrack		
3	15% seagrass, shell debris	Y	25 ZM / 75 HO		
4	20% seagrass, wrack, crab burrows	Y	70 ZM / 30 HO		
5	5% seagrass, brown algae, crab burrows	Y	90 HO / 10 Z		
Comments					
On Western edge of jetty, in between pylons and rail structure, ascidians on substrate, sand at Q5					

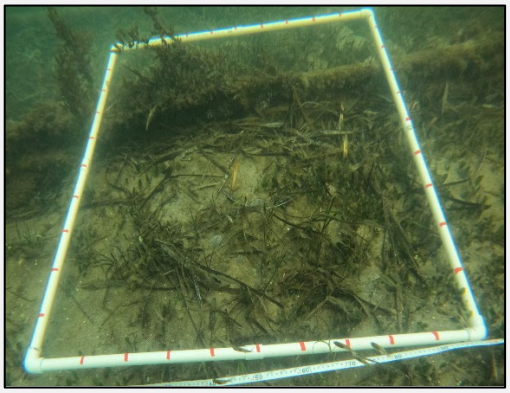
2m

4m

6m



8m



10m

Table B-5 Point intercept data for transect 5

Transect #5				**Date**	**9/05/2024, 10:45**
Start WP	**71**	**Lat/Long**	**-36.89500499**	**149.906875**	
End WP	**72**	**Lat/Long**	**-36.89501898**	**149.906909**	
Quadrat	**Benthic substrate**	**Seagrass**	**Zostera/Posidonia/Halophila**		
1	Bare sand, mud, crab burrows and worm holes	N	-		
2	same as previous quadrat	N	-		
3	as above, 1% seagrass	Y	100 HO		
4	10% seagrass, a few worm holes	Y	100 HO		
5	10% seagrass	Y	75 H / 25 ZC		
Comments					
Starts at shore. sandy mud, shallow, flat, water depth <30cm. *Z. capricorni* present.					

2m

4m

6m

8m

10m

Table B-6 Point intercept data for transect 6

Transect #6				**Date**	**9/05/2024, 11:05**
Start WP	**73**	**Lat/Long**	**-36.89561896**	**149.906163**	
End WP	**74**	**Lat/Long**	**-36.89570697**	**149.906182**	
Quadrat	**Benthic substrate**	**Seagrass**	**Zostera/Posidonia/Halophila**		
1	sand/mud, 10% seagrass, a few crab burrows	Y	100 ZM		
2	As above, additional worm holes	Y	100 ZM		
3	sand/mud, 5% seagrass, rocks, shell debris	Y	95 ZM / 5 HO		
4	sand/mud/rock, 5% seagrass, empty shells	Y	90 ZM / 10 HO		
5	rock/sand/mud 5% seagrass, rocks	Y	15 ZM / 75 HO		
Comments					
Q5: less shells, epiphytes, macroalgae					

2m

4m

6m

8m

10m

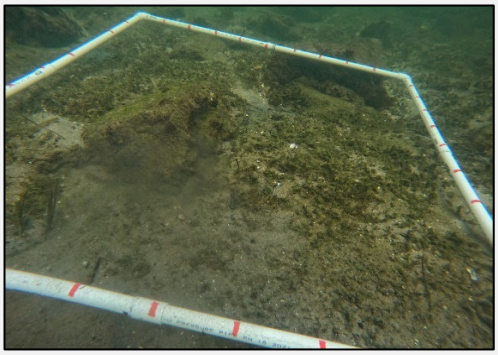
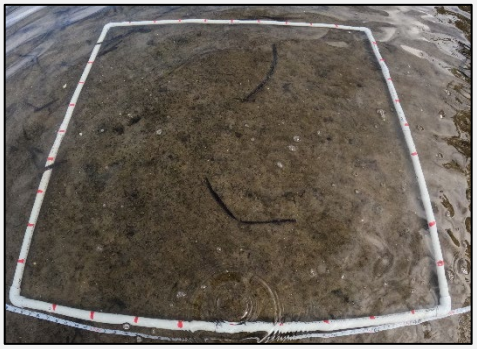


Table B-7 Point intercept data for transect 7

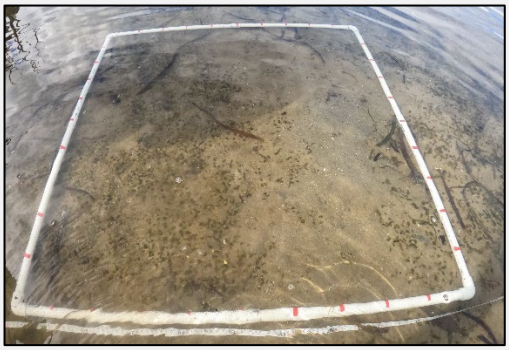
Transect #7				**Date**	**9/05/2024, 11:24**
Start WP	**75**	**Lat/Long**	**-36.89573999**	**149.905648**	
End WP	**76**	**Lat/Long**	**-36.89585701**	**149.905686**	
Quadrat	**Benthic substrate**	**Seagrass**	**Zostera/Posidonia/Halophila**		
1	bare sand/mud, crab holes, 1% seagrass	Y	100 ZC		
2	sand/mud, crab holes, 2% seagrass	Y	80 ZC / 20 HO		
3	sand/mud, 5% seagrass	Y	10 ZC / 90 HO		
4	sand/mud, 15% seagrass	Y	50 ZC / 50 HO		
5	mud/sand, 25% seagrass	Y	50 ZC / 50 HO		
Comments					
Becomes increasingly muddy towards Lake. Bare rock at the boardwalk.					

2m

4m



6m



8m

10m

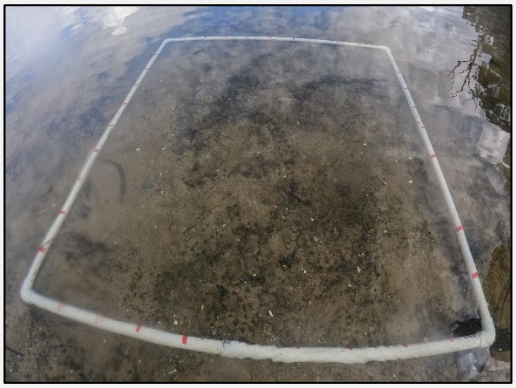
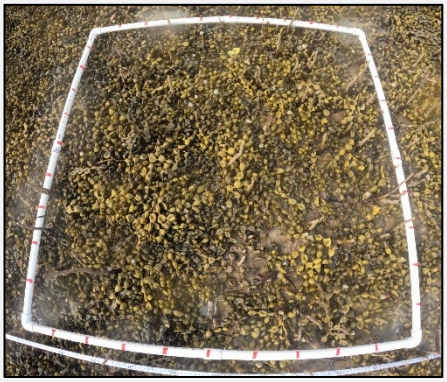


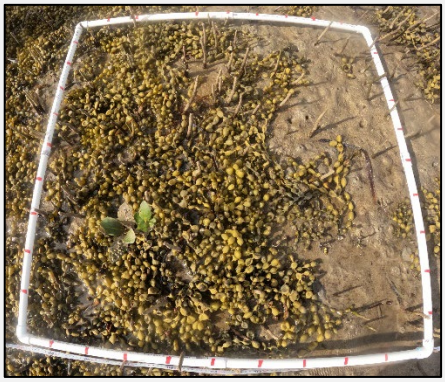
Table B-8 Point intercept data for transect 8

Transect #8				**Date**	**9/05/2024, 11:42**
Start WP	**77**	**Lat/Long**	**-36.89567504**	**149.903298**	
End WP	**78**	**Lat/Long**	**-36.89576698**	**149.903301**	
Quadrat	**Benthic substrate**	**Seagrass**	**Zostera/Posidonia/Halophila**		
1	sand/mud, snails, pneumatophores	N	-		
2	sand/mud, crab holes, less pneumatophores	N	-		
3	sand/mud, crabholes, ~10 pneumatophores	N	-		
4	bare sand/mud, crab burrows	N	-		
5	same as previous quadrat	N	-		
Comments					
Exposed at current tide. At middle car park. Q1 + Q2: Neptune's Necklace wrack					

2m



4m



6m

8m

10m

Table B-9 Point intercept data for transect 9

Transect #9				**Date**	**9/05/2024, 11:55**
Start WP	**79**	**Lat/Long**	**-36.89651599**	**149.901726**	
End WP	**80**	**Lat/Long**	**-36.89657299**	**149.901776**	
Quadrat	**Benthic substrate**	**Seagrass**	**Zostera/Posidonia/Halophila**		
1	sand, burrows, Posidonia and NN wrack	N	-		
2	sand, crab burrows	N	-		
3	sand, crab burrows	N	-		
4	sand, crab burrows	N	-		
5	sand, crab burrows	N	-		
Comments					
Bare sand across all quadrats, with sand becoming firmer towards Lake. Crab burrows decrease towards Lake.					

2m

4m

6m

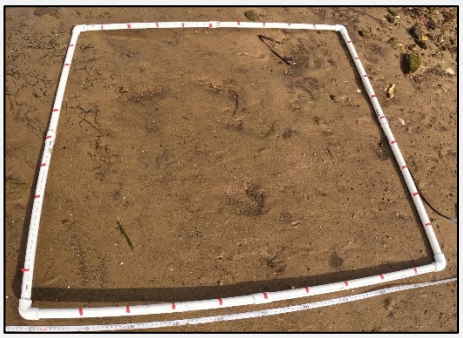
8m

10m

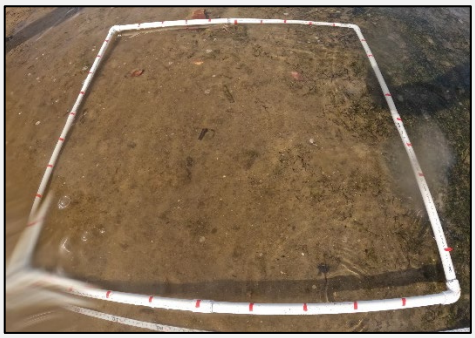
Table B-10 Point intercept data for transect 10

Transect #10				**Date**	**9/05/2024, 12:00**
Start WP	**81**	**Lat/Long**	**-36.89746197**	**149.900863**	
End WP	**82**	**Lat/Long**	**-36.89750296**	**149.900895**	
Quadrat	**Benthic substrate**	**Seagrass**	**Zostera/Posidonia/Halophila**		
1	sand, 1% seagrass	Y	100 ZC		
2	sand, rock, 5% seagrass	Y	100 ZC		
3	sand, some rocks, 50% seagrass	Y	50 ZC / 50 HO		
4	sandy mud, single rock, 15% seagrass	Y	50 ZC / 50 HO		
5	sandy mud, snail, 15% seagrass	Y	10 ZC / 90 HO		
Comments					
Adjacent to Oyster Farm 81-8,sand flat, some rocks, sandy, patch of seagrass along transect					

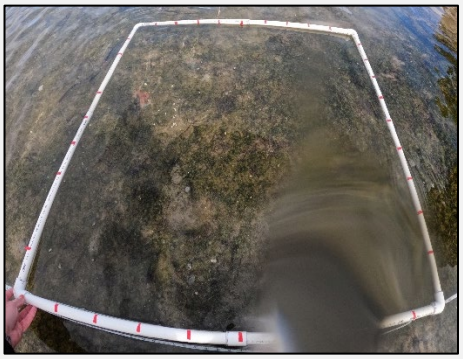
2m



4m



6m



8m

10m

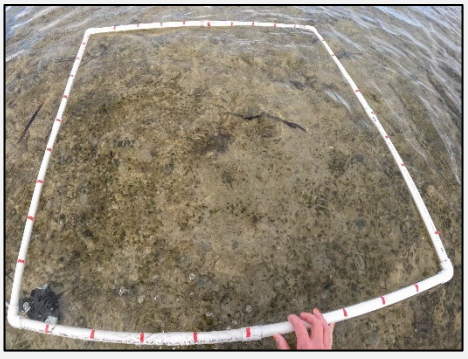


Table B-11 Point intercept data for transect 11

Transect #11				**Date**	**9/05/2024, 12:15**
Start WP	**83**	**Lat/Long**	**-36.89748201**	**149.900318**	
End WP	**84**	**Lat/Long**	**-36.89756298**	**149.900238**	
Quadrat	**Benthic substrate**	**Seagrass**	**Zostera/Posidonia/Halophila**		
1	sand, rocks, crab burrows, snail	N	-		
2	sand, rock, a few crab burrows, snails	N	-		
3	sand, single rock, shell debris	N	-		
4	sand, snail, shell debris	N	-		
5	sand, snail, some shells	N	-		
Comments					
Next to Oyster Lease, exposed at current tide					

2m

4m

6m

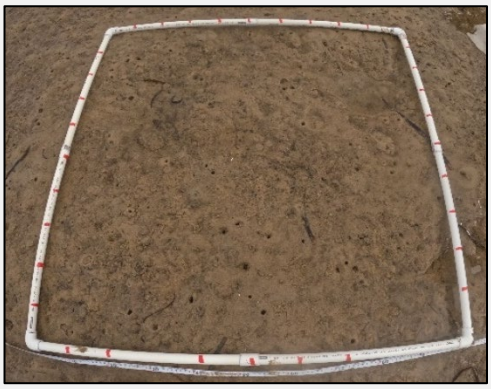
8m

10m

Table B-12 Point intercept data for transect 12

Transect #12				**Date**	**9/05/2024, 12:24**
Start WP	**85**	**Lat/Long**	**-36.89586799**	**149.896595**	
End WP	**86**	**Lat/Long**	**-36.89596798**	**149.896569**	
Quadrat	**Benthic substrate**	**Seagrass**	**Zostera/Posidonia/Halophila**		
1	sand, crab burrows	N	-		
2	sand, crab burrows and worm holes	N	-		
3	sand, crab burrows and worm holes	N	-		
4	sand, crab burrows	N	-		
5	sand, crab burrows and worm holes	N	-		
Comments					
Adjacent to saltmarsh, sand is flat and exposed.					

2m



4m

6m

8m

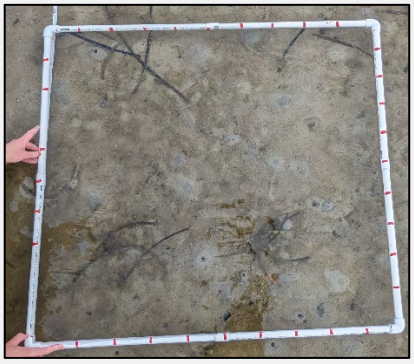
10m
Picture N/A

Table B-13 Point intercept data for transect 13

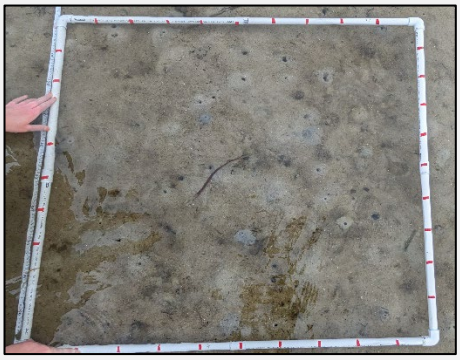
Transect #13				**Date**	**9/05/2024, 12:40**
Start WP	**87**	**Lat/Long**	**-36.893354**	**149.891668**	
End WP	**88**	**Lat/Long**	**-36.89337202**	**149.891601**	
Quadrat	**Benthic substrate**	**Seagrass**	**Zostera/Posidonia/Halophila**		
1	sandy mud, crab burrows	Y	<1% ZC		
2	sandy mud, crab burrows	Y	<1% ZC		
3	sandy mud, crab burrows	Y	<1% ZC		
4	sandy mud, crab burrows	Y	3% ZC		
5	sandy mud, crab burrows	Y	3% ZC		
Comments					
Photos are on CB phone. Started at the end of the jetty/steps. Adjacent to Oyster Lease 79/059.					

2m

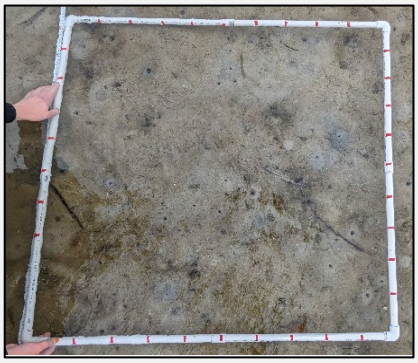
4m



6m



8m

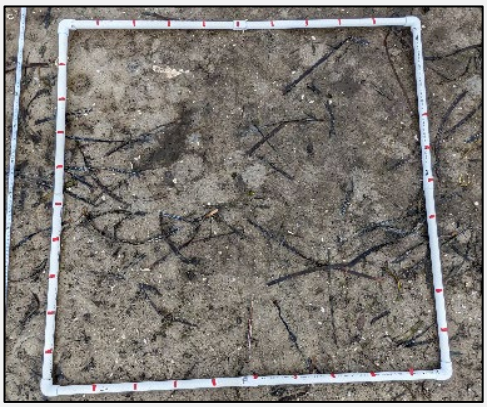


10m

Table B-14 Point intercept data for transect 14

Transect #14				**Date**	**9/05/2024, 12:51**
Start WP	**89**	**Lat/Long**	**-36.89514002**	**149.893572**	
End WP	**90**	**Lat/Long**	**-36.89528913**	**149.8934017**	
Quadrat	**Benthic substrate**	**Seagrass**	**Zostera/Posidonia/Halophila**		
1	sand, crab burrows	N	-		
2	sand, crab burrows	N	-		
3	sand, algae, crab burrows, <1% seagrass	Y	100 ZC		
4	sand, algae, crab burrows, <1% seagrass	Y	100 ZC		
5	sand, algae, crab burrows	N	-		
6	sand, shell debris	N	-		
7	sand, shell debris, 1% seagrass, brown algae	Y	100 HO		
8	sand, shell debris, 20% seagrass	Y	100 HO		
9	sand, macroalgae, 20% seagrass	Y	80 P / 20 HO		
10	sand, macroalgae, 30% seagrass	Y	100 P		
Comments					
Start of transect in between mangroves in clear area. Water depth increasing towards end of transect, current strong					

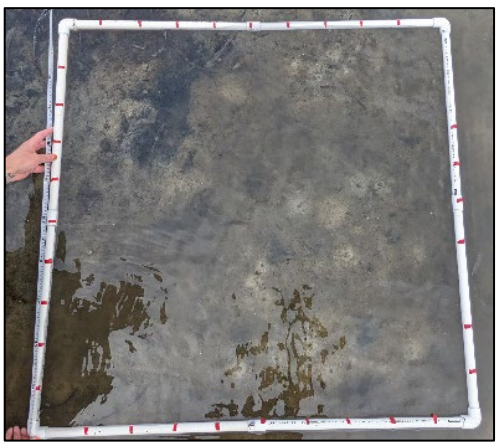
2m



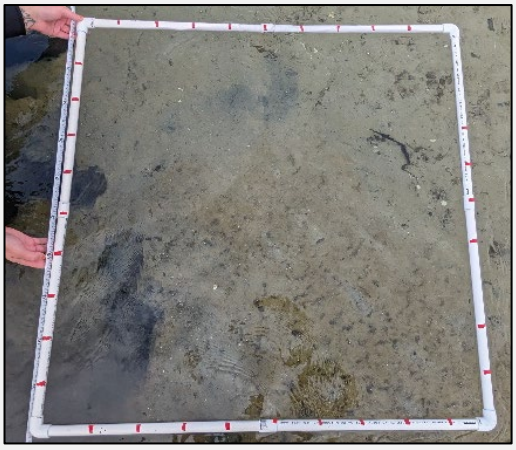
4m

6m

8m

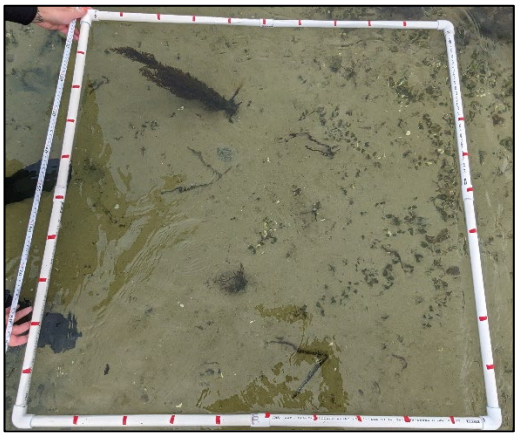


10m

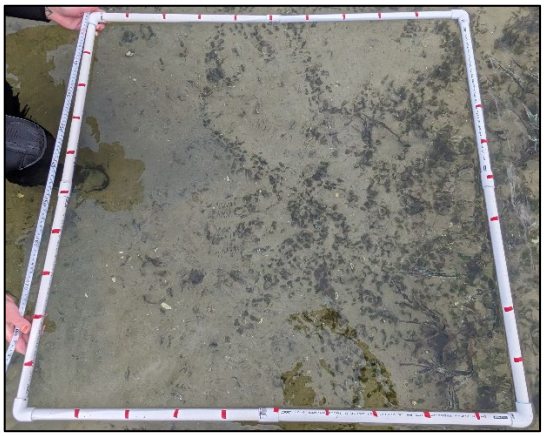


12m

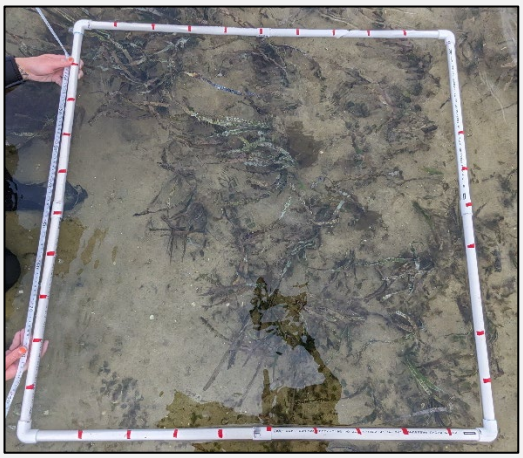
14m



16m



18m



20m

Appendix C Stationary Fish Plot Observations

Table C-1 Fauna observations from stationary fish plot footage

Video #	Time	Fauna Type	Scientific name	Common name	#	Comments
P1, Jetty, 8 May 2024						
1	0:22	Fish	*Redigobius macrostoma*	Largemouth Goby	2	
1	1:07	Crustacean		shrimp	1	
1	2:06	Fish	*Centropogon australis*	Eastern Fortescue	1	
1	2:30	Fish	*Redigobius macrostoma*	Largemouth Goby	2	
1	2:38	Fish	*Coris picta*	Comb Wrasse	2	
1	2:55	Fish	*Coris picta*	Comb Wrasse	2	
1	2:38	Fish	*Girella tricuspidata*	Luderick	1	
1	4:22	Fish	*Girella tricuspidata*	Luderick	2	
1	5:02	Fish	*Girella tricuspidata*	Luderick	1	
1	5:20	Fish	*Tetractenos glaber*	Smooth Toadfish	1	
1	6:24	Fish	*Redigobius macrostoma*	Largemouth Goby	1	
1	6:40	Fish	*Girella tricuspidata*	Luderick	1	
1	6:55	Fish	*Girella tricuspidata*	Luderick	3	
1	6:55	Fish	*Omobranchus anolius*	Oyster Blenny	1	
1	7:10	Fish	*Girella tricuspidata*	Luderick	1	
1	7:20	Fish	*Redigobius macrostoma*	Largemouth Goby	1	
1	7:33	Fish	*Centropogon australis*	Eastern Fortescue	1	
1	7:38	Fish	*Omobranchus anolius*	Oyster Blenny	1	
1	7:50	Fish	*Centropogon australis*	Eastern Fortescue	1	
1	7:50	Fish	*Rhabdosargus sarba*	Tarwhine	5	
1	7:52	Fish	*Coris picta*	Comb Wrasse	1	
1	7:57	Fish	*Coris picta*	Comb Wrasse	1	
1	7:57	Crustacean		medium crab	1	
1	8:15	Fish	*Omobranchus anolius*	Oyster Blenny	1	

Video #	Time	Fauna Type	Scientific name	Common name	#	Comments
1	8:32	Fish	*Tetractenos glaber*	Smooth Toadfish	1	
1	8:57	Fish	*Girella tricuspidata*	Luderick	1	
1	9:10	Fish	*Parablennius intermedius*	Horned Blenny	1	
1	10:03	Fish	*Pseudocaranx georgianus*	Silver Trevally	2	
1	10:03	Fish	*Coris picta*	Comb Wrasse	3	
1	10:03	Fish	*Centropogon australis*	Eastern Fortescue	2	
2	0:09	Fish	*Coris picta*	Comb Wrasse	1	
2	0:09	Fish	*Parablennius intermedius*	Horned Blenny	1	
2	0:30	Fish	*Coris picta*	Comb Wrasse	1	
2	0:30	Fish	*Centropogon australis*	Eastern Fortescue	1	
2	0:30	Fish	*Girella tricuspidata*	Luderick	1	
2	0:30	Fish	*Redigobius macrostoma*	Largemouth Goby	2	
2	0:30	Fish	*Pseudocaranx georgianus*	Silver Trevally	1	
2	0:45	Fish	*Parablennius intermedius*	Horned Blenny	1	
2	1:27	Fish	*Girella tricuspidata*	Luderick	1	
2	1:48	Fish	*Centropogon australis*	Eastern Fortescue	2	
2	1:48	Fish	*Redigobius macrostoma*	Largemouth Goby	1	
2	2:00	Fish	*Girella tricuspidata*	Luderick	1	
2	2:10	Fish	*Coris picta*	Comb Wrasse	2	
2	2:30	Fish	*Redigobius macrostoma*	Largemouth Goby	3	
2	2:30	Fish	*Centropogon australis*	Eastern Fortescue	2	
2	2:30	Fish	*Omobranchus anolius*	Oyster Blenny	1	
2	2:57	Fish	*Redigobius macrostoma*	Largemouth Goby	1	
2	2:57	Fish	*Girella tricuspidata*	Luderick	1	
2	3:14	Fish	*Coris picta*	Comb Wrasse	2	
2	3:25	Fish	*Centropogon australis*	Eastern Fortescue	2	
2	3:25	Fish	*Coris picta*	Comb Wrasse	1	
2	3:48	Fish	*Tetractenos glaber*	Smooth Toadfish	1	

Video #	Time	Fauna Type	Scientific name	Common name	#	Comments
2	3:59	Fish	*Atherinidae*	Hardyhead	100	estimate
2	3:59	Fish	*Coris picta*	Comb Wrasse	4	
2	3:59	Fish	*Redigobius macrostoma*	Largemouth Goby	1	
2	3:59	Fish	*Centropogon australis*	Eastern Fortescue	1	
2	4:17	Fish	*Girella tricuspidata*	Luderick	1	
2	4:35	Fish	*Girella tricuspidata*	Luderick	1	
2	4:40	Fish	*Centropogon australis*	Eastern Fortescue	1	
2	4:50	Fish	*Redigobius macrostoma*	Largemouth Goby	2	
2	4:50	Crustacean		medium crab	1	
2	4:50	Fish	*Omobranchus anolius*	Oyster Blenny	1	
2	4:51	Fish	*Girella tricuspidata*	Luderick	1	
2	5:50	Fish	*Centropogon australis*	Eastern Fortescue	2	
2	5:50	Fish	*Redigobius macrostoma*	Largemouth Goby	1	
2	7:15	Fish	*Coris picta*	Comb Wrasse	2	
2	8:15	Fish	*Centropogon australis*	Eastern Fortescue	1	
2	8:45	Fish	*Girella tricuspidata*	Luderick	1	
2	9:08	Fish	*Centropogon australis*	Eastern Fortescue	1	
2	9:08	Fish	*Girella tricuspidata*	Luderick	1	
2	9:44	Crustacean		shrimp	1	
2	10:03	Fish	*Centropogon australis*	Eastern Fortescue	2	
2	10:03	Fish	*Girella tricuspidata*	Luderick	1	
2	10:30	Fish	*Girella tricuspidata*	Luderick	1	
2	11:00	Fish	*Parablennius intermedius*	Horned Blenny	1	
2	11:01	Fish	*Rhabdosargus sarba*	Tarwhine	1	
2	11:25	Fish	*Girella tricuspidata*	Luderick	1	
2	11:25	Fish	*Rhabdosargus sarba*	Tarwhine	1	
3	0:19	Fish	*Coris picta*	Comb Wrasse	5	
3	0:19	Fish	*Rhabdosargus sarba*	Tarwhine	4	

Video #	Time	Fauna Type	Scientific name	Common name	#	Comments
3	0:47	Fish	*Tetractenos glaber*	Smooth Toadfish	4	
3	1:20	Fish	*unidentified*	unidentified	2	too far
3	1:38	Fish	*Rhabdosargus sarba*	Tarwhine	7	
3	1:38	Fish	*Girella tricuspidata*	Luderick	1	
3	1:45	Fish	*Tetractenos glaber*	Smooth Toadfish	1	
3	2:05	Fish	*Parablennius intermedius*	Horned Blenny	1	
3	2:05	Fish	*Omobranchus anolius*	Oyster Blenny	1	
3	2:12	Fish	*Girella tricuspidata*	Luderick	1	
3	2:27	Fish	*Centropogon australis*	Eastern Fortescue	1	
3	2:52	Fish	*Girella tricuspidata*	Luderick	3	
3	2:52	Fish	*Girella tricuspidata*	Luderick	1	
3	3:30	Fish	*Redigobius macrostoma*	Largemouth Goby	2	
3	3:30	Fish	*Centropogon australis*	Eastern Fortescue	1	
3	3:40	Fish	*Girella tricuspidata*	Luderick	1	
3	4:14	Fish	*Rhabdosargus sarba*	Tarwhine	1	
3	4:50	Fish	*Centropogon australis*	Eastern Fortescue	1	
3	5:10	Fish	*Parablennius intermedius*	Horned Blenny	1	
3	5:28	Fish	*Rhabdosargus sarba*	Tarwhine	1	
3	5:28	Fish	*Girella tricuspidata*	Luderick	1	
3	6:02	Fish	*Tetractenos glaber*	Smooth Toadfish	1	
3	7:30	Fish	*Ambassis jacksoniensis*	Port Jackson Glassfish	1	
3	7:31	Fish	*Rhabdosargus sarba*	Tarwhine	1	
3	7:31	Fish	*Girella tricuspidata*	Luderick	1	
3	8:22	Fish	*Girella tricuspidata*	Luderick	1	
3	8:22	Fish	*Girella tricuspidata*	Luderick	1	
3	8:38	Fish	*Girella tricuspidata*	Luderick	1	
3	8:45	Fish	*Ambassis jacksoniensis*	Port Jackson Glassfish	1	
3	8:49	Fish	*Ambassis jacksoniensis*	Port Jackson Glassfish	1	

Video #	Time	Fauna Type	Scientific name	Common name	#	Comments
3	9:06	Fish	*Parablennius intermedius*	Horned Blenny	2	
3	9:28	Fish	*Girella tricuspidata*	Luderick	1	
3	9:35	Fish	*Tetractenos glaber*	Smooth Toadfish	1	
3	9:48	Fish	*Girella tricuspidata*	Luderick	1	
3	10:00	Crustacean		shrimp	1	
3	10:18	Fish	*Tetractenos glaber*	Smooth Toadfish	1	
3	10:18	Fish	*Parablennius intermedius*	Horned Blenny	1	
3	10:18	Fish	*Girella tricuspidata*	Luderick	1	
3	10:46	Fish	*Redigobius macrostoma*	Largemouth Goby	2	
3	11:20	Fish	*Centropogon australis*	Eastern Fortescue	2	
3	11:20	Fish	*Girella tricuspidata*	Luderick	2	
3	11:45	Fish	*Redigobius macrostoma*	Largemouth Goby	1	
3	11:45	Fish	*Girella tricuspidata*	Luderick	1	
4	0:11	Fish	*Atherinidae*	Hardyhead	50	estimate
4	0:20	Fish	*Centropogon australis*	Eastern Fortescue	1	
4	0:40	Fish	*Centropogon australis*	Eastern Fortescue	1	
4	0:40	Fish	*Tetractenos glaber*	Smooth Toadfish	1	
4	1:04	Fish	*Girella tricuspidata*	Luderick	1	
4	1:04	Fish	*Redigobius macrostoma*	Largemouth Goby	1	
4	1:55	Fish	*Girella tricuspidata*	Luderick	1	
4	2:10	Fish	*Girella tricuspidata*	Luderick	1	
4	2:25	Fish	*Coris picta*	Comb Wrasse	1	
4	2:50	Fish	*Redigobius macrostoma*	Largemouth Goby	3	
4	3:10	Fish	*Centropogon australis*	Eastern Fortescue	1	
4	3:10	Fish	*Tetractenos glaber*	Smooth Toadfish	1	
4	3:10	Fish	*Redigobius macrostoma*	Largemouth Goby	1	
4	3:10	Fish	*Parablennius intermedius*	Horned Blenny	1	
4	3:45	Fish	*Tetractenos glaber*	Smooth Toadfish	1	

Video #	Time	Fauna Type	Scientific name	Common name	#	Comments
4	3:45	Fish	*Girella tricuspidata*	Luderick	1	
4	3:45	Fish	*Coris picta*	Comb Wrasse	1	
4	3:47	Crustacean		small crab	1	
4	3:58	Fish	*Pseudocaranx georgianus*	Silver Trevally	3	
4	4:35	Fish	*Pseudocaranx georgianus*	Silver Trevally	2	
4	5:05	Fish	*Girella tricuspidata*	Luderick	1	
4	5:05	Fish	*Girella tricuspidata*	Luderick	1	
4	5:30	Fish	*Parablennius intermedius*	Horned Blenny	1	
4	5:41	Crustacean		medium crab	1	
4	5:41	Fish	*Coris picta*	Comb Wrasse	1	
4	5:55	Fish	*Coris picta*	Comb Wrasse	2	
4	5:55	Fish	*Centropogon australis*	Eastern Fortescue	1	
4	5:55	Fish	*Girella tricuspidata*	Luderick	1	
4	6:15	Fish	*Girella tricuspidata*	Luderick	1	
4	6:15	Fish	*Centropogon australis*	Eastern Fortescue	1	
4	6:30	Fish	*Coris picta*	Comb Wrasse	2	
4	6:50	Fish	*Coris picta*	Comb Wrasse	4	
4	7:09	Fish	*Girella tricuspidata*	Luderick	1	
4	7:09	Fish	*Centropogon australis*	Eastern Fortescue	2	
4	7:09	Fish	*Pseudocaranx georgianus*	Silver Trevally	1	
4	8:01	Fish	*Girella tricuspidata*	Luderick	1	
4	8:01	Fish	*Girella tricuspidata*	Luderick	1	
4	8:09	Fish	*Redigobius macrostoma*	Largemouth Goby	1	
4	8:30	Fish	*Girella tricuspidata*	Luderick	2	
4	8:30	Fish	*Girella tricuspidata*	Luderick	2	
4	8:49	Fish	*Centropogon australis*	Eastern Fortescue	2	
4	9:22	Fish	*Girella tricuspidata*	Luderick	2	
4	9:25	Fish	*Parablennius intermedius*	Horned Blenny	1	

Video #	Time	Fauna Type	Scientific name	Common name	#	Comments
4	9:25	Fish	*Girella tricuspidata*	Luderick	2	
4	10:38	Fish	*Pseudocaranx georgianus*	Silver Trevally	2	
4	10:56	Fish	*Centropogon australis*	Eastern Fortescue	1	
4	10:56	Fish	*Girella tricuspidata*	Luderick	1	
4	11:45	Fish	*Tetractenos glaber*	Smooth Toadfish	2	
5	0:10	Fish	*Pseudocaranx georgianus*	Silver Trevally	2	
5	0:10	Fish	*Coris picta*	Comb Wrasse	2	
5	0:10	Fish	*Tetractenos glaber*	Smooth Toadfish	1	
5	0:48	Fish	*Pseudocaranx georgianus*	Silver Trevally	4	
5	1:20	Fish	*Redigobius macrostoma*	Largemouth Goby	1	
5	1:20	Fish	*Centropogon australis*	Eastern Fortescue	1	
5	1:20	Fish	*Parablennius intermedius*	Horned Blenny	1	
5	1:50	Fish	*Girella tricuspidata*	Luderick	1	
5	2:11	Fish	*Redigobius macrostoma*	Largemouth Goby	3	
5	2:11	Fish	*Tetractenos glaber*	Smooth Toadfish	1	
5	2:43	Fish	*Girella tricuspidata*	Luderick	2	
5	3:01	Fish	*Girella tricuspidata*	Luderick	1	
5	3:12	Fish	*Centropogon australis*	Eastern Fortescue	1	
5	3:26	Fish	*Pseudocaranx georgianus*	Silver Trevally	6	
5	3:36	Fish	*Pseudocaranx georgianus*	Silver Trevally	2	
5	3:38	Fish	*Redigobius macrostoma*	Largemouth Goby	3	
5	3:38	Fish	*Centropogon australis*	Eastern Fortescue	1	
5	3:38	Fish	*Tetractenos glaber*	Smooth Toadfish	1	
5	4:21	Fish	*Girella tricuspidata*	Luderick	1	
5	5:09	Fish	*Girella tricuspidata*	Luderick	1	
5	5:09	Fish	*Girella tricuspidata*	Luderick	1	
5	5:09	Fish	*Girella tricuspidata*	Luderick	1	
5	5:09	Fish	*Girella tricuspidata*	Luderick	1	

Video #	Time	Fauna Type	Scientific name	Common name	#	Comments
5	5:50	Fish	*Pseudocaranx georgianus*	Silver Trevally	5	
5	5:50	Fish	*Girella tricuspidata*	Luderick	1	
5	5:50	Fish	*Girella tricuspidata*	Luderick	1	
5	5:50	Fish	*Coris picta*	Comb Wrasse	2	
5	5:50	Fish	*Parablennius intermedius*	Horned Blenny	1	
5	5:50	Fish	*Tetractenos glaber*	Smooth Toadfish	1	
5	6:30	Fish	*Pseudocaranx georgianus*	Silver Trevally	1	
5	6:30	Fish	*Tetractenos glaber*	Smooth Toadfish	1	
5	6:30	Fish	*Redigobius macrostoma*	Largemouth Goby	1	
5	6:39	Fish	*Pseudocaranx georgianus*	Silver Trevally	2	
5	6:39	Fish	*Girella tricuspidata*	Luderick	1	
5	7:32	Fish	*Redigobius macrostoma*	Largemouth Goby	2	
5	7:48	Fish	*Girella tricuspidata*	Luderick	1	
5	7:58	Fish	*Girella tricuspidata*	Luderick	1	
5	8:29	Fish	*Coris picta*	Comb Wrasse	1	
5	8:57	Fish	*Girella tricuspidata*	Luderick	2	
5	9:29	Fish	*Coris picta*	Comb Wrasse	3	
5	9:54	Fish	*Redigobius macrostoma*	Largemouth Goby	1	
5	9:54	Fish	*Tetractenos glaber*	Smooth Toadfish	1	
5	10:25	Fish	*Centropogon australis*	Eastern Fortescue	1	
5	10:25	Fish	*Pseudocaranx georgianus*	Silver Trevally	3	
5	10:58	Fish	*Tetractenos glaber*	Smooth Toadfish	2	
5	10:58	Fish	*Girella tricuspidata*	Luderick	1	
5	11:46	Fish	*Coris picta*	Comb Wrasse	3	
6	0:09	Fish	*Coris picta*	Comb Wrasse	1	
6	0:18	Fish	*Coris picta*	Comb Wrasse	3	
6	0:42	Fish	*Coris picta*	Comb Wrasse	2	
6	0:42	Fish	*Girella tricuspidata*	Luderick	1	

Video #	Time	Fauna Type	Scientific name	Common name	#	Comments
6	0:42	Fish	*Redigobius macrostoma*	Largemouth Goby	1	
6	0:42	Fish	*Girella tricuspidata*	Luderick	1	
6	1:05	Fish	*Tetractenos glaber*	Smooth Toadfish	1	
6	1:26	Fish	*Girella tricuspidata*	Luderick	1	
6	1:45	Fish	*Coris picta*	Comb Wrasse	4	
6	1:50	Fish	*Tetractenos glaber*	Smooth Toadfish	1	
6	1:50	Fish	*Coris picta*	Comb Wrasse	1	
6	2:00	Fish	*Girella tricuspidata*	Luderick	1	
6	2:13	Fish	*Girella tricuspidata*	Luderick	1	
6	2:38	Fish	*Coris picta*	Comb Wrasse	3	
P2, Boat ramp, 8 May 2024						
1	1:40	Fish	*Girella tricuspidata*	Luderick	7	
1	1:52	Fish	*Girella tricuspidata*	Luderick	2	
1	2:01	Fish	*Girella tricuspidata*	Luderick	20	estimate
1	3:09	Crustacean		shrimp	3	
1	3:09	Fish	*Redigobius macrostoma*	Largemouth Goby	1	
1	4:50	Crustacean		shrimp	3	
1	4:50	Fish	*Rhabdosargus sarba*	Tarwhine	1	
1	5:15	Fish	*Girella tricuspidata*	Luderick	2	
1	5:25	Fish	*Girella tricuspidata*	Luderick	10	
1	6:50	Fish	*Ambassis sp.*	Glassfish	5	
1	7:47	Fish	*Girella tricuspidata*	Luderick	1	
1	8:55	Fish	*Girella tricuspidata*	Luderick	20	estimate
2	3:55	Fish	*Tetractenos glaber*	Smooth Toadfish	1	
2	4:45	Fish	*Atherinidae*	Hardyhead	20	estimate
2	9:50	Fish	*Redigobius macrostoma*	Largemouth Goby	1	
3	1:30	Fish	*Rhabdosargus sarba*	Tarwhine	1	
3	4:10	Fish	*Girella tricuspidata*	Luderick	1	

Video #	Time	Fauna Type	Scientific name	Common name	#	Comments
3	3:40	Crustacean		hermit crab	1	
3	4:25	Crustacean		hermit crab	1	
3	6:00	Fish	*Girella tricuspidata*	Luderick	20	estimate
3	6:42	Fish	*Tetractenos glaber*	Smooth Toadfish	1	
3	9:07	Fish	*Rhabdosargus sarba*	Tarwhine	1	
3	9:15	Fish	*Rhabdosargus sarba*	Tarwhine	1	
4	1:05	Fish	*Tetractenos glaber*	Smooth Toadfish	1	
4	2:10	Fish	*Redigobius macrostoma*	Largemouth Goby	1	
4	3:05	Bird		Pied Cormorant	1	
4	3:35	Fish	*Atherinidae*	Hardyhead	10	estimate
4	5:03	Bird	*Phalacrocorax varius*	Pied Cormorant	1	
4	5:30	Crustacean		Shrimp	1	
4	5:50	Fish	*Ambassis jacksoniensis*	Port Jackson Glassfish	100	estimate
4	6:08	Bird	*Phalacrocorax varius*	Pied cormorant	1	
4	6:48	Fish	*Ambassis jacksoniensis*	Port Jackson Glassfish	100	estimate
4	6:50	Fish	*Girella tricuspidata*	Luderick	1	
4	7:50	Bird	*Phalacrocorax varius*	Pied Cormorant	1	
4	8:25	Bird	*Phalacrocorax varius*	Pied Cormorant	1	
4	9:28	Fish	*Ambassis jacksoniensis*	Port Jackson Glassfish	100	estimate
4	9:47	Fish	*Girella tricuspidata*	Luderick	3	
4	10:02	Fish	*Girella tricuspidata*	Luderick	3	
4	11:03	Fish	*Girella tricuspidata*	Luderick	1	
4	11:15	Fish	*Tetractenos glaber*	Smooth Toadfish	1	
5	2:13	Fish	*Girella tricuspidata*	Luderick	1	
5	3:50	Crustacean		shrimp	1	
5	4:50	Crustacean		shrimp	1	
5	5:05	Fish	*Rhabdosargus sarba*	Tarwhine	2	
5	6:00	Fish	*Redigobius macrostoma*	Largemouth Goby	1	

Video #	Time	Fauna Type	Scientific name	Common name	#	Comments
5	6:50	Fish	*Girella tricuspidata*	Luderick	1	
5	7:14	Fish	*Girella tricuspidata*	Luderick	5	
5	7:14	Fish	*Girella tricuspidata*	Luderick	1	
5	7:14	Fish	*Tetractenos glaber*	Smooth Toadfish	1	
5	7:50	Fish	*Girella tricuspidata*	Luderick	1	
5	8:02	Fish	*Girella tricuspidata*	Luderick	1	
5	9:50	Fish	*Ambassis jacksoniensis*	Port Jackson Glassfish	100	estimate
5	10:12	Crustacean		shrimp	2	
5	11:14	Fish	*Girella tricuspidata*	Luderick	1	
6	0:20	Fish	*Tetractenos glaber*	Smooth Toadfish	1	
6	1:14	Fish	*Girella tricuspidata*	Luderick	1	
6	1:22	Fish	*Girella tricuspidata*	Luderick	3	
6	2:02	Fish	*Redigobius macrostoma*	Largemouth Goby	1	
6	2:44	Fish	*Atherinidae*	Hardyhead	10	estimate
6	3:45	Fish	*Girella tricuspidata*	Luderick	5	
6	5:16	Fish	*Girella tricuspidata*	Luderick	1	
6	5:40	Fish	*Ambassis jacksoniensis*	Port Jackson Glassfish	10	estimate
P3, Boat ramp, 9 May 2024						
1	0:52	Fish	*Pseudocaranx georgianus*	Silver Trevally	10	
1	1:08	Fish	*Pseudocaranx georgianus*	Silver Trevally	10	
1	1:33	Fish	*Girella tricuspidata*	Luderick	10	estimate
1	2:30	Fish	*Chrysophrys auratus*	Snapper	1	
1	2:45	Fish	*Pseudocaranx georgianus*	Silver Trevally	20	estimate
1	2:45	Fish	*Girella tricuspidata*	Luderick	10	estimate
1	3:33	Fish	*Mugil cephalus*	Sea Mullet	1	
1	4:07	Fish	*Chrysophrys auratus*	Snapper	1	
1	4:30	Fish	*Pseudocaranx georgianus*	Silver Trevally	20	estimate
1	4:30	Fish	*Girella tricuspidata*	Luderick	4	

Video #	Time	Fauna Type	Scientific name	Common name	#	Comments
1	4:30	Fish	*Rhabdosargus sarba*	Tarwhine	1	
1	5:56	Fish	*Mugil cephalus*	Sea Mullet	2	
1	6:20	Fish	*Girella tricuspidata*	Luderick	1	
1	6:20	Fish	*Rhabdosargus sarba*	Tarwhine	1	
1	6:50	Fish	*Rhabdosargus sarba*	Tarwhine	1	
1	6:50	Fish	*Pseudocaranx georgianus*	Silver Trevally	1	
1	7:15	Fish	*Girella tricuspidata*	Luderick	1	
1	7:15	Fish	*Pseudocaranx georgianus*	Silver Trevally	1	
1	7:15	Fish	*Rhabdosargus sarba*	Tarwhine	1	
1	7:30	Fish	*Chrysophrys auratus*	Snapper	2	
1	8:25	Fish	*Mugil cephalus*	Sea Mullet	2	
1	8:25	Fish	*Tetractenos glaber*	Smooth Toadfish	1	
1	8:25	Fish	*Meuschenia trachylepis*	Variable Leatherjacket	1	
1	10:00	Fish	*Girella tricuspidata*	Luderick	5	
1	10:00	Fish	*Chrysophrys auratus*	Snapper	2	
1	10:00	Fish	*Pseudocaranx georgianus*	Silver Trevally	3	
1	10:43	Fish	*Sillago ciliata*	Whiting	1	
1	11:02	Fish	*Bathytoshia brevicaudata*	Smooth Stingray	1	
1	11:20	Fish	*Girella tricuspidata*	Luderick	2	
2	0:10	Fish	*Mugil cephalus*	Sea Mullet	2	
2	0:12	Fish	*Mugil cephalus*	Sea Mullet	1	
2	0:20	Fish	*Pseudocaranx georgianus*	Silver Trevally	5	
2	0:20	Fish	*Rhabdosargus sarba*	Tarwhine	1	
2	0:20	Fish	*Meuschenia trachylepis*	Variable Leatherjacket	1	
2	0:24	Fish	*Mugil cephalus*	Sea Mullet	1	
2	0:45	Fish	*Pseudocaranx georgianus*	Silver Trevally	5	
2	0:51	Fish	*Girella tricuspidata*	Luderick	3	
2	0:51	Fish	*Mugil cephalus*	Sea Mullet	1	

Video #	Time	Fauna Type	Scientific name	Common name	#	Comments
2	1:00	Fish	*Girella tricuspidata*	Luderick	15	estimate
2	1:22	Fish	*Meuschenia trachylepis*	Variable Leatherjacket	1	
2	3:45	Fish	*Pseudocaranx georgianus*	Silver Trevally	5	
2	4:38	Fish	*Mugil cephalus*	Sea Mullet	1	
2	4:49	Fish	*Mugil cephalus*	Sea Mullet	1	
2	4:50	Fish	*Rhabdosargus sarba*	Tarwhine	2	
2	5:11	Fish	*Mugil cephalus*	Sea Mullet	1	
2	5:55	Fish	*Girella tricuspidata*	Luderick	1	
2	5:55	Fish	*Bathytoshia brevicaudata*	Smooth Stingray	1	
2	6:02	Fish	*Rhabdosargus sarba*	Tarwhine	1	
2	6:17	Fish	*Mugil cephalus*	Sea Mullet	1	
2	6:44	Fish	*Rhabdosargus sarba*	Tarwhine	1	
2	6:44	Fish	*Meuschenia trachylepis*	Variable Leatherjacket	1	
2	7:00	Fish	*Rhabdosargus sarba*	Tarwhine	1	
2	7:30	Fish	*Meuschenia trachylepis*	Variable Leatherjacket	2	
2	7:52	Fish	*Rhabdosargus sarba*	Tarwhine	1	
2	7:52	Fish	*Meuschenia trachylepis*	Variable Leatherjacket	1	
2	7:52	Fish	*Mugil cephalus*	Sea Mullet	3	
2	8:20	Fish	*Pseudocaranx georgianus*	Silver Trevally	1	
2	8:20	Fish	*Mugil cephalus*	Sea Mullet	1	
P4, Jetty, 9 May 2024						
1	0:20	Fish	*Ambassis jacksoniensis*	Port Jackson Glassfish	100	estimate
1	6:10	Fish	*Redigobius macrostoma*	Largemouth Goby	1	
1	6:10	Crustacean		medium crab	1	
1	11:12	Crustacean		Shrimp	1	
3	9:10	Crustacean		medium crab	1	
4	9:20	Fish	*Redigobius macrostoma*	Largemouth Goby	1	
4	9:20	Crustacean		medium crab	1	

Video #	Time	Fauna Type	Scientific name	Common name	#	Comments
P5, Boat ramp, 9 May 2024						
1	3:06	Crustacean		Shrimp	1	
1	3:27	Fish	*Tetractenos glaber*	Smooth Toadfish	1	
1	6:38	Fish	*Girella tricuspidata*	Luderick	6	
1	6:57	Fish	*Redigobius macrostoma*	Largemouth Goby	1	
1	11:45	Fish	*Arenigobius frenatus*	Halfbridled Goby	1	
2	0:16	Fish	*Girella tricuspidata*	Luderick	30	estimate
2	0:40	Fish	*Redigobius macrostoma*	Largemouth Goby	1	
2	1:20	Fish	*Girella tricuspidata*	Luderick	30	estimate
2	3:50	Fish	*Arenigobius frenatus*	Halfbridled Goby	1	
2	10:20	Fish	*Girella tricuspidata*	Luderick	20	estimate
3	3:30	Fish	*Tetractenos glaber*	Smooth Toadfish	1	
3	4:04	Crustacean		Shrimp	1	
3	6:20	Fish	*Girella tricuspidata*	Luderick	1	
3	10:20	Fish	*Atherinidae*	Hardyhead	30	estimate
4	1:25	Crustacean		Shrimp	1	
4	2:47	Fish	Gobiidae	Goby	1	
4	3:05	Crustacean		Shrimp	1	
4	3:30	Fish	*Tetractenos glaber*	Smooth Toadfish	1	
4	4:48	Crustacean		Shrimp	1	
4	7:50	Fish	*Pseudocaranx georgianus*	Silver Trevally	3	
4	10:36	Fish	*Rhabdosargus sarba*	Tarwhine	1	
4	11:47	Fish	*Pseudocaranx georgianus*	Silver Trevally	4	
5	1:31	Crustacean		shrimp	1	
5	2:35	Fish	*Girella tricuspidata*	Luderick	1	
5	4:52	Fish	*Pseudocaranx georgianus*	Silver Trevally	1	
5	8:26	Fish	*Redigobius macrostoma*	Largemouth Goby	1	
5	9:30	Fish	*Arenigobius frenatus*	Halfbridled Goby	1	

Video #	Time	Fauna Type	Scientific name	Common name	#	Comments
5	10:25	Fish	*Pseudocaranx georgianus*	Silver Trevally	20	estimate
5	11:02	Fish	*Arenigobius frenatus*	Halfbridled Goby	2	
6	0:15	Fish	*Redigobius macrostoma*	Largemouth Goby	1	
6	3:50	Fish	unidentified	unidentified	40	estimate, too far
6	4:59	Crustacean		shrimp	1	
6	6:10	Crustacean		shrimp	1	
6	8:45	Fish	*Arenigobius frenatus*	Halfbridled Goby	1	

Appendix D Map of waypoints

Figure D-1 All waypoints recorded during the aquatic field surveys (Source: NGH, 2024)

Appendix E Commonwealth Protected Matters report

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. Please see the caveat for interpretation of information provided here.

Report created: 17-Apr-2024

Summary

Matters of National Environment 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 (Ramsar	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	1
Listed Threatened Ecological Communities:	5
Listed Threatened Species:	97
Listed Migratory Species:	57

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 https://www.dcceew.gov.au/parks-heritage/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 Lands:	3
Commonwealth Heritage Places:	None
Listed Marine Species:	87
Whales and Other Cetaceans:	14
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None
Habitat Critical to the Survival of Marine Turtles:	None

Extra Information

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

State and Territory Reserves:	5
Regional Forest Agreements:	1
Nationally Important Wetlands:	4
EPBC Act Referrals:	3
Key Ecological Features (Marine):	1
Biologically Important Areas:	19
Bioregional Assessments:	None
Geological and Bioregional Assessments:	None

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 a Commonwealth Marine Area but which has, may have or is likely to have a significant impact on the environment in the Commonwealth Marine Area.

Feature Name	Buffer Status
Commonwealth Marine Areas (EPBC Act)	In buffer area only

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.
Status of Vulnerable, Disallowed and Ineligible are not MNES under the EPBC Act.

Community Name	Threatened Category	Presence Text	Buffer Status
Brogo Vine Forest of the South East Corner Bioregion	Endangered	Community likely to occur within area	In feature area
Littoral Rainforest and Coastal Vine Thickets of Eastern Australia	Critically Endangered	Community likely to occur within area	In feature area
Lowland Grassy Woodland in the South East Corner Bioregion	Critically Endangered	Community likely to occur within area	In feature area
River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria	Critically Endangered	Community likely to occur within area	In feature area
Subtropical and Temperate Coastal Saltmarsh	Vulnerable	Community likely to occur within area	In feature area

Listed Threatened Species [Resource Information]

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act.
Number is the current name ID.

Scientific Name	Threatened Category	Presence Text	Buffer Status
BIRD			
Anthochaera phrygia			
Regent Honeyeater [82338]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Aphelocephala leucopsis			
Southern Whiteface [529]	Vulnerable	Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Ardenna grisea Sooty Shearwater [82651]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat known to occur within area	In feature area
Calidris acuminata Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat known to occur within area	In feature area
Calidris canutus Red Knot, Knot [855]	Vulnerable	Species or species habitat known to occur within area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Callocephalon fimbriatum Gang-gang Cockatoo [768]	Endangered	Species or species habitat known to occur within area	In feature area
Calyptorhynchus lathami lathami South-eastern Glossy Black-Cockatoo [67036]	Vulnerable	Species or species habitat known to occur within area	In feature area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Climacteris picumnus victoriae Brown Treecreeper (south-eastern) [67062]	Vulnerable	Species or species habitat known to occur within area	In feature area
Dasyornis brachypterus Eastern Bristlebird [533]	Endangered	Species or species habitat may occur within area	In feature area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Diomedea antipodensis gibsoni Gibson's Albatross [82270]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area	In feature area
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat likely to occur within area	In feature 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	In feature area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Halobaena caerulea Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Limosa lapponica baueri Nunivak Bar-tailed Godwit, Western Alaskan Bar-tailed Godwit [86380]	Endangered	Species or species habitat known to occur within area	In feature area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area	In feature area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Melanodryas cucullata cucullata South-eastern Hooded Robin, Hooded Robin (south-eastern) [67093]	Endangered	Species or species habitat likely to occur within area	In feature area
Neophema chrysogaster Orange-bellied Parrot [747]	Critically Endangered	Species or species habitat may occur within area	In feature area
Neophema chrysostoma Blue-winged Parrot [726]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Pachyptila turtur subantarctica Fairy Prion (southern) [64445]	Vulnerable	Species or species habitat known to occur within area	In feature area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Pterodroma leucoptera leucoptera Gould's Petrel, Australian Gould's Petrel [26033]	Endangered	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Pycnoptilus floccosus Pilotbird [525]	Vulnerable	Species or species habitat known to occur within area	In feature area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area	In feature area
Stagonopleura guttata Diamond Firetail [59398]	Vulnerable	Species or species habitat known to occur within area	In feature area
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Species or species habitat known to occur within area	In feature area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Thalassarche bulleri platei Northern Buller's Albatross, Pacific Albatross [82273]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Thalassarche cauta Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area	In feature area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Foraging, feeding or related behaviour may occur within area	In feature area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area
Thinornis cucullatus cucullatus Eastern Hooded Plover, Eastern Hooded Plover [90381]	Vulnerable	Species or species habitat known to occur within area	In feature area
Tringa nebularia Common Greenshank, Greenshank [832]	Endangered	Species or species habitat likely to occur within area	In feature area
FISH			
Epinephelus daemelii Black Rockcod, Black Cod, Saddled Rockcod [68449]	Vulnerable	Species or species habitat may occur within area	In feature area
Prototroctes maraena Australian Grayling [26179]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Seriolella brama Blue Warehou [69374]	Conservation Dependent	Species or species habitat known to occur within area	In buffer area only
Thunnus maccoyii Southern Bluefin Tuna [69402]	Conservation Dependent	Species or species habitat known to occur within area	In feature area
FROG			
Heleioporus australiacus Giant Burrowing Frog [1973]	Vulnerable	Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Litoria aurea			
Green and Golden Bell Frog [1870]	Vulnerable	Species or species habitat known to occur within area	In feature area
Litoria raniformis			
Southern Bell Frog,, Growling Grass Frog, Green and Golden Frog, Warty Swamp Frog, Golden Bell Frog [1828]	Vulnerable	Species or species habitat may occur within area	In feature area
Litoria watsoni			
Southern Heath Frog, Watson's Tree Frog [91509]	Endangered	Species or species habitat likely to occur within area	In feature area
Mixophyes balbus			
Stuttering Frog, Southern Barred Frog (in Victoria) [1942]	Vulnerable	Species or species habitat may occur within area	In buffer area only
MAMMAL			
Balaenoptera borealis			
Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In buffer area only
Balaenoptera musculus			
Blue Whale [36]	Endangered	Species or species habitat likely to occur within area	In buffer area only
Balaenoptera physalus			
Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In buffer area only
Dasyurus maculatus maculatus (SE mainland population)			
Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat known to occur within area	In feature area
Eubalaena australis			
Southern Right Whale [40]	Endangered	Species or species habitat known to occur within area	In feature area
Isoodon obesulus obesulus			
Southern Brown Bandicoot (eastern), Southern Brown Bandicoot (south-eastern) [68050]	Endangered	Species or species habitat likely to occur within area	In feature area
Petauroides volans			
Greater Glider (southern and central) [254]	Endangered	Species or species habitat likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Petaurus australis australis](#)			
Yellow-bellied Glider (south-eastern) [87600]	Vulnerable	Species or species habitat known to occur within area	In feature 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]	Endangered	Species or species habitat likely to occur within area	In feature area
[Potorous tridactylus trisulcatus](#)			
Long-nosed Potoroo (southern mainland) [86367]	Vulnerable	Species or species habitat known to occur within area	In feature area
[Pseudomys fumeus](#)			
Smoky Mouse, Konoom [88]	Endangered	Species or species habitat likely to occur within area	In feature area
[Pseudomys novaehollandiae](#)			
New Holland Mouse, Pookila [96]	Vulnerable	Species or species habitat may occur within area	In feature area
[Pteropus poliocephalus](#)			
Grey-headed Flying-fox [186]	Vulnerable	Roosting known to occur within area	In feature area
PLANT			
[Acacia georgensis](#)			
Bega Wattle [9848]	Vulnerable	Species or species habitat may occur within area	In buffer area only
[Amphibromus fluitans](#)			
River Swamp Wallaby-grass, Floating Swamp Wallaby-grass [19215]	Vulnerable	Species or species habitat may occur within area	In buffer area only
[Astrotricha crassifolia](#)			
Thick-leaf Star-hair [10352]	Vulnerable	Species or species habitat may occur within area	In buffer area only
[Caladenia tessellata](#)			
Thick-lipped Spider-orchid, Daddy Long-legs [2119]	Vulnerable	Species or species habitat likely to occur within area	In feature area
[Calochilus pulchellus](#)			
Pretty Beard Orchid, Pretty Beard-orchid [84677]	Endangered	Species or species habitat may occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Correa baeuerlenii Chef's Cap [17007]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Corunastylis rhyolitica listed as Genoplesium rhyoliticum Pambula Midge-orchid, Rhyolite Midge Orchid [78697]	Endangered	Species or species habitat likely to occur within area	In buffer area only
Cryptostylis hunteriana Leafless Tongue-orchid [19533]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Glycine latrobeana Clover Glycine, Purple Clover [13910]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Leionema ralstonii [64926]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Persicaria elatior Knotweed, Tall Knotweed [5831]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Pomaderris cotoneaster Cotoneaster Pomaderris [2043]	Endangered	Species or species habitat may occur within area	In feature area
Pomaderris parrisiae Parris' Pomaderris [22119]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Thesium australe Austral Toadflax, Toadflax [15202]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Westringia davidii [19079]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Zieria formosa Shapely Zieria [56733]	Endangered	Species or species habitat likely to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Zieria parrisiae Parris's Zieria [56735]	Critically Endangered	Species or species habitat known to occur within area	In buffer area only
REPTILE			
Caretta caretta Loggerhead Turtle [1763]	Endangered	Breeding likely to occur within area	In feature area
Chelonia mydas Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area	In feature area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding likely to occur within area	In feature area
SHARK			
Carcharias taurus (east coast population) Grey Nurse Shark (east coast population) [68751]	Critically Endangered	Foraging, feeding or related behaviour likely to occur within area	In feature area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Migration route known to occur within area	In feature area
Galeorhinus galeus School Shark, Eastern School Shark, Snapper Shark, Tope, Soupfin Shark [68453]	Conservation Dependent	Species or species habitat may occur within area	In buffer area only
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area	In feature area

Listed Migratory Species			[Resource Information]
Scientific Name	Threatened Category	Presence Text	Buffer Status
Migratory Marine Birds			

Scientific Name	Threatened Category	Presence Text	Buffer Status
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area	In feature area
Ardenna carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Foraging, feeding or related behaviour likely to occur within area	In feature area
Ardenna grisea Sooty Shearwater [82651]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area	In feature area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area	In feature area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Sternula albifrons Little Tern [82849]		Breeding likely to occur within area	In feature area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Thalassarche cauta Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area	In feature area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Foraging, feeding or related behaviour may occur within area	In feature area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area	In feature area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area
Migratory Marine Species			
Balaenoptera borealis Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Balaenoptera edeni](#) Bryde's Whale [35]		Species or species habitat may occur within area	In buffer area only
[Balaenoptera musculus](#) Blue Whale [36]	Endangered	Species or species habitat likely to occur within area	In buffer area only
[Balaenoptera physalus](#) Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In buffer area only
[Caperea marginata](#) Pygmy Right Whale [39]		Foraging, feeding or related behaviour likely to occur within area	In buffer area only
[Carcharhinus longimanus](#) Oceanic Whitetip Shark [84108]		Species or species habitat may occur within area	In feature area
[Carcharodon carcharias](#) White Shark, Great White Shark [64470]	Vulnerable	Migration route known to occur within area	In feature area
[Caretta caretta](#) Loggerhead Turtle [1763]	Endangered	Breeding likely to occur within area	In feature area
[Chelonia mydas](#) Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area
[Dermochelys coriacea](#) Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area	In feature area
[Eretmochelys imbricata](#) Hawksbill Turtle [1766]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area
[Eubalaena australis as Balaena glacialis australis](#) Southern Right Whale [40]	Endangered	Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat may occur within area	In buffer area only
Lamna nasus Porbeagle, Mackerel Shark [83288]		Species or species habitat likely to occur within area	In feature area
Megaptera novaeangliae Humpback Whale [38]		Foraging, feeding or related behaviour known to occur within area	In buffer area only
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding likely to occur within area	In feature area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat likely to occur within area	In feature area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area	In feature area
Migratory Terrestrial Species			
Cuculus optatus Oriental Cuckoo, Horsfield's Cuckoo [86651]		Species or species habitat may occur within area	In buffer area only
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area	In feature area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area	In feature area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area	In feature area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Symposiachrus trivirgatus as Monarcha trivirgatus			
Spectacled Monarch [83946]		Species or species habitat known to occur within area	In buffer area only
Migratory Wetlands Species			
Actitis hypoleucos			
Common Sandpiper [59309]		Species or species habitat known to occur within area	In feature area
Calidris acuminata			
Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat known to occur within area	In feature area
Calidris canutus			
Red Knot, Knot [855]	Vulnerable	Species or species habitat known to occur within area	In feature area
Calidris ferruginea			
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Calidris melanotos			
Pectoral Sandpiper [858]		Species or species habitat may occur within area	In feature area
Charadrius leschenaultii			
Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Gallinago hardwickii			
Latham's Snipe, Japanese Snipe [863]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Gallinago megala			
Swinhoe's Snipe [864]		Foraging, feeding or related behaviour likely to occur within area	In feature area
Gallinago stenura			
Pin-tailed Snipe [841]		Foraging, feeding or related behaviour likely to occur within area	In feature area
Limosa lapponica			
Bar-tailed Godwit [844]		Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Numenius madagascariensis			
Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Numenius minutus			
Little Curlew, Little Whimbrel [848]		Foraging, feeding or related behaviour likely to occur within area	In feature area
Pandion haliaetus			
Osprey [952]		Species or species habitat known to occur within area	In feature area
Tringa nebularia			
Common Greenshank, Greenshank [832]	Endangered	Species or species habitat likely to occur within area	In feature area

Other Matters Protected by the EPBC Act

Commonwealth Lands [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.

Commonwealth Land Name	State	Buffer Status
Communications, Information Technology and the Arts - Telstra Corporation Limited		
Commonwealth Land - Australian Telecommunications Commission [16089]	NSW	In buffer area only
Commonwealth Land - Australian Telecommunications Commission [15535]	NSW	In buffer area only
Commonwealth Land - Australian Telecommunications Commission [12265]	NSW	In buffer area only

Listed Marine Species [Resource Information]

Scientific Name	Threatened Category	Presence Text	Buffer Status
Bird			
Actitis hypoleucos			
Common Sandpiper [59309]		Species or species habitat known to occur within area	In feature area
Apus pacificus			
Fork-tailed Swift [678]		Species or species habitat likely to occur within area overfly marine area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Ardenna carneipes as Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Foraging, feeding or related behaviour likely to occur within area	In feature area
Ardenna grisea as Puffinus griseus Sooty Shearwater [82651]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Bubulcus ibis as Ardea ibis Cattle Egret [66521]		Species or species habitat may occur within area overfly marine area	In feature area
Calidris acuminata Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat known to occur within area	In feature area
Calidris canutus Red Knot, Knot [855]	Vulnerable	Species or species habitat known to occur within area overfly marine area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area overfly marine area	In feature area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area overfly marine area	In feature area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Diomedea antipodensis gibsoni as Diomedea gibsoni Gibson's Albatross [82270]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area	In feature area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]	Vulnerable	Species or species habitat likely to occur within area overfly marine area	In feature area
Gallinago megala Swinhoe's Snipe [864]		Foraging, feeding or related behaviour likely to occur within area overfly marine area	In feature area
Gallinago stenura Pin-tailed Snipe [841]		Foraging, feeding or related behaviour likely to occur within area overfly marine area	In feature area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area	In feature area
Halobaena caerulea Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area overfly marine area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Lathamus discolor](#) Swift Parrot [744]	Critically Endangered	Species or species habitat known to occur within area overfly marine area	In feature area
[Limosa lapponica](#) Bar-tailed Godwit [844]		Species or species habitat known to occur within area	In feature area
[Macronectes giganteus](#) Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area	In feature area
[Macronectes halli](#) Northern Giant Petrel [1061]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
[Merops ornatus](#) Rainbow Bee-eater [670]		Species or species habitat may occur within area overfly marine area	In feature area
[Monarcha melanopsis](#) Black-faced Monarch [609]		Species or species habitat known to occur within area overfly marine area	In feature area
[Myiagra cyanoleuca](#) Satin Flycatcher [612]		Species or species habitat known to occur within area overfly marine area	In feature area
[Neophema chrysogaster](#) Orange-bellied Parrot [747]	Critically Endangered	Species or species habitat may occur within area overfly marine area	In feature area
[Neophema chrysostoma](#) Blue-winged Parrot [726]	Vulnerable	Species or species habitat likely to occur within area overfly marine area	In feature area
[Numenius madagascariensis](#) Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Numenius minutus Little Curlew, Little Whimbrel [848]		Foraging, feeding or related behaviour likely to occur within area overfly marine area	In feature area
Pachyptila turtur Fairy Prion [1066]		Species or species habitat known to occur within area	In feature area
Pandion haliaetus Osprey [952]		Species or species habitat known to occur within area	In feature area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Pterodroma cervicalis White-necked Petrel [59642]		Species or species habitat may occur within area	In feature area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area overfly marine area	In feature area
Rostratula australis as Rostratula benghalensis (sensu lato) Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area overfly marine area	In feature area
Stercorarius antarcticus as Catharacta skua Brown Skua [85039]		Species or species habitat may occur within area	In buffer area only
Sterna striata White-fronted Tern [799]		Foraging, feeding or related behaviour likely to occur within area	In feature area
Sternula albifrons as Sterna albifrons Little Tern [82849]		Breeding likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Symposiachrus trivirgatus as Monarcha trivirgatus			
Spectacled Monarch [83946]		Species or species habitat known to occur within area overfly marine area	In buffer area only
Thalassarche bulleri			
Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Thalassarche bulleri platei as Thalassarche sp. nov.			
Northern Buller's Albatross, Pacific Albatross [82273]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Thalassarche carteri			
Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Thalassarche cauta			
Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area	In feature area
Thalassarche eremita			
Chatham Albatross [64457]	Endangered	Foraging, feeding or related behaviour may occur within area	In feature area
Thalassarche impavida			
Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area	In feature area
Thalassarche melanophris			
Black-browed Albatross [66472]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Thalassarche salvini			
Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Thalassarche steadi			
White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Thinornis cucullatus as Thinornis rubricollis](#)			
Hooded Plover, Hooded Dotterel [87735]		Species or species habitat known to occur within area overfly marine area	In feature area
[Thinornis cucullatus cucullatus as Thinornis rubricollis rubricollis](#)			
Eastern Hooded Plover, Eastern Hooded Plover [90381]	Vulnerable	Species or species habitat known to occur within area overfly marine area	In feature area
[Tringa nebularia](#)			
Common Greenshank, Greenshank [832]	Endangered	Species or species habitat likely to occur within area overfly marine area	In feature area
Fish			
[Heraldia nocturna](#)			
Upside-down Pipefish, Eastern Upside-down Pipefish, Eastern Upside-down Pipefish [66227]		Species or species habitat may occur within area	In feature area
[Hippocampus abdominalis](#)			
Big-belly Seahorse, Eastern Potbelly Seahorse, New Zealand Potbelly Seahorse [66233]		Species or species habitat may occur within area	In feature area
[Hippocampus breviceps](#)			
Short-head Seahorse, Short-snouted Seahorse [66235]		Species or species habitat may occur within area	In feature area
[Hippocampus minotaur](#)			
Bullneck Seahorse [66705]		Species or species habitat may occur within area	In feature area
[Histiogamphelus briggsii](#)			
Crested Pipefish, Briggs' Crested Pipefish, Briggs' Pipefish [66242]		Species or species habitat may occur within area	In feature area
[Histiogamphelus cristatus](#)			
Rhino Pipefish, Macleay's Crested Pipefish, Ring-back Pipefish [66243]		Species or species habitat may occur within area	In feature area
[Hypselognathus rostratus](#)			
Knifesnout Pipefish, Knife-snouted Pipefish [66245]		Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Kaupus costatus Deepbody Pipefish, Deep-bodied Pipefish [66246]		Species or species habitat may occur within area	In feature area
Kimblaeus bassensis Trawl Pipefish, Bass Strait Pipefish [66247]		Species or species habitat may occur within area	In feature area
Leptoichthys fistularius Brushtail Pipefish [66248]		Species or species habitat may occur within area	In feature area
Lissocampus runa Javelin Pipefish [66251]		Species or species habitat may occur within area	In feature area
Maroubra perserrata Sawtooth Pipefish [66252]		Species or species habitat may occur within area	In feature area
Mitotichthys semistriatus Halfbanded Pipefish [66261]		Species or species habitat may occur within area	In feature area
Mitotichthys tuckeri Tucker's Pipefish [66262]		Species or species habitat may occur within area	In feature area
Notiocampus ruber Red Pipefish [66265]		Species or species habitat may occur within area	In feature area
Phyllopteryx taeniolatus Common Seadragon, Weedy Seadragon [66268]		Species or species habitat may occur within area	In feature area
Solegnathus robustus Robust Pipehorse, Robust Spiny Pipehorse [66274]		Species or species habitat may occur within area	In feature area
Solegnathus spinosissimus Spiny Pipehorse, Australian Spiny Pipehorse [66275]		Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Stigmatopora argus Spotted Pipefish, Gulf Pipefish, Peacock Pipefish [66276]		Species or species habitat may occur within area	In feature area
Stigmatopora nigra Widebody Pipefish, Wide-bodied Pipefish, Black Pipefish [66277]		Species or species habitat may occur within area	In feature area
Stipecampus cristatus Ringback Pipefish, Ring-backed Pipefish [66278]		Species or species habitat may occur within area	In feature area
Syngnathoides biaculeatus Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area	In feature area
Urocampus carinirostris Hairy Pipefish [66282]		Species or species habitat may occur within area	In feature area
Vanacampus margaritifer Mother-of-pearl Pipefish [66283]		Species or species habitat may occur within area	In feature area
Vanacampus phillipi Port Phillip Pipefish [66284]		Species or species habitat may occur within area	In feature area
Vanacampus poecilolaemus Longsnout Pipefish, Australian Long-snout Pipefish, Long-snouted Pipefish [66285]		Species or species habitat may occur within area	In feature area
Mammal			
Arctocephalus forsteri Long-nosed Fur-seal, New Zealand Fur-seal [20]		Species or species habitat may occur within area	In feature area
Arctocephalus pusillus Australian Fur-seal, Australo-African Fur-seal [21]		Species or species habitat may occur within area	In feature area
Reptile			
Caretta caretta Loggerhead Turtle [1763]	Endangered	Breeding likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Chelonia mydas Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area	In feature area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding likely to occur within area	In feature area

Whales and Other Cetaceans			[Resource Information]
Current Scientific Name	Status	Type of Presence	Buffer Status
Mammal			
Balaenoptera acutorostrata Minke Whale [33]		Species or species habitat may occur within area	In feature area
Balaenoptera borealis Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In buffer area only
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area	In buffer area only
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area	In buffer area only
Balaenoptera physalus Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In buffer area only
Caperea marginata Pygmy Right Whale [39]		Foraging, feeding or related behaviour likely to occur within area	In buffer area only

Current Scientific Name	Status	Type of Presence	Buffer Status
Delphinus delphis Common Dolphin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area	In feature area
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat known to occur within area	In feature area
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area	In feature area
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat may occur within area	In buffer area only
Megaptera novaeangliae Humpback Whale [38]		Foraging, feeding or related behaviour known to occur within area	In buffer area only
Orcinus orca Killer Whale, Orca [46]		Species or species habitat likely to occur within area	In feature area
Tursiops aduncus Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area	In feature area
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area	In feature area

Extra Information

State and Territory Reserves			[Resource Information]
Protected Area Name	Reserve Type	State	Buffer Status
Ben Boyd	National Park	NSW	In buffer area only
Bournda	National Park	NSW	In buffer area only
Bournda	Nature Reserve	NSW	In buffer area only
South East Forest	National Park	NSW	In buffer area only
Yurammie	State Conservation Area	NSW	In buffer area only

Protected Area Name	Reserve Type	State	Buffer Status

Regional Forest Agreements [Resource Information]

Note that all areas with completed RFAs have been included. Please see the associated resource information for specific caveats and use limitations associated with RFA boundary information.

RFA Name	State	Buffer Status
Eden RFA	New South Wales	In feature area

Nationally Important Wetlands [Resource Information]

Wetland Name	State	Buffer Status
Bondi Lake	NSW	In buffer area only
Merimbula Lake	NSW	In feature area
Pambula Estuarine Wetlands	NSW	In buffer area only
Wallagoot Lagoon (Wallagoot Lake)	NSW	In buffer area only

EPBC Act Referrals [Resource Information]

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Not controlled action				
Improving rabbit biocontrol: releasing another strain of RHDV, sthrn two thirds of Australia	2015/7522	Not Controlled Action	Completed	In feature area
INDIGO Central Submarine Telecommunications Cable	2017/8127	Not Controlled Action	Completed	In feature area
Not controlled action (particular manner)				
INDIGO Marine Cable Route Survey (INDIGO)	2017/7996	Not Controlled Action (Particular Manner)	Post-Approval	In feature area

Key Ecological Features [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	Buffer Status
Upwelling East of Eden	South-east	In buffer area only

Biologically Important Areas [Resource Information]

Scientific Name	Behaviour	Presence	Buffer Status
Dolphins			
Tursiops aduncus			
Indo-Pacific/Spotted Bottlenose Dolphin [68418]	Breeding	Likely to occur	In feature area
Seabirds			

Scientific Name	Behaviour	Presence	Buffer Status
Ardenna grisea Sooty Shearwater [82651]	Foraging	Likely to occur	In buffer area only
Ardenna pacifica Wedge-tailed Shearwater [84292]	Foraging	Likely to occur	In buffer area only
Ardenna tenuirostris Short-tailed Shearwater [82652]	Foraging	Likely to occur	In buffer area only
Diomedea exulans (sensu lato) Wandering Albatross [1073]	Foraging	Known to occur	In buffer area only
Diomedea exulans antipodensis Antipodean Albatross [82269]	Foraging	Known to occur	In buffer area only
Pelagodroma marina White-faced Storm-petrel [1016]	Breeding	Known to occur	In buffer area only
Pelagodroma marina White-faced Storm-petrel [1016]	Foraging	Known to occur	In buffer area only
Thalassarche cauta cauta Shy Albatross [82345]	Foraging likely	Likely to occur	In feature area
Thalassarche chlororhynchos bassi Indian Yellow-nosed Albatross [85249]	Foraging	Known to occur	In buffer area only
Thalassarche melanophris Black-browed Albatross [66472]	Foraging	Known to occur	In buffer area only
Thalassarche melanophris impavida Campbell Albatross [82449]	Foraging	Known to occur	In buffer area only
Sharks			
Carcharias taurus Grey Nurse Shark [64469]	Foraging	Known to occur	In feature area
Carcharodon carcharias White Shark [64470]	Distribution	Known to occur	In buffer area only
Carcharodon carcharias White Shark [64470]	Distribution (low density)	Likely to occur	In buffer area only

Scientific Name	Behaviour	Presence	Buffer Status
Carcharodon carcharias White Shark [64470]	Known distribution	Known to occur	In buffer area only
Whales			
Balaenoptera musculus brevicauda Pygmy Blue Whale [81317]	Distribution	Known to occur	In buffer area only
Balaenoptera musculus brevicauda Pygmy Blue Whale [81317]	Foraging	Likely to be present	In buffer area only
Megaptera novaeangliae Humpback Whale [38]	Foraging	Known to occur	In buffer area only

Caveat

1 PURPOSE

This report is designed to assist in identifying the location of matters of national environmental significance (MNES) and other matters protected by the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) which may be relevant in determining obligations and requirements under the EPBC Act.

The report contains the mapped locations of:

- World and National Heritage properties;
- Wetlands of International and National Importance;
- Commonwealth and State/Territory reserves;
- distribution of listed threatened, migratory and marine species;
- listed threatened ecological communities; and
- other information that may be useful as an indicator of potential habitat value.

2 DISCLAIMER

This report is not intended to be exhaustive and should only be relied upon as a general guide as mapped data is not available for all species or ecological communities listed under the EPBC Act (see below). Persons seeking to use the information contained in this report to inform the referral of a proposed action under the EPBC Act should consider the limitations noted below and whether additional information is required to determine the existence and location of MNES and other protected matters.

Where data are available to inform the mapping of protected species, the presence type (e.g. known, likely or may occur) that can be determined from the data is indicated in general terms. It is the responsibility of any person using or relying on the information in this report to ensure that it is suitable for the circumstances of any proposed use. The Commonwealth cannot accept responsibility for the consequences of any use of the report or any part thereof. To the maximum extent allowed under governing law, the Commonwealth will not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance

3 DATA SOURCES

Threatened ecological communities

For threatened ecological communities where the distribution is well known, maps are generated based on information contained in recovery plans, State vegetation maps and 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

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

Where little information is available for a 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 detailed distribution mapping methods are used to update these distributions

4 LIMITATIONS

The following species and ecological communities have not been mapped and do not appear in this report:

- threatened species listed as extinct or considered vagrants;
- some recently listed species and ecological communities;
- some listed migratory and listed marine species, which are not listed as threatened species; and
- migratory species that are very widespread, vagrant, or only occur in Australia in small numbers.

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

- listed migratory and/or listed marine seabirds, which are not listed as threatened, have only been mapped for recorded
- seals which have only been mapped for breeding sites near the Australian continent

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

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

Acknowledgements

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

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

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

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

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