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# Aquatic Habitat Survey

Proposed Jetty, Ramp & Pontoon
No. 118 Cove Boulevard, North Arm Cove NSW 2324

Prepared for Bruce Norquay C/o: The Jetty Man Pty Ltd

Updated 12July 23

# Aquatic Habitat Survey

**Report Number**

AHS240

**Client**

Bruce Norquay C/o: The Jetty Man Pty Ltd

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V1.2 Update

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# Executive Summary

## Introduction

Daniel Smith - Environmental Consultant has been engaged by The Jetty Man Pty Ltd on behalf of Bruce Norquay (the proponent) to prepare an Aquatic Habitat Survey report to inform the Statement of Environmental Effects (SoEE) for the proposed construction of a domestic jetty, ramp, and pontoon at No. 118 Cove Boulevard, North Arm Cove (Lot 511 DP9939) within the Mid Coast LGA.

The survey inspects the aquatic habitats present within the area of the proposed works (project area). A preliminary database search and desktop review of Fisheries NSW aquatic habitat mapping was completed to provide baseline information on species of marine vegetation likely to be present in the project area. Threatened and/or protected species listed under the schedules of the Commonwealth EPBC Act (EPBC Act), Biodiversity Conservation Act 2016 (BC Act) and the Fisheries Management Act 1994 (FM Act) were identified using the online EPBC Environmental Reporting Tool and via desktop reviews of the threatened species schedules of each Act. Tests of significance were conducted for any species, population, and communities known or likely to occur within the project area and that may have the potential to be adversely impacted. A water-based site inspection was conducted on Friday 12 May 2023. The inspection included a survey and habitat assessment within the proposed project footprint extending 10m in all directions. The dominant marine vegetation within the project area and footprint is seagrass (*Zostera capricorni*). No *Caulerpa taxilfolia* was observed. No endangered *Posidonia australis* seagrass was observed. A vegetation map was constructed using up to date aerial photographs and information derived from the field survey.

## Assessment of impacts

It is estimated that approximately 0.049m$^2$ of seagrass habitat would be directly impacted by the installation of one 250mm dia. pontoon support pile. The loss of a very small area of seagrass is not considered significant as *Zostera* seagrass is common and any marine species using these areas of seagrass habitat would readily relocate to adjacent areas of undisturbed seagrass. The loss of any rocky habitat from jetty pile installation would be completely offset by wetted surface of the new jetty piles and pontoon. Shading of seagrass can be mitigated to a level of insignificance with recommendations for seagrass friendly mesh decking to the jetty and ramp component. The pontoon would be located over unvegetated seabed, and the shading impact would be negligible. Any increase in turbidity from construction would be minor and temporary and could be mitigated with recommendation.

## Recommendations and mitigation measures

The impacts on the aquatic ecology of the area arising from the project could be mitigated if suitable mitigation measures are included. The main mitigation measures to be considered include:

- Jetty and ramp to be decked with mesh decking (min. 40% aperture).
- Silt curtain to be deployed during piling works.
- No anchoring of work barges in seagrass areas. And barges and work boats to be moved to deep water when not in use.

# Table of Contents



## Figures

# 1 Introduction

## 1.1 Project Overview

The proponent is seeking DA consent from Mid Coast Council for the following:

- **Domestic Jetty & Pontoon** – Installation of a domestic jetty (17.7m x 1.2m), ramp (6m x1.2m) and pile supported pontoon (4.2m x 2.4m) to be located parallel and adjacent to the south common property boundary prolongation. The completed jetty length (26.1m OA) would achieve -1.65m (AHD) of water depth at its outer end. A site plan of the proposal is provided in Appendix A – Figure 2.

The project is located within marine environs zoned W2 – Recreational Waterways under the *Great Lakes Local Environmental Plan 2014* and is located within the General Use Zone of the Port Stephens -Great Lakes Marine Park. Development for the purpose of a jetty is permissible within these zones. Fisheries NSW aquatic vegetation mapping accessed online via the Fisheries NSW Spatial Data Portal (Appendix A - Figure 3) indicates seagrass (*Zostera sp.)* 120m south of the proposed development site.

## 1.2 Assessment approach and requirements

This aquatic habitat survey report has been prepared in accordance with reporting requirements and the guidelines specified by Section 3.3 of the *Fisheries NSW Policy & Guidelines for Fish Habitat Conservation & Management (2013 update)*. Daniel Smith – Environmental Consultant is a qualified and recognised consultant experienced in the preparation of aquatic habitat survey and assessment for projects of this nature.

## 1.3 Relevant legislation

The following statutory requirements are relevant to the project:

- Fisheries Management Act (FM Act) 1994 and its Regulations
- Environment Protection and Biodiversity Conservation Act (EPBC Act) 1999
- Biodiversity Conservation Act (BC Act) 2016
- State Environmental Planning Policy (Resilience & Hazards) 2021

### Fisheries Management Act 1994 (FM Act)

Sections 204 and 205 of the FM Act and the associated FM regulations set out provisions to protect marine vegetation (mangroves, seagrasses and macroalgae) from 'harm' on public water land below the astronomical high tide mark or the foreshore of such land. A permit is required from NSW Fisheries to harm marine vegetation in these areas. 'Harm' under part 7 of the Act means gather, cut, pull up, destroy, poison, dig up, remove, injury, prevent light from reaching or otherwise harm the marine vegetation or any part of it.

### Environmental Protection and Biodiversity Conservation Act 1999 (EPBC Act)

The EPBC Act which is administered by the Department of Environment and Energy. The EPBC Act is the central piece of environmental legislation in Australia. The EPBC Act provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities, and heritage places — defined in the EPBC Act as matters of national environmental significance (NES). In the marine environment, the EPBC Act list the following matters of NES:

- Ramsar wetlands of international importance
- Commonwealth marine areas (from 3 to 200 nautical miles from the coast).
- Migratory Species protected under international agreements
- Nationally recognised marine threatened species, ecological communities, critical habitats
- Nationally recognised Key Threatening Processes

Under the EPBC Act, any action that will have, or is likely to have a significant impact on a matter of NES must be referred to the Australian Government Minister for a decision on whether assessment and approval is required under the EPBC Act.

### Biodiversity Conservation Act 2016 (BC Act)

The BC Act is the main legislation that identifies and protects threatened species populations and ecological communities in NSW. The BC Act requires that when considering the likely impacts of development on the natural environment, the likely significance of impacts on threatened species or ecological communities, or their habitats must be determined. Section 7.2 of the BC Act provides that development under the Environmental Planning and Assessment Act 1979 (EP&A Act) is likely to significantly affect threatened species if:

a) It is likely to significantly affect threatened species or ecological communities, or their habitat, according to the test in section 7.3, or

b) The development exceeds the biodiversity offsets scheme threshold (min. clearing threshold 2500m$^2$) if the biodiversity offsets scheme applies to the impacts of the development on biodiversity values, or

c) The development is conducted in an area of outstanding biodiversity value declared under Part 3 of the BC Act, or

For an activity under Part 5 of the EP&A Act clause (b) does not apply.

A Biodiversity Development Assessment Report (BDAR) is required where a development application is likely to significantly affect a threatened species.

The proposal was assessed in accordance with the requirements of the BC Act. The proposal does not trigger the requirement for a species impact statement or Biodiversity Development Assessment Report (BDAR) for the following reasons:

- The proposal is not likely to significantly affect threatened species or ecological communities, or their habitat.
- The proposal does not exceed the biodiversity offsets clearing threshold of 2500m$^2$ of vegetation.
- The proposal is not located within a declared area of outstanding biodiversity value.

### State Environmental Planning Policy (Resilience & Hazards) 2021

Resilience & Hazards SEPP 2021 implements the objectives of the *Coastal Management Act 2016* (the Act) from a land use planning perspective, by specifying how development proposals are to be assessed if they fall within the coastal zone. The Act defines the NSW coastal zone, including for land use planning under the *Environment Planning and Assessment Act 1979*. The Resilience & Hazards SEPP includes mapping of the four coastal management areas that make up the coastal zone.

The project site is located within the 'coastal environment' and 'coastal use' area mapped under the policy.

Under Part 2.2 of the Resilience & Hazards SEPP, development in a coastal use or coastal environment area must address the requirements of Division 3 Part 2.2 of the Resilience & Hazards SEPP. These matters are addressed in the following table.

| *Section 2.10 & 2.11 of Resilience and Hazards Sepp 2021* | *Comment on Proposal* |
|---|---|
| **2.10 Development on land within the coastal environment area**<br><br>(a) The integrity and resilience of the biophysical, hydrological (surface and groundwater) and ecological environment, | With recommendation the proposal would avoid significant impacts to the ecological environment.<br><br>No ongoing operational impacts are expected to occur that would impact the integrity and resilience of the biophysical, hydrological, and ecological environment. |
| (b) coastal environmental values and natural coastal processes, | Construction would be undertaken for a brief time and potential impacts on coastal environmental values and natural coastal processes are considered unlikely with the implementation of mitigation measures outlined in Section 5. |
| (c) The water quality of the marine estate (within the meaning of the Marine Estate Management Act 2014), in particular, the cumulative impacts of the proposed development on any of the sensitive coastal lakes identified in Schedule 1, | Not Applicable |
| (d) Marine vegetation, native vegetation and fauna and their habitats, undeveloped headlands, and rock platforms, | With recommendations (Section 5), impacts on marine vegetation would be minimised and limited to the disturbance of approximately 0.59m$^2$ of macroalgae from jetty piling and 0.07m2 of low density *Zostera capricorni* seagrass from installation of one pontoon support pile. Shading of the seabed and seagrass could be mitigated by utilising mesh decking minimum 40% aperture on the jetty and ramp component. The new pontoon and jetty pile habitat will provide additional areas of hard intertidal and subtidal habitat for marine flora and fauna.<br><br>The proposal is not located within areas of undeveloped headlands or rock platforms (within the meaning of the Sepp).<br><br>No threatened species would be significantly impacted. |
| (e) Existing public open space and safe access to and along the foreshore, beach, headland, or rock platform for members of the public, including persons with a disability, | Existing public access (boating) to this area of the foreshore would be maintained at all times during construction and ongoing operation. |
| (f) Aboriginal cultural heritage, practices, and places, | No known Aboriginal item affects the proposal. |
| (g) The use of the surf zone. | Not Applicable. |
| **2.11 Development on land within the coastal use area** (a) (i) existing, safe access to and along the foreshore, beach, headland, or rock platform for members of the public, including persons with a disability, | Existing public access to this area of the foreshore would be maintained at all times during construction and ongoing operation of the structure. |

| | |
|---|---|
| (ii) overshadowing, wind funnelling and the loss of views from public places to foreshores, | No adverse visual impacts or loss of views are anticipated due to the low-profile nature of construction and consistency with the other foreshore development in the area. |
| (iii) the visual amenity and scenic qualities of the coast, including coastal headlands, | Visual amenity and scenic quality of the area will be retained as the development is consistent with the built form and material finish of other foreshore developments in the area. |
| (iv) Aboriginal cultural heritage, practices, and places, | There would be no known impacts to Aboriginal cultural heritage, practices and places during construction or operation. |
| (v) cultural and built environment heritage, and | There would be no impacts to cultural and built heritage during construction or operation. |
| (b) is satisfied that—<br><br>(i) the development is designed, sited, and will be managed to avoid an adverse impact referred to in paragraph (a), | The proposal with recommendation can be sited, constructed, and operated in a manner which does not result in adverse impacts on any of the above listed items. |

# 2 Survey & assessment methodology

## 2.1 Desktop review

A database search was undertaken to identify threatened marine vegetation and fauna species, populations, or ecological communities that are known or likely to occur within the project area and that may be affected by the proposal. Threatened species refers to any marine species, populations or ecological communities listed under Schedules 4 or 5 of the FM Act, Schedule 1 & 2 of the BC Act, or Schedule 1 of the EPBC Act. Database records pertaining to the project site and locality were reviewed prior to the field survey and included:

- NSW Office of Environment and Heritage (OEH) Bionet Atlas for records of threatened species listed under the BC Act and EPBC Act which have been recorded in the locality.
- The Australian Government Department of the Environment and Energy (DoEE) Protected Matters Search Tool for Matters of National Environmental Significance listed under the EPBC Act which may occur in the area.
- Schedule 4 and 5 of the Fisheries Management Act 1994.

For the any Act to have relevance there must be a likelihood that one or more threatened species or their habitat occur in the project area which could then be potentially impacted by works. If it is initially determined that threatened species are 'likely' to be affected, then a Test of Significance is conducted.

A likelihood assessment of species identified during the database searches is provided as Appendix C.

## 2.2 Field survey

A survey of the project site was undertaken to identify the dominant marine vegetation (seagrass) and search for known threatened and protected species. The survey was conducted on Friday 12 May 2023 (Refer: Section 3.3 of this report). A series of reference photographs were captured during the survey (Appendix B). A vegetation map was constructed by overlaying information obtained during the field survey on to up to date aerial photographs (Nearmap) (Figure 1).

# 3 Results

## 3.1 Desktop review

### 3.1.1 Threatened ecological communities (EEC)

The database search predicted one EPBC Act listed EEC - *Posidonia australis* seagrass meadows of the Manning-Hawksbury ecoregion ecological community with the potential to occur within the project area. No *Posidonia* seagrass was observed during the field survey and no *Posidonia* seagrass has been mapped by NSW Fisheries as occurring within the area (Figure 2). The EEC is not located within the project area and a test of significance is not warranted for this EEC.

### 3.1.2 FM Act protected seagrass

All species of marine vegetation are protected from harm under Section 204 of the FM Act. *Zostera capricorni* seagrass beds greater than $5m^2$ in area are declared as Type 1 Highly Sensitive habitat. It is illegal to 'harm' seagrass and other marine vegetation (saltmarsh, mangroves) without the authority issued by Fisheries under Section 205 of the FM Act. This report would be forwarded to Fisheries NSW for their consideration.

### 3.1.3 Threatened marine fauna

The likelihood of threatened marine fauna occurring within the project area has been assessed (Appendix C). The BC Act & EPBC Act listed Green Turtle (*Chelonia mydas*) was determined as having a moderate likelihood of occurrence within the project area at certain times. A significance test was completed for this species (Appendix D).

### 3.1.4 Key threatening processes

Works associated with the project (construction of a jetty, ramp, and pontoon) do not constitute one of the key threatening processes listed under the Schedules of the FM Act or EPBC Act.

## 3.2 Field survey

The field survey was conducted at 11:00 am on Friday 12 May 2023. Weather conditions were sunny with a light south-east breeze <5 knots. The tide was at approximately 0.70m and rising from a low tide of 0.49m at 8:59 am towards a high tide of 1.35m at 3:20 pm. The water surface was calm and water visibility was to 1m. The intertidal habitats were surveyed on foot while the subtidal area was surveyed using snorkel. A 30m measuring tape was fixed to the shoreline in the planned location of the jetty and deployed onto the seabed for 30m (survey limit). Information on the species, composition, and density of marine vegetation was recorded along the tape.

The intertidal habitats within the project footprint consist of a 12m wide beach composed of rock cobble and coarse sand that dips gently seaward from a 1m high rocky embankment. A constructed rock groyne immediately adjacent to the south of the proposed jetty site provides additional areas of rocky intertidal habitat. The hard intertidal surface of the rock cobble beach and rock groyne support a high-density cover of Sydney rock oysters (*Saccostrea glomerata*) and provide habitat for numerous periwinkles (*Bembicium auratum*). The base of the rock groyne provides habitat for brown algae (*Hormosira banksii*). There are no areas of saltmarsh or mangroves within the intertidal.

The subtidal zone consists of a gently sloped seabed composed of rock rubble out to 19m from the shoreline. The rock groyne adjacent to the proposed jetty location continues into the shallow subtidal for a short distance before terminating onto a very soft fine silt seabed. The subtidal surfaces of the rock rubble and rock groyne were covered by a dense mat of bearded mussels (*Trichomya hirsuta*) and support green algae (*Codium fragile*) and brown algae (*Sargassum* sp.). The very soft silty seabed in the deeper subtidal supports a narrow tract of the common Zostera seagrass (*Zostera capricorni*). The tract of Zostera is present in the proposed project footprint at 18.7m offshore. The tract of Zostera continues offshore for a further 5m before terminating at 23.7m offshore. Zostera leaf length was high (>30cm), and seagrass density was estimated to be low (20%/$m^2$). The leaves of the seagrass were covered in a thick layer of epiphytic algae. Beyond 23.7m offshore the seabed is composed of deeper subtidal non-vegetated fine silt.

No pest species *Caulerpa taxifolia* was observed.

No threatened seagrass *Posidonia australis* was observed in the project area.

No fish were observed during the survey.

A marine vegetation map is provided as Figure 1. Photographs are provided in Appendix B.


**Figure 1. Seagrass Map**

# 4 Potential impacts

## 4.1 Impacts on threatened species

A significance test was completed for the BC Act and EPBC Act listed Green Turtle (*Chelonia mydas*) which have been recorded in North Arm Cove and have a moderate likelihood of occurring within the project area at certain times. The tests of significance have determined that the construction and ongoing use of the jetty, ramp and pontoon would not have a significant adverse impact on the Green Turtle for the following reasons:

- Any occurrence of the Green Turtle within the project area would be infrequent and transient in nature.
- The proposal aims to avoids direct impacts to potential feed/foraging habitat (seagrass) from jetty piling and shading.
- The seagrass within the proposal area is low density and is considered to be of low habitat value with respect to marine turtles.

## 4.2 Impacts on marine vegetation

The proposed fixed jetty component will require the installation of approximately 12 x 250mm diameter (nominal) piles with a combined surface area of 0.59m$^2$. These piles would be located within areas of intertidal rock cobble habitat which supports oysters, periwinkles and macroalgae. Any loss of habitat from these piles would be completely offset by the wetted surface of the new piles which over time would be colonised by the same species colonising the natural rocky habitat. The impacts from the installation of jetty piles is considered neutral.

One 250mm diameter (nominal) pontoon support pile would be located within an area of *Zostera capricorni* seagrass habitat and 0.049m$^2$ of low-density seagrass would be directly impacted. The loss of a very small area of common and low-density seagrass is considered negligible. The Zostera is low density (20%/m$^2$) and considered to have minimal habitat value. Any species of marine fauna using these areas of seagrass would readily relocate to nearby areas of undisturbed seagrass habitat located outside the building footprint. The other pontoon support pile would be located within unvegetated seabed habitat.

The jetty and ramp has the potential to shade the areas of macroalgae and seagrass habitat beneath. To mitigate the potential shading impact to a level of insignificance it is recommended that the jetty and ramp component is decked with a grid, grate, or mesh with a minimum 40% aperture (holes). The pontoon would be located over areas of deeper unvegetated seabed and the shading impacts from this component are considered negligible.

## 4.3 Habitat Creation

The pontoon and jetty piles would provide additional areas of artificial intertidal and subtidal habitat, which over time would be colonised by flora and fauna typical of the rocky habitats and jetties in the area e.g., oysters, mussels and macroalgae.

## 4.4 Construction related impacts

Barges, work boats and underwater equipment used in demolition and construction have the potential to impact the marine environment by:

- Using barge spuds that are used to anchor work barges in place in areas of seagrass.
- Shading of seagrass if barges are left over seagrass for extended periods.
- Vessels propellor wash of seagrass in shallow water seagrass areas when towing or pushing work barges into place.

- Introduction or spread of pest species such as *Caulerpa taxifolia* from barges, boats, and underwater equipment.

These construction related impacts could be avoided/ mitigated with the implementation of recommendations made in Section 5 of this report.

## 4.5 Mobilisation of sediment and increased turbidity during construction

A local increase in turbidity would be expected due to the suspension of fine silt sediment during piling. Any increased turbidity during construction would be temporary and localised to the immediate area if works are appropriately timed and provided that best practice sediment control and construction techniques are employed. Recommendations to minimise these impacts are provided in Section 5.

## 4.6 Impacts from ongoing operations (boating)

The water depth at the end of the completed jetty and pontoon (-1.65m AHD) exceeds the minimum -0.9m requirement of NSW Fisheries for jetties located over and within areas of seagrass. The risk of vessel scour or propeller dredging of seagrass can be minimised if safe and sensible boating practices are adhered to. Any vessel using the facility must approach the structures in a low-speed manner and adjust the motor leg to provide clearance from the lakebed.

# 5 Recommended mitigation measures

The risk of significant adverse impacts can be diminished by the implementation of basic mitigation measures. The following recommendations have been developed for the project consistent with the Fisheries NSW *Policy & Guidelines for Fish Habitat Conservation & Management* (2013 update) and the Great Lakes Development Control Plan and LEP 2014. It is considered that the project would have considered and satisfied the relevant clauses of the Resilience & Hazards SEPP 2021 if these recommendations are implemented (in full).

- Jetty and ramp to be constructed with a mesh, grid, or grate decking with a minimum 40% aperture.
- Construction materials to be prefabricated and painted off site to minimise on-site construction time and related impacts.
- Program work to ensure that it takes place during low flow periods e.g., during the lower half of the tidal cycle and restricted to calm weather conditions.
- Silt fence or curtain to be installed around the work are during demolition and jetty piling. The silt fence or sediment curtain should be anchored in a way that does not allow it to be dragged on the seabed and damage seagrass and installed leaving a 100mm gap at its base to allow any fish to escape.
- Barge movement over shallow seagrass areas should be avoided where possible and barges must anchor in such a way as to avoid any disturbance to seagrass habitat.
- Barges should be moved to deeper water when not being used to avoid prolonged shading of seagrass in their footprint.
- Towing and pushing vessels are not to use excessive power to manoeuvre barges into place and restrict speeds to minimise wash and bottom scour.

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# 6 References


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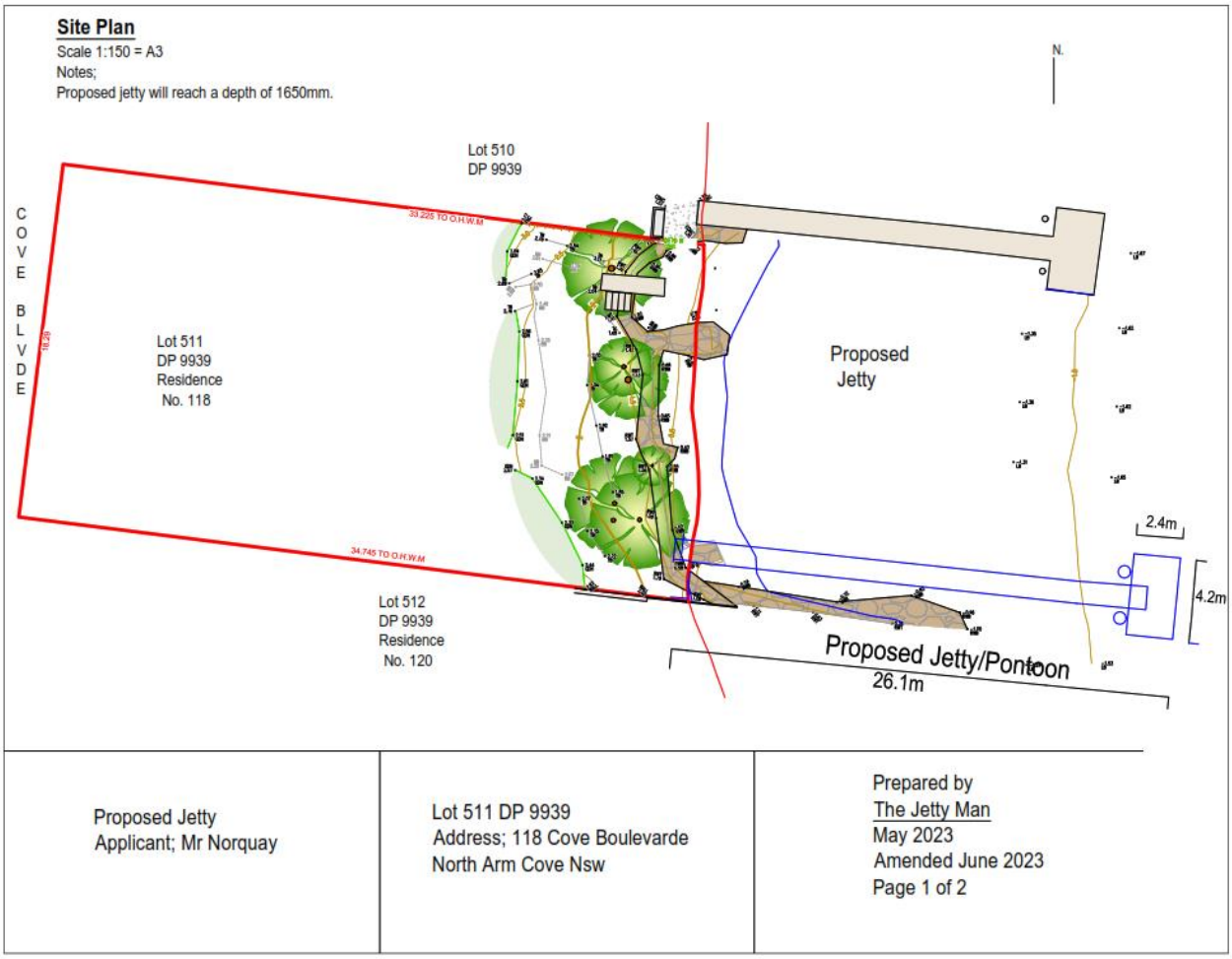
# Appendix A - Figures

**Figure 2 DA Plan extract**



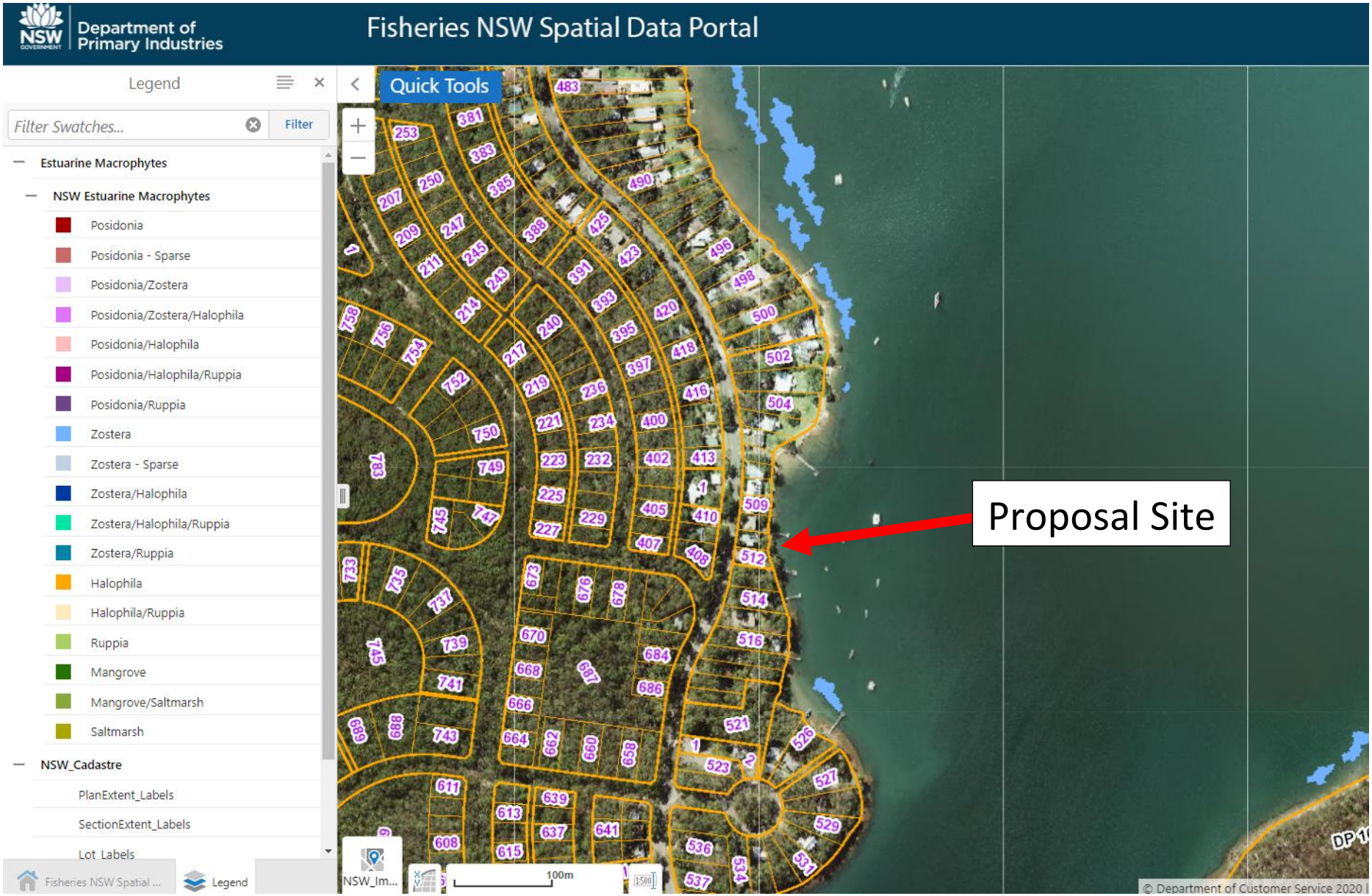



**Figure 3. NSW Fisheries Seagrass Mapping**

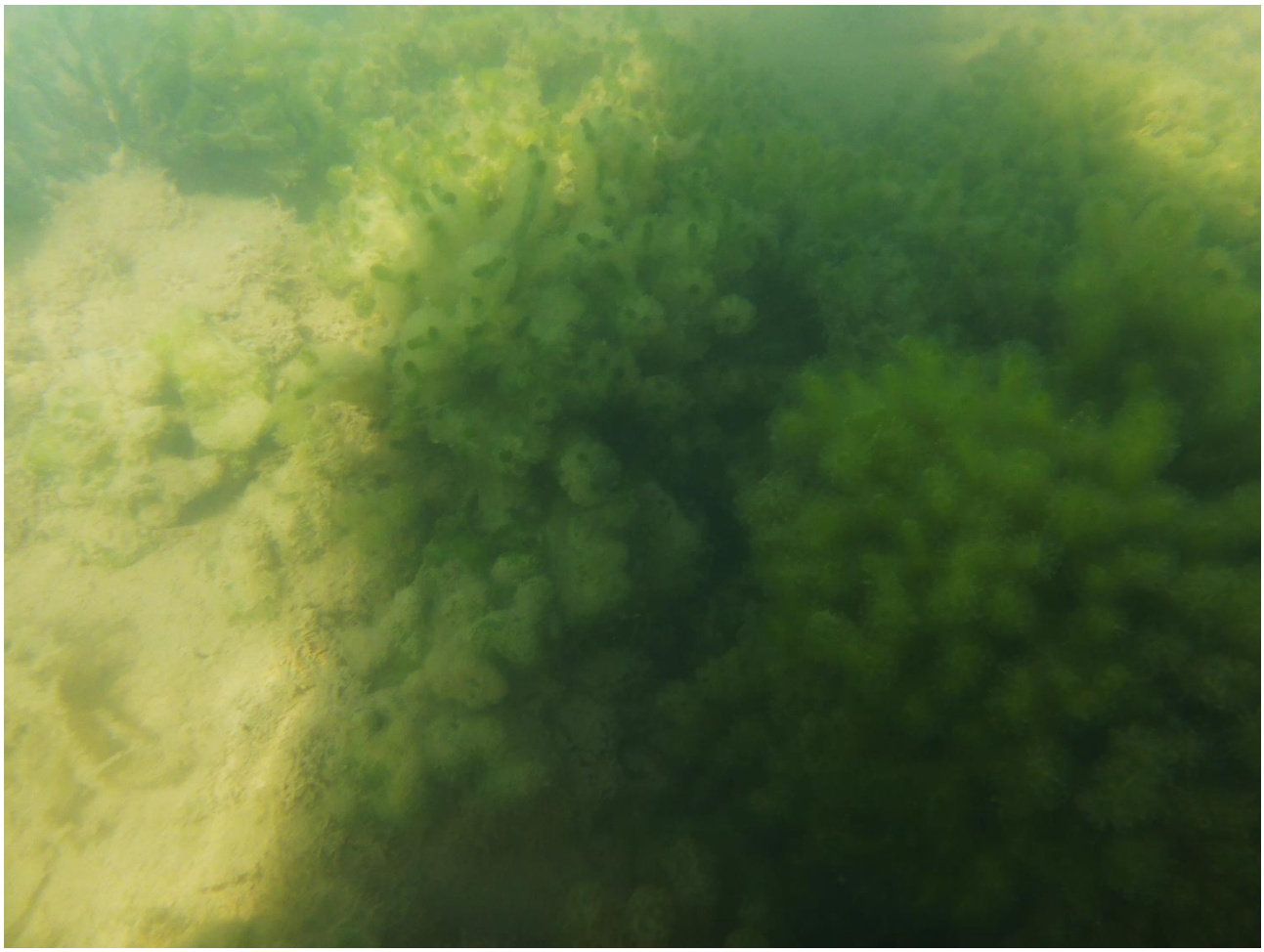
# Appendix B – Photographs

**Photograph 1**

Location of the proposed jetty and the intertidal shoreline at the property.

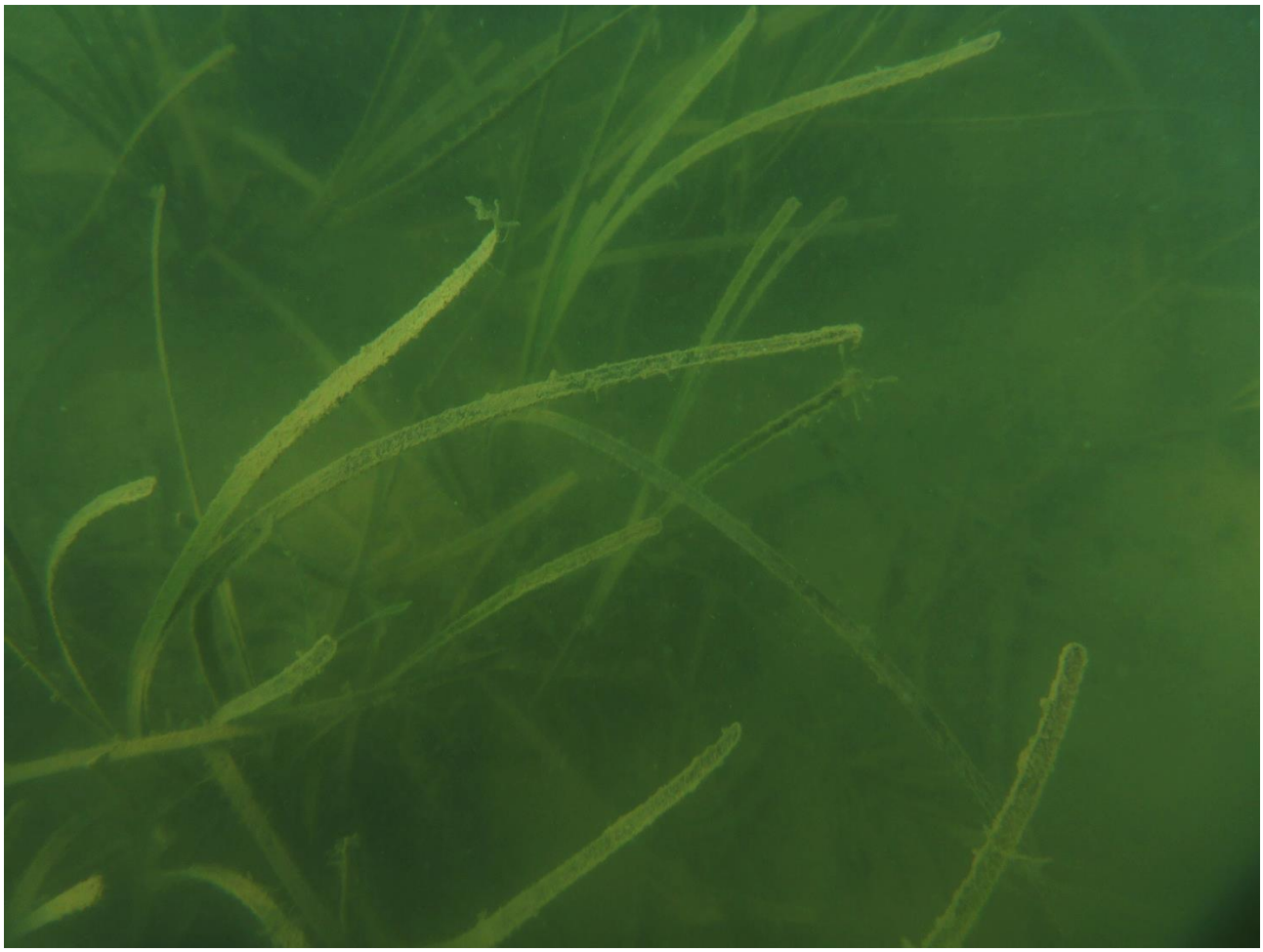
**Photograph 2**

Sydney rock oysters and *Hormosira banksii* colonising lower intertidal rock cobble and rock groyne toe.



**Photograph 3**

Bearded mussels and green algae (*Codium fragile*) colonising shallow subtidal rock cobble in planned jetty footprint.



**Photograph 4**

Low density *Zostera capricorni* seagrass 18.7m offshore in proposed ramp footprint.

# Appendix C – Likelihood assessments

## Likelihood of occurrence assessment – 128 Cove Boulevarde, North Arm Cove

## Threatened biota known or predicted from the locality

| Scientific Name | Common Name | BC Act | FM Act | EPBC Act | Habitat Association | Nature of Record | Likelihood of occurrence in the proposal site |
|---|---|---|---|---|---|---|---|
| ***Fauna - Birds*** | | | | | | | |
| *Anthochaera phrygia* | Regent Honeyeater | CE | | CE | The regent honeyeater has a patchy distribution between south-east Queensland and central Victoria. It primarily occurs in box-ironbark woodland, but also occurs in other forest types. The species primarily feeds on nectar and, to a lesser extent, insects and their exudates (lerps and honeydew). It mainly feeds on nectar from eucalypts and mistletoes and it prefers taller and larger diameter trees for foraging. | Foraging, feeding or related behaviour likely to occur within area | None<br>No suitable habitat present in the study area. |
| *Botaurus poiciloptilus* | Australasian Bittern | E | | E | When in Australia, distributed from Queensland to South Australia and Tasmania. Preferred habitat is permanent freshwater wetlands with tall, dense reed beds particularly Typha spp. And Eleocharis spp., with adjacent shallow, open water for foraging. Feeds on wetland animals including fish, eels, crayfish, and frogs. Roosts amongst dense reeds or rushes. | Species or species habitat likely to occur within area | None<br>No suitable habitat present in the study area. |
| *Calidris canutus* | Red Knot | | | E,M | The Red Knot is commonly found in most parts of coastal Australia except in the Great Australian Bight. Typical habitat includes intertidal mudflats, sandflats and sandy beaches on the coast, estuaries, bays, inlets, and harbours. Forage on substrate near the edge of the water on low tide. Have been recorded foraging on eelgrass. Breeds in Arctic areas. | Species or species habitat known to occur within area | **Low**<br>May occur in the study area on occasion.<br>**No impact**<br>Works are largely confined to the subtidal and would not cause impacts to potential marine foraging habitat for the species. |
| *Calidris ferruginea* | Curlew Sandpiper | E | | CE,M | Distributed around the Australian coast and widespread inland during their non-breeding season. Mainly reside on intertidal mudflats in sheltered coastal areas, like estuaries, bays, inlets and lagoons. Forage on mudflats, and amongst vegetation like saltmarsh and feeds on seagrass, seaweed, algae and waterweed. Roost on dry shingle, shell or sand beaches, sandspits and islets around wetlands or lagoons. | Species or species habitat known to occur within area | **Low**<br>May occur in the study area on occasion<br>**No impact**<br>Works are largely confined to the subtidal and would not cause impacts to potential marine foraging habitat for the species. |
| *Calidris tenuirostris* | Great Knot | V | | CE | Seen in scattered sites along the NSW coast. Occurs within sheltered, coastal habitats with intertidal mudflats or sandflats. Occasionally use mudflats near sandy spits, islets and on exposed reefs or rock platforms. | Roosting known to occur within area | **Low**<br>May occur in the study area on occasion<br>**No impact** |

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| *Charadrius mongolus* | Lesser Sand Plover | V | | E,M | Distributed throughout northern and eastern Australia. When not breeding, the species occurs in coastal littoral and estuarine environments. Inhabits large intertidal sandflats or mudflats in sheltered bays, harbours and estuaries. Can occur in saltmarsh and mangroves. Species feeds on freshly exposed intertidal mud and sand flats. Roosts near foraging areas. | Roosting known to occur within area | **Low**<br>May occur in the study area on occasion<br>**No impact**<br>Works are largely confined to the subtidal and would not cause impacts to potential marine foraging habitat for the species. |
| *Charadrius leschenaultii* | Greater Sand Plover | | | V,M | The Greater Sand Plover occurs in coastal areas in all states, though the greatest numbers occur in northern Australia. In the non breeding grounds in Australasia, the species is almost entirely coastal, inhabiting littoral and estuarine habitats. They mainly occur on sheltered sandy, shelly or muddy beaches with large intertidal mudflats or sandbanks, as well as sandy estuarine lagoons, and inshore reefs, rock platforms, small rocky islands or sand cays on coral reefs. They are occasionally recorded on near-coastal saltworks and salt lakes, including marginal saltmarsh, and on brackish swamps. | Species or species habitat likely to occur within area | **Low**<br>May occur in the study area on occasion<br>**No impact**<br>Works are largely confined to the subtidal and would not cause impacts to potential marine foraging habitat for the species. |
| *Diomedea antipodensis* | Antipodean Albatross | | | V,Mi,Ma | This is a marine species that breeds on offshore islands | Foraging, feeding or related behaviour likely to occur within area | None<br>Study area not within species distribution. Cliffs and sandy beaches closer to the ocean may provide more suitable temporary resting habitat for this migratory species. |
| *Diomedea antipodensis gibsoni* | Gibson's Albatross | | | V,Mi,Ma | This is a marine species that breeds on offshore islands | Foraging, feeding or related behaviour likely to occur within area | None<br>Study area not within species distribution. Cliffs and sandy beaches closer to the ocean may provide more suitable temporary resting habitat for this migratory species. |
| *Diomedea epomophora* | Southern Royal Albatross | | | V,Mi,Ma | This is a marine species that breeds on offshore islands | Foraging, feeding or related behaviour likely to occur within area | None<br>Study area not within species distribution. Cliffs and sandy beaches closer to the ocean may provide more suitable temporary resting habitat for this migratory species. |
| *Diomedea exulans* | Wandering Albatross | V | | V,Mi,Ma | The Wandering Albatross breeds on Macquarie Island. It feeds in Australian portions of the Southern Ocean. In the Australasian region, it occurs inshore, offshore and in pelagic waters. | Foraging, feeding or related behaviour likely to occur within area | None<br>Study area not within species distribution. Cliffs and sandy beaches closer to the ocean may provide more suitable temporary resting habitat for this migratory species. |

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| *Diomedea sanfordi* | North Roya Albatross | | | E,Ma,Mi | This is a marine species that breeds on offshore islands Northern Royal Albatrosses usually nest on the flat summits of tiny islands with herb fields and grasses. The nest is typically a low mound of vegetation, mud, feathers, stone chips etc, on flat ground and slopes on islands and headlands | Foraging, feeding or related behaviour likely to occur within area | None<br>Study area not within species distribution. Cliffs and sandy beaches closer to the ocean may provide more suitable temporary resting habitat for this migratory species. |
| *Erythrotriorchis radiatus* | Red Goshawk | CE | | V | The Red Goshawk is endemic to Australia, ranging from the western Kimberley region to north-eastern NSW. Occurs in coastal and sub-coastal areas in forest and woodland of tropical and warm-temperate Australia. Preferred vegetation types include eucalypt woodland, open forest, tall open forest, gallery rainforest, swamp sclerophyll forest, and rainforest margins. | Species or species habitat may occur within area | None<br>No suitable habitat present in the study area. |
| *Falco hypoleucos* | Grey Falcon | E | | V | The Grey Falcon is an elusive species endemic to mainland Australia. The species occurs in arid and semi-arid Australia, including the Murray-Darling Basin, Eyre Basin, central Australia and Western Australia. | Species or species habitat may occur within area | None<br>No suitable habitat present in the study area. |
| *Fregetta grallaria grallaria* | White-bellied Storm-petrel | | | E | The White-bellied Storm-Petrel (Tasman Sea) breeds on small offshore islets and rocks in the Lord Howe Island group. In the non-breeding season, it reaches and forages over near-shore waters along the continental shelf of mainland Australia. | Species or species habitat likely to occur within area | None<br>Study area not within species distribution. Cliffs and sandy beaches closer to the ocean may provide more suitable temporary resting habitat for this migratory species. |
| *Grantiella picta* | Painted Honeyeater | V | | V | Nomadic, occurring in low densities across most of NSW. Highest concentrations and almost all breeding occur on inland slopes of the Great Dividing Range. Inhabits Boree, Brigalow and Box Gum woodlands and Box-Ironbark forests. Specialist forager on the fruits of mistletoes, preferably of the Amyema genus. Nests in outer tree canopy. | Species or species habitat likely to occur within area | None<br>No suitable habitat present in the study area. |
| *Hirandapus caudacutus* | White-throated Needletail | | | V | In Australia, White-throated Needletails almost always forage aerially, at heights up to 'cloud level', above a wide variety of habitats ranging from heavily treed forests to open habitats, such as farmland, heathland or mudflats though they sometimes forage much closer to the ground in open habitats, once as low as about 15 cm in a coastal saltworks. | Species or species habitat likely to occur within area | None<br>No suitable habitat present in the study area. |
| *Lathamus discolor* | Swift Parrot | E | | CE | Migratory, travelling to the mainland from March to October. Breeds in Tasmania from September to January. On the mainland, it mostly occurs in the southeast foraging on winter flowering eucalypts and lerps, with records of the species between Adelaide and Brisbane. Principal over-winter habitat is box-ironbark communities on the inland slopes and plains. Eucalyptus dominated coastal forests are also important habitat. | Species or species habitat known to occur within area | None<br>No suitable habitat present in the study area. |

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| *Limosa lapponica baueri* | Alaskan Bar-tailed Godwit | | | V | Occurring on all coastal areas of Australia. Roosts on sandy beaches, sandbars, sandspits and near coastal saltmarsh. | Species or species habitat known to occur within area | **Low**<br>May occur in the study area on occasion<br>**No impact**<br>Works are largely confined to the subtidal and would not cause impacts to potential marine foraging habitat for the species. |
| *Macronectes giganteus* | Southern Giant Petrel | E | | E;M;Ma | The Southern Giant-Petrel breeds on six subantarctic and Antarctic islands in Australian territory. The winter dispersal is circumpolar, extending north to the Tropic of Capricorn and sometimes beyond. The waters off southeastern Australia may be particularly important wintering grounds. | Species or species habitat may to occur within area | None<br>Study area not within species distribution. Cliffs and sandy beaches closer to the ocean may provide more suitable temporary resting habitat for this migratory species. |
| *Macronectes halli* | Northern Giant Petrel | | | V,M,Ma | The Northern Giant Petrel breeds in the sub-Antarctic, and visits areas off the Australian mainland mainly during the winter months (May-October). Immature and some adult birds are commonly seen during this period in offshore and inshore waters from around Fremantle (WA) to around Sydney. | Foraging, feeding or related behaviour likely to occur within area | None<br>Study area not within species distribution. Cliffs and sandy beaches closer to the ocean may provide more suitable temporary resting habitat for this migratory species. |
| *Numenius madagascariensis* | Eastern Curlew | | | CE | The Curlew is a migratory bird that travels from Australia to Russia. In Australia it is primarily coastal, residing in estuaries, bays, harbours, inlets and coastal lagoons. Forages on crabs and molluscs on mudflats. | Species or species habitat known to occur within area | **Low**<br>May occur in the study area on occasion<br>**No impact**<br>Works are largely confined to the subtidal and would not cause impacts to potential marine foraging habitat for the species. |
| *Pachyptila turtu subantarctica* | Fairy Prion | | | V | The fairy prion (southern) breeds on Macquarie Island and a number of other subantarctic islands outside of Australia. The subspecies digs burrows among rocks or low vegetation in which to nest. Burrows may be dug below mat forming herbs. Fairy Prion feed by plucking food from the ocean surface. Some individuals may migrate towards New Zealand and southern Australia in winter. | Species or species habitat known to occur within area | None<br>Study area not within species distribution. |
| *Phoebetria fusca* | Sooty Albatross | | | V,Mi | This is a marine species that breeds on offshore islands. | Foraging, feeding or related behaviour likely to occur within area | None<br>Study area not within species distribution. Cliffs and sandy beaches closer to the ocean may provide more suitable temporary resting habitat for this migratory species. |
| *Pterodroma leucoptera leucoptera* | Gould's Petrel | | | E | Gould's Petrel is a pelagic marine species, spending much of its time foraging at sea and coming ashore only to breed. The Australian subspecies breeds and roosts on two islands off NSW, Cabbage Tree and Boondelbah Islands, and the at-sea distribution is poorly known. The foraging behaviour of the Gould's Petrel probably consists of seizing prey from the surface of the sea. The species has been recorded feeding in association with other seabirds as well as tuna and dolphins. | Species or species habitat may occur within area | None<br>No suitable habitat and distribution is in open waters off the coast. |

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| *Pterodroma neglecta neglecta* | Kermadec Petrel | V | | V | Range is over subtropical and tropical waters of the South Pacific. Balls Pyramid near Lord Howe Island and Phillip Island near Norfolk Island are the only Australian breeding sites. Diet is squid and crustaceans. Vagrant birds occur in coastal NSW waters, particularly after storm events. | Foraging, feeding or related behaviour may occur within area | None<br>No suitable habitat and distribution is in open waters off the coast. |
| *Pyconptilus floccossus* | Pilotbird | | | V | Pilotbirds are endemic to south-east Australia. Lowland Pilotbirds occur in forests from the Blue Mountains west of Newcastle, around the wetter forests of eastern Australia, to Dandenong near Melbourne. | Species or species habitat may occur within area | None<br>No suitable habitat present in the study area. |
| *Rostratula australis* | Australian Painted Snipe | E | | E | In NSW many records are from the Murray-Darling Basin, including the Paroo wetlands, Lake Cowal, Macquarie Marshes, Fivebough Swamp and more recently, swamps near Balldale and Wanganella. Other important locations with recent records include wetlands on the Hawkesbury River and the Clarence and lower Hunter Valleys. Prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber. | Species or species habitat likely to occur within area | None<br>No suitable habitat present in the study area. |
| *Sternula albifrons* | Little Tern | E | | Ma | In NSW occurs mainly north of Sydney, with smaller numbers south to VIC. Almost exclusively coastal, preferring sheltered environments; may occur several kilometres from the sea in harbours, inlets and rivers. Nests in low dunes or sandy beaches just above high tide mark near estuary mouths/ adjacent to coastal lakes and islands. Forage in shallow waters of estuaries, coastal lagoons and lakes, also along open coasts, less often at sea, and usually within 50 of shore. | Species or species habitat may occur within area | **Low**<br>May forage in the study area on occasion<br>**No impact**<br>Study area not within species distribution. Cliffs and sandy beaches closer to the ocean may provide more suitable temporary resting habitat for this migratory species. |
| *Thalassarche bulleri* | Buller's Albatross | | | V,M,Ma | Buller's Albatross breed in New Zealand, but are regular visitors to Australian waters. They are frequently seen off the coast from Coffs Harbour, south to Tasmania and west to Eyre Peninsula. Buller's Albatross are marine and pelagic. | Species or species habitat may occur within area | None<br>Study area not within species distribution. Cliffs and sandy beaches closer to the ocean may provide more suitable temporary resting habitat for this migratory species. |
| *Thalassarche cauta cauta* | Shy Albatross | V | | V,M | Most adult Shy Albatrosses remain in the waters off southeast Australia all year round, and seldom venture more than 600km from the breeding colony. Breeding occurs on Albatross Island, Bass Strait, and Mewstone and Pedra Branca, off southern Tasmania | Species or species habitat may occur within area | None<br>Study area not within species distribution. Cliffs and sandy beaches closer to the ocean may provide more suitable temporary resting habitat for this migratory species |
| *Thalassarche cauta steadi* | White-capped Albatross | | | Ma,Mi | The White-capped Albatross is probably common off the coast of south-east Australia throughout the year. This species is similar to the Shy Albatross and can be difficult to identify, especially at sea and as a juvenile. | Species or species habitat likely to occur within area | Unlikely<br>Study area not within species distribution. Cliffs and sandy beaches closer to the ocean may provide more suitable temporary resting habitat for this migratory species. |

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| *Thalassarche eremita* | Chatham Albatross | | | E,Ma,Mi | Breeding for the Chatham Albatross is restricted to Pyramid Rock, Chatham Islands, off the coast of New Zealand. The principal foraging range for this species is in coastal waters off eastern and southern New Zealand, and Tasmania. | Foraging, feeding or related behaviour may occur within area | None<br>Study area not within species distribution. Cliffs and sandy beaches closer to the ocean may provide more suitable temporary resting habitat for this migratory species. |
| *Thalassarche impavida* | Campbell Albatross | | | V,Ma,Mi | This is a marine species that breeds on offshore islands | Species or species habitat may occur within area | None<br>Study area not within species distribution. Cliffs and sandy beaches closer to the ocean may provide more suitable temporary resting habitat for this migratory species. |
| *Thalassarche melanophris* | Black-browned Albatross | | | V,Ma,Mi | This is a marine species that breeds on offshore islands | Foraging, feeding or related behaviour likely to occur within area | None<br>Study area not within species distribution. Cliffs and sandy beaches closer to the ocean may provide more suitable temporary resting habitat for this migratory species. |
| *Thalassarche salvini* | Salvin'sAlbatross | | | V,Ma,Mi | Salvin's Albatross is a marine species occurring in subantarctic and subtropical waters, reaching the tropics in the cool Humboldt Current, off South America. During the non-breeding season, the species occurs over continental shelves around continents. It occurs both inshore and offshore and enters harbours and bays | Foraging, feeding or related behaviour likely to occur within area | None<br>Study area not within species distribution. Cliffs and sandy beaches closer to the ocean may provide more suitable temporary resting habitat for this migratory species. |
| *Thalassarche steadi* | White-capped Albatross | | | V,Ma,Mi | The White-capped Albatross is a marine species occurring in subantarctic and subtropical waters, reaching the tropics in the cool Humboldt Current, off South America. During the non-breeding season, the species occurs over continental shelves around continents. It occurs both inshore and offshore and enters harbours and bays | Foraging, feeding or related behaviour likely to occur within area | None<br>Study area not within species distribution. Cliffs and sandy beaches closer to the ocean may provide more suitable temporary resting habitat for this migratory species. |
| ***Turtles*** | | | | | | | |
| *Caretta caretta* | Loggerhead Turtle | E | | E,M | In Australia, the Loggerhead Turtle occurs in the waters of coral and rocky reefs, seagrass beds and muddy bays throughout eastern, northern and western Australia. Nesting populations are known from southern Queensland and Western Australia. Loggerhead Turtles are carnivorous, feeding primarily on benthic invertebrates in habitat ranging from nearshore to 55 m. | Foraging, feeding or related behaviour known to occur within area | **Low**<br>Species would occur in the study area on an opportunistic basis and their occurrence would be transient in nature. |
| *Chelonia mydas* | Green Turtle | V | | V | The green turtle (Chelonia mydas) is widely distributed in the tropical and temperate waters off the Australian coast. They occur in coastal waters of NSW, where they are generally seen on the north and central coast. Whilst there is no known nesting areas within North Arm Cove they are frequently recorded within the estuary. Green turtles are herbivorous and forage/feed on a diet of seagrasses and macroalgae. | Foraging, feeding or related behaviour known to occur within area | **Moderate**<br>May occur in the study area on occasion. Suitable foraging/ feed habitat (seagrass & macroalgae). Recorded within North Arm Cove.<br>**Assessment of significance required.** |

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| *Dermochelys coriacea* | Leatherback Turtle | | | E | In Australia, leatherback turtles occur in tropical and temperate waters. Leatherback turtles are most commonly reported feeding in coastal waters in central eastern Australia (from the Sunshine Coast in southern Queensland to central New South Wales). Most leatherback turtles living in Australian waters migrate to breed in neighbouring countries, particularly in Indonesia, Papua New Guinea and the Solomon Islands. The leatherback turtle is carnivorous and feeds mainly in the open ocean on jellyfish and other soft-bodied invertebrates. | Breeding likely to occur within area | **Low**<br>Pelagic species, unlikely to occur within North Arm Cove. |
| *Eretmochelys imbricata* | Hawksbill Turtle | P | | V | Occurs in tropical, subtropical and temperate waters, and have been seen as far south as northern NSW. Key foraging and breeding grounds are located in WA, NT and Qld. | Species or species habitat known to occur within area | **Low**<br>Pelagic species, unlikely to occur within North Arm Cove. |
| *Natator depressus* | Flatback Turtle | P | | V,M,Mi,Ma | Key foraging and breeding sites are located in northern tropical and subtropical waters, but has been recorded along the NSW coast. | Foraging, feeding or related behaviour known to occur within area | None<br>Pelagic species, unlikely to occur within North Arm Cove. |
| ***Sharks*** | | | | | | | |
| *Carcharodon carcharias* | Great White Shark | | V | V,Mi,Ma | Great white sharks are widely, but not evenly, distributed in Australian waters. Areas where observations are more frequent include waters in and around some Fur seal and sea lion colonies such as the Neptune Islands (South Australia) and the islands off the lower west coast of Western Australia. Great white sharks also swim into bays and estuaries. The great white shark moves seasonally along the south and east Australian coasts, moving northerly along the coast during autumn and winter and returning to southern Australian waters by early summer. Juveniles appear to aggregate seasonally in certain key areas including the 90 Mile Beach area of eastern Victoria and the coastal region between Newcastle and Forster in NSW. Great white sharks eat a variety of prey including finfish, other sharks and rays, marine mammals, such as seals, sea lions, dolphins, and whales, as well as squid, crustaceans, and seabirds. | Breeding known to occur within area | **Low**<br>Insufficient habitat.<br>**No Impact**<br>Any occurrence of this species within the area would be infrequent, opportunistic, and transient in nature. There is no specific great white shark habitat or reliable food source within North Arm Cove (e.g., seal colonies, large aggregations of schooling fish). |
| *Carcharias taurus* | Grey Nurse Shark | | CE | CE | Grey nurse sharks are often observed just above the seabed in or near deep sandy-bottomed gutters or rocky caves, in the vicinity of inshore rocky reefs and islands. The diet of the adult grey nurse shark consists of a wide range of fish, other sharks, squids, crabs and lobsters. Grey nurse sharks have a broad inshore distribution, primarily in subtropical to cool temperate waters around the main continental land masses. | Species or species habitat likely to occur within area | **Low**<br>Not recorded within estuary. Species unlikely to occur within Belmont Bay. |
| *Rhincodon typus* | Whale Shark | | | V,Mi,Ma | Pelagic species. | Species or species habitat may occur within area | None<br>Pelagic species, unlikely to occur North Arm Cove. |
| *Lamna nasus* | Porbeagle, Mackerel Shark | | | Mi, Ma | In Australia, the species occurs in waters from southern Queensland to south-west Australia (Last & Stevens 2009). | Species or species habitat may occur within area | None |

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| | | | | | Animals typically occur in oceanic waters off the continental shelf, although they occasionally enter coastal waters (Francis et al. 2002). | | Pelagic species, unlikely to occur within North Arm Cove. |
| ***Fish*** | | | | | | | |
| *Epinephelus daemeli* | Black Rockcod | | V | V | Occurs within caves and gutters and beneath bommies on rocky reef, from near shore environments to depths of at least 50 metres. Small juvenile black rockcod are often found in coastal rock pools, and larger juveniles around rocky shores in estuaries. | Species or species habitat known to occur within area | None<br>No suitable habitat for species. |
| *Hippocampus whitei* | White's Seahorse | | E | E | White's Seahorse is endemic to the east coast of Australia. Favours shallow-water estuarine habitats, it is currently known to occur in eight estuaries on the NSW Coast, but is most abundant in Port Stephens, Sydney Harbour and Port Hacking. Its northern limit is Hervey Bay in Queensland, and it has been historically recorded as far south as St Georges Basin in NSW. Habitats that are considered important habitat for the White's Seahorse include natural habitats such as sponge gardens, seagrass meadows and soft corals. It is also known to use artificial habitats such as protective swimming net enclosures and jetty pylons. In Port Stephens, adult White's Seahorses show a preference for sponge, soft coral and Posidonia australis seagrass habitats. Pipehorses are found on soft bottoms near reefs or rubble in shallow to very deep waters, or amongst seagrasses | Species or species habitat known to occur within area | **Low**<br>Insufficient habitat for the species. No adverse impact expected. New jetty piles would provide additional habitat for seahorse. |
| *Thunnus maccoyii* | Southern Bluefin Tuna | | E | CD | Southern Bluefin Tuna are highly migratory pelagic fish. In Australian waters they range from northern NSW around southern Australia to northwestern Australia. Southern Bluefin Tuna are found in oceanic waters normally on the seaward side of the continental shelf. | Species or species habitat likely to occur within area | None<br>Pelagic species. |
| *Seriolella brama* | Blue Warehou | | | CD | Ranges from Portland, Queensland, to the Great Australian Bight, Western Australia, including northern and eastern Tasmania, and possibly to east of Albany, Western Australia. Elsewhere the species occurs in southern New Zealand. Blue Warehou mostly occur in offshore waters, although juveniles may be found in bays, estuaries and coastal waters. Juveniles (to about 35 cm in length) form large schools inshore to feed on plankton near the surface, although they also occur offshore to a depth of 100 m. 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 200 m. | Species or species habitat known to occur within area | None<br>Insufficient habitat. Species unlikely to occur within area. |
| *Manta alfredi* | Reef Manta Ray | | | Mi,Ma | Known on Australian waters from about Perth, Western Australia, around the tropical north to at least Sydney, New South Wales; | Species or species habitat may occur within area | **Low** |

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| | | | | | also Cocos (Keeling) Islands and Christmas Island in the eastern Indian Ocean. Elsewhere the species is circumglobal in tropical waters. Although Manta Rays are often seen inshore around coral and rocky reefs in tropical and subtropical waters, they also occur around offshore reefs and seamounts. Individuals undertake seasonal migrations and aggregate at certain sites, presumably during times of high seasonal plankton productivity. | | Area is at the southernmost extent of the species distribution, and not recorded within the locality. No impacts expected. |
| *Manta birostris* | Giant Manta Ray | | | Mi,Ma | Migratory, found in tropical, subtropical and temperate bodies of water, including productive coastal waters. Recorded from south-western Western Australia and up and around to southern coast of NSW down to depths of 120 metres. Feeds on plankton in warmer pelagic waters. Mating occurs December to April in waters 26-29°C. Gives birth to 1 to 2 live pups. | Species or species habitat may occur within area | **Low**<br>Area is at the southernmost extent of the species distribution, and not recorded within the locality. No impacts expected. |
| ***Mammals (whales, dolphins, dugong)*** | | | | | | | |
| *Balaenoptera musculus* | Blue Whale | E | | E, Mi | Eastern Australia/New Zealand population - This stock may reside in the Tasman Sea and the Lau Basin in winter and feed mostly in the South Taranaki Bight and off the coast of eastern North Island. Blue whales have been detected around New Zealand throughout the year.[2 | Species or species habitat may occur within area | None<br>Habitat in the study area is in shallow waters within an estuary, which is not suitable habitat for this species. |
| *Eubalaena australis* | Southern Right Whale | E | | E,Mi,Ma | Seasonally present on the Australian coast between about May and November. | Species or species habitat may occur within area | None<br>Habitat in the study area is in shallow waters within an estuary, which is not suitable habitat for this species. |
| *Balaenoptera edeni* | Brydes Whale | | | Mi, Ma | In the southwestern Pacific, they occur as far south as the North Island of New Zealand. | Species or species habitat may occur within area | None<br>Habitat in the study area is in shallow waters within an estuary, which is not suitable habitat for this species. |
| *Rhincodon typus* | Whale Shark | | | V,Mi,Ma | Pelagic species. In Australia, the Whale Shark is known from NSW, Queensland, Northern Territory, Western Australia and occasionally Victoria and South Australia, but it is most commonly seen in waters off northern Western Australia, Northern Territory and Queensland | Species or species habitat may occur within area | None<br>Pelagic species, unlikely to occur within North Arm Cove. |
| *Orcinus orca* | Killer Whale | | | V, Mi, Ma | In Australia, Killer Whales are recorded from all states, with concentrations reported around Tasmania. | Species or species habitat may occur within area | None<br>Pelagic species, unlikely to occur North Arm Cove |
| *Megaptera novaeangliae* | Humpback Whale | | | Mi,Ma | Both the east coast and west coast Australian populations make their annual migrations between breeding areas in tropical waters along the east and west coast of Australia (15° S to 20° S) and feeding areas in the Antarctic (south of 56° S. The east Australian | Species or species habitat may occur within area | None<br>Habitat in the study area is in shallow waters within an estuary, which is not suitable habitat for this species. |

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| | | | | | population is currently believed to rely predominately on a feeding area that is between 130° E and 170° W. | | |
| *Dugong dugon* | Dugong | E | | MI, Ma | Dugongs (Dugong dugong) occur in coastal and inland waters from Shark Bay in Western Australia (25° S) across the northern coastline to Moreton Bay in Queensland (27° S) (Marsh et al. 2002, 2011a). Stranded dugongs have been recorded as far south as ~36.5° S on the east coast, with occasional sightings south to 32–33.5° S (Newcastle region) in summer (Allen et al. 2004). Dugongs spend most of their time in the neritic zone, especially near tidal and subtidal seagrass meadows. | Species or species habitat may occur within area | Low<br>Feeding/foraging habitat (seagrass) occurs within the study area however, dugong would be at the extreme southern limit of its distribution and there are no records of dugong within North Arm Cove.<br>No impact |
| *Lagenorhynchus obscurus* | Dusky Dolphin | | | Mi, Ma | In Australia, Dusky Dolphins are known from only 13 reports since 1828, with two sightings in the early 1980s (DEW 2007). They occur across southern Australia from Western Australia to Tasmania (Gill et al. 2000), with unconfirmed sightings south of continental Australia but confirmed sightings near Kangaroo Island, South Australia, and off Tasmania, and a recent stranding in the latter State. | Species or species habitat may occur within area | Low<br>Pelagic species. Any occurrence of the species would be opportunistic and transient in nature.<br>No impact |
| ***Migratory Bird Species*** | | | | | | | |
| *Actitis hypoleucos* | Common Sandpiper | | | M | Found along the Australian coastline, and areas inland. When in Australia, the species is concentrated in Northern and Western Australia. Habitat includes coastal and inland wetlands, with varying levels of salinity. Mostly found on muddy margins or rocky shores of mudflats. These margins are often narrow and steep. | Species or species habitat known to occur within area | **Low**<br>May occur in the study area on occasion<br>**No impact**<br>Works are largely confined to the subtidal and would not cause impacts to potential marine foraging habitat for the species. |
| *Arenaria interpres* | Ruddy Turnstone | | | M | Widespread throughout the Australian coastline. Typical habitat for the species includes coastal regions with rocky shores and coral reefs. Lives near platforms and shelves, often with shallow tidal pools. | Roosting known occur within area | **Low**<br>May occur in the study area on occasion<br>**No impact**<br>Works are largely confined to the subtidal and would not cause impacts to potential marine foraging habitat for the species. |
| *Calidris acuminata* | Sharp-tailed Sandpiper | | | | When in Australia, this species is distributed widespread along the coast. The species prefers habitat with muddy edges of fresh or brackish water. Forage in saltmarsh, grass, or sedges. Also, in sewage ponds and hypersaline environments. | Roosting known to occur within area | **Low**<br>May occur in the study area on occasion<br>**No impact**<br>Works are largely confined to the subtidal and would not cause impacts to potential marine foraging habitat for the species. |
| *Calidris canutus* | Red Knot | | | E,M | The Red Knot is commonly found in most parts of coastal Australia except in the Great Australian Bight. Typical habitat includes intertidal mudflats, sandflats and sandy beaches on the coast, estuaries, bays, inlets and harbours. Forage on substrate near the edge of the water on low tide. Have been recorded foraging on eelgrass. Breeds in Arctic areas. | Species or species habitat known to occur within area | **Low**<br>May occur in the study area on occasion<br>**No impact**<br>Works are largely confined to the subtidal and would not cause impacts to potential marine foraging habitat for the species. |

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| *Calidris ferruginea* | Curlew Sandpiper | E | | CE,M | Distributed around the Australian coast and widespread inland during their non-breeding season. Mainly reside on intertidal mudflats in sheltered coastal areas, like estuaries, bays, inlets and lagoons. Forage on mudflats, and amongst vegetation like saltmarsh and feeds on seagrass, seaweed, algae and waterweed. Roost on dry shingle, shell or sand beaches, sandspits and islets around wetlands or lagoons. Breeding occurs in Siberia (TSSC, 2015). | Species or species habitat known to occur within area | **Low**<br>May occur in the study area on occasion<br>**No impact**<br>Works are largely confined to the subtidal and would not cause impacts to potential marine foraging habitat for the species. |
| *Calidris melanotos* | Pectoral Sanpiper | | | M | Distributed throughout the Australia coast. Preferred habitat is shallow, fresh to saline wetlands. | Species or species habitat may occur within area | **Low**<br>May occur in the study area on occasion<br>**No impact**<br>Works are largely confined to the subtidal and would not cause impacts to potential marine foraging habitat for the species. |
| *Calidris ruficollis* | Red-necked Stint | | | M | Occurs along most of the Australian coastline, but concentrates around the Victorian and Tasmanian coastline when in Australia. Found in coastal areas including sheltered inlets, bays, lagoons and estuaries with intertidal mudflats. Will also occur in saltmarsh amongst ephemeral wetlands. | Roosting known to occur within area | **Low**<br>May occur in the study area on occasion<br>**No impact**<br>Works are largely confined to the subtidal and would not cause impacts to potential marine foraging habitat for the species. |
| *Charadrius bicinctus* | Double-banded Plover | | | M | Found on littoral, estuarine and fresh or saline terrestrial wetlands and also saltmarsh, grasslands, and pasture. It occurs on muddy, sandy, shingled or sometimes rocky beaches, bays and inlets, harbours, and margins of fresh or saline terrestrial wetlands such as lakes, lagoons and swamps, shallow estuaries and rivers. The species is sometimes associated with coastal lagoons, inland salt lakes and saltworks. It is also found on seagrass beds, especially Zostera, which, when exposed at low tide, remain heavily saturated or have numerous water-filled depressions. | Roosting known to occur within area | **Low**<br>May occur in the study area on occasion<br>**No impact**<br>Works are largely confined to the subtidal and would not cause impacts to potential marine foraging habitat for the species. |
| *Gallinago hardwickii* | Latham's Snipe | | | M | Latham's Snipe sometimes occur in habitats that have saline or brackish water, such as saltmarsh, mangrove creeks, around bays and beaches, and at tidal rivers. The foraging habitats of Latham's Snipe are characterized by areas of mud (either exposed or beneath a very shallow covering of water) and some form of cover (e.g. low, dense vegetation. The snipe roost on the ground near (or sometimes in) their foraging areas, usually in sites that provide some degree of shelter, e.g. beside or under clumps of vegetation, among dense tea-tree, in forests, in drainage ditches or plough marks, among boulders, or in shallow water if cover is unavailable. | Species or species habitat likely to occur within area | **Low**<br>May occur in the study area on occasion<br>**No impact**<br>Works are largely confined to the subtidal and would not cause impacts to potential marine foraging habitat for the species. |
| *Gallinago stenura* | Pin-tailed Snipe | | | M | Species distribution in Australia is not well known, but there are records of sighting from New South Wales, Western | Roosting likely to occur within area | **Low**<br>May occur in the study area on occasion |

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| | | | | | Australia and the Pilbara. During non-breeding periods, the species occurs on the edges of shallow freshwater swamps, ponds and lakes with grass/sedge cover | | **No impact**<br>Works are largely confined to the subtidal and would not cause impacts to potential marine foraging habitat for the species. |
| *Limosa lapponica* | Bar-tailed Godwit | | | M | Occurring on all coastal areas of Australia. Roosts on sandy beaches, sandbars, sand spits and near coastal saltmarsh. | Species or species habitat known to occur within area | **Low**<br>May occur in the study area on occasion<br>**No impact**<br>Works are largely confined to the subtidal and would not cause impacts to potential marine foraging habitat for the species. |
| *Limosa Limosa* | Black-tailed Godwit | | | M | Found in all states of Australia on the coast, where it resides in sheltered bays, estuaries and lagoons with large intertidal mudflats or sand flats. | Roosting known to occur within area | **Low**<br>May occur in the study area on occasion<br>**No impact**<br>Works are largely confined to the subtidal and would not cause impacts to potential marine foraging habitat for the species. |
| *Numenius madagascariensis* | Eastern Curlew | | | CE,M | The eastern curlew takes an annual migratory flight to Russia and north-eastern China to breed, arriving back home to Australia in August to feed on crabs and molluscs in intertidal mudflats. | Species or species habitat known to occur within area | **Low**<br>May occur in the study area on occasion<br>**No impact**<br>Works are largely confined to the subtidal and would not cause impacts to potential marine foraging habitat for the species. |
| *Numenius minutus* | Little Curlew | | | M | Occurs along the coastline when in Australia but has also been seen inland. Often found feeding in short, dry grassland and sedge land, including floodplains and black soil plains. Habitat includes open woodlands with a grassy understorey, dry saltmarsh, coastal swamps, mudflats or sand flats. | Roosting likely to occur within area | **Low**<br>May occur in the study area on occasion<br>**No impact**<br>Works are largely confined to the subtidal and would not cause impacts to potential marine foraging habitat for the species. |
| *Numensius phaeopus* | Whimbrel | | | M | Found on intertidal mudflats on sheltered coasts. Also occurs in harbours, lagoons, estuaries and river deltas. | Roosting likely to occur within area | **Low**<br>May occur in the study area on occasion<br>**No impact**<br>Works are largely confined to the subtidal and would not cause impacts to potential marine foraging habitat for the species. |
| *Pandion haliaetus* | Osprey | V | | M | The species occurs in littoral and coastal habitats and terrestrial wetlands in tropical and temperate Australia, and offshore islands mostly found in coastal regions on cliffs, but also occur along rivers. Feeding requires expansive areas of open fresh, brackish or saline water. | Breeding known to occur within area | **Low**<br>May occur in the study area on occasion<br>**No impact**<br>Works are largely confined to the subtidal and would not cause impacts to potential marine foraging habitat for the species. |
| *Pluvialus fulva* | Pacific Golden Plover | | | M | Pacific Golden Plovers usually occur on beaches, mudflats and sandflats (sometimes in vegetation such as mangroves, low saltmarsh or beds of seagrass) in sheltered areas including harbours, estuaries and lagoons, and also in evaporation ponds in saltworks. | Roosting known to occur within area | **Low**<br>May occur in the study area on occasion<br>**No impact** |

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| | | | | | | | Works are largely confined to the subtidal and would not cause impacts to potential marine foraging habitat for the species. |
| *Pluvialis squatarola* | Grey Plover | | | M | Occur almost entirely in coastal areas, usually in sheltered embayments with mud or sandflats and occasionally on rocky coasts or near-coastal lakes and swamps. Very occasionally recorded further inland. Forage on exposed mudflats and beaches. | Roosting known to occur within area | **Low**<br>May occur in the study area on occasion<br>**No impact**<br>Works are largely confined to the subtidal and would not cause impacts to potential marine foraging habitat for the species. |
| *Tringa brevipes* | Grey-tailed Tattler | | | M | Often found on sheltered coasts with reefs and rock platforms or with intertidal mudflats. It has also been recorded foraging on exposed intertidal mudflats, especially with mangroves and possibly seagrass nearby. Occasionally it forages on intertidal sandflats, around banks of seaweed or protruding rocks or lumps of coral | Roosting known to occur within area | **Low**<br>May occur in the study area on occasion<br>**No impact**<br>Works are largely confined to the subtidal and would not cause impacts to potential marine foraging habitat for the species. |
| *Tringa nebularia* | Common Greenshank | | | M | This species has the widest national distribution than any other shorebird in Australia, as it occurs inland and on the coast throughout all states in Australia. The typical habitat for the common greenshank includes inland wetlands and sheltered coastal habitats. Coastal habitats with mudflats and saltmarsh, mangroves, or seagrass is favoured. | Species or species habitat known to occur within area | **Low**<br>May occur in the study area on occasion<br>**No impact**<br>Works are largely confined to the subtidal and would not cause impacts to potential marine foraging habitat for the species. |
| *Tringa stagnatilis* | Marsh Sandpiper | | | M | Found on coastal and inland Australia, in permanent or ephemeral wetlands of varying salinity like swamps, saltpans and estuaries. | Roosting known to occur within area | **Low**<br>May occur in the study area on occasion<br>**No impact**<br>Works are largely confined to the subtidal and would not cause impacts to potential marine foraging habitat for the species. |
| *Xenus cinereus* | Terek Sandpiper | | | | Coastal distribution along northern and eastern Australia. Mostly forages in the open, on soft, wet intertidal mudflats or in sheltered estuaries, embayments, harbours or lagoons. Roosts in mangroves. | Roosting known to occur within area | **Low**<br>May occur in the study area on occasion<br>**No impact**<br>Works are largely confined to the subtidal and would not cause impacts to potential marine foraging habitat for the species. |

# Appendix D – Test of significance

***Assessment of Significance Test***

***Green Turtle (Chelonia mydas)***

The Green Turtle is widely distributed in the tropical and temperate waters off the Australian coast. They occur in coastal waters of NSW, where they are generally seen on the north and central coast. Whilst there is no known nesting areas within Port Stephens they are frequently recorded as vagrants within the estuary. Green turtles are herbivorous and forage/feed on a diet of seagrasses and macroalgae. The species breeds along the Great Barrier Reef.

The Green Turtle is listed as a Vulnerable species under BC Act & EPBC Act.

**Test for determining whether proposed development or activity likely to significantly affect vulnerable species, or their habitats**

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

The new construction would directly disturb a small area of seagrass habitat ($0.1m^2$). The direct disturbance of such a small area of seagrass would not adversely affect the life cycle of the Green Turtle such that a viable local population would be placed at risk of extinction.

Construction would require a variety of vessels, including large barges which would move infrequently. These work vessels would be travelling at low speeds to comply with NSW Maritime safety restrictions (≤6 knots within 30m of land or structures). The risk of turtle strike from construction vessels is considered very low as any occurrence of the Green Turtle within the area would be infrequent and transient in nature, vessels would be travelling at low speeds, during daylight hours and vessel and construction noise would likely deter turtles and other large fauna.

**(b) in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity—**

Not applicable

**(c) in relation to the habitat of a threatened species or ecological community—**

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

Approximately $0.1m^2$ of seagrass habitat being potential feed/foraging habitat for the green turtle would be directly disturbed by jetty pile installation. This is an extremely small area of seagrass when compared with the available area of seagrass habitat within Port Stephens. The loss of such a small area is considered negligible.

**(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and**

The proposal would not fragment or isolated any areas of Green Turtle (seagrass) habitat.

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

The loss of a small area of seagrass habitat is not considered important to the long-term survival of the Green Turtle within Port Stephens.

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

The proposal is not located within an area of outstanding biodiversity value and would not impact on any area of biodiversity value either directly or indirectly.

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

The works and ongoing use of the jetty is not considered a KTP.

**Conclusion**

The proposed development is not likely to significantly affect the Green Turtle or its habitat.