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Sydney Fish Market Pontoon Relocation Marine Ecology Impact Statement

Infrastructure NSW

DOCUMENT TRACKING

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Template 2.8.1

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Abbreviations

Abbreviation	Description
BC Act	NSW <i>Biodiversity Conservation Act 2016</i>
DPI	NSW Department of Primary Industries
ELA	Eco Logical Australia Pty Ltd
EPBC Act	Commonwealth <i>Environment Protection and Biodiversity Conservation Act 1999</i>
FM Act	NSW <i>Fisheries Management Act 1994</i>
KFH	Key fish habitat

Executive summary

Infrastructure NSW (INSW) proposes to relocate the Sydney Fish Markets Landing Pontoon 160 m north-west to the Timber Wharf. Relocation would require sediment reprofiling to accommodate the pontoon and installation of new support piles. Other piling works are required to create a new berthing area for fishing vessels (net spooling zone) on the Concrete Wharf. The purpose of the works is to make room for the construction of the new Sydney Fish Markets without disrupting commercial and private vessels. This report has been prepared as a technical appendix for the Review of Environmental Factors. Consideration has been given to DPI Fisheries' Policy and Guidelines for Fish Habitat Conservation and Management (2013 update).

This assessment combines desktop and underwater field surveys in 2017 and 2021 across Blackwattle Bay. Within the study area for the proposed works, there is only Type 3 key fish habitat (KFH) in the form of subtidal silty sand with sparse to dense infauna, intertidal rock rubble, seawalls and man-made structures. There is no Type 1 highly sensitive KFH in Blackwattle Bay. The nearest Type 2 moderately sensitive KFH is the band of macroalgae 280 m away on the opposite side of the bay.

A targeted survey did not find any occurrence of seahorses, and concluded that no suitable habitat is present on the existing piles or pontoon and they are highly unlikely to use the site. No other threatened species, populations of communities are likely to be impacted by the works.

The piling works would have a minor impact to the unvegetated substrate, but create new vertical hard habitat. The sediment reprofiling would impact benthic infauna, but these species would return over time. During construction, sediment plumes will be contained with a silt curtain. Short-term sediment upwelling may also occur during operation as boat propellers and thruster jets may not have been used in the approach and turning areas. There would be no net loss of key fish habitat, therefore, no further offsets or environmental compensation is required for the proposal.

This aquatic ecology assessment concludes that the proposed pontoon relocation, sediment reprofiling and additional piles would:

- not have a significant impact on any threatened species, population or community
- not trigger the need for a Species Impact Statement, nor further appraisal using the Biodiversity Assessment Method, nor referral to a Commonwealth body
- not require a permit to *Harm Marine Vegetation* under Part 7 of the FM Act
- not require fauna management in regard to syngnathids (seahorses and their relatives) or Black rockcod.

1. Introduction

Infrastructure NSW (INSW) requires a Marine Ecology Impact Statement for the relocation of the existing Sydney Fish Markets Landing Pontoon to the north side of the Timber Wharf, including sediment reprofiling (Figure 1 and Figure 2). Other piling works are required to create a new berthing area for fishing vessels. The purpose of the works is to make room for the construction of the new Sydney Fish Markets without disrupting commercial and private vessels. This report has been prepared as a technical appendix for the Review of Environmental Factors (REF) prepared by others.

The aim of this report is to increase knowledge of the biota and habitats occurring near the proposed work. With this understanding, we determine if any significant impact would occur to threatened species, communities or populations from the proposed development as defined in Part 5 of the NSW *Environmental Planning and Assessment Act 1979*; and if a permit to *Harm Marine Vegetation* is required under Section 205 of the NSW *Fisheries Management Act 1994* (FM Act). The following tasks were undertaken to address these aims:

- Desktop review of existing literature and site data to confirm the presence of known and likely species and habitats in a given study area
- Underwater marine habitat survey
- Mapping and photography of key fish habitat (KFH) (eg seagrasses, mangroves, saltmarsh, macroalgae beds)
- Assessment of the density and condition of aquatic flora and KFH, including verification of any threatened or protected species, populations or ecological communities, pest species or presence of 'critical habitat' that may occur locally in the marine environment
- Provide recommendations to mitigate impact and assist management of construction and operational outcomes.

Consideration has been given to DPI Fisheries' Policy and Guidelines for Fish Habitat Conservation and Management (2013 update, Fairfull 2013).

1.1 Proposed works

The relocation of the existing Sydney Fish Markets Landing Pontoon to the north side of the Timber Wharf and other piling work as shown in Figure 1 and Figure 2 would require:

- Detachment of the existing 9 m long pontoon and 9 m long gangway, which would be towed to the new location 160 m to the north-west.
- Pulling or cutting of two concrete/steel piles supporting the pontoon. These would be disposed of at a licensed recycling or waste facility.
- Minor sediment reprofiling to RL -1.85 m around the pontoon's new location, approximately 22 x 15 m surface area of seabed (approx.. 350 m³). This would allow for a clearance of 1200 mm beneath the pontoon at the lowest astronomical tide. Sediment would be spread near the end of the timber wharf in deeper water.
- Installation of two new piles to support the pontoon in its new location.
- Attachment of the pontoon and gangway to the new piles and existing timber wharf.
- Installation of two protection piles on the northern side of the concrete jetty for fishing boats to use as a net spooling area (currently performed at the at the end of the concrete wharf).

- Installation of eight mooring piles at the end of the Timber Wharf.

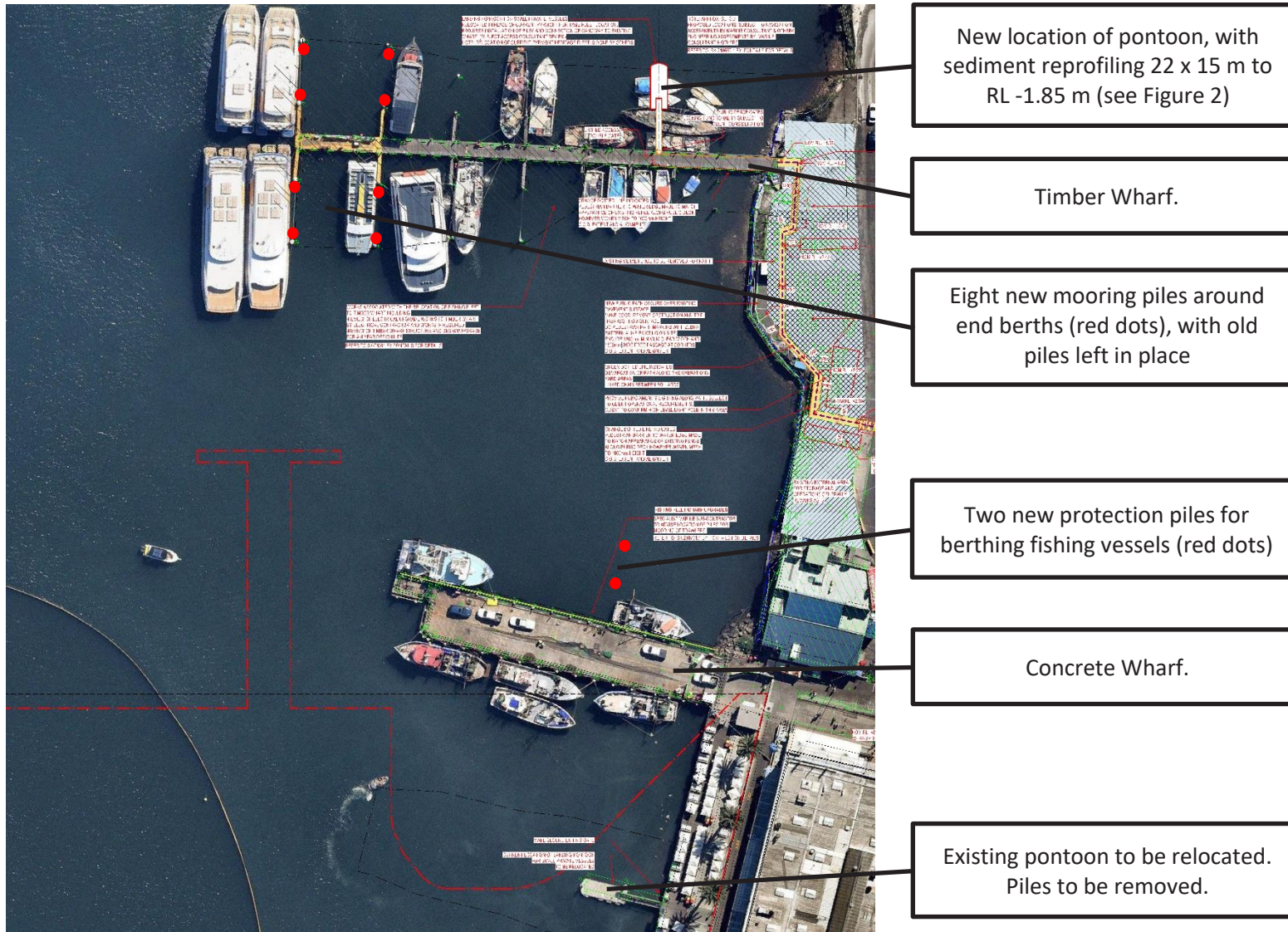


Figure 1: Proposed works to relocate boating infrastructure

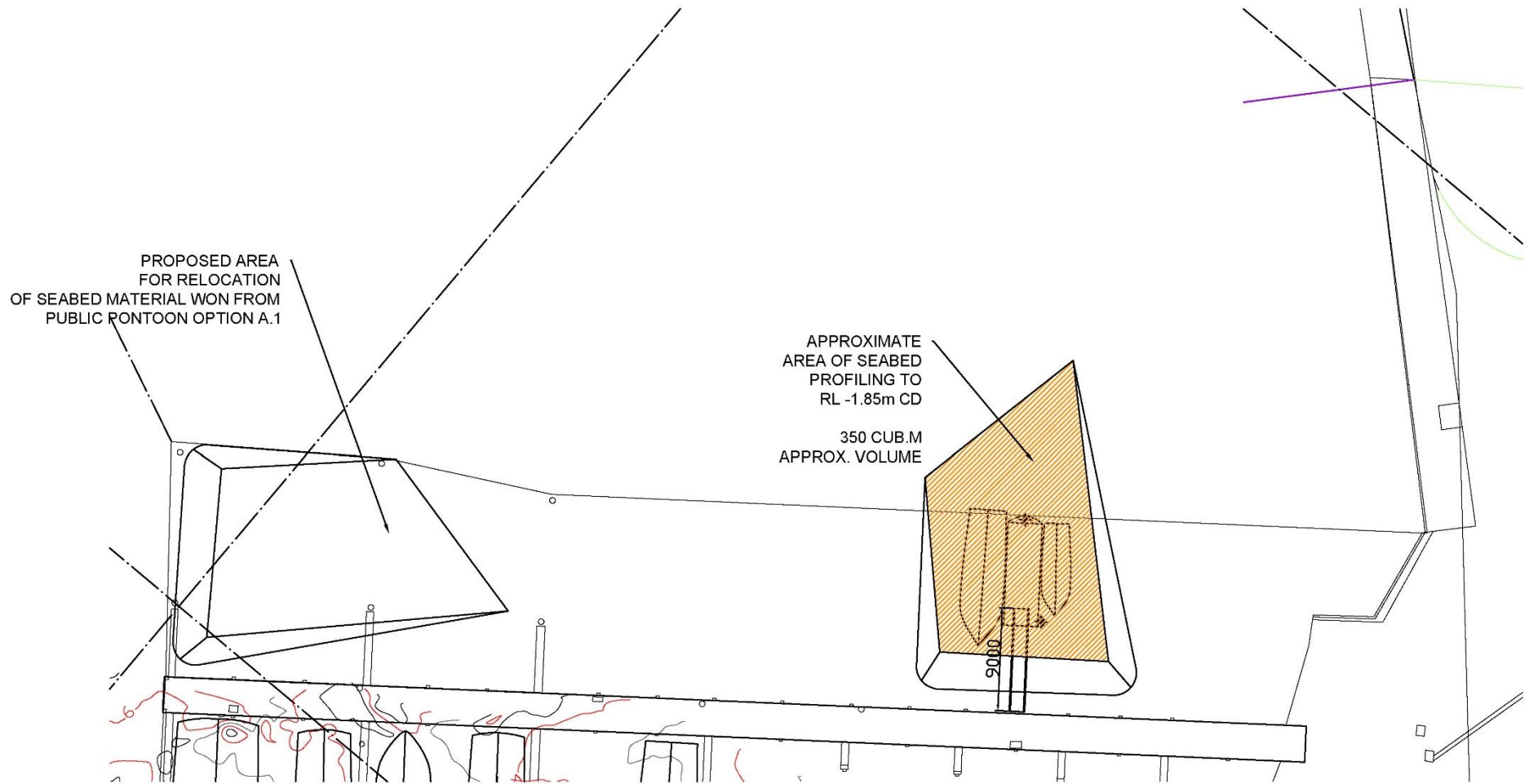


Figure 2: Sediment reprofiling around new location of pontoon

2. Legislative context

2.1 Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)

Under the EPBC Act, the Commonwealth Environment Minister needs to approve any development that is likely to have a significant impact on Matters of National Environmental Significance (MNES). Should such an impact, as defined in the EPBC Act Policy Statement 1.1 – Significant Impact Guidelines (DEWHA 2009), be likely, the preparation and submission of a Referral is required. MNES relevant to this study includes threatened ecological communities, flora and fauna species and migratory species that are listed under the Act. The proposed work would not cause a significant impact, and therefore a Referral would not be required.

2.2 NSW Environmental Planning and Assessment Act 1979 (EP&A Act)

All developments in NSW are assessed in accordance with the provisions of the EP&A Act and the EP&A Regulation. The EP&A Act provides a system for environmental planning and assessment, including approvals and environmental impact assessment requirements for proposed developments. Implementation of the EP&A Act is the responsibility of the Minister for Planning, statutory authorities and local councils.

2.3 NSW Biodiversity Conservation Act 2016 (BC Act)

Under the BC Act, an assessment of significance must be completed to determine the significance of impacts to threatened species, populations and/or communities or their habitat. There are unlikely to be any listed threatened aquatic species, populations or communities within the study area, therefore, no impact is expected and an assessment of significance has not been triggered. As no native terrestrial vegetation would be cleared or harmed, and the site is not located within the 'Biodiversity Value Map', the proposal does not trigger a test of significance or require further assessment under The Biodiversity Assessment Method. The gangway of the existing pontoon is exposed to the elements and does not provide roosting habitat for microbats (verified during field inspection).

2.4 NSW Fisheries Management Act 1994 (FM Act)

The FM Act is the principal piece of legislation protecting aquatic habitat in NSW. The act aims to conserve fish stocks, KFH, aquatic vegetation, and threatened species, populations and communities. Threatened aquatic species, populations and communities are listed under Schedules 4, 4A and 5 of the FM Act, while key threatening processes are listed under Schedule 6. There are no other threatened species, populations or communities listed under the FM Act that are likely to use the site or depend on it for habitat.

If works involve harm to marine vegetation (saltmarsh, mangroves, macroalgae or seagrass), then the proponent would require a permit under Section 205 of the FM Act.

2.5 NSW Water Management Act 2000 (WM Act)

The WM Act aims to provide for the sustainable and integrated management of water sources for NSW. The Act requires developments on waterfront land to be ecologically sustainable, and recognises the benefits of aquatic ecosystems to agriculture, fisheries, and recreation.

Approvals under Section 91 are required for controlled activities on waterfront land. Under the WM Act, a controlled activity means any of the following:

- a. the erection of a building or the carrying out of a work (within the meaning of the EP&A Act)
- b. the removal of material (whether or not extractive material) or vegetation from land, whether by way of excavation or otherwise
- c. the deposition of material (whether or not extractive material) on land, whether by way of landfill operations or otherwise
- d. the carrying out of any other activity that affects the quantity or flow of water in a water source.

Section 91E(1) of the WM Act identifies that it is an offence to carry out a controlled activity in, on or under waterfront land without gaining a controlled activity approval. However, under Clause 41 of the *Water Management (General) Regulation 2018*, public authorities are exempt from Section 91E(1) of the WM Act, and therefore do not require any approvals for controlled activities on waterfront land.

2.6 Sydney Regional Environmental Plan (SREP, Sydney Harbour Catchment) 2005

The proposal is located within the Sydney Harbour Catchment and is subject to the SREP (Sydney Harbour Catchment) 2005. The SREP lists matters that the proponent is to consider before carrying out any activity determined under Part 5 of the EP&A Act. Relevant Clauses to this aquatic ecology assessment are:

- Clause 21: biodiversity, ecology and environment protection
- Clauses 61–63: wetland protection.

Clause 21 has been considered in Section 5.4. As no wetlands are mapped within or near the site, clauses 61-63 have not been considered further.

2.7 NSW Coastal Management Act 2016 (CM Act) and State Environmental Planning Policy (Coastal Management) 2018 (Coastal Management SEPP)

The objects of this Act are to manage the coastal environment of NSW in a manner consistent with the principles of ecologically sustainable development for the social, cultural and economic well-being of the people of the State. Part 2 of the CM Act identifies objectives related to four coastal management areas of the 'coastal zone':

- Coastal wetlands and littoral rainforests area
- Coastal vulnerability area
- Coastal environment area
- Coastal use area.

Under the Coastal Management SEPP, no wetlands or littoral rainforests are identified on or near the site.

The site is zoned as a 'coastal environment area'. However, Clause 13(3) of the Coastal Management SEPP states that development controls for 'coastal environment areas' do not apply to land within the Foreshores and Waterways Area within the meaning of the *Sydney Regional Environmental Plan (Sydney Harbour Catchment) 2005*. Therefore, the Coastal Management SEPP does not apply to this proposal.

2.8 Ports and Maritime Administration Regulation 2012

Clause 67ZN states that a person must not use drags, grapplings, or other apparatus for lifting any object or material from the bed of a port described in Schedule 1, or otherwise disturb any such bed in any way, except with the written permission of the relevant Harbour Master and in accordance with the conditions attaching to such permission.

Schedule 1 describes the port boundaries, that includes the waters of Sydney Harbour and of all tidal bays, rivers and their tributaries connected or leading to Sydney Harbour bounded by mean high water mark together with that part of the Tasman Sea below mean high water mark enclosed by the arc of a circle of radius 4 nautical miles having as its centre the navigation light at Hornby Lighthouse.

3. Methods

3.1 Desktop assessment

Online database searches were used to confirm the presence of recorded species in the region prior to the field survey. This was then used to infer what was likely to be present in the study area. The desktop search covered Port Jackson (Sydney Harbour including tidal areas of Parramatta River and Lane Cove River) plus a 10 km buffer. The desktop search grid is about 50 x 30 km using the coordinates:

- Latitude: -33.6974792526866, Longitude: 150.915584274089
- Latitude: -33.6974792526866, Longitude: 151.474105513707
- Latitude: -33.9762150862402, Longitude: 151.474105513707
- Latitude: -33.9762150862402, Longitude: 150.915584274089.

Only species known to use estuarine/marine water or intertidal foreshores were considered in this aquatic assessment. Databases accessed include:

- EPBC Act – Protected Matters Search Tool
- BC Act – Threatened Species Search Tool (BioNet)
- FM Act – Listed protected and threatened species and populations, including species profiles, ‘Primefact’ publications and expected distribution maps (Riches et al 2016)
- Online Zoological Collections of Australian Museums (OZCAM) and Atlas of Living Australia – individual species searches to determine likelihood of occurrence of threatened species.

3.2 Field survey

The previous survey in 2017 was undertaken for all of Blackwattle Bay. In that survey, underwater video transects were achieved by lowering a boat-mounted video camera to the seafloor and around piles. A GoPro 8 inside a Spot X™ Squid Cast drop camera system allowed for live streaming of habitat features to an on-board monitor. Video was recorded to allow post-field examination of high definition footage. GPS mapping of transects ensured all habitat types were adequately surveyed. Habitat types were mapped in the field using a GPS-enabled tablet. Georeferenced high definition footage was later reviewed to check habitat extent and condition. Aquatic flora and KFH mapped in the field were merged into a final map using ArcPro.

For this study, the site was re-visited between 11 am and 12 pm on 30 June 2021 by two ELA ecologists, including one senior aquatic ecologist. The aim of the survey was to validate the 2017 mapping and search for seahorses around the pontoon and piles. The survey area covered at least 20 m from the edge of proposed work using a 5 m extendable pole mounted with an underwater video camera. Weather conditions were calm and with no swell. Underwater visibility was poor (<2 m), with the inner bay turbid from recent storms. The maximum depth surveyed was approximately 5 m.

4. Aquatic habitats and ecology

4.1 Previous aquatic habitat mapping

Map 8 of the 'Sydney Harbour - Foreshores and Waterways Area Development Control Plan 2005: Ecological Communities and Landscape Characters', does not identify the site as any aquatic ecological community (Figure 3).

Sheet 4 of the 'Sydney Regional Environmental Plan (Sydney Harbour Catchment) 2005: Wetlands Protection Area', shows no 'Wetlands Protection Areas' in or near the study area (Figure 4). Therefore, no further assessment is required for wetlands under Clause 61-63 of the SREP (Sydney Harbour Catchment) 2005.

The State-wide mapping of estuarine macrophytes (mangroves, saltmarsh and seagrass) by DPI Fisheries identifies mangroves occurring in the adjoining Rozelle Bay (Creese et al 2009, Figure 5). There are no local records of seagrass, saltmarsh or the threatened *Posidonia* seagrass population. Macroalgae is not included in this dataset.

ELA staff mapped marine habitat in 2017 for all of Blackwattle Bay, Rozelle Bay, Johnstons Bay and White Bay (see Figure 6 in next section).

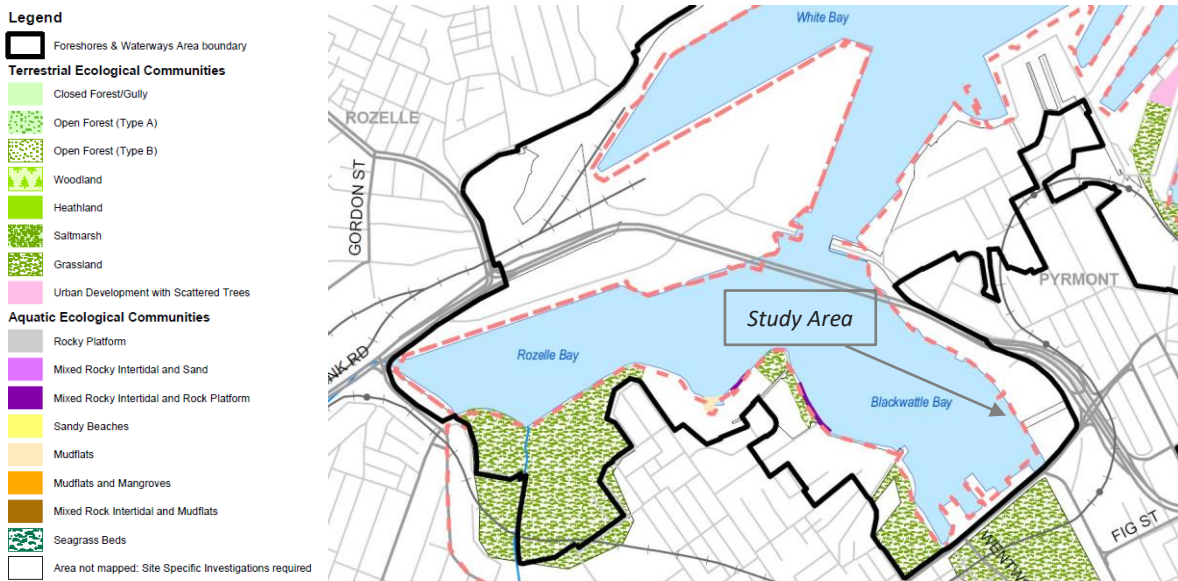


Figure 3: Sydney Harbour - Foreshores and Waterways Area Development Control Plan: Ecological Communities and Landscape Characters (map sheet 8)

Source: <http://www.planning.nsw.gov.au/Policy-and-Legislation/Environment-and-Heritage/Sharing-Sydney-Harbour>

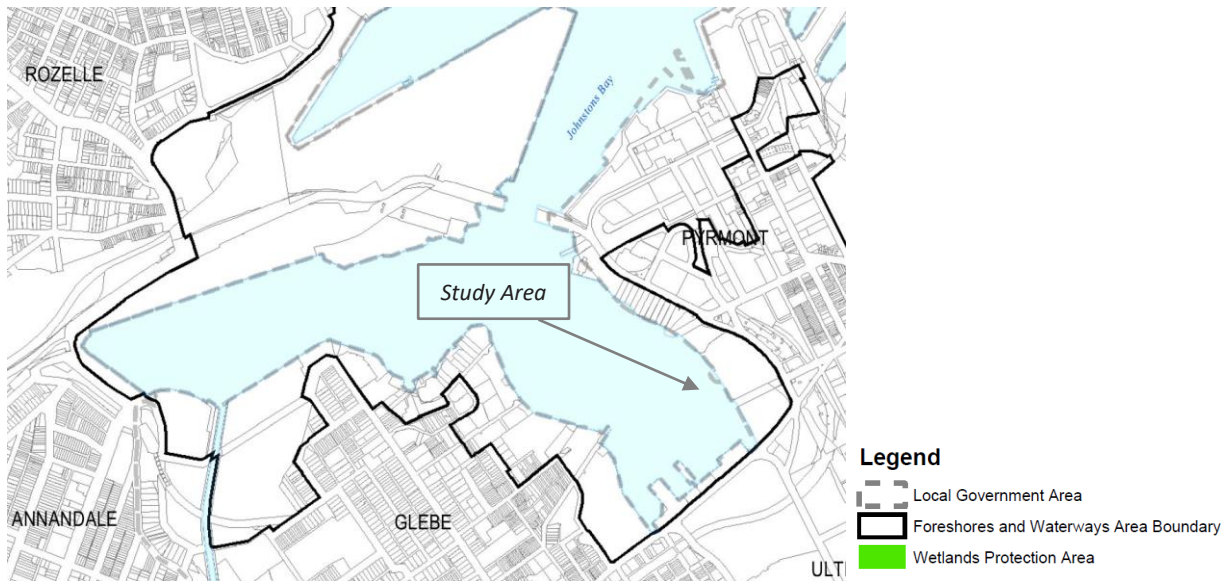


Figure 4: Sydney Regional Environmental Plan (Sydney Harbour Catchment) 2005: Wetlands Protection Area (map sheet 4)

Source: <http://www.planning.nsw.gov.au/Policy-and-Legislation/Environment-and-Heritage/Sharing-Sydney-Harbour>



Figure 5: DPI Fisheries mapping of estuarine macrophytes (Creese et al 2009)

4.2 Field-validated aquatic habitat mapping

The 2021 field survey confirmed that mapping from 2017 remains valid, with no observable change in key fish habitat types.

Blackwattle Bay is typically a large flat bay dominated by unvegetated subtidal silty sand. A narrow band of submerged rubble and macroalgae occurs mostly on the western side. Within the study area, seven distinct habitat zones were identified during the field survey, as mapped in Figure 6, with representative photographs in Figure 7:

- Subtidal silty sand with dense infauna
- Subtidal silty sand, fine woody debris with sparse infauna
- Subtidal silty sand, fine woody debris with dense infauna
- Subtidal silty sand, fine woody debris, moderate shell cover with dense infauna
- Intertidal rock rubble
- Seawalls (mix of smooth concrete, rough sandstone, and sloped rock rubble)
- Man-made structures (pontoon and piles supporting two wharves), with biota dominated by Ascidians (Sea squirts), *Galeolaria caespitosa* (Tube worms), *Mytilus* sp. (Mussel), *Patelloida* sp. (True limpet), *Tesseropora rosea* (Rose barnacle), *Ulva* sp. (Sea lettuce) and other turfing algae.

DPI Fisheries identify three types of KFH in their Policy and Guidelines for Fish Habitat Conservation and Management (Fairfull 2013, Appendix B). Within the study area, only Type 3 (minimally sensitive KFH) occurs. The noxious alga *Caulerpa taxifolia* was not observed on site. No seahorses were found during targeted surveys.

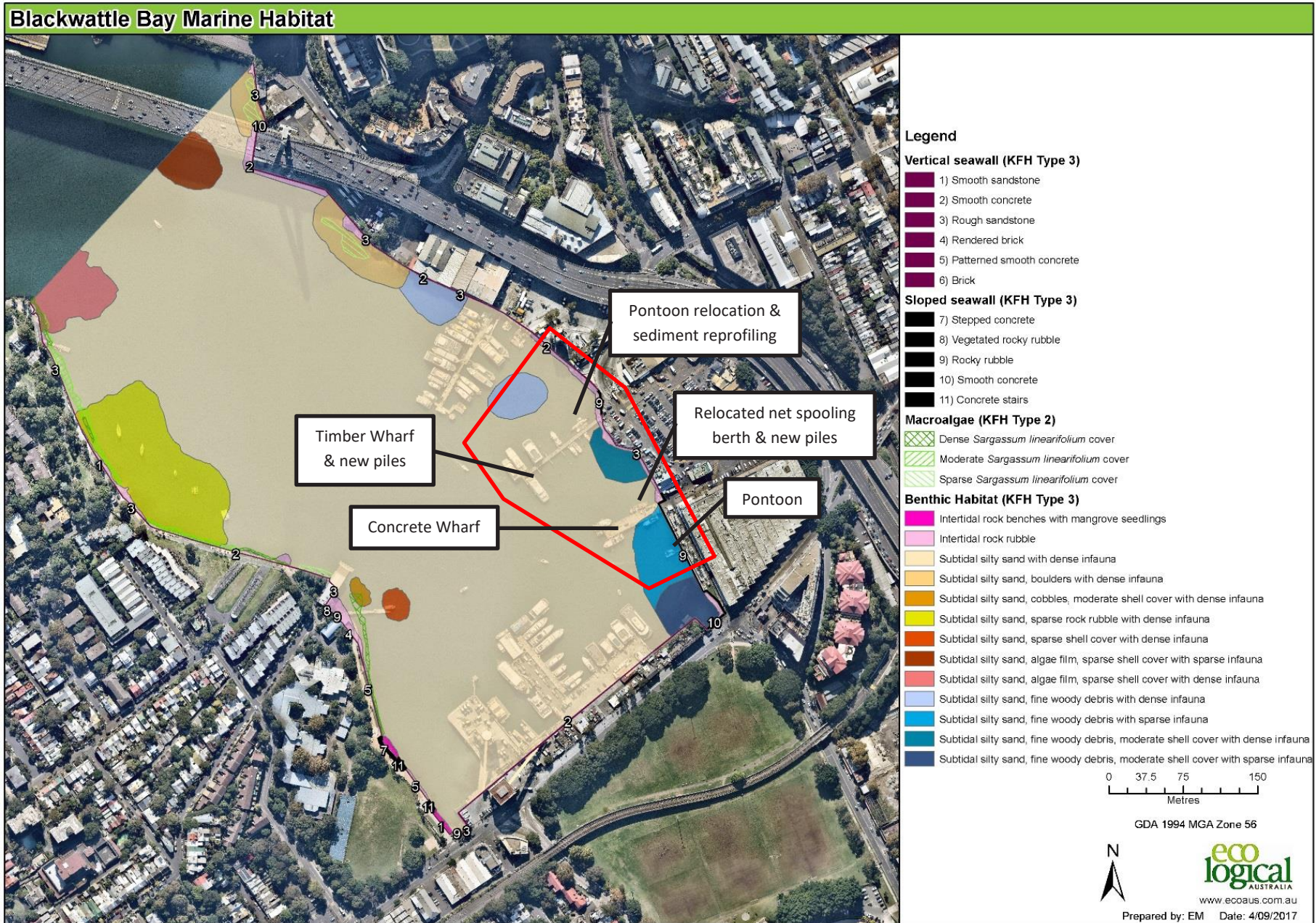


Figure 6: Previous marine habitat map for Blackwattle Bay (2017) and validated study area (red box, 2021)



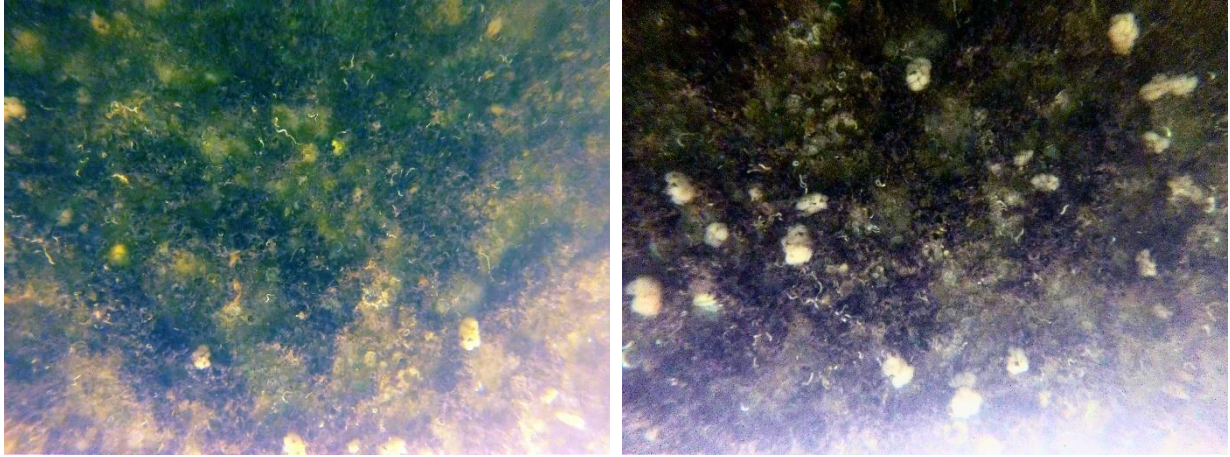
Pontoon to be relocated



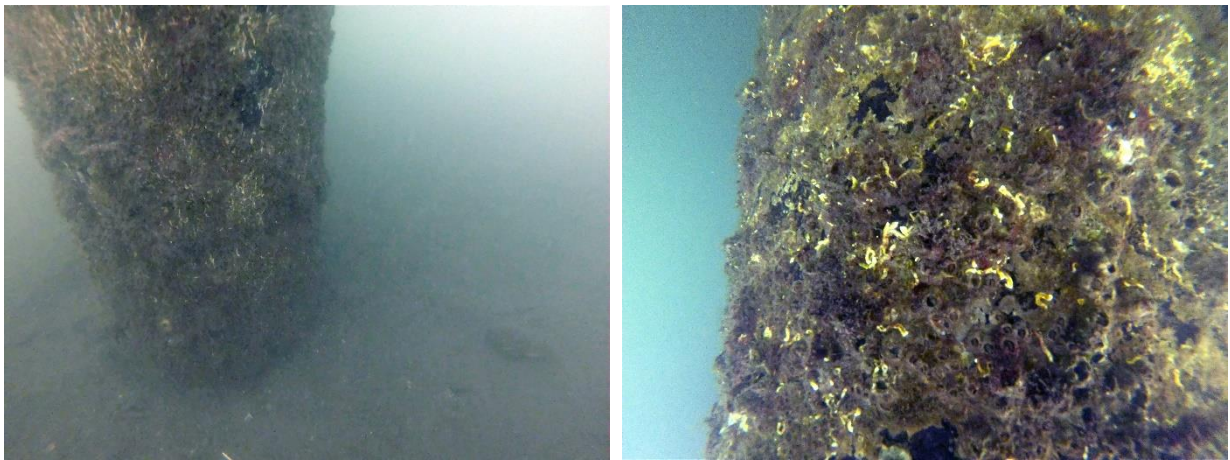
Relocated site for pontoon (water in foreground of smaller boat)



Pontoon habitat (sides) – Ulva sp., limpets and mussels with dense epiphyte cover



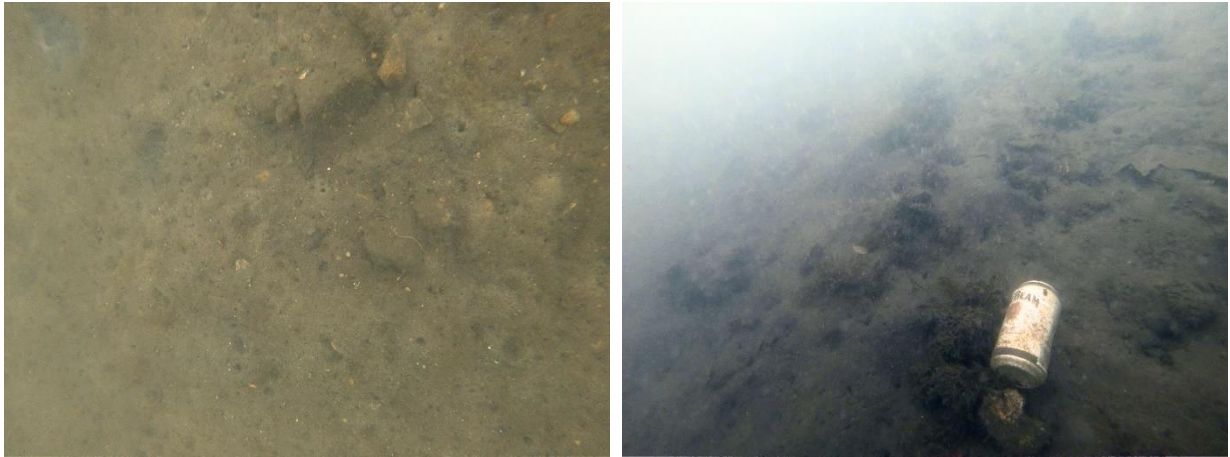
Pontoon habitat (underside) – turfing green algae, ascidians and tube worms



Pile habitat to be removed (left – base of pile, right – middle of pile) – turfing algae, barnacles and tube worms



Bare silty sand at pontoon relocation site where sediment reprofiling is proposed



Bare silty sand at pontoon relocation site where sediment reprofiling is proposed



Left – Concrete Wharf requiring two protection piles for relocation of the net spooling berth; right – typical sediment for new piles (bare silty sand with fine filamentous algae crust)

Figure 7: Site photographs (30 June 2021)

4.3 Presence or likelihood of threatened and protected species, populations and communities

Threatened species, populations or communities listed under the FM Act, BC Act and EPBC Act that are known or expected to occur in the region are listed and assessed in Appendix A. In the study area, there was no valuable or specific habitat capable of supporting threatened aquatic/estuarine species, populations or communities. It is possible some species may opportunistically pass near or through the area given the connectivity to the broader harbour and coastal habitats, but they are unlikely to depend on habitat within the site for their survival. As no species were considered likely to depend on the site, further assessment of significance in accordance with Section 220ZZ(2A) of the FM Act, Section 7.3 of the BC Act, and Part 3 of the EPBC Act is not triggered. An overview of key species or groups is described below, including protected species (not threatened) that are typical considerations around Sydney Harbour:

- *Hippocampus whitei* (White's seahorse) and other protected syngnathids are known to occur in Sydney Harbour. White's seahorse is known to use artificial structures such as jetty piles if there is suitable macroalgal to grasp for support. Other preferred habitat types, such as seagrass beds, soft corals, sponges and swimming nets are not present in the study area. The pontoon and its piles do not have suitable macroalgae growth suited to seahorses. The lower and mid-height of the piles have a dense cover of short encrusting organism. The upper portion of the piles has minimal marine life due to the pontoon sliding up and down the piles with the tides. No seahorses and other syngnathids were observed in the underwater assessment and are considered highly unlikely to use the impact area.
- *Epinephelus daemeli* (Black rockcod) is unlikely to occur. It prefers rock crevices, overhangs and caves, all of which are absent from the study area. None were observed in the underwater assessment and are considered highly unlikely to use the impact area.
- Threatened sharks and rays may opportunistically pass through the area while exploring or chasing prey. Both fauna groups are highly mobile and would likely avoid construction activity and regular boat traffic may deter large fauna from regularly using the area. Their overall habitat would remain the same during operation.
- The threatened seagrass population, *Posidonia australis*, occurs in the harbour and is known to grow on subtidal sand up to 10 m deep. No seagrass was observed in the study area.
- Marine vegetation is protected under the FM Act and includes macroalgae (seaweeds), seagrass, mangroves and saltmarsh (saltmarsh is also a threatened community under the BC Act and EPBC Act):
 - Macroalgae – only small amount of *Ulva* sp. (Sea lettuce) occurs in the study area, found as a narrow band around the pontoon sides around the water line. Under Section 228(2a) of the *Fisheries Management (General) Regulation 2019*, *Ulva* spp. are exempt from a permit to harm marine vegetation. No other marine macroalgae was found on the pontoon, piles or on the substrate across the study area. A narrow band of *Sargassum linearifolium* (brown macroalgae) occurs on the opposite side of the bay and would not be harmed.
 - Seagrass – none present in Blackwattle Bay.
 - Mangroves – none present in the study area. Some small juveniles on opposite side of bay.
 - Saltmarsh – none present in Blackwattle Bay.
- Aquatic mammals (whales, dolphins, dugongs and seals) are known or modelled to occur east of Millers Point where there is a greater connection to coastal waters. Large mammals are unlikely to use habitat this close to shore. Dugongs are more typical in tropical and subtropical waters and forage on seagrass beds, which are absent at the site. There are no records of dugongs in the harbour, suggesting that if they do venture down the east coast they may prefer more expansive beds such as those in Botany Bay. Seals have been sighted around the harbour, including basking on artificial structures. It is likely that most aquatic mammals avoid human activities and would be deterred by vessels which frequently berth in this area.
- Aquatic reptiles (turtles) are more common along coastal waters than in the harbour or its estuaries. It is possible they explore the greater area but would not depend on the site for feeding habitat or nesting.
- Shore, wetland, migratory and pelagic birds may use calm intertidal zones to forage. They are unlikely to occur in the study area because of the lack of intertidal wading areas and high wash zone caused by seawalls.

5. Impact assessment and mitigation

This section considers the impact of relocating the pontoon and addition of protection piles based on the work described in Section 1.1.

5.1 Assessment of construction impact

Three impact types are likely to occur during wharf installation:

- Piling (noise, habitat loss and sediment plumes)
- Sediment reprofiling (noise, habitat loss and sediment plumes)
- Construction vessels (boat/propeller wash, temporary mooring and accidental spills).

Pile impact

A total of twelve new piles would be drilled and hammered to refusal into the bedrock. The two piles supporting the pontoon and two protection piles would be approximately 0.5 m in diameter, creating a total impact area to the substrate of less than 2.4 m². This impact would be offset by the creating of hard vertical substrate on the piles (loss and gain both Type 3 KFH). The use of a silt curtain to contain sediment plumes during pile removal and drilling is suitable in this calm bay. Hammering of piles is unlikely to create significant sediment plumes, with sediment being pushed downwards and outwards.

On average, a pile would be drilled or hammered for about 10 minutes followed by a relatively quiet period for the next 30 minutes or more before the next stage is progressed. Underwater noise from hammering piles has the potential to cause disturbance or physical impact to marine fauna in the area. Fish in the vicinity would be affected by excessive underwater noise, ranging from mortality to interruption of communication, depending on species anatomy (eg fish with swim bladders closer to the ear are more sensitive to acoustic impact than species with swim bladders further from the ear). The number of fish impacted by noise is difficult to determine without modelling species abundance and distribution in the harbour. However, the impact is expected to be low when considering the small proportion of surrounding habitat compared to similar habitat in the greater harbour. A small number of fish, if any, could be entrapped by the use of a silt curtain and impacted by sediment plumes and noise. If the curtain does not touch the bottom, then these fish would have the ability to escape the area.

Sediment reprofiling impact

During sediment reprofiling there would be a direct loss of benthic infauna and smothering of adjacent similar habitat (Type 3 minimally sensitive KFH). Benthic species would recolonise the area over time, resulting in only a minor and temporary impact to the benthic infauna and foraging resources in the area. Indirect impact may arise if bed sediment particles become entrained in the water, increasing turbidity and potentially releasing contaminants, if present. Best-practise construction methods, such as a silt curtain and water quality monitoring (turbidity) outside of the curtain, would reduce this risk and the potential impact would be minor. There is no Type 1 highly sensitive KFH in Blackwattle Bay. The nearest Type 2 moderately sensitive KFH is the band of *Sargassum linearifolium* (brown macroalgae) 280 m away on the opposite side of the bay.

Construction vessel impact

There would be little direct or indirect impact caused by construction vessels if best practice environmental management procedures are in place and effective. However, potential impact may include chemical/material spills from machinery, propeller scouring and upwelling in shallow water, and anchor/mooring/jack-up impact from barges. Such risks would increase with unfavourable swell and weather conditions.

Scouring of benthic sediments either from dragging anchor or mooring chain, or upwelling from shallow barge operation, could cause bed sediment particles to become entrained in the water, increasing turbidity. The increased sediment load would reduce light penetration through the water column, and temporarily impact marine biota.

Sediment movement could also smother infauna burrows. It is unlikely that large volumes of sediment would be moved because of vessels, but any silt or sand that does settle on infauna burrows would not cause significant damage.

Chemical spills are unlikely but may occur during refuelling or if there is a hydraulic fluid leak. Spilt petrochemicals have the potential to wash up on shore or disperse in the water. This could kill or impair fish and infauna.

Vessels may also be a vector for movement of marine pests, especially if ships are not from the local area. For example, machinery and vessels used on other sites where the noxious alga *Caulerpa taxifolia* was present could introduce the weed if hygiene procedures aren't followed. To prevent the spread of this weed, barges moving from areas where *Caulerpa* is present should be cleaned and inspected before travelling to the harbour and entering the site. If *Caulerpa* becomes established around the structures, then other boats would potentially become vectors for the further spread of this weed.

5.2 Assessment of operational impact

Three impact types are likely to occur during wharf operation:

- Boat traffic using the relocated pontoon and piles
- Shading impact on benthic habitat from the pontoon and gangway
- Creation of new aquatic habitat.

Boat traffic impact

The impacts which could occur in marine habitats during operation are typically those associated with boat wash, disturbance of sediments, and an increase in pollutants and litter. Given the location and existing surrounding use, the following impacts are considered minor in change, if any:

- Boat wash would not impact the foreshore, which is stabilised by seawalls.
- Propeller/thrust disturbance to sediments may occur initially as boats may not have conducted manoeuvres in these specific areas (pontoon and net spooling area). This may initially upwell sediments, but those would settle nearby on the same type of habitat (no Type 1 or Type 2 sensitive habitat are nearby). After some time of boating use the mobilisation of sediment would decrease.
- Pollutants expelled from boats would be the same as existing conditions.

- The clearance beneath the pontoon at its new location after sediment reprofiling is estimated as 1200 mm (low tide). There is a risk that sediment may accumulate beneath or near the pontoon over time, resulting in a beached pontoon and/or propellor scouring from boats. However, this may take some years to occur, which by then the replacement facilities at the new Sydney Fish Market will be available.

Shading impact

Partial shading from the new pontoon and gangway would have an indirect impact on subtidal unvegetated sediment. This impact would be low as the sediment here would be colonised by benthic fauna that are not light-dependant.

Creation of hard substrates

Overall, the proposal would provide more habitat than the existing structure, as the addition of piles for the net spooling area increase hard substrate compared to what would be lost from piling. The new vertical hard substrate would provide areas for the attachment of sessile marine organisms and structural habitat for small fish (Type 3 KFH).

5.3 Fisheries Management Act habitat protection and permit requirements

DPI Fisheries’ Policy and Guidelines for Fish Habitat Conservation and Management (Fairfull 2013) outline requirements for assessing impact of waterfront development to ensure the sustainable management, and ‘no net loss’, of KFH in NSW (Table 1). Part 7 of the FM Act addresses the protection of aquatic habitats and works that requires a permit.

Table 1: Assessment requirements under DPI Fisheries’ Policy and Guidelines for Fish Habitat Conservation

Assessment	Response	Comment
Will the proposed works directly or indirectly impact threatened species, populations or communities?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	No seahorses or rock cod are likely to occur. No Posidonia occurs in the bay. No other threatened species, populations or communities are likely to occur (see Section 4.3 and Appendix A).
Will the proposed works harm protected vegetation (seagrass, macroalgae, mangroves and /or saltmarsh)?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	No seagrass or saltmarsh occurs in Blackwattle Bay. No macroalgae occurs on the pontoon or piles. Mangroves seedlings across the bay would not be harmed.
Are the proposed works in or near critical habitat for the Grey Nurse Shark (Part 7A of FM Act)?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Nearest site is Magic Point, Malabar
Will the proposed works impact aquaculture leases or commercial fisheries?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Commercial boats use the wharves and pontoon, but this proposal does not alter accessibility for those vessels.
Are the works categorised as a key threatening process (as per Schedule 6 of the FM Act) for example:		
<ul style="list-style-type: none"> • Current shark meshing program in NSW waters • Hook and line fishing in areas important for survival of threatened fish species • Human-caused climate change 	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	The proposal does not meet definition of these key threatening processes.

Assessment	Response	Comment
<ul style="list-style-type: none"> • Instream structures and other mechanisms that alter the natural flow • Introduction of non-indigenous fish and marine vegetation to the coastal waters of NSW • Introduction of fish to fresh waters within a river catchment outside their natural range • Removal of large woody debris from NSW rivers and streams • Degradation of native riparian vegetation along NSW watercourses. 		
<p>Will the works result in a 'net loss' of key fish habitat?</p>	<p><input type="checkbox"/> Yes <input checked="" type="checkbox"/> No</p>	<p>Pontoon relocation does not shade a different type of habitat. Old piles will be removed, but added to new location. Additional mooring piles will lose a small amount of Type 3 bare substrate, but piles will create vertical hard habitat. Overall only Type 3 KFH would be altered and is like-for-like.</p>

5.4 Sydney Regional Environmental Plan (SREP, Sydney Harbour Catchment) 2005

Clause 21 of the SREP provides nine matters to be taken into consideration in relation to biodiversity, ecology and environment protection:

21(a) Development should have a neutral or beneficial effect on the quality of water entering the waterways.

During construction, potential impact to water quality would be controlled by implementation of a Construction Environmental Management Plan (CEMP). The proposal would not change operational use in the area and would not alter the water quality of the harbour.

21(b) Development should protect and enhance terrestrial and aquatic species, populations and ecological communities and, in particular, should avoid physical damage and shading of aquatic vegetation (such as seagrass, saltmarsh and algal and mangrove communities).

No protected or threatened marine vegetation occurs in the impact area.

21(c) Development should promote ecological connectivity between neighbouring areas of aquatic vegetation (such as seagrass, saltmarsh and algal and mangrove communities).

The scale of the works does not offer the opportunity to connect valued habitat, which is on the other side of the bay.

21(d) Development should avoid indirect impacts on aquatic vegetation (such as changes to flow, current and wave action and changes to water quality) as a result of increased access.

No protected or threatened marine vegetation occurs in or near the impact area.

21(e) Development should protect and reinstate natural intertidal foreshore areas, natural landforms and native vegetation.

An existing seawall prevents establishment of any natural intertidal foreshore, landforms or vegetation. The proposal cannot alter this situation due to scale of works and nearby onshore land use.

21(f) Development should retain, rehabilitate and restore riparian land.

Riparian land in this vicinity is heavily modified by the seawall and concourse. The proposal does not interfere with the foreshore.

21(g) Development on land adjoining wetlands should maintain and enhance the ecological integrity of the wetlands and, where possible, should provide a vegetative buffer to protect the wetlands.

The proposal site is not near a designated wetland identified on the Sydney Regional Environmental Plan (Sydney Harbour Catchment) 2005 – Wetlands Protection Map.

21(h) The cumulative environmental impact of development.

No cumulative impact is expected as the works are relocating existing facilities within the same operation zone.

21(i) Whether sediments in the waterway adjacent to the development are contaminated, and what means will minimise their disturbance.

During construction, disturbance would arise from piling and sediment reprofiling. Sediments suspended during the construction would be contained by a silt curtain. Operation of boats may cause upwelling of sediments, which would settle nearby on the same type of habitat. Any potential contaminants would settle on the same quality of sediment nearby.

5.5 Recommended mitigation measures

The following mitigation measures are recommended to minimise the risk of impact during construction and operation. These are adapted from DPI Fisheries document Policy and Guidelines for Fish Habitat Conservation and Management. At a minimum, the construction contractor or representative should:

- Develop a Construction Environmental Management Plan (CEMP) to address pollution, contamination and unnecessary disturbance which could arise during construction, such as:
 - sediment and rock debris control
 - oil/fuel/chemical storage and spill management
 - machinery and engine maintenance schedule to reduce oil/fuel leakage
 - low impact barge positioning to prevent propeller scouring and thrust wash onto benthic habitats
 - minimise footprint and establish no-go zones in shallow habitats
 - accidental waste/material overboard response (eg construction materials dropped into the bay)
 - biological hygiene (eg prevent spread of noxious species on and off the site)
 - other measure listed below.
- Work positioning barges, drilling and pile driving should occur during calm conditions.
- All lines should be suspended off the seafloor to minimise drag across benthic habitat.
- Use of a floating boom with silt curtain encompassing full works area. The curtain is to remain in place until all suspended material has settled (no visible plumes).
- All waste material should be disposed of on land and not reused in the construction or left on the seafloor.
- Care should be taken not to introduce *Caulerpa taxifolia* to the area by using contaminated vessels and machinery. For example, a drill head or anchor used at another site with *Caulerpa* should be thoroughly cleaned of plant propagules and sediment before being used at another location. Fragments of *Caulerpa* can remain viable for up to three days out of the water. Best hygiene practices are outlined in the NSW Control Plan for the Noxious Marine Alga *Caulerpa taxifolia* (NSW I&I 2009).
- Gentle start-up hammering is recommended to allow undetected aquatic fauna to leave the area and avoid hearing damage. Work should be stopped if large fauna is observed nearby (although unlikely in Blackwattle Bay).
- Seahorses are not expected on this site, so no specific mitigation measures are required.

6. Conclusion

This aquatic ecology assessment concludes that the proposed pontoon relocation, sediment reprofiling and additional piles would:

- not have a significant impact on any threatened species, population or community
- not trigger the need for a Species Impact Statement, nor further appraisal using the Biodiversity Assessment Method, nor referral to a Commonwealth body
- not require a permit to *Harm Marine Vegetation* under Part 7 of the FM Act
- not require fauna management in regard to syngnathids (seahorses and their relatives) or Black rockcod.

In regard to the DPI Fisheries Policy and Guidelines for Fish Habitat Conservation and Management (2013 update), there would be 'no net loss' of KFH. All works are on Type 3 KFH and no habitats of greater sensitivity occur nearby. No further offsets or environmental compensation is required for the proposal.

In regard to the biodiversity, ecology and environmental protection requirements of the Sydney Regional Environmental Plan (Sydney Harbour Catchment) 2005, the proposal would not alter marine vegetation, or change other aquatic values compared to the current situation.

7. References

Creese, R.G., Glasby, T.M., West, G. and Galen, C. 2009. *Mapping the habitats of NSW estuaries. Industry & Investment NSW Fisheries Final Report Series 113*. Port Stephens, NSW, Australia.

Fairfull, S. 2013. *Fisheries NSW Policy and Guidelines for Fish Habitat Conservation and Management (2013 update)*. NSW Department of Primary Industries.

NSW I&I 2009. *NSW Control Plan for the Noxious Marine Alga *Caulerpa taxifolia**. NSW Industry and Investment.

Appendix A Threatened species likelihood of occurrence and impact

If a species has suitable habitat present on site **AND** is likely to use this habitat **AND** the species or its habitat would be directly or indirect impacted, **THEN** an Assessment of Significance is required. Such species, if any, are highlighted in the table below. This list excludes terrestrial species that do not use estuarine/marine water or tidal foreshores.

Type	Species name	Common name	BC/FM Act Status	EPBC Status	Use of site	Is an impact assessment required?
Fish	<i>Epinephelus daemeli</i>	Black Rockcod	V	V	No suitable habitat present, eg rock overhangs, crevices or caves	No
	<i>Hippocampus whitei</i>	White's Seahorse	E		Unlikely due to the lack of suitable habitat. None observed during a targeted underwater survey	No
	<i>Macquaria australasica</i>	Macquarie Perch	E1	E	Freshwater species	No
	<i>Prototroctes maraena</i>	Australian Grayling	E	V	No records in catchment	No
Shark	<i>Carcharias taurus</i>	Grey Nurse Shark	E4A	CE	No suitable habitat	No
	<i>Carcharodon carcharias</i>	Great White Shark	V	V		No
	<i>Lamna nasus</i>	Porbeagle, Mackerel Shark		Bonn		No
	<i>Rhincodon typus</i>	Whale Shark		V,Bonn		No
Ray	<i>Manta alfredi</i>	Reef Manta Ray		Bonn	No recent records in harbour, unlikely to regularly visit area	No
	<i>Manta birostris</i>	Giant Manta Ray		Bonn		No
	<i>Pristis zijsron</i>	Green Sawfish	E4	V	Presumed extinct in NSW	No
Turtle	<i>Caretta caretta</i>	Loggerhead Turtle	E1	E	Typically coastal, unlikely to use site	No
	<i>Chelonia mydas</i>	Green Turtle	V	V		No
	<i>Dermochelys coriacea</i>	Leatherback Turtle	E1	E		No

Type	Species name	Common name	BC/FM Act Status	EPBC Status	Use of site	Is an impact assessment required?
	<i>Eretmochelys imbricata</i>	Hawksbill Turtle		V,Bonn		No
	<i>Natator depressus</i>	Flatback Turtle		V,Bonn		No
Whale	<i>Balaenoptera bonaerensis</i>	Antarctic Minke Whale		Bonn	Unlikely close to shore	No
	<i>Balaenoptera edeni</i>	Bryde's Whale		Bonn		No
	<i>Balaenoptera musculus</i>	Blue Whale	E1	E		No
	<i>Caperea marginata</i>	Pygmy Right Whale		Bonn		No
	<i>Eubalaena australis</i>	Southern Right Whale	E1	E		No
	<i>Megaptera novaeangliae</i>	Humpback Whale	V	V		No
	<i>Physeter macrocephalus</i>	Sperm Whale	V			No
Dolphin	<i>Lagenorhynchus obscurus</i>	Dusky Dolphin		Bonn	Unlikely close to shore	No
	<i>Orcinus orca</i>	Killer Whale, Orca		Bonn		No
	<i>Sousa chinensis</i>	Indo-Pacific Humpback Dolphin		Bonn		No
Marine mammal	<i>Dugong dugon</i>	Dugong	E1	Bonn	No foraging habitat on site	No
Seal	<i>Arctocephalus forsteri</i>	New Zealand Fur-seal	V		May pass through but limited basking areas	No
	<i>Arctocephalus pusillus doriferus</i>	Australian Fur-seal	V			No
Frog	<i>Litoria aurea</i>	Green and Golden Bell Frog	E1	V	No habitat	No
Bird	<i>Actitis hypoleucos</i>	Common Sandpiper		C,J,K	Unlikely as only a small amount of intertidal or shallow habitat available for foraging or roosting during low tide due to seawall. Some species only occur offshore.	No
	<i>Anseranas semipalmata</i>	Magpie Goose	V			No
	<i>Apus pacificus</i>	Fork-tailed Swift		C,J,K		No
	<i>Arenaria interpres</i>	Ruddy Turnstone		C,J,K		No
	<i>Botaurus poiciloptilus</i>	Australasian Bittern	E1	E		No

Type	Species name	Common name	BC/FM Act Status	EPBC Status	Use of site	Is an impact assessment required?
	<i>Calidris acuminata</i>	Sharp-tailed Sandpiper		C,J,K		No
	<i>Calidris alba</i>	Sanderling	V	C,J,K		No
	<i>Calidris canutus</i>	Red Knot		C,J,K		No
	<i>Calidris ferruginea</i>	Curlew Sandpiper	E1	CE,C,J,K		No
	<i>Calidris melanotos</i>	Pectoral Sandpiper		J,K		No
	<i>Calidris ruficollis</i>	Red-necked Stint		C,J,K		No
	<i>Calidris subminuta</i>	Long-toed Stint		C,J,K		No
	<i>Calidris tenuirostris</i>	Great Knot	V	C,J,K		No
	<i>Calonectris leucomelas</i>	Streaked Shearwater		C,J,K		No
	<i>Charadrius bicinctus</i>	Double-banded Plover		Bonn		No
	<i>Charadrius leschenaultii</i>	Greater Sand-plover	V	C,J,K		No
	<i>Charadrius mongolus</i>	Lesser Sand-plover	V	C,J,K		No
	<i>Charadrius veredus</i>	Oriental Plover		J,K		No
	<i>Diomedea antipodensis</i>	Antipodean Albatross	V	V		No
	<i>Diomedea dabbenena</i>	Tristan Albatross		Bonn		No
	<i>Diomedea exulans</i>	Wandering Albatross	E1	V,J		No
	<i>Diomedea gibsoni</i>	Gibson's Albatross	V	V		No
	<i>Diomedea sanfordi</i>	Northern Royal Albatross		E,Bonn		No
	<i>Ephippiorhynchus asiaticus</i>	Black-necked Stork	E1			No
	<i>Epthianura albifrons</i>	White-fronted Chat	E2,V			No
	<i>Esacus magnirostris</i>	Beach Stone-curlew	E4A			No

Type	Species name	Common name	BC/FM Act Status	EPBC Status	Use of site	Is an impact assessment required?
	<i>Eudyptula minor</i>	Little Penguin in the Manly Point Area	E2			No
	<i>Fregetta grallaria grallaria</i>	White-bellied Storm-Petrel		V		No
	<i>Gallinago hardwickii</i>	Latham's Snipe		C,J,K		No
	<i>Gallinago megala</i>	Swinhoe's Snipe		Bonn,C		No
	<i>Gallinago stenura</i>	Pin-tailed Snipe		Bonn,C		No
	<i>Gygis alba</i>	White Tern	V			No
	<i>Haematopus fuliginosus</i>	Sooty Oystercatcher	V			No
	<i>Haematopus longirostris</i>	Pied Oystercatcher	E1			No
	<i>Heteroscelus brevipes</i>	Grey-tailed Tattler		J		No
	<i>Heteroscelus incanus</i>	Wandering Tattler		J		No
	<i>Hirundapus caudacutus</i>	White-throated Needletail		C,J,K		No
	<i>Ixobrychus flavicollis</i>	Black Bittern	V			No
	<i>Limicola falcinellus</i>	Broad-billed Sandpiper	V	C,J,K		No
	<i>Limosa lapponica</i>	Bar-tailed Godwit		C,J,K		No
	<i>Limosa limosa</i>	Black-tailed Godwit	V	C,J,K		No
	<i>Macronectes giganteus</i>	Southern Giant Petrel	E1	E		No
	<i>Macronectes halli</i>	Northern Giant-Petrel	V	V		No
	<i>Monarcha melanopsis</i>	Black-faced Monarch		Bonn		No
	<i>Monarcha trivirgatus</i>	Spectacled Monarch		Bonn		No
	<i>Numenius madagascariensis</i>	Eastern Curlew		CE,C,J,K		No
	<i>Numenius minutus</i>	Little Curlew		C,J,K		No

Type	Species name	Common name	BC/FM Act Status	EPBC Status	Use of site	Is an impact assessment required?
	<i>Numenius phaeopus</i>	Whimbrel		C,J,K		No
	<i>Onychoprion fuscata</i>	Sooty Tern	V			No
	<i>Pachyptila turtur subantarctica</i>	Fairy Prion (southern)		V		No
	<i>Pandion cristatus</i>	Eastern Osprey	V			No
	<i>Pandion haliaetus</i>	Eastern Osprey		Bonn		No
	<i>Philomachus pugnax</i>	Ruff		C,J,K		No
	<i>Phoebastria fusca</i>	Sooty Albatross	V	V		No
	<i>Pluvialis fulva</i>	Pacific Golden Plover		C,J,K		No
	<i>Pluvialis squatarola</i>	Grey Plover		C,J,K		No
	<i>Pterodroma leucoptera leucoptera</i>	Gould's Petrel	V	E		No
	<i>Pterodroma neglecta neglecta</i>	Kermadec Petrel	V	V		No
	<i>Pterodroma solandri</i>	Providence Petrel	V	J		No
	<i>Puffinus carneipes</i>	Flesh-footed Shearwater		J,K		No
	<i>Rostratula australis</i>	Australian Painted Snipe	E1	E		No
	<i>Sternula albifrons</i>	Little Tern	E1	Bonn,C,J,K		No
	<i>Sternula nereis nereis</i>	Australian Fairy Tern		V		No
	<i>Thalassarche bulleri</i>	Buller's Albatross		V,Bonn		No
	<i>Thalassarche cauta</i>	Shy Albatross	V	V		No
	<i>Thalassarche cauta steadi</i>	White-capped Albatross		V		No
	<i>Thalassarche eremita</i>	Chatham Albatross		E,Bonn		No
	<i>Thalassarche impavida</i>	Campbell Albatross		E,Bonn		No

Type	Species name	Common name	BC/FM Act Status	EPBC Status	Use of site	Is an impact assessment required?
	<i>Thalassarche melanophris</i>	Black-browed Albatross	V	V		No
	<i>Thalassarche salvini</i>	Salvin's Albatross		V,Bonn		No
	<i>Tringa nebularia</i>	Common Greenshank		C,J,K		No
	<i>Tringa stagnatilis</i>	Marsh Sandpiper		C,J,K		No
	<i>Xenus cinereus</i>	Terek Sandpiper	V	C,J,K		No
Seagrass	Posidonia australis - Port Hacking, Botany Bay, Sydney Harbour, Pittwater, Brisbane Waters and Lake Macquarie populations	Posidonia australis	E2		No plants observed	No
	Posidonia australis seagrass meadows of the Manning-Hawkesbury ecoregion	Posidonia australis		E		No
Saltmarsh	Subtropical and Temperate Coastal Saltmarsh	Coastal Saltmarsh	E1	V	No plants observed	No
	<i>Wilsonia backhousei</i>	Narrow-leafed Wilsonia	V			No

BC Act: E1 = Endangered, E2 = Endangered Population, E4 = Extinct, E4A = Critically Endangered, V = Vulnerable

FM Act: E1 = Endangered, E2 = Endangered Population, E4 = Extinct, E4A = Critically Endangered, V = Vulnerable

EPBC Act: Bonn = Listed migratory species under Bonn Convention, CD = Conservation Dependent, CE = Critically Endangered, E = Endangered, V = Vulnerable, X = Extinct

Appendix B Key fish habitat types

NSW key fish habitat types and associated sensitivity classification (from Fairfull 2013)

<p>TYPE 1 - Highly sensitive key fish habitat:</p> <ul style="list-style-type: none"> ▪ <i>Posidonia australis</i> (strapweed) ▪ <i>Zostera</i>, <i>Heterozostera</i>, <i>Halophila</i> and <i>Ruppia</i> species of seagrass beds >5m² in area ▪ Coastal saltmarsh >5m² 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 ▪ SEPP 14 coastal wetlands, wetlands recognised under international agreements (e.g. Ramsar, JAMBA, CAMBA, ROKAMBA wetlands), wetlands listed in the Directory of Important Wetlands of Australia² ▪ Freshwater habitats that contain in-stream gravel beds, rocks greater than 500 mm in two dimensions, snags greater than 300 mm in diameter or 3 metres 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 ▪ Mound springs 	<p>TYPE 2 – Moderately sensitive key fish habitat:</p> <ul style="list-style-type: none"> ▪ <i>Zostera</i>, <i>Heterozostera</i>, <i>Halophila</i> and <i>Ruppia</i> species of seagrass beds <5m² in area ▪ Mangroves ▪ Coastal saltmarsh <5m² in area ▪ Marine macroalgae such as <i>Ecklonia</i> and <i>Sargassum</i> species ▪ Estuarine and marine rocky reefs ▪ Coastal lakes and lagoons that are permanently open or subject to artificial opening via agreed management arrangements (e.g. managed in line with an entrance management plan) ▪ Aquatic habitat within 100 m of a marine park, an aquatic reserve or intertidal protected area ▪ Stable intertidal sand/mud flats, coastal and estuarine sandy beaches with large populations of in-fauna ▪ Freshwater habitats and brackish wetlands, lakes and lagoons other than those defined in TYPE 1 ▪ Weir pools and dams up to full supply level where the weir or dam is across a natural waterway <hr/> <p>TYPE 3 – Minimally sensitive key fish habitat may include:</p> <ul style="list-style-type: none"> ▪ Unstable or unvegetated sand or mud substrate, coastal and estuarine sandy beaches with minimal or no in-fauna ▪ Coastal and freshwater habitats not included in TYPES 1 or 2 ▪ Ephemeral aquatic habitat not supporting native aquatic or wetland vegetation
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