



# Mollymook Outfall Project – Review of Environmental Factors

Shoalhaven City Council

13 February 2023



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## Project Details

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## DETERMINATION

This Review of Environmental Factors (REF) has been prepared by Water Technology on behalf of Shoalhaven City Council. The report presents the assessment of potential environmental impacts associated with the proposed stormwater entrainment structure and dune restoration works at Mollymook Beach.

Shoalhaven City Council is both the proponent and the nominated determining authority as defined in the *Environmental Planning and Assessment Act 1979* (EP&A Act). The proposed work satisfies the definition of an activity under the Act, and subsequently Section 5.5 of the Act stipulates that Shoalhaven City Council must assess and consider the environmental impacts of the proposed work before determining whether to proceed.



This REF has been prepared in accordance with Sections 111 and 112 of the EP&A Act and Section 171 of the *Environmental Planning and Assessment Regulation 2021* (EP&A Regulation) . This REF provides a true and fair assessment of the proposed activity in relation to its likely effects on the environment. It addresses to the fullest extent possible all matters affecting or likely to affect the environment as a result of the proposed activity.

During construction, the main potential environmental impacts of the proposed work are related to restrictions of public access and recreational amenity, noise, traffic and soil/water management. However, these impacts would be temporary and are not considered to be significant. During operation, it is anticipated that there will be negligible impacts, and long term positive environmental outcomes will be achieved.

All relevant considerations set forth in Section 171 of the EP&A Regulation have been assessed, and it has been determined that the proposed work is unlikely to have a significant impact on the environment or a threatened species, population or ecological community, and is not on land that is critical habitat or any identified threatened ecological communities, and accordingly, an Environmental Impact Statement is not required. The below signatories certify that the REF:

- Examines and takes into account all matters affecting or likely to affect the environment as a result of activities associated with the proposed works
- Is accurate and does not omit any material information
- Considers the proposed works in accordance with the principles of Ecological Sustainable Development
- Will need to be adhered to by the developer, including undertaking the proposed works as described, implementing the safeguards to manage the risk of environmental impact.
- The proposed activity is not likely to significantly affect threatened species, populations, ecological communities, or critical habitat. Therefore, a Species Impact Statement (SIS) is not required
- The proposed Activity is not likely to affect any Commonwealth land, is not being carried out on Commonwealth land, or significantly affect any Matters of National Environmental Significance



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# 1 INTRODUCTION

## 1.1 Project Background

The Shoalhaven Coastal Zone Management Plan Risk Assessment (Advisian, 2018a) was undertaken in 2018 and identified infrastructure and assets across the Local Government Area (LGA) coastal zone that are potentially exposed to coastal hazard risks - in both the present day, and over future planning horizons to 2100. In the centre of Mollymook Beach, two assets were identified as exposed to “high” or “extreme” coastal hazard risk – including:

- Wastewater pump station SPSZ6, which is located on Mitchell Parade, Mollymook directly behind the primary foredune; and
- Mitchell Parade, Mollymook, which is a public road servicing the local area.

These assets are located seawards of the 1% Annual Exceedance Probability (AEP) coastal hazard line (Advisian, 2016) – as depicted in Figure 1-1. Furthermore, the exposure of these assets is expected to increase over time due to future sea level rise projections and the associated long-term shoreline recession.

The erosion of Mollymook Beach and the local dune system in front of these assets is locally exacerbated by the presence of a stormwater outlet that discharges onto the beach – see Figure 1-1 to Figure 1-3. Stormwater discharges flow across the beach on a regular basis, and act to scour beach sands, lower the level of the incipient dune, and prevent the colonisation of dune vegetation. Subsequently, the stormwater outlet has created a localised erosion “pinch point” near the assets.

In 2020, Water Technology was engaged to undertake a study to determine appropriate interim (“transitional”) and long term (“end state”) coastal protection measures (Water Technology, 2020) for the assets. One outcome of that study was the identification of a transitional coastal management option that comprises the design and construction of a stormwater entrainment structure at the beach outlet – which would be supplemented by dune building and restoration works.

A Basis of Design Report and Technical Specifications have been prepared for the works. Subsequently, this REF has been prepared in accordance with Sections 111 and 112 of the EP&A Act and Section 171 of the *Environmental Planning and Assessment Regulation 2021* (EP&A Reg). This REF provides a true and fair assessment of the proposed activity in relation to its likely effects on the environment, and addresses to the fullest extent possible all matters affecting or likely to affect the environment as a result of the proposed activity.



Figure 1-1 The study area and coastal hazard lines



Figure 1-2 Mollymook Beach in front of the stormwater outlet, looking west



Figure 1-3 Mollymook Beach in front of the stormwater outlet, looking north

## 1.2 Summary of Proposed Works, and Objectives

The proposed works will comprise two main components, and is depicted in Figure 1-4:

- **Stormwater Management Works:** This will involve:
  - Construction of a stormwater entrainment structure: This structure will comprise two small geotextile sand container (GSC) groynes, placed and interlocked atop a scour protection bedding of specifically manufactured rock bags. The purpose of this structure will be to entrain stormwater flows directly across the beach and minimise scour of the beach and immediate dune system.
  - Upgrade and replacement of the existing stormwater outlet headwall.
  - These works are not considered works directly intended to reduce the impact of *coastal hazards*. Rather, the structure is intended to reduce impacts of *stormwater processes* on the natural coastal protection buffer zone (dune).
- **Coastal Protection Works:** Dune building and rehabilitation, which will include restoring and revegetating the local dune system either side of the entrainment structure. It will involve:
  - Local beach nourishment to increase height and width of the dune system in front of Mitchell Parade. In order to achieve the required beach profile, sand material can be sourced from the intertidal zone through beach scraping. Beach scraping also known as Nature Assisted Beach Enhancement (NABE), is a coastal management technique which aims to accelerate natural sediment accumulation (or accretion) processes through the mechanical movement of sand from the lower part of the beach profile onto the upper beach face.. The volume of marine sand required to achieve the desired outcomes is calculated to be relatively small at approximately 250 m<sup>3</sup>.
  - Revegetation of the immediate dune system (to provide stability and improved ecological values) using native primary dune species. The revegetation species will comprise those listed for the “Primary” and “Secondary” dune zones, as defined in the NSW Coastal Dune Management Manual.
  - Installation of dune forming fencing to restrict pedestrian access and assist in dune growth.



It should be noted that the structure is to be located seawards of the 1% Annual Exceedance Probability (AEP) coastal hazard lines in this location – refer Figure 1-1. According to this hazard mapping, under a 1% AEP event, Mitchell Parade and the wastewater pump station SPSZ6 would likely be undermined and are at risk of their structural integrity being compromised. Therefore, the preferred option is not intended to provide long term protection of Mitchell Parade or the wastewater pump station SPSZ6 from a design 1% AEP storm event. Such protection would require implementing a more substantial “end state” solution for this location – likely in the form of a large-scale coastal revetment (seawall) or beach nourishment campaign.

The measures proposed are not intended as the end state solution but are considered a transitional measure as it to be installed seaward of the coastal hazard lines and needs to be complemented in the long-term with the aforementioned end state solutions. It is intended to provide a moderate level of protection for less severe AEP storm events and increase dune resilience and recovery after storm events.

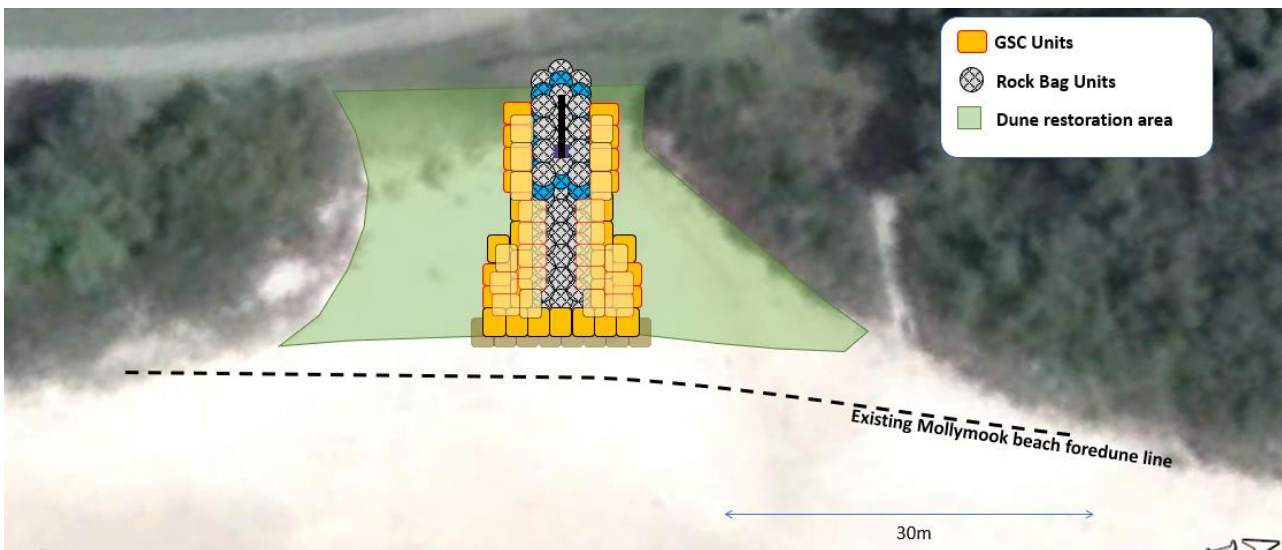


Figure 1-4 Overview of the proposed works

### 1.3 Location of the Proposed Activity, Land Use and Ownership

Mollymook Beach is an open-coast beach approximately two kilometres long. It is flanked by a rocky sandstone headland of Bannisters Point at the northern end and an intertidal rock shelf to the south (SMEC, 2009). The vegetated foredune largely comprises coastal scrub, and the dune levels at the site slope down from approximately +6.1 m AHD at Mitchell Parade to a level of around +3.8m AHD at the foredune vegetation line (under normal beach conditions). Figure 1-5 shows the existing terrain levels at the site.

The stormwater entrainment structure and dune restoration works will be located on Council managed foreshore reserve, as per detail provided in Table 1-1, and depicted in Figure 1-6. The Council reserve extends from Mitchell Parade, over the dune system down to a level of Mean High Water (MHW) – below which, is Crown Land Waterway. Beach scraping works to source sand for the beach nourishment, will be undertaken across the intertidal zone, and will extend into Crown Land Waterway.

Table 1-1 Land tenure details

Parameter	Detail
Lot Number	182//DP29209
LEP 2014 Zoning	RE1 Public Recreation
Tenure	Council managed foreshore reserve

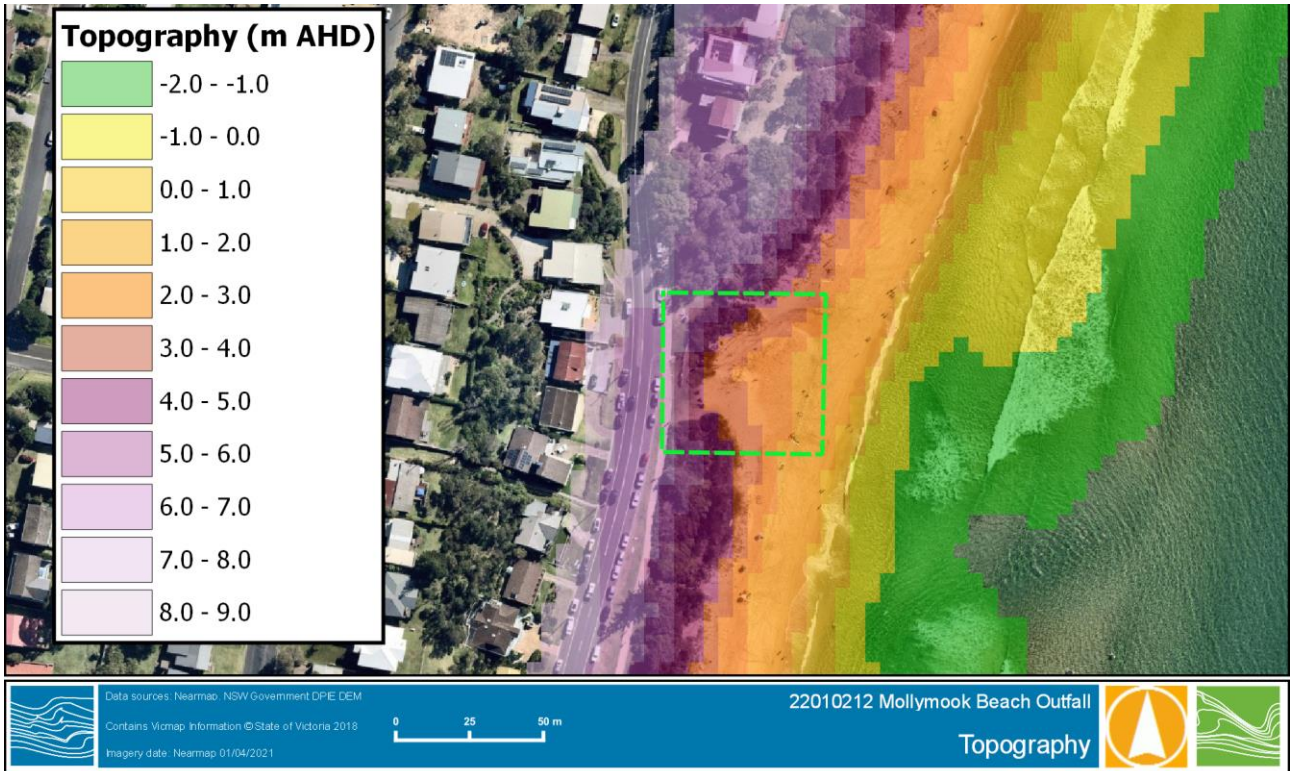


Figure 1-5 Site elevations



Figure 1-6 Land Tenure



## 2 STATUTORY PLANNING FRAMEWORK

### 2.1 Environmental Planning Instruments

#### 2.1.1 State Environmental Planning Policy (Transport and Infrastructure) 2021

State Environmental Planning Policy (Transport and Infrastructure) 2021 (hereafter referred to as the TISEPP) aims to assist in the effective delivery of public infrastructure across the State by improving certainty and regulatory efficiency through consistent planning assessment and approvals regime for public infrastructure and services and through the clear definition of environmental assessment and approval process for public infrastructure and services facilities.

Division 20, Section 2.137 of the TISEPP states that:

- 1) *Development for the purpose of stormwater management systems may be carried out by or on behalf of a public authority without consent on any land.*
- 2) *A reference in this clause to development for the purpose of stormwater management systems includes a reference to development for any of the following purposes if the development is in connection with a stormwater management system:*
  - a. *construction works*
  - b. *routine maintenance works, including maintenance dredging to remove sediment build-up in a stormwater canal or at exit points into natural waterways that affects the efficiency of the stormwater management system,*
  - c. *environmental management works,*
  - d. *buildings, including buildings containing amenities for staff, that have a height of not more than 12m above ground level (existing).*

**Implications for Stormwater Management Works:** The stormwater entrainment structure is not considered to be works directly intended to reduce the impact of coastal hazards (i.e, they are not classified as coastal protection works). Rather, the structure is intended to reduce impacts of stormwater processes on the natural coastal protection buffer zone (dune). Therefore, as Shoalhaven City Council is a public authority, the construction of the stormwater entrainment structure may be undertaken without the need to gain development consent under the TISEPP.

**Implications for Coastal Protection Works (beach nourishment and dune building):** Division 25, Section 2.165 of the TISEPP states that:

- 1) *Development for the purpose of waterway or foreshore management activities may be carried out by or on behalf of a public authority without consent on any land.*

*Waterway or foreshore management activities* includes coastal management and beach nourishment works, and revegetation works as defined per Section 2.164 – and therefore the dune refurbishment works may also be undertaken without the need to gain development consent.

#### **Relationship to State Environmental Planning Policy (Resilience and Hazards) 2021**

Under Section 2.7 of the TISEPP, it states that:

- 1) *Except as provided by subsection (2), if there is an inconsistency between this Chapter and any other environmental planning instrument, whether made before or after the commencement of this Chapter, this Chapter prevails to the extent of the inconsistency.*



- 2) *Except as provided by subsections (3) and (4), if there is an inconsistency between a provision of this Chapter and any of the following provisions of another environmental planning instrument, the provision of the other instrument prevails to the extent of the inconsistency—*
  - a. *clauses 2.7, 2.8 and 2.16 of State Environmental Planning Policy (Resilience and Hazards) 2021<sup>1</sup>*
  - b. *all of the provisions of State Environmental Planning Policy (State Significant Precincts) 2005.*
- 3) *Section 2.54 of this Chapter prevails over clauses 2.7 and 2.8 of State Environmental Planning Policy (Resilience and Hazards) 2021 to the extent of any inconsistency.*

Consequently, the TISEPP prevails over Sections 2.9 to 2.13 of the State Environmental Planning Policy (Hazards and Resilience) 2021. This is discussed further below.

### **2.1.2 State Environmental Planning Policy (Resilience and Hazards) 2021**

State Environmental Planning Policy (Hazards and Resilience) 2021 (hereafter referred to as RHSEPP) updates and consolidates into one integrated policy a series of previously enforced SEPPs, including: SEPP 14 (Coastal Wetlands), SEPP 26 (Littoral Rainforests) and SEPP 71 (Coastal Protection).

The RHSEPP gives effect to the objectives of the *Coastal Management Act 2016* (CM Act) from a land use planning perspective, by specifying how development proposals are to be assessed if they fall within the coastal zone.

The RHSEPP streamlines coastal development assessment requirements, identifies development controls for consent authorities to apply to each coastal management area to achieve the objectives of the CM Act, and establishes the approval pathway for coastal protection works.

The area of the proposed works falls within the following coastal management areas, as per Figure 2-1:

- The coastal environment and
- The coastal use areas.
- Coastal vulnerability area (note: while no CVA has yet been officially mapped, the location of the works is such that they would almost certainly fall within this coastal management area).

Figure 2-2 depicts the Coastal Wetland and Littoral Rainforest Area Mapping for the study area. This demonstrates that the proposed works would not be located on, or in close proximity to those coastal management areas.

Sections 2.7 to 2.15 of the RHSEPP list the provisions which are to be considered prior to granting development consent within these coastal management areas. However, the following is noted in relation to these Sections:

- Section 2.7 and 2.8 - these do not apply to the proposed works as they are not located within any mapped coastal wetland or littoral rainforest area.
- Section 2.9 to 2.15 - as noted in Section 2.1.1 of this REF, development consent would not be required for the proposed works under the provisions of the TISEPP. Therefore, the proposed works do not require a development application under Part 4 of the EP&A Act and those Sections do not apply.

Furthermore, Section 2.16 of the RHSEPP states the following with regards to development consent for coastal protection works (of which beach nourishment meets this definition under Section 4(1) of the CM Act):

---

<sup>1</sup> References to specific SEPP and their respective clauses have been updated to reflect recent revisions.



(2) Coastal protection works by public authority Development for the purpose of coastal protection works may be carried out on land to which this Chapter applies by or on behalf of a public authority—

(a) without development consent—if the coastal protection works are—

(i) identified in the relevant certified coastal management program, or

(ii) **beach nourishment**, or

(iii) the placing of sandbags for a period of not more than 90 days, or

(iv) routine maintenance works or repairs to any existing coastal protection works, or

(b) with development consent—in any other case.

**Implications for Stormwater Management Works:** As per Section 2.7 of the TISEPP, the TISEPP prevails over Sections 2.9 to 2.15 of the RHSEPP – and no development consent is required for the stormwater management works under those Sections of the RHSEPP.

**Implications for Coastal Protection Works (beach nourishment and dune building):** As the coastal protection works meet the definition of beach nourishment, these works can be may also be undertaken without the need to gain development consent under the RHSEPP.

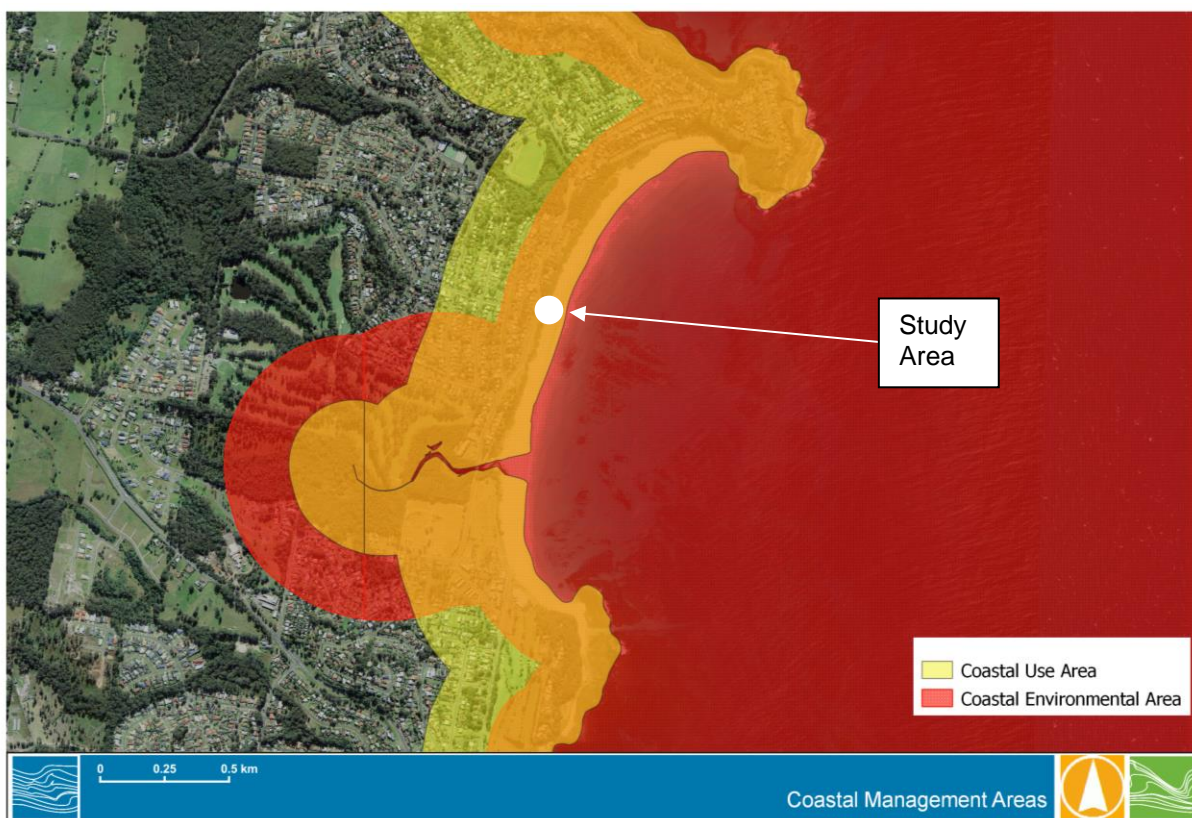
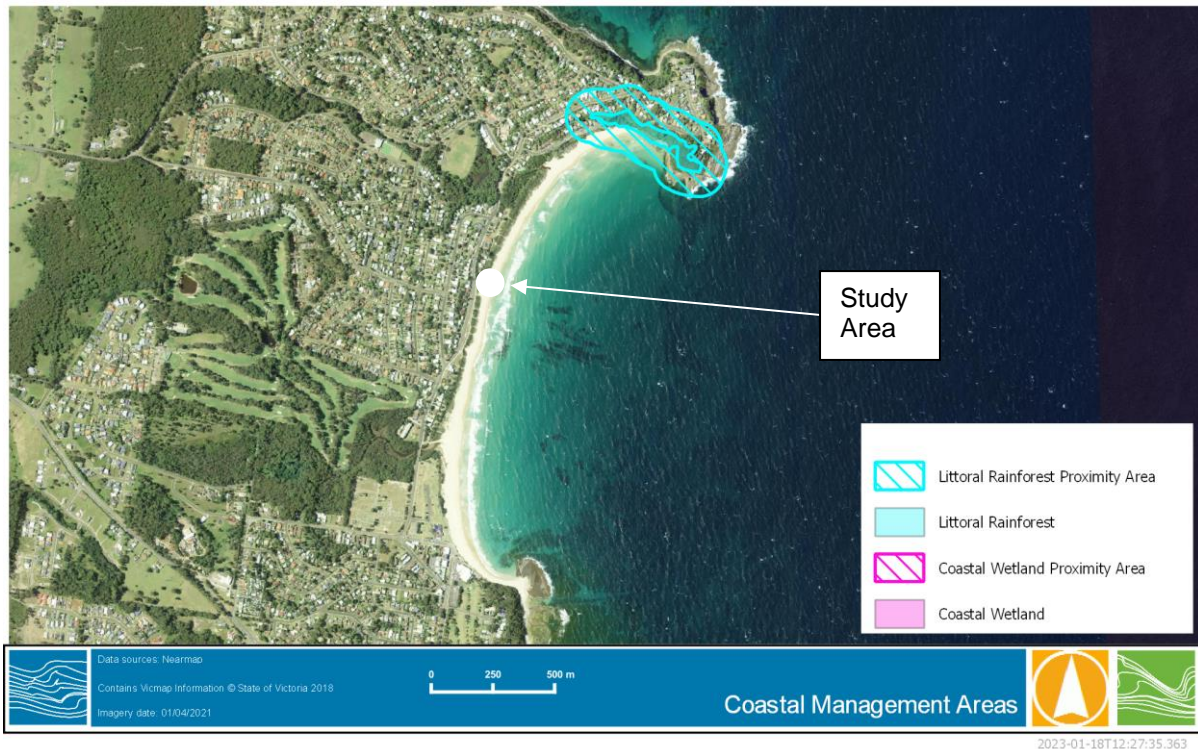


Figure 2-1 Coastal Use and Coastal Environment Areas, as per the RHSEPP



**Figure 2-2 Coastal Wetlands and Littoral Rainforest Areas, as per the RHSEPP**

### 2.1.3 State Environmental Planning Policy (Planning Systems) 2021

Section 8A of Schedule 6 of the State Environmental Planning Policy (Planning Systems) 2021 (hereafter referred to as PSSEPP) states that defines what coastal protection works may comprise "Regionally Significant Development":

#### 8A Certain Coastal Protection Works

(1) *The following development on land within the coastal zone that is directly adjacent to, or is under the waters of, the open ocean, the entrance to an estuary or the entrance to a coastal lake that is open to the ocean—*

(a) *development for the purpose of coastal protection works carried out by a person other than a public authority, other than coastal protection works identified in the relevant certified coastal management program,*

(b) *development for the purpose of coastal protection works carried out by or on behalf of a public authority (other than development that may be carried out without development consent under clause 2.16(2)(a) of State Environmental Planning Policy (Resilience and Hazards) 2021*

**2.1.4 This means that under Schedule 6, Section 8A(1)(b) the proposed beach nourishment works are not classified as Regionally Significant Development, as they may be carried out without development consent under clause 2.16(2)(a) of the RH SEPP. Shoalhaven City Council Local Environment Plan 2014**

The site of the proposed works falls within the Shoalhaven City Council Local Environment Plan 2014 (SLEP 2014), within the RE1 Public Recreation zone. The objectives of this zone are as follows:



- To enable land to be used for public open space or recreational purposes.
- To provide a range of recreational settings and activities and compatible land uses.
- To protect and enhance the natural environment for recreational purposes

Approval from Shoalhaven City Council is not required as the:

- The stormwater management works are permissible without consent under the TISEPP (see Section 2.1.1) and
- The coastal protection works are permissible without consent under both the TISEPP and the RHSEPP (see Section 2.1.1).

This is consistent with Section 5.12(1) of the SLEP 2014.

## 2.2 Relevant Legislation

### 2.2.1 Environmental Planning and Assessment Act 1979

Shoalhaven City Council is both the proponent and the nominated determining authority as defined in the *Environmental Planning and Assessment Act 1979* (EP&A Act). The proposed works satisfies the definition of an activity under the Act, and subsequently Section 5.5 of the Act stipulates that Shoalhaven City Council must assess and consider the environmental impacts of the proposed works before determining whether to proceed.

Therefore, the proposed works have been assessed under Part 5 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). The Review of Environmental Factors (REF) assesses potential environmental impacts of the proposed activity. This REF has been prepared in accordance with Section 5.5 of the EP&A Act, which requires that the proponent take into account to the fullest extent possible all matters affecting or likely to affect the environment due to the proposed activity.

Consideration of the factors listed under Section 171 of the EP&A Regulation has been used to assist in assessing the significance of the project, and is provided in Appendix A.

This REF has concluded that the proposed works is unlikely to have a significant impact on the environment.

### 2.2.2 Coastal Management Act 2016

The *Coastal Management Act 2016* (CM Act) establishes the framework and sets out the objectives for coastal management in NSW. The purpose of the CM Act is to manage the use and development of the coastal environment in an ecologically sustainable way, for the social, cultural and economic well-being of the people of NSW (DPIE, 2019).

Section 5 to 9 of the CM Act defines the coastal zone as comprising four coastal management areas:

1. Coastal wetlands and littoral rainforests area
2. Coastal vulnerability area
3. Coastal environment area
4. Coastal use area.

The CM Act establishes management objectives specific to each of these management areas, reflecting their different values to coastal communities. These coastal management areas are mapped as part of the RHSEPP – and is depicted in Figure 2-1. This shows that the study area is located within the coastal environment area, the coastal use areas, and the coastal vulnerability area.



As per Section 2.1.2, Sections 2.9 to 2.15 of the RHSEPP list matters that must be considered prior to granting development consent on land within these coastal management areas respectively. However, as noted in Section 2.1.1, development consent would not be required for the proposed works under the provisions of the TISEPP. Therefore, the proposed works are not a development application under Part 4 of the EP&A Act and those clauses do not apply.

The CM act requires Councils to develop Coastal Management Plans (CMPs) to outline these management objectives, roles and responsibilities for the coastal environment within their jurisdiction. Shoalhaven City Council does not yet have a certified CMP, and current management of the coast is in accordance with the Coastal Zone Management Plan for the Shoalhaven Coastline 2018 (CZMP), developed under the now superseded Coastal Protection Act 1979 (NSW). The proposed works had been determined as an outcome from a technical investigation which was a defined planning action from the CZMP.

### 2.2.3 Fisheries Management Act 1994

The objects of the *Fisheries Management Act 1994* (FM Act) are to conserve, develop and share the fishery resources of the State for the benefit of present and future generations. In particular, the objects of this Act include:

- to conserve fish stocks and key fish habitats, and
- to conserve threatened species, populations and ecological communities of fish and marine vegetation, and
- to promote ecologically sustainable development, including the conservation of biological diversity.

The following definitions apply with regards to dredging and reclamation in the FM Act:

- Public Water land means land submerged by water (whether permanently or intermittently), being—:
  - a) Crown land, or
  - b) land vested in a public authority, or
  - c) land vested in trustees for public recreation or for any other public purpose, or
  - d) land acquired by the Minister under Division 1 of Part 8,
- Dredging work means any work that involves:
  - a) excavating water land, or
  - b) the removal of material from water land that is prescribed by the regulations as being dredging work to which this Division applies.
- Reclamation work means any work that involves:
  - a) using any material (such as sand, soil, silt, gravel, concrete, oyster shells, tyres, timber or rocks) to fill in or reclaim land, or
  - b) depositing any such material on water land for the purpose of constructing anything over water land (such as a bridge), or
  - c) draining water from water land for the purpose of its reclamation.

Consequently, the proposed beach scraping and beach nourishment works would meet the definition of dredging and reclamation works into water land - and as such the proposed works trigger the dredging and reclamation provisions of Part 7, Division 3 of the FM Act. Therefore, a permit is required for any proposed dredging and reclamation works in water land undertaken by a local authority, in accordance with Section 200 of the FM Act.



Alternatively, if the works are authorised by another public authority (other than a local government authority) such as NSW Crown Lands, then Section 199 of the FM Act would prevail, and the public authority would be required to consult with and consider any matters concerning the proposed work that are raised by DPI-Fisheries prior to issuing the licence.

Table 2-1 outlines relevant provisions of the FM Act that would apply to the proposed works.

**Table 2-1 Activities requiring concurrence under the FM Act**

Section	Activities
198-202	A permit under Section 200 of the FM Act would be required to be obtained by Council before undertaking the works. Alternatively, if the works are authorised by another public authority (other than a local government authority) such as NSW Crown Lands, then Section 199 of the FM Act would prevail, and the public authority would be required to consult with and consider any matters concerning the proposed work that are raised by DPI-Fisheries prior to issuing the licence.
204-205	Any works must not affect mangroves or other protected marine vegetation. If marine vegetation would be harmed by flood mitigation works a permit must be sought from the Minister before works commence. Clause 205 (2) states that <i>A person must not harm any such marine vegetation in a protected area, except under the authority of a permit issued by the Minister under this Part.</i>  Analysis undertaken during this REF has indicated that the proposed works are unlikely to harm any aquatic species, marine vegetation or intertidal habitats, permits related to species and marine vegetation are not required. Refer to Section 5.11 of this REF.
Schedule 4, 4A, 5 and 6	Any proposed works must consider any presence of local threatened aquatic habitat for flora or fauna. Key Threatening Processes (KTPs) would need to be considered in preparation of the REF.  As detailed in Section 5.10 of this REF, the works will not result in impacts to protected flora and fauna or Key Threatening Processes (KTPs).

#### 2.2.4 Crown Land Management Act 2016

NSW Crown Lands is responsible for the administration and/ or management of Crown land under the *Crown Land Management Act 2016* (CLM Act). Crown land includes submerged Crown land below the Mean High Water (MHW) line, seabed and subsoil to three nautical miles from the coastline of NSW that is within the limits of the coastal waters of the State. The CLM Act requires that environmental, social, cultural heritage and economic considerations be considered in decision-making about Crown land.

Whilst the entrainment structure and dune restoration works would be located on Council managed foreshore, the proposed sand source for the beach nourishment would be from the intertidal zone – which is below the MHW line and therefore located on Crown Land.

Under Section 5.30 of the CLM Act, a licence may be sought from Crown Land to enable the licensee “to remove gravel, sand or any other material” from Crown Land. Therefore, a Crown Lands licence will be required for the beach scraping works, and as per Section 2.2.3 consultation requirements with DPI fisheries would be addressed by DPE Crown land prior to issuing approval.

#### 2.2.5 Marine Estate Management Act 2014

The *Marine Estate Management Act 2014* (MEM Act) forms part of the NSW Marine Estate Management Framework. The framework comprises statutory instruments, strategies, assessment plans and policy settings, and is administered under the auspices of the Marine Estate Management Authority (MEMA).



The objective of the MEM Act is to foster strategic and integrated management of the NSW marine estate, including the marine waters, coasts and estuaries (MEMA, 2018). The key legislative instruments under the MEM Act include:

- Marine Estate Management Regulation 2017;
- Marine Estate Management (Management Rules) Regulation 1999; and,
- Aquatic Reserves Notification 2015.

It should be noted that one of the objectives of the CM Act (and of the broader CMP process) is to support the objectives of the MEM Act.

### **2.2.6 Protection of the Environment Operations Act 1997**

The Protection of the Environment Operations Act 1997 (POEO Act) regulates air, noise, land and water pollution, and is administered by Environment Protection Authority (EPA).

Activities listed under Schedule 1 of the POEO Act are scheduled activities which require an Environment Protection Licence (EPL) to be issued by the Environment Protection Authority (EPA). The proposed works are not a scheduled activity and therefore an EPL would not be required for the proposed works.

Although the proposed works associated with the sand redistribution at Mollymook beach is not a scheduled activity, under Section 120 of the POEO Act it is an offence to pollute water unless an EPL is obtained.

Assuming that the safeguards identified in this REF are implemented (as listed in Section 5), it is anticipated that no pollution of the waters would occur as a result of the proposed works, and that the resources are protected and conserved. As such, an EPL for the proposed works is not anticipated to be required.

### **2.2.7 Biodiversity Conservation Act 2016**

The Act stipulates how development activities on land are regulated and how the impacts of these activities on the natural environment are managed. It is intended to conserve biological diversity and promote ecologically sustainable development. This Act also lists declared critical habitat, Key Threatening Processes and allows for the preparation of Recovery Plans and Threat Abatement Plans.

The impacts of any works that may affect biodiversity, as listed in the BC Act, must be properly assessed. An assessment of the flora and fauna impacts of the proposed works is contained in Section 5.10, which concludes that it is unlikely to have a significant impact on any fauna threatened species or their habitats. Therefore, the preparation of a Species Impact Statement is not required.

### **2.2.8 Environment Protection and Biodiversity Conservation Act 1999**

The Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) provides for Commonwealth involvement in development assessment and approval in circumstances where there exist 'matters of national environmental significance'. Matters of national environmental significance include:

- World Heritage properties;
- National Heritage places;
- Ramsar Wetlands;
- Nationally threatened species and ecological communities;
- Migratory species;
- Commonwealth marine areas;



- Great Barrier Reef Marine Park; and
- Nuclear actions (including uranium mining).
- A water resource, in relation to coal seam gas development and large coal mining development.

Under this Act an action would require approval from the Minister if the action has, will have, or is likely to have, a significant impact on a matter of national environmental significance.

The site is not considered to provide significant habitat for threatened species which are protected under the EPBC Act, and therefore the proposed sand redistribution works would not have a significant impact on any of these matters (Refer to Section 5.10 and 5.11 of this REF).

As such, the works would not be deemed a controlled action and would not require referral to the Federal Minister for the Environment for further consideration and approval.

### **2.2.9 National Parks and Wildlife Act 1974**

This Act provides, amongst other things, for the protection of Aboriginal heritage. All Aboriginal objects are protected under Section 90 of the *National Parks and Wildlife Act 1974* (NPW Act).

Under Section 90, it is an offence to destroy, deface, damage or desecrate an Aboriginal object or Aboriginal place without the prior issue of an Aboriginal Heritage Impact Permit (AHIP) by the Department of Planning and Environment. The amended Act requires that reasonable precautions and due diligence must be taken to avoid impacts on Aboriginal objects which includes:

- identifying whether there are, or likely to be any listed Aboriginal objects present in the area;
- determining whether the proposed activities are likely to harm Aboriginal objects (if present);
- determining whether an Aboriginal Heritage Impact Permit (AHIP) is required.

If an AHIP is required, then consultation must be undertaken with Aboriginal stakeholder groups in accordance with the requirements in cl.80C of the National Parks and Wildlife Regulation and the Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales, Department of Environment, Climate Change and Water NSW, 2010.

The potential Aboriginal cultural heritage impacts of the proposed work are discussed in Section 5.7 of this REF. It is concluded that the proposed work is not likely to have a significant impact on any aboriginal heritage features.

### **2.2.10 Heritage Act 1977**

The *Heritage Act 1977* provides for the protection of non-Aboriginal heritage in NSW. Items listed on the State Heritage Register, including archaeological heritage, require consent of the Heritage Council to undertake work or development which alters, moves, despoils or damages any part of the heritage item, place, precinct, land, its relics or any vegetation.

The potential heritage impacts of the proposed work are discussed in Section 5.7 of this REF. It is concluded that the proposed work is not likely to have a significant impact on any heritage features.

### **2.2.11 Water Management Act 2000**

The *Water Management Act 2000* (WM Act) provides for the sustainable and integrated management of the water sources of the State for the benefit of both present and future generations. The WM Act defines principles of water management, sets out water licensing laws and environmental water provisions.



Section 91 (2) states that: A controlled activity approval confers a right on its holder to carry out a specified controlled activity at a specified location in, on or under waterfront land. In accordance with Clause 41 of the Water Management (General) Regulation 2018, this project is being carried out by or on behalf of Council and therefore exempt from requiring a Controlled Activity Approval in accordance with the Act.

### 2.2.12 Contaminated Land Management Act 1997

The *Contaminated Land Management Act 1997* provides a process for investigating and (where appropriate) remediating land that the EPA considers to be contaminated significantly enough to require regulation. One of its main objectives is to ensure that contaminated land is managed with regard to the principles of ecologically sustainable development. Assessment of contaminated land is discussed in Section 5.8 of this REF.

### 2.2.13 Native Title Act 1993

The commonwealth *Native Title Act 1993* establishes a framework for the protection and recognition of native title and outlines the kinds of acts that that affect native title.

The proposed works on Crown Land reserve would affect Native Title. The applicable Future Act option was determined to be provided by Part 2, Division 3, Subdivision K (Facilities for services to the public) of the Act, for the following reasons:

- The proposed works are to be conducted on an onshore place and consists of the construction of a device for management of water flows by a local government body.
- The works will not prevent native title holder for having reasonable access to such land or waters in the vicinity of the structure except for during construction.

Consequently a ‘future act’ assessment was submitted to Shoalhaven City Councils Native Title Manager on the 12 January 2023 (D23/11963).

## 2.3 Summary of Required Approvals and Permits

Shoalhaven City Council is both the proponent and the nominated determining authority as defined in the *Environmental Planning and Assessment Act 1979* (EP&A Act). The proposed works satisfy the definition of an activity under the Act, and subsequently Section 5.5 of the Act stipulates that Shoalhaven City Council must assess and consider the environmental impacts of the proposed works before determining whether to proceed.

**Table 2-2 Summary of Approvals and Permits**

Planning Instrument	Stormwater management works	Coastal protection works (dune building and beach nourishment)
TISEPP	<p>The stormwater management works are not considered to be works directly intended to reduce the impact of coastal hazards. Rather, the works are intended to reduce impacts of stormwater processes on the natural coastal protection buffer zone (dune).</p> <p>Therefore - under Section 2.137 the TISEPP - as Shoalhaven City Council is a public authority, the stormwater management works may be undertaken without the need to gain development consent.</p>	<p>As the coastal protection works meet the definition of beach nourishment and are therefore “<i>Waterway or foreshore management activities</i>”, as defined per Section 2.164 of the TISEPP.</p> <p>Therefore – under Section 2.165 of the TISEPP – the dune refurbishment works may be undertaken without the need to gain development consent.</p>



Planning Instrument	Stormwater management works	Coastal protection works (dune building and beach nourishment)
RHSEPP	As per Section 2.7 of the TISEPP, the TISEPP prevails over Sections 2.9 to 2.15 of the RHSEPP – and no development consent is required for the stormwater management works under those Sections of the RHSEPP.	As the coastal protection works meet the definition of beach nourishment, these works may also be undertaken without the need to gain development consent – under Section 2.16(2)(a) of the RHSEPP
PSSEPP	N/A.	Under Schedule 6, Section 8A(1)(b) of the PSSEPP, the proposed beach nourishment works are not classified as Regionally Significant Development, as they may be carried out without development consent under clause 2.16(2)(a) of the RHSEPP.
CLM Act and FM Act	<p>As the beach scraping works are to occur on Crown waterway or directly (Minister) managed Crown land, an authorisation from NSW Crown Lands is required under Section 5.30 the CLM Act. As part of the NSW Crown Lands licence application process, the following would be required under the CLM Act:</p> <ul style="list-style-type: none"> <li>▪ A determined environmental assessment must be submitted with any Crown Land licence application. This assessment must also fulfill the requirements of Part 5 of the EP&amp;A Act. This REF has subsequently been prepared to fulfill these requirements.</li> <li>▪ Furthermore, under Section 199 of the FM Act, Crown land licence applications that involve ‘dredging and reclamation’ must be referred to DPI-Fisheries for their consideration. As part of this process, Council would be required to consult with and consider any matters concerning the proposed work that are raised by DPI-Fisheries prior to DPE-Crown Lands issuing a licence.</li> </ul>	

## 2.4 Relevant Policies and Guidelines

### 2.4.1 Policy & Guidelines – Aquatic Habitat Management and Fish Conservation Update 2013 (DPI, 2013)

The Policy and Guidelines for Aquatic Habitat Management and Fish Conservation (referred to as the Policy) has been prepared to improve the conservation and management of aquatic habitats in NSW and provide guidance on the developments which may impact on aquatic ecosystems. It is targeted at local and state government authorities, proponents of developments and their advisors, and individuals or organisations concerned with the planning and management of our aquatic resources, including conservation organisations.

NSW DPI take the Policy into account when they assess proposals for developments or other activities affecting fish habitats. The Policy will assist NSW DPI to apply the legislative requirements consistently and fairly to individual proposals. NSW DPI recommends proponents of developments or other activities to submit proposals that address these policies and guidelines.

As discussed in Section 2.2.3, the works are considered to meet the definition of both dredging and reclamation under the FM Act.

It is considered that the “reclamation works” would be defined under the Policy as beach nourishment (also termed replenishment). The placement of sand in this location would provide for protection of Mitchell Road and wastewater pump station SPSZ6 from storm damage and ongoing sediment loss due to stormwater discharge.

The following table includes the items in these guidelines which are considered relevant to the proposed works and indicates where they are addressed in the REF.



Table 2-3 DPI Policies for dredging and reclamation

Policy	How / Where addressed
<b>Beach Nourishment (reclamation)</b>	
1) NSW DPI requires that beach nourishment proposals include an assessment of the potential for shifting sands to affect nearby fish habitat	Sections 5.11
2) NSW DPI requires that all beach nourishment proposals give due consideration to the environmental impacts on the borrow area (the location from which sand is supplied).	Section 5.9 to 5.11
3) NSW DPI will generally only approve the use of clean sand with similar particle size analysis to that on the beach being rehabilitated.	Only existing sand on from Mollymook beach will be used.
<b>Sediment extraction (dredging) policies</b>	
1) NSW DPI will generally not approve sediment extraction proposals in TYPE 1 and 2 habitats, CLASS 1 or 2 waterways or that interfere with commercial and recreational fishing or aquaculture activities unless impacts can be adequately mitigated or compensated, or the extraction will result in the rehabilitation of aquatic habitats and fish stocks.	No works proposed in TYPE 1 or TYPE 2 habitats or in CLASS 1 or 2 waterways.
<p>11) NSW DPI will assess extraction proposals with consideration for the following priorities:</p> <ul style="list-style-type: none"> <li>▪ essential remediation works of contaminated sites and other hazardous situations;</li> <li>▪ maintenance of existing essential navigation channels for public use;</li> <li>▪ stream and estuary rehabilitation purposes;</li> <li>▪ flood mitigation and asset protection for public purposes;</li> <li>▪ non-remediation extraction for private purposes including oyster production, flood control, drainage, navigation, and sale of materials.</li> </ul>	The works are required to provide protection for essential public assets – including Mitchell Parade and wastewater pump station SPSZ6.
3) NSW DPI will generally not approve the creation of navigation channels for private use in areas that support TYPE 1 or 2 habitats.	N/A
4) NSW DPI will generally not approve dredging and reclamation to create artificial canals attached to existing waterways. This includes coastal developments and freshwater environments such as artificial lake estates.	N/A
<p>11) NSW DPI will require proponents to carefully monitor the impacts of extraction activities including:</p> <ul style="list-style-type: none"> <li>▪ rates of sediment infilling post-works,</li> <li>▪ upstream and downstream impacts,</li> <li>▪ immediate habitat changes.</li> </ul>	Post sand redistribution monitoring is proposed. Council undertakes periodic monitoring and survey of Mollymook Beach
6) NSW DPI will require extraction proposals for rehabilitation or remediation works to ensure that the environmental outcomes are positive, and that environmental harm does not result.	Environmental outcomes are considered to be positive through increased vegetated dune cover. No expected adverse impacts on marine flora or fauna.



Policy	How / Where addressed
7) NSW DPI will require the environmental assessment for any extraction proposals to address impacts on borrow sites (areas where sediment is extracted for the purposes of rehabilitating adjacent habitats) in terms of natural replenishment rate and whether the area will be adversely affected by the loss of sediment.	See Section 5.9 to 5.11
8) NSW DPI will generally not approve the disposal of spoil into the waterway as it can impact on the aquatic environment (e.g. smothering benthic animals and plants, water quality). Disposal of spoil into a waterway may be permitted if procedures comply with OEH guidelines and disposal occurs at recognised offshore dumping grounds.	Sand will be placed above the Highest Astronomical Tide (HAT) level.
9) NSW DPI requires that excavation spoil not be stockpiled within 50 m of TYPE 1 and 2 aquatic habitats as it may cause problems with sedimentation and turbidity. Sediment and erosion control measures must be put in place for the management of any spoil disposal sites which have the potential to contaminate nearby waterways.	No stockpiling of sand is proposed within TYPE 1 or TYPE 2 habitats or in CLASS 1 or 2 waterways. The contractor is to development safe stockpiling methods in the Construction Environmental Management Plan and Storm Contingency Plan that will be approved by Council prior to works commencing.

## 2.5 Consultation

### 2.5.1 Agency Consultation

Significant agency consultation was undertaken prior to certification of the CZMP and has also occurred through the development of the CMP for the open coast which has encompassed the management proposal for the area.

This REF will be provided as an attachment to the applicable agency approval applications as defined in Sections 2.2.3 and 2.2.4.

### 2.5.2 Community Consultation

Significant community consultation was undertaken prior to certification of the CZMP and has also since occurred through the development of the CMP for the open coast which has encompassed the management proposal for the area. This REF will be made public prior to commencing works.

It is recommended that two weeks prior to the works, Shoalhaven City Council should:

- Publicly advertise the works through their regular communication channels (including social media), and
- Provide additional notice to local residents along Mitchell Parade who may be temporarily impacted on by noise or traffic associated with construction.

It is noted that under Section 171 (4) of the EP&A Regulations, the REF document must be published on the determining authority’s website or the NSW planning portal if the activity requires an approval or permit under Section 200 of the FM Act. As concurrence from DPI-Fisheries is required under Section 200 of the FM Act, this Section 171 (4) applies and Council is required to publish the REF on their website either:



- a) before the activity commences, or
- b) if publishing the review before the activity commences is not practicable—as soon as practicable, and no later than 1 month, after the activity commences.



### 3 OPTION EVALUATION AND PROJECT JUSTIFICATION

#### 3.1 Existing Conditions

The Shoalhaven Coastal Zone Management Plan Risk Assessment (Advisian, 2018a) was undertaken in 2018 and identified infrastructure and assets across the LGA coastal zone that are potentially exposed to coastal hazard risks – in both the present day, current and over future planning horizons to 2100. In the centre of Mollymook Beach, two assets were identified as being exposed to “high” or “extreme” coastal hazard risk – including:

- Wastewater pump station SPSZ6, which is located on Mitchell Parade, Mollymook directly behind the primary foredune; and
- Mitchell Parade, Mollymook, which is a public road servicing the local area.

These assets are located seawards of the 1% Annual Exceedance Probability (AEP) coastal hazard line (Advisian, 2016) – as depicted in Figure 1-1. However, the exposure of these assets is expected to increase over time due to future sea level rise and the associated response of long-term shoreline recession.

Coastal hazard analysis undertaken as part of the Mollymook SPS Coastal Protection Options Assessment (Water Technology, 2021) indicated the SPS asset is likely to be impacted by erosion in the present day with an AEP of around 1.4% (around a 70 years Average Recurrence Interval (ARI) event), increasing to around a 3% AEP (30 years ARI) by the year 2050 – see Table 3-1.

**Table 3-1 Approximate Coastal hazard exposure of the SPS Asset**

Asset	Asset Impact at Event Magnitude	Wave Run-up Exposure (Inundation)			ZRFC Exposure (Erosion)		
		2020	2030	2050	2020	2030	2050
SPS Z6	AEP (%)	2.4%	3.1%	4.6%	1.4%	1.9%	3.4%
	ARI (Years)	41.7	32.6	21.7	69.3	53.7	29.7

One of the contributing factors to the erosion vulnerability at this location is the presence of a stormwater outlet which discharges onto the beach. This is a common issue on beaches that contain stormwater outlets. Although the total flow out of such outlets can be relatively small, the instantaneous discharge rates can be high, particularly during periods of intense rainfall. As a result, stormwater discharged through such outlets and onto the beach can generate significant and ongoing localised erosion. The result is typically the generation of erosion channels through the beach berm and across the beach into the ocean. This increased erosion can have a double effect whereby the scour channel allows waves to penetrate to the back of the beach, further exacerbating the erosion, this can also pose public safety hazard relating to pedestrian access.

As can be seen in Figure 1-1 and Figure 1-2, stormwater discharge from the outlet at this location has resulted in a locally depleted dune system. To the immediate north and south of the outlet, the vegetated dune system is around 15-20 m wide and is generally built up to a level of +6 m AHD. However, recurrent discharge from the outlet has resulted in a nearly constant process of sand scour that has resulted in a local “disconnect” in the dune system. The discharges do not always flow “directly” out to sea, as can be seen in Figure 1-1, but rather take a meandering path where flows are channelled north or south from the outlet depending on local beach levels. This results in a localised loss of dune protection in front of Mitchell Parade and the SPS asset.



## 3.2 The Need for the Proposed Works

The assets in question are exposed to a high level of coastal hazard risk. It is also to be noted that the assets themselves are critical in nature (a main road, and key component of the local wastewater network) – and provide essential services to the local community.

This is supported by the Shoalhaven Water Wastewater Asset Management Plan (Shoalhaven Water, 2019), which provides a framework that identifies which assets in their network are considered to be “critical”, with the level of criticality defined in terms of the consequences of asset failure. The three criticality grades are:

- **Extremely Critical:** Assets where the consequences of failure are unacceptable and must therefore be reduced.
- **Critical:** Assets where the consequences of failure are sufficiently serious that it is desirable to avoid the failure of these assets to the extent that it is practicable to do so.
- **Non-critical:** Assets where the consequences of failure are not significant enough that Shoalhaven Water should actively commit resources to preventing their failure.

Wastewater assets are considered potentially critical if they are located inside or within 50 m from the edge of waterways and beaches, boundary of food production sites, or environments of ecological significance. Therefore, wastewater pump station SPSZ6 is “Critical” infrastructure.

In addition to this, the Shoalhaven Coastal Zone Management Plan Risk Assessment (Advisian, 2018a) and the NSW Coastal Management Manual (OEH, 2018d) both classify utility infrastructure and main roads as “Essential Infrastructure”.

## 3.3 Option Evaluation

### 3.3.1 The Mollymook SPS Coastal Protection Options Assessment

Based on the outcomes of the Shoalhaven Coastal Zone Management Plan Risk Assessment (Advisian, 2018a), a detailed options assessment was undertaken as part of the Mollymook SPS Coastal Protection Options Assessment (Water Technology, 2021).

As part of that project a range of potential coastal management solutions were identified and assessed. These included:

- “End State” solutions – those that will present long term solutions to mitigate coastal hazard risk. Typically, these solutions involve active relocation, or the implementation of hard coastal protection structures such as revetments and seawalls. These end state solutions typically involve substantial costs and can involve lengthy funding and environmental approval processes.
- Therefore, in addition to identifying the long-term end state solutions, a probabilistic cost-benefit analysis was used to assess “Transitional”, or “Interim” coastal management actions that can mitigate coastal hazard risk in the short to medium term. Whilst these do not represent long term solutions, they can be considered as transitional measures, assisting to provide a level of protection against medium term risk over a nominal forward 30 years planning period.

Options considered for the study area included:

- Option A: Active relocation: Relocating the asset before it is damaged:
- Option B: Passive relocation: A “do nothing” approach, where the asset is left to fail when the time comes and is relocated after failure to safer ground
- Option C: Adaptation – i.e., relocation of individual SPS components, such as the telemetry unit



- Option E: A 370 m rock armoured seawall structure to protect the exposed section of Mitchell Parade and the SPS asset. This structure was first examined as part of the Shoalhaven “Authorised Locations” Coastal Erosion Remediation Options – Mollymook Beach (Royal HaskoningDHV, 2012).
- Option F: Construction of a stormwater entrainment structure and dune restoration works: *The works proposed as part of this REF.*

The full range of potential alternatives were assessed based on a probabilistic cost-benefit analysis over a forward 30-year planning period. For the SPS asset in question, the options assessment included the following for each option:

- Calculation of the capital expenditure (CAPEX).
- Determination of the 30-year Net Present Value (NPV) operational expenditure (OPEX). This included three (3) components:
  - **Baseline Asset Maintenance Costs:** The costs associated with maintaining the SPS assets over the forward 30-year life-cycle period. This included the cost of replacing the individual components as they reach the end of their useful life.
  - **Baseline Option Maintenance Costs:** For coastal protection options, this included the cost of maintaining the structure and/or dune system.
  - **Coastal Hazard Damage Costs:** The additional costs associated with coastal storm related damage, principally those associated with coastal erosion and coastal inundation. Unlike maintenance costs, these costs cannot be reliably predicted over the 30-year life-cycle period as they are weather dependant – and so a probabilistic approach was adopted that provided the potential range of future costs.
- A multicriteria analysis (MCA) to determine the performance of each option against a number of established criteria (including engineering feasibility, environmental impacts, and social & recreational impacts). Based on the MCA, a net-benefit score and cost-benefit score were calculated for each option.

### 3.3.2 Outcomes

For SPSZ6, the consideration of options has considered the life-cycle costings associated with the SPS asset, as well as other broader issues including the vulnerability of Mitchell Parade and the adjacent stormwater outlet.

RHDHV (2012; 2014) noted that due to the scale, nature and exposure of these assets, there is no reasonable opportunity to relocate them – and therefore in the long term they must either be relinquished or protected.

The most robust option would be the development of a coastal revetment structure. This structure would provide the requisite level of coastal protection for the SPS asset, Mitchell Parade, and surrounding infrastructure. In fact, RHDHV (2012) notes that “*Given the immediate threat to Precinct C, it is proposed that the project be designed and constructed as soon as possible*”. Given the exposure of the site and the value of the foreshore infrastructure, Water Technology agrees with RHDHV (2012; 2014) that this revetment represents the most viable long-term solution for the site.

However, it is noted that the structure may be prohibitively expensive for Council in the short term. Approvals and funding for such large and expensive structures can often take years to procure and are generally dependent upon satisfying robust economic cost-benefit-analyses that address net public benefit for the local community and for visitors to the area. An example of the costs of the structure and impact on ongoing SPS maintenance costs have been provided herein. However, a similar assessment of economic value of Mitchell Parade and the stormwater outlet (and the value of their continued utility), and the private property also likely to be affected would further support development of a terminal revetment.



Therefore, the proposed works was preferred as a rational and cost-effective management response that can serve as a transitional measure, assisting to provide a level of protection against medium term risk.

- The stormwater management works will entrain stormwater flows directly across the beach and minimise scour of the beach and local immediate dune system;
- The coastal protection works (such as beach nourishment and dune building) can provide an increased erosion buffer at what is considered to be a highly vulnerable pinch-point (and one that will only become more exposed over time due to sea level rise and net shoreline recession).

The proposed works represent a balanced approach that covers quadruple bottom line dimensions of cultural, economic, environmental and social factors.



## 4 SCOPE OF WORKS

### 4.1 Description of the Proposed Works

The proposed works will comprise two main components, and are depicted in Figure 1-4:

- Construction of a stormwater entrainment structure:
- Dune building and restoration, which will include restoring and revegetating the local dune system either side of the entrainment structure.

These components are described in detailed in Section 4.1.1 and 4.1.2 below.

#### 4.1.1 Stormwater Entrainment Structure

##### *Construction Materials*

The stormwater entrainment structure will be constructed using a variety of materials. It will be a hybrid structure composed of geotextile sand containers and rock bag units – and sit above a base consisting of three-dimensional geo-grid matting. The purpose of this structure will be to entrain stormwater flows directly across the beach and minimise scour of the beach and local dune system. A brief overview of the construction materials is provided herein:

- **Geotextile sand containers:** The entrainment structures will be comprised of geotextile sand container (GSC) units. A GSC comprises a structure that is formed by sewing geotextile fabric that is then filled with sand – see Figure 4-1. Durability for high-quality GSC's exposed to UV and wave action is typically 15 to 20 years, although this can be reduced due to debris damage or vandalism. Detailed design of the structure indicated that 2.5 m<sup>3</sup> GSC units would be required in order to achieve functional stability. This units are sufficiently heavy (4.5 t) so as to minimise the risk of displacement, delamination and deformation of the bags in such an energetic, swash zone environment. The units would be filled using in-situ Mollymook Beach sands from the sand sourcing area (see Section 4.1.2 for more sand sourcing information).
- **Rock Bag units:** The base of the structure will be formed of rock bags units. Specially engineered rock bags have been used for erosion control and scour protection in the marine environment for over 25 years. The rock bag units consist of double membrane polyester net filled with rocks. The netting is suitable for hydraulic works as it is non-corrosive, rot proof, and non-rusting. Most manufacturers claim durability under UV and marine exposure for up to 30 years. The units are flexible and are therefore well suited to use in the swash zone where the beach is active and dynamic. The structure should employ rock bag units of 2 t sizing. These units will provide sufficient resistance to high intensity discharges from the outlet, and provide reasonable stability from wave run-up in the swash zone – whilst also maintaining an efficiency of constructability on site. Depending on the preferred construction methodology of the contractor (and bag supplier), the units may be either assembled off-site and the transported to site, or the raw materials may be transported to the site and then assembled on site (as per the Technical



Figure 4-1 Schematic of an ELCOROCK GSC Unit



Figure 4-2 Schematic of a rock bag unit



Specifications). Geoweb matting: The structure will sit atop a matting bed comprised of a lightweight but strong three-dimensional cellular confinement system, commonly referred to as *geogrid* or *geoweb*. This material is commonly used as foundation reinforcement for enhancing load carrying characteristics of weak soils and as erosion protection for slopes. The purpose of the matting will be to provide additional scour protection beneath the structure. Configuration and Alignment

- **Alignment:** The structure is to be aligned in a shore-normal direction to efficiently drain stormwater flows and maximise space available for dune rehabilitation. The orientation of the structure is approximately 100° relative to true north.
- **Length:** The structure will be long enough to sufficiently entrain stormwater flows into the coastal waters, but not so long as to generate a significant groyne feature that disrupts local littoral drift along Mollymook Beach. Therefore, the structure extends out onto Mollymook Beach such that its toe aligns with the foredune of the surrounding foredune (either side of the outlet). It is around 20 metres in length.
- **Slope:** The slope of the structure has been graded to match the existing foreshore slope to the greatest possible extent whilst still maintaining structural stability. The design slope is 1:15 (V:H).
- **Configuration:** The base of the structure comprises three 2 t rock bag units set out three abreast. These rock bag units will allow for filtration of low flows through the base of the structure into the swash zone groundwater system. The bags are also well suited to withstand high flowrate discharges from the stormwater outlet. The base units will be protected by a two layers of flanking 2.5 t GSC armour units. The units will be stepped to maximise structural stability and to ensure pedestrian safety. To the greatest extent practical, the placement of the GSC units should ensure that the two layers are offset from one another to increase stability and interlocking of the units. At the seaward end of the structure, a breakwater “roundhead” has been implemented, adopting a high interlock “herringbone” placement pattern. This design feature aims to maximise stability against breaking and broken wave actions – as the seaward end of the structure will be subject to the highest wave energy. The configuration is presented in the design drawings and associated technical specifications.
- **Toe design:** In extreme storm events, large scale erosion can occur at the toe of the structure. In order to overcome this issue, a self-healing toe has been incorporated in the design to reduce risk of undermining of the structure. This self-healing toe is comprised of an additional row of GSC units at the seawards end of the structure (at the point of bed settlement) and will move with the bed. This has the advantage that it will limit potential undermining of the structure at its seawards end.

### **Outlet Headwall**

The works will also include replacement of the existing stormwater outlet headwall, with a new reinforced concrete headwall structure, connecting to the existing pipe network with a flexible pipe connection.

### **Safety In Design**

The Safe Design Register (SDR) was developed during the detailed design process. This register details the risk management procedures implemented throughout the design phase of the project, including:

- Hazard identification, risk assessment and risk control
- Description of hazards identified during the key lifecycle stages of the structure during construction (including demolition of existing structures), operation, maintenance and demolition
- Design mitigation measures, controls to be implemented during construction and any residual risks to be adopted by Council, other designers, the principal contractor, operator, maintenance or demolition contractor

#### 4.1.2 Dune Building and Restoration

Local beach nourishment will be undertaken in order to increase height and width of the dune system in front of Mitchell Parade. This will involve placement of a relatively small volume (around 250 m<sup>3</sup>) of sand on the upper beach face either side of the entrainment structure.

The crest of the refurbished dune area would be around +4.5 m AHD and would grade down at the same slope as the surrounding dune (1V:10H) to a level of around +3.5 m AHD where it will neatly merge into the existing beach face.

In order to achieve the required beach profile, sand material can be borrowed from the intertidal zone using beach scraping, also referred to as NABE. As the required volume is small, the 250 m<sup>3</sup> of sand can be obtained by skimming a shallow layer of swash zone sand around 0.3 m deep, over an area around 800 m<sup>2</sup> in footprint (a rectangular borrow area of around 80 m x 10 m). The NABE borrow area should start at around HAT (+1.1 m AHD), which is likely around ~35 m seawards of the existing dune vegetation line. Based on likely foreshore slopes, the NABE borrow area will extend to around -0.1 m AHD. An indicative footprint encompassing sufficient borrow area is provided in Figure 4-3.

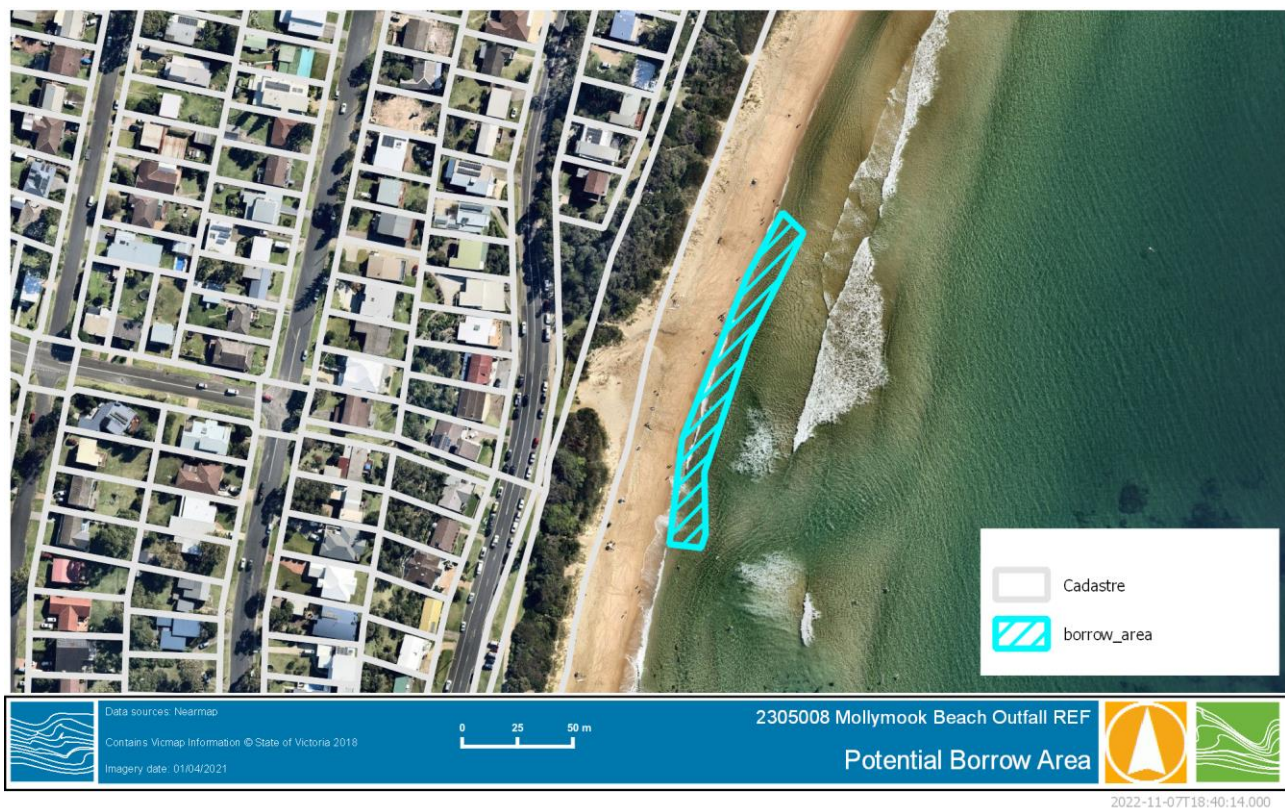


Figure 4-3 Potential NABE borrow area of beach nourishment

As part of the NABE process, local sand material is bulldozed from the swash zone, starting at low tide, and pushed up onto the berm, working up the swash zone as the tide rises. The sand harvested from the swash zone onto the berm can then be moved to the back of the beach during the higher phases of the tide to form the incipient dune (Gordon, 2015).

In relatively calm wave conditions following storm erosion, it has historically been found that the rate of natural resupply from the offshore region to the swash zone borrow is initially rapid - so that typically, a 0.3 m skimming of the swash zone on one tide can result in near reinstatement of the previous swash zone by the next tide (Gordon, 2015).



It should also be noted that NABE accelerates the process of natural process of foreshore accretion and onshore sediment transport, by flattening the beach slope.

Once the dune building has been undertaken, the primary dune will be revegetated. The species used in the revegetation should be guided by Chapter G6 of the Shoalhaven Council DCP and the NSW Coastal Dune Management Manual. The revegetation species should comprise those listed for the “Primary” and “Secondary” dune zones. Revegetation will complement existing vegetation growing at this location.

The works will also include installation of fencing, including:

- Sand trap fencing, which is to be included in the dune reconstruction area – this will assist with ongoing natural growth of the dune after construction and NABE works and completed.
- Fencing will be applied along Mitchell Parade in order to prevent pedestrian access to the beach from over the top of the existing dune system. This Mitchell Parade fencing should also include geotextile material to prevent sand-blown wind-drift onto Mitchell Parade.

## 4.2 Works Methodology

The exact methodology for undertaking the works is unknown at this stage and would be determined by the successful contractor. An indicative methodology has been provided based on the proposed design details; this is considered sufficient to inform the REF assessment process.

### 4.2.1 Works Activities

The following sequence of activities is likely to be undertaken.

- Preliminaries
  - Preparation of the Construction Environmental Management Plan to outline all of the relevant environmental aspects and their appropriate mitigation and associated documentation;
  - Identification of services.
- Site establishment;
  - Site compound, parking areas and fencing etc
  - Delineating the construction site, storage and laydown areas,
  - Installation of sediment and erosion controls,
  - Localised closure of part of the beach and secure the works area.
  - Traffic management along Mitchell Parade
  - Any other relevant site preparation works.
- Construction of entrainment structure
  - Minor excavation work
  - Placement of geoweb cellular confinement system matting
  - Filling of rock bag units using the production frame supplied by the manufacturer
  - Placement of rock bag units as per design specifications
  - Filling of GSC units using the hydraulic filling apparatus and placement cradles provided by the bag manufacturers
  - Placement of GSC units as per design specifications
- Sand redistribution and dune building works.



- Skimming of sand borrow area and local stockpiling of sand material
- Placement, profiling and grooming of sand to desired dune profile
- Planting of primary and secondary dune vegetation
- Installation of dune forming fencing
- Site dis-establishment and clean up
  - Make-good disturbed surfaces;
  - Removal of sediment controls.
  - Dismantling compounds, removal and disposal of waste material and removing construction signage
  - Completion of 'as built' survey

It is likely that sand will need to be temporarily placed in some areas along the beach to allow access during the sand redistribution works. The contractor would place the minimum sand necessary to achieve this and only a minimal profile adjustment is proposed.

#### 4.2.2 Equipment Requirements

- Construction of entrainment structure
  - GSC filling and placement requires filling apparatus including J-Bins (manufacturer supplied), 2 Shock absorbing retracting lanyards and safety harnesses, 50mm lay flat high pressure hose with quick lock fittings (manufacturer supplied), 13 tonne or similar excavator for filling sand containers, 35 tonne or similar suitable excavator for placement of sand containers.
  - Rock bag filling and placement requires a single-lift excavator/crane. The rock bag manufacturer installation guideline should be adhered to for filling the bags, noting that the contractor may propose to construct the bags on site.
- Sand redistribution and dune building works
  - It is likely that either a small dozer or an excavator and two small dump trucks would be employed to undertake the works. A small excavator would be used to level and grade sand to the design profiles.

#### 4.2.3 Works Program

The works program would depend on the prevailing tide, ocean and weather conditions at the site. Therefore, the following program is indicative only and may vary depending on local site and weather conditions.

It is anticipated that the works would take up to a month one to two weeks (depending on environmental conditions and equipment capacity). The works will be scheduled to occur mostly during low tides, with at least 50 % of the NABE works required to be undertaken during the low tide cycle only.

#### **Working Hours**

As per the Interim Construction Noise Guideline (DECC, 2009), all activities or project works, including the arrival and departure of vehicles delivering or removing materials from or to the site, would be carried out between the hours of:

- Monday to Friday 7:00 am to 6:00 pm
- Saturday 8:00 am to 1:00 pm
- At no time on Sunday and public holidays.



Work could be undertaken outside these hours only with prior written approval from the Principals Authorised Person after consultation with Council.

The works would be undertaken outside of the peak beach usage time periods of summer and the Easter holidays.

## 4.3 Construction Management Issues

### 4.3.1 Construction Environmental Management Plan

The proposed works would be undertaken in accordance with a Construction Environmental Management Plan (CEMP) prepared by the contractor and approved by Council prior to the commencement of works. The CEMP would include detailed works and contingency planning and scheduling of works. The plan would reflect the environmental safeguards identified in Section 5 of the REF, and incorporate the following relevant sub-plans:

- Public Safety Plan
- Emergency Oil and Fuel Spillage Plan
- Storm Contingency Plan

### 4.3.2 Site Facilities

The contractor would establish a works compound area to accommodate vehicle / equipment parking, facilities for workers, storage and material lay down areas, and rubbish bins. The entire works area, including the works compound would be fenced.

The location of the works compound site would be determined by the contractor in consultation with Council. Given the space restrictions at the site, it is likely that a small works compound would be established on the strip of Council foreshore reserve in between the dunes and Mitchell Parade.

Heavy plant and equipment would be left on site and appropriately secured outside of normal construction hours. At completion of the works, the work areas would be left in a clean and tidy state. The compound site would be restored to a condition equivalent to or better than the original.



## 5 ENVIRONMENTAL ASSESSMENT

The following chapter identifies and characterises the likely potential impacts associated with the proposed works and post works. Where considered necessary, mitigation measures are identified. The key objectives of this assessment are:

- Identify those facets of the environment likely to be affected by the proposed works
- Identify the sensitivity of the site
- Identify and characterise the associated impacts
- Identify and evaluate mitigation measures for the identified impacts

Environmental issues of potential relevance to the proposed works would be associated with the works phase and include impacts associated with:

- Land use and amenity
- Public safety
- Traffic and access
- Noise
- Air quality
- Water quality and erosion and sedimentation
- Waste management
- Cultural heritage
- Flora and fauna
- Aquatic environment
- Coastal processes and climate change

The proposed works have been evaluated with due consideration of the provisions of Section 171 of the *Environmental Planning and Assessment Regulation 2021* (see Appendix A). The mitigation measures provided in this section would be incorporated into the CEMP for the works.

### 5.1 Land Use and Amenity

#### ***Existing Environment and Potential Impacts***

The works could occupy a localised stretch of Mollymook Beach around 150 m wide. In order to ensure adequate public and plant/equipment separation during the implementation of the construction work, the beach area where active works are occurring will be inaccessible for the duration of the temporary works period, and the beach access track opposite 55 Mitchell Parade would need to be closed to the public for the duration of the works. A works compound would be established at a suitable location in consultation with Council. The area would be fenced, and equipment secured when not in use.

The proposed works would therefore impact on the land-based passive recreation, swimming and general use of the beach. However, Mollymook Beach is over 2.2 km long, and it is noted that there are 11 alternative beach access points across the beach. The duration of the works is also expected to be relatively short.

Given the location of residential property boundaries directly on the foreshore, traffic, noise and visual impacts associated with heavy equipment and site fencing is likely to impact upon the general amenity for residents during the works.



Construction of the proposed works is expected to impact temporarily on the visual amenity of the local environment. Activities that may cause adverse visual impacts include:

- Use and storage of machinery, equipment and work vehicles
- Installation of temporary fencing
- Excavation of trenches
- Stockpiles of soil
- Laydown areas for materials and equipment

These impacts would be temporary and only occur during the construction period.

### **Mitigation Measures**

**Table 5-1 Mitigation Measures – Land Use and Amenity**

<b>ID</b>	<b>Mitigation Measures</b>	<b>Roles / Responsibilities</b>
<b>Pre-Construction</b>		
1.1	Detailed works planning – including preparation of a Construction Plan and CEMP – is to be undertaken to ensure the impact to surrounding residents and beach users is minimised.	Contractor/Council
1.2	Implement notification of works signage prior to commencing works to inform relevant businesses and community groups. Signage would be regularly updated to inform the public of the likely timing and programming of the works, changes to beach access, detail areas where public access will be temporarily unavailable and other important safety information.	Contractor/Council
<b>Construction</b>		
1.3	Undertake works in accordance with Council’s communications policies and requirements, including: <ul style="list-style-type: none"> <li>▪ Notify impacted residents and businesses</li> <li>▪ Erect signs to inform the public on nature of work</li> <li>▪ Personnel treat community enquiries appropriately.</li> </ul>	Contractor/Council
1.4	Work areas and surrounding areas would be kept clean and free from rubbish and debris during the entire works period.	Contractor
1.5	All materials and equipment are to be stored within the works compound.	Contractor
1.6	On completion of the work the contractor would remove all temporary depots, facilities and reinstate the areas disturbed by the works activities to a condition equivalent to or better than the pre-works condition unless otherwise agreed to with Council.	Contractor
1.7	Conduct works in standard working hours (see Section 4.2.3).	Contractor



## 5.2 Public Safety

### *Existing Environment and Potential Impacts*

As the proposed works would occur within a public space, the works pose an elevated risk of hazards to people in the vicinity – such as through the use of work vehicles along the beach, uneven surfaces, obstacles and excavated areas.

Specific mitigation measures have been developed to minimise the risks to public safety as detailed below. The contractor would undertake a risk assessment based on the proposed work method and develop additional mitigation measures to protect the public during the works. If the mitigation measures provided are implemented, the risk to public safety during the works would be low.

To minimise risks to public safety, the works would be undertaken outside periods of high beach usage – such as holiday periods. Signage would be provided to inform the public of the likely timing and programming of the works and other important safety information. Proposed signage would be approved by Council prior to being erected.

### *Mitigation Measures*

Table 5-2 Mitigation Measures – Public Safety

ID	Mitigation Measures	Roles / Responsibilities
<b>Pre-Construction</b>		
2.1	Work Health & Safety Management plans and procedures are to be prepared by the appointed contractor and determined applicable as defined by the requirements of Safe Work NSW based on site/works specific safety hazard analysis. The applicable documentation would address all considerations and identified control measures for the appropriate management of public and worker safety prior to and during the works.	Contractor
<b>Construction</b>		
2.2	Contractors to liaise closely with Council with regards the works program and the scheduling of works.	Contractor/Council
2.3	Works would be undertaken outside the summer period and periods of high beach usage.	Contractor
2.4	Conduct works in standard working hours (see Section 4.2.3).	Contractor
2.5	Signage would be provided and regularly updated to inform the public of the likely timing and programming of the works, changes to beach access, detail areas where public access will be temporarily unavailable and other important safety information.	Contractor
2.6	Signage to be approved by Council prior to being erected.	Contractor/Council
2.7	Security and safety fencing to be established and maintained around the compound area for the entire works period. Compound machinery away from parking spaces and accessways, where possible.	Contractor/Council
2.8	The work site is to be made safe, kept tidy and equipment stowed in a secure state outside of normal work hours.	Contractor



## 5.3 Traffic and Access

### *Existing Environment and Potential Impacts*

Mitchell Parade is a main road which provides transport connectivity between the township of Mollymook Beach and Ulladulla. As such, the road is subject to heavy traffic volumes at times. The road has one lane in each direction, with a hard shoulder on both sides of the road for on-street parking – see Figure 5-1. There is no public vehicle access permitted to Mollymook Beach.

Off-street parking is available in public car parks at the southern end of the beach adjacent to Mollymook Surf Life Saving Club and Mollymook Golf Club. However, parking is subject to time restrictions. On-street parking is available at various points along Mitchell Parade.



**Figure 5-1 Mitchell Parade at the proposed works site (image source: Google StreetView)**

The proposed works are expected to have a limited impact on traffic flows. It is estimated that a workforce of around five staff would be required to carry out the works. Depending on the contractors' method, tracked earthmoving machinery such as a bulldozer, skid steer or excavator and two dump trucks are likely to be used. Once plant and equipment are delivered to the site, they will remain there for the duration of the works period with machinery operating along the beach. It is unlikely that heavy machinery will be required to traverse public roads during the works period. The traffic movements pertaining to the proposed works would be associated with loading/unloading materials/equipment required and the workforce arriving and leaving the site daily.

It is estimated therefore that a maximum of ten vehicle movements per day (both to and from the site) would be expected. The impact on the adjoining road network is therefore predicted to be minimal. Council staff would also be visiting the site intermittently to inspect works.

The main impact on traffic would be parking for works' staff given the generally limited availability in the area. However, working hours would be restricted to fall outside of peak public use periods which would assist in alleviating any issues associated with parking. The works will not impede or restrict nearby residential noise receivers from accessing their property.

The works would require a works compound to house contractor amenities (there are no public amenities in proximity to the works area), plant and equipment. A number of potential locations could be utilised, and this would be confirmed by the contractor in consultation with Council.



The implementation of effective management measures during works would minimise any issues associated with traffic and access. Such measures include ongoing consultation, particularly with landowners who adjoin the site. This would allow the local community to plan for any inconvenience resulting from the works.

### Mitigation Measures

Table 5-3 Mitigation Measures – Traffic

ID	Mitigation Measures	Roles / Responsibilities
<b>Pre-Construction</b>		
3.1	<p>A traffic management plan prepared by the Contractor would address safety issues with regards to traffic and public access during the works. The plan would cover all aspects of public access and traffic management at the site, with the aim of minimising the impact of the works on the existing traffic flow, parking and public recreation areas outside of the works area.</p> <p>The CEMP would address as a minimum:</p> <ul style="list-style-type: none"> <li>▪ Safe entry and egress from the site;</li> <li>▪ Methods to ensure public safety;</li> <li>▪ Minimising any reduction in existing parking as well as impacts to pedestrian beach access.</li> </ul>	Contractor
3.2	A suitable works compound area would be established in consultation with Council with the aim of minimising impacts to local residents and the community.	Contractor
3.3	Consultation is to be undertaken with local residents detailing the works program and likely traffic requirements (e.g., no major materials deliveries at school drop off or pick up times etc.).	Contractor
3.4	Should the contractor propose to use the beach for the storage of machinery or vehicles outside of normal working hours, precautions and management strategies to minimising any damage caused are to be detailed in the CEMP.	Contractor
<b>Construction</b>		
3.5	Works would be undertaken outside the summer period and periods of high beach usage.	Contractor
3.6	Conduct works in standard working hours (see Section 4.2.3).	Contractor
3.7	Compound machinery away from public parking spaces and accessways, where possible.	Contractor
3.8	Ensure public vehicle/4WD beach access is not available. Access points / gates to be closed off to ensure no public vehicle access through site or onto beach.	Contractor
3.9	Erect signs to inform road users of changed traffic conditions as required.	Contractor
3.10	Ensure work vehicles do not obstruct vehicular or pedestrian traffic, or private driveways, public facility or business access unless necessary, and only if appropriate notification has been provided.	Contractor



ID	Mitigation Measures	Roles / Responsibilities
3.11	Where vehicles are required to use public roads, roads shall, where necessary, be swept with a vacuum sweeper to remove any sand / material. Where hosing of the road surface is carried out, loose material should be trapped to prevent it from being discharged into drains and waterways.	Contractor
3.12	All traffic would comply with all applicable traffic laws and regulations including speed limits.	Contractor
3.13	The contractor is to provide regular updates of works progress, planned work schedule and expected disruptions.	Contractor
3.14	Post works, any roads impacted by the works would be returned to a condition equivalent to or better than its prior condition.	Contractor
3.15	Where necessary, traffic control is to be undertaken to ensure public safety on Mitchell Parade.	Contractor

## 5.4 Noise

### *Existing Environment and Potential Impacts*

Mollymook Beach has low to moderate background noise levels. Traffic associated with Mitchell Parade is considered to be the greatest source of noise in the area. Heavy (truck) traffic using Mitchell Parade is audible from the beach.

The extent of audible noise from construction will depend on the time of day that works are undertaken. Residents are usually most annoyed by work at night-time as it has the potential to disturb sleep. Noise from work on evenings, Saturday afternoons, Sundays and public holidays can also be annoying to most residents as it may interrupt leisure activities (DECC, 2009).

Background noise monitoring was not undertaken as part of this REF. The daytime background noise level has been assumed to be around 55 dB(A) – based on the traffic noise assessment criteria for residential land uses provided in the NSW Road Noise Policy (DECCW, 2011). The nearest sensitive noise receivers to Mollymook Beach are the residential properties located immediately across Mitchell Parade (approximately 15 m from the works site), and those to the north located adjacent to the beach on the foreshore (approximately 45 m from the works site).

The Interim Construction Noise Guideline (DECC, 2009) has been developed to manage noise from works regulated by the EPA. Construction management levels for noise at residences are listed in Chapter 4 (Table 2) of the guideline. The guideline states that construction works with a duration of more than three weeks should be subject to a quantitative assessment of noise impacts. Although the works program is not predicted to exceed three weeks, an assessment of noise impacts has been undertaken as inclement weather has the potential to delay the works and extend the overall works program.

Under the guideline, construction noise objectives are calculated as the rating background noise plus an additional 10 dB(A) when undertaken within standard working hours. Based on an estimated average daytime background noise level being 55 dB(A), the noise level objective for the works would be 65 dB(A) at the nearest residence. Noise levels would vary depending on the nature of the activities being undertaken, however for the majority of the works program noise emissions would be fairly consistent.



It is expected that the equipment listed in Table 5-4 below would be required to undertake the works. The typical A-weighted sound power levels for this equipment are also listed (as adopted from the *Australian Standard Guide to Noise and Vibration Control on Construction Demolition and Maintenance Sites AS2436-2010*).

**Table 5-4 Estimated Noise Levels of Construction Equipment**

Item	dB(A)
<b>Background Noise and Management Levels</b>	
Estimated Background Noise	55
Construction Noise Objective	65
Threshold of “Highly Noise Affected”	75
<b>Estimated Construction Noise at 15 m proximity (nearest residential property)</b>	
Dozer	85
Excavator (20 to 30 t)	75
Dump Trucks	85

Given the close proximity of residential properties to the works area, noise associated with the construction machinery is unlikely to meet the recommended noise level objective (of 65 dB(A)) for the entire works period. Therefore, it is likely that the works would exceed the “Highly Noise Affected” level of 75 dB(A) which represents the point where there may be strong community reaction to noise.

The Interim Construction Noise Guideline (DECC, 2009) states that, where noise is above the “Highly Noise Affected” level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account:

- Times identified by the community when they are less sensitive to noise, such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences
- If the community is prepared to accept a longer period of works in exchange for restrictions on construction times.

**Mitigation Measures**

Control measures to minimise the impacts of noise on nearby residences would be documented in the CEMP to be implemented during the works, which would be required to be submitted for approval prior to commencement of works. This should include consideration of Tables 4-10 of Interim Construction Noise Guideline (DECC, 2009), which presents a summary of options for work practices with lower noise impacts. The CEMP for the works would address site specific issues, including noise reduction practices, so as to minimise impacts to nearby residences.

**Table 5-5 Mitigation Measures – Noise**

ID	Mitigation Measures	Roles / Responsibilities
<b>Pre-Construction</b>		
4.1	Neighbouring land users would be informed of the construction time frame and construction scheduling.	Council
4.2	Control measures to minimise noise impacts would be documented in the CEMP. This should include consideration of Tables 4-10 of Interim	Contractor



ID	Mitigation Measures	Roles / Responsibilities
	Construction Noise Guideline (DECC, 2009), which presents a summary of options for work practices with lower noise impacts.	
<b>Construction</b>		
4.3	Conduct works in standard working hours (see Section 4.2.3).	Contractor
4.4	Maintain vehicles and plant to ensure they are in good working order.	Contractor
4.5	Optimum siting of work areas, vehicle and plant parking areas, materials stockpiles and equipment storage areas would be undertaken in residential locations to minimise the impact on surrounding residences / land users. These aspects would be included in the daily work planning session	Contractor
4.6	All possible steps would be taken to ensure construction equipment is operated to manufacturer's specifications.	Contractor
4.7	Any noise complaint received would be investigated as soon as practicable. Any practicable and feasible measures to minimise noise would be identified. The complainant would be advised of the outcome.	Contractor

## 5.5 Air Quality

### *Existing Environment and Potential Impacts*

The air quality at Mollymook Beach is considered to be good due to the seaside location. Possible sources of air pollution would consist mostly of exhaust fumes generated by vehicular traffic on Mitchell Parade. Exposed and drying seaweed is an occasional source of odour at Mollymook Beach.

Local air quality may be affected by emissions from machinery moving sand along the foreshore. However, given the limited number of vehicles required, this is expected to be minimal.

Airborne dust may also occur from delivery of rock material to site and filling of rock bags (if done onsite), and also during placing and moving of filled bags. Impacts on air quality from sand work is considered unlikely given the sand is expected to be reasonably or fully saturated in the works location. Appropriate mitigation measures would be implemented to suppress potential dust. On this basis, it is considered unlikely that airborne dust resulting from the works would contribute to a permanent detectable reduction in local air quality.

### *Mitigation Measures*

Table 5-6 Mitigation Measures – Air Quality

ID	Mitigation Measures	Roles / Responsibilities
<b>Pre-Construction</b>		
5.1	The CEMP would require all vehicles, plant and equipment to have been suitably serviced within the six-month period prior to commencement of the works activities.	Contractor
<b>Construction</b>		



ID	Mitigation Measures	Roles / Responsibilities
5.2	All vehicles, plant and equipment would be monitored to ensure they do not emit unacceptable levels of smoke and fumes as per emission levels set by the EPA.	Contractor
5.3	The contractor would ensure that works are undertaken to minimise dust, smoke, cement dust and other objectionable matter into the atmosphere.	Contractor
5.4	The contractor would take all proper precautions to minimise any nuisance arising from dust caused by the works activities. Such precautions may include but not be limited to covering loads on trucks with tarpaulins and to spraying the roads with water or other suitable liquids. Methods to suppress potential dust would be included in the CEMP to minimise dust formation and maintain a suitable level of air quality.	Contractor
5.5	Odour or air pollutant emission complaints will be dealt with promptly and the source will be eliminated wherever practicable. Details of the complaint will be recorded and reported to Council.	Contractor
5.6	Limit works during high wind conditions.	Contractor
5.7	Limit stockpiling to the minimum necessary.	Contractor
5.8	Compact sand appropriately and sufficiently enough to minimise wind erosion following placement.	Contractor

## 5.6 Waste Management

### *Existing Environment and Potential Impacts*

Minimal waste is expected to result from the works, which primarily involves excavation and redistribution of sand across the foreshore. Sources of waste would include general miscellaneous waste, such as packaging of the GSCs. Waste can be readily managed to ensure no off-site impacts occur.

Waste may also be present on site including dumped general solid waste, remnant building material (timber fencing and wire), discarded fishing gear.

### *Mitigation Measures*

Table 5-7 Mitigation Measures – Waste Management

ID	Mitigation Measures	Roles / Responsibilities
<b>Pre-Construction</b>		
6.1	The contractor undertaking the works shall detail waste management procedures in a CEMP. The contractor would be responsible for the regular, safe and efficient disposal of all solid, liquid and gaseous contaminants and waste generated on site.	Contractor
6.2	The CEMP would also need to be consistent with the <i>Waste Classification Guidelines</i> (DECCW 2009) in that all waste removed from the site is to be classified and disposed of appropriately.	Contractor
6.3	The CEMP is to include:	Contractor



ID	Mitigation Measures	Roles / Responsibilities
	<ul style="list-style-type: none"> <li>▪ details of, and the waste management action proposed for each type of Waste</li> <li>▪ procedures that ensure the waste is transported to a lawful place</li> <li>▪ a description of the roles and responsibilities of everyone who manages the waste, including the site supervisor and sub-contractors.</li> </ul>	
<b>Construction</b>		
6.4	Refer to Shoalhaven City Council Contaminated Land Policy for protocols in relation to the unforeseen detection of asbestos and other contaminated waste that may be detected within illegally dumped material. Works are to shut down and a proper assessment protocol developed in consultation with Council's Environmental Officer and Asbestos Policy.	Contractor
6.5	All waste will be disposed of appropriately in accordance with the Resource Management Hierarchy (Avoidance, Recovery, Disposal) to a NSW Environment Protection Authority (EPA) licensed facility.	Contractor

## 5.7 Cultural Heritage

### *Existing Environment and Potential Impacts*

#### **Aboriginal Cultural Heritage**

A search of the NSW State Government's Aboriginal Heritage Information Management System (AHIMS) database indicated that no identified Aboriginal sites or places have been recorded at Mollymook Beach within 250 m of the proposed works location. The results of this search are provided in Appendix B.

The Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW (DECCW, 2010) has been used in assessing the likelihood of encountering items of Aboriginal cultural heritage during the works. The code of practices notes that Aboriginal objects are often associated with particular landscape features such as sand dunes, waterways, waterholes and wetlands, and requires consideration of area that are:

- within 200m of waters, or
- located within a sand dune system.

However, the local dune system at Mollymook fits the code of practice description of "disturbed land" due to the highly dynamic nature of the local dune system, which experiences constant cycles of natural erosion and accretion. Therefore, the probability of impacts on cultural heritage items are highly unlikely.

It is considered that further archaeological investigations and/or an Aboriginal Heritage Impact Permit are not required and that the proposed development can proceed with caution.

If, during the proposed works, any unexpected Aboriginal objects or evidence of Aboriginal occupation is uncovered, all work must cease, and the mitigation measures listed in this REF should be applied.

#### **Non-indigenous Cultural Heritage**



A review of the Stage Heritage Inventory Register (<https://www.heritage.nsw.gov.au/search-for-heritage/state-heritage-inventory/>) was undertaken and there are no listed non-Aboriginal heritage items located within the vicinity of the project area. This includes commonwealth, state and locally listed non-Aboriginal heritage items.

If, during the proposed works, any unexpected heritage items are uncovered, all work must cease, and the mitigation measures listed in this REF should be applied.

### **Mitigation Measures**

Table 5-8 Mitigation Measures – Cultural Heritage

ID	Mitigation Measures	Roles / Responsibilities
<b>Pre-Construction</b>		
7.1	All workers/contractors at each stage of the works would be informed of their obligations and protocols for Cultural Heritage management.	Contractor
<b>Construction</b>		
7.2	An unexpected finds protocol is to be implemented should any previously unidentified Aboriginal or non-Aboriginal heritage items be identified during excavation and construction. All works must cease and notifications to the following will be issued: <ul style="list-style-type: none"> <li>▪ NSW Department of Premier and Cabinet – Heritage NSW;</li> <li>▪ Council representative;</li> <li>▪ A qualified archaeologist;</li> <li>▪ Jerrinja Local Aboriginal Land Council (LALC) in the case of Aboriginal heritage.</li> </ul>	Contractor / Council
7.3	In the case of skeletal remains the following process will be implemented: <ul style="list-style-type: none"> <li>▪ The find will be reported to NSW Police and state coroner;</li> <li>▪ Crown Land will be notified of the find;</li> <li>▪ Aboriginal stakeholders – Ulladulla Local Aboriginal Land Council (LALC);</li> <li>▪ Heritage NSW will be notified of the find.</li> </ul>	Contractor / Council
7.4	Do not make publicly available or publish, in any form, Aboriginal heritage information on sites / potential archaeological deposits, particularly regarding location.	Contractor / Council

## 5.8 Water Quality and Sediment Contamination

### **Existing Environment and Potential Impacts**

#### **Water Quality**

There are 4 stormwater outlets that discharge directly onto Mollymook Beach, and two intermittent estuaries (ICOLLs). The NSW *State of the Beaches Reports* issued by DPE for the last five years have indicated that Mollymook Beach has received an overall Water Quality grading as Very Good – see Table 5-9. As an open coast beach, the nearshore waters are a highly dispersive environment that ensure continual mixing and flushing.



**Table 5-9 State of the Beaches Water Quality Scores for Mollymook Beach**

Year	Rating
2021-22	Very Good
2020-21	Very Good
2019-20	Very Good
2018-19	Very Good
2017-18	Very Good

Given the location of the work site on Mollymook Beach, there is a low risk of water quality impacts arising. The excavation and sand redistribution works involve the movement of subaerial sand originating from Mollymook Beach only and therefore the main potential water quality impact would arise from the loss of foreshore sediment to the beach or water. This may arise as a result of heavy vehicle / machinery accessing the beach and destabilising existing dune or beach sediment through surface disturbance. Appropriate controls would be implemented to minimise the risks and manage any resulting impacts.

Where taking place in the intertidal zone, planned work should be undertaken around the low tide (mid-low, low-mid) to minimise machinery working in water as much as practical and to reduce the potential for any sediment plumes in adjacent waters. To this end, to the greatest extent practical, the NABE beach scraping works should be timed to occur during a spring tidal phase where tidal ranges are greater, providing lower low tides to ensure optimal conditions for obtaining sand during the periods of low water levels and where intertidal shoals will be most exposed.

There would be no change to local water quality post works. The works would result in a more consistent flow of stormwater into the coastal waters, and the application of scour protection will result in reduced scour of the beach.

The contractor would develop a Storm Contingency Plan to detail procedures to cover in the event of high water levels on the beach, overtopping of the work compound and foreshore by waves, and rain events during the sand relocation works. The plan would aim to protect unfinished works, minimise risk to the plant and equipment and minimise the risk of pollution to the environment. The Storm Contingency Plan is to also provide for the safety of personnel.

The Storm Contingency Plan would include a plan showing locations that may be overtopped by waves during a storm. Any works such as stockpiles, equipment and the like would be located outside the area that has the potential to be overtopped by waves in a storm event if practicable.

The contractor would monitor weather conditions throughout the works phase and implement the Storm Contingency Plan when necessary.

### **Sediment Quality**

Acid sulfate soils (ASS) are sediments deposited under estuarine conditions that contain the sulfidic mineral pyrite. Generally speaking, ASS materials do not pose a problem if left undisturbed in the subsurface. However, they pose a risk if exposed to air by excavation or the lowering of the water table, as the iron sulfides they contain react with oxygen to create and release sulfuric acid and acid leachates in toxic amounts (DPIE, 2021).

ASS Risk Mapping has been obtained from the NSW Governments eSPADE 2.2 spatial viewer system and is depicted in Figure 5-2. This mapping does not indicate that there is a high risk of encountering ASS during the proposed works. This is to be expected, as the proposed works would take place in the swash zone of Mollymook Beach, where the morphological processes are energetic, and the beach face is highly dynamic. Inspection of the NSW Beach profile database indicates that vertical shoreline changes of up to 2 metres have



been historically recorded in the proposed works location in recent decades. Consequently, the swash zone sands are expected to be transient in nature and therefore free of ASS. Therefore, as the works are located on the upper beach face and are not expected to involve excavation works below the mean tide level – the risk of exposure of ASS is considered to be low.

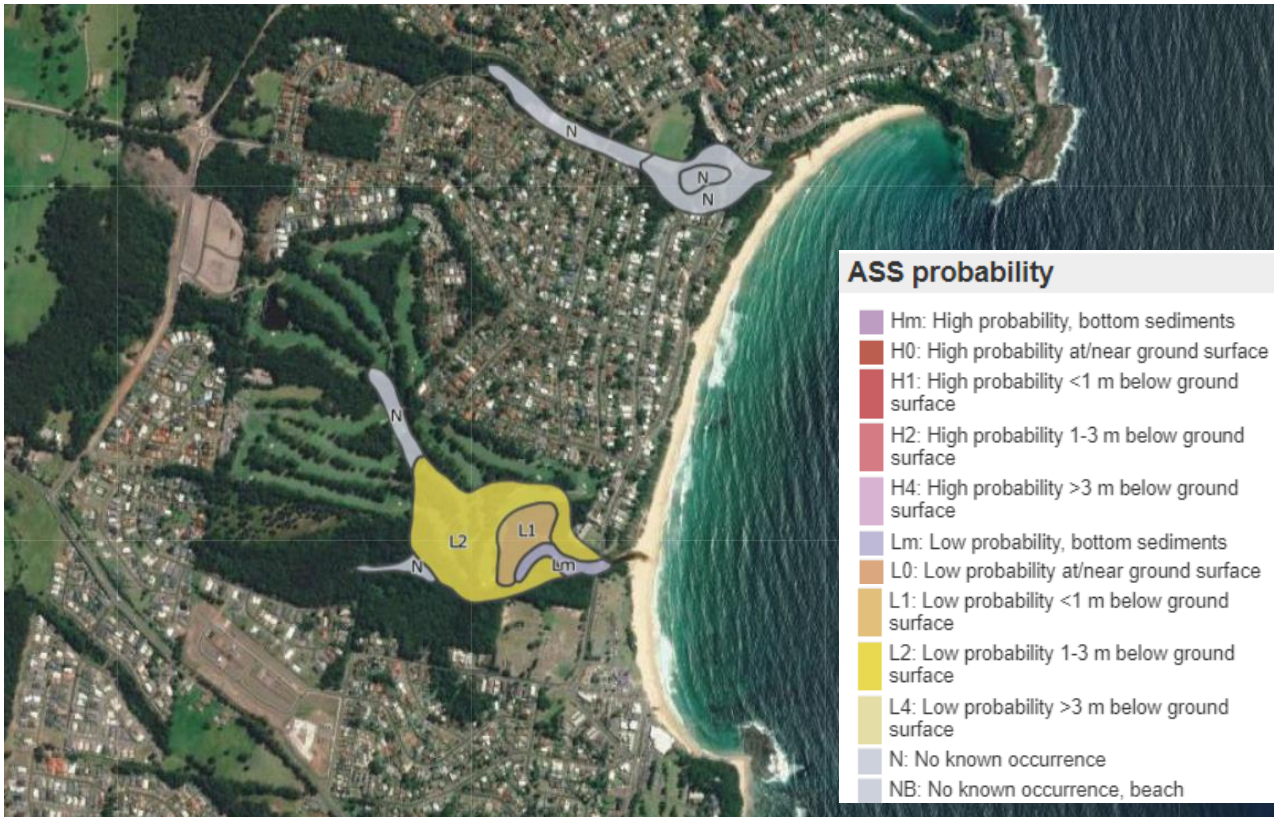


Figure 5-2 ASS Risk Mapping for the study area

If unexpected, contaminated material including asbestos containing material (ACM) or potential acid sulfate soils (PASS) are discovered, works are to shut down and a proper assessment protocol developed in consultation with Council's Environmental Officer.

To minimise the risk of pollution from machinery, refuelling shall generally be done off site, however if refuelling on site is required, due care shall be taken to avoid spilling fuel and a tray shall be used to catch any accidentally spilt fuel.

Furthermore, rock material used to fill the rock bags is to meet the specific size/grade requirements of excavated material in the Technical Specifications – in order to minimise risk of sediment release when the bags come into contact with water.

### Contaminated Land

A search of the NSW EPA Contaminated land record of notices and Council's Potentially Contaminated Land (PCL) Register has indicated that the site is not recorded as being on or near an area of contaminated lands.



## Mitigation Measures

Table 5-10 Mitigation Measures – Water and Sediment Quality

ID	Mitigation Measures	Roles / Responsibilities
<b>Pre-Construction</b>		
8.1	Prior to works commencing, all contractors would be made aware of the strict liability provisions of the Protection of the Environment Operations Act 1997, particularly that it is an offence under Section 120 of the Act to pollute water.	Contractor
8.2	Sediment and erosion control measures would be documented in a Soil and Water Management Plan (SWMP) developed by the contractor as part of the CEMP. The SWMP would be prepared using the NSW Landcom (2004) <i>Managing Urban Stormwater – Soils and Construction</i> as a primary reference and would need to be endorsed by Council prior to implementation.	Contractor
8.3	<p>The SWMP would need to be site specific taking into consideration local site (beach and foreshore) conditions. As a minimum, the SWMP would need to address the following issues to prevent sand, sediment loss and water quality impacts.</p> <ul style="list-style-type: none"> <li>▪ The installation of sediment and erosion controls prior to the commencement of the works.</li> <li>▪ A detailed plan showing the location of both land based and water based erosion sediment control devices. Sediment booms should not block fish passage,</li> <li>▪ Methods to minimise the discharge of water containing soil from the foreshore to the beach or ocean,</li> <li>▪ A vehicle shakedown area on land to ensure that soil and sediment from the land is not tracked onto the beach and the prevention of sand from vehicles exiting the beach from being tracked onto the foreshore areas or surrounding public roads.</li> <li>▪ Methods to reduce the likelihood or impact of any fuel or petrochemicals spill at the site such as due to refuelling.</li> </ul>	Contractor
8.4	<p>The contractor would develop a Storm Contingency Plan to detail procedures to cover in the event of high water levels on the beach, overtopping of the works area and foreshore by waves, and rain events during the construction stages. The plan would aim to protect unfinished works, minimise risk to the plant and equipment and minimise the risk of pollution to the environment. The Storm Contingency Plan is to also provide for the safety of personnel.</p> <p>The Storm Contingency Plan would include a plan showing locations that may be overtopped by waves during a storm. Any works such as stockpiles, depots, equipment and the like would be located outside the area that has the potential to be overtopped by waves in a storm event if practicable.</p>	Contractor
<b>Construction</b>		
8.5	If unexpected, contaminated material including asbestos containing material (ACM) or potential acid sulfate soils (PASS) are discovered, works are to shut down and a proper assessment protocol developed in consultation with Council's Environmental Officer.	Contractor



ID	Mitigation Measures	Roles / Responsibilities
8.6	Acid Sulfate Soils (ASS) or Potential Acid Sulfate Soil (PASS) would be managed according to Council's Chapter G26 – Acid Sulphate Soils and Geotechnical Guidelines (Shoalhaven Council, 2021)	Contractor
8.7	To avoid the risk of pollution from machinery, refuelling shall generally be done off site, however if refuelling on site is required, due care shall be taken to avoid spilling fuel and a tray shall be used to catch any accidentally spilt fuel.	Contractor
8.8	Storage of fuel, oils and other hazardous chemicals must be within a hardstand bunted area.	Contractor
8.9	All machinery to be used shall be clean, and in good working order prior to entering the site, with daily pre-start checklists to be recorded for all heavy plant used on site.	Contractor
8.10	An emergency marine spill kit is to be available on site at all times with procedures to contain and collect any leakage or spillage of fuels, oils and greases from plant and equipment. In the event of an accidental oil/fuel spill, Council is to be notified immediately by phone and a written incident report with corrective actions is to be supplied by the Contractor to Council within 24 hours of the incident occurring.	Contractor
8.11	No major equipment maintenance works shall be undertaken on-site.	Contractor
8.12	Changing of hydraulic attachments on machinery is to take place offsite in the compound or hardstand area.	Contractor
8.13	Where taking place in the intertidal zone, planned work is to be undertaken around the low tide (mid-low, low-mid) to minimise machinery working in water as much as practical and to reduce the potential for any sediment plumes in adjacent waters.	Contractor
8.14	Works will be timed to occur during a spring tidal phase where tidal ranges are greater, providing lower low tides to ensure optimal conditions for obtaining sand during the periods of low water levels and where intertidal shoals will be most exposed.	Contractor
8.15	Stabilising exposed dunes through revegetation, brush matting and implementation of measures outlined in ESCP to limit movement of sediment to waterways.	Contractor

## 5.9 Coastal Processes

### *Existing Environment and Potential Impacts*

#### **Coastal Geomorphology**

Mollymook Beach is located north of Ulladulla and south of Narrawallee on the Shoalhaven coast and is a popular tourist beach. It is a 2.2 km long open-coast embayed beach bounded by the Bannisters Point sandstone headland to the north, and an intertidal rock shelf to the south. There is a rocky reef offshore in the central part of the beach. It faces south in the lee of Bannisters Point, then quickly turns towards the east, with a northern-facing southern tip in the lee of the rocky reef.

Mollymook Beach is an intermediate energy, rip-dominated beach. It maintains an attached sand bar and is classified as a transverse bar and rip (i.e., bars are perpendicular to and attached to the beach and are



separated by deeper rip channels) to low tide terrace (i.e., beach is joined to the attached bar at low tide) beach type (Short, 2007). The predominant wave direction is from the southeast, and the southern rock platform and headland reduce wave energy along the southern part of the beach.

The beach is backed by a near-continuous low foredune (see Figure 5-3), and the entire length of the beach is flanked by extensive urban development – including roads (Mitchell Parade, Ocean Street, and Golf Avenue) and dozens of coastal residential properties immediately behind the dune. During development of the Mollymook township, parts of the frontal dune were heavily modified, reshaped and stripped of natural vegetation, particularly at the southern end (Short, 2007).

There are two ICOLLs that discharge onto Mollymook Beach. To the north is Mollymoke Farm Creek with a catchment area of 1.2 km<sup>2</sup>, and to the south is Blackwater Creek with a catchment area of around 3 km<sup>2</sup>. Tripper walls, or training walls, have been constructed on the northern sides of both creek outlets to limit entrance meandering and for mitigation of local beach erosion impacts in the vicinity of the outlets. Mollymoke Farm Creek’s tripper wall was constructed in 1994 and upgraded in 2016 to prevent the creek flowing to the north along the back of the beach towards the road.



Figure 5-3 Mollymook Beach – view looking south from the study area

### **Astronomical Tides and Storm Tides**

Astronomical tide refers to the rise and fall of the sea surface due to gravitational attraction between Earth, Moon and Sun. Water level variations in coastal areas due to the astronomical tide can be reliably predicted, provided a reasonable length of continuous water level observations is available. The tidal planes for Ulladulla Harbour (OEH, 2012) are presented below within Table 5-11.

Table 5-11 Ulladulla tidal planes

Tidal Plane	Present Day Level (m AHD)
High High Water Spring Solstice (HHWSS)	0.96
Mean High Water Springs (MHWS)	0.62
Mean High Water Neaps (MHWN)	0.40
Mean Sea Level (MSL)	0.04
Mean Low Water Neaps (MLWN)	-0.32



Tidal Plane	Present Day Level (m AHD)
Mean Low Water Springs (MLWS)	-0.53
Indian Spring Low Water (ISLW)	-0.78

Storm events can elevate ocean water levels which can cause coastal flooding. Storm tide is the addition of storm surge plus astronomical tide level. Storm surges are generated by meteorological processes such as the inverse barometric pressure effect, coastally trapped waves and wind setup. Extreme water level statistics for Jervis Bay and Fort Denison are provided in Table 5-12 (MHL, 2018), and are representative of conditions at the study area.

### Sea Level Rise

Scientific research into the implications of sea level rise for Australia has been conducted by a broad spectrum of scientists and organisations that includes universities, research institutes, consultancies, government bodies and community groups. There are numerous studies assessing the on-going long term global mean sea level rise (SLR). The Intergovernmental Panel on Climate Change (IPCC) Sixth Assessment Report indicates that the thermal expansion of the oceans and glacial melting have been the dominant contributors to the 20<sup>th</sup> century global mean sea level rise, and that this pattern is likely to continue over the coming decades. In February 2015 Shoalhaven City Council adopted the following SLR projections:

- 100 mm for 2030;
- 230 mm for 2050; and
- 360 mm for 2100.

These projections were based on a review of the findings of South Coast Regional Sea-level Rise Planning and Policy Response Framework (Whitehead & Associates, 2014). While these projections are not necessarily conservative and may be exceeded, nonetheless these provide a valuable guideline for the scour protection works design. Extreme water level statistics for the study area that include these SLR allowances endorsed by Council are provided in Table 5-12.

**Table 5-12 Extreme water levels for the study area (offshore – excluding wave set-up and run-up), in mAHD**

ARI (Years)	Jervis Bay Present Day	Fort Denison Present Day	Fort Denison 2030	Fort Denison 2050
1	-	1.26	1.36	1.49
10	-	1.35	1.45	1.58
20	1.32	1.38	1.48	1.61
50	-	1.41	1.51	1.64
100	1.36	1.44	1.54	1.67

### Wave Climate

The deep-water wave climate of the southern NSW coast comprises a highly variable wind wave (local seas) climate, combined with a persistent long period, moderate to high energy east to south-easterly Tasman Sea swell. Modal offshore significant wave heights are in the range of 0.5-2.0 metres with spectral peak periods predominantly in the range 7-12 seconds (Kulmar, Modra, & Fitzhenry, 2013). The wave climate is periodically affected by large wave events originating from offshore storms systems – which include east coast lows and southerly secondary lows. Shand et al (2011) undertook extreme wave heights analysis for events with ARIs of between 1 and 100 years at Port Kembla and Batemans Bay; these are provided in Table 5-13.



**Table 5-13 Design offshore significant wave heights Hs (m)**

ARI Years	Port Kembla (m)	Batemans Bay (m)
1	5.4	4.9
10	7.1	6.3
20	7.6	6.7
50	8.3	7.3
100	8.8	7.7

In the nearshore waters near the proposed works, maximum wave-heights will be limited by depth-induced breaking. The design waves above would likely break in a water depth of around 10 metres, which, given the prevailing bed-slopes within the breaker zone, would be around 100 to 200 m from the shoreline. Significant wave run-up and some wave reformation would occur landwards of the breaker zone – as well as the propagation of lower frequency infragravity wave energy (i.e., slow and steady water level rise lasting several minutes).

### Coastal Hazards and Historical Management Responses

Strong wave action and elevated ocean water levels during storm events (such as East Coast Lows) can cause severe erosion of the upper regions of the profile. If the storm or cyclone is particularly severe, the erosion may threaten or damage foreshore infrastructure. During severe storms, waves remove the sand from the beach face and the beach berm and transport it beyond the breaker zone through a combination of longshore and rip currents, where it is deposited in the deeper waters as sand bars. This erosion process usually takes place over several days to a few weeks (Advisian, 2016). Subsequent milder wave conditions can return this sand back onto the beach, where waves and onshore winds then re-work it to establish the pre-storm beach condition – however this process can take anywhere from several weeks to many years.

In 2016, Council commissioned the most contemporary update of the Shoalhaven LGA coastal hazard mapping (Advisian, 2016). The updated hazard mapping along the study area depicts the present day (then 2016), 2030, 2050 and 2100 coastal hazard lines – which represent the landward limit of the Zone of Reduced Foundation Capacity (ZRFC). The hazard lines for the study area are depicted in Figure 1-1, and indicate that the study area works are highly exposed to coastal hazards. That study determined the following coastal hazard parameters for Mollymook Beach – reproduced in Table 5-14.

**Table 5-14 Coastal hazards parameters for Mollymook Beach from Advisian (2016)**

Parameter	Value
Design Storm Erosion	90-230 m <sup>3</sup> /m
Design Wave Run-up Level (present Day)	5.5-6.0 m AHD
Long Term Recession rate	0.0 m/yr
Potential future shoreline recession due to +0.1 m SLR (2030)	4.4 m
Potential future shoreline recession due to +0.23 m SLR (2050)	10.1 m
Potential future shoreline recession due to +0.36 m SLR (2100)	15.4 m

Mollymook Beach has a long history of coastal hazard impacts. Mollymook Beach was heavily impacted by the 1974-75 storm events. Significant erosion occurred at the southern end of the beach and undermined part of the road at the corner of Golf Avenue and Ocean Street (Royal HaskoningDHV, 2012). More recently, the beach was impacted by the damaging June 2016 East Coast Low storm, well as additional storm events in

2020 and 2021. Following the 2020 erosion event, Council undertook beach scraping work at the southern end of the beach (very similar in nature to the beach scraping works proposed for this project) to restore the upper beach face, see Figure 5-4. No adverse environmental impacts have been reported from historical beach scraping activities at Mollymook Beach.

Sand nourishment occurred in 2014 in front of the existing dune, just north of Blackwater Creek. Approximately 3,000 m<sup>3</sup> of sand dredged from Lake Conjola was added over approximately 300 m of the beach (Royal HaskoningDHV, 2015). The nourishment works were complemented with dune revegetation works and are an example of successful dune rebuilding that are similar in nature to the dune restoration works proposed in this project.



Figure 5-4 Mollymook Beach Erosion and subsequent beach scraping in mid-2020. Image source: SCC

### Potential Impacts of the Proposed Works

The proposed works are not expected to have any adverse impacts on the local coastal processes, based on the following rationale:

- The stormwater entrainment structure extends out onto Mollymook beach such that its toe aligns with the foredune of the surrounding foredune (either side of the outlet). Therefore, the structure will be long enough to sufficiently entrain stormwater flows into the coastal waters, but not so long so as to generate a significant groyne feature that disrupts the local littoral drift on Mollymook Beach.
- The stormwater entrainment structure will not have any adverse impacts on local erosion processes. Conversely, the intent of the structure is to improve resilience to coastal erosion through protecting and enhancing the local dune system.
- As detailed in the Basis of Design Report, the stormwater entrainment structure has been designed to an appropriate standard for its intended design life (including accommodation for future sea level rise), as per the following guidelines and standards:
  - AS1170 AS/NZS 1170.2:2021 Structural design actions
  - AS4997 Design of Maritime Structures (Standards Australia, 2005)



- BS 6349 British Standard Code of Practice for Maritime Structures (BSI, 2021)
- Coastal Engineering Manual (USACE, 2006)
- Guidelines for Responding to the Effects of Climate Change in Coastal and Ocean Engineering (Engineers Australia, 2017)
- ISO 21650 Actions from waves and currents on coastal structures (ISO, 2007)
- The dune revegetation works will provide enhanced dunes, and the planting of mature stock, in conjunction with installation of seedling stock is intended to enable quick colonisation and succession as part of the revegetation.
- The fencing of the area will limit informal pedestrian access over the dune and improve the rate of vegetation establishment and dune stabilisation.

### Mitigation Measures

Table 5-15 Mitigation Measures – Coastal Processes

ID	Mitigation Measures	Roles / Responsibilities
<b>Pre-Construction</b>		
9.1	Works to be conducted in accordance with a site-specific Soil and Water Management Plan (SWMP) developed by the contractor and approved by Council, including (at discretion of Council): Boundaries for plant machinery, and sediment traps/fencing, if required. This is to include, at the very minimum, the removal of non-biodegradable sediment and erosion controls following the appropriate stabilisation of the site.	Contractor / Council
<b>Construction</b>		
9.2	Undertake revegetation works to stabilise dunes. Planting of mature stock to be in conjunction with installation of seedling stock in areas of high pedestrian traffic to enable quick colonisation and succession as part of the revegetation program.	Contractor / Council
9.3	Revegetation works to be undertaken in the most optimal growing season (i.e., Spring, and seasonal high rain periods) where possible to expedite stabilising function. This must take into consideration rainfall patterns and temperatures to enable the highest possible likelihood of plant survival.	Contractor / Council
9.4	Areas within the foredune with significant sand exposure where immediate ground cover is required to be fenced off and covered with biodegradable jute or coir mesh to minimize windblown erosion prior to vegetation establishment.	Contractor / Council
9.5	Access pathways are to be deemed suitable for plant and equipment before use to avoid bogging, and destabilisation and sediment runoff as a result.	Contractor / Council
<b>Operational</b>		
9.6	Maintenance of revegetated areas to be periodically addressed to ensure longevity and establishment of plants installed.	Contractor / Council



## 5.10 Flora and Fauna

### **Existing Environment and Potential Impacts**

The proposed works would be undertaken on the upper beach face of the Mollymook Beach, in front of the existing stormwater outlet. Mollymook Beach contains an extensive vegetated dune system running along the entire 2 km long beach compartment. To the immediate north and south of the outlet, the vegetated dune system is around 15-20 m wide and is generally built up to a level of +6 m AHD. The species and extent of dune vegetation is relatively uniform along the beach from South to North.

Inspection of the study area has indicated that to the immediate south and north of the works area, the incipient foredune area is largely colonised by native dune vegetation such as Spinifex (*Spinifex sericus*), Pig Face (*Carpobrotus glaucescens*), Coastal Beach Bean (*Canavalia rosea*), Native Lily (*Dianella caerulea*) and Sea Purslane. Within the Secondary Zone, species such as Spiny Matt Rush (*Lomandra longifolia*), White Correa (*Correa alba*), Coastal Beard-heath (*Leucopogon parviflorus*), Golden Wattle (*Acacia longifolia subsp. Longifolia*) and Boobialla (*Myoporum acuminatum*) are prevalent. Vegetation appears to be in relatively good condition. Most of the existing dune system is well vegetated with indigenous species and this can provide a planting template to follow for the revegetation works.

Plant Community Types (PCTs) located in the vicinity of the study area are depicted in Figure 5-5, and include Coastal Foredune Wattle Scrub, Sydney Coastal Sandstone Headland Heath, and Spinifex Strandline Grassland. Figure 2-2 depicts the Coastal Wetland and Littoral Rainforest Area Mapping for the study area as per the RHSEPP, and demonstrates that the proposed works would not be located on, or in close proximity to these coastal management areas. It is noted that there is a community of Littoral Rainforest at the northern end of Mollymook Beach, approximately 900 m north of the proposed works area – but this would not be impacted on by the proposed works in any way.

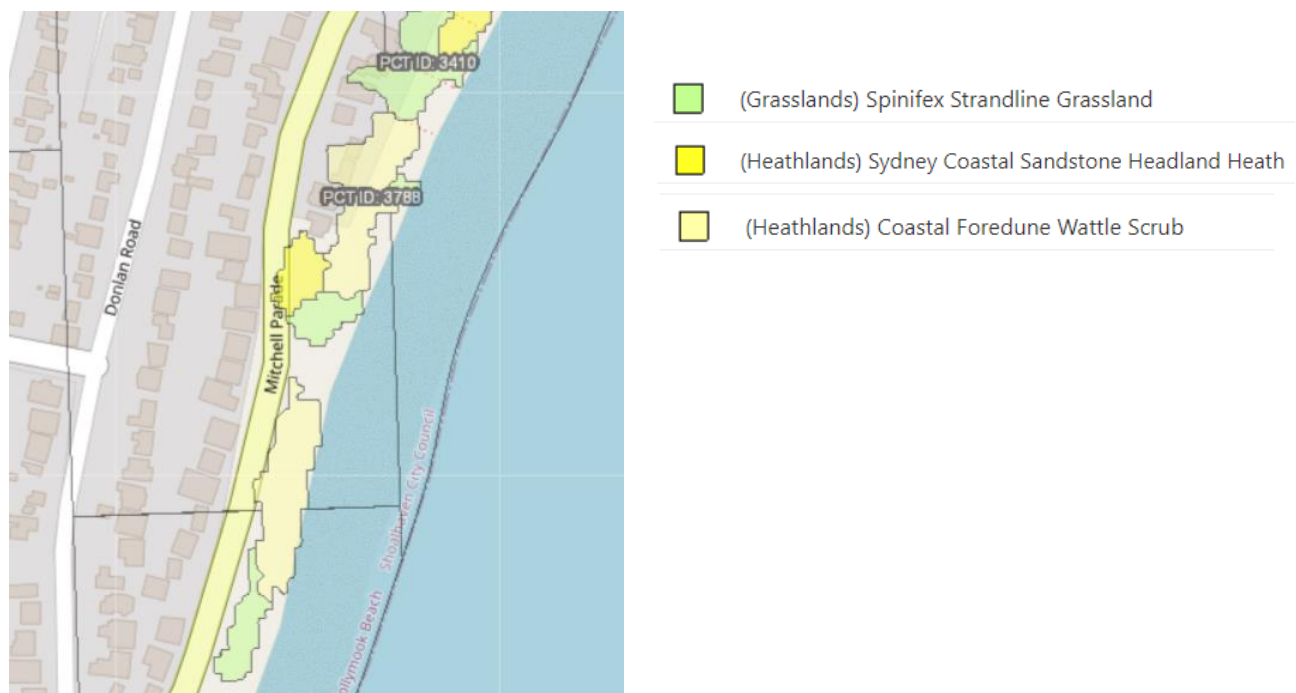


Figure 5-5 PCT types at the area of the proposed works (source: NSW BioNet Vegetation Classification)

Figure 5-6 shows the extent of the proposed dune rebuilding and dune revegetation works. It shows that the dune building works would not result in any major smothering of any existing dune vegetation, and no impact on terrestrial flora is predicted.

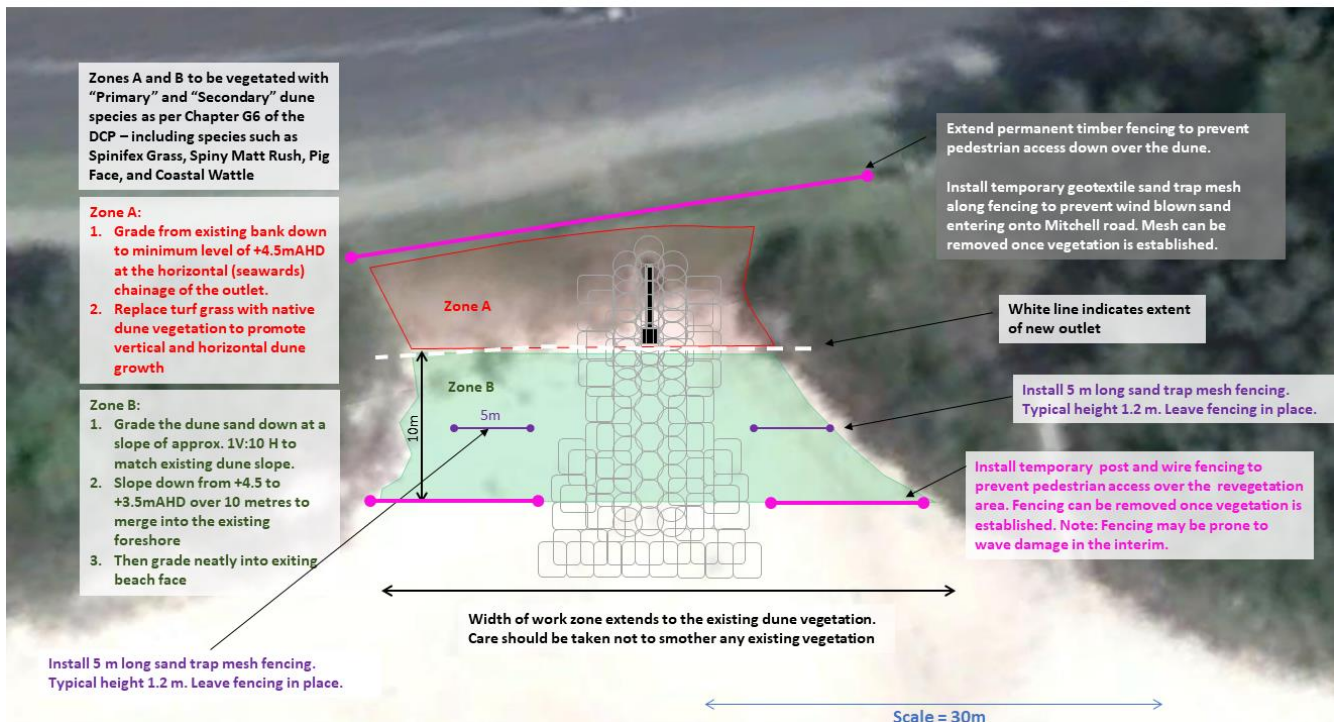


Figure 5-6 Extent of dune rebuilding and revegetation works

As part of this REF, database searches have been undertaken for NSW Bionet, NSW threatened species profile search ([www.environment.nsw.gov.au/threatenedspeciesapp/](http://www.environment.nsw.gov.au/threatenedspeciesapp/)), and Commonwealth Protected Matters database in order to identify any endangered ecological communities, populations, threatened flora and/or threatened or protected fauna, or migratory species within the vicinity of the proposed works (using a nominal 5 km search radius). See Appendix D for the full likelihood of occurrence assessment. The Matters of National Significance as per the EPBC Act can be found in Appendix C. A summary of the results are provided in Table 5-16:

Table 5-16 Summary of species most likely to be found at, or near, the area of the proposed works

Parameter	Summary
Fauna	<p>87 species of threatened fauna were returned in the database search. Those species of note that are more likely to occur near proposed works area (comprising the upper beach face, immediate surrounding foredune and nearshore waters include:</p> <ul style="list-style-type: none"> <li>▪ Nesting shorebirds - including the endangered Little Terns (<i>Sternula albifrons</i>) and Pied Oystercatcher (<i>Haematopus longirostris</i>), and the critically endangered Hooded Plovers (<i>Thinornis cucullatus cucullatus</i>) and Beach stone-curlew (<i>Esacus magnirostris</i>). These species nest on sandy shores and therefore may be susceptible to disturbance by machinery associated with the works. A suitably qualified person must inspect the entire site of works and occupation for the presence of threatened and migratory shorebirds. A pre-works survey will be undertaken at least one (1) week prior to the commencement of works to determine presence/absence of threatened and migratory shorebirds. The mitigation measures identified in Table 5-17 must be implemented as part of the proposed works.</li> </ul>



Parameter	Summary
Flora	30 species of threatened flora were returned in the database search. Those species of note that are more likely to occur near immediate surrounding foreshore dune of the proposed works area include the endangered Coast Groundsel ( <i>Senecio spathulatus</i> ) and Australian Saltgrass ( <i>Distichlis distichophylla</i> ) and Sand Spurge ( <i>Chamaesyce psammogeton</i> ). However, the risk of encountering these species is considered to be very low, and none have been recorded at or adjacent to the works area.
Threatened Ecological Communities	12 Threatened Ecological Communities (TEC) were returned in the database search. The closest mapped TEC is a community of bangalay sand forest, located at the northern end of Narrawalle Beach, approximately 3km north of the study area.

No negative impacts on threatened species, populations or ecological communities, or their habitats are predicted as a result of the proposed works, as:

- The dune building works would not result in any major smothering of any existing dune vegetation, and therefore no impact to terrestrial flora is predicted. Furthermore, the risk of encountering threatened flora species is very low, and none have been recorded at or adjacent to the works area. The foredune area is also a highly dynamic zone, prone to natural cycles of erosion and accretion that impact on incipient foredune vegetation.
- The proposed NABE works would be undertaken across the nearshore intertidal zone at low tide, and therefore the risk of encountering threatened marine species is low.
- There is an identified risk of impacts on nesting shorebirds, however this risk can be adequately managed if the mitigation measures identified in Table 5-17 are implemented.
- No adverse environmental impacts have been reported from historical beach scraping activities at Mollymook Beach.

Rather, the works are likely to result in improved habitat and biodiversity values in the study area. The dune revegetation and restoration works will increase the cover and density of native vegetation, and provide improved habitat for local dune fauna. It should be noted that no adverse environmental impacts have been reported from historical beach scraping activities at Mollymook Beach.

Nonetheless, a series of mitigation measures have been identified in order to reduce construction impacts on flora and fauna, as summarised in Table 5-17 below.

### Mitigation Measures

Table 5-17 Mitigation Measures – Flora and Fauna

ID	Mitigation Measures	Roles / Responsibilities
<b>Pre-Construction</b>		
10.1	A suitably qualified person must inspect the entire site of works for the presence and occupation of threatened and migratory shorebirds. A pre-works survey will be undertaken at least one (1) week prior to the commencement of works to determine presence/absence of threatened and migratory shorebirds.	Contractor / Council
10.2	Control the spread of Bitou Bush, Lantana, Crofton Weed and other priority weeds by avoiding disturbance to vegetation and ensuring machinery is clean prior to arrival of site (to prevent spread of seed).	Contractor / Council



ID	Mitigation Measures	Roles / Responsibilities
	Treat weed species on site using approved qualifications/accreditations (i.e. ChemCert) where identified, prior to commencement of works, to contain and reduce risk of spread during works.	
<b>Construction</b>		
10.3	<p>Works must be separated from threatened shorebirds as follows:</p> <ul style="list-style-type: none"> <li>▪ April - September: A minimum buffer of 50 m (as adopted standard of the National Parks and Wildlife Service) must be maintained from individual threatened shorebirds using habitat, where all plant, personnel and equipment will be excluded at least 50 m from the shorebird(s).</li> <li>▪ October - March: Should the birds be nesting then the buffer distance must be not less than 255 m (Industry guidelines for avoiding, assessing, and mitigating impacts on <i>Environmental Planning and Biodiversity Conservation Act 1999</i> (Cth) listed migratory shorebird species Commonwealth of Australia, 2017). If nesting threatened shorebirds are detected within 255 m of the works or ancillary sites or activities, work will immediately stop and the local NPWS office will be contacted for instruction and assistance and/or clearance.</li> <li>▪ If threatened shorebirds are detected within 50 m of the works or ancillary sites or activities, works and/or machinery movement will stop immediately and not resume until the bird(s) has/have vacated the site autonomously.</li> <li>▪ In the case whereby earth works surface disturbance is attracting bird activity an assessment is to be made onsite for the likelihood of impact on fauna. In the case of cause-and-effect conditions that may arise works may proceed if impacts on bird species are deemed low risk by relevant Council officer.</li> <li>▪ Exclusion zones are to be shown in Works Plan, where required.</li> <li>▪ Works are to avoid more heavily vegetated areas of the incipient dune, as well as potential habitat features such as large logs, to reduce potential impacts on mammal nests and burrows.</li> <li>▪ Site access to be via official defined Council accessways or where required at well-defined points designated by Council prior to works commencing. Contractor is to demonstrate knowledge and ascertain suitability of these prior to works commencing.</li> <li>▪ Machine movement to be limited to 20 km/hr to minimise risk of injury to fauna.</li> <li>▪ No foraging or breeding habitat to be impacted on by the works, specifically including no impacts on hollow bearing trees or access to site through old growth vegetation areas.</li> <li>▪ One worker on foot to act as a fauna spotter ahead of machinery movement and operation.</li> </ul>	Contractor / Council
10.4	Access track management works to include control of <i>Asparagus</i> spp., <i>Chrysanthemoides monilifera subsp. rotundata</i> (Bitou Bush), <i>Conyza</i> spp. (Fleabane), <i>Hypochaeris radicata</i> (Cats Ear), <i>Ipomoea</i> spp. (Morning Glory spp.), <i>Lantana camara</i> , <i>Pennisetum clandestinum</i> (Kikuyu) and <i>Eragrostis curvula</i> (African Lovegrass).	Contractor / Council



ID	Mitigation Measures	Roles / Responsibilities
10.5	Beach scraping and nourishment works are to be restricted to the section of the beach in front of the vegetated foredune	Contractor / Council
10.6	Protection zones for trees from machinery and vehicles will be maintained in accordance with AS 4970-20-9 - Protection of Trees on Development Sites.	Contractor / Council
10.7	All workers will be trained in identifying Sand Spurge ( <i>Euphorbia psammogeton</i> ), Narrow-leafed Wilsonia ( <i>Wilsonia backhousei</i> ), Australian Saltgrass ( <i>Distichlis distichophylla</i> ), and Coast Grondsel ( <i>Senecio spathulatus</i> ) and site to be inspected for species presence by suitable qualified officer prior to works.	Contractor / Council
10.8	Where threatened plant species are identified, exclusion zones of >20m will be maintained to prevent indirect and direct impacts on them.	Contractor / Council
10.9	Vehicles and machinery will utilise existing cleared access tracks only	Contractor / Council
10.10	Only minimum vegetation pruning is to be undertaken as required for maintenance of existing formal access points	Contractor / Council
10.11	Thoroughly clean all plant and equipment prior to arriving on site and when leaving the site to avoid transfer of weeds or weed seeds and pathogens	Contractor / Council
10.12	Pruned branches to be left on site (but off pathways) as brush matting. Pruning is to be undertaken in accordance with AS 4373—2007 – Pruning of amenity trees	Contractor / Council

## 5.11 Aquatic Ecology

### **Existing Environment and Potential Impacts**

Sandy beaches help maintain biodiversity and genetic resources supporting food webs, and provide various ecosystems services and can be functional links between the terrestrial and marine environments (Omar Defeo, 2009). Sandy beaches vary spatially and temporally and are moulded by the physical forces that act on them - particularly waves and currents. Within the sandy granules reside a range fauna that are specific to such systems, commonly referred to as benthic fauna. Consequently, the resident benthic faunal communities vary in accordance with the physical forces acting on the beach.

The intertidal and near shore zones of Mollymook Beach are likely to contain species typical of soft sediment beaches across the Illawarra region such as molluscs (pipis), crustaceans (crabs) and worms, living in or on the top few centimetres of the sand layers. Benthic fauna play a key role in nutrient cycling and mineralisation within the sandy beach ecosystem. In addition, benthic fauna are also influenced by the food availability on the beaches and littoral zones and form an important source for food supply. The benthic community abundance, richness and biomass vary depending on the beach morphology and this may vary both spatially as well as temporally. However, to date no studies have investigated the faunal composition in the Shoalhaven LGA in detail.

The works would result in the redistribution of approximately 250 m<sup>3</sup> of beach sand and the temporary disturbance of other areas of the beach through the movement of construction plant and equipment. The works would mostly occur in the intertidal zone (between the high and low water mark) of the beach.



There is the potential for some short-term increases in turbidity during construction due to the operation of heavy machinery and physical disturbance of sand. This is unlikely to result in any measurable or ecological impacts to the fish or the marine environment.

The redistribution of sand along the beach may result in the movement and relocation of invertebrate species living within the sediment. However, the majority of sand would be moved from areas above the mid-tide mark which is considered to contain limited invertebrate species. Furthermore, given the natural process of accretion and erosion within sandy beach environments, many species potentially impacted by the works are likely to be suitably adapted to sediment movement. It should be noted that no adverse environmental impacts have been reported from historical beach scraping activities at Mollymook Beach.

The works area is not classified as a Coastal Wetland area in the RHSEPP. Furthermore, as an energetic open coast beach environment, no major seagrass beds or other estuarine macrophytes have been identified by the NSW DPI-Fisheries data portal as being in close proximity to the study area. ([https://webmap.industry.nsw.gov.au/Html5Viewer/index.html?viewer=Fisheries\\_Data\\_Portal](https://webmap.industry.nsw.gov.au/Html5Viewer/index.html?viewer=Fisheries_Data_Portal)). No key fish habitat have been identified within 5 km of the proposed works area, and none are mapped along Mollymook Beach or across the contributing catchments that drain onto the beach.

As identified in Appendix the nearshore waters adjacent to the proposed works area may be home to a range of vulnerable or threatened fish species including the black cod (*Epinephalus daemeli*) and Australian Grayling (*Prototroctes maraena*). Furthermore, marine mammals such as seals and whales are also known to migrate through and inhabit the coastal waters of the Shoalhaven. However, as the works will be undertaken primarily above the mean tide level and on the upper beach face, no negative impacts resulting from turbidity, noise or disturbance are expected on aquatic fauna.

The works would not result in any impact to seagrasses or mangroves and no impact to fish is predicted. Mitigation measures as detailed in Section 5.8 above would be implemented to protect water quality during the works. No impact to threatened aquatic species listed under the FM Act is predicted to occur.

### Mitigation Measures

Table 5-18 Mitigation Measures – Aquatic Ecology

ID	Mitigation Measures	Roles / Responsibilities
<b>Pre-Construction</b>		
11.1	Obtain permit under section 200 of the FM Act for dredging and reclamation	Council
<b>Construction</b>		
11.2	The contractor to implement best management practices with respect to stormwater, erosion and sediment control in accordance with the SWMP, and controls required by Council	Contractor
11.3	Suitably sized construction equipment would be used to minimise the indirect impact to the beach associated with the works.	Contractor



## 5.12 General Environmental Management

### **General Environmental Mitigation Measures**

Prepare a Construction Environmental Management Plan (CEMP) addressing the requirements of this environmental assessment. The CEMP should specify licence, approval and notification requirements. Prior to the start of work, all project staff and contractors will be inducted in the CEMP.

The CEMP must be readily available on site and include a site plan which shows:

- Go/no go areas and boundaries of the work area
- Location of environmental controls (including erosion and sediment controls, any fences or other measures to protect vegetation or fauna, spill kits, stockpile areas)
- Location and full extent of any vegetation disturbance.

Council's Project Manager (after consultation with Council's environment and community representatives and affected landowners) can approve temporary ancillary construction facilities (such as compounds and access tracks), without additional environmental assessment or approval if the facilities meet the following principles:

- Limit proximity to sensitive receivers
- No disruption to property access
- No impact to known items of non-Aboriginal and Aboriginal heritage
- Outside high-risk areas for Aboriginal heritage
- Use existing cleared areas and existing access tracks
- No impacts to remnant native vegetation or key habitat features
- No disturbance to waterways
- Potential environmental impacts can be managed using the safeguards in this REF
- No disturbance of contaminated land or acid sulfate soils
- Will be rehabilitated at the end of construction.

The Contractor must demonstrate in writing how the proposed ancillary facilities meet these principles. Any facilities that do not meet these principles will require additional environmental impact assessment. The agreed location of these facilities must be shown on the CEMP site plan and appropriate environmental controls installed.

The Contractor must Prepare an Incident Management Plan (IMP) outlining actions and responsibilities during:

- Predicted/onset of heavy rain during works
- Spills
- Unexpected finds (e.g. heritage and contamination)
- Other potential incidents relevant to the scope of works.

All site personnel should be inducted into the IMP.



## 6 CONCLUSION

Pursuant to the provisions of the *Environmental Planning and Assessment Act 1979*, and *Environmental Planning and Assessment Regulation 2021*, an environmental impact assessment of the proposed works has been undertaken. Consideration has been given to the likely impact of the activity on the environment, having regard to all relevant factors.

The proposed works include:

- **Stormwater Management Works:** Comprising the construction of a stormwater entrainment structure, and replacement of the existing stormwater outlet headwall. The structure is intended to reduce impacts of stormwater processes (scour) on the natural coastal protection buffer zone (dune).
- **Coastal Protection Works:** Comprising dune building (using NABE) and rehabilitation, which will include restoring and revegetating the local dune system either side of the entrainment structure. These works are intended to alleviate a coastal erosion “pinch point” at Mollymook Beach and in doing so reduce the coastal hazard risk for critical infrastructure including Mitchell Parade and a local wastewater pump station SPSZ6.

The works are also likely to result in improved habitat and biodiversity values in the study area. The dune revegetation and restoration works will increase the cover and density of native vegetation and provide improved habitat for local dune fauna.

During construction, the main potential environmental impacts of the proposed works are typical construction impacts related to restrictions of public access and recreational amenity, noise, traffic and soil/water management. However, these impacts would be temporary and are not considered to be significant. Particular care would need to be exercised while work is carried out in order to prevent potential water quality impacts. During operation, the impacts are anticipated to be minimal.

The works are not considered to have a significant impact on any threatened terrestrial or aquatic species, populations or communities or their habitat.

No known Aboriginal items would be impacted by the works and no impacts to items of European historic heritage would occur.

On the basis of the information presented in this REF, it is concluded that by adopting the safeguards identified in this assessment there would be no significant adverse environmental impacts associated with the proposed works and therefore an environmental impact statement is not required under Division 5.1 of the EP&A Act.

The proposed works will result in positive environmental improvements. The proposed works will not result in the degradation of the quality of the environment and will not pose a risk to the safety of the environment.

The stormwater management works will not require development consent under the as per Section 2.137 TISEPP. The coastal protection works will not require development consent as per Section 2.165 of the TISEPP and Section 2.16(2)(a) of the RHSEPP. As the coastal protection works include NABE and beach scraping on Crown waterway, an authorisation for the works is required from NSW Crown Lands under Section 5.30 the CLM Act. Furthermore, under Section 199 of the FM Act, Crown land licence applications that involve ‘dredging and reclamation’ must be referred to DPI-Fisheries for their consideration. As part of this process, Council would be required to consult with and consider any matters concerning the proposed work that are raised by DPI-Fisheries prior to DPE-Crown Lands issuing a licence.



# APPENDIX A CONSIDERATION OF SECTION 171 OF THE EP&A REGULATION





Section 171 of the EP&A Regulation 2021 stipulates, for purposes of Part 5 of the Act, the factors that must be taken into account when consideration is being given to the likely impact of an activity on the environment.

A determining authority is only required to consider the following matters where an EIS has been prepared for a Part 5 activity under the EP&A Act. However, the following information is provided to assist determining authorities in making determinations consistent with those made for an activity requiring preparation of an EIS.

The various factors and findings following environmental assessment are presented below.

Section 171 Checklist	REF Finding
Any environmental impact on a community	There is the potential for some temporary noise, visual, recreational and local traffic impacts during the construction works. Mitigation measures would be implemented to minimise these impacts. The general community would benefit from enhanced erosion resilience for critical infrastructure, and improved environmental and ecological values of the local dune system.
Any transformation of a locality	The proposed work will not result in the transformation a locality. The works would result in the re-profiling of the beach with sand relocated to areas where the loss of beach sediments has occurred, however views to the beach would not be affected
Any environmental impact on the ecosystems of the locality	The proposed work will not involve significant environmental impacts to ecosystems of the locality. Rather, the works will result in improved environmental and ecological values of the local dune system in the long term.
Any reduction of the aesthetic, recreational, scientific or other environmental quality or value of a locality	The proposed works would have a temporary impact on the land based passive and active recreational pursuits during construction. No impacts are predicted post construction.
Any effect on a locality, place or building having aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance or other special value for present or future generations	The proposed works will not impact on any known Aboriginal site and it is unlikely that the proposed works would impact on areas of unidentified Aboriginal heritage, due to the disturbed and urban nature of the site. The subject site is not identified on any heritage inventory and is not located in a heritage conservation area.
Any impact on the habitat of any protected animals (within the meaning of the <i>Biodiversity Conservation Act 2016</i> )	The construction works will have negligible impact on fauna or fauna habitat. The proposed works will not impact on any threatened species, population, ecological communities or their habitat. The proposed works will not impact on any fauna of national conservation concern.
Any endangering of any species of animal, plant or other form of life, whether living on land, in water or in the air	The proposed work will not be endangering any species of animal, plant or other form of life, whether living on land, in water or in the air.
Any long-term effects on the environment	The proposed work will not have any long-term negative impacts on the environment – but rather will generate a long-term benefit by providing enhanced erosion resilience for critical infrastructure, and improved environmental and ecological values of the local dune system.



Section 171 Checklist	REF Finding
Any degradation of the quality of the environment	The proposed work will not cause the degradation of the quality of the environment.
Any risk to the safety of the environment	No hazardous materials likely to be used and handled on site. Mitigation measures would be implemented to minimise safety risks.
Any reduction in the range of beneficial uses of the environment	The proposed work will not have any reduction in the range of beneficial uses of the environment
Any pollution of the environment	Environmental safeguards will mitigate the potential for the proposed work to pollute the environment. No pollution of the environment is expected
Any environmental problems associated with the disposal of waste	The disposal of wastes will be conducted in accordance with the environmental safeguards, and no environmental problems associated with the disposal of waste are expected
Any increased demands on resources (natural or otherwise) that are, or are likely to become, in short supply	None identified.
Any cumulative environmental effect with other existing or likely future activities	No impacts identified.
Any impact on coastal processes and coastal hazards, including those under projected climate change conditions.	The works would not have any adverse impacts on coastal processes. However, the works would result in enhanced coastal hazard resilience of the foreshore, and improved protection for critical infrastructure – for both present day conditions and over future sea level rise scenarios.



# APPENDIX B AHIMS SEARCH RESULTS



Water Technology Pty Ltd  
Level 1, Suite 3 20 Wentworth St  
Parramatta New South Wales 2150  
Attention: Christopher Beadle  
Email: chris.beadle@watertech.com.au

Date: 08 November 2022

Dear Sir or Madam:

**AHIMS Web Service search for the following area at Lat, Long From : -35.3325, 150.4724 - Lat, Long To : -35.3282, 150.4802, conducted by Christopher Beadle on 08 November 2022.**

**The context area of your search is shown in the map below. Please note that the map does not accurately display the exact boundaries of the search as defined in the paragraph above. The map is to be used for general reference purposes only.**



A search of Heritage NSW AHIMS Web Services (Aboriginal Heritage Information Management System) has shown that:

<b>0</b>	<b>Aboriginal sites are recorded in or near the above location.</b>
<b>0</b>	<b>Aboriginal places have been declared in or near the above location. *</b>

### **If your search shows Aboriginal sites or places what should you do?**

- You must do an extensive search if AHIMS has shown that there are Aboriginal sites or places recorded in the search area.
- If you are checking AHIMS as a part of your due diligence, refer to the next steps of the Due Diligence Code of practice.
- You can get further information about Aboriginal places by looking at the gazettal notice that declared it. Aboriginal places gazetted after 2001 are available on the [NSW Government Gazette \(https://www.legislation.nsw.gov.au/gazette\)](https://www.legislation.nsw.gov.au/gazette) website. Gazettal notices published prior to 2001 can be obtained from Heritage NSW upon request

### **Important information about your AHIMS search**

- The information derived from the AHIMS search is only to be used for the purpose for which it was requested. It is not to be made available to the public.
- AHIMS records information about Aboriginal sites that have been provided to Heritage NSW and Aboriginal places that have been declared by the Minister;
- Information recorded on AHIMS may vary in its accuracy and may not be up to date. Location details are recorded as grid references and it is important to note that there may be errors or omissions in these recordings,
- Some parts of New South Wales have not been investigated in detail and there may be fewer records of Aboriginal sites in those areas. These areas may contain Aboriginal sites which are not recorded on AHIMS.
- Aboriginal objects are protected under the National Parks and Wildlife Act 1974 even if they are not recorded as a site on AHIMS.
- This search can form part of your due diligence and remains valid for 12 months.





# APPENDIX C EPBC ACT PROTECTED MATTERS REPORT





Australian Government

Department of Climate Change, Energy,  
the Environment and Water

# EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected. Please see the caveat for interpretation of information provided here.

Report created: 18-Jan-2023

[Summary](#)

[Details](#)

[Matters of NES](#)

[Other Matters Protected by the EPBC Act](#)

[Extra Information](#)

[Caveat](#)

[Acknowledgements](#)

# Summary

## Matters of National Environment Significance

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

<a href="#">World Heritage Properties:</a>	None
<a href="#">National Heritage Places:</a>	None
<a href="#">Wetlands of International Importance (Ramsar)</a>	None
<a href="#">Great Barrier Reef Marine Park:</a>	None
<a href="#">Commonwealth Marine Area:</a>	None
<a href="#">Listed Threatened Ecological Communities:</a>	7
<a href="#">Listed Threatened Species:</a>	85
<a href="#">Listed Migratory Species:</a>	58

## Other Matters Protected by the EPBC Act

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

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

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

<a href="#">Commonwealth Lands:</a>	3
<a href="#">Commonwealth Heritage Places:</a>	None
<a href="#">Listed Marine Species:</a>	79
<a href="#">Whales and Other Cetaceans:</a>	14
<a href="#">Critical Habitats:</a>	None
<a href="#">Commonwealth Reserves Terrestrial:</a>	None
<a href="#">Australian Marine Parks:</a>	None
<a href="#">Habitat Critical to the Survival of Marine Turtles:</a>	None

## Extra Information

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

<a href="#">State and Territory Reserves:</a>	1
<a href="#">Regional Forest Agreements:</a>	1
<a href="#">Nationally Important Wetlands:</a>	None
<a href="#">EPBC Act Referrals:</a>	5
<a href="#">Key Ecological Features (Marine):</a>	1
<a href="#">Biologically Important Areas:</a>	7
<a href="#">Bioregional Assessments:</a>	1
<a href="#">Geological and Bioregional Assessments:</a>	None

# Details

## Matters of National Environmental Significance

### Listed Threatened Ecological Communities

[ [Resource Information](#) ]

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

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

Community Name	Threatened Category	Presence Text	Buffer Status
<a href="#">Coastal Swamp Oak (<i>Casuarina glauca</i>) Forest of New South Wales and South East Queensland ecological community</a>	Endangered	Community likely to occur within area	In feature area
<a href="#">Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland</a>	Endangered	Community may occur within area	In feature area
<a href="#">Illawarra and south coast lowland forest and woodland ecological community</a>	Critically Endangered	Community likely to occur within area	In feature area
<a href="#">Illawarra-Shoalhaven Subtropical Rainforest of the Sydney Basin Bioregion</a>	Critically Endangered	Community likely to occur within area	In feature area
<a href="#">Littoral Rainforest and Coastal Vine Thickets of Eastern Australia</a>	Critically Endangered	Community likely to occur within area	In buffer area only
<a href="#">River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria</a>	Critically Endangered	Community likely to occur within area	In feature area
<a href="#">Subtropical and Temperate Coastal Saltmarsh</a>	Vulnerable	Community likely to occur within area	In buffer area only

### Listed Threatened Species

[ [Resource Information](#) ]

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act.

Number is the current name ID.

Scientific Name	Threatened Category	Presence Text	Buffer Status
<b>BIRD</b>			
<a href="#">Anthochaera phrygia</a> Regent Honeyeater [82338]	Critically Endangered	Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
<a href="#">Botaurus poiciloptilus</a> Australasian Bittern [1001]	Endangered	Species or species habitat likely to occur within area	In feature area
<a href="#">Calidris canutus</a> Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area	In feature area
<a href="#">Calidris ferruginea</a> Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area	In feature area
<a href="#">Callocephalon fimbriatum</a> Gang-gang Cockatoo [768]	Endangered	Species or species habitat known to occur within area	In feature area
<a href="#">Calyptorhynchus lathami lathami</a> South-eastern Glossy Black-Cockatoo [67036]	Vulnerable	Species or species habitat known to occur within area	In feature area
<a href="#">Charadrius leschenaultii</a> Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat likely to occur within area	In feature area
<a href="#">Dasyornis brachypterus</a> Eastern Bristlebird [533]	Endangered	Species or species habitat likely to occur within area	In feature area
<a href="#">Diomedea antipodensis</a> Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
<a href="#">Diomedea antipodensis gibsoni</a> Gibson's Albatross [82270]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
<a href="#">Diomedea epomophora</a> Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
<a href="#">Diomedea exulans</a> Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
<a href="#">Diomedea sanfordi</a> Northern Royal Albatross [64456]	Endangered	Species or species habitat may occur within area	In feature area
<a href="#">Falco hypoleucos</a> Grey Falcon [929]	Vulnerable	Species or species habitat may occur within area	In feature area
<a href="#">Fregetta grallaria grallaria</a> White-bellied Storm-Petrel (Tasman Sea), White-bellied Storm-Petrel (Australasian) [64438]	Vulnerable	Species or species habitat likely to occur within area	In feature area
<a href="#">Grantiella picta</a> Painted Honeyeater [470]	Vulnerable	Species or species habitat likely to occur within area	In feature area
<a href="#">Hirundapus caudacutus</a> White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area	In feature area
<a href="#">Lathamus discolor</a> Swift Parrot [744]	Critically Endangered	Species or species habitat known to occur within area	In buffer area only
<a href="#">Limosa lapponica baueri</a> Nunivak Bar-tailed Godwit, Western Alaskan Bar-tailed Godwit [86380]	Vulnerable	Species or species habitat known to occur within area	In feature area
<a href="#">Macronectes giganteus</a> Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area	In feature area
<a href="#">Macronectes halli</a> Northern Giant Petrel [1061]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
<a href="#">Neophema chrysogaster</a> Orange-bellied Parrot [747]	Critically Endangered	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
<a href="#">Numenius madagascariensis</a> Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area	In feature area
<a href="#">Pachyptila turtur subantarctica</a> Fairy Prion (southern) [64445]	Vulnerable	Species or species habitat known to occur within area	In feature area
<a href="#">Phoebetria fusca</a> Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area	In feature area
<a href="#">Pterodroma leucoptera leucoptera</a> Gould's Petrel, Australian Gould's Petrel [26033]	Endangered	Species or species habitat may occur within area	In feature area
<a href="#">Pterodroma neglecta neglecta</a> Kermadec Petrel (western) [64450]	Vulnerable	Foraging, feeding or related behaviour may occur within area	In feature area
<a href="#">Pycnoptilus floccosus</a> Pilotbird [525]	Vulnerable	Species or species habitat likely to occur within area	In feature area
<a href="#">Rostratula australis</a> Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area	In feature area
<a href="#">Sternula nereis nereis</a> Australian Fairy Tern [82950]	Vulnerable	Species or species habitat known to occur within area	In feature area
<a href="#">Thalassarche bulleri</a> Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area	In feature area
<a href="#">Thalassarche bulleri platei</a> Northern Buller's Albatross, Pacific Albatross [82273]	Vulnerable	Species or species habitat may occur within area	In feature area
<a href="#">Thalassarche carteri</a> Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
<a href="#">Thalassarche cauta</a> Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area	In feature area
<a href="#">Thalassarche eremita</a> Chatham Albatross [64457]	Endangered	Foraging, feeding or related behaviour may occur within area	In feature area
<a href="#">Thalassarche impavida</a> Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area	In feature area
<a href="#">Thalassarche melanophris</a> Black-browed Albatross [66472]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
<a href="#">Thalassarche salvini</a> Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
<a href="#">Thalassarche steadi</a> White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area
<a href="#">Thinornis cucullatus cucullatus</a> Eastern Hooded Plover, Eastern Hooded Plover [90381]	Vulnerable	Species or species habitat known to occur within area	In feature area
<b>FISH</b>			
<a href="#">Epinephelus daemeli</a> Black Rockcod, Black Cod, Saddled Rockcod [68449]	Vulnerable	Species or species habitat likely to occur within area	In feature area
<a href="#">Hippocampus whitei</a> White's Seahorse, Crowned Seahorse, Sydney Seahorse [66240]	Endangered	Species or species habitat likely to occur within area	In feature area
<a href="#">Prototroctes maraena</a> Australian Grayling [26179]	Vulnerable	Species or species habitat likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
<a href="#">Seriolella brama</a> Blue Warehou [69374]	Conservation Dependent	Species or species habitat known to occur within area	In feature area
<a href="#">Thunnus maccoyii</a> Southern Bluefin Tuna [69402]	Conservation Dependent	Species or species habitat likely to occur within area	In feature area
<b>FROG</b>			
<a href="#">Heleioporus australiacus</a> Giant Burrowing Frog [1973]	Vulnerable	Species or species habitat known to occur within area	In feature area
<a href="#">Litoria aurea</a> Green and Golden Bell Frog [1870]	Vulnerable	Species or species habitat known to occur within area	In feature area
<a href="#">Litoria watsoni</a> Watson's Tree Frog [91509]	Endangered	Species or species habitat likely to occur within area	In feature area
<a href="#">Mixophyes balbus</a> Stuttering Frog, Southern Barred Frog (in Victoria) [1942]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
<b>MAMMAL</b>			
<a href="#">Balaenoptera borealis</a> Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In buffer area only
<a href="#">Balaenoptera musculus</a> Blue Whale [36]	Endangered	Species or species habitat may occur within area	In feature area
<a href="#">Balaenoptera physalus</a> Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In buffer area only
<a href="#">Chalinolobus dwyeri</a> Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
<a href="#"><u>Dasyurus maculatus maculatus (SE mainland population)</u></a> Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat known to occur within area	In feature area
<a href="#"><u>Eubalaena australis</u></a> Southern Right Whale [40]	Endangered	Species or species habitat known to occur within area	In feature area
<a href="#"><u>Isoodon obesulus obesulus</u></a> Southern Brown Bandicoot (eastern), Southern Brown Bandicoot (south-eastern) [68050]	Endangered	Species or species habitat likely to occur within area	In feature area
<a href="#"><u>Petauroides volans</u></a> Greater Glider (southern and central) [254]	Endangered	Species or species habitat known to occur within area	In feature area
<a href="#"><u>Petaurus australis australis</u></a> Yellow-bellied Glider (south-eastern) [87600]	Vulnerable	Species or species habitat likely to occur within area	In feature area
<a href="#"><u>Phascolarctos cinereus (combined populations of Qld, NSW and the ACT)</u></a> Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Endangered	Species or species habitat likely to occur within area	In feature area
<a href="#"><u>Potorous tridactylus trisulcatus</u></a> Long-nosed Potoroo (southern mainland) [86367]	Vulnerable	Species or species habitat may occur within area	In feature area
<a href="#"><u>Pseudomys novaehollandiae</u></a> New Holland Mouse, Pookila [96]	Vulnerable	Species or species habitat may occur within area	In feature area
<a href="#"><u>Pteropus poliocephalus</u></a> Grey-headed Flying-fox [186]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area
<b>PLANT</b>			
<a href="#"><u>Caladenia tessellata</u></a> Thick-lipped Spider-orchid, Daddy Long-legs [2119]	Vulnerable	Species or species habitat known to occur within area	In feature area
<a href="#"><u>Calochilus pulchellus</u></a> Pretty Beard Orchid, Pretty Beard-orchid [84677]	Endangered	Species or species habitat may occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
<a href="#">Corunastylis vernalis listed as Genoplesium vernale</a> East Lynne Midge-orchid [78699]	Vulnerable	Species or species habitat may occur within area	In feature area
<a href="#">Cryptostylis hunteriana</a> Leafless Tongue-orchid [19533]	Vulnerable	Species or species habitat known to occur within area	In feature area
<a href="#">Genoplesium baueri</a> Yellow Gnat-orchid, Bauer's Midge Orchid, Brittle Midge Orchid [7528]	Endangered	Species or species habitat may occur within area	In buffer area only
<a href="#">Melaleuca biconvexa</a> Biconvex Paperbark [5583]	Vulnerable	Species or species habitat may occur within area	In buffer area only
<a href="#">Persicaria elatior</a> Knotweed, Tall Knotweed [5831]	Vulnerable	Species or species habitat may occur within area	In feature area
<a href="#">Prasophyllum affine</a> Jervis Bay Leek Orchid, Culburra Leek-orchid, Kinghorn Point Leek-orchid [2210]	Endangered	Species or species habitat likely to occur within area	In feature area
<a href="#">Pterostylis gibbosa</a> Illawarra Greenhood, Rufa Greenhood, Pouched Greenhood [4562]	Endangered	Species or species habitat may occur within area	In feature area
<a href="#">Rhizanthella slateri</a> Eastern Underground Orchid [11768]	Endangered	Species or species habitat may occur within area	In feature area
<a href="#">Rhodamnia rubescens</a> Scrub Turpentine, Brown Malletwood [15763]	Critically Endangered	Species or species habitat known to occur within area	In feature area
<a href="#">Syzygium paniculatum</a> Magenta Lilly Pilly, Magenta Cherry, Daguba, Scrub Cherry, Creek Lilly Pilly, Brush Cherry [20307]	Vulnerable	Species or species habitat likely to occur within area	In feature area
<a href="#">Thesium australe</a> Austral Toadflax, Toadflax [15202]	Vulnerable	Species or species habitat likely to occur within area	In feature area

## REPTILE

Scientific Name	Threatened Category	Presence Text	Buffer Status
<a href="#">Caretta caretta</a> Loggerhead Turtle [1763]	Endangered	Breeding likely to occur within area	In feature area
<a href="#">Chelonia mydas</a> Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area	In feature area
<a href="#">Dermochelys coriacea</a> Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area	In feature area
<a href="#">Eretmochelys imbricata</a> Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area	In feature area
<a href="#">Hoplocephalus bungaroides</a> Broad-headed Snake [1182]	Vulnerable	Species or species habitat may occur within area	In feature area
<a href="#">Natator depressus</a> Flatback Turtle [59257]	Vulnerable	Species or species habitat known to occur within area	In feature area

## SHARK

<a href="#">Carcharias taurus (east coast population)</a> Grey Nurse Shark (east coast population) [68751]	Critically Endangered	Species or species habitat likely to occur within area	In feature area
<a href="#">Carcharodon carcharias</a> White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area	In feature area
<a href="#">Galeorhinus galeus</a> School Shark, Eastern School Shark, Snapper Shark, Tope, Soupfin Shark [68453]	Conservation Dependent	Species or species habitat may occur within area	In buffer area only
<a href="#">Rhincodon typus</a> Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area	In feature area

## Listed Migratory Species

[ [Resource Information](#) ]

Scientific Name	Threatened Category	Presence Text	Buffer Status
Migratory Marine Birds			

Scientific Name	Threatened Category	Presence Text	Buffer Status
<a href="#">Anous stolidus</a> Common Noddy [825]		Species or species habitat may occur within area	In buffer area only
<a href="#">Apus pacificus</a> Fork-tailed Swift [678]		Species or species habitat likely to occur within area	In feature area
<a href="#">Ardenna carneipes</a> Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Foraging, feeding or related behaviour likely to occur within area	In feature area
<a href="#">Ardenna grisea</a> Sooty Shearwater [82651]		Species or species habitat likely to occur within area	In feature area
<a href="#">Diomedea antipodensis</a> Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
<a href="#">Diomedea epomophora</a> Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
<a href="#">Diomedea exulans</a> Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
<a href="#">Diomedea sanfordi</a> Northern Royal Albatross [64456]	Endangered	Species or species habitat may occur within area	In feature area
<a href="#">Macronectes giganteus</a> Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area	In feature area
<a href="#">Macronectes halli</a> Northern Giant Petrel [1061]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
<a href="#">Phaethon lepturus</a> White-tailed Tropicbird [1014]		Species or species habitat may occur within area	In feature area
<a href="#">Phoebastria fusca</a> Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area	In feature area
<a href="#">Sternula albifrons</a> Little Tern [82849]		Species or species habitat may occur within area	In feature area
<a href="#">Thalassarche bulleri</a> Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area	In feature area
<a href="#">Thalassarche carteri</a> Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat likely to occur within area	In feature area
<a href="#">Thalassarche cauta</a> Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area	In feature area
<a href="#">Thalassarche eremita</a> Chatham Albatross [64457]	Endangered	Foraging, feeding or related behaviour may occur within area	In feature area
<a href="#">Thalassarche impavida</a> Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area	In feature area
<a href="#">Thalassarche melanophris</a> Black-browed Albatross [66472]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
<a href="#">Thalassarche salvini</a> Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
<a href="#">Thalassarche steadi</a> White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area
<b>Migratory Marine Species</b>			
<a href="#">Balaenoptera borealis</a> Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In buffer area only
<a href="#">Balaenoptera edeni</a> Bryde's Whale [35]		Species or species habitat may occur within area	In feature area
<a href="#">Balaenoptera musculus</a> Blue Whale [36]	Endangered	Species or species habitat may occur within area	In feature area
<a href="#">Balaenoptera physalus</a> Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In buffer area only
<a href="#">Caperea marginata</a> Pygmy Right Whale [39]		Foraging, feeding or related behaviour likely to occur within area	In feature area
<a href="#">Carcharhinus longimanus</a> Oceanic Whitetip Shark [84108]		Species or species habitat may occur within area	In feature area
<a href="#">Carcharodon carcharias</a> White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area	In feature area
<a href="#">Caretta caretta</a> Loggerhead Turtle [1763]	Endangered	Breeding likely to occur within area	In feature area
<a href="#">Chelonia mydas</a> Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
<a href="#">Dermochelys coriacea</a> Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area	In feature area
<a href="#">Eretmochelys imbricata</a> Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area	In feature area
<a href="#">Eubalaena australis as Balaena glacialis australis</a> Southern Right Whale [40]	Endangered	Species or species habitat known to occur within area	In feature area
<a href="#">Lagenorhynchus obscurus</a> Dusky Dolphin [43]		Species or species habitat may occur within area	In feature area
<a href="#">Lamna nasus</a> Porbeagle, Mackerel Shark [83288]		Species or species habitat likely to occur within area	In feature area
<a href="#">Megaptera novaeangliae</a> Humpback Whale [38]		Species or species habitat known to occur within area	In feature area
<a href="#">Mobula birostris as Manta birostris</a> Giant Manta Ray [90034]		Species or species habitat may occur within area	In feature area
<a href="#">Natator depressus</a> Flatback Turtle [59257]	Vulnerable	Species or species habitat known to occur within area	In feature area
<a href="#">Orcinus orca</a> Killer Whale, Orca [46]		Species or species habitat likely to occur within area	In feature area
<a href="#">Rhincodon typus</a> Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area	In feature area
<b>Migratory Terrestrial Species</b>			
<a href="#">Cuculus optatus</a> Oriental Cuckoo, Horsfield's Cuckoo [86651]		Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
<a href="#">Hirundapus caudacutus</a> White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area	In feature area
<a href="#">Monarcha melanopsis</a> Black-faced Monarch [609]		Species or species habitat known to occur within area	In feature area
<a href="#">Myiagra cyanoleuca</a> Satin Flycatcher [612]		Species or species habitat known to occur within area	In feature area
<a href="#">Rhipidura rufifrons</a> Rufous Fantail [592]		Species or species habitat known to occur within area	In feature area
<a href="#">Symposiachrus trivirgatus as Monarcha trivirgatus</a> Spectacled Monarch [83946]		Species or species habitat may occur within area	In feature area
<b>Migratory Wetlands Species</b>			
<a href="#">Actitis hypoleucos</a> Common Sandpiper [59309]		Species or species habitat likely to occur within area	In feature area
<a href="#">Calidris acuminata</a> Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area	In feature area
<a href="#">Calidris canutus</a> Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area	In feature area
<a href="#">Calidris ferruginea</a> Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area	In feature area
<a href="#">Calidris melanotos</a> Pectoral Sandpiper [858]		Species or species habitat likely to occur within area	In feature area
<a href="#">Charadrius bicinctus</a> Double-banded Plover [895]		Species or species habitat known to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
<a href="#">Charadrius leschenaultii</a> Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat likely to occur within area	In feature area
<a href="#">Gallinago hardwickii</a> Latham's Snipe, Japanese Snipe [863]		Species or species habitat likely to occur within area	In feature area
<a href="#">Limosa lapponica</a> Bar-tailed Godwit [844]		Species or species habitat known to occur within area	In feature area
<a href="#">Numenius madagascariensis</a> Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area	In feature area
<a href="#">Pandion haliaetus</a> Osprey [952]		Species or species habitat known to occur within area	In feature area
<a href="#">Tringa nebularia</a> Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area	In feature area

## Other Matters Protected by the EPBC Act

### Commonwealth Lands [\[ Resource Information \]](#)

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

Commonwealth Land Name	State	Buffer Status
<b>Commonwealth Trading Bank of Australia</b>		
Commonwealth Land - Commonwealth Trading Bank of Australia [12017]	NSW	In buffer area only
<b>Communications, Information Technology and the Arts - Australian Postal Corporation</b>		
Commonwealth Land - Australian Postal Commission [12016]	NSW	In buffer area only
<b>Communications, Information Technology and the Arts - Telstra Corporation Limited</b>		
Commonwealth Land - Australian Telecommunications Commission [12015]	NSW	In buffer area only

### Listed Marine Species [\[ Resource Information \]](#)

Scientific Name	Threatened Category	Presence Text	Buffer Status
Bird			

Scientific Name	Threatened Category	Presence Text	Buffer Status
<a href="#">Actitis hypoleucos</a> Common Sandpiper [59309]		Species or species habitat likely to occur within area	In feature area
<a href="#">Anous stolidus</a> Common Noddy [825]		Species or species habitat may occur within area	In buffer area only
<a href="#">Apus pacificus</a> Fork-tailed Swift [678]		Species or species habitat likely to occur within area overfly marine area	In feature area
<a href="#">Ardena carneipes as Puffinus carneipes</a> Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Foraging, feeding or related behaviour likely to occur within area	In feature area
<a href="#">Ardena grisea as Puffinus griseus</a> Sooty Shearwater [82651]		Species or species habitat likely to occur within area	In feature area
<a href="#">Bubulcus ibis as Ardea ibis</a> Cattle Egret [66521]		Species or species habitat may occur within area overfly marine area	In feature area
<a href="#">Calidris acuminata</a> Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area	In feature area
<a href="#">Calidris canutus</a> Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area overfly marine area	In feature area
<a href="#">Calidris ferruginea</a> Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area overfly marine area	In feature area
<a href="#">Calidris melanotos</a> Pectoral Sandpiper [858]		Species or species habitat likely to occur within area overfly marine area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
<a href="#">Charadrius bicinctus</a> Double-banded Plover [895]		Species or species habitat known to occur within area overfly marine area	In buffer area only
<a href="#">Charadrius leschenaultii</a> Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat likely to occur within area	In feature area
<a href="#">Charadrius ruficapillus</a> Red-capped Plover [881]		Species or species habitat known to occur within area overfly marine area	In buffer area only
<a href="#">Diomedea antipodensis</a> Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
<a href="#">Diomedea antipodensis gibsoni as Diomedea gibsoni</a> Gibson's Albatross [82270]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
<a href="#">Diomedea epomophora</a> Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
<a href="#">Diomedea exulans</a> Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
<a href="#">Diomedea sanfordi</a> Northern Royal Albatross [64456]	Endangered	Species or species habitat may occur within area	In feature area
<a href="#">Gallinago hardwickii</a> Latham's Snipe, Japanese Snipe [863]		Species or species habitat likely to occur within area overfly marine area	In feature area
<a href="#">Haliaeetus leucogaster</a> White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
<a href="#">Hirundapus caudacutus</a> White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area overfly marine area	In feature area
<a href="#">Lathamus discolor</a> Swift Parrot [744]	Critically Endangered	Species or species habitat known to occur within area overfly marine area	In buffer area only
<a href="#">Limosa lapponica</a> Bar-tailed Godwit [844]		Species or species habitat known to occur within area	In feature area
<a href="#">Macronectes giganteus</a> Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area	In feature area
<a href="#">Macronectes halli</a> Northern Giant Petrel [1061]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
<a href="#">Merops ornatus</a> Rainbow Bee-eater [670]		Species or species habitat may occur within area overfly marine area	In feature area
<a href="#">Monarcha melanopsis</a> Black-faced Monarch [609]		Species or species habitat known to occur within area overfly marine area	In feature area
<a href="#">Myiagra cyanoleuca</a> Satin Flycatcher [612]		Species or species habitat known to occur within area overfly marine area	In feature area
<a href="#">Neophema chrysogaster</a> Orange-bellied Parrot [747]	Critically Endangered	Species or species habitat may occur within area overfly marine area	In feature area
<a href="#">Neophema chrysostoma</a> Blue-winged Parrot [726]		Species or species habitat may occur within area overfly marine area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
<a href="#">Numenius madagascariensis</a> Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area	In feature area
<a href="#">Pachyptila turtur</a> Fairy Prion [1066]		Species or species habitat known to occur within area	In feature area
<a href="#">Pandion haliaetus</a> Osprey [952]		Species or species habitat known to occur within area	In feature area
<a href="#">Phaethon lepturus</a> White-tailed Tropicbird [1014]		Species or species habitat may occur within area	In feature area
<a href="#">Phoebastria fusca</a> Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area	In feature area
<a href="#">Rhipidura rufifrons</a> Rufous Fantail [592]		Species or species habitat known to occur within area overfly marine area	In feature area
<a href="#">Rostratula australis as Rostratula benghalensis (sensu lato)</a> Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area overfly marine area	In feature area
<a href="#">Stercorarius skua as Catharacta skua</a> Great Skua [823]		Species or species habitat may occur within area	In buffer area only
<a href="#">Sternula albifrons as Sterna albifrons</a> Little Tern [82849]		Species or species habitat may occur within area	In feature area
<a href="#">Symposiachrus trivirgatus as Monarcha trivirgatus</a> Spectacled Monarch [83946]		Species or species habitat may occur within area overfly marine area	In feature area
<a href="#">Thalassarche bulleri</a> Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
<a href="#">Thalassarche bulleri platei as Thalassarche sp. nov.</a> Northern Buller's Albatross, Pacific Albatross [82273]	Vulnerable	Species or species habitat may occur within area	In feature area
<a href="#">Thalassarche carteri</a> Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat likely to occur within area	In feature area
<a href="#">Thalassarche cauta</a> Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area	In feature area
<a href="#">Thalassarche eremita</a> Chatham Albatross [64457]	Endangered	Foraging, feeding or related behaviour may occur within area	In feature area
<a href="#">Thalassarche impavida</a> Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area	In feature area
<a href="#">Thalassarche melanophris</a> Black-browed Albatross [66472]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
<a href="#">Thalassarche salvini</a> Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
<a href="#">Thalassarche steadi</a> White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area
<a href="#">Thinornis cucullatus as Thinornis rubricollis</a> Hooded Plover, Hooded Dotterel [87735]		Species or species habitat known to occur within area overfly marine area	In feature area
<a href="#">Thinornis cucullatus cucullatus as Thinornis rubricollis rubricollis</a> Eastern Hooded Plover, Eastern Hooded Plover [90381]	Vulnerable	Species or species habitat known to occur within area overfly marine area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
<a href="#">Tringa nebularia</a> Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area overfly marine area	In feature area
<b>Fish</b>			
<a href="#">Acentronura tentaculata</a> Shortpouch Pygmy Pipehorse [66187]		Species or species habitat may occur within area	In feature area
<a href="#">Cosmocampus howensis</a> Lord Howe Pipefish [66208]		Species or species habitat may occur within area	In feature area
<a href="#">Heraldia nocturna</a> Upside-down Pipefish, Eastern Upside-down Pipefish, Eastern Upside-down Pipefish [66227]		Species or species habitat may occur within area	In feature area
<a href="#">Hippocampus abdominalis</a> Big-belly Seahorse, Eastern Potbelly Seahorse, New Zealand Potbelly Seahorse [66233]		Species or species habitat may occur within area	In feature area
<a href="#">Hippocampus breviceps</a> Short-head Seahorse, Short-snouted Seahorse [66235]		Species or species habitat may occur within area	In feature area
<a href="#">Hippocampus whitei</a> White's Seahorse, Crowned Seahorse, Sydney Seahorse [66240]	Endangered	Species or species habitat likely to occur within area	In feature area
<a href="#">Histiogamphelus briggsii</a> Crested Pipefish, Briggs' Crested Pipefish, Briggs' Pipefish [66242]		Species or species habitat may occur within area	In feature area
<a href="#">Kimblaeus bassensis</a> Trawl Pipefish, Bass Strait Pipefish [66247]		Species or species habitat may occur within area	In feature area
<a href="#">Lissocampus runa</a> Javelin Pipefish [66251]		Species or species habitat may occur within area	In feature area
<a href="#">Maroubra perserrata</a> Sawtooth Pipefish [66252]		Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
<a href="#">Notiocampus ruber</a> Red Pipefish [66265]		Species or species habitat may occur within area	In feature area
<a href="#">Phyllopteryx taeniolatus</a> Common Seadragon, Weedy Seadragon [66268]		Species or species habitat may occur within area	In feature area
<a href="#">Solegnathus spinosissimus</a> Spiny Pipehorse, Australian Spiny Pipehorse [66275]		Species or species habitat may occur within area	In feature area
<a href="#">Solenostomus cyanopterus</a> Robust Ghostpipefish, Blue-finned Ghost Pipefish, [66183]		Species or species habitat may occur within area	In feature area
<a href="#">Stigmatopora argus</a> Spotted Pipefish, Gulf Pipefish, Peacock Pipefish [66276]		Species or species habitat may occur within area	In feature area
<a href="#">Stigmatopora nigra</a> Widebody Pipefish, Wide-bodied Pipefish, Black Pipefish [66277]		Species or species habitat may occur within area	In feature area
<a href="#">Syngnathoides biaculeatus</a> Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area	In feature area
<a href="#">Urocampus carinirostris</a> Hairy Pipefish [66282]		Species or species habitat may occur within area	In feature area
<a href="#">Vanacampus margaritifer</a> Mother-of-pearl Pipefish [66283]		Species or species habitat may occur within area	In feature area
<a href="#">Vanacampus phillipi</a> Port Phillip Pipefish [66284]		Species or species habitat may occur within area	In feature area
<b>Mammal</b>			
<a href="#">Arctocephalus forsteri</a> Long-nosed Fur-seal, New Zealand Fur-seal [20]		Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
<a href="#">Arctocephalus pusillus</a> Australian Fur-seal, Australo-African Fur-seal [21]		Species or species habitat may occur within area	In feature area
<b>Reptile</b>			
<a href="#">Caretta caretta</a> Loggerhead Turtle [1763]	Endangered	Breeding likely to occur within area	In feature area
<a href="#">Chelonia mydas</a> Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area	In feature area
<a href="#">Dermochelys coriacea</a> Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area	In feature area
<a href="#">Eretmochelys imbricata</a> Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area	In feature area
<a href="#">Natator depressus</a> Flatback Turtle [59257]	Vulnerable	Species or species habitat known to occur within area	In feature area
<b>Whales and Other Cetaceans</b>			<a href="#">[ Resource Information ]</a>
Current Scientific Name	Status	Type of Presence	Buffer Status
<b>Mammal</b>			
<a href="#">Balaenoptera acutorostrata</a> Minke Whale [33]		Species or species habitat may occur within area	In feature area
<a href="#">Balaenoptera borealis</a> Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In buffer area only
<a href="#">Balaenoptera edeni</a> Bryde's Whale [35]		Species or species habitat may occur within area	In feature area
<a href="#">Balaenoptera musculus</a> Blue Whale [36]	Endangered	Species or species habitat may occur within area	In feature area

Current Scientific Name	Status	Type of Presence	Buffer Status
<a href="#">Balaenoptera physalus</a> Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In buffer area only
<a href="#">Caperea marginata</a> Pygmy Right Whale [39]		Foraging, feeding or related behaviour likely to occur within area	In feature area
<a href="#">Delphinus delphis</a> Common Dolphin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area	In feature area
<a href="#">Eubalaena australis</a> Southern Right Whale [40]	Endangered	Species or species habitat known to occur within area	In feature area
<a href="#">Grampus griseus</a> Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area	In feature area
<a href="#">Lagenorhynchus obscurus</a> Dusky Dolphin [43]		Species or species habitat may occur within area	In feature area
<a href="#">Megaptera novaeangliae</a> Humpback Whale [38]		Species or species habitat known to occur within area	In feature area
<a href="#">Orcinus orca</a> Killer Whale, Orca [46]		Species or species habitat likely to occur within area	In feature area
<a href="#">Tursiops aduncus</a> Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area	In feature area
<a href="#">Tursiops truncatus s. str.</a> Bottlenose Dolphin [68417]		Species or species habitat may occur within area	In feature area

## Extra Information

### State and Territory Reserves [\[ Resource Information \]](#)

Protected Area Name	Reserve Type	State	Buffer Status
Narrawallee Creek	Nature Reserve	NSW	In buffer area only

### Regional Forest Agreements [\[ Resource Information \]](#)

Note that all areas with completed RFAs have been included.

RFA Name	State	Buffer Status
<a href="#">Southern RFA</a>	New South Wales	In feature area

### EPBC Act Referrals [\[ Resource Information \]](#)

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Not controlled action				
<a href="#">Improving rabbit biocontrol: releasing another strain of RHDV, sthrn two thirds of Australia</a>	2015/7522	Not Controlled Action	Completed	In feature area
<a href="#">INDIGO Central Submarine Telecommunications Cable</a>	2017/8127	Not Controlled Action	Completed	In feature area
<a href="#">wastewater collection systems and pumping stations</a>	2001/511	Not Controlled Action	Completed	In buffer area only
Not controlled action (particular manner)				
<a href="#">INDIGO Marine Cable Route Survey (INDIGO)</a>	2017/7996	Not Controlled Action (Particular Manner)	Post-Approval	In feature area

### Referral decision

<a href="#">Breeding program for Grey Nurse Sharks</a>	2007/3245	Referral Decision	Completed	In feature area
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### Key Ecological Features [\[ Resource Information \]](#)

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

Name	Region	Buffer Status
<a href="#">Upwelling East of Eden</a>	South-east	In buffer area only

### Biologically Important Areas

Scientific Name	Behaviour	Presence	Buffer Status
Dolphins			
<a href="#">Tursiops aduncus</a>			
Indo-Pacific/Spotted Bottlenose Dolphin [68418]	Breeding	Likely to occur	In feature area

### Seabirds

Scientific Name	Behaviour	Presence	Buffer Status
<a href="#">Ardena grisea</a> Sooty Shearwater [82651]	Foraging	Likely to occur	In buffer area only
<a href="#">Ardena pacifica</a> Wedge-tailed Shearwater [84292]	Foraging	Likely to occur	In feature area
<a href="#">Ardena tenuirostris</a> Short-tailed Shearwater [82652]	Foraging	Likely to occur	In feature area
<a href="#">Pelagodroma marina</a> White-faced Storm-petrel [1016]	Breeding	Known to occur	In feature area

## Sharks

<a href="#">Carcharias taurus</a> Grey Nurse Shark [64469]	Foraging	Known to occur	In feature area
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## Whales

<a href="#">Megaptera novaeangliae</a> Humpback Whale [38]	Foraging	Known to occur	In feature area
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## Bioregional Assessments

SubRegion	BioRegion	Website	Buffer Status
Sydney	Sydney Basin	<a href="#">BA website</a>	In feature area

# Caveat

## 1 PURPOSE

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

The report contains the mapped locations of:

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

## 2 DISCLAIMER

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

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

## 3 DATA SOURCES

Threatened ecological communities

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

Threatened, migratory and marine species

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

Where little information is available for a species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc.).

In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More detailed distribution mapping methods are used to update these distributions

## 4 LIMITATIONS

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

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

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

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

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

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

# Acknowledgements

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

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

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

Please feel free to provide feedback via the [Contact us](#) page.

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# APPENDIX D FLORA AND FAUNE LIKELIHOOD OF OCCURANCE TABLE





**Table D-1 Threatened Species: Likelihood Criteria**

Likelihood	Criteria
Recorded	The species was observed in the study area during the current survey.
High	It is highly likely that a species inhabits the study area and is dependent on identified suitable habitat (ie. for breeding or important life cycle periods such as winter flowering resources), has been recorded recently in the locality (10km) and is known or likely to maintain resident populations in the study area. Also includes species known or likely to visit the study area during regular seasonal movements or migration.
Moderate	Potential habitat is present in the study area. Species unlikely to maintain sedentary populations, however, may seasonally use resources within the study area opportunistically or during migration. The species is unlikely to be dependent (ie. for breeding or important life cycle periods such as winter flowering resources) on habitat within the study area, or habitat is in a modified or degraded state. Includes cryptic flowering flora species that were not seasonally targeted by surveys and that have not been recorded.
Low	It is unlikely that the species inhabits the study area and has not been recorded recently in the locality (10km). It may be an occasional visitor, but habitat similar to the study area is widely distributed in the local area, meaning that the species is not dependent (ie. for breeding or important life cycle periods such as winter flowering resources) on available habitat. Specific habitat is not present in the study area, or the species are a non-cryptic perennial flora species that were specifically targeted by surveys and not recorded.
None	Suitable habitat is absent from the study area.



Table D-2 Threatened Species: Fauna

Type Of Species	Type Of Species	Scientific Name	Common Name	NSW Status	Comm. Status	Occurrence within 5km search radius	Likelihood of Occurrence for Proposed Works
Animal	Amphibians	<i>Litoria aurea</i>	Green and Golden Bell Frog	Endangered	Vulnerable	Known	Low
Animal	Amphibians	<i>Litoria littlejohni</i>	Littlejohn's Tree Frog	Endangered		Known	Low
Animal	Amphibians	<i>Mixophyes balbus</i>	Stuttering Frog	Endangered	Vulnerable	Known	Low
Animal	Amphibians	<i>Heleioporus australiacus</i>	Giant Burrowing Frog	Vulnerable	Vulnerable	Known	Low
Animal	Bats	<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	Vulnerable	Vulnerable	Known	Low
Animal	Bats	<i>Falsistrellus tasmaniensis</i>	Eastern False Pipistrelle	Vulnerable		Known	Low
Animal	Bats	<i>Micronomus norfolkensis</i>	Eastern Coastal Free-tailed Bat	Vulnerable		Known	Low
Animal	Bats	<i>Miniopterus orianae oceanensis</i>	Large Bent-winged Bat	Vulnerable		Known	Low
Animal	Bats	<i>Myotis macropus</i>	Southern Myotis	Vulnerable		Known	Low
Animal	Bats	<i>Phoniscus papuensis</i>	Golden-tipped Bat	Vulnerable		Known	Low
Animal	Bats	<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	Vulnerable	Vulnerable	Known	Low
Animal	Bats	<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail-bat	Vulnerable		Known	Low
Animal	Bats	<i>Scoteanax rueppellii</i>	Greater Broad-nosed Bat	Vulnerable		Known	Low



Type Of Species	Type Of Species	Scientific Name	Common Name	NSW Status	Comm. Status	Occurrence within 5km search radius	Likelihood of Occurrence for Proposed Works
Animal	Bats	<i>Vespadelus troughtoni</i>	Eastern Cave Bat	Vulnerable		Known	Low
Animal	Birds	<i>Anthochaera phrygia</i>	Regent Honeyeater	Critically Endangered	Critically Endangered	Known	Low
Animal	Birds	<i>Esacus magnirostris</i>	Beach Stone-curlew	Critically Endangered		Known	Moderate
Animal	Birds	<i>Neophema chrysogaster</i>	Orange-bellied Parrot	Critically Endangered	Critically Endangered	Predicted	Low
Animal	Birds	<i>Thinornis cucullatus cucullatus</i>	Eastern Hooded Dotterel	Critically Endangered	Vulnerable	Known	Low
Animal	Birds	<i>Botaurus poiciloptilus</i>	Australasian Bittern	Endangered	Endangered	Known	Low
Animal	Birds	<i>Burhinus grallarius</i>	Bush Stone-curlew	Endangered		Known	Moderate
Animal	Birds	<i>Calamanthus fuliginosus</i>	Striated Fieldwren	Endangered		Known	Moderate
Animal	Birds	<i>Calidris ferruginea</i>	Curlew Sandpiper	Endangered	Critically Endangered	Known	Moderate
Animal	Birds	<i>Dasyornis brachypterus</i>	Eastern Bristlebird	Endangered	Endangered	Known	Low
Animal	Birds	<i>Diomedea exulans</i>	Wandering Albatross	Endangered	Vulnerable	Known	None
Animal	Birds	<i>Ephippiorhynchus asiaticus</i>	Black-necked Stork	Endangered		Predicted	Low
Animal	Birds	<i>Haematopus longirostris</i>	Pied Oystercatcher	Endangered		Known	Moderate



Type Of Species	Type Of Species	Scientific Name	Common Name	NSW Status	Comm. Status	Occurrence within 5km search radius	Likelihood of Occurrence for Proposed Works
Animal	Birds	<i>Lathamus discolor</i>	Swift Parrot	Endangered	Critically Endangered	Known	Low
Animal	Birds	<i>Macronectes giganteus</i>	Southern Giant Petrel	Endangered	Endangered	Known	None
Animal	Birds	<i>Sternula albifrons</i>	Little Tern	Endangered		Known	Moderate
Animal	Birds	<i>Artamus cyanopterus cyanopterus</i>	Dusky Woodswallow	Vulnerable		Known	Low
Animal	Birds	<i>Calidris alba</i>	Sanderling	Vulnerable		Known	Low
Animal	Birds	<i>Callocephalon fimbriatum</i>	Gang-gang Cockatoo	Vulnerable	Endangered	Known	Low
Animal	Birds	<i>Calyptorhynchus lathamii</i>	Glossy Black-Cockatoo	Vulnerable		Known	Low
Animal	Birds	<i>Charadrius mongolus</i>	Lesser Sand-plover	Vulnerable		Known	Low
Animal	Birds	<i>Circus assimilis</i>	Spotted Harrier	Vulnerable		Predicted	Low
Animal	Birds	<i>Climacteris picumnus victoriae</i>	Brown Treecreeper (eastern subspecies)	Vulnerable		Known	Low
Animal	Birds	<i>Daphoenositta chrysoptera</i>	Varied Sittella	Vulnerable		Known	Low
Animal	Birds	<i>Diomedea gibsoni</i>	Gibson's Albatross	Vulnerable		Known	None
Animal	Birds	<i>Epthianura albifrons</i>	White-fronted Chat	Vulnerable		Known	Low
Animal	Birds	<i>Glossopsitta pusilla</i>	Little Lorikeet	Vulnerable		Known	Low
Animal	Birds	<i>Haematopus fuliginosus</i>	Sooty Oystercatcher	Vulnerable		Known	Low



Type Of Species	Type Of Species	Scientific Name	Common Name	NSW Status	Comm. Status	Occurrence within 5km search radius	Likelihood of Occurrence for Proposed Works
Animal	Birds	<i>Hieraaetus morphnoides</i>	Little Eagle	Vulnerable		Known	Low
Animal	Birds	<i>Ixobrychus flavicollis</i>	Black Bittern	Vulnerable		Known	Low
Animal	Birds	<i>Limicola falcinellus</i>	Broad-billed Sandpiper	Vulnerable		Known	None
Animal	Birds	<i>Limosa limosa</i>	Black-tailed Godwit	Vulnerable		Known	Low
Animal	Birds	<i>Lophoictinia isura</i>	Square-tailed Kite	Vulnerable		Known	Low
Animal	Birds	<i>Macronectes halli</i>	Northern Giant-Petrel	Vulnerable	Vulnerable	Known	None
Animal	Birds	<i>Neophema pulchella</i>	Turquoise Parrot	Vulnerable		Known	Low
Animal	Birds	<i>Ninox connivens</i>	Barking Owl	Vulnerable		Known	Low
Animal	Birds	<i>Ninox strenua</i>	Powerful Owl	Vulnerable		Known	Low
Animal	Birds	<i>Onychoprion fuscata</i>	Sooty Tern	Vulnerable		Known	None
Animal	Birds	<i>Pachycephala olivacea</i>	Olive Whistler	Vulnerable		Known	Low
Animal	Birds	<i>Pandion cristatus</i>	Eastern Osprey	Vulnerable		Known	Low
Animal	Birds	<i>Petroica boodang</i>	Scarlet Robin	Vulnerable		Known	Low
Animal	Birds	<i>Petroica phoenicea</i>	Flame Robin	Vulnerable		Known	Low
Animal	Birds	<i>Petroica rodinogaster</i>	Pink Robin	Vulnerable		Known	None
Animal	Birds	<i>Pezoporus wallicus wallicus</i>	Eastern Ground Parrot	Vulnerable		Known	Low
Animal	Birds	<i>Ptilinopus superbus</i>	Superb Fruit-Dove	Vulnerable		Known	Low
Animal	Birds	<i>Puffinus assimilis</i>	Little Shearwater	Vulnerable		Known	None



Type Of Species	Type Of Species	Scientific Name	Common Name	NSW Status	Comm. Status	Occurrence within 5km search radius	Likelihood of Occurrence for Proposed Works
Animal	Birds	<i>Stictonetta naevosa</i>	Freckled Duck	Vulnerable		Known	None
Animal	Birds	<i>Thalassarche cauta</i>	Shy Albatross	Vulnerable	Endangered	Known	None
Animal	Birds	<i>Thalassarche melanophris</i>	Black-browed Albatross	Vulnerable	Vulnerable	Known	None
Animal	Birds	<i>Tyto novaehollandiae</i>	Masked Owl	Vulnerable		Known	Low
Animal	Birds	<i>Tyto tenebricosa</i>	Sooty Owl	Vulnerable		Known	None
Animal	Birds	<i>Xenus cinereus</i>	Terek Sandpiper	Vulnerable		Known	Low
Animal	Invertebrates	<i>Petalura gigantea</i>	Giant Dragonfly	Endangered		Known	Low
Animal	Marine Mammals	<i>Dugong dugon</i>	Dugong	Endangered		Known	Low
Animal	Marine Mammals	<i>Eubalaena australis</i>	Southern Right Whale	Endangered	Endangered	Known	Low
Animal	Marine Mammals	<i>Arctocephalus forsteri</i>	New Zealand Fur-seal	Vulnerable		Known	Low
Animal	Marine Mammals	<i>Arctocephalus pusillus doriferus</i>	Australian Fur-seal	Vulnerable		Known	Low
Animal	Marine Mammals	<i>Physeter macrocephalus</i>	Sperm Whale	Vulnerable		Known	Low
Animal	Marsupials	<i>Isodon obesulus obesulus</i>	Southern Brown Bandicoot (eastern)	Endangered	Endangered	Known	Low
Animal	Marsupials	<i>Petauroides volans</i>	Greater Glider	Endangered	Endangered	Known	Low
Animal	Marsupials	<i>Petrogale penicillata</i>	Brush-tailed Rock-wallaby	Endangered		Known	Low
Animal	Marsupials	<i>Phascolarctos cinereus</i>	Koala	Endangered		Known	Low



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Animal	Marsupials	<i>Cercartetus nanus</i>	Eastern Pygmy-possum	Vulnerable		Known	Low
Animal	Marsupials	<i>Dasyurus maculatus</i>	Spotted-tailed Quoll	Vulnerable		Known	Low
Animal	Marsupials	<i>Petaurus australis</i>	Yellow-bellied Glider	Vulnerable		Known	Low
Animal	Marsupials	<i>Petaurus norfolcensis</i>	Squirrel Glider	Vulnerable		Known	Low
Animal	Marsupials	<i>Phascogale tapoatafa</i>	Brush-tailed Phascogale	Vulnerable		Known	Low
Animal	Marsupials	<i>Potorous tridactylus</i>	Long-nosed Potoroo	Vulnerable		Known	Low
Animal	Marsupials	<i>Sminthopsis leucopus</i>	White-footed Dunnart	Vulnerable		Known	Low
Animal	Reptiles	<i>Dermochelys coriacea</i>	Leatherback Turtle	Endangered	Endangered	Known	None
Animal	Reptiles	<i>Hoplocephalus bungaroides</i>	Broad-headed Snake	Endangered	Vulnerable	Known	Low
Animal	Reptiles	<i>Chelonia mydas</i>	Green Turtle	Vulnerable	Vulnerable	Known	Low
Animal	Reptiles	<i>Varanus rosenbergi</i>	Rosenberg's Goanna	Vulnerable		Known	Low
Animal	Rodents	<i>Pseudomys gracilicaudatus</i>	Eastern Chestnut Mouse	Vulnerable		Known	Low
Community	Threatened Ecological Communities	<i>Bangalay Sand Forest of the Sydney Basin and South East Corner bioregions</i>	Bangalay Sand Forest of the Sydney Basin and South East Corner bioregions	Endangered Ecological Community		Known	None



Type Of Species	Type Of Species	Scientific Name	Common Name	NSW Status	Comm. Status	Occurrence within 5km search radius	Likelihood of Occurrence for Proposed Works
Community	Threatened Ecological Communities	<i>Coastal Saltmarsh in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions</i>	Coastal Saltmarsh in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	Endangered Ecological Community		Known	None
Community	Threatened Ecological Communities	<i>Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions</i>	Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	Endangered Ecological Community		Known	None
Community	Threatened Ecological Communities	<i>Illawarra Lowlands Grassy Woodland in the Sydney Basin Bioregion</i>	Illawarra Lowlands Grassy Woodland in the Sydney Basin Bioregion	Endangered Ecological Community		Known	None
Community	Threatened Ecological Communities	<i>Illawarra Subtropical Rainforest in the Sydney Basin Bioregion</i>	Illawarra Subtropical Rainforest in the Sydney Basin Bioregion	Endangered Ecological Community		Known	None
Community	Threatened Ecological Communities	<i>Littoral Rainforest in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions</i>	Littoral Rainforest in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	Endangered Ecological Community		Known	None



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Community	Threatened Ecological Communities	<i>Lowland Rainforest in the NSW North Coast and Sydney Basin Bioregions</i>	Lowland Rainforest in the NSW North Coast and Sydney Basin Bioregions	Endangered Ecological Community		Known	None
Community	Threatened Ecological Communities	<i>Milton Ulladulla Subtropical Rainforest in the Sydney Basin Bioregion</i>	Milton Ulladulla Subtropical Rainforest	Endangered Ecological Community		Known	None
Community	Threatened Ecological Communities	<i>River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions</i>	River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	Endangered Ecological Community		Known	None
Community	Threatened Ecological Communities	<i>Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions</i>	Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	Endangered Ecological Community		Known	None
Community	Threatened Ecological Communities	<i>Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions</i>	Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	Endangered Ecological Community		Known	Low



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Community	Threatened Ecological Communities	<i>Sydney Freshwater Wetlands in the Sydney Basin Bioregion</i>	Sydney Freshwater Wetlands in the Sydney Basin Bioregion	Endangered Ecological Community		Known	None
Plant	Herbs and Forbs	<i>Chamaesyce psammogeton</i>	Sand Spurge	Endangered		Known	Low
Plant	Herbs and Forbs	<i>Distichlis distichophylla</i>	Australian Saltgrass	Endangered		Known	Low
Plant	Herbs and Forbs	<i>Galium australe</i>	Tangled Bedstraw	Endangered		Known	Low
Plant	Herbs and Forbs	<i>Senecio spathulatus</i>	Coast Groundsel	Endangered		Predicted	Low
Plant	Herbs and Forbs	<i>Thesium australe</i>	Austral Toadflax	Vulnerable	Vulnerable	Known	Low
Plant	Mallees	<i>Eucalyptus langleyi</i>	Albatross Mallee	Vulnerable		Known	Low
Plant	Mallees	<i>Eucalyptus sturgissiana</i>	Ettrema Mallee	Vulnerable		Known	Low
Plant	Orchids	<i>Caladenia tessellata</i>	Thick Lip Spider Orchid	Endangered	Vulnerable	Known	Low
Plant	Orchids	<i>Calochilus pulchellus</i>	Pretty Beard Orchid	Endangered	Endangered	Known	Low
Plant	Orchids	<i>Genoplesium baueri</i>	Bauer's Midge Orchid	Endangered	Endangered	Known	Low
Plant	Orchids	<i>Prasophyllum affine</i>	Jervis Bay Leek Orchid	Endangered	Endangered	Known	Low
Plant	Orchids	<i>Pterostylis gibbosa</i>	Illawarra Greenhood	Endangered	Endangered	Known	None
Plant	Orchids	<i>Cryptostylis hunteriana</i>	Leafless Tongue Orchid	Vulnerable	Vulnerable	Known	Low
Plant	Orchids	<i>Genoplesium vernale</i>	East Lynne Midge Orchid	Vulnerable		Predicted	None



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Plant	Orchids	<i>Rhizanthella slateri</i>	Eastern Australian Underground Orchid	Vulnerable	Endangered	Known	None
Plant	Shrubs	<i>Banksia vincentia</i>	Banksia vincentia	Critically Endangered		Known	Low
Plant	Shrubs	<i>Rhodamnia rubescens</i>	Scrub Turpentine	Critically Endangered	Critically Endangered	Known	Low
Plant	Shrubs	<i>Acacia bynoeana</i>	Bynoe's Wattle	Endangered		Known	Low
Plant	Shrubs	<i>Hibbertia puberula</i>	Hibbertia puberula	Endangered		Known	Low
Plant	Shrubs	<i>Hibbertia stricta subsp. furcatula</i>	Hibbertia stricta subsp. furcatula	Endangered		Known	Low
Plant	Shrubs	<i>Solanum celatum</i>	Solanum celatum	Endangered		Known	None
Plant	Shrubs	<i>Triplarina nowraensis</i>	Nowra Heath Myrtle	Endangered		Known	Low
Plant	Shrubs	<i>Wilsonia rotundifolia</i>	Round-leafed Wilsonia	Endangered		Known	None
Plant	Shrubs	<i>Acacia pubescens</i>	Downy Wattle	Vulnerable		Known	Low
Plant	Shrubs	<i>Epacris gnidioides</i>	Budawang's Cliff-heath	Vulnerable		Known	Low
Plant	Shrubs	<i>Haloragis exalata subsp. exalata</i>	Square Raspwort	Vulnerable		Predicted	None
Plant	Shrubs	<i>Prostanthera densa</i>	Villous Mint-bush	Vulnerable		Known	Low
Plant	Shrubs	<i>Wilsonia backhousei</i>	Narrow-leafed Wilsonia	Vulnerable		Known	Low
Plant	Trees	<i>Syzygium paniculatum</i>	Magenta Lilly Pilly	Endangered	Vulnerable	Known	Low
Plant	Trees	<i>Melaleuca biconvexa</i>	Biconvex Paperbark	Vulnerable	Vulnerable	Known	Low



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Type Of Species	Type Of Species	<i>Scientific Name</i>	Common Name	NSW Status	Comm. Status	Occurrence within 5km search radius	Likelihood of Occurrence for Proposed Works
Animal	Amphibians	<i>Litoria aurea</i>	Green and Golden Bell Frog	Endangered	Vulnerable	Known	Low
Animal	Amphibians	<i>Litoria littlejohni</i>	Littlejohn's Tree Frog	Endangered		Known	Low
Animal	Amphibians	<i>Mixophyes balbus</i>	Stuttering Frog	Endangered	Vulnerable	Known	Low
Animal	Amphibians	<i>Heleioporus australiacus</i>	Giant Burrowing Frog	Vulnerable	Vulnerable	Known	Low



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