

# Victoria Energy Terminal Project

## Desktop Marine Ecology Characterisation

**Report to Aurecon**

December 2022



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# Victoria Energy Terminal Project Desktop Marine Ecology Characterisation

## Document Control Sheet

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## Executive Summary

This desktop assessment aims to characterise the marine habitats, species and general marine values of the Victoria Energy Terminal Project region, located in the Geelong Arm of Port Phillip Bay. The Geelong Arm is generally characterised by low energy conditions which influences the biological communities in this location. In the sublittoral zone, the Berth and Pipeline Area overlaps with sediment beds that comprise bare muddy sediments in the offshore sections, to sandy sediments in the nearshore sections that are associated with *Caulerpa* spp. algal beds, multi-species epifauna assemblages associated with *Pyura dalbyi* ascidian clumps. Microphytobenthos (photosynthetic benthic microalgae) are major contributors of primary production on these sediments. In the nearshore sector of the Berth and Pipeline Area *Zostera nigricaulis* seagrass beds occur on sediments. Drift algae beds are a significant feature of sublittoral sediments throughout the Geelong Arm. Spatially constrained sublittoral reefs occur in the nearshore section of the Berth and Pipeline Area.

The Port Phillip Bay (Western Shoreline) and Bellarine Peninsula Ramsar Site, an internationally important wetland, is a key feature of the coastal environment. Littoral sediment and seagrass, *Zostera muelleri*, beds are key biotopes in the Geelong Arm and northwestern sector of the Bay that are used by abundant avifauna including migratory species.

Species of conservation significance are listed as occurring in the Geelong Arm, although for several vagrant migrators that occasionally enter, Port Phillip Bay is not critical habitat. The species of conservation significance that are resident in the Geelong Arm are the EPBC Act 1999 listed big-belly seahorse *Hippocampus abdominalis* and Port Phillip pipefish *Vanacampus philipi* and the FFG Act listed species, southern hooded shrimp, *Athanopsis australis*, the sea cucumber, *Thyone nigra*, and the seagrass species *Zostera nigricaulis*. The big-belly seahorse is typically associated with macroalgae habitats and is observed associated with man-made structures, although it is also known to occur over sediments in Gippsland Lakes. The Port Phillip pipefish is associated with seagrass habitats. The southern hooded shrimp and sea cucumber are associated with sediment habitats and while they have not been recorded from the Berthing and Pipeline Area, are considered likely to occur here.

Key ecosystem processes and functions of the Geelong Arm include primary production, denitrification, supporting avifauna and marine trophic webs, and sustaining commercial and recreational fish stocks and biodiversity. Sediment-based denitrification processes in particular are identified as a key function of the expansive sediment beds in the Geelong Arm. The spatial distribution, extent and juxtaposition of biotopes in the Geelong Arm underpins ecological function and the life histories of key species including a number of demersal fish species that currently support commercial and recreational fisheries.

One mussel aquaculture lease area exists within the Berth and Pipeline Area. Being filter-feeding organisms, water quality is a primary consideration for mussel aquaculture. Recreational fishing and boating is generally considered a growth area and recreational fishing is likely to represent the primary cultural ecosystem service and on-water activity in the Geelong Arm and northwestern sector of the Bay. Boating, jet skiing, bird-watching and other marine based leisure activities occur in the Berth and Pipeline Area. There are initiatives currently underway to restore the lost shellfish reefs of Port Phillip Bay by installing rock

substrates and seeding these with shellfish. There is one such shellfish reef restoration site within the Berth and Pipeline Area.

The Point Cook Marine Sanctuary occurs in Geelong Arm, some 12 km to the north of the Berth and Pipeline Area. Other features of significance in the Geelong Arm and the northwestern sector of the Bay include shipwrecks and plane wrecks, a historic dredged material dumping ground inside the Berth and Pipeline Area, the Point Wilson military area and the commercial Port of Geelong dredged channels and port operations. Some of the most intact and extensive sublittoral *Zostera nigricaulis* seagrass beds in northern Port Phillip Bay occur along the northern and southern coasts of Corio Bay and on the northern Bellarine coast along the Curlewis Bank to Point Richards.

Littoral and sublittoral habitats in the Geelong Arm are exposed to a number of existing impacts and threatening processes. Reef condition is impacted by grazing by over-abundant native urchins, *Heliocidaris erythrogramma* and infestation of the introduced algae *Undaria pinnatifida*, which combine to form urchin-*Undaria* barrens that now replace much of the former *Ecklonia radiata*-dominated macroalgae communities. Nutrient inputs from the Western Treatment Plant, agricultural areas and urbanised surface water runoff and groundwater flows have led to eutrophication in some areas. Sublittoral drift algae beds occur in the Geelong Arm and can interact with the littoral environment in the form of wrack. The role of nutrient inputs in driving drift algal growth and the ecological role of this biotope in the Geelong Arm is the subject of ongoing studies. A detailed assessment of water quality in the Geelong Arm was not conducted in this assessment, but it is acknowledged that the Geelong Arm is classified as a ‘slightly to moderately modified system’ in the State Environment Protection Policy (Waters) in recognition of existing stressors in this sector of the bay. Marine pests are prevalent throughout the Geelong Arm and while detailed studies are lacking, are considered to have contributed to significant ecological changes in the Bay. Maintenance dredging is conducted Corio Bay and this along with coastal infrastructure projects and surface water runoff can introduce sediment to the nearshore environment.

A considerable challenge for a desktop consideration of the existing environment is that there have been ecosystem changes in the Geelong Arm that cannot be adequately characterised using desktop data and literature assessments, most of which rely on data that are now decades old. The present assessment has benefited by the existence of some information from 2019 studies at nearshore reefs and intertidal habitats in the northwestern sector of the Bay. However, directed field studies will be required in the future.



## **1. Introduction**

### **1.1. Project overview**

Vopak proposes to build a floating liquefied natural gas (LNG) import terminal to help secure energy supply as a part of Victoria's energy transition.

The aim of the Project is to provide access to a competitive new source of natural gas (peak rate of 600 mmscf/d (standard cubic feet per day) output) for households, businesses and industries in Victoria and across south-eastern Australia. It would underpin energy supply security by providing access to a large international gas market to complement local production in south-eastern Australia as Victoria transitions to a renewable energy future.

The Project would utilise a Floating Storage Re-gasification Unit (FSRU) moored at an existing anchorage point in Port Phillip Bay, approximately 19 km directly offshore from Avalon. The FSRU would receive LNG from import vessels, re-gasify it and supply the gas directly into the Victorian Transmission System via a new 29 km pipeline comprising of approximately 19 km of pipe under Port Phillip Bay, 1.5 km of pipe within a trenchless shore crossing and 8.5 km of pipe trenched onshore.

Before entering the Victorian Transmission System, gas quality would be monitored at a Gas Receiving Station (GRS) on land adjacent to the Princes Freeway (between Point Wilson Road and English Road).

A new 132kV overhead transmission line (powerline) (to the substation), substation (located adjacent to the GRS) and electricity cables (from the substation to the shore crossing overhead or underground and subsea from the shore crossing to the FSRU) would supply electricity for the operation of the Project.

The project would be delivered by Vopak Victoria Energy Terminal Pty Ltd. For the purpose of this report, the pipeline area (defined in Section 1.2) only relates to the offshore and shore crossing sections of the pipeline and electricity cable relevant to this report.

All onshore infrastructure including the 132kV powerline, substation, GRS, part of the pipeline and part of the 66kV electricity cable are located onshore and therefore not considered in this report.'

#### ***Regasification modes (open and closed loop)***

Two methods for regasification are being investigated for the Project, the FSRU vessel may operate one or both modes. Both operational modes (open or closed) would be powered using onshore renewable energy. The use of electrical steam boilers (power from onshore) would replace the use of gas fired boilers (typically used) and greenhouse gas emissions associated with using gas. The selection of either or both methods is dependent upon various factors including, potential for significant effects to the marine environment (likely higher with open loop), contribution to greenhouse gas emissions (likely higher with closed loop) climatic conditions, throughput capacity, energy efficiency and commercial viability.

### ***Open Loop***

An open loop system on the FSRU uses seawater to heat the LNG. Seawater is continuously drawn in via intakes, passes once through a heat exchange system and is then returned directly to the sea at temperatures of between 5 and 7 °C below ambient water temperature. Seawater is generally used as a heat source for warming and vaporising the LNG.

The regasification system would be capable of delivering 400 – 600 million standard cubic feet per day (mmscf/d) (a unit of measurement for gases) of gas at high reliability depending on future market requirement. The seawater intake volume of up to 13,000 m<sup>3</sup>/hr is based upon the regasification rate of 600mmscf/d. Anticipated seawater flow-through rate would be lower in accordance with a lower regasification rate.

### ***Closed Loop***

A closed loop system would use electrical steam boilers to heat a closed loop of circulating a mix of seawater and glycol within the FSRU as an intermediate heating medium for heat exchange in the LNG regasification trains. Around 500 m<sup>3</sup> of seawater would be required to fill the FSRU heat exchange piping. Instead of being regularly discharged from the FSRU as per open loop mode, the seawater is continually circulated in the process. The seawater-glycol mix would only be discharged when maintenance is required (anticipated to be annually) but would be treated onshore and not discharged back into the marine environment. The seawater-glycol mix would be transported via a vessel to a local treatment facility for treatment. Following confirmation of the preferred operational mode, the location of the treatment facility would be confirmed.

The regasification system would be capable of delivering the same amount of gas as the open loop mode (400 – 600 mmscf/d) depending on future market requirement.

The closed loop facilities would be located on a platform adjacent to the Gas Pipe Riser and the FSRU.

## **1.2. Project zones definition**

The assessment deals with three spatial scales as follows:

- 1) Whole of Port Phillip Bay: to characterise the ecophysical setting of the Bay and contextualise the setting of the project.
- 2) The Geelong Arm and the northwestern sector of Port Phillip Bay within which the project is located and including the surrounding areas that are the primary ecosystem linkages in the area. The State Environment Protection Policy (SEPP) 2018 Geelong Arm segment and is erected here as an estimate of the potential area of influence that the project may have on the marine environment.
- 3) The ‘Berth and Pipeline Area’: the project development zone defined by Victoria Energy Terminal Project (zone termed ‘pipeline’ zone in maps herein), being a buffer zone around the proposed berthing site and pipeline alignment.

### **1.3. Purpose and scope**

The scope of this desktop assessment was to describe the marine environmental values and conditions of the Project site using existing data. No site-specific field studies were completed to inform this report.

As described in Section 1.1, the Project would extend across terrestrial, coastal and offshore habitats. This report illustrates key relevant features of the northwestern sector of Port Phillip Bay, however it primarily focuses on the characterisation of the marine environment, ecology and values of the offshore region that relates to the offshore infrastructure within the Project Berth and Pipeline Area.

## **2. Methods**

### **2.1. Desktop review**

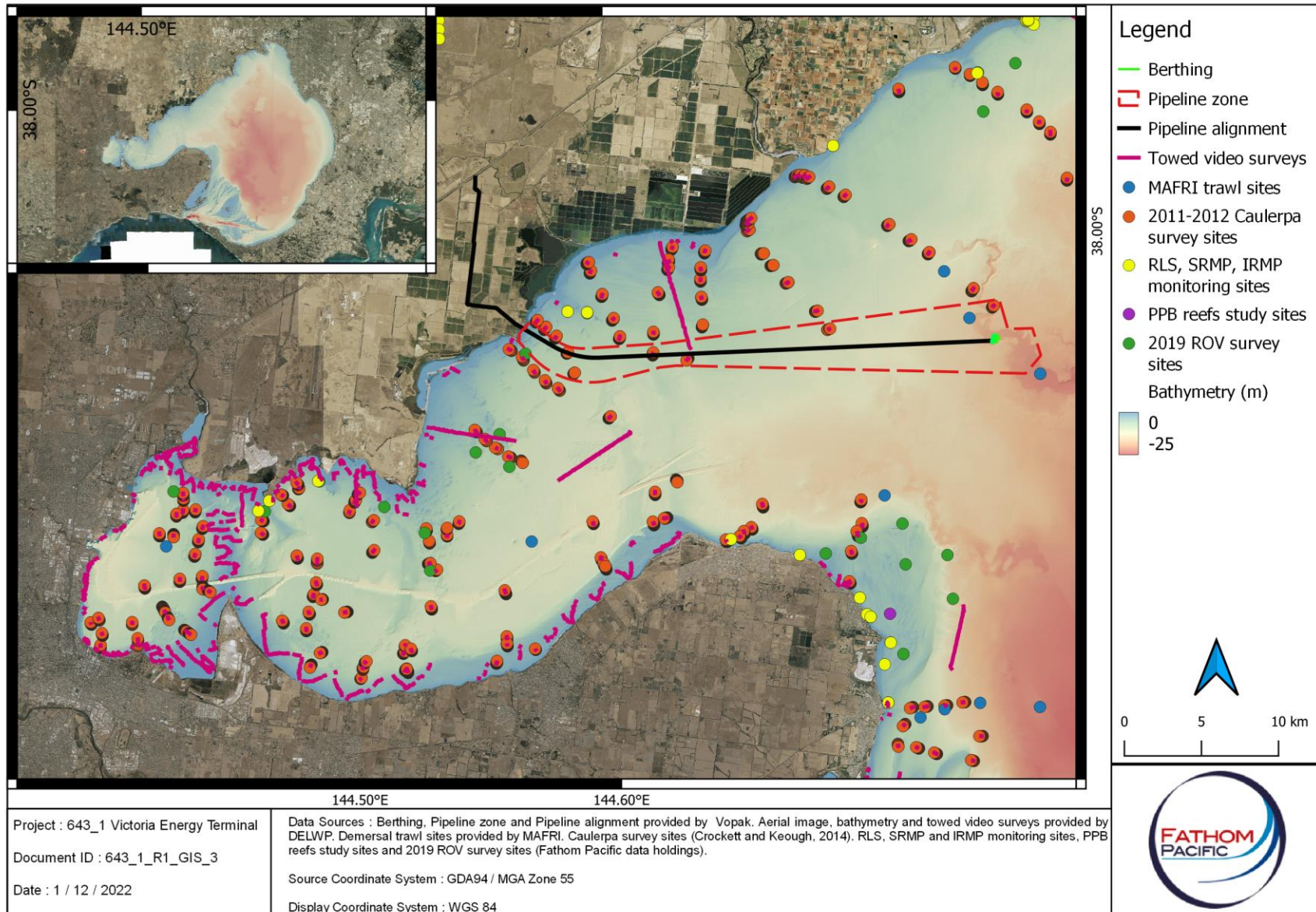
Reports, scientific papers, online data repositories and in-house data holdings were reviewed for this desktop assessment. The review aimed to cover information on:

- Ecophysical conditions in Port Phillip Bay.
- Habitats and species in the Geelong Arm and northwestern sector of the Bay.
- Status of the existing environment in the Geelong Arm and northwestern sector of the Bay.
- Existing impacts in the Geelong Arm and northwestern sector of the Bay.
- Listings of matters of national and state significance.

### **2.2. Data sources**

The locations of available historic data in the Geelong Arm and northwestern sector of Port Phillip Bay used to support this assessment are shown in Figure 1 and described below. Relevant information from the wider Port Phillip Bay region is also used where appropriate. Much of the knowledge of ecosystem processes comes from two CSIRO Port Phillip Bay Environmental Studies in 1968-71 and 1996. Major monitoring programs in Port Phillip Bay Environmental associated with the Parks Victoria Marine Sanctuary monitoring and the Port of Melbourne Channel Deeping Project have ceased.

Imagery from a 2019 remote operated vehicle (ROV) survey of sublittoral reefs and sediments and unmanned aerial vehicle (UAV or drone) survey of littoral habitats by Fathom Pacific Pty Ltd for the Department of Environment, Land, Water and Planning (DELWP) was used for this assessment. While the number of sites shown in Figure 1 might suggest ample existing data, it should be noted that much of the data, particularly that associated with sediments, is now over 10 years old and for most sites, no temporal information is available.



**Figure 1** Locations of available data in the Geelong Arm and northwestern sector of Port Phillip Bay informing a description of the marine environment.

### **2.2.1. Marine Knowledge Framework and CoastKit**

DELWP is in the process of implementing a state Marine Knowledge Framework (MKF). The MKF is accessible via DELWP's CoastKit website, a portal to access data. The MKF serves as an evidence base for DELWP assessments and aims to ensure that research and monitoring efforts are directed towards management priorities, addresses knowledge gaps, reduces uncertainties and informs management interventions.

The MKF contains:

- Biotope Atlas: Georeferenced data points classified to biotope level using the Victorian Combined Biotope Classification Scheme (CBiCS).
- Features Atlas: Identification of habitats or sites of state significance, including breeding sites, abiotic habitat features, feeding areas, recreational fishing areas, etc.
- Biotope Mapping: Polygon maps of biotopes classified according to the Victorian Combined Biotope Classification Scheme (CBiCS).
- Geobibliography: Georeferenced literature library.

### **2.2.2. Victorian biodiversity atlas**

The Victorian Biodiversity Atlas (VBA) is a dataset showing the current and historical distribution of Victorian species and monitoring data. This tool feeds into other decision-support tools used by the Victorian government for public land management, research activities and State of the Environment reporting. VBA data needs to align to national standards, they contain information on the time of the survey, which species were recorded, and the methods used. Incidental sightings are also added to the VBA.

The VBA includes most species recorded in the state, including native, introduced species and species listed as threatened. The *Flora and Fauna Guarantee Act 1988* (the FFG Act) provides taxa, threatened communities of flora and fauna and potentially threatening processes and it currently includes over 730 threatened species, communities and threats. ([www.environment.vic.gov.au/conserving-threatened-species/threatened-list](http://www.environment.vic.gov.au/conserving-threatened-species/threatened-list)).

The FFG Act comprises the Threatened List of taxa and communities of native flora and fauna which are threatened, and the Processes List contains potentially threatening processes. A Scientific Advisory Committee is established to advise the Minister on the listing, assess additions or amendments to the lists and other flora and fauna conservation matters.

### 2.2.3. Protected Matters Search Tool (PMST)

The Protected Matters Search Tool (PMST) managed by the Commonwealth Department of Agriculture, Water and the Environment (DAWE) generates a report including information on the occurrence of Matters of National Environmental Significance (MNES) or other matters protected by the *Environment Protection and Biodiversity and Conservation Act 1999* (EPBC Act) within an area of interest. The information provided by this search tool is limited by the amount of data from surveys in the local area and therefore should be considered indicative and may require further investigation.

The PMST interactive tool provides search data for the nine MNES, these being:

1. Listed threatened species and communities.
2. Listed migratory species.
3. Ramsar wetlands of international importance.
4. Commonwealth marine environment.
5. World Heritage Properties.
6. National Heritage Places.
7. The Great Barrier Reef Marine Park.
8. Nuclear actions.
9. A water resource, in relation to coal seam gas development and large coal mining development.

Additionally, the report generated includes a list of threatened species and ecological communities according to the EPBC Act, describing their status and type of presence within the region of interest.

### **3. Existing conditions**

#### **3.1. Port Phillip Bay ecophysical setting**

Port Phillip Bay is located in the central region of Victoria. The Bay's 264 km of coastline is almost continuously populated and includes Victoria's two largest cities – Melbourne and Geelong. The Bay itself is 1,950 km<sup>2</sup> and its catchment area is 9,790 km<sup>2</sup>. The narrow entrance to Port Phillip Bay, known as "The Rip" is bounded by Point Nepean to the east and Point Lonsdale to the west, collectively referred to as Port Phillip Heads.

The continental shelf Marine Ecoregions of the World (Spalding et al. 2007) place Port Phillip Bay in a large region along with much of the Victorian coast in the Southeast Australia Shelf region. The IMCRA mesoscale bioregions placed Port Phillip Bay in a Victorian Embayments region within the Bassian Province, along with Western Port (IMCRA v4.0, 2006). A recent finer-scale classification of Victorian biounits was established for the Victorian Department of the Environment, Land, Water and Planning (DELWP), using data and expert knowledge of the biological communities along the Victorian coast (Edmunds and Flynn 2018b). This regionalisation established two biounits in the bay: the Port Phillip Bay biunit in the north and the Port Phillip Heads biunit in the south (Figure 2). These biounits are segregated on the basis of differential wave and current energy, and biological community composition. The Victorian biounits are established as the state's marine management and spatial planning domains.



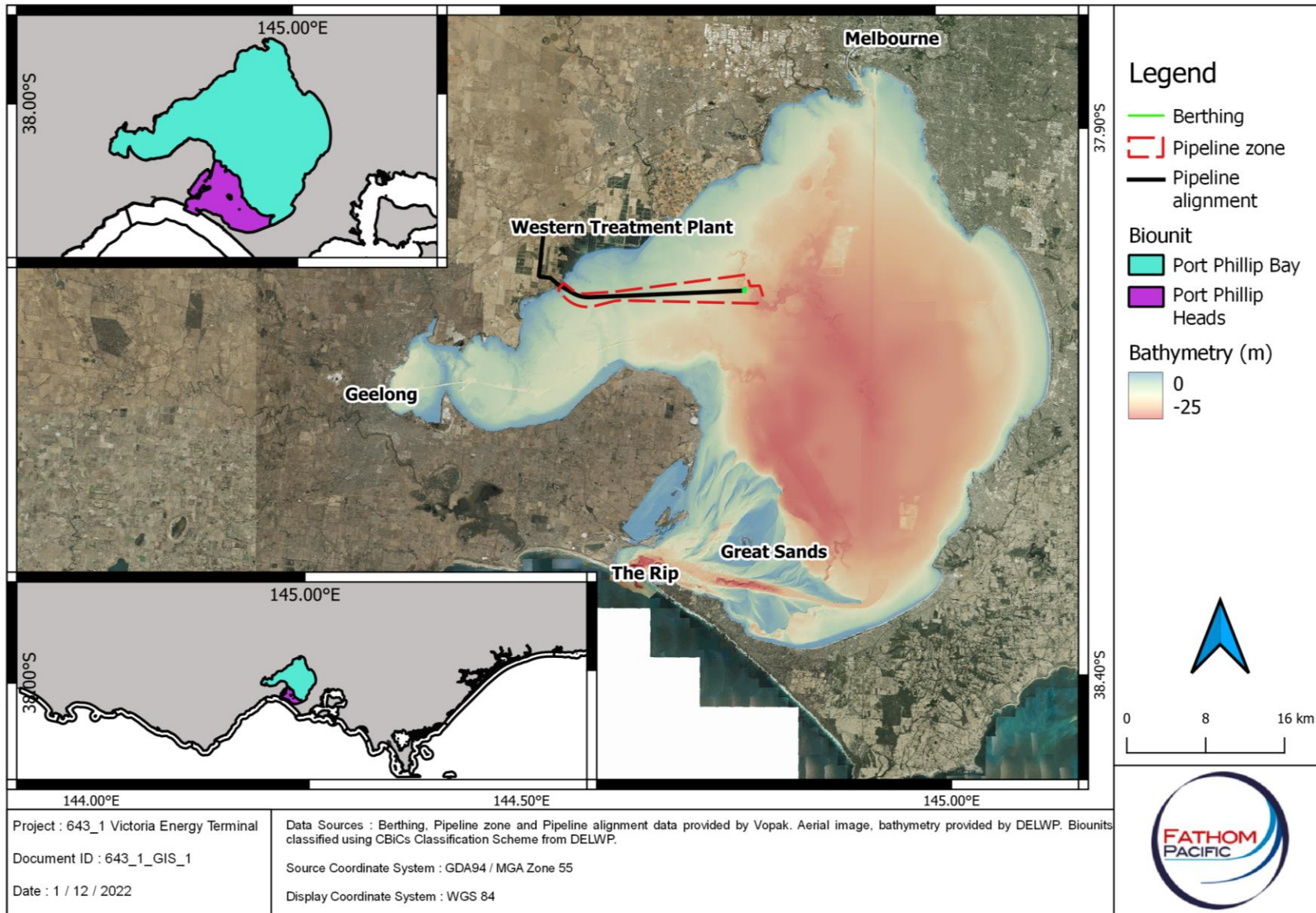


Figure 2 Location and biounits of Port Phillip Bay.

The Port Phillip Heads biounit is an environment of high and moderate winds and currents (Tran, 2020). Here, sublittoral reefs are generally *Ecklonia*-dominated but with generally high seaweed diversity (Plummer et al. 2003, Barton et al. 2012). Unique sponge communities, comprising diverse assemblages of bryozoans and hydroids, occur in the Entrance Canyon and this Flora and Fauna Guarantee Act (FFG) (1988) listed community (Port Phillip Bay Entrance Deep Canyon Marine Community) is reliant on the geomorphology and current regimes of the canyon (VEAC 2019). The characteristic geomorphic features of the Entrance Canyon, the Great Sands flood-tide delta occur in the Port Phillip Heads biounit. Sublittoral sediments in this biounit are characterised by coarse and fine sands and in depositional basins, gravels and cobbles occur. The biological communities of the intertidal zone are also structured by energy regimes, with littoral rock platforms and littoral sediment platforms and beaches present. Swan Bay is a unique feature of the Port Phillip Heads Biounit.

The northern Port Phillip Bay biounit is characterised by low wave and tidal energy. This biounit is characterised by vast sediment beds of gravels to sands and muds around the margins of the bay to muds in the central deep basin and in Corio Bay. Reefs in northern Port Phillip Bay are typically shallow nearshore reefs and in recent years these reefs, particularly on the western side of the bay, have been severely impacted by over-abundant urchin infestations and the introduced algae *Undaria pinnatifida*, which combine to create ‘urchin-*Undaria* barrens’. Urchin barrens represent a phase shift from former productive kelp biotopes (see Section 3.2.4).

## 3.2. Ecosystem components and features

### 3.2.1. Features Atlas

Key features of the Geelong Arm and northwestern area of Port Phillip Bay are shown in Figure 3. A key feature of the area is The Port Phillip Bay (Western Shoreline) and Bellarine Peninsula Ramsar Site, an internationally important wetland. The intertidal and nearshore environment is key to the maintenance of ecological values of this site. Microphytobenthos, biofilms and infauna communities characterising the intertidal and nearshore sediments are critical to providing feeding grounds and nurseries for land, marine and freshwater animals and supporting bird foraging and thus supporting Ramsar values.

A shellfish aquaculture lease occurs within the Berth and Pipeline Area. A number of shipwrecks occur to the southeast of the Berth and Pipeline Area, including the wreck of the SS City of Launceston which has a 500 m radius protected zone around it, within which anchoring, fishing, trawling and diving are prohibited without a permit. ‘Abalone reefs’ mapped in the Berth and Pipeline Area were formerly monitored by the Victorian Marine and Freshwater Resources Institute (MAFRI) as part of the abalone (principally blacklip *Haliotis rubra*) dive harvest fishery monitoring. A shellfish reef restoration site occurs inside the Berth and Pipeline Area (see Figure 3), this is a Victorian Fisheries Authority reef site installed in October 2020<sup>1</sup>.

The Point Cook Marine Sanctuary is located in the northwestern area of Port Phillip Bay, some 10-12 km from the Berth and Pipeline Area. The Berth and Pipeline Area is with approximately 5 km of the Point Wilson Jetty, a military site and exclusion zone. The Berth and Pipeline Area is close to Corio Bay, a heavily industrialised port.

Kent et al. (2012) identified The Western Treatment Plant coast as a ‘marine asset area’, owing to its avifauna, wetlands, saltmarshes and tidal platforms. The Port Phillip Bay sediment basin (>10 m depth) was identified as a marine asset area owing to its role in nutrient regulation, while in the northwestern sector of the Bay, the Altona-Point Cook shore was also identified on the basis of avifauna values.

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<sup>1</sup> For an overview of the shellfish reefs installed by The Nature Conservancy in Port Phillip Bay see: <https://www.mornpen.vic.gov.au/Building-Planning/Coastal-Planning/DELWP-and-Key-Agency-Coastal-Projects/Port-Phillip-Bay-Shellfish-Reef-Restoration-Project>



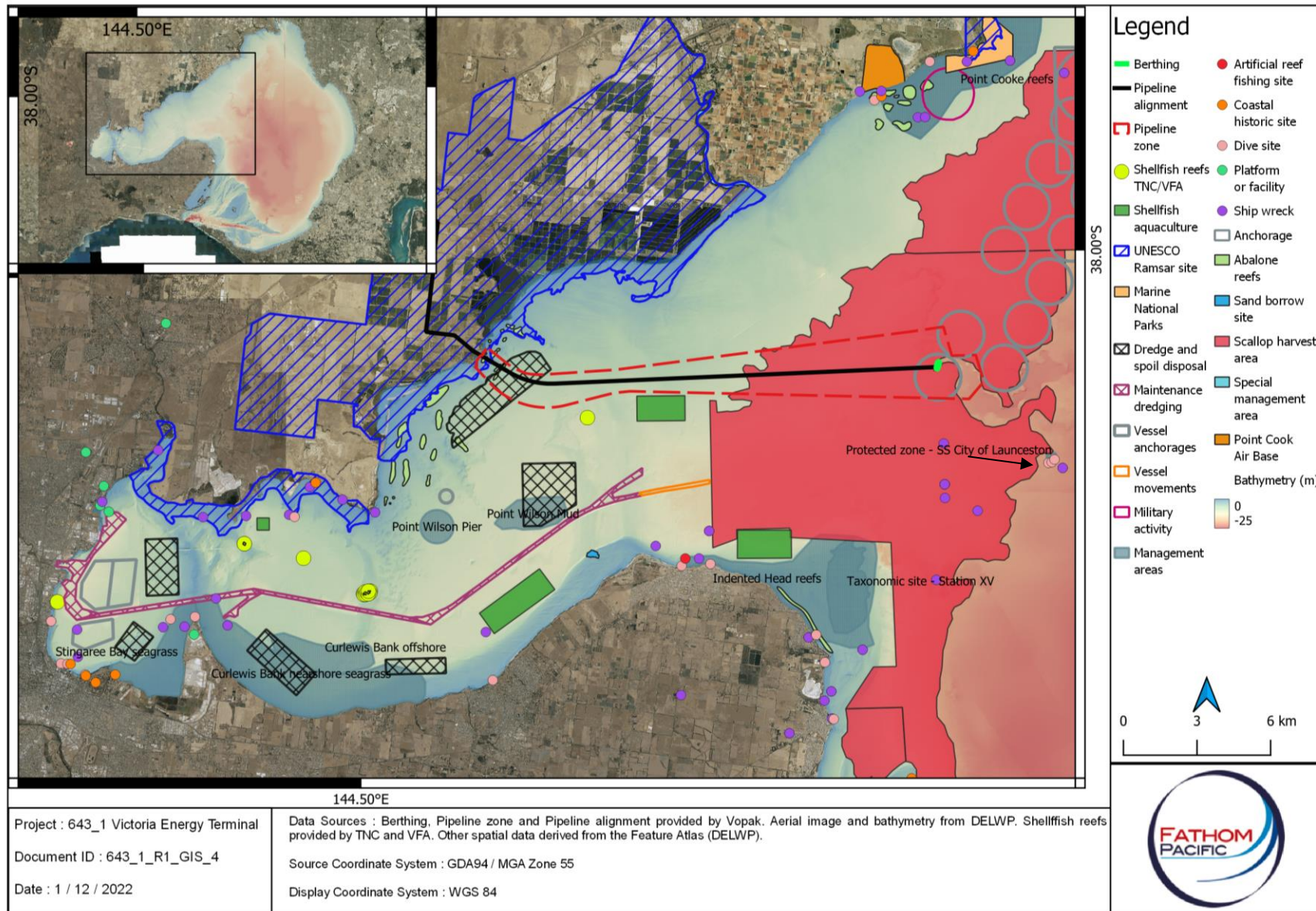


Figure 3 Features in the Geelong Arm and northwestern sector of the Bay.

### 3.2.2. Biotopes

DELWP has adopted a biotope classification scheme to classify ecological communities and map marine habitats of Port Phillip Bay. Biotopes are the core management unit in the Port Phillip Bay Environmental Management Plan (DELWP, 2017) and in marine spatial planning and values assessment across Victoria. Biotopes link through a state-wide Marine Knowledge Framework and thus are connected to understandings of biodiversity, ecological function and threatening processes. Biotope classification for Port Phillip Bay is based on the interaction between biotic and abiotic components of the seabed and is supported by ground-truthing imagery available from the Combined Biotope Classification Scheme (CBiCS) Atlas (Edmunds and Flynn 2018a). The classification scheme is hierarchical and allows for classifications to be made on the basis of geoform and substrate in the absence of specific biological data. Biotopes in the Geelong Arm are shown in Figure 4 and biotopes of the offshore and nearshore segments are shown in Figure 5 and Figure 6 respectively. In the G4 anchorage area, biotopes have been classified to level 4 (biotope complex level) of the 6-level classification scheme. The G4 anchorage area is located at the boundary of two biotope complexes:

- Port Phillip Bay northern deep lower muds; and
- Mornington-Werribee intermediate upper muddy sands.

The former is characterised by silty muds and the community is based on infauna and microphytobenthos observations. The latter is characterised by muddy sands and the community is based on infauna and epifauna observations. A relic river channel, the former Werribee River channel, runs through the G4 anchorage area:

- Port Phillip Bay northern deep lower muds relic channel.

The relic Werribee River channel feature is observable as a sinuous depression in the seafloor (see Figure 2) that was inundated by seawater intrusion into Port Phillip Bay (Holdgate et al. 2011). In the vicinity of the proposed berthing location, the channel is some 3 m deeper than the surrounding seafloor and some 300 m wide. The feature is of relevance to the project as it may influence the behaviour of cold, saline water discharges in the bottom waters. Sediment beds of various classes are encountered within the Berth and Pipeline Area. A key feature of this area is the presence of large drift algal beds. Unattached to the seabed, drift algae beds are likely to be somewhat dynamic. In areas deeper than 10 m in the Geelong Arm, the dominant drift algae in these is *Botryocladia sonderi*, that forms perennial beds and oxygen consumption in these beds may boost sediment denitrification efficiency (Valero Rodríguez 2019). In shallower areas, mixed species assemblages occur and the composition and biomass of these beds fluctuates in response to nutrient inputs. Sublittoral seagrass beds (*Zostera nigricaulis*)<sup>2</sup> are mapped in the nearshore environment. Seagrass beds are mapped in the immediate vicinity north and south of the proposed shoreline crossing. Sublittoral reef is mapped in the nearshore environment.

<sup>2</sup> In this report, we ascribe sublittoral seagrass excepting *Halophila australis*, as *Zostera nigricaulis* following Jacobs and Les (2009) and the World Register of Marine Species to provide consistency with the historic Port Phillip Bay nomenclature for sublittoral seagrass mapping. Kuo (2005) assigned the species as *Heterozostera nigricaulis* and this classification may be used by some workers. The two species names can be considered interchangeable for the purposes of this desktop review and the functional significance of the seagrass beds is the same regardless of the species attribution.



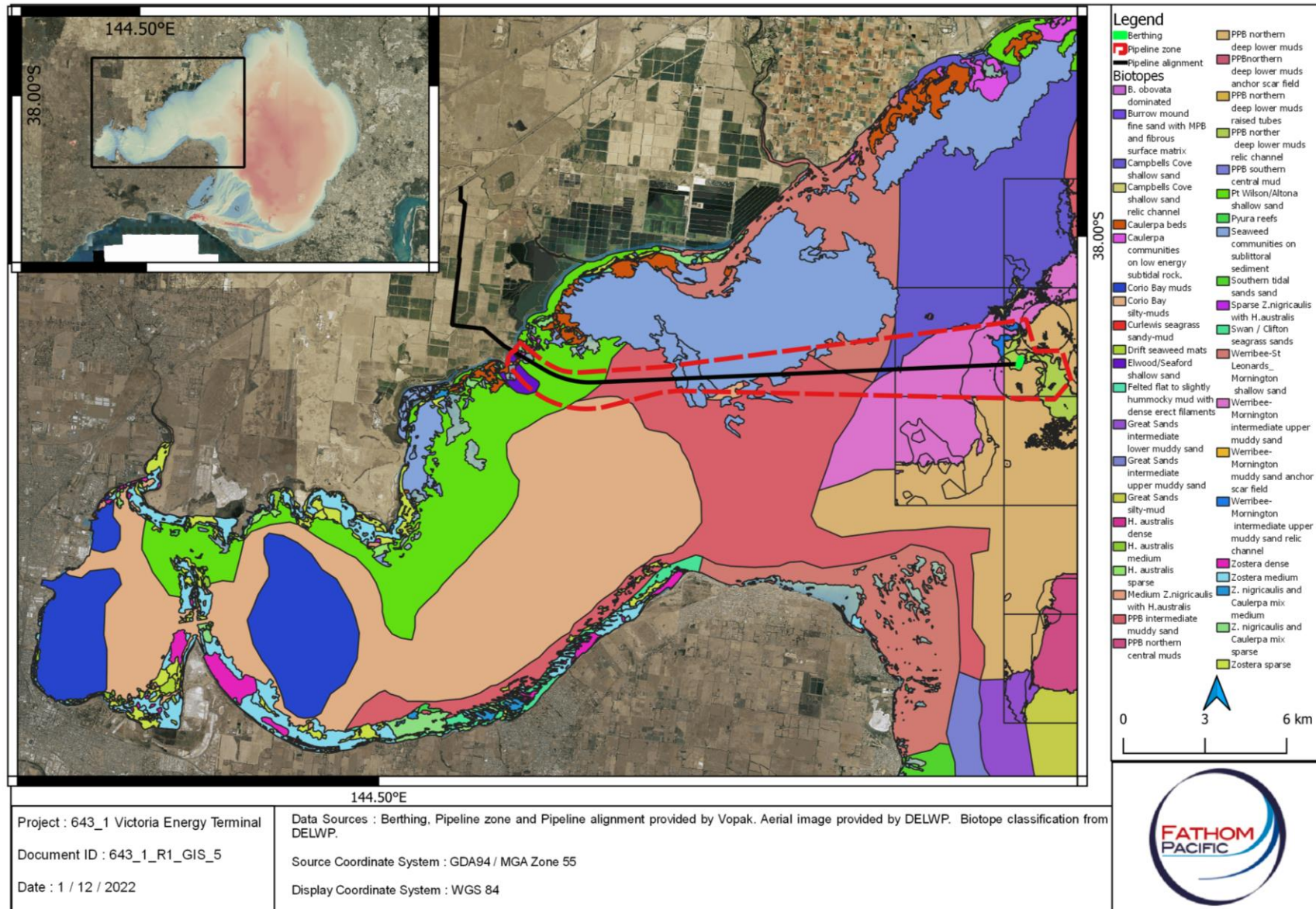


Figure 4 Biotopes of the Geelong Arm.

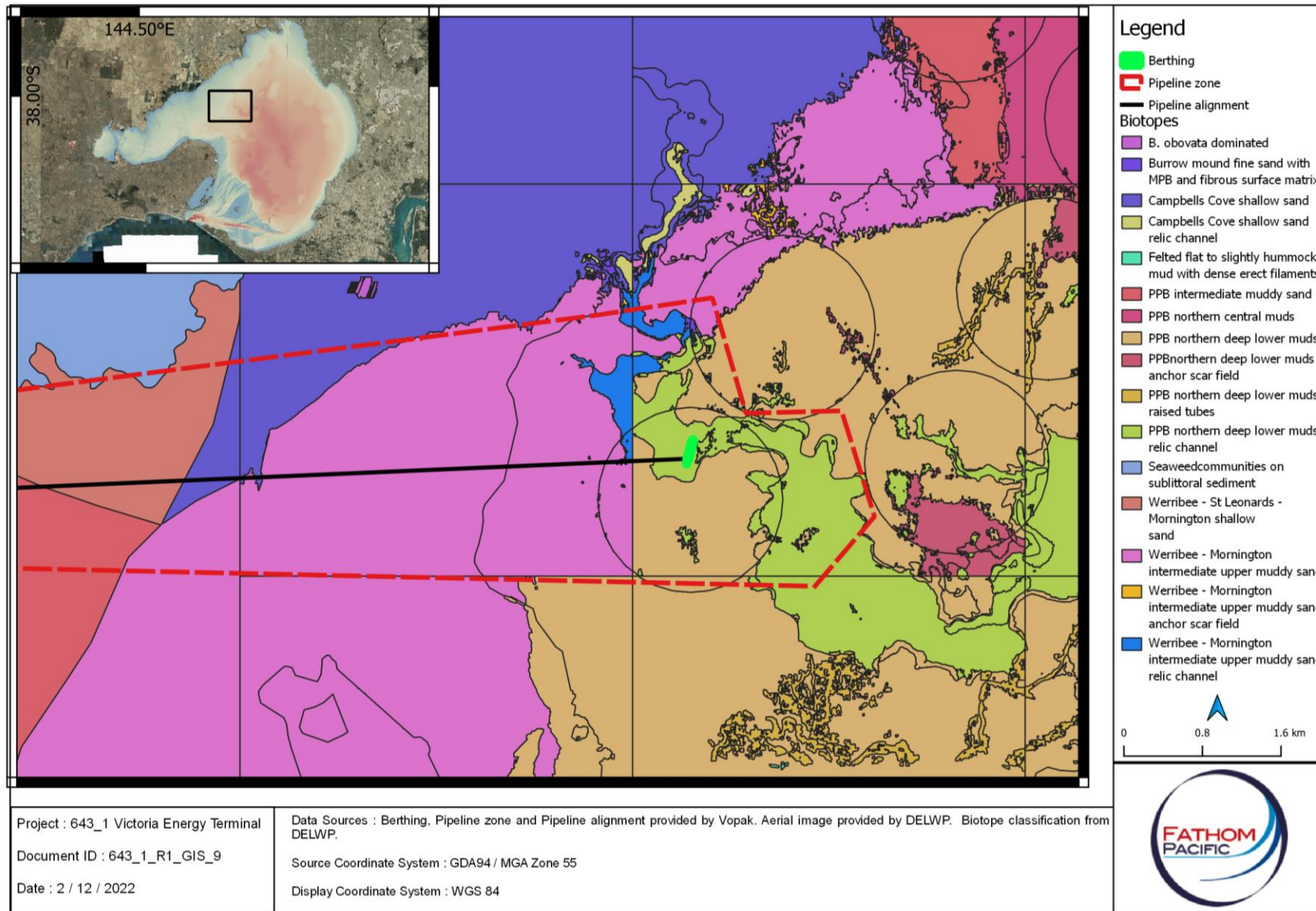


Figure 5 Biotopes of the Berthing and Pipeline Area. Segmented features in the offshore area include relic river channels and other features that are putative biotopes.



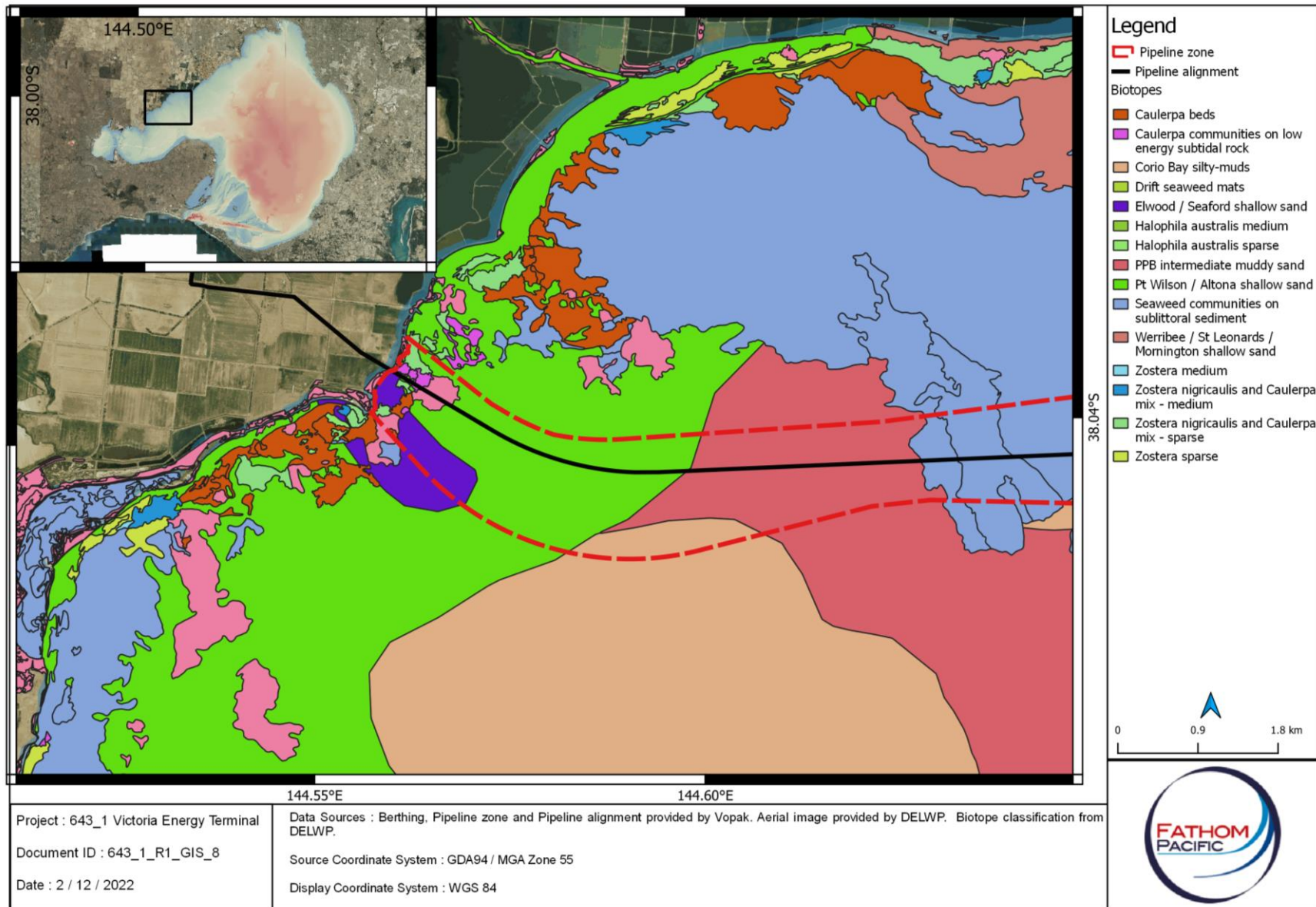


Figure 6 Biotopes of the inshore pipeline area



### 3.2.3. Sublittoral sediments

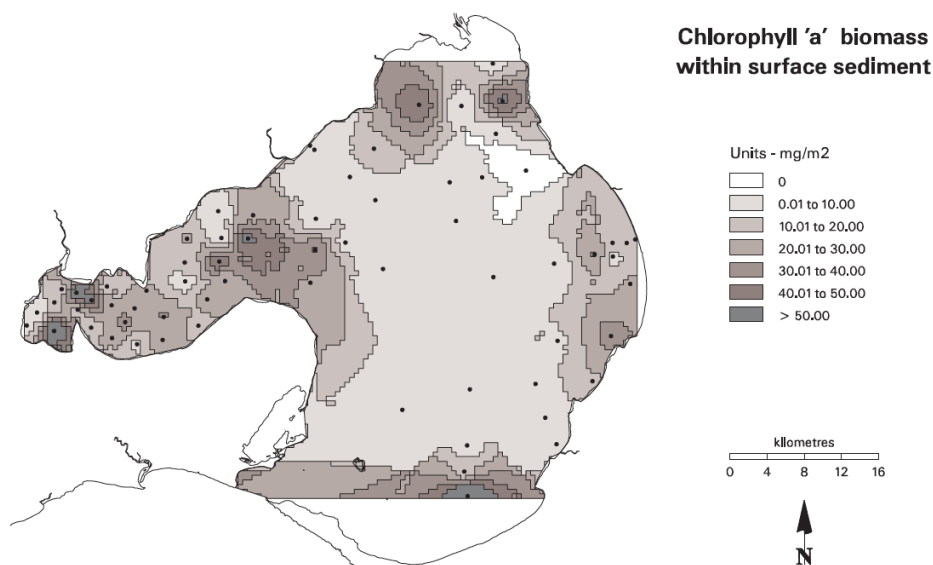
Sediment beds are the dominant benthic habitat in Port Phillip Bay and range from coarse marginal sands to fine central basin muds. Sediment types were mapped by Beasley (1966) and subsequent infauna and epifauna classifications of sediment by Poore et al (1975), Poore and Rainer (1979) derived a sediment classification (Poore 1992). Cohen et al (2000) completed further sampling that modified the sediment classification and the understanding of sediment types developed in the 1990s–2000 era stands today.

Microphytobenthos (MPB) is recognised as a key ecosystem component of Port Phillip Bay sediments in general and is a feature of sublittoral sediment habitats in the Berth and Pipeline area (Figure 7). MPB contributes significantly to primary production, denitrification processes and is directly consumed by infauna and other species (Axelrad et al. 1981, Beardall and Light 1994, 1997). According to the model presented in Beardall al Light, the Geelong Arm and northwestern area of the Bay are areas of relatively high potential MPB production (Figure 8).



Source: Crockett (2012)

Figure 7 MPB felts and stains (brown material) on shallow rippled sediment in western Port Phillip Bay.



Source: Beardall and Light (1997)

Figure 8 Interpolated distribution of chlorophyll a biomass in surficial sediments (0-10 mm)

Some areas of sublittoral sediment in western Port Phillip Bay Sandy are characterised by abundant burrow mounds (Figure 9). Burrow-forming infauna includes polychaetes and crustaceans such as callianassid ghost shrimps and the process of sediment reworking and burrow ventilation (bioirrigation) may play a role in sediment nutrient processing (Berelson et al 1998, 1999, Na et al. 2008).



**Source:** Crockett 2012 (top) and Fathom Pacific/DELWP (bottom)

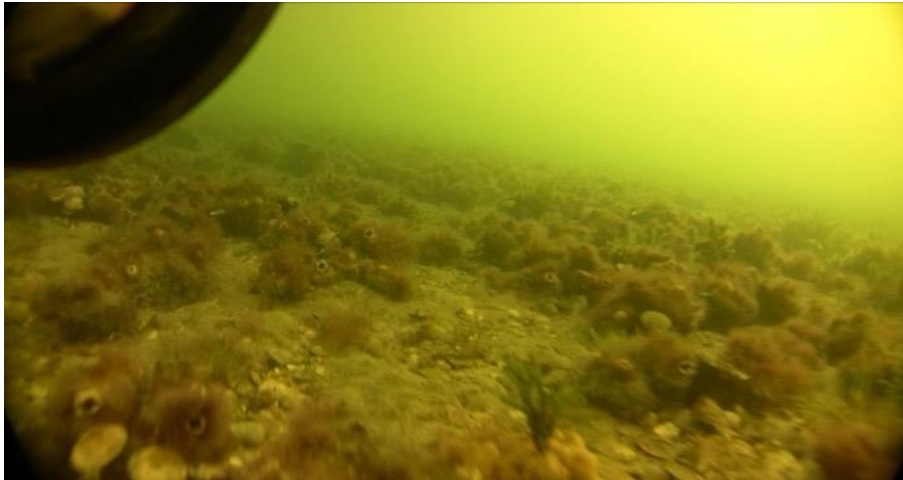
**Figure 9** Burrows and burrow-mound features of sediments in western Port Phillip Bay offshore of Kirk Point (top) and Point Cook (bottom)

There have been significant changes in the bay sediment infauna and epifauna communities from the 1960s to 1990s (Wilson et al. 1998, Currie and Parry 1996). There has been no consistent monitoring of sediment communities since this era, so the description and status of the existing condition of sediment beds requires piecing together multiple lines of evidence. Marine pest introduction, most notably the bivalves *Theora lubrica* and *Corbula bigga*, the polychaete *Euchone limnicola*, the seastar *Asterias amurensis*, and the fanworm *Sabella spallanzanii* are cited as major drivers of change in sediment bed communities up to the 1990s (Wilson et al. 1998, Currie and Parry 1996).

Sediment beds support populations of scallop *Pecten fumatus* that are found across sublittoral sediments of Port Phillip Bay. Scallops were harvested in a commercial dredge fishery from

the late 1950s to 1997 (see Figure 3). A single licence exists today for diver hand-harvesting of scallops in Port Phillip Bay.

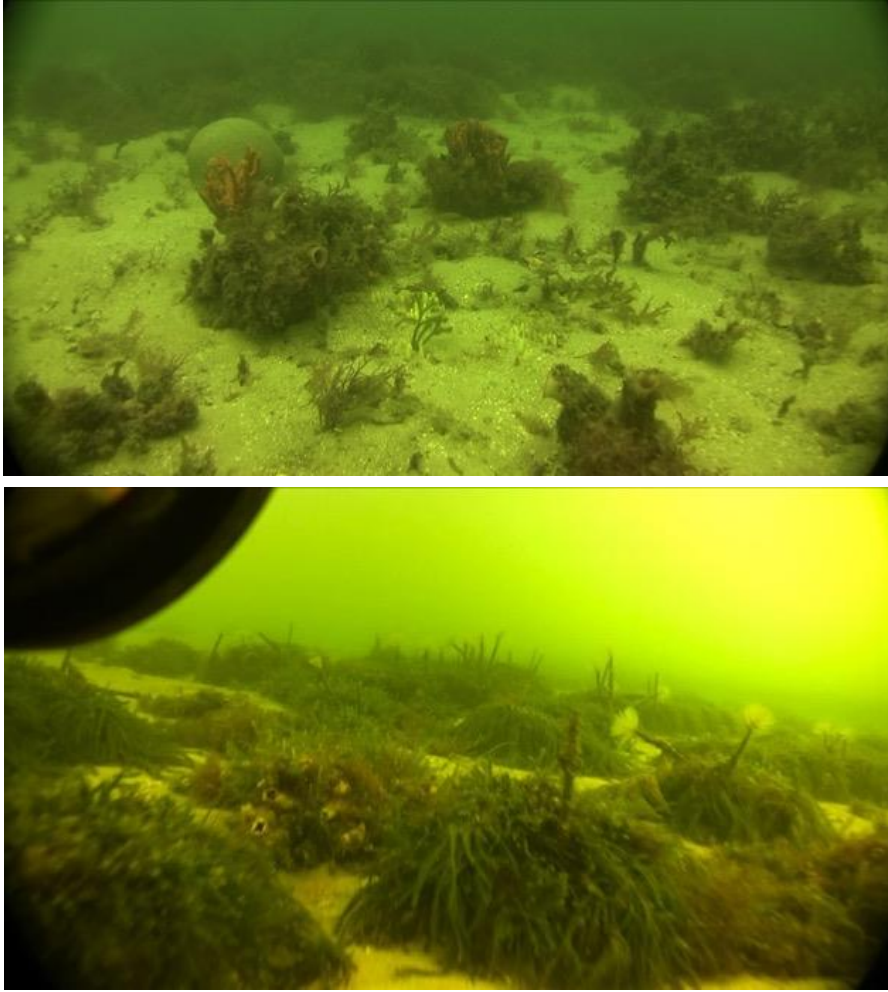
Shallow inshore sediments have in the past supported biogenic bed forming mats of the ascidian *Pyura stolonifera* (Parry et al. 1995, Cohen et al. 2000) (Figure 10), although Cohen et al. (2000) noted their decline and the status of these communities today is unknown.



**Figure 10** Biogenic bed-forming *Pyura stolonifera* on shallow sediments in northern Port Phillip Bay, 2010.

Today, the colonial ascidian *Pyura dalbyi* is among the most significant epifaunal biogenic habitat-forming species associated with sediments in the Geelong Arm and Port Phillip Bay sediments in general. *P. dalbyi* can be sparse to locally abundant, but have not been recorded forming a contiguous beds. *Caulerpa* spp. green algae, red algae, sponges, hydroids, gastropods and bivalve molluscs can be epizootic on *P. dalbyi* clumps (Crockett 2012, Edmunds and Flynn 2018a, Edmunds and Flynn 2018b). Crockett (2012) recorded abundant *P. dalbyi* clumps in the Victoria Energy Terminal Project Berth and Pipeline Area and identified that these were an important substrate for the green algae *Caulerpa remotifolia* in particular.

*Caulerpa* spp. seaweed beds are an important existing habitat of northwestern Port Phillip Bay region where there is unusually high diversity and abundance (Womersley 1966, Brown et al. 1980, Light and Woelkerling 1992, Chidgey and Edmunds 1999). The ecological role of this macroalgae is particularly significant for the Geelong Arm and western Port Phillip Bay because *Caulerpa* spp. potentially contribute to sediment denitrification due to its ability to assimilate nitrogen, ammonium and other nutrients from sediments (Williams 1984, Chisholm et al. 1996). Indeed, globally some exotic *Caulerpa* spp. infestations are associated with wastewater and stormwater discharges.



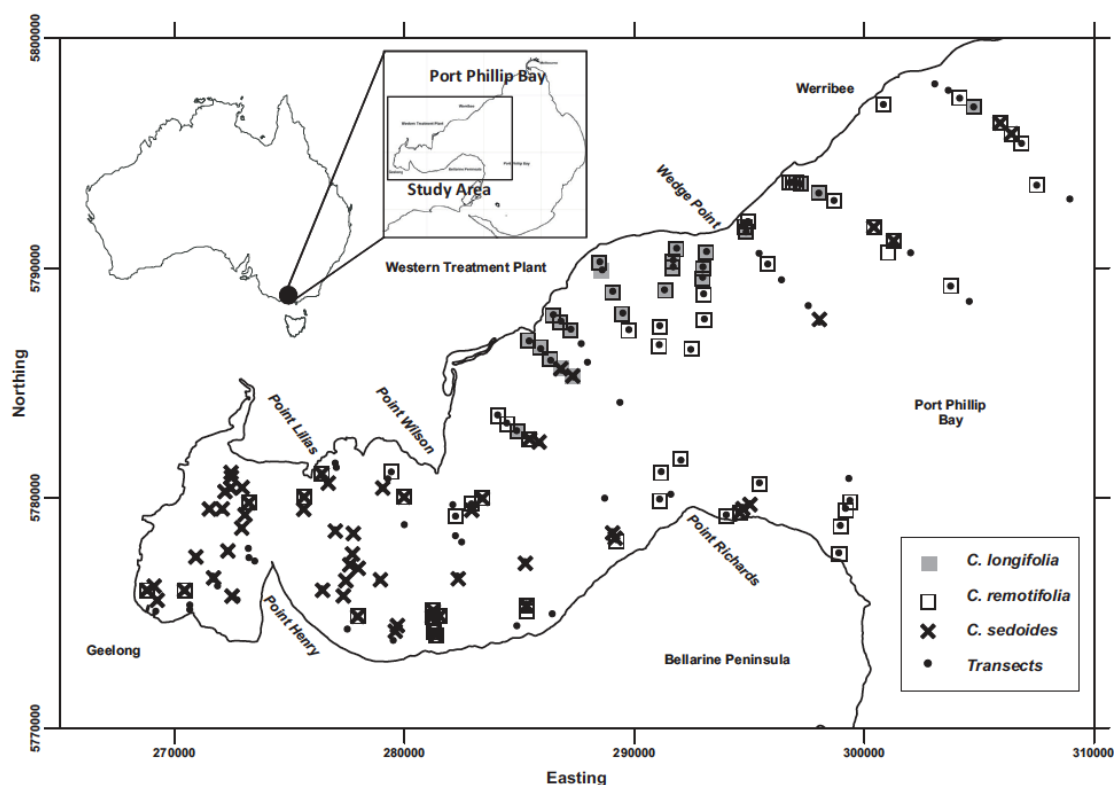
**Figure 11** Non-reef epibenthos biotopes associated with *Pyura dalbyi* and sponges in southern Port Phillip Bay (top) and *Pyura dalbyi* and *Caulerpa* spp. green algae in northern Port Phillip Bay (bottom), 2010.



**Figure 12** Example of *Caulerpa* spp. bed in western Port Phillip Bay, 2010.



Crockett and Keough (2014) listed *Caulerpa remotifolia* as the most common species in northern Port Phillip Bay, and that this species, *C. longifolia* and *C. sedoides* were the most common and abundant species, in agreement with Womersley's (1966) observations (Figure 13). Crockett and Keough (2014) identified significant stands of *C. sedoides* in Geelong Arm and beds of this species in the Berth and Pipeline Area generally occurred in deeper areas. There have not been any comprehensive surveys of *Caulerpa* distribution since 2012. While the significance of this loss of habitat-forming algae has not been thoroughly assessed, it is expected to be indicative of ecosystem change, brought about in part by historic oyster and scallop dredging.



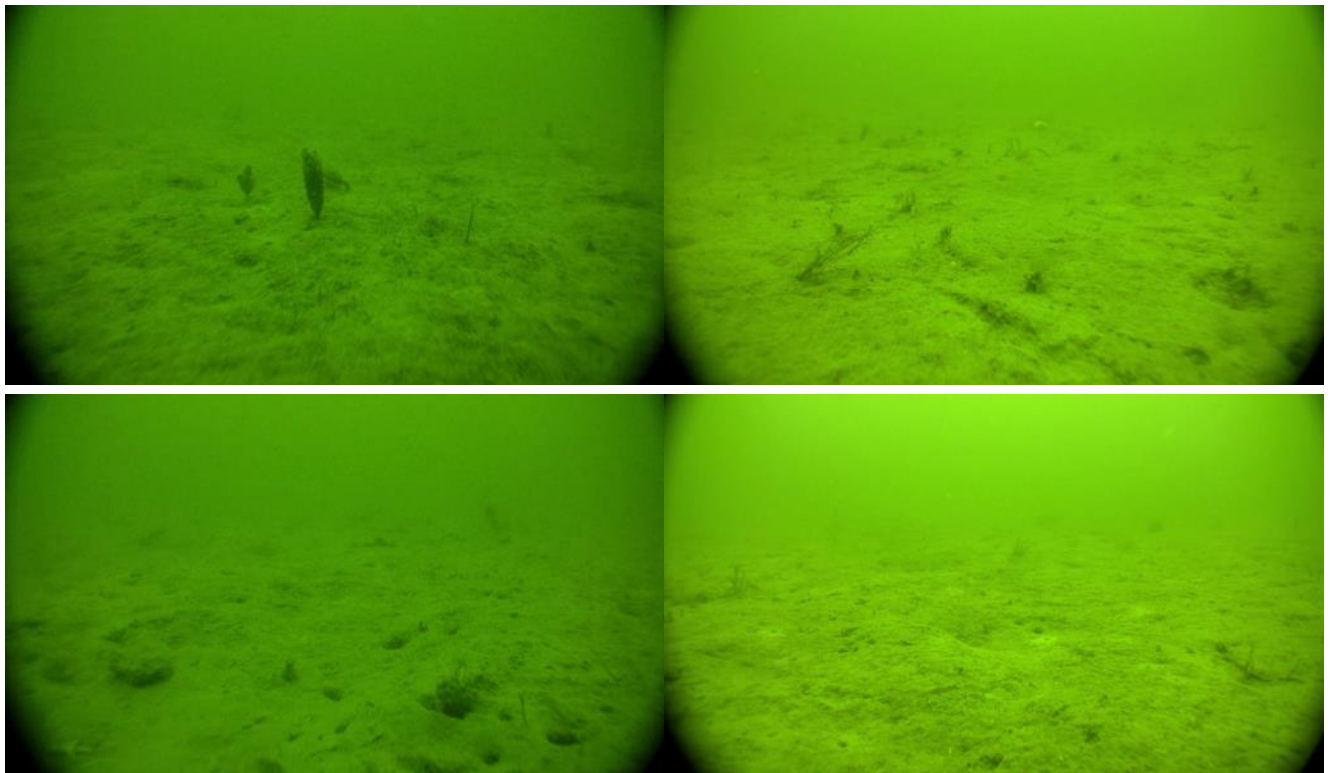
Source: Crockett and Keough (2014)

**Figure 13** Distribution of the three most common *Caulerpa* species in western Port Phillip Bay.

Historic DELWP towed video transects surveyed two locations (T93 and T94) approximately 2–4 km from the proposed FSRU location in 2009–2010. Water depth at these historic survey sites were within 3 m of the proposed FSRU site. At site T93 and T94, the seafloor was characterised by felted texture, likely composed of fine sediment particles, microphytobenthos and particulate organic matter, erect short tubular stalks (presumed to be polychaete worm tubes) and solitary ascidians (Figure 14). Funnel burrows and burrow mounds were present.

The general structure of the seabed sediments in the Geelong Arm and northwestern sector of Port Phillip Bay is expected to be similar today as it was in 2009/2010. However, there is evidence of significant ecological change in the nearshore environment since 2009/2010 and while these deeper areas may be considered spatially removed from point sources of anthropogenic inputs and buffered from some of the nearshore issues. Therefore, it cannot be assumed that ecological conditions are the same with respect to biological communities and processes. The last comprehensive epifauna and infauna assessments in this area were completed in the 1990s and major changes were recorded in these surveys from the previous set of data in the 1960s, suggesting that there is likely to be a new ‘baseline’ required for project impact assessment purposes.

**Figure 14** Images of the seafloor at historic sites T93 and T94 in the general vicinity of the proposed FSRU



location (2009-2010)

Sediment beds support sublittoral seagrass beds that are ecologically significant in the Geelong Arm and in general in Port Phillip Bay. The FFG listed sublittoral species *Zostera nigricaulis* provides nursery habitat for a range of juvenile fish species and listed pipefish, *Vanacampus philipi*. *Halophila australis* is also common in deeper areas of the Geelong Arm where forms sparse, low beds.

### 3.2.4. Sublittoral rock

Sublittoral rock habitats in Geelong Arm and northwestern sector of Port Phillip Bay are severely affected by *Undaria*-urchin barrens and drift algae (Ling et al. 2019). Long Reef, a named and mapped reef located within the Geelong Arm and a well-known recreational fishing and diving location, has been the subject of several surveys (see Figure 15). Canopy, sub-canopy and lower-strata algae species are in very low abundance which is expected to be having consequences to ecosystem functioning of these reefs (Reeves et al. 2018). Reefs in the Kirk Point area are notable as being the sites of first identification of infestation of *Undaria pinnatifida*.

Figure 15 illustrates the sublittoral rock biotopes as surveyed in winter of 2019 (Flynn and Edmunds 2020). Notable in 2019 was the prevalence of filamentous green algae at all of the sites surveyed in Figure 15, which is indicative of eutrophication, the absence of native kelp, and the prevalence of *Undaria pinnatifida*. The marine pests Northern Pacific seastar, *Asterias amurensis*, and European fan worm, *Sabella spallanzanii*, are generally abundant. Encrusting and mounded sponges, the coral *Plesiastrea versispora*, compound ascidians, solitary ascidians, mussels, *Mytilus edulus*, and the native seastar *Coscinasterias muricata* were observed. Fish diversity and abundance at these reefs was observed very low in the 2019 ROV surveys, although it should be acknowledged that this method was not targeting fish populations.

The Parks Victoria Subtidal Reef Monitoring Program (SRMP) surveyed sites in the north of the Geelong Arm and northwestern sector of Port Phillip Bay, within the Point Cook Marine Sanctuary and offshore of the RAAF base as a reference area.

Using a similar underwater visual census (UVC) method to the SRMP, the nearshore reef at Kirk Point was described as a “low diversity habitat” (grouped along with Jawbone and Point Wilson sites) (Jung 2010). Fish populations at the Kirk Point reef site were seasonally dominated by the hulafish (*Trachinops caudmaculatus*), a ubiquitous species, and most other reef-associated species had fewer than 10 individuals recorded in each sampling round: *Brachaluteres jacksonianus* (5), *Diodon nichthemerus* (2), *Neodax balteatus* (16), *Notolabrus tetricus* (1), *Parma victoriae* (2), *Siphemia cephalotes* (14), *Upeneichthys vlamingii* (1), *Vincentia conspersa* (2) (Jung 2010). Low fish abundance and diversity at Kirk Point was attributed to the low habitat structural diversity and quality (Jung and Swearer 2011).

The Reef Life Survey (Edgar and Stuart-Smith 2014) uses a different UVC method and in the Geelong Arm, Long Reef is monitored by this program with additional sites to the south and south (Figure 16). Data available for surveys in 2010, 2013 and 2018 show that total abundance and species richness for fish at Long Reef and Long Reef Outer are in a similar range to that recorded at other sites in Geelong Arm (Figure 17, Table 1, Table 2). The large school of pelagic schooling fish (*Atherinid* sp.) elevated fish abundance at Long Reef in 2018 (Figure 17). Invertebrate species richness at Long Reef was higher than several other sites in the region. Large numbers of *Meridiastra calcar* and *Heliocidaris erythrogramma*, were recorded at Long Reef and Long Reef Outer and the high numbers of *H. erythrogramma* are consistent with the observation of urchin-*Undaria* barrens in the area.



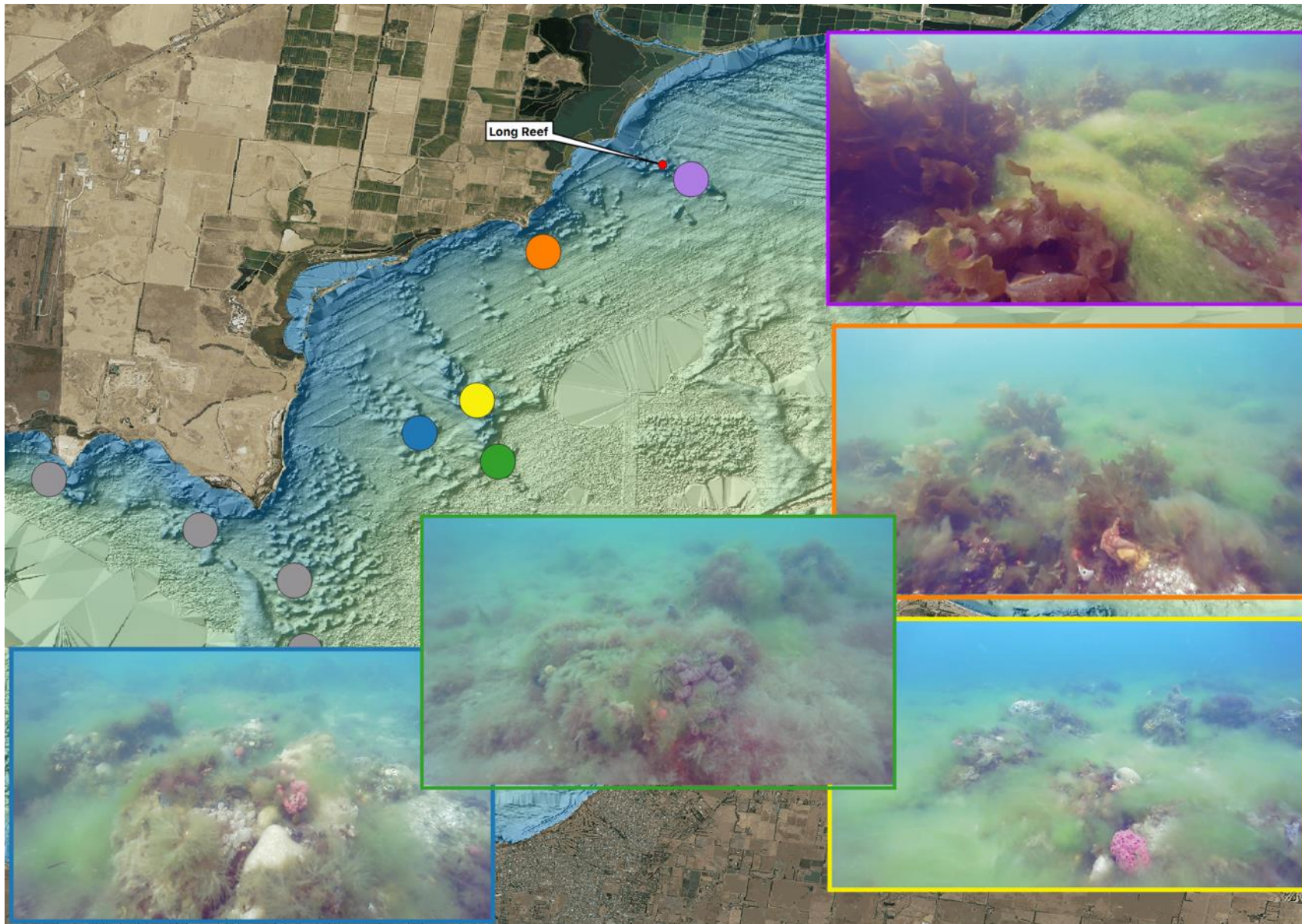


Figure 15 Reef biotopes in the proximity of the Berth and Pipeline Area as surveyed in 2019.



Evidence suggests that there have been significant ecosystem condition changes to the reefs in the Beacon Point to Point Wilson region over time and data indicate that between 2009 and 2019 there has been further change and eutrophication. The synergistic effects of *Undaria* infestation, urchin over-abundance and nutrient enhancement in this region may limit the ability for native canopy-forming *Ecklonia radiata* to recover on these reefs (Valentine and Johnson 2005a, b, Carnell and Keough 2019).

The ecology of reefs in northern Port Phillip Bay is closely linked to sediments and other surrounding habitats. Several authors have identified the connectivity between reef and neighbouring sediment beds with respect to larval supply, population connectivity and supply of sediment and food resources (Jung and Swearer 2010 and citations therein). The influence of sediments in particular and the loss of functions such as sediment “sweeping” by canopy and sub-canopy forming native algae, and trapping of sediments in biological matrix on rock surfaces in particular are key to reef status and functioning. Many of the mobile invertebrates and demersal fish species range between reef and sediment habitats and these habitats should be considered as parts of a habitat mosaic.

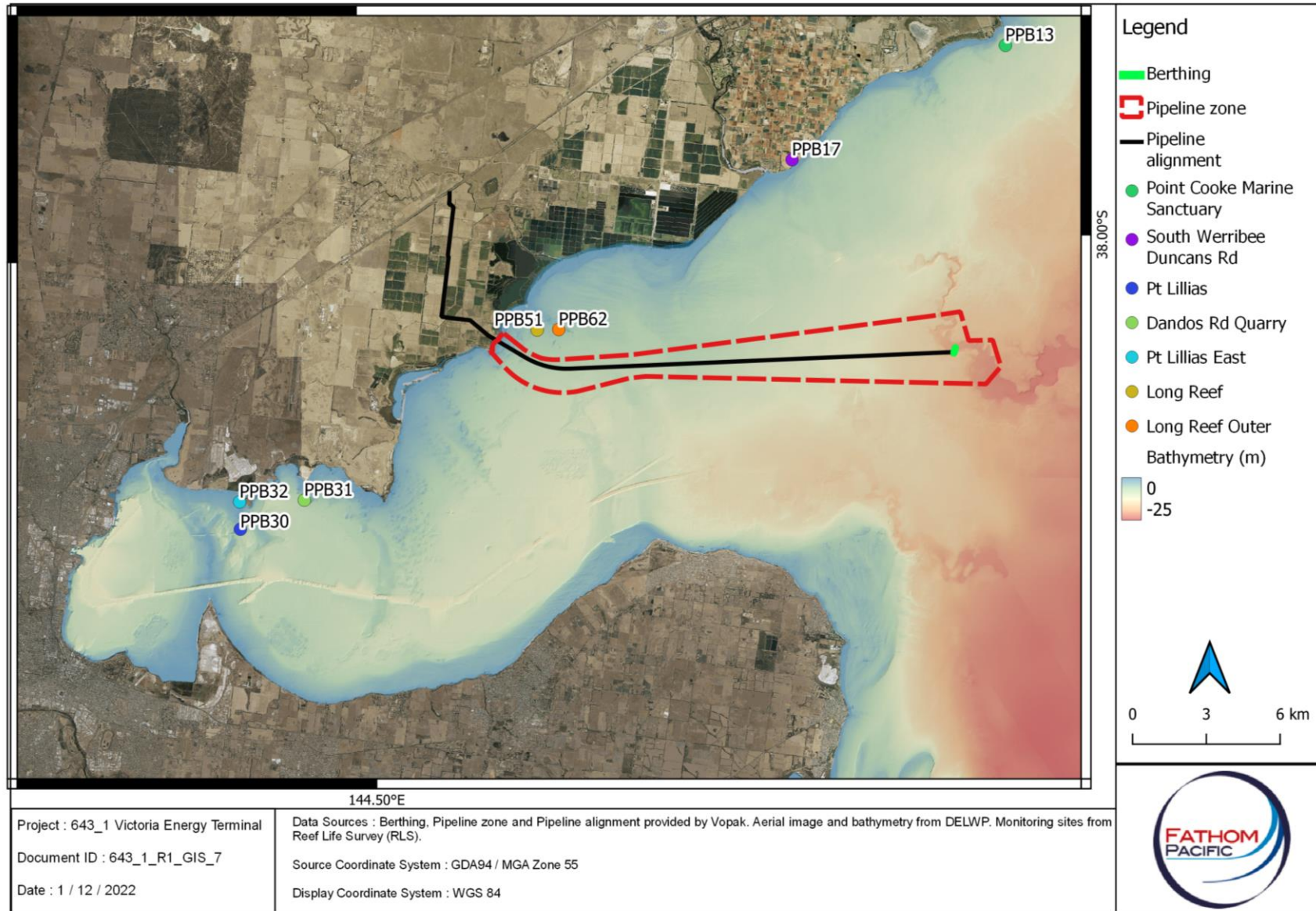


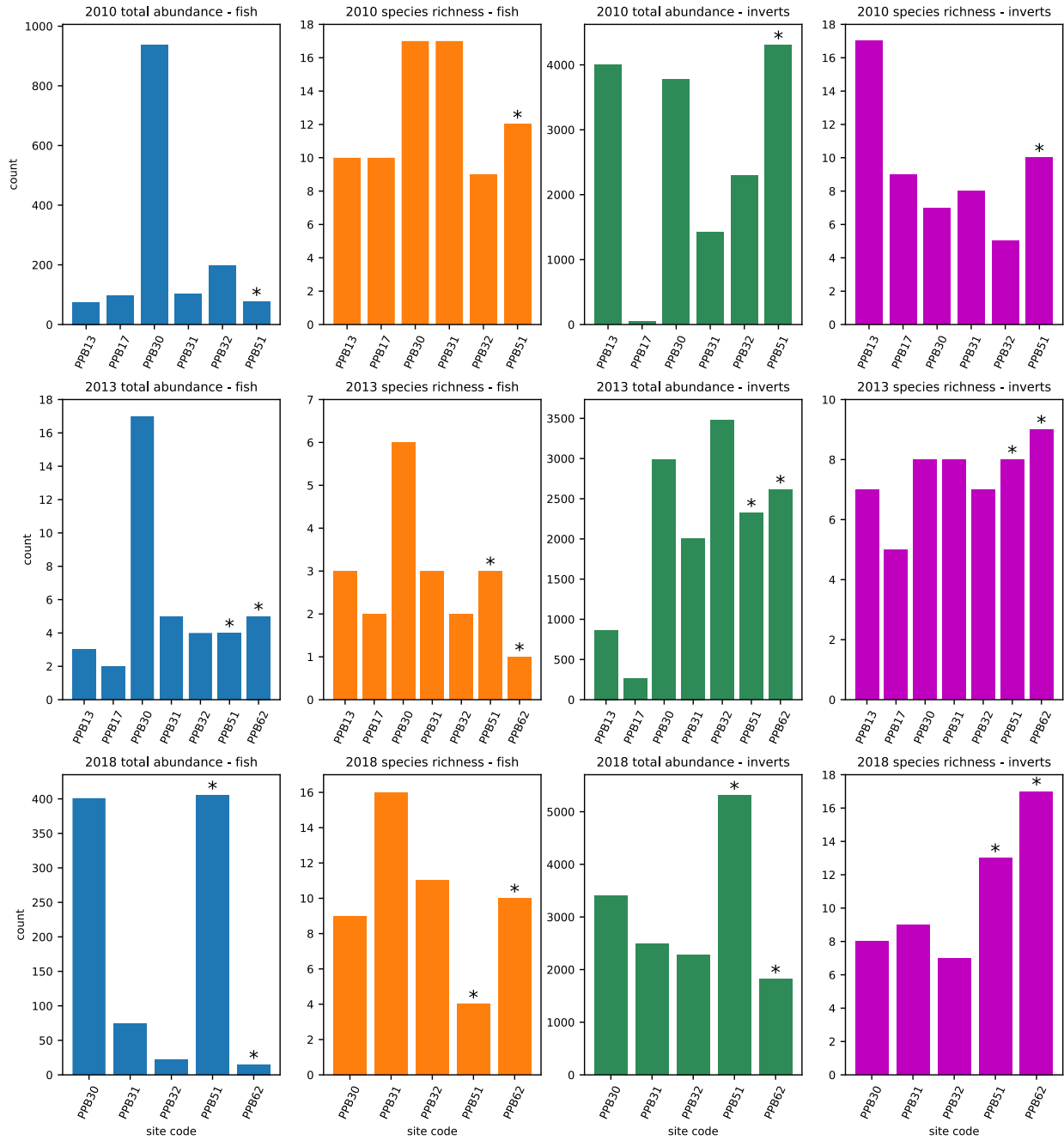
Figure 16 Reef Life Survey sites in the vicinity of the Berth and Pipeline area

**Table 1** Fish and invertebrate species abundance recorded from the Long Reef Reef Life Survey monitoring site

Site	Year	Cryptic fish	Fish	Invertebrates
Long Reef	2010	<i>Parablennius tasmanianus</i> (9)	<i>Neodax balteatus</i> (24)	<i>Meridiastra calcar</i> (3062)
		<i>Heteroclinus perspicillatus</i> (7)	<i>Siphamia cephalotes</i> (21)	<i>Heliocidaris erythrogramma</i> (898)
		<i>Heteroclinus tristis</i> (1)	<i>Diodon nichthemerus</i> (4)	<i>Haliotis rubra</i> (284)
			<i>Parablennius tasmanianus</i> (3)	<i>Haliotis laevigata</i> (22)
			<i>Meuschenia freycineti</i> (2)	<i>Coscinasterias muricata</i> (11)
			<i>Urolophus gigas</i> (2)	<i>Uniophora granifera</i> (9)
			<i>Brachaluteres jacksonianus</i> (2)	<i>Tosia australis</i> (6)
			<i>Notolabrus tetricus</i> (1)	<i>Dicathais orbita</i> (5)
			<i>Urolophus paucimaculatus</i> (1)	<i>Meridiastra gunnii</i> (3)
Long Reef	2013	<i>Heteroclinus perspicillatus</i> (2)	<i>Tetractenos glaber</i> (1)	<i>Decapoda spp.</i> (1)
		<i>Nesogobius pulchellus</i> (1)		<i>Meridiastra calcar</i> (1120)
				<i>Heliocidaris erythrogramma</i> (1108)
				<i>Haliotis rubra</i> (54)
				<i>Coscinasterias muricata</i> (32)
				<i>Uniophora granifera</i> (4)
				<i>Tosia australis</i> (4)
				<i>Meridiastra gunnii</i> (2)
				<i>Haliotis laevigata</i> (1)
Long Reef	2018	<i>Heteroclinus spp.</i> (2)	<i>Atherinid spp.</i> (400)	<i>Heliocidaris erythrogramma</i> (4879)
		<i>Parablennius tasmanianus</i> (2)	<i>Diodon nichthemerus</i> (1)	<i>Meridiastra calcar</i> (211)
				<i>Haliotis rubra</i> (115)
				<i>Patella laticostata</i> (73)
				<i>Asterias amurensis</i> (11)
				<i>Coscinasterias muricata</i> (7)
				<i>Tosia australis</i> (4)
				<i>Petricia vernicina</i> (1)
				<i>Dicathais orbita</i> (1)
				<i>Meridiastra gunnii</i> (1)
				<i>Cominella lineolata</i> (1)
				<i>Nectocarcinus integrifrons</i> (1)
				<i>Pentagonaster dubeni</i> (1)

**Table 2** Fish and invertebrate species abundance recorded from the Long Reef Outer Reef Life Survey monitoring site

Site	Year	Cryptic fish	Fish	Invertebrates
Long Reef Outer	2013	<i>Parablennius tasmanianus</i> (5)		<i>Heliocidaris erythrogramma</i> (2386)
				<i>Meridiastra calcar</i> (94)
				<i>Coscinasterias muricata</i> (63)
				<i>Haliotis rubra</i> (45)
				<i>Meridiastra gunnii</i> (18)
				<i>Uniophora granifera</i> (5)
				<i>Asterias amurensis</i> (3)
				<i>Tosia australis</i> (1)
				<i>Australostichopus mollis</i> (1)
Long Reef Outer	2018	<i>Parablennius tasmanianus</i> (4) <i>Heteroclinus spp.</i> (1) <i>Vincentia conspersa</i> (1)	<i>Urolophus paucimaculatus</i> (3)	<i>Heliocidaris erythrogramma</i> (1634)
			<i>Dactylophora nigricans</i> (2)	<i>Patelloida alticostata</i> (110)
			<i>Neodax balteatus</i> (1)	<i>Meridiastra gunnii</i> (20)
			<i>Parablennius tasmanianus</i> (1)	<i>Haliotis rubra</i> (13)
			<i>Upeneichthys vlamingii</i> (1)	<i>Coscinasterias muricata</i> (9)
			<i>Trygonorrhina dumerilii</i> (1)	<i>Meridiastra calcar</i> (9)
				<i>Asterias amurensis</i> (6)

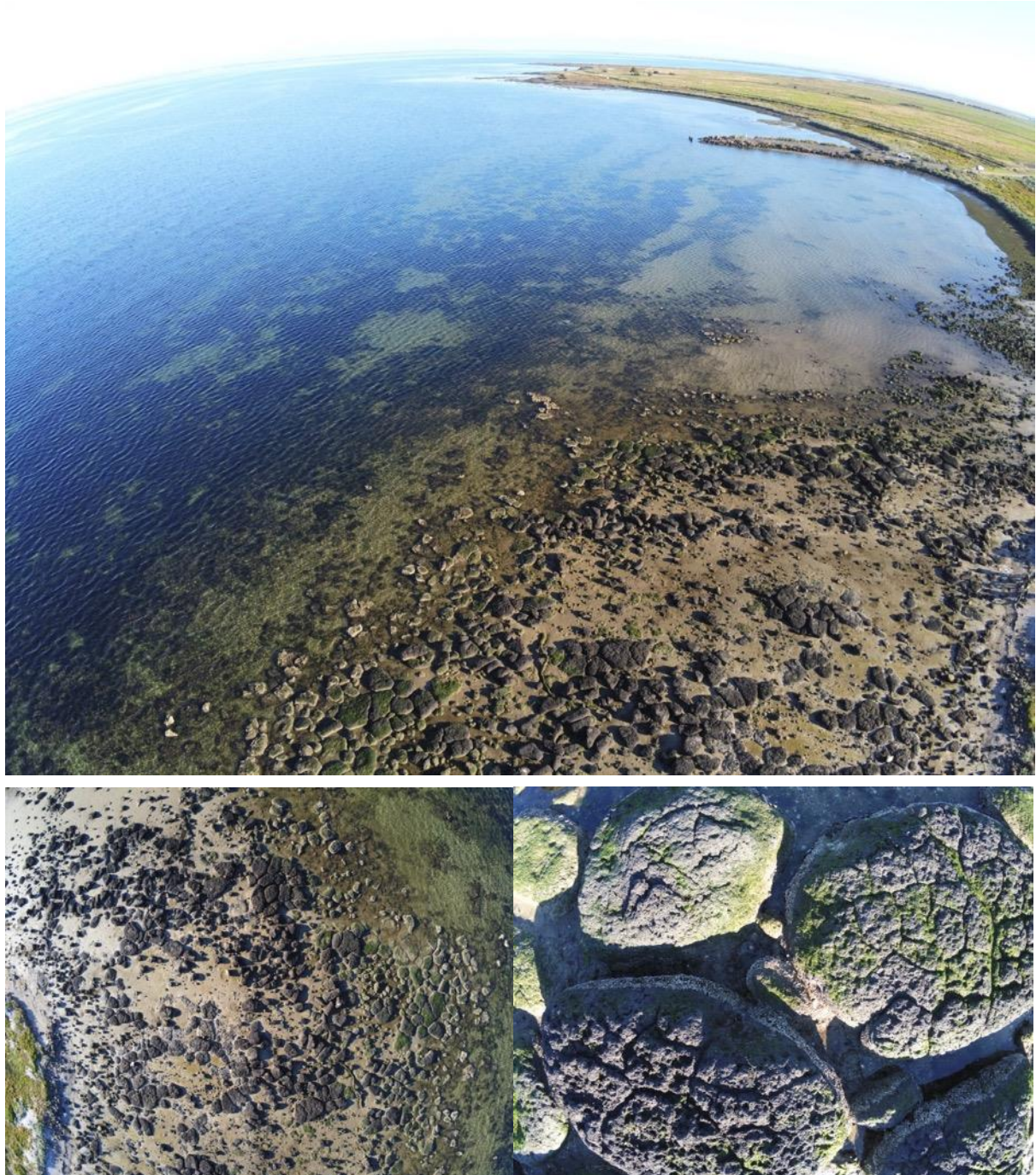


**Figure 17** Reef Life Survey fish and invertebrate total abundance and species richness recorded within a survey year and at the sites in the vicinity of the project Berth and Pipeline Area. Long Reef (PPB51) and Long Reef Outer (PPB62) marked with an asterisk.



### 3.2.5. Littoral rock

Littoral surveys by Fathom Pacific for the DELWP EMP studies in 2019 included sites between in the Berth and Pipeline Area, at the Point Wilson boat ramp at the terminus of Beach Road. The littoral environment in this area consists of a mosaic of littoral rock and sediment on the intertidal platform (Figure 18). Rock habitat consists mainly of basalt boulders, lower bands of which are encrusted with tubes of the serpulid worm *Galeolaria caespitosa*. Basalt boulders provide habitat for a number of gastropod molluscs, shore crabs and other intertidal species in Port Phillip Bay. At several locations in this area, 2019 surveys detected thallose green algae and filamentous green algae that were indicative of eutrophication.



Source: DELWP

**Figure 18** Littoral rock and sediment mosaics around Point Wilson boat ramp within the Geelong Arm in 2019.

The Parks Victoria Intertidal Reef Monitoring Program had sites at Point Cook Marine Sanctuary and a reference site at Altona. This monitoring ceased in 2015 and there has been no routine intertidal monitoring in the Geelong Arm and northwestern sector of the Bay. Data from 2011 monitoring (Flynn et al. 2011) at Altona showed that *Austrocochlea porcata*, a herbivorous gastropod, was the most abundant mobile invertebrate. *Bembicium* spp. and *Turbo undulatus* was recorded in low densities, as was the limpet *Cellana tramoserica*. The carnivorous gastropods *Cominella lineolata* and *Lepsiella vinosa* were present but at low density.

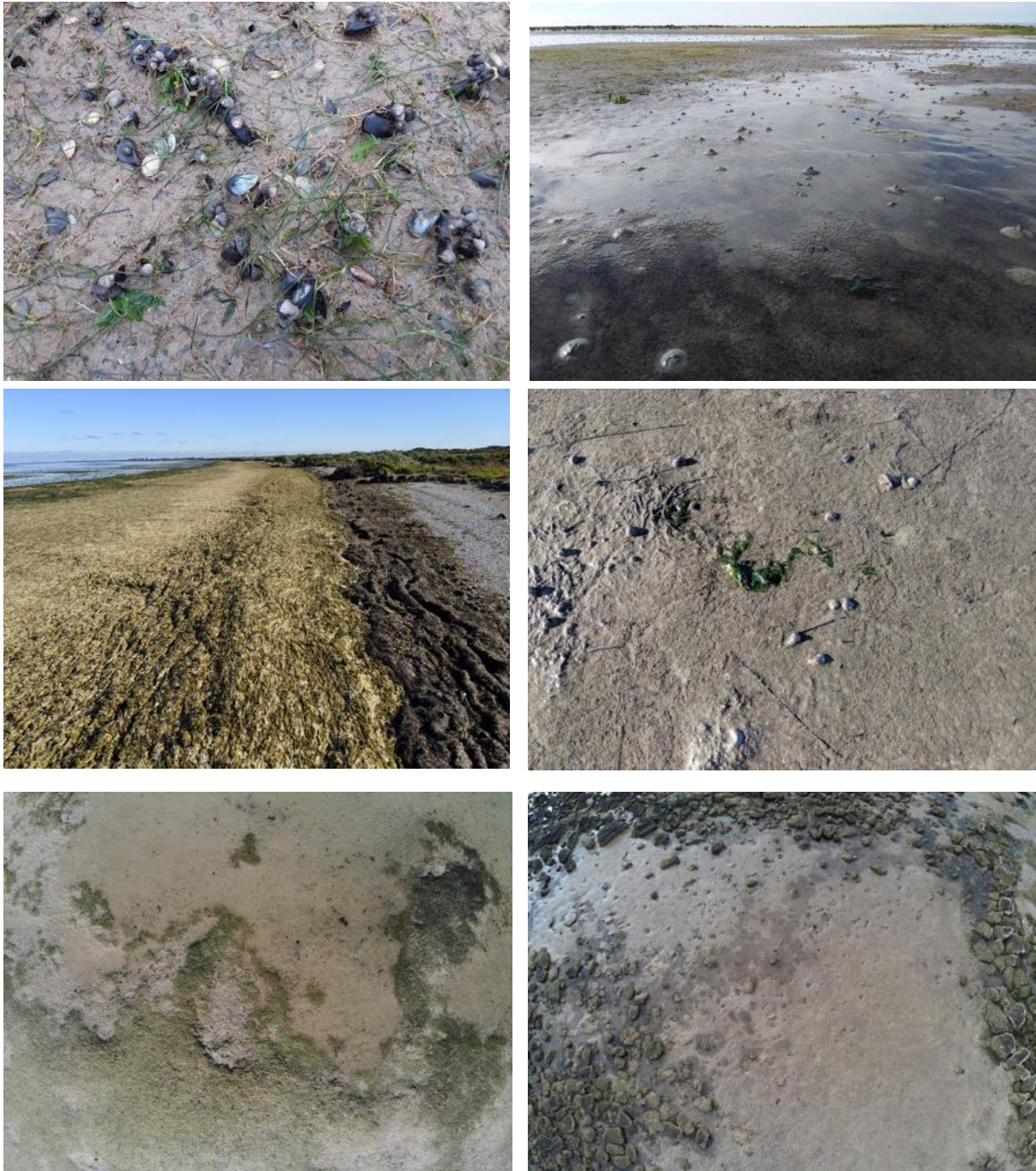
### **3.2.6. Littoral sediment**

Littoral sediments in the Berth and Pipeline Area in the vicinity of the Point Wilson boat ramp range comprise a narrow upper littoral beach berm, a coarse shelly sand beach grading to rippled muddy sands and mud. Microphytobenthos, biofilms and infauna communities are features of intertidal sediments and are critical to supporting bird foraging and thus supporting Ramsar values.

Drift algae wrack is a feature of the intertidal zone in this area, although is more prevalent to the north of the Point Wilson boat ramp. Intertidal seagrass *Zostera muelleri* occurs in the area in slightly raised beds. Intertidal seagrass beds are generally known to be productive habitats and support specific ecosystem functions (Hirst et al. 2008). Subtidal seagrass at Kirk Point and Long Reef were monitored as part of the Baywide Seagrass Monitoring Program but intertidal seagrass in the vicinity was not.

Research associated with the Western Treatment Plant (WTP) has identified that there is uptake of nitrogen from WTP outfalls (Jenkins et al. 2015) in subtidal seagrass but there is relatively little information on intertidal seagrass (e.g. see Warry and Hindell 2009 for a review, Lee et al. 2012) in terms of its extent and current condition.





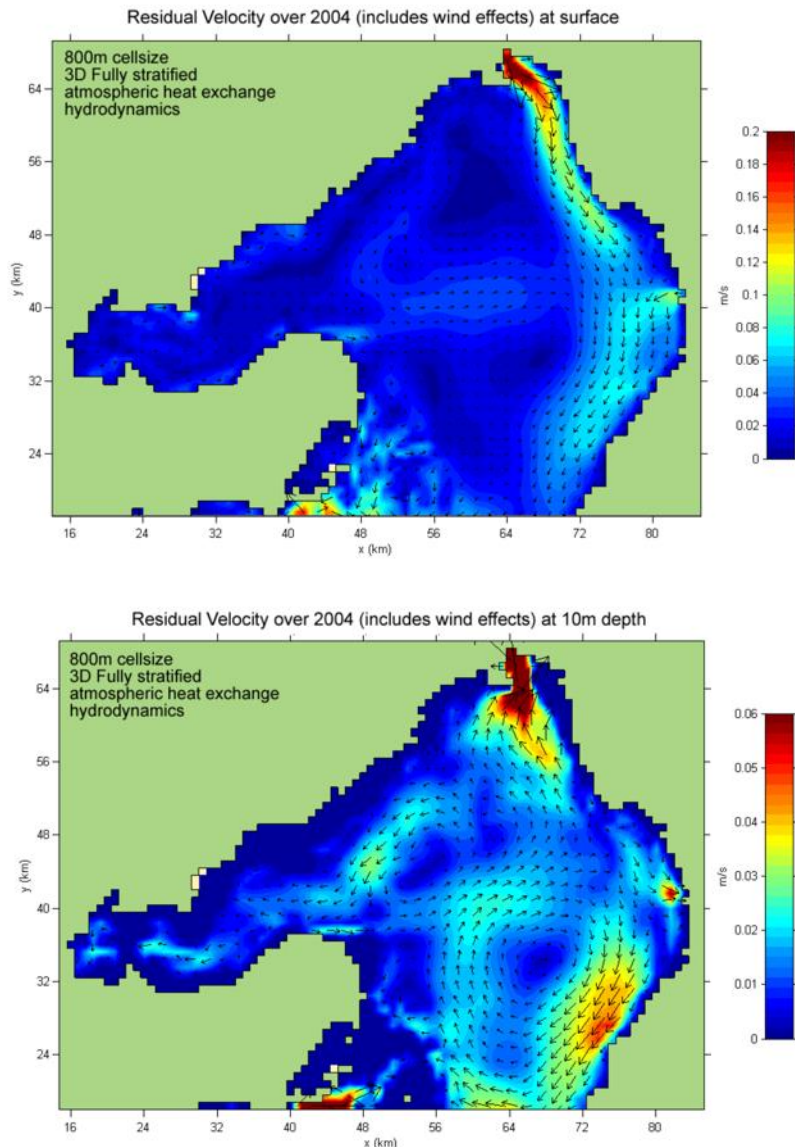
Source: DELWP

**Figure 19** Littoral rock and sediment mosaics around Point Wilson boat ramp within the Geelong Arm in 2019.



### 3.2.7. Water column and phytoplankton

The Berth and Pipeline Area is located within a region characterised by low wave and tidal energy. Studies into discharges of the Western Treatment Plant (WTP) have required the development of hydrodynamic models to investigate nutrient retention and water movement in the Bay (Black and Jenkins 2019, 2020). Modelling from 2004 indicated that surface currents in the Geelong Arm are very low and flow generally in a northwesterly to northerly direction along the coast of Geelong Arm, but flow in a southeasterly direction further offshore (Black et al. 2019) (Figure 20). At 10 m water depth, currents are stronger and flow in a southwesterly direction and are modelled to flow west into Corio Bay.



Source: Black et al. (2019)

**Figure 20** Modelled current velocity and direction at the surface (top) and at 10 m water depth (bottom).

Forces driving currents in the central Bay region are winds, gravitational mixing and salinity gradients. Surface currents in the nearshore zone show a general clockwise rotation, while deeper in the water column two counter-rotating gyres occur. Salinity patterns in the bay are spatially variable, influenced by size and location of freshwater discharges (Black and Jenkins 2019). Freshwater input from the Yarra River and WTP maintains the hyposaline condition of

Port Phillip Bay by overriding the evaporation rate, however periods of drought related to changes in climate may reverse the normal density gradients, resulting in hypersaline conditions. For Port Phillip Bay, the highest salinity occurs at Corio Bay, where a considerable reduction in seagrass coverage has been observed, coinciding with the 1997–2009 drought (Lee et al. 2012).

From previous assessment of the water quality of the bay, waters, sediments and biota showed early signs of nutrient enrichment, such as phytoplankton growth, the presence of the exotic suspension feeders *Sabella spallanzanii* and red drift algae beds (Harris et al. 1996). The concentration of nutrients is critical to water quality and ecological stability in the bay and water quality in the Geelong Arm region in particular is strongly dependent on denitrification, the principal mechanism of which is the interchange of nutrients through the water/sediment interface. In the Bay, natural processes of denitrification occur from the decomposition of organic matter reaching the sediments, while additional denitrification processes are associated with the catchment and sewage effluents (Harris et al. 1996).

Phytoplankton abundance and composition are critical to many other marine species. In Port Phillip Bay two major functional types of phytoplankton were identified, diatoms and flagellates. Flagellates dominate in low nutrient conditions, while diatoms are more abundant in high nutrient conditions. Processes like turbulence and turbidity influence light availability, which influences diatom-to-flagellate ratio, affecting primary productivity (Black et al. 2015). Hydrodynamic models of the Bay showed that flagellates and diatoms reach their peaks in summer, with flagellates peaking earlier, followed by diatoms blooms a few weeks later. In the Bay, the largest abundance of flagellates is associated with nitrogen discharges, corresponding to the elevated discharges the across summer months (Black and Jenkins 2020). Concentration of diatoms in the Bay can reach up to 95% of the total algal composition (Black et al. 2015).

Within Corio Bay, inside Geelong Arm, south-west winter winds drive surface waters out of the embayment and these are replaced by near seabed flows. The opposite water movement occurs in summer. Corio Bay salinity increases in summer due to evaporation, leading to a net current into Corio Bay from Geelong Arm, bringing a net flow of nutrients, phytoplankton and zooplankton, in particular flagellates (Black and Jenkins 2020).

The flagellates to diatoms ratio is critical in the pelagic food web and recruitment rate of species populating Port Phillip Bay. Phytoplankton is the main component of the diet of many zooplankton taxa. Excess of diatoms in the diet of fish larvae reduces early life survival of these species. Flagellates have higher nutritional value for many copepods (Black et al. 2015).

Zooplankton is a component of secondary production in Port Phillip Bay. The dominant zooplankton taxa in the Bay is the copepod *Paracalanus* spp. Which accounts for 28-53% of zooplankton composition (Kimmerer and McKinnon 1985; Black et al. 2015). Copepod taxa like *Paracalanus* spp. And *Acartia* spp. Constitute the main diet of snapper larvae, one of the most valuable recreational and commercial fish of Victoria. Copepod survival, growth and reproduction depends on phytoplankton concentration and nutritional quality. Zooplankton abundance varies annually, and it was observed to be influenced by the phytoplankton responses to river flow and nutrient input to the bay.

In Port Phillip Bay, a strong correlation was found between phytoplankton production in the water column and carbon respiration rate in the sediment, indicating that carbon returning to the water column is proportional to the amount stored in the seabed. As such, where water-column primary productivity is high, seabed carbon (and nitrogen) releases from the seabed are higher than areas of low primary productivity (Black et al. 2015). These findings indicated the important connectivity between the condition of sediment and water column components. The influence of drift algae on this nutrient cycling is considered potentially important to these processes (Black and Jenkins 2020) and is the subject of ongoing studies.

Water quality is monitored at fixed sites in Port Phillip Bay by the Environment Protection Authority Victoria (EPA) and Melbourne Water. Within the Geelong Arm, these sites are Long Reef offshore from the Western Treatment Plant and Inner Corio Bay. To meet the water quality objectives of the State Environment Protection Policy (Waters) (SEPP Waters), the following analytes and measurements are taken:

- Nutrients (nitrogen, phosphorus and silicate).
- Water clarity (total suspended solids and turbidity).
- Dissolved oxygen.
- Ammonia.
- Salinity.
- Algae (chlorophyll-a).
- Metals (arsenic, cadmium, chromium, copper, lead, nickel and zinc).
- Water temperature.
- Photosynthetically active radiation.

Raw data were not available to review in this assessment. However, the results are recorded in annual report cards and the report cards for 2018-2019 and 2019-2020 were available for this assessment (EPA 2020a, b). Water quality at Long Reef and Corio Bay were reported as ‘Good’ in 2019-2020 and suggests that water quality overall has remained relatively consistent since 2002. While water quality in main urbanised waterways entering the bay was classified as ‘Poor’ to ‘Very Poor’ in many areas around the Bay, tidal exchange and mixing of Bass Strait waters is suggested to maintain generally good water quality at the Bay monitoring sites.

The main contaminants of concern in the EPA monitoring set are nutrients and water clarity, with these two parameters receiving a ‘Fair’ classification in 2018-2019 and 2019-2020. As described in Section 3.7.4, nutrient enrichment and ecosystem functions around nutrient processing and denitrification are key to maintaining good water quality.

In summer, EPA also monitors water quality at 36 beaches and the Yarra River in relation to safety for recreational activities. Alerts are issued to the community on the basis of rainfall predictions and their relationship to weekly microbial (enterococci and *E. coli*) sampling (EPA 2020c). A number of alerts have issued for the Werribee South beach after high rainfall events indicating that high microbial loads sometimes occur in this area.

### **3.2.8. Nekton, seabirds and marine mammals**

Fish species in the Geelong Arm and northwestern sector of Port Phillip Bay can generally be categorised into groups of relatively site-attached reef associated benthic species, broad-ranging demersal species, and pelagic species. Superimposed on this general structure is a

strong a seasonal migratory component (Parry et al. 1995). Snapper, *Pagrus auratus*, gummy shark, *Mustelus antarcticus*, King George whiting, *Sillaginodes punctata* and calamari squid *Sepioteuthis australis* are among the most important seasonal migrators that are targeted by recreational fishers and will occur in the Geelong Arm and northwestern sector of the Bay at certain times.

Temperate reef-associated fish assemblages are dominated by macroinvertebrate feeding carnivores (divided into micro- and macrocarnivores), with omnivorous ‘pickers’ and herbivores also present (Sheppard and Edgar 2013). This general composition has been recorded on northern Port Phillip Bay reefs through the Parks Victoria Subtidal Reef Monitoring Program (SRMP) from 2003-2015 at Marine Sanctuaries and neighbouring reference areas. However, diminished native kelp cover and overall condition of reefs in the Geelong Arm and northwestern sector of the Bay is likely to be one explanation for the low fish diversity of reef associated species. Herbivores are in low abundance in northern Port Phillip Bay. On temperate reefs there is niche segregation among the macroinvertebrate carnivores and again, diminished algal habitat condition in the Geelong Arm and northwestern sector of the Bay is likely to at least partially explain the low diversity and abundance of reef-associated fishes here.

Broad-ranging demersal fish species include the key target species for recreational fishers and were previously targeted by commercial fisheries. These species range over the extensive sediment beds in the Geelong Arm and northwestern sector of the Bay and may occur over reefs at some times. Fish community structure was found to be depth- and habitat-dependent in 1995, with distinct ‘shallow’ (7 m stations), ‘intermediate’ (12 m and 17 m stations) and ‘deep’ (22 m and some 12 m and 17 m stations) groupings (Parry et al. 1995). The 10 most abundant demersal fish species in autumn trawls, listed in descending order of total biomass, were sand flathead (*Platycephalus bassensis*), eastern shovelnose stingaree (*Trygonoptera imitata*), eagle ray (*Myliobatus australis*), sparsely spotted stingaree (*Urolophus paucimaculatus*), globefish (*Diodon nichthemerus*), snapper (*Pagrus auratus*), southern fiddler ray (*Trygonorrhina fasciata*), smooth stingray (*Dasyatis brevicaudata*), barracouta (*Thyrsites atun*) and yank flathead (*Platycephalus speculator*) (Parry et al. 1995). Later trawl studies reported declines in the abundance and biomass of sand flathead and overall significant changes to fish community structure that was attributed in part to environmental factors in the late 1990s (Hirst et al. 2011).

The diets of demersal fish species have indicated a strong reliance on crustaceans, notably the pebble crab, *Philyra undecimspinosa* (now reclassified as *Bellidilia undecimspinosa*), fishes, molluscs and polychaetes (Parry et al. 1995). Food web studies indicate that in the Geelong Arm and northwestern sector of the Bay, there are likely to be differentiated food webs in deep, intermediate and shallow depths (Officer and Parry 1997), although it should be acknowledged that comprehensive fish community and diet data available are over 20 years old and the applicability of this information to the present time is uncertain.

Notable small pelagic fishes include seasonally abundant schooling species of the families Engraulidae and Clupeidae. The main species are anchovy, *Engraulis australis*, pilchard, *Sardinops sagax*, blue sprat *Spratelloides robustus* and sandy sprat (also known as whitebait), *Hyperolophus vittatus*. Larger pelagic species such as Australian herring, *Arripis georgianus*, Australian salmon, *Arripis trutta*, trevally, *Pseudocaranx* spp., jack mackerel, *Trachurus*

*declivis*, yellowtail scad, *Trachurus novaezelandiae*, longfin pike, *Dinolestes lewini* and barracouta, *Thyrstites atun* also occur in northern Port Phillip Bay and most of these species are strongly seasonal.

Small pelagic fishes are prey to pelagic predators in the Geelong Arm and northwestern sector of the Bay. Australasian gannet, *Morus serrata*, cormorants *Phalacrocorax fuscenscens*, *P. varius*, *P. sulcirostris*, *Microcarbo melanoleucos*, crested tern, *Sterna bergii*, little penguin, *Eudyptula minor*, bottlenose dolphin, *Tursiops cf. truncatus*, Burrunan dolphin, *Tursiops australis* and Australian fur seal *Arctocephalus pusillus doriferus*.

### **3.2.9. Functions and ecosystem services of Port Phillip Bay**

Port Phillip Bay supports ecological functions which regulate the Bay trophodynamics and maintain condition, and thus maintain values and ecosystem services (human uses). Primary production and particulate organic matter availability have a fundamental role, as they influence the composition of ecological communities. Other critical functions which largely determine the existing conditions of Port Phillip Bay are denitrification within sediments. Due to the increased amount of nutrients entering the Bay caused by urbanisation and human activities, these functions are responsible to maintain nutrients levels acceptable and ensure ecological stability.

The application of an Ecosystem-Based Management approach to evaluating the condition of Port Phillip Bay and to assessing impacts is fundamental to the regulatory settings. Policies and documents that contribute to define this approach are:

- Marine and Coastal Act 2018.
- State Environment Protection Policy (SEPP).
- Port Phillip Bay Environmental Management Plan 2017-2027.
- State of the Bays.
- Victorian Marine and Coastal Policy and Biodiversity Plan

### **3.3. Species and features of national and state importance**

Species protected by the EPBC Act and listed in the Protected Matters Search Tool (PMST) are presented in Appendix 1 and results of searches from the Victorian Biodiversity Atlas (VBA) are listed in Appendix 2.

Table 3 presents a summary of the conservation status and observations of species recorded in the VBA within the Geelong Arm. The VBA contains information on the conservation status according to the EPBC Act 1999, FFG Act 1988 and the Victorian Threatened Species Advisory list, created and maintained by DELWP which contains record of threatened species in Victoria based on technical information and scientific advice.

**Table 3** Conservation status of marine species, seabirds and plants of significance in Victoria that occur within the Geelong Arm. Note that the Port Phillip pipefish and the big-belly seahorse are listed in the EPBC Act, but do not have a conservation status assigned

Scientific name	Common name	EPBC Act 1999	FFG Act 1988	Vic Advisory List	Count	Last record year	Observations in Berth and Pipeline Area?
<b>Marine Species</b>							
<i>Arctocephalus pusillus doriferus</i>	Australian Fur Seal				28	2020	No
<i>Arctophoca forsteri</i>	Long-nosed Fur Seal			vu	1	2019	No
<i>Arctophoca tropicalis</i>	Subantarctic Fur Seal	EN			1	1996	No
<i>Athanopsis australis</i>	Southern hooded shrimp		L	vu	2	1995	No
<i>Australomedusa baylii</i>	Brackish Jellyfish			vu	1	1971	No
<i>Balaenoptera edeni</i>	Bryde's Whale			dd	1	1968	No
<i>Dermochelys coriacea</i>	Leatherback Turtle	EN	L	cr	2	2017	No
<i>Eubalaena australis</i>	Southern Right Whale	EN	L	cr	9	2018	Yes
<i>Halophila australis</i>	Paddle Weed			k	1	2014	No
<i>Hippocampus abdominalis</i>	Bigbelly Seahorse				11	2020	Yes
<i>Lepidochelys olivacea</i>	Pacific (Olive) Ridley	EN			1	1974	No
<i>Megaptera novaeangliae australis</i>	Southern Humpback Whale	VU	L	vu	10	2018	No
<i>Mirounga leonina</i>	Southern Elephant Seal	VU			11	2005	No
<i>Ruppia tuberosa</i>	Tuberous Seatassel			k	4	2000	No
<i>Thyone nigra</i>	Sea-cucumber species		L	vu	3	1960	No
<i>Tursiops australis</i> *	Burrnan Dolphin*		L	en	14	2013	No
<i>Vanacampus phillipi</i>	Port Phillip Pipefish				-	-	-
<b>Seabirds</b>							
<i>Macronectes giganteus</i>	Southern Giant-Petrel	EN	L	vu	6	1985	No
<i>Macronectes halli</i>	Northern Giant-Petrel	VU	L	nt	2	1986	No
<i>Pelagodroma marina</i>	White-faced Storm-Petrel			vu	10	1987	Yes
<i>Pelecanoides urinatrix</i>	Common Diving-Petrel			nt	4	2018	No
<i>Thalassarche carteri</i>	Indian Yellow-nosed Albatross	VU	L	vu	1	1979	No
<i>Thalassarche melanophris</i>	Black-browed Albatross	VU		vu	2	1986	No
<b>Plants</b>							
<i>Zostera nigricaulis</i>	Australian grass-wreck		L		4	2010	Yes

**Legend:** EN-Endangered under the EPBC Act 1999. VU-Vulnerable under the EPBC Act 1999, L-Listed as threatened in the FFG Act 1988, cr-Critically endangered under the Victorian Advisory List, en: Endangered under the Victorian Advisory List, vu-Vulnerable under the Victorian Advisory List, dd-Data deficient under the Victorian Advisory List. k-Poorly known under the Victorian Advisory List.

**Footnote:** \* See footnote 3 on the following page for details on the treatment of Burrnan dolphin.

In Table 3, counts and the year of last record is included to inform an assessment of the significance of the record and its confidence. Only three species have been recorded within the Berth and Pipeline Area. However, the significance of the occurrences of listed fauna in the area must be contextualised as follows:

- Singleton records from the late 1960s to mid 1980s of Bryde’s whale, Indian yellow-nosed albatross, northern giant petrel and brackish jellyfish indicate extremely rare occurrences or low confidence in identifications.
- Several listed species enter the Bay as vagrants in poor health, sometimes dying in the Bay, and Port Phillip Bay is outside their normal range of distribution. Subantarctic fur seal, southern elephant seal and all of the marine turtles fall into this category and observations of these species in the Bay are anomalies, typically associated with sick individuals.
- Whales, predominantly humpback whales, regularly enter the Bay during late-Autumn and winter during migrations and southern right whales are occasional visitors. Whale occurrences in Port Phillip Bay are principally in the eastern sector of the Bay. Northern Port Phillip Bay does not represent critical habitat for these species. Individuals typically reside in the bay for a number of days and exit to Bass Strait and the Victorian open coast environment where larger migratory groups of these species are known to be more common (Donnelly et al. 2020).

The Australian fur seal, common dolphin and Burrunan dolphin<sup>3</sup>, *Tursiops cf. truncatus*, range throughout the Geelong Arm and northwestern sector of the Bay and are often observed in multi-species foraging aggregations along with Australasian gannets, cormorants and little penguins, feeding on schools of small pelagic fishes that are seasonally abundant. Gannets, little penguins and bottlenose dolphins in particular are known to form multi-species feeding in aggregations in the Geelong Arm and northwestern sector of the Bay feeding on schools of sardines, *Sardinops sagax*, in autumn-winter (D. Donnelly, pers. obs.).

The big-belly seahorse *Hippocampus abdominalis* and the pipefish *Vanacampus philipi* are identified in the Geelong Arm and northwestern sector of the Bay, associated with reef and seagrass sites in the vicinity of Point Wilson, but not within the Berth and Pipeline Area (Figure 21). *H. abdominalis* is moderately common throughout macrophyte habitats in Port Phillip Bay (Edgar 1997, Kuitert 2008, Barton et al. 2012) and is frequently observed around man-made structures such as jetties (A. Flynn, pers. obs.). Although potential *H. abdominalis* habitat quality in the Pipeline Area has been diminished by the urchin-*Undaria* barren phenomenon, it is considered possible that the species occurs within the Berth and Pipeline Area. *V. philipi* is known from seagrass and bare sediment habitats in several Port Phillip Bay locations (Jenkins et al. 1997) and it is considered possible that the species occurs within the Berth and Pipeline Area.

The FFG Act listed species, southern hooded shrimp, *Athanopsis australis*, the sea cucumber, *Thyone nigra* and the seagrass *Zostera nigricaulis*, are recorded in the Geelong Arm. *A. australis* is an infaunal species, living commensally in the burrows of echiuran worms (Anker

<sup>3</sup> Recent studies have confirmed that resident Port Phillip *Tursiops* are in fact not a separate species *Tursiops australis* (Moura et al 2020 and Jedensjö et al 2020), hence our use of *Tursiops cf truncatus*.

and Ahyong 2007) and is recorded from a site to the east of Point Wilson and offshore of Portarlington (Figure 21). *T. nigra* is a burrowing sea-cucumber recorded from two sites in Corio Bay, to the west of Point Wilson (Figure 21). Given that these species inhabit sediment types that are present throughout the Geelong Arm and northwestern sector of the Bay, it is considered possible that both of these species occur within the Berth and Pipeline Area.

Two species of callianassid (ghost shrimp) crustacean (*Arenallianassa arenosa* and *Tastrypaea poorei*) are listed in the DELWP CoastKit Features Atlas as species that are not conservation listed but that have declined in abundance are important to sediment ecosystem function and present in the Geelong Arm and northwestern sector of the Bay (Figure 21). These species are burrowing species that serve a role in the breakdown of particulate organic matter, bioturbation and bioirrigation, all of which are important to denitrification processes (Marshall et al. 2021). A significant decline in the abundance of the mud ghost shrimp (named *Neochallichirus limosus* in the CSIRO studies and now classified as *Biffarius limosus*) was identified through the Port Phillip Bay Environment Studies in 1968-71 and 1996, potentially attributable to scallop dredging, dredged material dumping and marine pest introductions.

Additional features listed in the CoastKit Features Atlas are shown in Figure 21 and include bird roosts, geofoms of significance and established monitoring sites.

The Port Phillip Bay (Western Shoreline) and Bellarine Peninsula, a wetland of international importance and Ramsar site (see Figure 3) is a key feature in the Geelong Arm and northwestern sector of the Bay. Other areas protected by the EPBC Act consist of Commonwealth Land and Commonwealth Heritage places such as the PWEA, the Point Wilson Defence Natural Area and the Point Cook Air Base. The Point Cook Marine Sanctuary is located in the northwestern sector of Port Phillip Bay, some 9.4 km north of the Berth and Pipeline Area (see Figure 3).



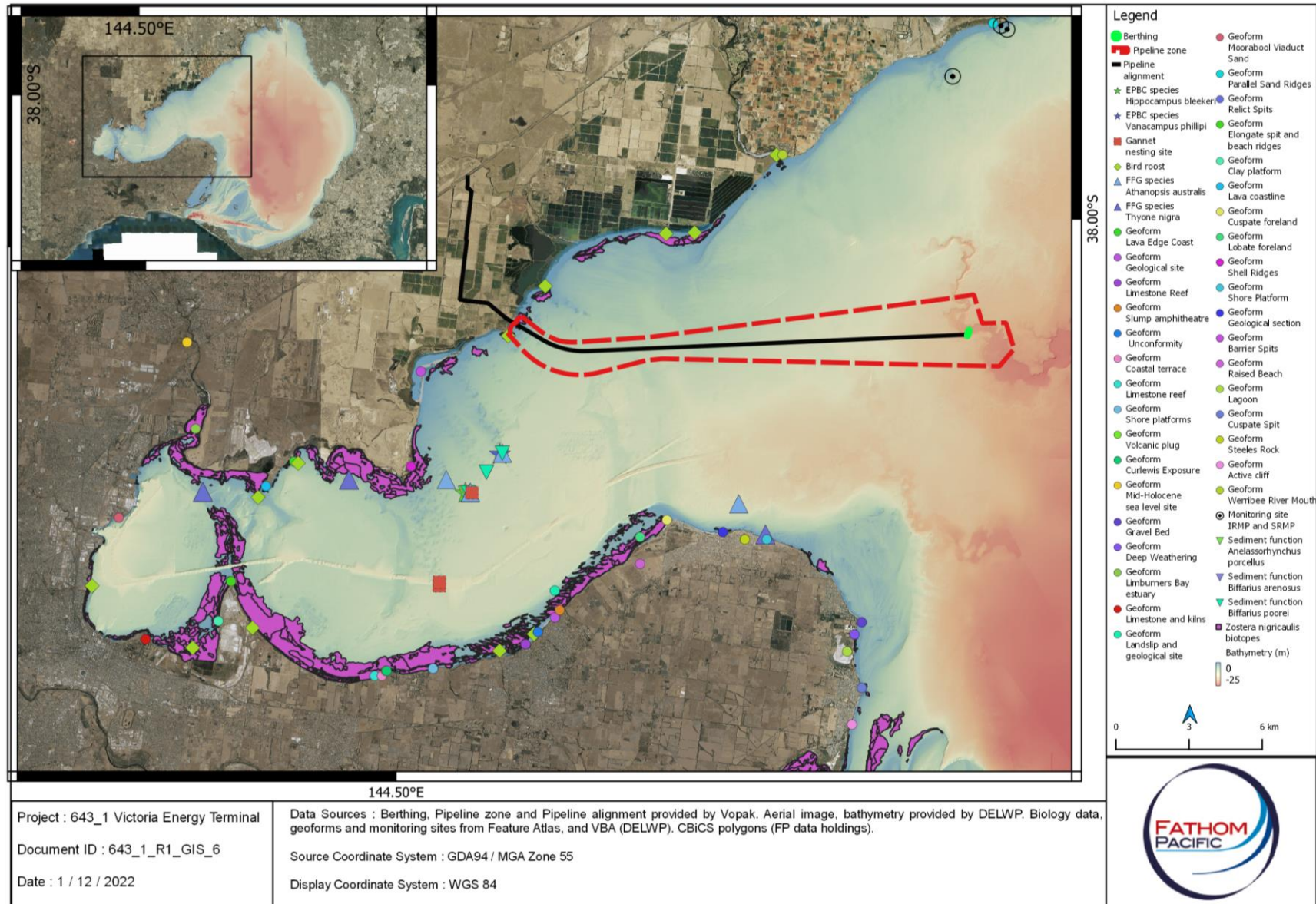


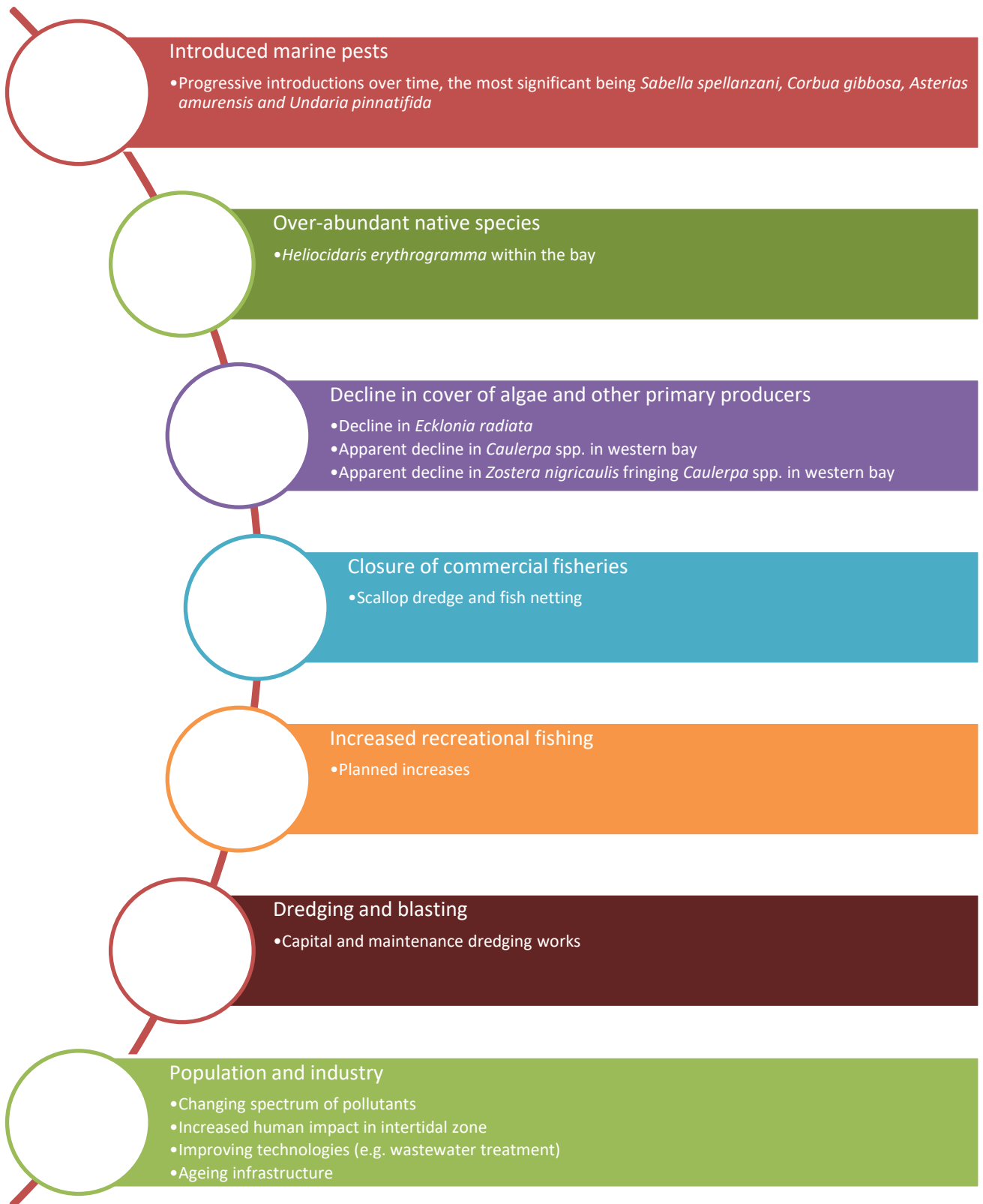
Figure 21 Species and geofoms of significance in the Geelong Arm, including EPBC and FFG listed species (FFG Act list as per October 2021 updates).

### **3.4. Bay Values and Status**

The Port Phillip Bay EMP 2017-2027 (DELWP 2017) identified the following key values and uses:

- Aquatic Habitats and Wildlife.
- Ecosystem Functions.
- Fishing.
- Industrial and Commercial Use.
- Cultural Heritage – Aboriginal and post-European.
- Recreation.

Collectively, the values of the bay deliver the benefits of healthy marine ecosystems, a thriving economy, recreation and tourism and liveable communities. In Port Phillip Bay, existing anthropogenic pressures impinge on the ecological character and values of the Bay. Some of the notable events and step-changes in knowledge in the modern history of the bay that are relevant to an interpretation of the ecological character are shown in Figure 22.



**Figure 22** Some of the most significant changes to the ecological character and human interactions in Port Phillip Bay

### 3.4.1. Marine pests

Marine pests are identified as a major component of broadscale ecological change in Port Phillip Bay (Hirst and Parry 2016) influencing the Bay conditions. Marine Pests known to occur in Port Phillip Bay are compiled from multiple sources and listed in Table 4.

**Table 4** Marine pests identified from Port Phillip Bay. Species in bold are those reported as those of ‘greatest concern’ by CES (2018)

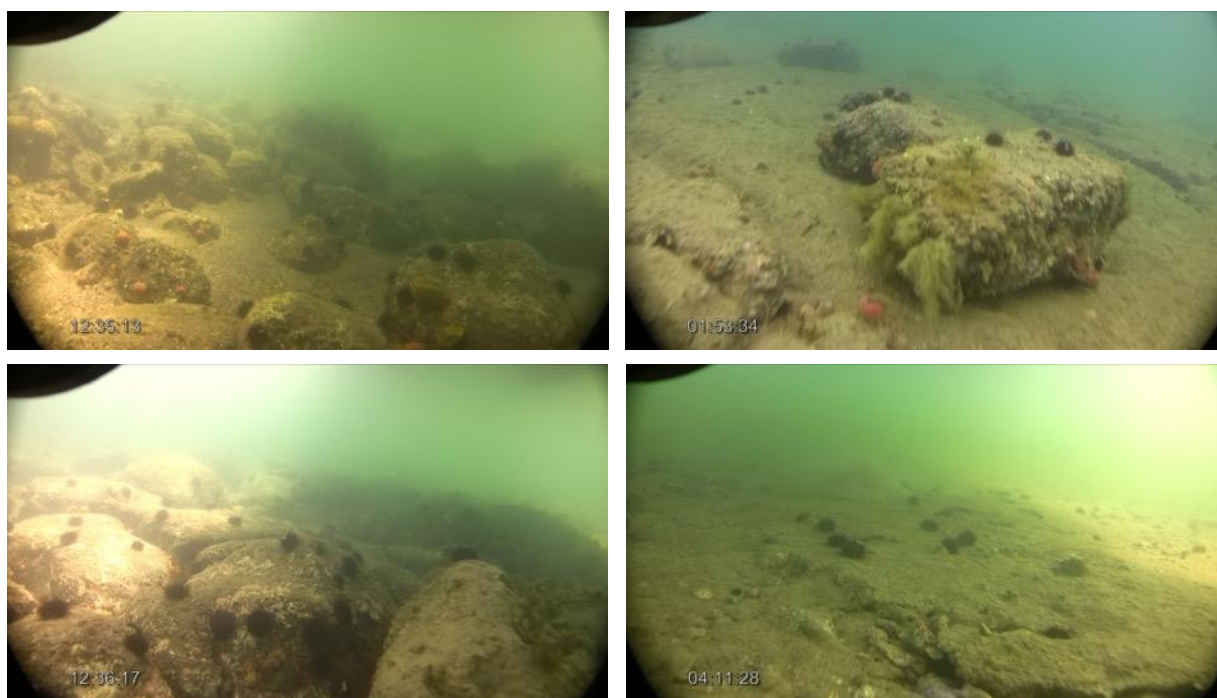
Phylum	Species	Common name	
Mollusca	<i>Theora lubrica</i>	Bivalve	
	<i>Corbula bigga</i>	European clam	
	<b><i>Crassostrea gigas</i></b>	<b><i>Pacific oyster</i></b>	
	<b><i>Maoricolpus roseus</i></b>	<b><i>New Zealand screw shell</i></b>	
	<i>Musculista senhousia</i>	Asian date mussel	
	<i>Raeta pulchella</i>	Bivalve	
Annelida	<i>Euchone limnicola</i>	Fan worm	
	<b><i>Sabella spallanzanii</i></b>	<b><i>European fan worm</i></b>	
	<i>Boccardia proboscidea</i>	Sipionid worm	
	<i>Ficopomatus enigmaticus</i>	Australian tubeworm	
	<i>Myxicola infundibulum</i>	Sabellid polychaete	
	<i>Neanthes succinea</i>	Nereid polychaete	
Bryozoa	<i>Bugula flabellata</i>	Branching bryozoan	
	<i>Bugula neritina</i>	Branching bryozoan	
	<i>Watersipora subtorquata</i>	Encrusting bryozoan	
Echinodermata	<b><i>Asterias amurensis</i></b>	<b><i>Northern Pacific seastar</i></b>	
Crustacea	<b><i>Carcinus maenas</i></b>	<b><i>European green crab</i></b>	
	<i>Caprella penantis</i>	Caprellid amphipod	
	<i>Caprella scaura</i>	Caprellid amphipod	
	<i>Cirolana harfordi</i>	Isopod	
	<i>Corophium acherusicum</i>	Amphipod	
	<i>Elminius modestus</i>	Barnacle	
	<i>Hemiaegina minuta</i>	Caprellid amphipod	
	<i>Hemigrapsus sanguineus</i>	Asian shore crab	
	<i>Iais californica</i>	Isopod	
	<i>Asciadiella aspersa</i>	Isopod	
	Chordata	<i>Ciona intestinalis</i>	Ascidian
		<i>Botrylloides leachi</i>	Compound ascidian
		<i>Botryllus schlosseri</i>	Compound ascidian
<i>Styela clava</i>		Solitary ascidian	
<i>Styela plicata</i>		Solitary ascidian	
<i>Acentrogobius pflaumi</i>		Goby	
<i>Acanthogobius flavimanus</i>		Yellowfin	
<i>Tridetiger trionocephalus</i>		Trident goby	
Ochrophyta	<b><i>Undaria pinnatifida</i></b>	<b><i>Wakame</i></b>	
Rhodophyta	<b><i>Grateloupia turuturu</i></b>	<b><i>Red algae</i></b>	
	<b><i>Codium fragile ssp. fragile</i></b>	<b><i>Dead man's fingers</i></b>	
Chlorophyta	<i>Ulva lactuca</i>	Sea lettuce	
Myzozoa	<i>Alexandrium catenella</i>	Dinoflagellate	
	<i>Alexandrium minutum</i>	Dinoflagellate	
	<i>Alexandrium tamarense</i>	Dinoflagellate	
	<i>Gymnodinium catenatum</i>	Dinoflagellate	

### 3.4.2. Urchin-*Undaria* barrens

In northern Port Phillip Bay, there has been significant decline in the abundance of the kelp *Ecklonia radiata* on sublittoral reefs since the early 2000s (Carnell and Keough 2019). *E. radiata* biotopes support diverse assemblages of macrofauna and co-occurring algae and



fishes (Edgar 1983a, b) so a decline in abundance of *E. radiata* has significant impacts on the Bay existing ecological condition and functioning. Grazing of macroalgae by over-abundant native sea urchin *Heliocidaris erythrogramma* has been implicated in the development of ‘urchin barrens’ in sheltered reef environments and these have been common throughout northern Port Phillip Bay since around 2009 (Figure 23). The Port Phillip Bay urchin barrens are driven by a different species and processes than the urchin barrens appearing on the Victorian open coast, the latter involving the urchin *Centrostephanus rodgersii*.



Source: DELWP towed underwater imagery, 2009-2010

**Figure 23** Examples of urchin barrens in northern Port Phillip Bay

### 3.4.3. Drift algae

Drift algae is a feature of sublittoral habitats in the Geelong Arm and northwestern sector of Port Phillip Bay and can wash ashore as wrack and thus interact with littoral habitats. Mats of thallose and filamentous red, green and brown macroalgae comprise the drift algae pool. Filamentous drift algae also occurs in the region, some of which may be generated from epiphytic growth on *Caulerpa* spp. and *Zostera nigricaulis* beds.

In 1995/1996 drift algae was estimated to cover some 94% of the seabed in the northwest of the Bay at depth of 4–10 m, reaching densities of up to 4 kg/m<sup>2</sup> in some cases (Chidgey and Edmunds 1997). Surveys in 2017/2018 recorded lower drift algal biomass than the 1995/1996 study (Valero Rodríguez 2019), potentially as a result of improved waste-water treatment practices and reduced surface water flows. However, persistent red algal communities were observed at 10–15 m water depths at locations close to nutrient sources with isotopic signatures indicating anthropogenic sources of nitrogen were dominant in nearshore sites. Fathom Pacific also identified significant areas of green filamentous algae affecting nearshore reefs in the

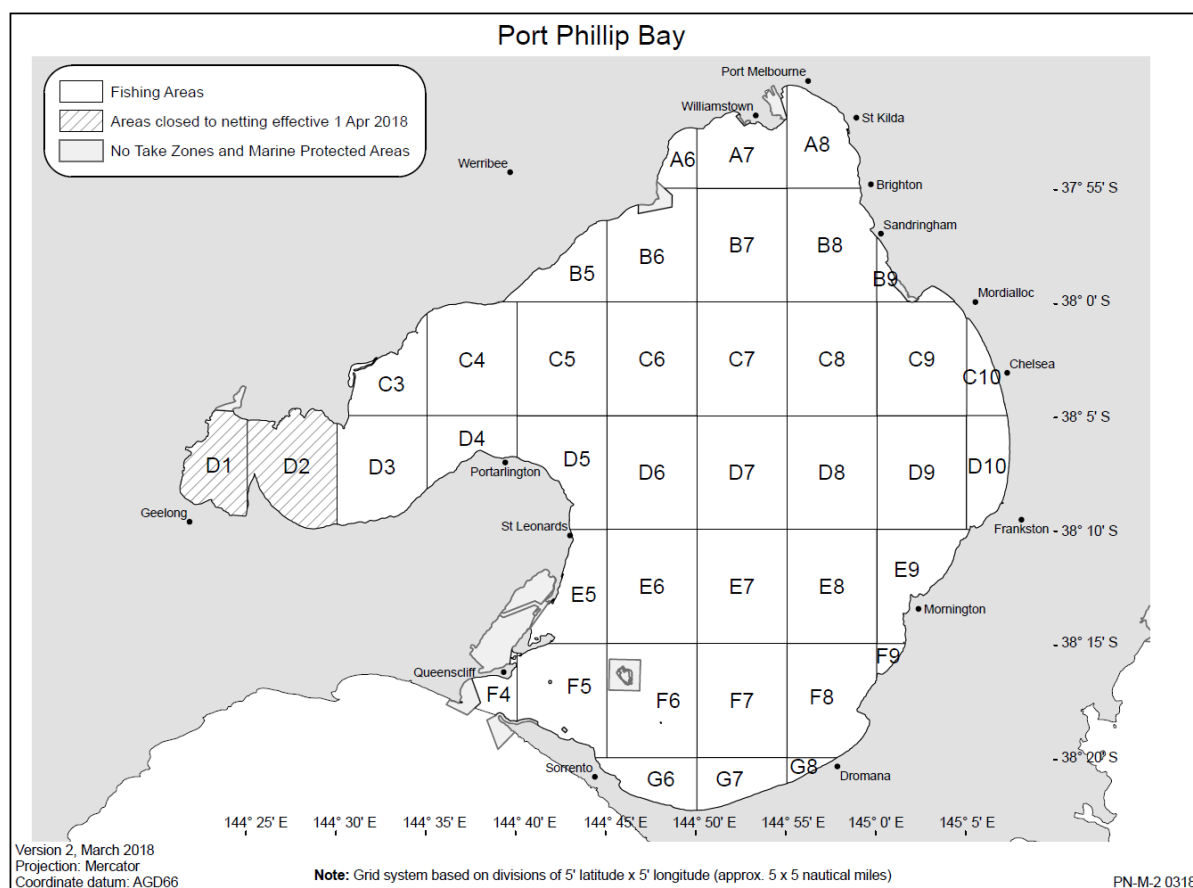


region in 2019 (see Section 3.2.4). Valero Rodríguez (2019) reported a shift in the species composition on drift algae beds between the 1995/1996 and 2017/2018 surveys,

### 3.4.4. Commercial and recreational fishing

Habitat suitability modelling using commercial fishing catch and effort data indicated that the Berthing and Pipeline Area are highly suitable habitat for juvenile snapper, King George whiting and Australian salmon, with medium suitability for adult snapper (Morris and Ball 2006).

The Victorian Government has announced the closure of all commercial net fisheries in Port Phillip Bay by 2022 in favour of actively promoting an increase in recreational fishing (the Target One Million plan). To date, 33 out of the 43 licence holders for the net fishery have accepted compensation packages to relinquish licences and Corio Bay has been closed to commercial netting (Figure 24).



**Source:** Victorian Fisheries Authority

**Figure 24** Commercial fishing reporting areas in Port Phillip Bay and areas closed to netting as at 2018 in Corio Bay.

In 2019/2020, commercial fish catch for the entire Bay was reported by VFA (2020) as shown in Table 5. No production was reported for a further six species due to the fact that there were less than five licence holders.

**Table 5** Commercial catch for reported species for Port Phillip Bay, 2019-2020.

Species	Total production (tonnes)
Australian salmon	1
Southern calamari	3
Rock flathead	1
Southern blue spotted flathead	1
Gummy shark	5
Snapper	30
King George whiting	24
Other	170

The scope of this study precluded a detailed assessment of commercial fisheries and analysis at the level of the grid cell. All net fisheries in Port Phillip Bay will cease by the end of 2022. However, other forms of commercial fisheries, including long-lining, will remain in place. Furthermore, new commercial fisheries and aquaculture enterprises such as sea urchin harvesting and seaweed aquaculture/harvesting may emerge in the future.

Recreational fishing is an important activity in the Bay and occurs throughout the western sector, with the key species targeted being snapper, gummy shark, King George whiting, calamari squid, flathead and Australian salmon. Spearfishing is also practiced in the region, in addition to the collection of scallops and blacklip abalone. Gleaning of invertebrates from intertidal reefs is also practiced. The Victorian Fisheries Authority (VFA) and The Nature Conservancy (TNC) have recently installed a number of shellfish reefs to restore the shellfish reefs that were lost to historic oyster dredging and enhance recreational fishing opportunities. One such reef is located within the Berth and Pipeline Area. The boat ramp at Kirk Point is a relatively small facility with limited capacity, favouring the use of small boats. Larger facilities at the Werribee River and Wyndham Harbour to the north of the Berth and Pipeline Area and Portarlington, St Leonards and in the Geelong Area to the south generally receive high vessel traffic. Several other government and peak-body initiatives seek to improve and increase recreational fishing participation in Victoria.

### 3.4.5. Aquaculture

Aquaculture of blue mussel (*Mytilus edulis*) is practiced in the Geelong Arm and aquaculture reserves are shown in Figure 3. The Kirk Point-Werribee Aquaculture Fisheries Reserve is located within the Berth and Pipeline Area. Aquaculture sites consist of spat collection and longline culture, with mussels hanging vertically from ropes marked by surface buoys. Mussels are harvested year-round in the larger farms, and the Kirk Point-Werribee Aquaculture Fisheries Reserve is likely to operate in this way. Smaller farms in Port Phillip Bay tend not to harvest in winter. The aquaculture industry is managed under the Fisheries Reserves Management Plan (DPI 2005) and under that plan, baseline and monitoring studies of the water

column and benthic environment are required with methodology stipulated by DPI (2006). Data from these monitoring surveys was not available for this assessment.

### 3.4.6. Shipping and shipwrecks

The Port of Melbourne and Port of Geelong support substantial shipping activities, the latter being in the Geelong Arm. The shipping lanes in Central Port Phillip Bay and Corio Bay are maintained by dredging as required.

A historic dredged material ground (DMG) resides within the Berth and Pipeline Area (see Figure 3). Changes to anchorage practices were brought about after reports of seabed scouring, damage to shipwrecks and ultimately the breaking of the ethane pipeline in 2008 in the far north of the Bay. Multibeam bathymetry shows that anchorage areas are characterised by substantial sediment gouging that is expected to cause altered ecosystem properties compared to non-anchorage areas (Figure 25).

Shipwrecks occur in the Geelong Arm but none are within the Berth and Pipeline Area.



**Figure 25** Multibeam bathymetry showing gouging scars on the seabed in an anchorage zone (top) and DMG mounds and scraping of spoil placement device in the southeast of the Bay (bottom).

### 3.4.7. Military activity

The Berth and Pipeline Area is located in the proximity of military zones, the Point Wilson Explosive Area, (PWEA) listed in the Commonwealth Heritage List and the RAAF Base Point Cook listed in the National Heritage List. The presence of military infrastructures implies the presence of exclusion zones and limited access to some areas due to military activities.

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**Appendix 1**  
**EPBC Act Protected Matters Report**



# EPBC Act Protected Matters Report

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

Report created: 22-Apr-2022

[Summary](#)

[Details](#)

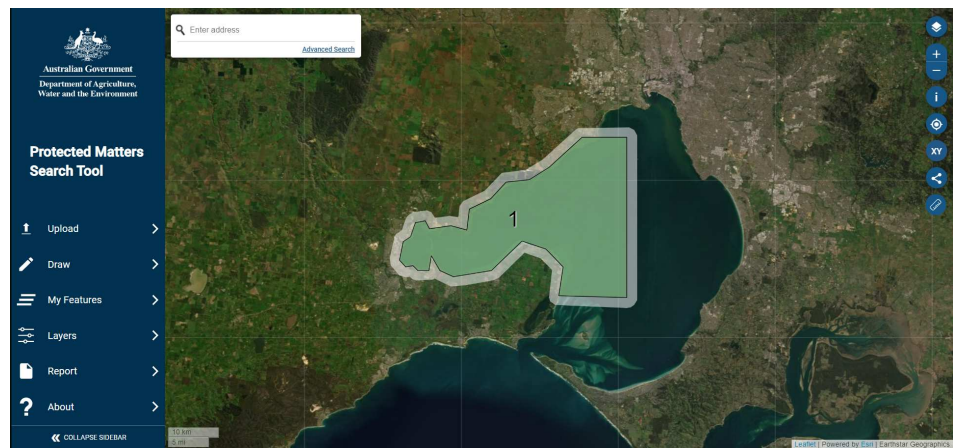
[Matters of NES](#)

[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>	1
<a href="#">Wetlands of International Importance (Ramsar)</a>	1
<a href="#">Great Barrier Reef Marine Park:</a>	None
<a href="#">Commonwealth Marine Area:</a>	None
<a href="#">Listed Threatened Ecological Communities:</a>	6
<a href="#">Listed Threatened Species:</a>	76
<a href="#">Listed Migratory Species:</a>	66

## 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

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

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

<a href="#">Commonwealth Lands:</a>	13
<a href="#">Commonwealth Heritage Places:</a>	4
<a href="#">Listed Marine Species:</a>	81
<a href="#">Whales and Other Cetaceans:</a>	9
<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>	8
<a href="#">Regional Forest Agreements:</a>	1
<a href="#">Nationally Important Wetlands:</a>	3
<a href="#">EPBC Act Referrals:</a>	72
<a href="#">Key Ecological Features (Marine):</a>	None
<a href="#">Biologically Important Areas:</a>	6
<a href="#">Bioregional Assessments:</a>	None
<a href="#">Geological and Bioregional Assessments:</a>	None

# Details

## Matters of National Environmental Significance

### National Heritage Places [\[ Resource Information \]](#)

Name	State	Legal Status	Buffer Status
Historic <a href="#">Point Cook Air Base</a>	VIC	Listed place	In feature area

### Wetlands of International Importance (Ramsar Wetlands) [\[ Resource Information \]](#)

Ramsar Site Name	Proximity	Buffer Status
<a href="#">Port phillip bay (western shoreline) and bellarine peninsula</a>	Within Ramsar site	In feature area

### 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="#">Grassy Eucalypt Woodland of the Victorian Volcanic Plain</a>	Critically Endangered	Community known to occur within area	In feature area
<a href="#">Natural Damp Grassland of the Victorian Coastal Plains</a>	Critically Endangered	Community may occur within area	In feature area
<a href="#">Natural Temperate Grassland of the Victorian Volcanic Plain</a>	Critically Endangered	Community likely to occur within area	In feature area
<a href="#">Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains</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 feature area
<a href="#">White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland</a>	Critically Endangered	Community likely to occur within area	In feature area

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

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

Number is the current name ID.

Scientific Name	Threatened Category	Presence Text	Buffer Status
BIRD <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 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 tenuirostris</a> Great Knot [862]	Critically Endangered	Roosting 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="#">Charadrius leschenaultii</a> Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area	In feature area
<a href="#">Charadrius mongolus</a> Lesser Sand Plover, Mongolian Plover [879]	Endangered	Roosting known 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	Foraging, feeding or related behaviour likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
<a href="#">Falco hypoleucos</a> Grey Falcon [929]	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 feature area
<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	Species or species habitat may occur within area	In feature area
<a href="#">Neophema chrysogaster</a> Orange-bellied Parrot [747]	Critically Endangered	Migration route 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="#">Pachyptila turtur subantarctica</a> Fairy Prion (southern) [64445]	Vulnerable	Species or species habitat known to occur within area	In feature area
<a href="#">Pedionomus torquatus</a> Plains-wanderer [906]	Critically Endangered	Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
<a href="#">Phoebastria fusca</a> Sooty Albatross [1075]	Vulnerable	Species or species habitat likely to 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="#">Rostratula australis</a> Australian Painted Snipe [77037]	Endangered	Species or species habitat known 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
<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 chrysostoma</a> Grey-headed Albatross [66491]	Endangered	Species or species habitat may occur within area	In feature area
<a href="#">Thalassarche impavida</a> Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
<a href="#">Thalassarche melanophris</a> Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area	In feature area



Scientific Name	Threatened Category	Presence Text	Buffer Status
<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 likely 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="#">Galaxiella pusilla</a> Eastern Dwarf Galaxias, Dwarf Galaxias [56790]	Vulnerable	Species or species habitat may occur within area	In feature area
<a href="#">Nannoperca obscura</a> Yarra Pygmy Perch [26177]	Vulnerable	Species or species habitat known to occur within area	In feature area
<a href="#">Prototroctes maraena</a> Australian Grayling [26179]	Vulnerable	Species or species habitat known to occur within area	In feature area
<a href="#">Serirolella 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="#">Litoria raniformis</a> Growling Grass Frog, Southern Bell Frog, Green and Golden Frog, Warty Swamp Frog, Golden Bell Frog [1828]	Vulnerable	Species or species habitat known to occur within area	In feature area
<b>INSECT</b>			
<a href="#">Synemon plana</a> Golden Sun Moth [25234]	Vulnerable	Species or species habitat likely to occur within area	In feature area
<b>MAMMAL</b>			

Scientific Name	Threatened Category	Presence Text	Buffer Status
<a href="#">Antechinus minimus maritimus</a> Swamp Antechinus (mainland) [83086]	Vulnerable	Species or species habitat may occur within area	In feature area
<a href="#">Dasyurus maculatus maculatus (SE mainland population)</a> Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	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="#">Petaurus australis australis</a> Yellow-bellied Glider (south-eastern) [87600]	Vulnerable	Species or species habitat may occur within area	In feature area
<a href="#">Pteropus poliocephalus</a> Grey-headed Flying-fox [186]	Vulnerable	Roosting known to occur within area	In feature area
<b>PLANT</b>			
<a href="#">Amphibromus fluitans</a> River Swamp Wallaby-grass, Floating Swamp Wallaby-grass [19215]	Vulnerable	Species or species habitat likely to occur within area	In feature area
<a href="#">Caladenia pumila</a> Dwarf Spider-orchid [4155]	Critically Endangered	Species or species habitat likely to occur within area	In feature area
<a href="#">Dianella amoena</a> Matted Flax-lily [64886]	Endangered	Species or species habitat likely to occur within area	In feature area
<a href="#">Diuris basaltica</a> Small Golden Moths Orchid, Early Golden Moths [64654]	Endangered	Species or species habitat may occur within area	In feature area
<a href="#">Diuris fragrantissima</a> Sunshine Diuris, Fragrant Doubletail, White Diuris [21243]	Endangered	Species or species habitat may occur within area	In feature area
<a href="#">Dodonaea procumbens</a> Trailing Hop-bush [12149]	Vulnerable	Species or species habitat likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
<a href="#">Glycine latrobeana</a> Clover Glycine, Purple Clover [13910]	Vulnerable	Species or species habitat likely to occur within area	In feature area
<a href="#">Lachnagrostis adamsonii</a> Adamson's Blown-grass, Adamson's Blowngrass [76211]	Endangered	Species or species habitat known to occur within area	In feature area
<a href="#">Lepidium aschersonii</a> Spiny Pepper-cress [10976]	Vulnerable	Species or species habitat likely to occur within area	In feature area
<a href="#">Lepidium hyssopifolium</a> Basalt Pepper-cress, Peppercress, Rubble Pepper-cress, Pepperweed [16542]	Endangered	Species or species habitat likely to occur within area	In feature area
<a href="#">Leucochrysum albicans subsp. tricolor</a> Hoary Sunray, Grassland Paper-daisy [89104]	Endangered	Species or species habitat likely to occur within area	In feature area
<a href="#">Pimelea spinescens subsp. spinescens</a> Plains Rice-flower, Spiny Rice-flower, Prickly Pimelea [21980]	Critically Endangered	Species or species habitat known to occur within area	In feature area
<a href="#">Prasophyllum spicatum</a> Dense Leek-orchid [55146]	Vulnerable	Species or species habitat likely to occur within area	In feature area
<a href="#">Pterostylis chlorogramma</a> Green-striped Greenhood [56510]	Vulnerable	Species or species habitat may occur within area	In feature area
<a href="#">Pterostylis cucullata</a> Leafy Greenhood [15459]	Vulnerable	Species or species habitat likely to occur within area	In feature area
<a href="#">Rutidosis leptorhynchoides</a> Button Wrinklewort [67251]	Endangered	Species or species habitat likely to occur within area	In feature area
<a href="#">Senecio macrocarpus</a> Large-fruit Fireweed, Large-fruit Groundsel [16333]	Vulnerable	Species or species habitat likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
<a href="#">Senecio psilocarpus</a> Swamp Fireweed, Smooth-fruited Groundsel [64976]	Vulnerable	Species or species habitat likely to occur within area	In feature area
<a href="#">Thelymitra epipactoides</a> Metallic Sun-orchid [11896]	Endangered	Species or species habitat may occur within area	In feature area
<a href="#">Xerochrysum palustre</a> Swamp Everlasting, Swamp Paper Daisy [76215]	Vulnerable	Species or species habitat known to occur within area	In feature area

## REPTILE

<a href="#">Caretta caretta</a> Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area	In feature area
<a href="#">Chelonia mydas</a> Green Turtle [1765]	Vulnerable	Species or species habitat may occur within area	In feature area
<a href="#">Delma impar</a> Striped Legless Lizard, Striped Snake-lizard [1649]	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	Foraging, feeding or related behaviour known to occur within area	In feature area
<a href="#">Tympanocryptis pinguicolla</a> Grassland Earless Dragon [66727]	Endangered	Species or species habitat may occur within area	In feature area

## SHARK

<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 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 likely to occur within area	In feature area
<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 may 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	Foraging, feeding or related behaviour likely 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	Species or species habitat may occur within area	In feature area



Scientific Name	Threatened Category	Presence Text	Buffer Status
<a href="#">Phoebetria fusca</a> Sooty Albatross [1075]	Vulnerable	Species or species habitat likely to 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 chrysostoma</a> Grey-headed Albatross [66491]	Endangered	Species or species habitat may occur within area	In feature area
<a href="#">Thalassarche impavida</a> Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
<a href="#">Thalassarche melanophris</a> Black-browed Albatross [66472]	Vulnerable	Species or species habitat may 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 likely to occur within area	In feature area

## Migratory Marine Species

Scientific Name	Threatened Category	Presence Text	Buffer Status
<a href="#">Caperea marginata</a> Pygmy Right Whale [39]		Foraging, feeding or related behaviour 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	Foraging, feeding or related behaviour known to occur within area	In feature area
<a href="#">Chelonia mydas</a> Green Turtle [1765]	Vulnerable	Species or species habitat may occur within area	In feature area
<a href="#">Dermochelys coriacea</a> Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour 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 may occur within area	In feature area
<b>Migratory Terrestrial Species</b>			
<a href="#">Hirundapus caudacutus</a> White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
<a href="#">Monarcha melanopsis</a> Black-faced Monarch [609]		Species or species habitat may occur within area	In feature area
<a href="#">Motacilla flava</a> Yellow Wagtail [644]		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
<b>Migratory Wetlands Species</b>			
<a href="#">Actitis hypoleucos</a> Common Sandpiper [59309]		Species or species habitat known to occur within area	In feature area
<a href="#">Arenaria interpres</a> Ruddy Turnstone [872]		Roosting known to occur within area	In feature area
<a href="#">Calidris acuminata</a> Sharp-tailed Sandpiper [874]		Roosting known to occur within area	In feature area
<a href="#">Calidris alba</a> Sanderling [875]		Roosting known to occur within area	In buffer area only
<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 known to occur within area	In feature area
<a href="#">Calidris ruficollis</a> Red-necked Stint [860]		Roosting known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
<a href="#">Calidris subminuta</a> Long-toed Stint [861]		Roosting known to occur within area	In feature area
<a href="#">Calidris tenuirostris</a> Great Knot [862]	Critically Endangered	Roosting known to occur within area	In feature area
<a href="#">Charadrius bicinctus</a> Double-banded Plover [895]		Roosting 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 known to occur within area	In feature area
<a href="#">Charadrius mongolus</a> Lesser Sand Plover, Mongolian Plover [879]	Endangered	Roosting known to occur within area	In feature area
<a href="#">Gallinago hardwickii</a> Latham's Snipe, Japanese Snipe [863]		Species or species habitat known to occur within area	In feature area
<a href="#">Gallinago megala</a> Swinhoe's Snipe [864]		Roosting likely to occur within area	In feature area
<a href="#">Gallinago stenura</a> Pin-tailed Snipe [841]		Roosting likely to occur within area	In feature area
<a href="#">Limicola falcinellus</a> Broad-billed Sandpiper [842]		Roosting known 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="#">Limosa limosa</a> Black-tailed Godwit [845]		Roosting 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="#">Numenius minutus</a> Little Curlew, Little Whimbrel [848]		Roosting likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
<a href="#">Numenius phaeopus</a> Whimbrel [849]		Roosting 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="#">Phalaropus lobatus</a> Red-necked Phalarope [838]		Roosting known to occur within area	In feature area
<a href="#">Philomachus pugnax</a> Ruff (Reeve) [850]		Roosting known to occur within area	In feature area
<a href="#">Pluvialis fulva</a> Pacific Golden Plover [25545]		Roosting known to occur within area	In feature area
<a href="#">Pluvialis squatarola</a> Grey Plover [865]		Roosting known to occur within area	In feature area
<a href="#">Tringa brevipes</a> Grey-tailed Tattler [851]		Roosting known to occur within area	In feature area
<a href="#">Tringa glareola</a> Wood Sandpiper [829]		Roosting known to occur within area	In feature area
<a href="#">Tringa nebularia</a> Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area	In feature area
<a href="#">Tringa stagnatilis</a> Marsh Sandpiper, Little Greenshank [833]		Roosting known to occur within area	In feature area
<a href="#">Xenus cinereus</a> Terek Sandpiper [59300]		Roosting known 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>Defence</b>		
Defence - AVALON AIRFIELD [21410]	VIC	In buffer area only
Defence - AVALON AIRFIELD [21405]	VIC	In buffer area only
Defence - AVALON AIRFIELD [21404]	VIC	In buffer area only
Defence - AVALON AIRFIELD [21397]	VIC	In buffer area only
Defence - AVALON AIRFIELD [21398]	VIC	In buffer area only
Defence - Myers Street (opp. Geelong Hospital) [20450]	VIC	In buffer area only
Defence - POINT WILSON EXPLOSIVES AREA [21443]	VIC	In buffer area only
Defence - POINT WILSON EXPLOSIVES AREA [21444]	VIC	In feature area
Defence - POINT WILSON EXPLOSIVES AREA [21441]	VIC	In feature area
Defence - POINT WILSON EXPLOSIVES AREA [21440]	VIC	In feature area
Defence - POINT WILSON EXPLOSIVES AREA [21442]	VIC	In feature area
Defence - POINT WILSON EXPLOSIVES AREA [21439]	VIC	In feature area
Defence - RAAF WILLIAMS - POINT COOK [20013]	VIC	In feature area

### Commonwealth Heritage Places

[\[ Resource Information \]](#)

Name	State	Status	Buffer Status
<b>Historic</b>			
<a href="#">Point Cook Air Base</a>	VIC	Listed place	In feature area
<a href="#">Point Cook Air Base - College &amp; Training Area</a>	VIC	Within listed place	In feature area
<a href="#">Point Cook Air Base - Museum &amp; Heritage Precincts</a>	VIC	Within listed place	In feature area

### Natural

<a href="#">Point Wilson Defence Natural Area</a>	VIC	Listed place	In feature area
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### Listed Marine Species

[\[ Resource Information \]](#)

Scientific Name	Threatened Category	Presence Text	Buffer Status
<b>Bird</b>			

Scientific Name	Threatened Category	Presence Text	Buffer Status
<a href="#">Actitis hypoleucos</a> Common Sandpiper [59309]		Species or species habitat known to occur within area	In feature area
<a href="#">Anous stolidus</a> Common Noddy [825]		Species or species habitat likely to occur within area	In feature area
<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="#">Ardenna 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="#">Ardenna grisea as Puffinus griseus</a> Sooty Shearwater [82651]		Species or species habitat may occur within area	In feature area
<a href="#">Arenaria interpres</a> Ruddy Turnstone [872]		Roosting known to occur within area	In feature area
<a href="#">Bubulcus ibis as Ardea ibis</a> Cattle Egret [66521]		Breeding likely to occur within area overfly marine area	In feature area
<a href="#">Calidris acuminata</a> Sharp-tailed Sandpiper [874]		Roosting known to occur within area	In feature area
<a href="#">Calidris alba</a> Sanderling [875]		Roosting known to occur within area	In buffer area only
<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

Scientific Name	Threatened Category	Presence Text	Buffer Status
<a href="#">Calidris melanotos</a> Pectoral Sandpiper [858]		Species or species habitat known to occur within area overfly marine area	In feature area
<a href="#">Calidris ruficollis</a> Red-necked Stint [860]		Roosting known to occur within area overfly marine area	In feature area
<a href="#">Calidris subminuta</a> Long-toed Stint [861]		Roosting known to occur within area overfly marine area	In feature area
<a href="#">Calidris tenuirostris</a> Great Knot [862]	Critically Endangered	Roosting known to occur within area overfly marine area	In feature area
<a href="#">Chalcites osculans as Chrysococcyx osculans</a> Black-eared Cuckoo [83425]		Species or species habitat known to occur within area overfly marine area	In feature area
<a href="#">Charadrius bicinctus</a> Double-banded Plover [895]		Roosting known to occur within area overfly marine area	In feature area
<a href="#">Charadrius leschenaultii</a> Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area	In feature area
<a href="#">Charadrius mongolus</a> Lesser Sand Plover, Mongolian Plover [879]	Endangered	Roosting known to occur within area	In feature area
<a href="#">Charadrius ruficapillus</a> Red-capped Plover [881]		Roosting known to occur within area overfly marine area	In feature area
<a href="#">Chroicocephalus novaehollandiae as Larus novaehollandiae</a> Silver Gull [82326]		Breeding known 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

Scientific Name	Threatened Category	Presence Text	Buffer Status
<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	Foraging, feeding or related behaviour likely to occur within area	In feature area
<a href="#">Gallinago hardwickii</a> Latham's Snipe, Japanese Snipe [863]		Species or species habitat known to occur within area overfly marine area	In feature area
<a href="#">Gallinago megala</a> Swinhoe's Snipe [864]		Roosting likely to occur within area overfly marine area	In feature area
<a href="#">Gallinago stenura</a> Pin-tailed Snipe [841]		Roosting 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
<a href="#">Himantopus himantopus</a> Pied Stilt, Black-winged Stilt [870]		Roosting known to occur within area overfly marine area	In feature area
<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 feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
<a href="#">Limicola falcinellus</a> Broad-billed Sandpiper [842]		Roosting known to occur within area overfly marine 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="#">Limosa limosa</a> Black-tailed Godwit [845]		Roosting known to occur within area overfly marine 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	Species or species habitat may 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 may occur within area overfly marine area	In feature area
<a href="#">Motacilla flava</a> Yellow Wagtail [644]		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	Migration route known to occur within area overfly marine area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
<a href="#">Neophema chrysostoma</a> Blue-winged Parrot [726]		Species or species habitat known to occur within area overfly marine 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="#">Numenius minutus</a> Little Curlew, Little Whimbrel [848]		Roosting likely to occur within area overfly marine area	In feature area
<a href="#">Numenius phaeopus</a> Whimbrel [849]		Roosting known to occur within area	In feature area
<a href="#">Onychoprion fuscatus as Sterna fuscata</a> Sooty Tern [90682]		Breeding 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="#">Phalaropus lobatus</a> Red-necked Phalarope [838]		Roosting known to occur within area	In feature area
<a href="#">Philomachus pugnax</a> Ruff (Reeve) [850]		Roosting known to occur within area overfly marine area	In feature area
<a href="#">Phoebastria fusca</a> Sooty Albatross [1075]	Vulnerable	Species or species habitat likely to occur within area	In feature area
<a href="#">Pluvialis fulva</a> Pacific Golden Plover [25545]		Roosting known to occur within area	In feature area
<a href="#">Pluvialis squatarola</a> Grey Plover [865]		Roosting known to occur within area overfly marine area	In feature area



Scientific Name	Threatened Category	Presence Text	Buffer Status
<a href="#">Recurvirostra novaehollandiae</a> Red-necked Avocet [871]		Roosting known to occur within area overfly marine 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 known to occur within area overfly marine area	In feature area
<a href="#">Sternula albifrons as Sterna albifrons</a> Little Tern [82849]		Species or species habitat may occur within area	In feature area
<a href="#">Sternula nereis as Sterna nereis</a> Fairy Tern [82949]		Breeding known to occur within area	In feature area
<a href="#">Stiltia isabella</a> Australian Pratincole [818]		Roosting known to 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
<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 chrysostoma</a> Grey-headed Albatross [66491]	Endangered	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
<a href="#">Thalassarche impavida</a> Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
<a href="#">Thalassarche melanophris</a> Black-browed Albatross [66472]	Vulnerable	Species or species habitat may 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 likely to occur within area	In feature area
<a href="#">Thinornis cucullatus as Thinornis rubricollis</a> Hooded Dotterel, Hooded Plover [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
<a href="#">Tringa brevipes as Heteroscelus brevipes</a> Grey-tailed Tattler [851]		Roosting known to occur within area	In feature area
<a href="#">Tringa glareola</a> Wood Sandpiper [829]		Roosting known to occur within area overfly marine area	In feature area
<a href="#">Tringa nebularia</a> Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area overfly marine area	In feature area
<a href="#">Tringa stagnatilis</a> Marsh Sandpiper, Little Greenshank [833]		Roosting known to occur within area overfly marine area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
<a href="#">Xenus cinereus</a> Terek Sandpiper [59300]		Roosting known to occur within area overfly marine area	In feature area

### Mammal

<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
<a href="#">Arctocephalus pusillus</a> Australian Fur-seal, Australo-African Fur-seal [21]		Species or species habitat may occur within area	In feature area

### Reptile

<a href="#">Caretta caretta</a> Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area	In feature area
<a href="#">Chelonia mydas</a> Green Turtle [1765]	Vulnerable	Species or species habitat may occur within area	In feature area
<a href="#">Dermochelys coriacea</a> Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area	In feature area

### Whales and Other Cetaceans

[ [Resource Information](#) ]

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="#">Caperea marginata</a> Pygmy Right Whale [39]		Foraging, feeding or related behaviour may 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

Current Scientific Name	Status	Type of Presence	Buffer Status
<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 may 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
Drakes B.R.	Natural Features Reserve	VIC	In buffer area only
Limeburners Lagoon (Hovells Creek) F.F.R.	Nature Conservation Reserve	VIC	In feature area
Point Cooke	Marine Sanctuary	VIC	In feature area
Portarlington (Point Richard) F.F.R.	Nature Conservation Reserve	VIC	In buffer area only
Port Phillip Heads	Marine National Park	VIC	In buffer area only
Salt Lagoon, St Leonards W.R.	Nature Conservation Reserve	VIC	In feature area
Swan Bay - Edwards Point W.R.	Nature Conservation Reserve	VIC	In feature area
The Spit W.R.	Nature Conservation Reserve	VIC	In feature area

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

Note that all areas with completed RFAs have been included.

RFA Name	State	Buffer Status
<a href="#">West Victoria RFA</a>	Victoria	In feature area

**Nationally Important Wetlands**[\[ Resource Information \]](#)

Wetland Name	State	Buffer Status
<a href="#">Point Cook &amp; Laverton Saltworks</a>	VIC	In feature area
<a href="#">Swan Bay &amp; Swan Island</a>	VIC	In feature area
<a href="#">Werribee-Avalon Area</a>	VIC	In feature area

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

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
<b>Controlled action</b>				
<a href="#">Basalt Quarry Extension (Mountainview Quarry)</a>	2004/1329	Controlled Action	Completed	In feature area
<a href="#">Changes in land use at the Western Treatment Plant Werribee, Victoria</a>	2008/4221	Controlled Action	Post-Approval	In feature area
<a href="#">City Of Greater Geelong Mosquito Control Program 2021-2030, Vic</a>	2020/8782	Controlled Action	Further Information Request	In feature area
<a href="#">Demolition of structures at RAAF Williams - Point Cook</a>	2019/8514	Controlled Action	Assessment Approach	In feature area
<a href="#">Development of Shipping Container Storage Facility</a>	2005/2161	Controlled Action	Completed	In feature area
<a href="#">Extension of Mountain View basalt quarry by 490 hectares (Stage 2)</a>	2004/1590	Controlled Action	Post-Approval	In feature area
<a href="#">Geelong Salt Fields Urban Renewal Project</a>	2012/6630	Controlled Action	Assessment Approach	In feature area
<a href="#">Industrial Development, Burns Road</a>	2004/1820	Controlled Action	Post-Approval	In feature area
<a href="#">Mixed Residential Development, Homestead Road</a>	2006/2819	Controlled Action	Post-Approval	In buffer area only
<a href="#">Mosquito Control</a>	2005/2132	Controlled Action	Post-Approval	In feature area
<a href="#">Motocross Track and Associated Infrastructure</a>	2009/4956	Controlled Action	Completed	In feature area
<a href="#">Port Phillip Bay Channel Deepening</a>	2002/576	Controlled Action	Post-Approval	In feature area

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
<b>Controlled action</b>				
<a href="#">Removal of the Bellman Hangars Due to Structural Deterioration</a>	2008/4251	Controlled Action	Completed	In feature area
<a href="#">Viva Energy Gas Terminal Project</a>	2020/8838	Controlled Action	Assessment Approach	In feature area
<a href="#">Western Treatment Plant Environment Improvement Project (post Effluent Reuse Stage 2)</a>	2002/688	Controlled Action	Post-Approval	In feature area
<a href="#">Wyndham Cove marina and residential development</a>	2004/1331	Controlled Action	Post-Approval	In feature area
<b>Not controlled action</b>				
<a href="#">Biogas Utilisation Facility</a>	2000/100	Not Controlled Action	Completed	In buffer area only
<a href="#">Bluff Heights Estate Stages 2 to 4</a>	2003/1047	Not Controlled Action	Completed	In feature area
<a href="#">Construction of a pressure sewer pipeline beneath the Werribee River</a>	2009/4918	Not Controlled Action	Completed	In feature area
<a href="#">Construction of the Edgars Road Extension, from Childs Road, Lalor to Cooper Street, Epping</a>	2003/1135	Not Controlled Action	Completed	In buffer area only
<a href="#">Conversion of the North Western Victoria rail system from broad gauge to standar</a>	2002/657	Not Controlled Action	Completed	In feature area
<a href="#">develop 8.37 ha industrial subdivision</a>	2005/2190	Not Controlled Action	Completed	In feature area
<a href="#">Effluent Reuse Stage 2</a>	2001/273	Not Controlled Action	Completed	In buffer area only
<a href="#">Expansion and upgrade of Biogas Utilisation Facilities at the Western Treatment</a>	2005/2183	Not Controlled Action	Completed	In feature area
<a href="#">Extension of Mountain View basalt quarry by 113 hectares (stage one)</a>	2004/1591	Not Controlled Action	Completed	In feature area
<a href="#">Geelong Bypass Sections 1 &amp; 2</a>	2005/2097	Not Controlled Action	Completed	In feature area
<a href="#">Golflinks Road Residential Development &amp; Water Storage Facility at Barwon Heads</a>	2004/1793	Not Controlled Action	Completed	In buffer area only
<a href="#">Grahams Reserve Landscaping &amp; Rehabilitation Program</a>	2003/955	Not Controlled Action	Completed	In feature area
<a href="#">Grahams Reserve Weed and Pest Animal Control Program</a>	2002/625	Not Controlled Action	Completed	In feature area



Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
<b>Not controlled action</b>				
<a href="#">Grahams Wetland Reserve walking bay trail connection, south of Werribee, Vic</a>	2013/7097	Not Controlled Action	Completed	In feature area
<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="#">Industrial Development, Burns Road, Marshall Court</a>	2004/1901	Not Controlled Action	Completed	In buffer area only
<a href="#">Installation of a 35 metre telecommunications facility at Jirrahlinga Animal San</a>	2003/1151	Not Controlled Action	Completed	In buffer area only
<a href="#">Multi-species Aquaculture Enterprise</a>	2001/404	Not Controlled Action	Completed	In feature area
<a href="#">Point Cooke Coastal Trail</a>	2001/324	Not Controlled Action	Completed	In feature area
<a href="#">Point Cooke recreational trail Stage 2</a>	2002/593	Not Controlled Action	Completed	In feature area
<a href="#">Port Phillip Channel Deepening Project - Trial Dredge Program</a>	2005/2164	Not Controlled Action	Completed	In feature area
<a href="#">Regional Fast Rail Project - Geelong Country Works Package</a>	2002/577	Not Controlled Action	Completed	In feature area
<a href="#">Reinstate rail link between Footscray Rd and Webb Dock</a>	2004/1438	Not Controlled Action	Completed	In buffer area only
<a href="#">Removal of Sludge to Produce Dried Biosolids, Western Treatment Plant</a>	2002/890	Not Controlled Action	Completed	In feature area
<a href="#">Residential Development, 409 The Esplanade, St Leonards</a>	2006/2950	Not Controlled Action	Completed	In feature area
<a href="#">Residential development 360-438 Point Cook Road, Point Cook, Vic</a>	2014/7381	Not Controlled Action	Completed	In buffer area only
<a href="#">Sanctuary Lakes Recycled Water Main between Altona Treatment Plant to the Sanctu</a>	2007/3645	Not Controlled Action	Completed	In buffer area only
<a href="#">Sludge handling and biosolids management - Western Treatment Plant</a>	2006/2620	Not Controlled Action	Completed	In feature area
<a href="#">The Development of Werribee River Regional Park</a>	2009/5246	Not Controlled Action	Completed	In feature area

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
<b>Not controlled action</b>				
<a href="#">Wastewater Treatment System Upgrade</a>	2004/1420	Not Controlled Action	Completed	In feature area
<a href="#">Western Treatment Plant Groyne and Beach Works</a>	2001/185	Not Controlled Action	Completed	In feature area
<a href="#">Western Treatment Plant Stage 2 Augmentation Project, Werribee, Vic</a>	2015/7515	Not Controlled Action	Completed	In feature area
<a href="#">WTP 115E Lagoon Seawall, Western Treatment Plant WTP, Werribee Victoria</a>	2019/8577	Not Controlled Action	Completed	In feature area
<a href="#">WTP Effluent Discharge Improvement Works (Multiple Outlets), Werribee, Vic</a>	2015/7619	Not Controlled Action	Completed	In feature area
<b>Not controlled action (particular manner)</b>				
<a href="#">'Waterhaven Estate' Residential Development (Stages 3 &amp; 4)</a>	2003/1149	Not Controlled Action (Particular Manner)	Post-Approval	In feature area
<a href="#">205W Sludge Drying Pan Refurbishment, Melbourne Water Western Treatment Plant, Vic</a>	2013/6939	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only
<a href="#">Class C Recycled Water Supply Reliability Improvement at Western Treatment Plant</a>	2011/5921	Not Controlled Action (Particular Manner)	Post-Approval	In feature area
<a href="#">Controlled Burn, Understorey Clearance and Removal of UXO</a>	2003/1030	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only
<a href="#">Corio Bay Channel Safety Adjustment Program</a>	2011/6208	Not Controlled Action (Particular Manner)	Post-Approval	In feature area
<a href="#">Gas Pipeline</a>	2006/3093	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only
<a href="#">Geelong Bypass Section 3</a>	2005/2099	Not Controlled Action (Particular Manner)	Post-Approval	In feature area
<a href="#">INDIGO Marine Cable Route Survey (INDIGO)</a>	2017/7996	Not Controlled Action (Particular Manner)	Post-Approval	In feature area

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
<b>Not controlled action (particular manner)</b>				
<a href="#">Maintenance Dredging Program</a>	2009/4953	Not Controlled Action (Particular Manner)	Post-Approval	In feature area
<a href="#">Maintenance Dredging Program 2012-21 in Port of Melbourne</a>	2012/6332	Not Controlled Action (Particular Manner)	Post-Approval	In feature area
<a href="#">Point Cook Coastal Park Bay Trail Construction (Stage 3, nth part)</a>	2008/4023	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only
<a href="#">Point Wilson Explosives Area Waterside Infrastructure Remediation</a>	2012/6376	Not Controlled Action (Particular Manner)	Post-Approval	In feature area
<a href="#">Rail Upgrades at Geelong Port Project</a>	2010/5363	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only
<a href="#">Regional Fibre Optic Project (RFOP)</a>	2003/913	Not Controlled Action (Particular Manner)	Post-Approval	In feature area
<a href="#">Trial Growing Mullet in Western Treatment Plant Sewage Ponds</a>	2009/4812	Not Controlled Action (Particular Manner)	Post-Approval	In feature area
<a href="#">Upgrade of capacity and supporting infrastructure, Western Treatment Plant</a>	2009/5036	Not Controlled Action (Particular Manner)	Post-Approval	In feature area
<a href="#">Western Lagoon Saltmarsh Restoration, Western Treatment Plant, Werribee, VIC</a>	2009/4831	Not Controlled Action (Particular Manner)	Post-Approval	In feature area
<a href="#">Western Treatment Plant Stage 1 Augmentation, Werribee, Vic</a>	2014/7313	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only
<b>Referral decision</b>				
<a href="#">'Waterhaven Estate' residential development (final stage)</a>	2004/1607	Referral Decision	Completed	In feature area
<a href="#">Aviators Field Precinct Structure Plan</a>	2020/8786	Referral Decision	Referral Decision	In feature area

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
<b>Referral decision</b>				
<a href="#">Proposed land subdivision for industrial development</a>	2009/4943	Referral Decision	Completed	In buffer area only

## Biologically Important Areas

Scientific Name	Behaviour	Presence	Buffer Status
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### Seabirds

#### [Ardena tenuirostris](#)

Short-tailed Shearwater [82652] Foraging Known to occur In feature area

#### [Morus serrator](#)

Australasian Gannet [1020] Foraging Known to occur In feature area

#### [Pelagodroma marina](#)

White-faced Storm-petrel [1016] Foraging Known to occur In feature area

#### [Pelecanoides urinatrix](#)

Common Diving-petrel [1018] Foraging Known to occur In feature area

#### [Thalassarche cauta cauta](#)

Shy Albatross [82345] Foraging likely Likely to occur In feature area

### Whales

#### [Eubalaena australis](#)

Southern Right Whale [40] Known core range Known to occur 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 2**

### **Victorian Biodiversity Atlas Listed Species**

## Victorian Biodiversity Atlas

This Appendix contains the VBA Search that lists species observation within the Geelong Arm region. The search was completed for the categories Conservation status “EPBC”, “FFG” and “Victorian Advisory List” for the categories “Marine”, “Aquatic Invertebrates”, “Marine Birds” and seagrass species of genus *Heterozostera* (also known as *Zostera*).

If a conservation status is available, the status is presented as follow.

Under the FFG Act 1988 the species status is classified as:

- L listed (categories include Extinct; Extinct in the wild; Critically endangered; Endangered; Vulnerable; Conservation dependent)
- X Rejected

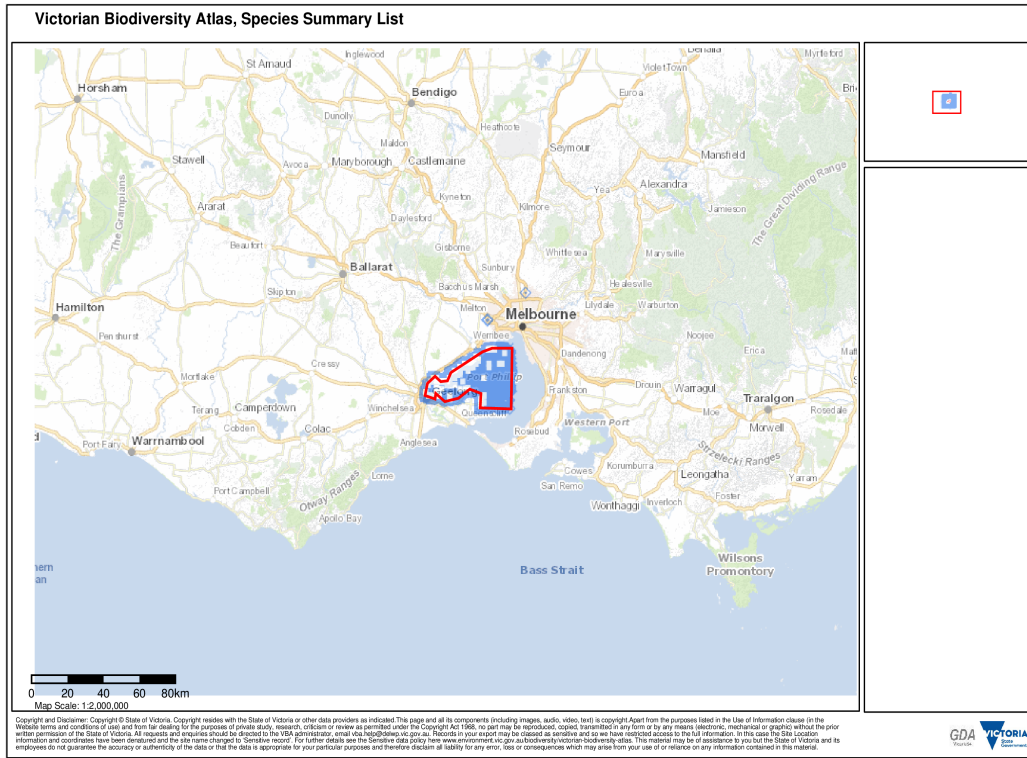
Under the EPBC Act 1999 the species status is classified as:

- EX Extinct under the EPBC Act 1999.
- CR Critically Endangered under the EPBC Act 1999.
- EN Endangered under the EPBC Act 1999.
- NT Near threatened under the EPBC Act 1999.
- VU Vulnerable under the EPBC Act 1999.

Under the Victorian Advisory List the species status is classified as:

- ex Extinct
- rx Regionally Extinct (vertebrate fauna only)
- ew Extinct in the wild (vertebrate fauna only)
- cr Critically endangered
- en Endangered
- vu Vulnerable
- r Rare (flora only)
- nt Near threatened (fauna only)
- dd Data deficient (fauna only)
- k Poorly known (flora only)

**Victorian Biodiversity Atlas, Species Summary List**  
(Date: 22/04/2022 12:30 PM)



**Selected Area**

Type: User Polygon Value: POLYGON ((144.702493 -38.19987,144.707288 -38.131951,144.636471 -38.111498,144.563819 -38.154161,144.477684 -38.19987,144.702493 -38.19987))

**Common Filter**

Scientific Name :  
 VBA Taxon ID :  
 Taxon Level : Species  
 Other Agency Codes :  
 Date Since : (dd/mm/yyyy)

Common Name :  
 Conservation Status : EPBC, FFG, Victorian Advisory List  
 Taxon Type :  
 Discipline : Marine  
 Date To : (dd/mm/yyyy)

Last Review Date:01 Apr 2022

Taxon ID	Scientific Name	Common Name	FFG Status	Conservation Status	Discipline	Taxon Origin	Short Name	Count of Sightings	Last Record
11543	Arctophoca forsteri	Long-nosed Fur Seal	Vulnerable	vu	Marine, Terrestrial fauna, Coastal			1	29/04/2019
11546	Mirounga leonina	Southern Elephant Seal		VU	Marine, Terrestrial fauna, Coastal			9	13/01/2005
11561	Eubalaena australis	Southern Right Whale	Endangered	EN en	Marine, Terrestrial fauna, Coastal			9	11/08/2018
11572	Balaenoptera edeni	Bryde's Whale			Marine, Terrestrial fauna, Coastal			1	25/07/1968
11575	Megaptera novaeangliae australis	Southern Humpback Whale	Critically Endangered	cr	Marine, Terrestrial fauna, Coastal			16	16/11/2018
11617	Tursiops australis	Burrnun Dolphin	Critically Endangered	cr	Marine, Terrestrial fauna, Coastal			14	27/04/2013
11830	Arctophoca tropicalis	Subantarctic Fur Seal		EN	Marine, Terrestrial fauna, Coastal			1	14/08/1996
12011	Lepidochelys olivacea	Pacific (Olive) Ridley		EN	Marine, Terrestrial fauna, Coastal			1	22/06/1974
12013	Dermodochelys coriacea	Leathery Turtle	Critically Endangered	EN cr	Marine, Terrestrial fauna, Coastal			2	19/03/2017
15096	Australomedusa bayllyi	Brackish Jellyfish	Endangered	en	Marine, Terrestrial fauna, Coastal			1	01/01/1971
15259	Thyone nigra	Sea-cucumber species	Endangered	en	Marine, Terrestrial fauna, Coastal			3	01/01/1960
501578	Halophila australis	Paddle Weed			Flora, Marine		Halop aust	1	05/04/2014
502980	Ruppia tuberosa	Tuberous Seataassel			Flora, Marine		Rupp tube	3	19/12/2000

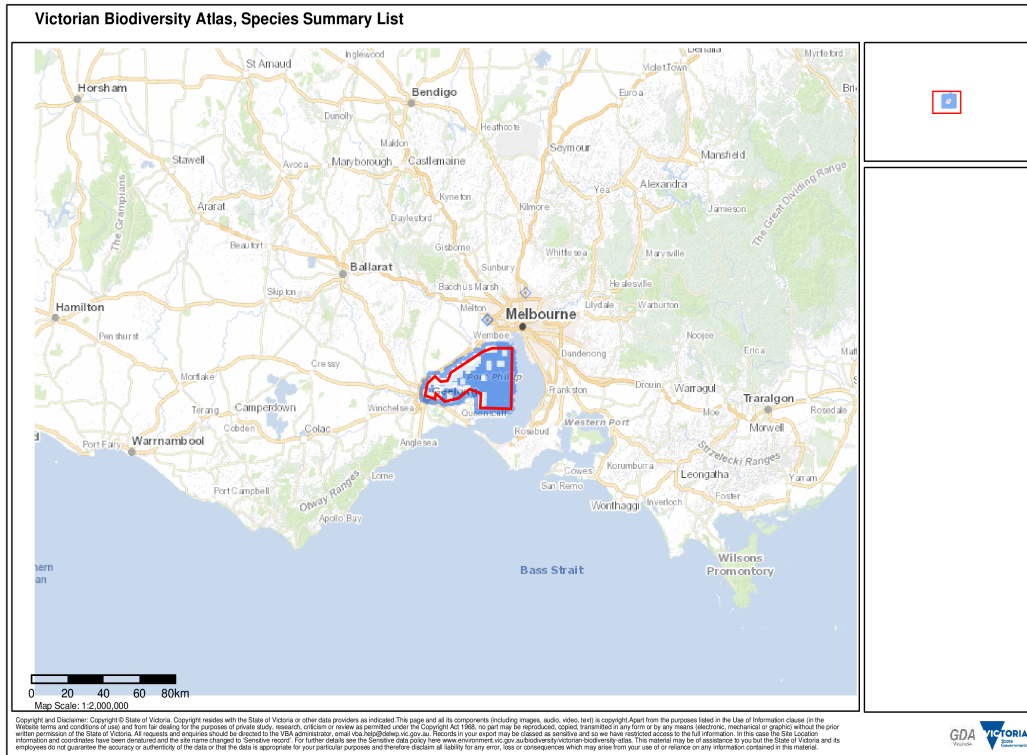
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**Victorian Biodiversity Atlas, Species Summary List**  
(Date: 22/04/2022 12:34 PM)



**Selected Area**

Type: User Polygon Value: POLYGON ((144.702493 -38.19987,144.707288 -38.131951,144.636471 -38.111498,144.563819 -38.154161,144.477684 -38.19987,144.702493 -38.19987))

**Common Filter**

Scientific Name :	Common Name :
VBA Taxon ID :	Conservation Status : EPBC, FFG, Victorian Advisory List
Taxon Level : Species	Taxon Type : Aquatic inverts
Other Agency Codes :	Discipline :
Date Since : (dd/mm/yyyy)	Date To : (dd/mm/yyyy)

Last Review Date:01 Apr 2022

Taxon ID	Scientific Name	Common Name	FFG Status	Conservation Status	Discipline	Taxon Origin	Short Name	Count of Sightings	Last Record
15253	Athanopsis australis	Southern Hooded Shrimp	Endangered en		Aquatic invertebrates, Aquatic fauna, Terrestrial fauna, Coastal			2	03/04/1995

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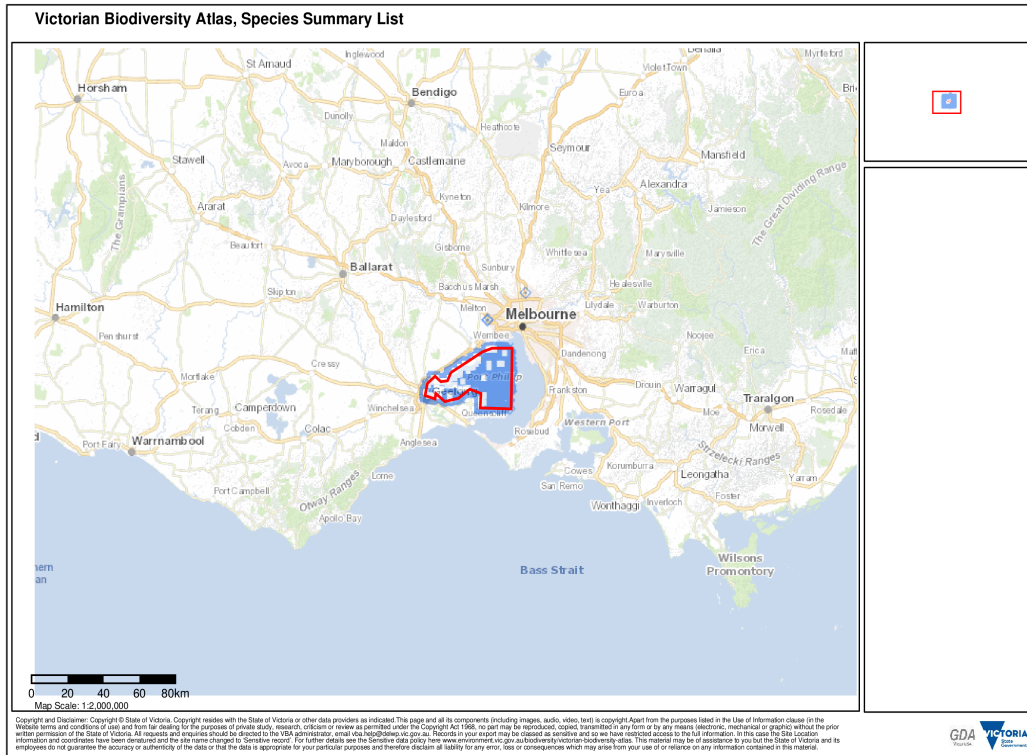
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**Victorian Biodiversity Atlas, Species Summary List**  
(Date: 22/04/2022 12:36 PM)



**Selected Area**

Type: User Polygon Value: POLYGON ((144.702493 -38.19987,144.707288 -38.131951,144.636471 -38.111498,144.563819 -38.154161,144.477684 -38.19987))

**Common Filter**

Scientific Name :	Common Name :
VBA Taxon ID :	Conservation Status : EPBC, FFG, Victorian Advisory List
Taxon Level : Species	Taxon Type : Marine birds
Other Agency Codes :	Discipline :
Date Since : (dd/mm/yyyy)	Date To : (dd/mm/yyyy)

Last Review Date:01 Apr 2022

Taxon ID	Scientific Name	Common Name	FFG Status	Conservation Status	Discipline	Taxon Origin	Short Name	Count of Sightings	Last Record
10065	Pelagodroma marina	White-faced Storm-Petrel	Endangered	en	Terrestrial fauna, Coastal			10	25/02/2020
10085	Pelecanoides urinatrix	Common Diving-Petrel			Terrestrial fauna, Coastal			4	29/10/2018
10088	Thalassarche melanophris	Black-browed Albatross		VU	Terrestrial fauna, Coastal			2	17/08/1986
10089	Thalassarche carteri	Indian Yellow-nosed Albatross	Endangered	VU en	Terrestrial fauna, Coastal			1	01/09/1979
10929	Macronectes giganteus	Southern Giant-Petrel	Endangered	EN en	Terrestrial fauna, Coastal			6	01/09/1985
10937	Macronectes halli	Northern Giant-Petrel	Endangered	VU en	Terrestrial fauna, Coastal			2	17/08/1986

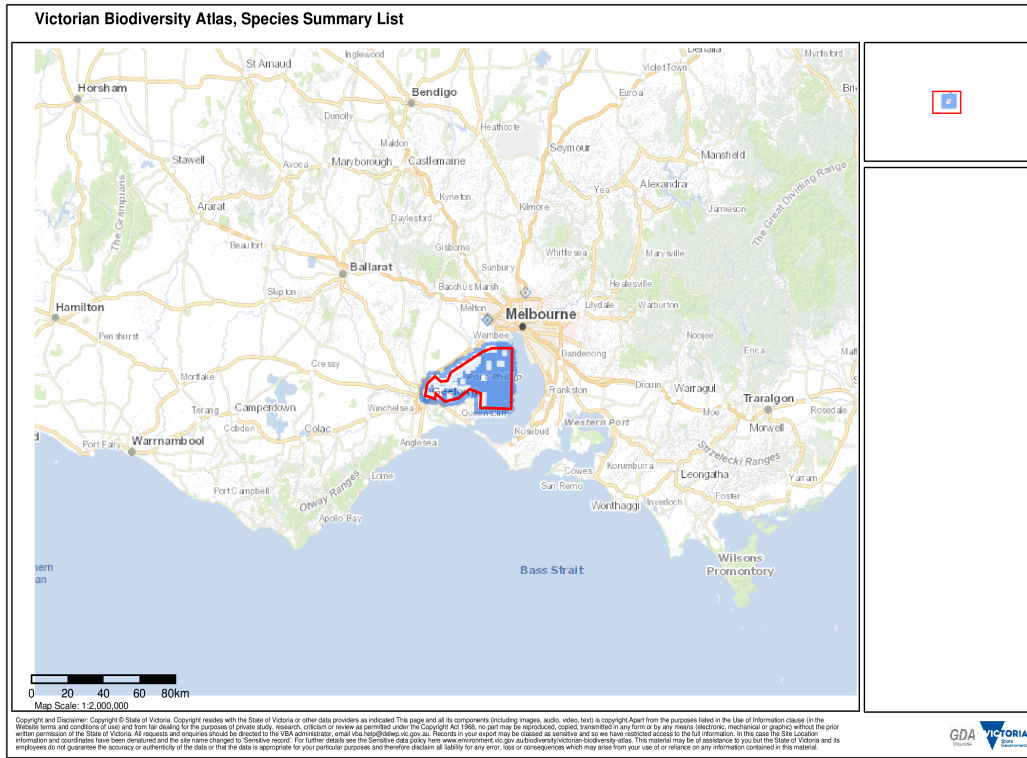
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**Victorian Biodiversity Atlas, Species Summary List**  
(Date: 22/04/2022 12:29 PM)



**Selected Area**

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**Common Filter**

Scientific Name : Heterozostera	Common Name :
VBA Taxon ID :	Conservation Status : EPBC, FFG, Victorian Advisory List
Taxon Level : Species	Taxon Type :
Other Agency Codes :	Discipline :
Date Since : (dd/mm/yyyy)	Date To : (dd/mm/yyyy)

Last Review Date:01 Apr 2022

Taxon ID	Scientific Name	Common Name	FFG Status	Conservation Status	Discipline	Taxon Origin	Short Name	Count of Sightings	Last Record
501660	Heterozostera tasmanica	Eelgrass	Endangered	en	Flora		H'zost tas	4	15/01/2011
507763	Heterozostera nigricaulis	Australian Grass-wrack	Endangered	en	Flora		H'zost nig	4	23/03/2010

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