

Attachment 1 - Preliminary marine ecology report

Star of the South Offshore Wind Farm Project EES referral



STAR OF THE SOUTH MARINE ECOLOGY REPORT

Marine Ecology Report

EEN19051.001
Star of the South Marine
Ecology Report
Rev 3.0
31 March 2020


REPORT

Document status

Version	Purpose of document	Authored by	Reviewed by	Approved by	Review date
1.0	Draft for Client Review	ESa	RMc/DDi	P. Pickett	25/02/20
2.0	Issued for use	ESa	RMc	P. Pickett	19/03/20
3.0	Issued for use	ESa	RMc	P.Pickett	31/03/20

Approval for issue

P. Pickett



31 March 2020

This report was prepared by RPS within the terms of RPS' engagement with its client and in direct response to a scope of services. This report is supplied for the sole and specific purpose for use by RPS' client. The report does not account for any changes relating the subject matter of the report, or any legislative or regulatory changes that have occurred since the report was produced and that may affect the report. RPS does not accept any responsibility or liability for loss whatsoever to any third party caused by, related to or arising out of any use or reliance on the report.

Prepared by:

RPS

Emma Samson
Managing Scientist

Level 2, 27-31 Troode Street
West Perth WA 6005

T +61 8 9211 1111
E emma.samson@rpsgroup.com.au

Prepared for:

Star of the South Wind Farm Pty Ltd

Martina Gassner
Environment and Approvals Manager (marine)

Level 30, 55 Collins Street
Melbourne VIC 3000

T +61 477 028 128
E mgassner@starofthesouth.com.au

Contents

ACRONYMS, ABBREVIATIONS AND TERMS	V
EXECUTIVE SUMMARY	1
1 INTRODUCTION	5
1.1 Project Overview	5
1.2 Purpose of this Report	5
2 LEGISLATIVE CONTEXT	6
3 DESCRIPTION OF THE PROJECT	9
3.1 EPBC Act Referral	9
3.2 EE Act Referral.....	10
4 EXISTING CONDITIONS	11
4.1 Method of Studies Undertaken.....	11
4.1.1 Sources of Information.....	11
4.1.2 Likelihood of Occurrence	11
4.2 Existing Conditions – Commonwealth Referral.....	12
4.2.1 Regional Overview.....	12
4.2.2 Hydrology.....	12
4.2.3 Coastal processes	13
4.2.4 Seabed Characteristics.....	13
4.2.5 Protected Areas	14
4.2.6 Biologically Important Areas	15
4.2.7 Benthic Environment.....	15
4.2.8 Marine Invertebrates and Fish	16
4.2.9 Marine Mammals and Turtles	19
4.2.10 Birds.....	27
4.3 Existing Conditions – Victorian Referral.....	32
4.3.1 Victorian Marine Protected Areas.....	32
4.3.2 Nationally Important Wetlands.....	33
4.3.3 Australian Marine Parks.....	33
4.3.4 Victorian Marine Assets	33
4.3.5 Biologically Important Areas	34
4.3.6 Coastal processes	34
4.3.7 Hydrology.....	34
4.3.8 Benthic Environment.....	35
4.3.9 Marine Invertebrates and Fish	37
4.3.10 Marine Mammals and Turtles	39
4.3.11 Birds.....	42
4.4 Planned Baseline Surveys	45
4.4.1 Overview	45
4.4.2 Benthic Ecology	45
4.4.3 Fish Ecology	45
4.4.4 Marine Mammals	46
4.4.5 Seabird and Shorebirds	46
5 ASSESSMENT OF POTENTIAL IMPACTS – OVERVIEW	47
5.1 Overview of Potential Impacts.....	47
5.2 Impact Assessment Studies.....	56
6 ASSESSMENT OF POTENTIAL SIGNIFICANT IMPACTS – COMMONWEALTH MATTERS.....	57
6.1 Wetlands of International Importance	57
6.2 Listed threatened ecological communities	59

REPORT

6.3	Listed threatened species	59
6.3.1	Critically endangered and endangered species	59
6.3.2	Vulnerable species	64
6.4	Listed migratory species	68
6.5	Commonwealth marine area	70
7	ASSESSMENT OF POTENTIAL IMPACTS – VICTORIAN MATTERS	74
8	MANAGEMENT AND MITIGATION	85
9	CONCLUSION	86
10	REFERENCES	89

Tables

Table 2.1	Legislation relevant to the assessment of potential impacts	6
Table 4.1	Likelihood of occurrence within the referral area	12
Table 4.2	List of threatened and migratory fish species relevant to the referral area	17
Table 4.3	List of threatened and migratory marine mammal species relevant to the referral area	19
Table 4.4	List of threatened and migratory marine reptile species relevant to the referral area	25
Table 4.5	List of threatened and migratory seabird species relevant to the referral area	27
Table 4.6	List of threatened and migratory shorebird species relevant to the referral area	29
Table 4.7	List of threatened and migratory land bird species relevant to the referral area	31
Table 4.8	Victorian marine assets near the referral area	33
Table 4.9	Threatened marine invertebrate species	37
Table 4.10	Threatened fish species	38
Table 4.11	Threatened marine mammal species	40
Table 4.12	Threatened seabird species	42
Table 4.13	Threatened shorebird species	43
Table 4.14	Threatened land bird species relevant to the referral area	45
Table 5.1	Overview of potential impacts to benthic habitats	47
Table 5.2	Overview of potential impacts to invertebrates and fish	48
Table 5.3	Overview of potential impacts to marine mammals	50
Table 5.4	Overview of potential impacts to marine turtles	52
Table 5.5	Overview of potential impacts to birds	54
Table 6.1	Significant impact assessment for wetlands of international importance	57
Table 6.2	EPBC Act listed critically endangered and endangered species	59
Table 6.3	Significant impact assessment for critically endangered and endangered species	59
Table 6.4	EPBC Act listed vulnerable species	64
Table 6.5	Significant impact assessment for vulnerable species	64
Table 6.6	EPBC Act listed migratory species	68
Table 6.7	Significant impact assessment for migratory species	68
Table 6.8	Significant impact assessment for the Commonwealth marine area	70
Table 7.1	Referral criteria: individual potential environmental effects	74
Table 7.2	Referral criteria: a combination of two or more of the following types of potential effects on the environment that might be of regional or State significance	79

Appendices

Appendix A - Figures

Appendix B - PMST Results

Figures

Figure 1 Location of the referral area, including the Licence Area.....	2
Figure 2 Commonwealth and Victorian protected areas	3
Figure 3 Commonwealth Threatened Ecological Communities	4
Figure 4 Indicative map of habitat types in the region.....	5
Figure 5 Biologically Important Areas for white sharks in the vicinity of the referral area.....	6
Figure 6 Satellite track from Shark 57, a juvenile great white shark tagged in Ballina, NSW in 2016	7
Figure 7 Biologically Important areas for Pygmy Blue Whales and Southern Right Whales	8
Figure 8 Pygmy Blue Whale migration routes (DoE 2015c).....	9
Figure 9 Humpback Whale migration routes (TSSC, 2015a).....	10
Figure 10 Marine turtle sightings recorded by the South Australian Sea Turtle Project	11
Figure 11 Important areas for Australian and New Zealand Fur Seals	12
Figure 12 Biologically Important Areas for seabirds.....	13

ACRONYMS, ABBREVIATIONS AND TERMS

Abbreviation/Term	Definition
AC	Alternating Current
Advisory List	Advisory List of Threatened Invertebrate Fauna in Victoria
AFMA	Australian Fisheries Management Authority
AMSA	Australian Maritime Safety Authority
Benthic communities	Biological communities that live in or on the seabed.
Benthic habitat	The seabed substrates that benthic communities grow on or in.
BIA	Biologically Important Area
BMT WBM	British Maritime Technology (Winders, Barlow and Morrison)
Cetacean	A marine mammal group including whales and dolphins.
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DAWE	Department of Agriculture, Water and the Environment
DAWR	Department of Agriculture, Water and Resources
DELWP	Department of Environment, Land, Water and Planning
DoA	Department of Agriculture
DoE	Department of the Environment
DoEE	Department of the Environment and Energy
DPI	DPI Industries
DSE	Department of Sustainability and Environment
DSEWPaC	Department of Sustainability, Environment, Water, Population and Communities
ECC	Environment Conservation Council
EE Act	Environment Effects Act 1978
EES	Environment Effects Statement
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999
EVC	Ecological Vegetation Class
FFG Act	Flora and Fauna Guarantee Act
GEMS	Global Environmental Modelling System
GHG	Greenhouse gas
ha	hectare
IMS	Invasive Marine Species
km	kilometres
kV	kilovolt
LCC	Land Conservation Council
Licence Area	Exploration Licence Area, issued under an Exploration Licence granted by the Commonwealth Government in March 2019.
Marine invertebrates	Invertebrates that live in marine habitats. They comprise many groups of different organisms and occur from the sea surface to the seafloor and into the substrate.
m	metres
MARPOL	The International Convention for the Prevention of Pollution from Ships
MNES	Matters of National Environmental Significance
MNP	Marine National Park
NATPLAN	National Plan for Maritime Emergencies
NCRIS	National Collaborative Research Infrastructure Strategy
nm	nautical miles
NSWDPI	New South Wales Department of Primary Industries

REPORT

Abbreviation/Term	Definition
Pinniped	Marine mammal group including fur seals and sea lions.
PMST	Protected Matters Search Tool
PPE	personal protective equipment
SARDI	South Australian Research and Development Institute
SBT	southern bluefin tuna
SWIFFT	State Wide Integrated Flora and Fauna Teams
t	tonnes
TEC	Threatened Ecological Community
The project	The Star of the South Offshore Wind Farm
TSSC	Threatened Species Scientific Committee
UK	United Kingdom
VEAC	Victorian Environmental Assessment Council
WTGs	wind turbine generators

EXECUTIVE SUMMARY

Project Overview

Star of the South ('the project') comprises an offshore wind farm, supporting electricity transmission assets required to transfer energy generated by the wind farm to the existing network and modifications to existing ports and harbours required to support the construction and operation of the wind farm.

The project would be located within both Commonwealth and Victorian jurisdictions and it is therefore being referred under the *Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth)* ('EPBC Act') and the *Environment Effects Act 1978 (Vic)* ('EE Act').

This marine ecology report provides an assessment of the potential marine impacts associated with the offshore scope of the project for the purposes of informing and supporting the Commonwealth and Victorian referrals. Impacts associated with the onshore scope of the project, including onshore transmission infrastructure and modifications to existing ports and harbours, are assessed in the Onshore Ecology Report.

The offshore referral areas that are within the scope of this report are shown in Appendix A - Figures, Figure 1. Infrastructure within the offshore referral areas would consist of the subsea export cables, which would extend from the high water mark at the Victorian shoreline into Commonwealth waters, wind turbine generators ('WTGs') and foundations, subsea array cables, substation platforms and foundations.

A detailed description of the existing conditions related to the referral area for the EPBC Act is provided in Section 4.2 of this report and a description of the existing conditions within the referral area for the EE Act is provided in Section 4.3 of this report.

Impact Assessment Process

A desktop literature review of publicly available data sources (see Section 4.1) was conducted to identify and characterise the marine species and habitats listed under the EPBC Act and the *Flora and Fauna Guarantee Act 1988 (Vic)* ('FFG Act') that could occur within the offshore referral areas. The species and habitats within the Commonwealth referral area are described in Section 4.2 and in Section 4.3 for the Victorian referral area.

A 'likelihood of occurrence' category was assigned to each listed species that was identified as potentially occurring within the referral areas, based on the outcomes of the literature review and the advice of subject matter experts. The category assigned to each species was determined based on whether the species is known to occur in the area (or could possibly migrate through the area), the depth range of the species (whether a species could occur in Commonwealth or Victorian waters) and the habitat preferences of a species. The four categories for 'likelihood of occurrence' which have been used are Rare, Unlikely, Possible and Likely. Many species in the area are data deficient, in these cases the species were classified as 'Possible' with a 50 per cent chance of occurrence.

The environmental aspects associated with the routine installation, operation and decommissioning activities of the project, as well as those associated with unplanned events, were identified and the potential direct and indirect offshore ecological impacts associated with those aspects was determined. These environmental aspects and impacts are summarised in the tables in Section 5.1, along with the legislative and standard control measures that would be implemented for the project as a minimum.

The information provided in Sections 4 and 5 informed the assessment of significant impacts under the EPBC Act (Section 6), and significant effects under the EE Act (Section 7). These assessments were undertaken against the Commonwealth significant impact criteria for Matters of National Environmental Significance ('MNES'), and the Victorian referral criteria set out under the EE Act, respectively. The purpose of the assessments was to identify whether there was the potential for significant impact or effects based on the existing environment, proposed activities, potential direct and indirect impacts, and the legislative and standard control measures that would be implemented.

Commonwealth Matters

The following marine species and habitats listed as MNES under the EPBC Act were identified in the literature review as being relevant to the Commonwealth referral and were assessed for significant impact:

REPORT

- The Corner Inlet Ramsar site (listed as a wetland of international importance)
- The subtropical and temperate coastal saltmarsh threatened ecological community ('TEC') (listed as vulnerable) and 45 listed threatened species (six critically endangered, 11 endangered and 28 vulnerable species)
- 68 listed migratory species
- The Commonwealth marine area.

Section 6 of this report presents a detailed assessment of significant impacts.

Protected areas

Significant impacts to the Corner Inlet Ramsar site are considered unlikely. The Corner Inlet Ramsar site does not overlap with the referral area therefore direct effects associated with the proposed construction, operation and decommissioning activities would be unlikely. Indirect effects are possible as a result of installation activities for the subsea export cables and trenchless shore crossing, discharges from support vessels and unplanned events such as the introduction and establishment of invasive marine species or a fuel spill. Increased levels of sedimentation and turbidity in the water column from installation activities are likely to be localised and dissipate rapidly. With implementation of the legislative and standard control measures summarised in Section 5, cable installation works and vessel discharges would result in negligible impacts to the wetland and the Commonwealth marine area.

Indirect impacts as a result of shore crossing activities, or the physical presence of offshore infrastructure (such as WTG and substation platform foundations) in Commonwealth waters may result in local changes to the wave and current regime and sediment transport processes. It is not expected that these changes would result in significant impacts to the wetland, however this will require further assessment in the project environmental impact assessment.

As identified in the Matters of National Environmental Significance – Significant impact guidelines 1.1 (DoE, 2013), "listed ecological communities in the vulnerable category of ecological communities listed under the EPBC Act, are not matters of national environmental significance for the purposes of Part 3 of the EPBC Act". A detailed assessment of significant impact has therefore not been performed for the subtropical and temperate coastal saltmarsh TEC.

Fish and invertebrates

The outcomes of the assessment found that significant impacts to fish and invertebrate species or their habitat within the referral area would be unlikely, with the exception of the white shark *Carcharodon Carcharias* and Australian grayling *Prototroctes maraena*. These species are listed as vulnerable under the EPBC Act and it was determined it is likely that their area of occupancy could be reduced during the installation phase of the project. With respect to the white shark, the assessment also identified there was the potential for the project to: lead to a long-term decrease in the size of an important population, adversely affect or substantially modify habitat critical to the survival of the species, and to modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline. The referral area overlaps with a white shark breeding (nursery area) Biologically Important Area ('BIA') which may represent critical habitat under the Recovery Plan for the Great White Shark (DSEWPaC, 2013b). Habitat within the BIA could be affected by the installation of subsea infrastructure or unplanned activities such as spills.

It was also determined that there was the potential for significant impact to the white shark if its breeding cycle was disrupted. Project activities could have adverse impacts on white shark breeding behaviour within and near the referral area. Planned installation activities or unplanned activities such as spills could affect the abundance of prey species and the presence and abundance of the white shark within the referral area.

There is uncertainty regarding the extent to which these species use the referral area. Fish baseline surveys are planned which will provide more information to determine the presence or absence of these species and the habitats they use. Benthic habitat baseline surveys are also planned to provide additional information on the habitats that are representative of the referral area. This information would be used in the project environmental impact assessment to inform a more detailed assessment of the potential impacts on habitat and populations of these species.

Marine turtles

There are three species of marine turtles that could occur within the referral area, the loggerhead turtle *Caretta caretta*, leatherback turtle *Dermochelys coriacea* and green turtle *Chelonia mydas*. The referral area

does not support significant numbers of these species. With control measures in place significant impacts on these species is considered unlikely.

Marine mammals

The outcomes of the assessment found that significant impacts to marine mammal species or their habitat within the referral area would be unlikely, with the exception of the criteria associated with reducing the area of occupancy of the species. Significant impact was considered likely based on the expectation that during construction, marine mammals, particularly the pygmy blue whale *Balaenoptera musculus brevicauda* and southern right whale *Eubalaena australis* which are listed as critically endangered, could be displaced from areas they utilise for foraging, migration or resting due to underwater noise and vibration from foundation installation activities.

It is anticipated that the pygmy blue whale and southern right whale will show behavioural disturbance and displacement from the referral area and the surrounding areas during the construction period (particularly during the installation of foundations) and it is expected that these species would return to the area following installation activities. Given the area of displacement is likely to be small in relation to the wider available habitat and distribution of the species, it is not expected that this would lead to a long-term significant impact on populations. This will require further assessment in the project environmental impact assessment and underwater noise modelling and data from marine mammal baseline surveys will be used to inform this assessment.

Birds

Significant impacts to seabirds, shorebirds and migratory land birds were considered unlikely, with the exception of a few criteria. It is likely that the area of occupancy of listed threatened species would be reduced during the installation phase of the project and impacts associated with collision risk have the potential to lead to a long-term decrease in the size of a population or affect the breeding cycle of the population.

The installation activities and physical presence of the wind farm could affect migration paths, foraging activities and the passage of species to and from Corner Inlet and other breeding islands off Wilson's Promontory. Noise and vibration or night-time lighting (e.g. from vessels, turbines) could divert birds from their normal flight paths or displace them from foraging habitat within the referral area.

Operation of the turbines would result in the risk of collision, which may affect bird populations or disrupt breeding cycles. The level of impact associated with collision of birds is uncertain at this stage. Data from baseline surveys and collision risk modelling would be used to inform the project impact assessment. Based on assessments from offshore wind farms overseas, it is unlikely that the level of collision would have a significant impact on the population, however this will need to be assessed based on local species, their population trends, and the size and importance of the regional population in the project environmental impact assessment.

Commonwealth Marine Area

The project has the potential to have significant impact on the Commonwealth marine area, with the potential for a substantial adverse effect on a population of a marine species or cetacean (see Section 6.5).

Summary

The key receptors that could experience a significant impact as a direct or indirect result of the project is the white shark, Australian grayling, listed threatened and migratory species of marine mammals and listed threatened and migratory species of birds. Other species could be adversely affected, however significant impacts on those species is considered unlikely.

Victorian Matters

The marine species and habitats listed under the FFG Act that were identified as key receptors that could experience a significant effect as a direct or indirect result of the project are the critical habitats for the white shark and the shy albatross *Thalassarche cauta*. Other listed species of fish and invertebrates, marine mammals and birds, or their habitats, could be adversely affected, however significant effects are considered unlikely.

It was determined there was the potential for the project to result in the loss of critical habitat or potential critical habitat for the white shark and shy albatross. The assessment of the remaining Victorian referral criteria concluded the project would have 'no' significant effects or would be 'unlikely' to result in significant environmental effects.

The referral area overlaps with a white shark breeding (nursery area) BIA that may represent critical habitat under the Recovery Plan for the Great White Shark (DSEWPaC, 2013b). Habitat within the BIA could be affected by the installation of subsea infrastructure or unplanned activities such as spills. The extent of utilisation of the referral area by the white shark is currently uncertain. Fish baseline surveys are planned, which will provide more information to determine the presence or absence of these species within the referral area and the habitats they are currently using. This information would be used in the project environmental impact assessment to conduct a more detailed assessment of the potential impacts on their populations.

The shy albatross is managed under the National Recovery Plan for Threatened Albatrosses and Giant Petrels 2011-2016 (DSEWPaC, 2011b), which notes that waters south of 25 degrees latitude are "critical foraging habitat and where most of these species spend the majority of their foraging time". This area extends across southern Australia and is not limited to the referral area. It is acknowledged that there is uncertainty regarding the presence or absence of these species, and their use of habitat within and near the referral area. Seabird and shorebird baseline surveys are in progress to gather additional information on species presence and abundance. This information would be used in the project environmental impact assessment to conduct a more detailed assessment of the potential impacts on their populations.

1 INTRODUCTION

1.1 Project Overview

Star of the South ('the project') comprises an offshore wind farm, supporting electricity transmission assets required to transfer energy generated by the wind farm to the existing network and modifications to existing ports and harbours required to support the construction and operation of the wind farm. The project would supply renewable electricity to the Australian electricity market and play a key role in supporting Victoria's transition to a clean electricity supply.

The key components of the project are:

- Offshore wind assets, including wind turbine generators ('WTGs'), substructures installed on foundations and a network of subsea array cables connecting strings of WTGs together and connecting the WTGs to the offshore transmission assets.
- Offshore transmission assets, including substation platforms, substructures installed on foundations and subsea export cables to connect the wind farm to the Gippsland coast
- Onshore transmission infrastructure, including substations, to provide a connection to the National Electricity Market in the Latrobe Valley
- Existing port and harbour modifications to support project construction and operations.

The project would be located within both Commonwealth and Victorian jurisdictions. The offshore wind farm, connecting subsea array cables and offshore substation platforms would be located in Commonwealth waters, within the boundary of the Exploration Licence Area ('Licence Area') (issued under an Exploration Licence granted by the Commonwealth Government in March 2019), (Appendix A - Figures, Figure 1).

The subsea export cables would be located in the Licence Area, Commonwealth waters and Victorian coastal waters. The onshore transmission infrastructure would be located within the Wellington Shire and/or City of Latrobe. The proposed port and harbour modifications are located within the South Gippsland and/or Mornington Peninsula Shires.

1.2 Purpose of this Report

As the project is located both within Commonwealth and Victorian jurisdictions, it is being referred under the *Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth)* ('EPBC Act') and the *Environment Effects Act 1978 (Vic)* ('EE Act'). The purpose of this report is to assess the potential impacts associated with the offshore scope of the project to support and inform these referrals. Impacts associated with the onshore scope of the project, including onshore transmission infrastructure and modifications to existing ports and harbours, are assessed in the Onshore Ecology Report.

2 LEGISLATIVE CONTEXT

Table 2.1 summarises the key legislation that has been considered in the assessment of potential environmental impacts relevant to the project and the determination of control measures that would be applied to mitigate those impacts.

Table 2.1 Legislation relevant to the assessment of potential impacts

Legislation	Description	Project relevance
Commonwealth		
<i>Australian Maritime Safety Authority Act 1990</i>	Promotes maritime safety and protects the marine environment from pollution from ships and other environmental damage caused by shipping. Provides for a national search and rescue service and facilitates the preparation and response to marine pollution events such as oil spills. Administered by the Commonwealth Australian Maritime Safety Authority ('AMSA').	Response to marine pollution events from vessels associated with the project would be undertaken in accordance with the National Plan for Maritime Emergencies ('NATPLAN'). The roles and responsibilities of Commonwealth, Victorian authorities and industry are outlined in the NATPLAN. The AMSA is the designated control agency for oil spills from vessels in Commonwealth waters.
<i>Biosecurity Act 2015</i>	Regulates vessels entering Commonwealth waters with regard to ballast water and hull fouling to prevent the introduction, establishment or spread of diseases or pests (e.g. invasive marine species ('IMS')). Administered by the Commonwealth Department of Agriculture ('DAWE').	Star of the South would be required to implement control measures that reduce the likelihood of the introduction and establishment of invasive marine species and respond to any incursions that are the result of project activities. Ballast water would be managed in accordance with Ballast Water Management Requirements (DAWR, 2017) and anti-fouling in accordance with the Anti-fouling and In-water Cleaning Guidelines (DoA/DoE, 2015)
<i>Environment Protection and Biodiversity Conservation Act 1999</i>	Protects Matters of National Environmental Significance ('MNES') in relation to actions impacting on Commonwealth marine waters. Administered by the Commonwealth Department of Agriculture, Water and the Environment ('DAWE').	Star of the South have considered the MNES that could be directly or indirectly affected by the project and assessed the potential for significant impacts on MNES. The outcomes of the assessment are detailed in Section 6 of this report.
<i>Navigation Act 2012</i>	Regulates vessel-related activities in Commonwealth waters and gives effect to relevant international conventions for maritime issues where Australia is a signatory. The Act promotes the safety of life at sea, safe navigation and marine pollution prevention. Administered by the AMSA.	Commercial vessels associated with the project would be subject to the requirements of this Act, such as adhering to safe navigation and pilotage practices, having the appropriate pollution prevention certificates in place and ensuring the required navigational aids are in place.
<i>Protection of the Sea (Prevention of Pollution from Ships) Act 1983</i>	Relates to the protection of the sea from pollution by oil and other substances discharged by vessels and invokes certain requirements of the International Convention for the Prevention of Pollution from Ships ('MARPOL') relating to the discharge of substances such as noxious liquid substances, sewage, garbage or air pollution. Administered by the AMSA.	Vessels associated with the project would be required to adhere to the invoked discharge standards of MARPOL including Annex I (Oil), Annex II (Noxious liquid substances), Annex III (Harmful packaged substances), Annex IV (Sewage), Annex V (Garbage) and Annex VI (Air emissions). The reporting of marine pollution incidents would also be required for project vessels.
<i>Underwater Cultural Heritage Act 2018</i>	Protects the heritage values of shipwrecks and relics of shipwrecks older than 75 years, sunken aircraft and other types of underwater cultural heritage. Administered by the DAWE.	There are currently no known shipwrecks or other cultural heritage features within the referral area. However if any are identified during geophysical, geotechnical surveys or marine habitat baseline surveys, Star of the

Legislation	Description	Project relevance
Victorian		
<i>Emergency Management Act 2013</i>	Establishes governance arrangements for emergency management in Victoria. Administered by Emergency Management Victoria.	South would be required to notify the DAWE and adhere to the requirements set out in the Act, such as meeting any minimum distance requirements.
<i>Environment Effects Act 1978</i>	Establishes a process for assessing the potential environmental effects of a proposed development and enables statutory decision-makers to determine whether a project with potentially significant environmental effects should proceed. Administered by the Department of Environment, Land, Water and Planning ('DELWP').	The project's emergency management plans would be integrated with the governance arrangements described in the Act.
<i>Environment Protection Act 1970</i>	Creates a legislative framework for the protection of the environment in Victoria having regard to the principles of environment protection. Administered by the Environment Protection Authority Victoria.	Star of the South has assessed the potential for significant environmental effects that could directly or indirectly occur as a result of the project. The outcomes of the assessment are detailed in Section 7 of this report.
<i>Fisheries Act 1995</i>	Provides a legislative framework for the regulation, management and conservation of Victorian fisheries including aquatic habitats. Administered by the Victorian Fisheries Authority.	The project is required to incorporate the following principles: <ul style="list-style-type: none"> • Integration of economic, social and environmental consideration • Precautionary principle • Intergenerational equity • Conservation of biological diversity and ecological integrity • Improved valuation, pricing and incentive mechanism • Shared responsibility • Product stewardship • Wastes hierarchy • Enforcement.
<i>Flora and Fauna Guarantee Act 1988</i>	Regulates the conservation of threatened species and communities and the management of potentially threatening processes. It includes requirements for: <ul style="list-style-type: none"> • Listing threatened species, communities and threats to native species. • An overarching strategy for Victoria's biodiversity. • The declaration of habitat critical to the survival of native plants and animals. • Permits for activities that could harm threatened plants and fish and communities. Administered the DELWP.	The project is required to consider impacts to fish species listed under this Act as Protected Aquatic Biota. The project may require a permit to undertake fish surveys.
<i>Marine and Coastal Act 2018</i>	Provides an integrated approach to protect and manage the marine and coastal environment. This Act also: <ul style="list-style-type: none"> • Provides for integrated and co-ordinated policy, planning, management, decision- 	Star of the South is required to assess the potential impacts to threatened species and communities listed under this Act and the project may require a Permit to Take Protected Flora/Fauna.
		The project may require consent to undertake works on marine and coastal Crown land and would be required to align with requirements of any local coastal and marine management plans applicable to the referral area.

Legislation	Description	Project relevance
	<p>making and reporting across catchment, coastal and marine areas.</p> <ul style="list-style-type: none"> Establishes objectives and guiding principles for ecologically sustainable planning, management and decision-making. <p>Administered by the DELWP.</p>	
<i>Marine Safety Act 2010</i>	<p>Provides for safe marine operations in Victoria amongst other provisions by imposing a range of safety duties, providing for the regulation and management of the use of, and navigation of vessels in Victorian waters and provisions regarding port management and pilotage.</p> <p>Administered by Maritime Safety Victoria.</p>	<p>Vessel contractors would be required to implement a range of safety duties and ensure masters are licensed and specific navigational and pilotage requirements are adhered to.</p>
<i>National Parks Act 1975</i>	<p>Provides for the establishment of national parks, state parks, marine national parks and coastal parks.</p> <p>Administered by the DEWLP.</p>	<p>There are two marine national parks ('MNPs') located in the vicinity of the referral area: Ninety Mile Beach MNP and Corner Inlet MNP.</p>
<i>Pollution of Waters by Oil and Noxious Substances Act 1986</i>	<p>Provides for the protection of the sea and certain waters from pollution by oil and other noxious substances and to implement MARPOL.</p> <p>Administered by the Environment Protection Authority Victoria.</p>	<p>Vessels associated with the project would be required to adhere to the requirements of this Act, including the implementation of MARPOL requirements.</p>
<i>Wildlife Act 1975</i>	<p>Establishes procedures to protect and conserve wildlife, allows for the sustainable use of and access to wildlife; and regulates the conduct of persons engaged in wildlife related activities.</p> <p>Administered by the DELWP.</p>	<p>This project may require management authorisation for fauna handling.</p>

3 DESCRIPTION OF THE PROJECT

As the project would be located within both Commonwealth and Victorian jurisdictions, the following sections describe the key components of the project and outline which are relevant to the EPBC Act and EE Act referral areas.

3.1 EPBC Act Referral

For the EPBC Act referral, all key components of the project are relevant because of their potential to impact MNES, including Commonwealth marine areas. This includes:

- Offshore wind assets, which comprise:
 - Up to 400 WTGs
 - Substructures each installed on foundations
 - A network of buried or mechanically protected (in areas where burial is not possible) subsea array cables connecting strings of WTGs together and connecting the WTGs to the offshore transmission assets.
- Offshore transmission assets, which comprise:
 - Up to four Alternating Current ('AC') substation platforms collecting the generated electricity and transforming the electricity for transmission to shore. These substation platforms may also be linked to one another via connecting subsea array cables
 - Substructures each installed on foundations
 - Up to 13 AC subsea export cables, buried or mechanically protected (in areas where burial is not possible), transmitting the electricity from the wind farm to the shore.
- Onshore transmission assets, which comprise:
 - Underground cable/combined underground cable and overhead powerlines
 - Up to four AC substations
 - Connection to the National Electricity Market in the Latrobe Valley.
- Existing port and harbour modifications, which comprise:
 - Use of the Port of Hastings, Barry Beach Marine Terminal and Port Anthony and/or other ports in the region for construction and operation of the project
 - Landside development at ports to prepare land for the manufacturing and storage facilities for the wind farm
 - Minor upgrades to the existing jetty at the Port of Hastings may be required, which could include works in the water in the immediate vicinity of the existing jetty
 - At Barry Beach Marine Terminal, structural improvements to a quay wall may be required, however these works are anticipated to be undertaken from the landside area.

More detail on the proposed action can be found in Section 1.2 of the Star of the South Offshore Wind Farm EPBC Act Referral.

For the purposes of this report, the offshore area relevant to the EPBC Act referral is shown in Appendix A - Figures, Figure 1 and is the area within which the offshore components of the Project would be located. Infrastructure within the offshore EPBC Act referral area would consist of the offshore wind assets and offshore transmission assets listed above. If marine works are required at the Port of Hastings, impacts will be assessed in the project impact assessment.

Impacts associated with the onshore components of the EPBC Act referral, including land-based modifications to existing ports and harbours, are assessed in the Onshore Ecology Report.

3.2 EE Act Referral

For the EE Act referral, the impacts within Victorian jurisdiction are relevant. Impacts would typically be limited to those caused by components that are located within Victorian jurisdiction, which include:

- Offshore transmission assets that occur within three nautical miles ('nm') of shore (e.g. export cables connecting the offshore infrastructure to the shore)
- Onshore transmission assets
- Existing port and harbour modifications.

There may be some instances where the infrastructure located within Commonwealth jurisdiction has the potential to result in indirect impacts on receptors within the Victorian jurisdiction. These have been assessed where relevant.

More detail on the project can be found in Part 1 of the Star of the South Offshore Wind Farm EE Act Referral.

For the purposes of this report, the offshore area relevant to the EE Act referral is shown in Appendix A - Figures, Figure 1. Infrastructure within the offshore EE Act referral area would consist of the offshore transmission assets that occur within three nautical miles ('nm') of shore. If marine works are required at the Port of Hastings, impacts will be assessed in the project impact assessment.

Impacts associated with the onshore components of the EE Act referral, including land-based modifications to existing ports and harbours are assessed in the Onshore Ecology Report.

4 EXISTING CONDITIONS

This section provides a description of the existing environment within the EPBC Act referral area and the EE Act referral area and surrounding areas. This information supports the content required in the EPBC Act and EE Act referral forms and has been used to inform the assessment undertaken to determine the potential impacts of the project. The impact assessment is summarised in Sections 6 to 7 of this report.

4.1 Method of Studies Undertaken

4.1.1 Sources of Information

The description of the existing environmental conditions in the referral areas, as presented in the following sections, has been informed by a desktop review of publicly available data sources. The information and data sources below were used to establish or infer a likelihood of occurrence for listed species (see Section 4.1.2). Where regional data on a species known to occur in the Gippsland marine environment was available from the literature (such as spatial and seasonal distributions, and presence of biologically important activities e.g. breeding, spawning, nesting, feeding, migration), this information was used to draw conclusions on the likelihood of the species being present within the referral areas. The potential presence of habitat important for a species, and/or whether the referral areas or surrounds could potentially support biologically important activities was also determined or inferred. Key data gaps have been identified where there is insufficient baseline data/information to support the evaluation of potential impacts from the project.

The information presented in this section was collated from a desktop review of the following sources:

- Peer reviewed scientific papers and studies
- Publications from relevant organisations, including but not limited to:
 - Australian Fisheries Management Authority (AFMA)
 - South Australian Research and Development Institute (SARDI)
 - Fisheries Research and Development Corporation
 - West Gippsland Catchment Management Authority
 - Commonwealth Threatened Species Scientific Committee (TSSC)
- South-east marine regional profile (DoE, 2015a)
- Databases, including but not limited to:
 - EPBC Act Protected Matters Search Tool (PMST) (DoEE, 2019a) (accessed 28/01/2020)
 - Species Profile and Threats Database (DoEE, 2019b) (accessed 11/12/2019)
 - Victorian Biodiversity Atlas (DELWP, 2019a) (accessed 10/12/2019)
 - Atlas of Living Australia (CSIRO, 2019) (accessed 10/12/2019)
 - Victorian Government 'State Wide Integrated Flora and Fauna Team' (SWIFFT, 2019) (accessed 06/01/2020)
 - South Australian Sea Turtle Project (Deakin University, 2019) (accessed 11/12/2019)
 - NatureKit (DELWP, 2020) (accessed 21/02/2020)
 - Australian Wetlands Database (DEWR, 2005) (accessed 21/02/2020).

As relevant, a description of the data sets/sources, the spatial (geographical) and temporal (seasonal) extents and the currency (validity/age) of the data used to inform the description of the existing environment is provided below.

4.1.2 Likelihood of Occurrence

A 'likelihood of occurrence' category was assigned to each listed species that was identified as potentially occurring within the referral areas, based on the outcomes of the literature review and the advice of subject

matter experts. The category assigned to each species was determined based on whether the species is known to occur in the area (or could possibly migrate through the area), the depth range of the species (whether a species could occur in Commonwealth or Victorian waters) and the habitat preferences of a species. The four categories for 'likelihood of occurrence' which have been used are Rare, Unlikely, Possible and Likely. There is a deficiency of data for many species in the area. In these cases a conservative approach was adopted and the species were classified as 'Possible' with a 50 per cent chance of occurrence.

Table 4.1 Likelihood of occurrence within the referral area

Likelihood	Description
Likely	It is more probable than not that the species or community could occur in any year and within the referral area (>50 per cent)
Possible	It is equally probable that the species or community could or could not occur in any year and within the referral area (50 per cent)
Unlikely	It is less probable than not that the species or community could occur in any year and within the referral area (<50 per cent)
Rare	It is improbable that the species or community could occur in any year and within the referral area (<5 per cent). The species or community is only theoretically possible or would require exceptional circumstances to occur.

4.2 Existing Conditions – Commonwealth Referral

4.2.1 Regional Overview

For the purposes of this document and assessment under the EPBC Act, the referral area is defined in Appendix A - Figures, Figure 1.

The Commonwealth waters of the referral area are located within the South-east Marine Region of Australia (DoE, 2015b). This region covers approximately 1,632,402 km² and incorporates Commonwealth waters from New South Wales around Tasmania to Kangaroo Island in South Australia. The region is characterised by low nutrient concentrations and low primary productivity, with localised areas of high productivity associated with upwelling events. The region extends over the continental shelf and encompasses a wide range of water depths and seafloor features.

A total of 46 marine species protected under the EPBC Act are known to, or are likely to, occur in the South-east Marine Region and a further 94 may occur (DoE, 2015b). Many historic shipwrecks occur within Commonwealth waters of the South-east Marine Region, along with 14 Commonwealth marine reserves and one World Heritage Property (Macquarie Island between Antarctica and New Zealand). The closest National Heritage Place is the "Australian Alps National Parks and Reserves", located onshore 83 km inland of the referral area.

The socio-economic values of the South-east Marine Region include more than four million people living along the coastline adjacent to the region who rely on the sea, directly or indirectly (DoE, 2015b). Commercial fishing, recreational fishing and aquaculture contribute economically to the region. Indigenous occupation of coastal areas dates back >40,000 years. The region also supports offshore oil and gas production, shipping transport and port activities and is being explored for carbon capture and storage potential.

4.2.2 Hydrology

The referral area does not include any interaction with onshore hydrological features.

The referral area is exposed to swell from the south-west through to the south-east and locally generated wind waves from all directions. Mean significant wave heights are in the order of 2-3 m (Hemer et al., 2007), with larger waves at times of local or remote storms (generating long-range swells). Wave disturbance to the seabed in the deeper parts of the referral area would occur only during extreme wave conditions, while frequent wave disturbance would occur in the inshore, shallower parts of the referral area.

Regional currents are eastward in winter (driven by prevailing westerly winds) and westward in summer (prevailing south-easterly winds) (Gibbs et al., 1986). Local metocean conditions are also likely to be influenced by winter storms. Ebb and flood tides produce longshore currents of 0.1-0.2 m/s in the referral area.

The depth range across the Commonwealth referral area is 0-55 m. The shallowness of the water means that these waters more rapidly warm in summer and cool in winter than other waters of the South-east Marine Region (DoE, 2015b). Seasonal and transient upwellings are important ecological features of the South-east Marine Region. Nutrient concentrations in Bass Strait are low overall (mesotrophic to oligotrophic) but rise in winter due to inputs from deeper waters, particularly from upwelling along the eastern Bass Strait shelf break (Gibbs et al., 1986). The proximity of the referral area to the continental shelf break (70 nm / 130 km south east) means it has higher nutrient availability than other parts of Bass Strait and is therefore more productive (particularly from a fisheries perspective).

Corner Inlet is a tide dominated estuary, with an average daily tidal range of about 2 m (DSEWPaC, 2011). The tidal range in the Bass Strait and the extensive shallow areas in Corner Inlet mean that more than 60 per cent of the inlet volume is exchanged over an average tidal cycle.(DSEWPaC, 2011).

Water quality in the area generally meets Victorian standards for water quality based on State Environment Protection Policy objectives. Rare exceedances are generally attributable to increased contaminants from terrestrial run-off after storm activity. Victoria's marine water quality is strongly related to local activities, geomorphology (e.g. exposure, coastline, seabed or embayment type) and sediment types (e.g. finer sediments remain in the water column longer) (Commissioner for Environmental Sustainability, 2009). Levels of turbidity are particularly affected by high energy events such as storms, which can either directly re-suspend seabed sediments in the water column or increase sediment input from river catchments through rainwater run-off.

4.2.3 Coastal processes

The Victorian coast is a dynamic system, affected by the tides, wave energy and weather (e.g. strong winds or storms). Different landforms, such as sandy shores, rocky shores/headlands, mud flats or estuaries are dependent on coastal processes, and hence changes in coastal processes can have implications for coastal features. Around 90 per cent of the Gippsland coast is comprised of sandy beaches and dune systems, which are more susceptible to erosion than the rocky headlands that make up the remaining 10 per cent of the coastline (DELWP, 2015). Waterways and bays are also susceptible to accretion or sedimentation, which can affect the existing environmental condition (e.g. smothering of seabed habitats), affect safety of waterway users and reduce access.

4.2.4 Seabed Characteristics

The referral area lies within the Gippsland Basin, which is located about 200 km east of Melbourne and covers an area of 46,000 km², of which two thirds are located offshore. This area is composed of a series of massive sediment flats, interspersed with small patches of reef, bedrock and consolidated sediment. Sandy plains are occasionally broken by low ribbons of reef, which formed as shorelines or sand dunes during ice ages when the sea level was lower than today.

The seabed is characterised by a variety of sediment types that are associated with tidal currents and wave energy. Nearshore sediments consist of coarse sands with isolated areas of gravels, shells and pebbles, and become progressively finer with distance from shore. Sediments can be grouped generally into three megafacies dominated either by quartzose sand (inner shelf and around islands in Bass Strait), relict carbonate particles (mid shelf and nearshore islands in Bass Strait) or Holocene biogenic carbonate (inner to outer shelf) (Jones & Davies, 1983).

Video observations of the Bass Strait inshore areas indicate that the seabed consists of symmetrical wave generated sandy ripples, becoming shelly in the troughs as the depth increases. Further offshore, a change to an irregular bed occurs near the 35 to 40 m depth contour. Finer, muddy sands occur further offshore in the midshelf regions (50-70 m water depth, NCRIS, 2020). The higher mud component is due to the seaward transport of finer grained sediment from the high energy inner to middle shelf. Unconsolidated sediments of quartzose sand cover the mostly flat seabed of the inner Gippsland Shelf (Bax & Williams, 2001; Jones & Davies, 1983).

Sedimentation in the Gippsland Basin is generally low due to the small supply from rivers and the relatively low productivity of carbonate. Sedimentation rates are estimated at 50 to 160 mm per 100 years. In the Gippsland Basin, seabed material is predominantly calcium carbonate comprised of calcarenite maerls and marine shales. Seaward, the sediments are composed primarily of sand (92 per cent) and silt/clay (8 per cent) (GEMS, 2005).

4.2.5 Protected Areas

4.2.5.1 Wetlands of International Importance – Corner Inlet Ramsar Site

The referral area lies adjacent to the north-eastern edge of the Corner Inlet Ramsar site boundary (from McLoughlins Beach to north of Woodside Beach) (Appendix A - Figures, Figure 2).

The Corner Inlet Ramsar site is listed as a Wetland of International Importance under the Ramsar Convention. It is the southern-most marine embayment and intertidal system of mainland Australia, covering an area of 67,186 ha and is located approximately 200 km south-east of Melbourne (DSEWPaC, 2011). The site is listed as nationally important under the Directory of Important Wetlands in Australia (see Section 4.3.2) and includes all of Corner Inlet Marine and Coastal Park and most of the Nooramunga Marine and Coastal Park, as well as the area in between these two reserves (Department of Environment and Primary Industries, 2013). The site also includes the Corner Inlet MNP (Appendix A - Figures, Figure 2).

Private land within the site exists on Sunday Island, Dog Island, Little Dog Island and Bullock Island.

The Corner Inlet Ramsar site consists of a submerged plain covered by sand or mud flats with well-developed seagrass beds, and large sand islands (DSEWPaC, 2011). Deeper channels support tidal exchange over the flats and the areas between the islands.

The inlet's importance is due to its large geographical area, high productivity, the wetland types present (particularly the extensive subtidal seagrass beds), internationally significant populations of a number of aquatic and semi-aquatic species and abundant flora and fauna (including significant proportions of the total global population of a number of waterbird species).

Important natural features of the Corner Inlet Ramsar site include:

- Several key wetland mega-habitat types including seagrass, intertidal sand or mud flats, mangroves, saltmarshes and permanent shallow marine water. Four species of seagrass occur in Corner Inlet, although the area contains the only extensive meadows of broad-leafed seagrass *Posidonia australis* in Victoria (DSEWPaC, 2011; ParksVic, 2002; O'Hara et al, 2002). Saltmarsh and mangrove communities are of limited distribution (DSEWPaC, 2011).
- A high diversity of bird species with 32 wader species recorded. The extensive tidal flats are important feeding areas for waders at low tide. It is estimated that nearly 50 per cent of the overwintering migratory waders in Victoria occur in Corner Inlet.
- Important sites for waterbird breeding which are found on the sand barrier islands.
- Support of nationally threatened fauna species including the orange-bellied parrot, growling grass frog, fairy tern and Australian grayling.
- Outstanding fish habitat values that contribute to the health and sustainability of the region.
- Seagrass beds and subtidal channels which support more than 390 species of marine invertebrates (dominated by polychaetes, amphipods, gastropod and bivalve molluscs and echinoderms).

4.2.5.2 Threatened Ecological Communities

An ecological community is a naturally occurring group of native plants, animals and other organisms that are interacting in a unique habitat (DoEE, 2019a). Threatened ecological communities (TECs) are protected under the EPBC Act. Low resolution data obtained from the DoEE (DoEE, 2020) indicates that the referral area could overlap with the Subtropical and Temperate Coastal Saltmarsh TEC (Figure 3) which is identified in the PMST results (Appendix B - PMST Results) as a vulnerable TEC. However, finer scale data from the University of Tasmania (Ierodiaconou, 2017) indicates there is no overlap. The extent of overlap would be further investigated as part of the project environmental impact assessment.

The Subtropical and Temperate Coastal Saltmarsh is generally found along coastal areas under regular or intermittent tidal influence (DSEWPac, 2013a). Saltmarsh typically occurs in the upper-intertidal zone and consists mainly of salt-tolerant vegetation (halophytes) including grasses, herbs, sedges, rushes and shrubs. The saltmarsh ecological community is inhabited by a wide range of infaunal and epifaunal invertebrates, as well as low and high tide visitors such as prawns, fish and birds (DSEWPac, 2013a). In Corner Inlet saltmarsh communities occur as a band along the landward edge of the mangrove zone and are common along the northern mainland shore of Corner Inlet (DSEWPac, 2011).

4.2.6 Biologically Important Areas

Biologically Important Areas (BIAs) are spatially defined areas where aggregations of individuals of a species are known to display biologically important behaviour such as breeding, foraging, resting or migration (DAWE, 2020).

As described further in the sections below, the BIAs that overlap with the referral area are:

- White shark *Carcharodon Carcharias*: one breeding (nursery area) BIA and three distribution BIAs (Appendix A - Figures, Figure 5). The foraging BIA for this species does not overlap the referral area being approximately 5 km south towards Wilson's Promontory (see Table 4.2).
- Pygmy blue whale *Balaenoptera musculus brevicauda*: one possible foraging area BIA and one distribution and migration BIA (Appendix A - Figures, Figure 7). The foraging BIA is large, extending along the southern coast of Australia from the eastern Great Australian Bight to offshore of Eden and Merimbula in New South Wales (see Table 4.3).
- Southern right whale *Eubalaena australis*: the migration and resting on migration BIA and known core range BIA (Appendix A - Figures, Figure 7) (see Table 4.3).
- Seabirds: three foraging BIAs (Appendix A - Figures, Figure 12): one for the short-tailed shearwater *Puffinus tenuirostris*, one for six species of albatross and one for the common diving-petrel *Pelecanoides urinatrix*. The little penguin *Eudyptula minor* foraging BIA is located on Curtis Island, 63 km south-east of the referral area. The nearest breeding location of seabirds is on Rag Island (12.5 km to the south-west), in the Seal Island group of islands where the fairy prion *Pachyptila turtur*, short-tailed shearwater, common diving-petrel and Pacific gull *Larus pacificus* breed (see Table 4.5).

4.2.7 Benthic Environment

The benthic environment comprises benthic communities and habitats. Benthic communities are biological communities that live in or on the seabed and include photosynthetic taxa such as algae, seagrass, mangroves and corals, or animals such as molluscs, sponges and worms (EPA, 2016). Benthic habitats are the seabed substrates that benthic communities grow on or in and range from unconsolidated sands to hard substrates such as limestone.

There are no threatened ecological communities in the referral area. This section describes only those benthic communities within Commonwealth marine waters. Benthic communities within Victorian waters of the referral area are described in Section 4.3.8.

There is little existing benthic ecological data specific to the referral area. A general understanding of benthic ecology in the referral area is described below.

The habitats that may occur within the referral area include:

- Subtidal offshore rocky reefs with kelp and other macroalgae
- Subtidal soft sediments.

Subtidal reefs occur either as extensions of rocky shores or as isolated offshore reefs. They are scattered throughout Bass Strait waters, with the best-known reefs occurring between the beach and the 100 m depth contour. Consolidated hard substrates are known to include rocky reef (bedrock) and consolidated sediment (Advisian, 2017; Wilson & Poore, 1987), but may also include some biogenic hard substrate (such as consolidated shell or maerl beds). Rocky reef in the area is considered to be mostly low relief (one to two metres or less) calcarenite/limestone or other sedimentary rock. Consultation with members of the recreational and commercial fishing communities indicates that there are a number of rocky reefs and potential reefs within the referral area ("Snapper Reefs") (Appendix A - Figures, Figure 4).

The rocky reefs of southern Australia support regionally endemic marine flora and fauna, most of which are widely distributed across southern Australia.

Over 1,400 species of algae have been recorded from southern Australia, with 70 per cent endemic to the region (DSE, 2009). Only one genus of green algae, *Caulerpa* sp., commonly occurs on unconsolidated seabed in Victoria, but its presence, diversity and distribution in the referral area is unknown. Giant kelp *Macrocystis pyrifera* marine communities are not known to occur within the referral area.

The soft sediment substrates in deeper, subtidal waters can support diverse marine communities. Soft subtidal sediments commonly support seapens, ascidians, hydroids, bryozoans and large, diverse sponge gardens. The animals within the marine sediments are predominately polychaete worms and crustaceans. Subordinate groups include bivalves, brittle stars, holothurians, sea urchins, gastropods, nematodes and nemerteans.

4.2.8 Marine Invertebrates and Fish

4.2.8.1 Marine Invertebrates

Marine invertebrates comprise many groups of different organisms and occur from the sea surface to the seafloor and into the substrate. They represent the vast majority of marine biodiversity and include, for example, sponges, corals, bluebottles, worms, shells, sea urchins, starfish, crustaceans, sea cucumbers and nudibranchs. Their size ranges from tiny microscopic organisms to several metres in length, and they are diverse in form (DAWE, 2020c). There are no threatened marine invertebrates known to occur in the referral area. This section describes only those species within Commonwealth marine waters. As there is no site-specific information on marine invertebrates for the referral area, the below description is based on regional surveys.

Macroalgal communities are not common on subtidal reefs in east Gippsland, possibly due to exposure, poor light levels and abrasion by moving sand. A periodic upwelling between Lakes Entrance and Gabo Island (Parry et al., 1990) results in coastal waters being about five degrees Celsius colder than adjacent surface waters and may contribute to the distinctiveness of fauna off east Gippsland (LCC, 1993). For example, Parry et al. (1990) found high diversity and patchiness of benthos sampled off Lakes Entrance, where 353 species of infauna were recorded. Crustaceans (53 per cent), polychaetes (32 per cent) and molluscs (nine per cent) dominated the samples.

During CarbonNet's offshore habitat assessment in April 2017 in the waters off Golden Beach (CarbonNet, 2018), the following were identified:

- Isolated occurrences of *Pseudogorgia godeffroyi*, a soft coral found only in Victoria between McGauran's Beach and Delray Beach (ECC, 2000).
- A small patch of unmapped, flat low-profile offshore reef (seaward of the 30 m isobath) with no ledges or crevices, dominated by sponges and ascidians (such as stalked ascidian *Pyura spinifera*) and smaller bryozoans and hydroids. Offshore reefs at three sites were less than 0.5 m higher than the surrounding seabed, while the inshore reefs were approximately 0.5 m to 1.5 m higher than the surrounding seabed (at three sites).
- Live commercial scallops *Pecten fumatus* were present in low abundance at one site (at a water depth of 32 m) and dead scallops were observed at one site in 23 m water depth.

Marine invertebrates and associated habitats similar to those identified in CarbonNet's marine habitat assessment could be located in the referral area.

4.2.8.2 Fish

The PMST results identified a total of five threatened and/or migratory fish species protected under the EPBC Act in or within the vicinity of the referral area, as detailed in Table 4.2. Three are listed as threatened (vulnerable): the Australian grayling *Prototroctes maraena*, white shark and whale shark. Of the three threatened species, the white shark and whale shark *Carcharodon Carcharias* are also listed as migratory under the EPBC Act. The other species listed as migratory are the shortfin mako shark *Isurus oxyrinchus* and the porbeagle (mackerel) shark. A full list of species from the PMST results is presented in Appendix B - PMST Results.

Table 4.2 List of threatened and migratory fish species relevant to the referral area

Common Name	Scientific Name	EPBC Act Status		BIA within referral area	Likelihood of occurrence*
		Threatened	Migratory		
Australian grayling	<i>Prototroctes maraena</i>	Vulnerable	No	No	Possible (larval and juvenile only)
White shark	<i>Carcharodon Carcharias</i>	Vulnerable	Yes	Yes	Likely
Whale Shark	<i>Rhincodon typus</i>	Vulnerable	Yes	No	Rare
Shortfin mako shark	<i>Isurus oxyrinchus</i>	No	Yes	No	Possible
Porbeagle shark	<i>Lamna nasus</i>	No	Yes	No	Rare

* See Table 4.1 for likelihood of occurrence definitions.

4.2.8.2.1 Australian grayling

The Australian grayling is listed as vulnerable under the EPBC Act and is managed under the National Recovery Plan for the Australian Grayling (Backhouse et al., 2008). The species is diadromous, migrating between rivers, estuaries and coastal seas and is endemic to south-eastern Australia. Key threats identified in the National Recovery Plan for the Australian grayling (Backhouse et al., 2008) include barriers to movement (e.g. weirs, dams), river regulation, poor water quality and siltation in catchments, introduced freshwater fish, climate change, disease and fishing.

Spawning occurs in freshwater from late summer to winter. Newly hatched larvae drift downstream and out to sea, where they remain for approximately six to ten months, and their habitat preference at this point is unknown. Juveniles then return to the freshwater environment (around November of their first year), where they remain for the remainder of their lives (Backhouse et al., 2008). The Australian grayling predate upon small organisms, such as cladocerans (water fleas), insects, and algae (Backhouse et al., 2008).

Given the wide distribution and range of habitats used by the species throughout its life, the National Recovery Plan and National Conservation Values Atlas does not specify habitat that is critical to survival (i.e. BIAs) but some habitats such as spawning, refuge and juvenile habitats are possible to be limited in distribution in Australian waters.

Adult Australian grayling are not expected to occur in the referral area. However, both the Albert and Agnes rivers that flow into the nearby Corner Inlet have been identified as important rivers for this species (Backhouse et al., 2008). It is therefore Possible that individuals could occur in the referral area during the larval and juvenile life stage.

4.2.8.2.2 White shark

The white shark is listed as vulnerable and migratory under the EPBC Act and is managed under the Recovery Plan for the White Shark (DSEWPaC, 2013b).

Five BIAs within the vicinity of the referral area have been created for the protection of the white shark (Appendix A - Figures, Figure 5). A “shark nursery area” and two distribution BIAs overlap the referral area. The nursery BIA extends from the shoreline to the 50 m depth contour off the Gippsland coast and is likely to be frequented between the months of December and June (Holliday, 2003). The nursery area may represent critical habitat under the Recovery Plan for the Great White Shark (DSEWPaC, 2013b). One BIA is identified where foraging is known to occur in waters in close proximity to Australian sea lion and fur seal colonies offshore of Wilsons Promontory and islands in the Bass Strait.

The white shark is found in a variety of habitats, from close inshore to the outer continental shelf around reef and areas with high prey density such as pinniped colonies (DoE, 2019). Individuals predate on a variety of fauna including fish, marine mammals, invertebrates and seabirds. Smaller individuals (<2.7 m) feed primarily on fishes, while larger individuals are more likely to target marine mammals.

White sharks are highly vulnerable to overexploitation due to their low fecundity and rates of population increase (Holliday, 2003). The key threats are from fishing (including as bycatch) and shark control activities (Bruce & Bradford, 2012). Other threats include the illegal trade in white shark products, habitat modification, climate change (including changes in sea temperature, ocean currents and acidification) and ecotourism activities such as cage diving (DSEWPaC, 2013b).

Commonwealth Scientific and Industrial Research Organisation ('CSIRO') has been tagging and genetic sampling juvenile white sharks at Port Stephens in New South Wales since 2007, with this work continued by the NSW Department of Primary Industry (NSWDPI, 2018). Between 2015 – 2018 the NSWDPI and CSIRO tagged 62 juvenile and sub-adult white sharks between Tuncurry and Ballina in New South Wales as part of the Government's targeted shark attack mitigation campaign. Of the 62 sharks tagged 29 were tracked through the referral area (DPI, 2018). Many of these sharks were passing through the referral area as they migrated through to Tasmania, South Australia or New Zealand. However, 13 of the sharks spent extended periods of time in the Gippsland shark nursery area, as demonstrated by the track of one individual in Appendix A - Figures, Figure 6. The white shark is therefore Likely to occur in the referral area.

4.2.8.2.3 Whale shark

The whale shark is listed as vulnerable and migratory under the EPBC Act. Whale sharks are generally found in warmer oceanic waters where temperatures range from 21 to 25 degrees Celsius. They mainly occur in waters off the Northern Territory, Queensland and northern Western Australia. However, there have been isolated reports of immature male whale sharks from the south-eastern coast of New South Wales through to South Australia and the western fringe of the Great Australian Bight (Last & Stevens, 1994). Critical habitats identified in the Whale Shark Recovery Plan 2005-2010 (Department of Environment and Heritage, 2005) are the known seasonal aggregation sites, which are believed to be linked to local seasonal food availability. In Australia, whale sharks are known to aggregate at Ningaloo Reef and in the Coral Sea.

The likelihood of the whale shark occurring in or migrating through the referral area is rated as Rare due to the referral area being outside this species core range and the absence of critical habitat in the Gippsland region.

4.2.8.2.4 Shortfin mako shark

The shortfin mako shark is listed as migratory under the EPBC Act. The shortfin mako shark is an oceanic species known to occur in both tropical and temperate waters. It is widespread in Australian waters, occurring to water depths of at least 500 m. It is occasionally found inshore where the continental shelf is narrow. It is not normally found in waters below 16 degrees Celsius (Cailliet et al., 2009). They feed on fish and squid. Shortfin mako sharks are viviparous and females are believed to pup in the offshore waters of New South Wales year-round. Females reach breeding age around 18 years and males at eight years of age (Last & Stevens, 2009).

The Southern Shark Ecology Group from the SARDI in South Australia tagged several shortfin mako sharks offshore of Lakes Entrance and Portland from 2012-2015 to identify the migration paths and assess residency of the species within the Victorian fishery (Rogers & Bailleul, 2015). The study found that sharks tagged in western Victoria resided in Great Australian Bight and Bass Strait in summer, then moved north to the Coral Sea in the winter and spring (Rogers & Bailleul, 2015). The Gippsland region was not identified as an area of residency.

Shortfin mako sharks are likely to occur within the referral area during autumn and spring at various life cycle stages, hence the likelihood of occurrence rating for the shortfin-mako shark in the referral area is Possible.

4.2.8.2.5 Porbeagle shark

The porbeagle shark *Lamna nasus* is listed as migratory under the EPBC Act. This species is distributed worldwide, primarily in temperate waters. They occur from southern Queensland to south-western WA, mostly in the outer continental shelf in water depths of more than 1,000 m. The porbeagle shark is also occasionally found in coastal waters in the Northern Atlantic (Campana & Joyce, 2004), however residency in these areas is unlikely and this movement is not confirmed in Australia. Porbeagle shark predate upon bony fish and squid.

Porbeagle sharks are thought to give birth to live young in the winter months in deep water off Australia and New Zealand. However, their migrations and habitat use in Australia are not well known.

Due to the deep-water distribution of its life-history stages, the porbeagle shark the likelihood of occurrence rating within the referral area is determined to be Rare.

4.2.8.2.6 Other important fish species

A total of 29 species from the Syngnathidae family, consisting of seahorses, pipefishes and sea dragons are classified as Listed Marine Species under the EPBC Act. Fish in this family are often monogamous, breeding in the summer after extensive courtship rituals. The preferred prey items for syngnathids are small benthic and pelagic crustaceans, such as mysids, copepods, amphipods and shrimp (Bray & Thompson, 2017). These species are listed in the PMST results (Appendix B - PMST Results).

The blue warehou *Seriolella brama*, southern bluefin tuna *Thunnus maccoyii* and school shark *Galeorhinus galeus* are listed under the EPBC Act as conservation dependant and were identified by Atlantis and Fishwell (2019) as caught within the referral area by commercial fishers. These species and the redfish *Centroberyx affinis* are managed under stock rebuilding strategies by the AFMA. There are a further 29 species identified of commercial and recreational fishing importance that may occur within the referral area.

4.2.9 Marine Mammals and Turtles

4.2.9.1 Marine Mammals

The EPBC Act PMST results (Appendix B - PMST Results) identified eight cetaceans (marine mammals including whales and dolphins) that may occur within or migrate through the referral area as listed in Table 4.3. These marine mammal species are listed under the EPBC Act as either threatened or migratory. A further eight marine mammals are identified as listed marine species.

Table 4.3 List of threatened and migratory marine mammal species relevant to the referral area

Common Name	Scientific Name	EPBC Act Status		BIA within referral area	Likelihood of occurrence*
		Threatened	Migratory		
Blue whale	<i>Balaenoptera musculus</i>	Endangered	Yes	Yes – possible foraging, migration	Possible
Southern right whale	<i>Eubalaena australis</i>	Endangered	Yes	Yes – migrating/ resting on migration	Possible
Humpback whale	<i>Megaptera novaeangliae</i>	Vulnerable	Yes	No	Likely
Fin whale	<i>Balaenoptera physalus</i>	Vulnerable	Yes	No	Unlikely
Sei whale	<i>Balaenoptera borealis</i>	Vulnerable	Yes	No	Rare
Pygmy right whale	<i>Caperea marginata</i>	No	Yes	No	Rare
Dusky dolphin	<i>Lagenorhynchus obscurus</i>	No	Yes	No	Rare
Killer whale	<i>Orcinus orca</i>	No	Yes	No	Unlikely

*See Table 4.1 for likelihood of occurrence definitions.

The likely presence of key marine mammal species and habitats of importance are described below.

4.2.9.1.1 Blue Whale

Blue whales *Balaenoptera musculus* are the largest of all whales. At least two subspecies are found in Australian waters: the pygmy blue whale *Balaenoptera musculus breviceauda* and the Antarctic blue whale *Balaenoptera musculus intermedia*. Both are listed as endangered and migratory under the Commonwealth EPBC Act and are managed under the Blue Whale Conservation Management Plan (DoE, 2015c). They are characterised by differences in morphology, distribution, genetics and vocal behaviour (DoE, 2015c), and have overlapping but different spatial distributions. Both migrate between breeding grounds at lower latitudes, where mating and calving takes place during winter, and summer feeding grounds at higher latitudes. The extensive migration routes of both subspecies are not known to follow coastlines or any particular oceanographic features (Bannister et al., 1996). The referral area overlaps with a possible foraging area BIA and a migration BIA for pygmy blue whales (Appendix A - Figures, Figure 7), however there are no records of sightings in the referral area and only two sightings in the Gippsland region (Victorian Biodiversity Atlas) due to the limited studies that have been conducted.

The two subspecies of blue whales found in Australian waters are represented by three recognised and overlapping populations. The pygmy blue whales found along southern and western Australia have been

termed the Eastern Indian Ocean pygmy blue whales (McCauley et al., 2018). The pygmy blue whale species found in New Zealand waters and along the eastern and northern Australian coast are known as the New Zealand pygmy blue whales (Balcazar et al., 2015; McCauley et al., 2018). Antarctic blue whales found in Australian waters are known as the Antarctic blue whale population (DoE 2015c; McCauley et al., 2018).

Blue whales in Victoria have been shown to prefer water depths between 50-150 m within the Bonney Upwelling area off the Portland coast, with Gill et al. (2011) recording 78 per cent of sightings within this range. However, sightings in Australia have been recorded in waters as deep as 1,548 m (Gill et al., 2011). Pygmy blue whales migrating up the west coast tend to pass along the shelf edge at depths between 500-1,000 m (DoE 2015c; Double et al. 2014) (Appendix A - Figures, Figure 8). The migratory pattern of the New Zealand pygmy blue whale population on the east coast of Australia are not known (DoE, 2015c). Acoustic detections of New Zealand pygmy blue whale calls along the east coast of Australia, and elevated levels of underwater noise in frequency bands of their vocalisations, suggests that this population of blue whales may utilise the Tasman Sea year-round. Both New Zealand pygmy blue whales and Antarctic blue whales were detected in Bass Strait, with all three types present within a short time frame (three months) on at least one occasion (McCauley et al., 2018), highlighting the likely importance of Bass Strait to blue whales. Migratory pathways of Antarctic blue whales are less clear, however recordings suggest they travel along the west and south coasts between high latitudes in summer and low latitudes in winter (DoE, 2015c).

Abundance of pygmy blue whales have been estimated in Western Australia at between 532 to 1,754 individuals, based on data from the Perth Canyon from 1999/2000 to 2004/05 (DoE, 2015c). Although there are no known estimates of the New Zealand pygmy blue whale population, it is considered much smaller and probably in the region of 250 animals (R. McCauley pers comm., 2019). The Bass Strait is thought to be the westward extremity of their distribution and it is therefore concluded that the Gippsland is likely to be frequented only by relatively low numbers of New Zealand pygmy blue whale. The Antarctic blue whale southern hemisphere population was estimated at 2,280 (based on data collected between 1992/93 to 2003/4, (DoE, 2015c).

Blue whales are lunge feeders, feeding on dense aggregations of planktonic prey, such as krill (Acevedo-Gutiérrez et al., 2002; Butler et al., 2002). Australia has two known seasonal feeding aggregations of pygmy blue whales, supported by upwelling systems located at the Perth Canyon off WA, and the Bonney Upwelling and adjacent waters off South Australia and Victoria (>500 km west of the referral area) (Gill, 2002; Gill et al., 2011). Pygmy blue whales generally move from eastern Great Australian Bight waters in South Australia at the beginning of the upwelling season into Victorian waters during January to April/May, peaking in February (Gill et al., 2011). In addition, other less well-known anecdotal feeding areas include offshore of Eden and Merimbula off New South Wales (especially during October) (Butt, 2001).

Within and between-season movement of pygmy blue whales between the east and west coasts of Australia have also been confirmed via photo-identification, where individuals were seen to move between the Bonney Upwelling and the Perth Canyon feeding areas (Garcia-Rojas et al., 2018). Further, genetic similarities have been reported between individuals from these feeding areas (Attard et al., 2010), providing evidence of migration between the east and west coasts of Australia.

The likelihood of occurrence rating for the blue whale, including subspecies, within the referral area is determined to be Possible.

4.2.9.1.2 Southern Right Whale

Southern right whales are listed as endangered and migratory under the EPBC Act and managed under the Conservation Management Plan for the Southern Right Whale (DSEWPaC, 2012). The referral area is within the coastal range for southern right whales including a BIA for migration and resting on migration, which extends across the entire Gippsland coast extending out to the 3 nm boundary (Appendix A - Figures, Figure 7). This connecting BIA was identified from data collected during aerial and land-based surveys off the southern Australian coast. Little other information exists on when southern right whales may be present in the Gippsland area or how they are utilising the area.

The total Australian population is estimated to comprise 3,500 individuals (DSEWPaC, 2012). Currently considered one species, there are two discrete sub-populations of southern right whales: the 'western' subpopulation and the 'eastern' sub-population (Mackay et al., 2015), which are based on genetic variation (Carroll et al., 2015, 2011) and different rates of population increase and abundance (Bannister, 2017). The 'western' Australian subpopulation, which is estimated to include 2,195 individuals, occupies areas between Cape Leeuwin, Western Australia and Ceduna, South Australia (Right & Bannister, 2017). The 'eastern' sub-population consists of fewer than 600 individuals and can be found along the south eastern coast, as far

south as Tasmania but rarely further north than Sydney. The referral area is within the range of the 'eastern' subpopulation breeding population.

Southern right whales are found along the southern coast of Australia in winter and spring (Kemper et al., 1997). Winter is the peak time for southern right whale abundance (Ward et al., 2014), when calving adult females are known to frequent shallow, north-east trending bays over sandy bottoms (Bannister et al., 1996). In Australian coastal waters, southern right whales generally occur within 2 km of the coastline and tend to be distinctly clumped in aggregation areas (DSEWPac, 2012). Most aggregate in a relatively small range compared with the area of suitable habitat available.

Depth is the most important factor for habitat selection within aggregation areas. Calving takes place very close to the coast in Australia, usually in waters less than 10 m deep, (DSEWPac, 2012) and these nursery grounds are occupied from late April / May to October. Female-calf pairs generally stay within the calving ground for two to three months. Calving and nursery grounds for southern right whales are found off southern Western Australia, in the Great Australian Bight off the far west of South Australia and off Warrnambool in south-western Victoria, which is the closest breeding/aggregation site to the referral area (approximately 500 km west of the referral area). The BIA for migration and resting on migration (Appendix A - Figures, Figure 7) is considered habitat important for the recovery of the species given that females show calving site fidelity, and that site fidelity combined with a low reproductive rate make calving sites of important for species recovery (Carroll et al., 2015; Pirzl, 2008). There is no known breeding area within the referral area. Emerging aggregation areas comprising small but growing numbers of non-calving whales that regularly aggregate for short periods of time have also been identified in coastal waters off Peterborough, Port Campbell, Port Fairy and Portland in Victoria (DSEWPac, 2012).

The migratory paths of southern right whales between southern feeding areas in the sub-tropical front (below latitude 40 degrees south) and coastal calving areas in Australian waters are not well understood (DSEWPac, 2012). However, they are known to migrate annually along the eastern coastline from southern feeding grounds (below 40 degrees south), where they feed on copepods and krill, to breed, calve and rest in coastal southern Australian waters between late April / May and October.

Coastal connectivity on the Australian coast is important for southern right whales as individuals tend to use widely separated coastal areas within a season, indicating substantial coast-wide movement (DSEWPac, 2012; Pirzl, 2008). Although it is not clear where southern right whales approach and leave the Australian coast to/from offshore areas, there is a predominance of a westward movement in coastal habitat (Burnell, 2001; Kemper et al., 1997). Southern right whales are thought to be solitary during migration, accompanied by a dependent calf or occasionally a yearling offspring (DSEWPac, 2012).

Sightings of southern right whales off the Victorian coast have been documented by the State Wide Integrated Flora and Fauna Teams ('SWIFFT') network as part of the Southern Right Whale South-Eastern Australia Monitoring Project (SWIFFT, 2019b)(SWIFFT, 2019a). However, only a few sightings have been made in inshore waters in the Gippsland area (the closest sightings were of a female-calf pair, made from Wilson's Promontory (SWIFFT, 2019)) as the majority of the observer effort has been in western Victoria around the Warrnambool aggregation area. Records from the Warrnambool area suggest that the south-eastern southern right whale population is small, isolated and vulnerable compared to the western population.

The likelihood of occurrence rating for the southern right whale within the referral area is determined to be Possible.

4.2.9.1.3 Humpback Whale

Humpback whales *Megaptera novaeangliae* are listed as vulnerable and migratory under the EPBC Act. This species has two sub-populations occurring within Australian waters: the western population, known as Breeding Stock D, and the eastern population, known as Breeding Stock E1 (Schmitt et al., 2014). Animals from the west coast population are not expected to occur in east coast waters of the Gippsland. There are no BIAs for this species overlapping or near to the referral area.

Both the western and the eastern Australian humpback whale populations are recovering from industrial whaling. The eastern humpback whale population has been estimated at 14,522 individuals, which is smaller than the west coast population but is increasing at a similar rate of 10.9-11 per cent per year (Noad et al., 2011).

Humpback whales migrate annually along the east coast of Australia between their summer feeding grounds in Antarctica and their winter calving grounds off Queensland (Andrews-Goff et al., 2018). They head north

from about May to August, and south from about September to December in diffuse and irregular movements (TSSC, 2015). Humpback whales tend to migrate further offshore during their northward migration (Noad & Cato, 2007; Paterson et al., 1994), and travel much closer to shore when migrating southward, as many are cows with calves. The main migratory route is east of Bass Strait although a recent study in which 30 humpback whales were satellite tagged over three consecutive austral summers (2008/09, 2009/10, and 2010/11) found that many whales also travel through Bass Strait, at least when heading south (Andrews-Goff et al., 2018). Of importance, four of the tagged whales exhibited 'searching' movements in Bass Strait (an inferred behaviour when animals made sharp turns and did not maintain movement persistence), suggesting that they were foraging during transit. These 'searching' humpback whales spent from four to 35 days in the Bass Strait (Andrews-Goff et al., 2018). The findings of the study also suggest that about half of the tagged animals travelled through Bass Strait, with a few either 'transiting' or 'searching' close to shore in the Gippsland region.

The study by Andrews-Goff et al. (2018) provided some insight into the potential usage of the Gippsland region by humpback whales. However, further work is required to better describe the seasonal spatial and temporal occurrence of humpback whales and types of behaviours (i.e. whether they are foraging) in the Gippsland region, including within the footprint of the referral area and especially during their northern and southern migrations (Appendix A - Figures, Figure 9 (TSSC, 2015a)). Whale watching tours are known to observe humpback whales in the vicinity of Wilson's Promontory (Wildlifecoast Cruises 2020) and there have been sightings within the referral area (DELWP, 2019a).

The likelihood of occurrence rating for the humpback whale within the referral area is determined to be Likely.

4.2.9.1.4 Fin Whale

Fin whales *Balaenoptera physalus* are listed as vulnerable and migratory under the EPBC Act. The fin whale is a baleen whale that occurs from polar to tropical waters. There are no BIAs for fin whales within Australian waters.

Although widely distributed in both hemispheres, the biology and life history of the species is poorly understood (TSSC, 2015b). There are no reliable estimates of the fin whale population size in Australia, however their global population is estimated to have declined by more than 70 per cent over the previous three-generation period due to industrial whaling pressure (TSSC, 2015b).

Fin whales rarely occur in inshore waters and are thought to undertake long annual migrations from higher latitude summer feeding grounds to lower latitude winter breeding grounds. In Australia, fin whales have been recorded in most coastal waters, with sightings recorded in the proximity of the Bonney Upwelling, Victoria along the continental shelf in summer and autumn months (Aulich et al., 2019; Gill, 2002).

The fin whale migration route between Antarctic feeding areas, subantarctic feeding areas and tropical breeding areas (TSSC, 2015b) means fin whales could potentially navigate through the referral area.

The likelihood of occurrence rating for the fin whale within the referral area is determined to be Unlikely.

4.2.9.1.5 Sei Whale

Sei whales *Balaenoptera borealis* are listed as vulnerable and migratory under the EPBC Act. They are considered a cosmopolitan species, ranging from polar to tropical latitudes, and are usually found in deeper waters. There are no BIAs for sei whales within Australian waters.

Their global population is estimated to have declined by 80 per cent over the previous three-generation period (TSSC, 2015c). For Commonwealth waters, there are no population estimates for the sei whales nor is it known if there are any mating or calving areas (TSSC, 2015c). Sei whales move between lower latitude winter breeding grounds through Australian waters to sub-Antarctic feeding areas, completing long annual seasonal migrations, but details of this migration, and whether it involves the entire population, are unknown (TSSC, 2015c).

Sei whales have been sighted in western Victorian waters such as at the Bonney Upwelling off South Australia (Miller et al., 2012), where opportunistic feeding has been observed between November and May (Gill et al., 2015). A small number of sei whale females and calves have also been observed about 40 km south of Hobart, Tasmania (Ensor et al., 2002).

The likelihood of occurrence rating for the sei whale within the referral area is determined to be Rare.

4.2.9.1.6 Pygmy Right Whale

The pygmy right whale *Caperea marginata* is a baleen whale found in temperate and sub-Antarctic waters in oceanic and inshore locations and is listed as migratory under the EPBC Act. There are no known BIAs for this species within Australian waters.

The species is thought to have a circumpolar distribution in the Southern Hemisphere between about latitudes 30 degrees south and 55 degrees south. Distribution appears limited by surface water temperature as they are almost always found in waters with temperatures ranging from 5 to 20 degrees Celsius (Baker, 1985). The northern distribution may be limited on the east coast of Australia by the warm, south-flowing East Australian Current. Pygmy right whales have been seen in sheltered shallow bays, but it appears that these are predominantly juveniles and sub-adults (DoEE, 2019d).

There are few confirmed sightings of pygmy right whales at sea (Reilly et al., 2008), with few or no records from eastern Victoria and no population estimates available for Commonwealth waters (DoEE, 2019d). The largest reported group sighted (more than 100) was near Portland, Victoria, in June 2007 (Gill et al. 2008). They have primarily been recorded in areas associated with upwellings and with high zooplankton abundance, particularly copepods and small euphausiids which constitute their main prey (Kemper, 2002; Sekiguchi et al., 1992).

The likelihood of occurrence rating for the pygmy right whale within the referral area is determined to be Rare.

4.2.9.1.7 Dusky Dolphin

Dusky dolphins *Lagenorhynchus obscurus* are listed as migratory under the EPBC Act and were identified in the PMST results (Appendix B - PMST Results) as potentially occurring in the referral area. They predominantly occur in temperate sub-Antarctic zones inshore around New Zealand but can also be pelagic at times (Bannister et al., 1996).

In Australia, they are known from only 13 reports since 1828 (DoE, 2020), with two sightings in the early 1980s (Bannister et al., 1996). They occur across southern Australia from Western Australia to Tasmania (Gill et al., 2000), with unconfirmed sightings south of continental Australia but confirmed sightings near Kangaroo Island, South Australia, and off Tasmania, and a recent stranding in the latter state.

The likelihood of occurrence rating for the dusky dolphin within the referral area is determined to be Rare.

4.2.9.1.8 Killer Whale

The killer whale *Orcinus orca* is listed as migratory under the EPBC Act and was identified in the PMST results as potentially occurring in the referral area (Appendix B - PMST Results).

Killer whales are the largest member of the dolphin family. The killer whale is considered the most cosmopolitan of all cetaceans and may be seen in any marine region. In Australia they are recorded in all states, with concentrations reported around southern Western Australia, Victoria and around Tasmania (DoE, 2020b). Killer whales are more common in cold, deep waters but have often been observed along the continental slope and shelf particularly near seal colonies (Bannister et al., 1996). In Victoria, sightings peak in June/July, where they have been observed feeding on sharks, sunfish, and Australian fur seals (Mustoe, 2008). The breeding season is variable, and the species moves seasonally to areas of higher food supply (Bannister et al., 1996; Morrice, 2004).

The likelihood of occurrence of the killer whale within the referral area is determined to be Rare.

4.2.9.1.9 Other key listed species

Other key listed species are marine mammal species that are listed marine species under the EPBC Act or listed as threatened under the *Flora and Fauna Guarantee Act 1988 (Vic)* ('FFG Act') and have been identified as potentially occurring within the referral area.

Cetaceans

Bottlenose dolphins *Tursiops aduncus* are a listed marine species under the EPBC Act. They have a worldwide distribution from tropical to temperate waters and can be found in coastal, estuarine, pelagic and

oceanic habitats. Bottlenose dolphins are considered a widespread species comprised of both nearshore and offshore forms (Hoelzel et al., 1998; Rice, 1998). The total population size is not known but it could be common in offshore waters of south-eastern and southern Australia (DoEE, 2019e). Due to the widespread distribution of this species documented, it may inhabit or traverse the referral area. The likelihood of occurrence rating for the bottlenose dolphin within the referral area is determined to be Possible.

The **minke whale** *Balaenoptera acutorostrata* is a listed marine species under the EPBC Act and the subspecies; dwarf minke whales *Balaenoptera acutorostrata* (*unnamed subspecies*) may occur broadly from Victoria to northern Queensland between March and October (Minke Whale Project, 2018). Scattered sightings and strandings from southern Queensland and northern New South Wales early in the season (May–June) and late in the season (September) suggest a migration route along the east Australian coast but records are too few to document movements of the whales (Minke Whale Project, 2018). This species may transverse the referral area, although the likelihood of occurrence rating for the minke whale within the referral area is determined to be Unlikely.

The **Burrnan dolphin** *Tursiops australis* is not listed under the Commonwealth EPBC Act, it is however, listed as threatened under the FFG Act (DELWP, 2019b) and endangered on the Advisory List of Threatened Invertebrate Fauna in Victoria ('Advisory List') (DSE, 2013). Burrnan dolphins are found in inshore and coastal waters of southern Australia, including regions of Victoria, Tasmania, and South Australia (Charlton-Robb et al., 2011; Möller et al., 2008). The likelihood of occurrence rating for the Burrnan dolphin within the referral area is determined to be Rare. More detailed information about the Burrnan dolphin is described in Section 4.3.10.1.4.

Pinnipeds

There are two listed marine species of fur seal listed under the Commonwealth EPBC Act that could occur (or their habitat occur) within the referral area (Appendix B - PMST Results). These species have BIAs near the referral area (Appendix A - Figures, Figure 11).

The **Australian fur seal** *Arctocephalus pusillus* is listed as marine under the EPBC Act and has a relatively restricted distribution around the islands of Bass Strait, parts of Tasmania and southern Victoria. There are ten established breeding colonies of Australian fur seals that are restricted to islands in the Bass Strait (Appendix A - Figures, Figure 11); six off the coast of Victoria and four off the coast of Tasmania.

The nearest breeding colonies to the referral area are:

- Rag Island (1,500 total in 2007; 277 pups in 2007 (Kirkwood et al., 2010) and 295 pups in 2013 (McIntosh et al., 2018))
- Kanowna Island off Wilsons Promontory (15,000 adults in 2007; 2,913 pups in 2007 and 2,430 pups in 2013 (McIntosh et al., 2018))
- Judgment Rock in the Kent Island Group, Tasmania (2,387 pups in 2007 and 1,710 pups in 2013 (McIntosh et al., 2018)).

Satellite tracking of seals from both Kanowna Island and the Skerries has shown that Australian fur seals commonly occur in the Gippsland Basin (Kirkwood & Arnould, 2008). Seals are frequently seen resting and foraging on the Bass Strait oil and gas platform structures (Arnould et al., 2015) and are likely to be encountered in the referral area, especially given the proximity of haul-out sites at White Rocks and Rag Island (Appendix A - Figures, Figure 11).

Australian fur seals are present in the region all year. Pups begin to forage in June/July and are generally weaned by September/October (Shaughnessy, 1999). During the summer months, Australian fur seals travel between northern Bass Strait islands along the eastern Tasmanian coast to their destination in southern Tasmanian waters, although lactating female fur seals and some territorial males are restricted to foraging ranges within Bass Strait waters (Shaughnessy, 1999). Male Australian fur seals are bound to colonies during the breeding season from late October to late December, and outside of this they time forage further afield (up to several hundred kilometres) and are away for long periods (Hume et al., 2004; Kirkwood et al., 2010).

The likelihood of occurrence rating for the Australian fur seal within the referral area is determined to be Likely.

The **New Zealand fur seal** *Arctocephalus forsteri* (also known as the long-nosed fur seal), is listed as marine under the EPBC Act and is Likely to occur in or near the referral area. New Zealand fur seals have a

widespread distribution from the New Zealand and Australian subantarctic islands through to temperate northern New Zealand and southern Australia. They are mostly found in central South Australian waters (Kangaroo Island to South Eyre Peninsula) (Shaughnessy, 1999). New Zealand fur seal populations are now considered to be around 200,000 and gradually increasing (Goldsworthy & Gales, 2008), with about half the total population in Australia.

New Zealand fur seals prefer the rocky parts of islands with jumbled terrain and boulders and prefer smoother igneous rocks over rough limestone, feeding on small pelagic fish, squid and seabirds, including little penguins (Shaughnessy, 1999). Juvenile seals feed primarily in oceanic waters beyond the continental shelf, lactating females feed in mid-outer shelf waters (50–100 km from the colony) and adult males forage in deeper waters (Chilvers, 2018).

Most breeding sites for New Zealand fur seals in Commonwealth waters are outside Victoria, with only lower density breeding areas in Victoria (Shaughnessy, 1999). New Zealand fur seal breeding locations in Victoria occur at:

- Rag Island (1,000 adult fur seals and 235 pups in 2006) (Shaughnessy, 1999)
- Kanowna Island (10,700 adults and 2,700 pups) (Shaughnessy, 1999)
- Skerries (Kirkwood et al., 2009).

Haul-out sites include Beware Reef, Kanowna Island, the Hogan Islands Group and West Moncoeur Island (Tasmania) (Appendix A - Figures, Figure 11). During the non-breeding season (November to January), the breeding sites are occupied by pups/young juveniles while adult females alternate between the breeding sites and foraging at sea (Shaughnessy, 1999).

Due to the nearby habitat of breeding and haul-out sites (Appendix A - Figures, Figure 11), the likelihood of occurrence rating for the New Zealand fur seal within the referral area is determined to be Possible.

4.2.9.2 Turtles

Three marine turtle species are listed as both threatened and migratory under the EPBC Act, as listed in Table 4.4. There are no marine turtle BIAs recognised within the referral area. All species of marine turtles in Australian waters are managed under the Recovery Plan for Marine Turtles in Australia (DEE, 2017).

Table 4.4 List of threatened and migratory marine reptile species relevant to the referral area

Common Name	Scientific Name	EPBC Act Status		BIA within referral area	Likelihood of occurrence
		Threatened	Migratory		
Leatherback turtle	<i>Dermochelys coriacea</i>	Endangered	Yes	No	Unlikely
Loggerhead turtle	<i>Caretta caretta</i>	Endangered	Yes	No	Rare
Green turtle	<i>Chelonia mydas</i>	Vulnerable	Yes	No	Rare

*See Table 4.1 for likelihood of occurrence definitions.

The South Australian Sea Turtle Project, an initiative of the Centre for Integrative Ecology (CIE) at Deakin University, has developed a database which compiles information from Victorian and Commonwealth government wildlife databases, media articles, reports and historical anecdotal sightings from commercial and recreational fishers and other marine users, and the general public. Since 2014 when the study began a total of 209 sightings of five marine turtle species have been recorded in these southern waters (Appendix A - Figures, Figure 10). However, only two sightings (both leatherbacks) have been recorded within the referral area (Victorian Biodiversity Atlas (DELWP, 2019a)).

4.2.9.2.1 Leatherback Turtle

The endangered leatherback turtle *Dermochelys coriacea* is listed as endangered under the EPBC Act and is distributed throughout tropical, sub-tropical and temperate waters around the world (Limpus, 2009a). Unlike other marine turtles, leatherback turtles do not take up residency in continental shelf waters but instead spend most of their life travelling vast distances and foraging in temperate coastal and open ocean areas. As the species is largely pelagic, leatherback turtles also differ in that they remain planktivorous throughout their life, feeding on jellyfish and large planktonic ascidians in the upper 300 m of the water column (Limpus, 2009a).

Within Australia, the species is most commonly reported from coastal waters in central-eastern Australia (southern Queensland to central New South Wales), south-east Australia (from Tasmania, Victoria and eastern South Australia) and in south-western Western Australia (Limpus 2009a). The central-eastern and south-eastern Australian region is one of five identified foraging sites (where area restricted behaviour is known to occur) for the leatherback turtles (Bailey et al., 2012; DoEE, 2019c; DEE, 2017e).

Tracks from individuals fitted with satellite tags indicate that they forage in warmer waters further north in autumn and spring and only forage at more southerly latitudes in south-east Australian waters during summer (November to February) (Bailey et al., 2012). This is consistent with reports that the species has often been observed in the Bass Strait during summer (Limpus, 2009a).

Away from their feeding grounds leatherback turtles are rarely found nearshore (DEE, 2017). Records available from the Atlas of Living Australia (CSIRO, 2017) suggest that the species is a rare but occasional visitor to the Great Australian Bight; between 2006 and 2016 there were eight sightings (including strandings) recorded in the Great Australian Bight and ten in the Bass Strait, compared to over 40 in waters off the coast of New South Wales. Limited data from overseas indicates that leatherback turtles concentrate in areas where currents converge with steep bathymetric contours, presumably where food is more readily available (Eckert et al., 1989; Houghton et al., 2006).

Leatherback turtles are known to forage off the east coast of Australia and in the Bass Strait (DoEE, 2019a). The South-east Marine Region has been identified as an important feeding area for the leatherback turtle (DoEE, 2019a). These turtles are thought to be from the western Pacific genetic stock (Bailey et al., 2012), one of the three potential leatherback turtle genetic stocks in the Indo-Pacific, that nest in north west Papua, northern Papua New Guinea, the Solomon Islands and Vanuatu.

Leatherback turtles are regularly seen in Tasmania and Victoria in the summer months, especially in western and eastern Bass Strait. In Bass Strait leatherback turtles appear to concentrate in areas where southward flowing warm currents converge with steep bathymetric contours, presumably where food is more readily available (Bone, 1998).

No major leatherback turtle rookeries have been recorded in Australia. Most leatherback turtles in Australian waters migrate to breed in neighbouring countries including Indonesia, north-west Papua, northern Papua New Guinea, the Solomon Islands and Vanuatu. However, nesting is known to occur in the Northern Territory during December/January as well as occasionally along parts of southern Queensland and northern New South Wales (last reported in 1996) (DEE, 2017). Nesting has not been recorded along any beaches around the referral area.

The leatherback turtle is expected to occasionally visit the referral area, most likely in the summer months. The likelihood of occurrence rating for the leatherback turtle in the referral area is Unlikely.

4.2.9.2.2 Loggerhead Turtle

The endangered loggerhead turtle *Caretta caretta* is globally distributed in tropical, sub-tropical waters and temperate waters (Limpus, 2008a). Loggerhead turtles show a strong fidelity to their breeding and feeding areas (Limpus, 2008a; Limpus et al., 1992).

The main Australian breeding areas for loggerhead turtles are generally confined to the southern Queensland and north-western Western Australian coasts (Limpus, 2008a). Hatchlings disperse into oceanic currents and gyres and remain in pelagic environments until large enough to settle in coastal feeding habitats (DEE, 2017). Current data on post-hatchling dispersal is limited but suggests that post-hatchling loggerhead turtles are swept south from Queensland rookeries by the East Australian Current, past northern New South Wales and then east into the South Pacific Ocean (Boyle et al., 2009; Limpus et al., 1994).

Pelagic juveniles from eastern Australian rookeries are known to travel as far as South America (DEE, 2017). Following this, loggerhead turtles take up residency nearshore and forage in depths up to 55 m, feeding primarily on benthic invertebrates such as molluscs and crabs (DEE, 2017).

It is unknown whether recordings of loggerhead turtles in Victoria are isolated outliers from known foraging areas, or if the area comprises part of the broader post-hatchling dispersal area (Limpus, 2009c).

Loggerhead turtles forage in the waters of all coastal states and the Northern Territory, but are uncommon in South Australia, Tasmania and Victoria (DEE, 2017). Most migrate less than 1000 km between their feeding and breeding areas (Limpus, 2008a). Loggerhead turtles have a minimum temperature threshold of 18 degrees Celsius, below which the turtles mobility and foraging decreases (Robson et al., 2017), so it is

unlikely they would be in the referral area in the winter months, when the water temperature is below this threshold.

The loggerhead turtle is expected to only be an occasional visitor to the Gippsland area and is unlikely to be encountered in the vicinity of the referral area. The likelihood of occurrence rating for the loggerhead turtle in the referral area is Rare.

4.2.9.2.3 Green Turtle

The vulnerable green turtle *Chelonia mydas* is distributed in subtropical and tropical waters around the world (Limpus, 2008). Green turtles show a strong fidelity to their breeding and feeding areas (Limpus, 2008; Limpus et al., 1992). Nine genetically distinct Australian green turtle stocks are recognised with breeding areas across northern Australian waters including the Cocos Keeling, North West Shelf, Ashmore Reef, Scott Reef-Browse Island, Cobourg, Gulf of Carpentaria, northern Great Barrier Reef and Torres Strait, Coral Sea and southern Great Barrier Reef (DEE, 2017). Green turtle hatchlings spend their first five to ten years drifting on ocean currents until they settle in tidal and subtidal coastal habitats such as reefs, bays and seagrass beds where they feed on seagrass and algae (Limpus, 2008; DEE, 2017e). Green turtles are predominantly found in Australian waters off the Northern Territory, Queensland and Western Australia coastlines, with limited numbers in New South Wales, Victoria and South Australia (DEE, 2017). Most migrate less than 1,000 km between feeding and breeding areas (Limpus, 2008b).

Immature green turtles recruit from pelagic post hatchling feeding areas to benthic foraging areas, mainly feeding in tidal and subtidal habitats including coral reefs, seagrass meadows and algal turfs on sand and mud flats. Known foraging areas are bounded by the eastern Arafura Sea, Gulf of Carpentaria, Torres Strait, Gulf of Papua, Coral Sea, Great Barrier Reef, Hervey Bay, Moreton Bay and New South Wales coastal waters (Limpus et al., 1994; Limpus & Reed, 1985; Speirs, 2002; EPA Queensland Turtle Conservation Project unpublished data). Green turtles have a minimum temperature threshold of 20 degrees Celsius, below which the turtles mobility and foraging decreases (Robson et al., 2017), so it is unlikely they would be in the referral area in the winter months, when the water temperature is below this threshold.

Green turtles are expected to only be an occasional visitor to the Gippsland area and are unlikely to be encountered in the vicinity of the referral area. The likelihood of occurrence rating for the green turtle in the referral area is Rare.

4.2.10 Birds

4.2.10.1 Seabirds

The PMST results (Appendix B - PMST Results) identified 25 seabird species listed as threatened or migratory under the EPBC Act that may occur within the referral area as listed in Table 4.5. Twenty-one of these seabirds are listed as threatened (four endangered and 17 vulnerable) and 18 are listed as migratory. Fifty-four additional species are listed as marine species occurring in of the referral area.

The referral area overlaps the foraging BIAs for the short-tailed shearwater, four species of albatross, and the common diving-petrel. There are no known breeding locations within the referral area; the closest being those on Rag Island, approximately 12.5 km south-west of the referral area (Appendix A - Figures, Figure 12).

Table 4.5 List of threatened and migratory seabird species relevant to the referral area

Common Name	Scientific Name	EPBC Act Status		BIA within referral area	Likelihood of occurrence*
		Threatened	Migratory		
Antipodean albatross	<i>Diomedea antipodensis</i>	Vulnerable	Yes	No	Rare
Gibson's albatross	<i>Diomedea antipodensis gibsoni</i>	Vulnerable	No	No	Rare
Southern royal albatross	<i>Diomedea epomophora</i>	Vulnerable	Yes	No	Likely
Wandering albatross	<i>Diomedea exulans</i>	Vulnerable	Yes	Yes	Likely
Northern royal albatross	<i>Diomedea sanfordi</i>	Endangered	Yes	No	Rare
Sooty albatross	<i>Phoebastria fusca</i>	Vulnerable	Yes	No	Possible

REPORT

Common Name	Scientific Name	EPBC Act Status		BIA within referral area	Likelihood of occurrence*
		Threatened	Migratory		
Buller's albatross	<i>Thalassarche bulleri</i>	Vulnerable	Yes	Yes	Likely
Northern Buller's albatross	<i>Thalassarche bulleri platei</i>	Vulnerable	No	No	Rare
Shy albatross	<i>Thalassarche cauta</i>	Vulnerable	Yes	No	Likely
White-capped albatross	<i>Thalassarche cauta steadi</i>	Vulnerable	Yes	No	Rare
Grey-headed albatross	<i>Thalassarche chrysostoma</i>	Endangered	Yes	No	Unlikely
Campbell albatross	<i>Thalassarche impavida</i>	Vulnerable	Yes	Yes	Rare
Black-browed albatross	<i>Thalassarche melanophris</i>	Vulnerable	Yes	Yes	Likely
Salvin's albatross	<i>Thalassarche salvini</i>	Vulnerable	Yes	No	Rare
White-bellied storm-petrel	<i>Fregetta grallaria</i>	Vulnerable	No	No	Rare
Blue petrel	<i>Halobaena caerulea</i>	Vulnerable	No	No	Unlikely
Southern giant-petrel	<i>Macronectes giganteus</i>	Endangered	Yes	No	Likely
Northern giant-petrel	<i>Macronectes halli</i>	Vulnerable	Yes	No	Likely
Gould's petrel	<i>Pterodroma leucoptera</i>	Endangered	No	No	Possible
Fairy prion	<i>Pachyptila turtur subantarctica</i>	Vulnerable	No	No	Likely
Australian fairy tern	<i>Sternula nereis</i>	Vulnerable	No	No	Possible
Little tern	<i>Sternula albifrons</i>	No	Yes	No	Possible
Flesh-footed shearwater	<i>Ardenna carneipes</i>	No	Yes	No	Likely
Sooty shearwater	<i>Ardenna grisea</i>	No	Yes	No	Rare
Short-tailed shearwater	<i>Ardenna tenuirostris</i>	No	Yes	Yes	Likely

*See Table 4.1 for likelihood of occurrence definitions.

Bass Strait is a large and relatively shallow area of sea, ranging from 50 to 100 m deep and provides a range of seabird breeding and foraging habitats. The edge of the continental shelf (or shelf break) is around 100 km east of the referral area. The continental shelf itself deflects deeper ocean currents away, leading to the occurrence of oceanic fronts and nutrient-rich, seasonal 'upwelling' that increases seabird prey resources such as bait fish (Ashmole, 1971; Brown, 1980; Schneider & Hunt, 1982). Foraging seabirds traverse large areas of oceanic habitat in search of prey (Reid, 2002). Although widespread, they tend to congregate in areas with high densities of prey, often in association with upwelling events along the continental shelf (Reid, 2002). The shelf break waters east and south-east of the Licence Area support a greater abundance and diversity of foraging seabirds than inshore (continental shelf) waters (Ashmole, 1971; Brown, 1980).

Many migratory seabird species return to Bass Strait islands, south-east of the referral area, to breed each year. Colonies of seabirds occur to the west of the referral area in Corner Inlet, on the islands around Wilsons Promontory, and to the east at the Skerries, Tullaberga Island and Gabo Island (Harris & Norman, 1981). Species that nest and breed on these islands include the little penguin, white-faced storm petrel *Pelagodroma marina*, short-tailed shearwater, fairy prion, common diving petrel, black-faced cormorants *Phalacrocorax fuscescens*, and the pacific gull. Eastern Bass Strait is also a foraging area for at least 15 species of albatross, three species of petrel and one species of skua.

Given their capacity for long distance movements, seabirds breeding in the area may fly over the referral area whilst foraging or in transit to breeding sites. Seabirds nesting on the islands around Wilsons Promontory are likely to move eastwards from these islands across the referral area to the rich marine foraging areas of the eastern Bass Strait continental shelf-break. At the end of a foraging period (lasting from one to several days), these birds would pass over the referral area to return to their breeding islands. The extent, location and numbers of birds involved in these movements are not well understood. However, preliminary information below and in Figure 12 (Appendix A - Figures, Figure 12) on the breeding areas and numbers of seabirds on nearby islands provides some insight into this.

The portion of Eastern Bass Strait between Wilsons Promontory and Lakes Entrance closest to the referral area supports several important breeding sites for seabirds (Appendix A - Figures, Figure 12), these are:

- The Seal Island Group, near the western part of the referral area
- The small granite islands of eastern Wilsons Promontory, including Rabbit Rocks and Rabbit Island on the east coast of Wilsons Promontory, and Bennison, Granite and Doughboy Islands within Corner Inlet
- The sandy barrier islands of the Nooramunga Marine and Coastal Park (Appendix A - Figures, Figure 2)
- The chain of islands between Wilsons Promontory and Flinders Island.

4.2.10.1.1 Other important marine seabirds

The species listed below have been identified as important either because they are known to breed locally or are common in the region:

- The little penguin is a listed marine species under the EPBC Act, with a foraging BIA on Curtis Island, 63 km south-east of the referral area (Appendix A - Figures, Figure 12). The closest known or likely little penguin breeding sites include Seal Island, Cliffy Island, Rabbit Island and Little Rabbit Island south-west of the referral area (Appendix A - Figures, Figure 12).
- The black-faced cormorant *Phalacrocorax fuscescens* is a listed marine species under the EPBC Act and breeds in Corner Inlet, on the islands around Wilsons Promontory, and on the Skerries, Tullaberga Island and Gabo Island.
- The common diving-petrel is a listed marine species under the EPBC Act and breeds on Rag Island.
- The Pacific gull is a listed marine species under the EPBC Act and breeds in Corner Inlet, on the islands around Wilsons Promontory (the closest on Rag island), and on the Skerries, Tullaberga Island and Gabo Island.
- The shy albatross *Thalassarche cauta*, black-browed albatross *Thalassarche melanophris* and/or yellow-nosed albatross *Thalassarche cateri*, great-winged petrel *Pterodroma macroptera* and white-chinned petrel *Procellaria aequinoctialis* do not breed locally but are relatively common in the region.

4.2.10.2 Shorebirds

The PMST results (Appendix B - PMST Results) include 35 shorebird EPBC Act listed shorebird species which may occur within the referral area as listed in Table 4.6. Of these species:

- Four are listed as critically endangered; great knot *Calidris tenuirostris*, curlew sandpiper *Calidris ferruginea*, northern Siberian bar-tailed godwit *Limosa lapponica menzbieri* and eastern curlew *Numenius madagascariensis*
- Three are listed as endangered; Australian painted snipe *Rostratula australis*, lesser sand plover *Charadrius mongolus* and red knot *Calidris canutus*
- Three are listed as vulnerable; greater sand plover *Charadrius leschenaultii*, hooded plover *Thinornis rubricollis rubricollis* and bar-tailed godwit (baueri) *Limosa lapponica baueri*
- Thirty-three are listed as migratory.

The referral area does not overlap any BIAs for shorebirds.

Table 4.6 List of threatened and migratory shorebird species relevant to the referral area

Common Name	Scientific Name	EPBC Act Status		BIA within referral area	Likelihood of occurrence*
		Threatened	Migratory		
Red knot	<i>Calidris canutus</i>	Endangered	Yes	No	Rare
Great knot	<i>Calidris tenuirostris</i>	Critically Endangered	Yes	No	Rare
Curlew sandpiper	<i>Calidris ferruginea</i>	Critically Endangered	Yes	No	Rare

REPORT

Common Name	Scientific Name	EPBC Act Status		BIA within referral area	Likelihood of occurrence*
		Threatened	Migratory		
Common sandpiper	<i>Actitis hypoleucos</i>	No	Yes	No	Rare
Sharp-tailed sandpiper	<i>Calidris acuminata</i>	No	Yes	No	Rare
Pectoral sandpiper	<i>Calidris melanotos</i>	No	Yes	No	Rare
Greater sand plover	<i>Charadrius leschenaultii</i>	Vulnerable	Yes	No	Rare
Lesser sand plover	<i>Charadrius mongolus</i>	Endangered	Yes	No	Rare
Double-banded plover	<i>Charadrius bicinctus</i>	No	Yes	No	Possible
Oriental plover	<i>Charadrius veredus</i>	No	Yes	No	Rare
Hooded plover	<i>Thinornis rubricollis rubricollis</i>	Vulnerable	No	No	Likely
Grey plover	<i>Pluvialis squatarola</i>	No	Yes	No	Rare
Pacific golden plover	<i>Pluvialis fulva</i>	No	Yes	No	Rare
Bar-tailed godwit	<i>Limosa lapponica baueri</i>	Vulnerable	Yes	No	Rare
Northern Siberian bar-tailed godwit	<i>Limosa lapponica menzbieri</i>	Critically Endangered	Yes	No	Rare
Black-tailed godwit	<i>Limosa limosa</i>	No	Yes	No	Rare
Eastern curlew	<i>Numenius madagascariensis</i>	Critically Endangered	Yes	No	Rare
Little curlew	<i>Numenius minutus</i>	No	Yes	No	Rare
Australian painted snipe	<i>Rostratula australis</i>	Endangered	No	No	Rare
Latham's snipe	<i>Gallinago hardwickii</i>	No	Yes	No	Rare
Swinhoe's snipe	<i>Gallinago megala</i>	No	Yes	No	Rare
Pin-tailed snipe	<i>Gallinago stenura</i>	No	Yes	No	Rare
Fork-tailed swift	<i>Apus pacificus</i>	No	Yes	No	Rare
Ruddy turnstone	<i>Arenaria interpres</i>	No	Yes	No	Rare
Sanderling	<i>Calidris alba</i>	No	Yes	No	Possible
Red-necked stint	<i>Calidris ruficollis</i>	No	Yes	No	Rare
Ruff (Reeve)	<i>Philomachus pugnax</i>	No	Yes	No	Rare
Crested tern	<i>Thalasseus bergii</i>	No	Yes	No	Likely
Wood sandpiper	<i>Tringa glareola</i>	No	Yes	No	Rare
Marsh sandpiper	<i>Tringa stagnatilis</i>	No	Yes	No	Rare
Terek sandpiper	<i>Xenus cinereus</i>	No	Yes	No	Rare
Whimbrel	<i>Numenius phaeopus</i>	No	Yes	No	Rare
Osprey	<i>Pandion haliaetus</i>	No	Yes	No	Rare
Grey-tailed tattler	<i>Tringa brevipes</i>	No	Yes	No	Rare
Common greenshank	<i>Tringa nebularia</i>	No	Yes	No	Rare

*See Table 4.1 for likelihood of occurrence definitions.

Shorebirds or 'waders' are characterised by their extensive use of intertidal and adjacent coastal habitats in the region. The group includes both resident and non-breeding migratory species. The coastal environments between Wilsons Promontory and the Gippsland Lakes includes a range of nationally and internationally significant shorebird habitats, particularly in the following areas:

- Rocky intertidal shores of islands and Wilsons Promontory
- Sandy ocean beaches of Wilsons Promontory the Nooramunga barrier islands and Ninety Mile Beach
- Corner Inlet and the Nooramunga Coastal and Marine Parks and similar areas of intertidal flats and sandy beach habitats around Barry Beach and Port Welshpool
- Coastal lakes, such as Lake Jack Smith, near Woodside and Lake Reeve near Seaspray.

Rocky intertidal shores occur from the northern point of Wilsons Promontory (Point Singapore) southwards to South Point and around Rabbit Island, and the Seal Islands provide foraging habitat for sooty oystercatchers *Haematopus fuliginosus* and Pacific gulls. Seasonal movements of sooty oystercatchers between offshore rocky islands and the mainland coast in the region are likely to be concentrated in the western part of the region, closest to Wilsons Promontory, away from the referral area. Most Pacific gulls in Victoria occur between the Bellarine Peninsula and Lakes Entrance (Emison et al., 1987), with few breeding records away from the Wilsons Promontory islands. Birds are likely to pass over the referral area in transit from the Gippsland Lakes to the breeding islands around Wilsons Promontory.

The sandy ocean beaches of Wilsons Promontory, the Nooramunga barrier islands and Ninety Mile Beach are relatively infertile habitats for the majority of shorebird species. However, they provide suitable habitat for particular species of shorebirds, including the pied oystercatcher *Haematopus longirostris* and hooded plover. The pied oystercatcher forages on sandy beaches and intertidal sand and mudflats; none of its regular movements would take it far from shore or over the referral area. The hooded plover breeds and forages on open, ocean sandy beaches along the entire Victorian coast, however this species rarely moves offshore and would confine its movements to the ocean coast and nearby sheltered wetlands in the region.

Migratory shorebirds may fly over or through the referral area, but this is likely to occur only on passage migration flights to and from their non-breeding habitat in south-eastern Australia, or in the course of longer distance flights in which they move between one Australian region and another, during the course of their annual sojourn in Australia. There is little or no empirical data about the flight routes of these birds that is of sufficient detail to indicate whether they fly through or over the referral area. Gulls, terns and cormorants forage in the referral area and may fly over it whilst on migration, but there is little existing data about the extent to which they may do so.

Likelihood of occurrence for threatened and migratory shorebirds is allocated in Table 4.6 relative to habitats that may be affected by the project, including the marine area and coastal locations where the export cables for the project may make landfall.

4.2.10.3 Migratory Land Birds

This group encompasses land birds that routinely migrate between Tasmania and mainland Australia (referred to as Bass Strait migrants) and may pass through the referral area on migration passages. Bass Strait migrants include a diversity of species including some raptors, parrots, cuckoos and passerines. They spend the warmer part of the year in Tasmania and/or on Bass Strait islands and migrate annually to mainland Australia. There is little conclusive information about the routes they use to fly across Bass Strait, however, some evidence suggests that particular species use specific flight paths. For example, a number of species such as swamp harriers and blue-wing parrots have been observed to aggregate in the north-eastern and north-western extremities of Tasmania prior to their departure from the island.

On their northward passage, orange-bellied parrots *Neophema chrysogaster* that breed only in south-western Tasmania, have often been observed to spend some days or weeks on King Island after they have left their breeding area. These observations are suggestive that species that behave in that way take the shortest available route to Victoria and/or 'island-hop', particularly during the northward, post-breeding migrations. On their southward migration, some individually identified orange-bellied parrots have been noted arriving in south-western Tasmania within one or two days of having been observed in southern Victoria and it is thus feasible that they take a direct route on the southward passage.

Overall, for this group of birds, there is limited understanding of the routes they use across Bass Strait. While currently available information is not sufficient to indicate specifically whether any of these birds may fly through the referral area, their known behaviour patterns suggest that they would do so no more than twice per year during migrations.

The likelihood of occurrence of Bass Strait migrants listed under the EPBC Act is in Table 4.7.

Table 4.7 List of threatened and migratory land bird species relevant to the referral area

Common Name	Scientific Name	EPBC Act Status		BIA within referral area	Likelihood of occurrence*
		Threatened	Migratory		
Glossy ibis	<i>Plegadis falcinellus</i>	No	Yes		Rare
Swift parrot	<i>Lathamus discolor</i>	Critically endangered	No		Rare

Common Name	Scientific Name	EPBC Act Status		BIA within referral area	Likelihood of occurrence*
		Threatened	Migratory		
Orange-bellied parrot	<i>Neophema chrysogaster</i>	Critically endangered	No		Rare
Fork-tailed swift	<i>Apus pacificus</i>	No	Yes		Possible
White-throated needletail	<i>Hirundapus caudacutus</i>	Vulnerable	Yes		Likely
Satin flycatcher	<i>Myiagra cyanoleuca</i>	No	Yes		Rare

*See Table 4.1 for likelihood of occurrence definitions.

4.3 Existing Conditions – Victorian Referral

For the purposes of this document and assessment under the EE Act, the referral area is defined in Appendix A - Figures, Figure 1.

4.3.1 Victorian Marine Protected Areas

A marine protected area in Victoria is an area reserved to protect environmental, historical or cultural features within Victorian waters. These protected areas are managed under the Parks Victoria Marine Protected Areas Program Plan (Parks Victoria, 2013).

4.3.1.1 Corner Inlet Marine and Coastal Park

The Corner Inlet Marine and Coastal Park covers 28,500 ha north of Wilsons Promontory National Park and west of the Nooramunga Marine and Coastal Park. The park is located almost entirely within the Corner Inlet Ramsar site boundary (Appendix A - Figures, Figure 2) and encompasses the Corner Inlet MNP, containing the only extensive seagrass *Posidonia australis* meadow in southern Australia. The waterbody is considered vital for fish breeding and migratory birds.

The waters of Corner Inlet are mostly a shallow intertidal environment comprising extensive mud and sandflats and seagrass beds. Approximately 385 km² of the inlet is less than one metre deep (Ecos, unpublished). A network of deeper channels divides the embayment and drain and fill from the inlet entrance to the east. The three main channels (Franklin, Middle and Bennison) are three to 10 m deep and become shallower in the northern and western areas of the inlet. Channels near the centre and eastern entrance of the inlet are deeper, reaching depths of about 40 m.

The referral area does not overlap the Corner Inlet Marine and Coastal Park.

4.3.1.2 Nooramunga Marine and Coastal Park

The Nooramunga Marine and Coastal Park lies to the south-west of the referral area and covers an area of 30,170 ha (Appendix A - Figures, Figure 2). The park consists of shallow marine waters, intertidal mudflats and a series of over 40 sandy islands. The park contains large stands of white mangrove and saltmarsh areas. The saltmarshes are dominated by beaded and shrubby glassworts.

Seaward of the mangroves are extensive areas of intertidal mud and sand flats. An immense range of marine plants and invertebrates can be found here that provide food for the thousands of migratory shorebirds that arrive each year from their northern hemisphere breeding grounds. Seagrass meadows occur throughout the park and provide habitat for over 300 marine invertebrate species, including a range of large crabs, seastars, gastropods, iridescent squid and many fish including pipefish, stingarees, flathead, whiting and flounder. Finfish such as snapper, King George whiting, flathead, garfish and salmon are targeted by recreational fishers.

Thirty-two migratory shorebird species have been recorded in the park, including the largest concentrations of bar tailed godwit *Limosa lapponica* and great knot in south-eastern Australia. These birds feed over the mudflats at low tide. At high tide, large flocks of shorebirds congregate on the sand spits at the ends of the barrier islands. In summer the ocean beaches and sand provide nesting habitat for pied oystercatchers, crested terns, Caspian terns, fairy terns and hooded plovers.

The referral area does not overlap the Nooramunga Marine and Coastal Park.

4.3.1.3 Ninety Mile Beach Marine and Coastal Park

The Ninety Mile Beach Marine and Coastal Park lies to the north-east of the referral area, covers an area of 2,750 ha that extends approximately 5 km along the coastline and offshore for 5 km from the high-water mark (Appendix A - Figures, Figure 2). The park supports four distinct marine ecological communities: intertidal sandy beach, subtidal sandy sediment, subtidal reef and open waters. It is one of the most biologically diverse marine sediment environments in the world. The park protects an internationally significant sandy environment, recognised for its exceptionally high diversity of marine invertebrates.

The referral area does not overlap the Ninety Mile Beach Marine and Coastal Park.

4.3.2 Nationally Important Wetlands

The Directory of Important Wetlands in Australia identifies nationally important wetlands and provides a knowledge base of what defines a wetland, their variety and the many flora and fauna species that depend on them (DAWE, 2020a). Within the vicinity of the referral area there are two listings in the Directory of Important Wetlands:

- Corner Inlet: which is a high value wetland for its high productivity, geomorphology and significant flora and fauna (see Section 4.2.5.1)
- Jack Smith Lake State Game Reserve: which includes Jack Smith and Lambs Lake and small herbfields interspersed between thickets of Swamp Paperbark *Melaleuca ericifolia* and subject to regular wetting and drying cycles (DAWE, 2020a). The Reserve's 13 km-long south-eastern boundary abuts the Ninety Mile Beach Coastal Reserve (see Section 4.3.1.3).

4.3.3 Australian Marine Parks

Australian Marine Parks (previously Commonwealth Marine Reserves) are a network of protected areas located within Commonwealth waters and are managed by the Australian Government. Australian Marine Parks within the South-east Marine Region are managed under the South-east Commonwealth Marine Reserve Network Management Plan 2013-23 (Director of National Parks, 2013). The referral area does not overlap any Australian Marine Parks. The closest is Beagle Marine Park which is 20 km south from the closest point of the referral area (Appendix A - Figures, Figure 2).

4.3.4 Victorian Marine Assets

The DELWP has developed a system of asset identification to inform natural resource management across Victoria. These assets are defined as tangible biophysical elements of the environment that are valuable for their ecosystem services (VEAC, 2019b).

There are five Victorian Marine Assets identified in the Gippsland Region that are in the vicinity of, but not within, the referral area as listed in Table 4.8.

Table 4.8 Victorian marine assets near the referral area

Asset	Category	Area	Reference in this report
Corner Inlet/Nooramunga mudflat environment	Victorian significance	Gippsland Region	Sections 4.3.8.1 and 4.3.8.3
Corner Inlet Posidonia habitat and Corner Inlet to Nooramunga Zostera habitat	Victorian significance	Gippsland Region	Sections 4.3.6 and 4.3.8.2
Wilson's Promontory southern islands	Victorian significance	Gippsland Region	Section 4.3.6
Wilson's Promontory deep water habitats	Victorian significance	Gippsland Region	Section 4.3.6
Corner Inlet mangroves	Bioregional significance	Gippsland Region	Section 4.3.8.3

4.3.5 Biologically Important Areas

The BIAs relevant to species listed under the FFG Act that overlap the referral area are:

- White shark: one breeding (nursery area) BIA and three distribution BIAs (Appendix A - Figures, Figure 5). The foraging BIA for this species does not overlap the referral area being approximately 20 km south towards Wilson's Promontory.
- Pygmy blue whale: one possible foraging area BIA and one distribution and migration BIA (Appendix A - Figures, Figure 7). These very large BIAs extend from the Perth Canyon in Western Australia, along the southern coast of Australia to offshore of Eden and Merimbula in New South Wales.
- Southern right whale: one migration and resting and migration BIA and one distribution BIA (Appendix A - Figures, Figure 7).
- Seabirds: foraging BIA for the Shy albatross (Appendix A - Figures, Figure 12)

BIAs relevant to species listed under the FFG Act which are near the referral area are:

- White shark: two foraging BIAs, one immediately adjacent and one approximately 20 km away (Appendix A - Figures, Figure 5).
- Seabirds: foraging BIAs Buller's albatross, Indian yellow-nosed albatross and wandering albatross immediately adjacent to the referral area (Appendix A - Figures, Figure 12).

More detailed information on these species is provided in Sections 4.3.9 to 4.3.11.

4.3.6 Coastal processes

The Victorian coast is a dynamic system, affected by the tides, wave energy and weather (e.g. strong winds or storms). Different landforms, such as sandy shores, rocky shores/headlands, mud flats or estuaries are dependent on coastal processes, and hence changes in coastal processes can have implications for coastal features. Around 90 per cent of the Gippsland coast is comprised of sandy beaches and dune systems, which are more susceptible to erosion than the rocky headlands that make up the remaining 10 per cent of the coastline (DELWP, 2015). Waterways and bays are also susceptible to accretion or sedimentation, which can affect the existing environmental condition (e.g. smothering of seabed habitats), affect safety of waterway users and reduce access.

4.3.7 Hydrology

The water depth of the referral area ranges from 0-21 m. The tide along the eastern Victorian coastline is semi-diurnal with diurnal inequality and tidal ranges in the eastern Bass Strait are 2-2.5 m (VEAC, 2019b).

The referral area is exposed to swell from the south-west through to the south-east and locally generated wind waves from all directions. Mean significant wave heights are in the order of 2-3 m (Hemer et al., 2007) with much larger waves at times of local or remote storms (generating long-range swells). Wave disturbance to the seabed in the offshore deeper parts of the referral area would occur only during extreme wave conditions, while frequent wave disturbance would occur in the inshore, shallower parts of the referral area.

Regional currents are eastward in winter (driven by prevailing westerly winds) and westward in summer (prevailing south-easterly winds) (Gibbs et al., 1986). Local metocean conditions are also likely to be influenced by winter storms. Ebb and flood tides produce longshore currents of 0.1-0.2 m/s in the referral area. The area east of Wilsons Promontory and Corner Inlet have some of the strongest tidal currents in the region (VEAC, 2019b).

Seasonal and transient upwellings are important ecological features of the South-east Marine Region. Nutrient concentrations in Bass Strait are low overall (mesotrophic to oligotrophic) but rise in winter due to inputs from deeper waters, particularly from upwelling along the eastern Bass Strait shelf break (Gibbs et al., 1986). The proximity of the referral area to the continental shelf break (70 nm / 130 km south east) means it has higher nutrient availability than other parts of Bass Strait and is therefore more productive (particularly from a fisheries perspective).

Corner Inlet is a tide dominated estuary, with an average daily tidal range of about 2 m (DSEWPac, 2011). The reasonably large tidal range in the Bass Strait and the extensive shallow areas in Corner Inlet mean that more than 60 per cent of the inlet volume is exchanged over an average tidal cycle (DSEWPac, 2011).

4.3.8 Benthic Environment

Based on studies for industry in adjacent areas and other regional scale sampling, habitats within the referral area include:

- Sandy beaches
- Intertidal rocky shores
- Intertidal seagrass
- Intertidal sand and mud flats
- Mangroves and saltmarshes
- Subtidal nearshore rocky reefs with kelp, other macroalgae and epifauna
- Seagrass meadows
- Subtidal soft sediments.

The benthic biodiversity of the referral area comprises algae and seagrasses, as well as infauna and motile and sessile epifauna (Appendix A - Figures, Figure 4). Most benthic species would be widely distributed in south-eastern Australia, although endemic species are also likely to be present. There are large knowledge gaps in relation to benthic marine biodiversity in the area (VEAC, 2019b).

Meadows of seagrasses cover the sea floor in many bays and inlets. The distribution of seagrasses in the referral area is unknown, however seagrasses are likely to be widespread on sandy seabed in the shallower parts of the referral area (less than 20 m). Seven seagrass species occur in Victoria and support a diverse marine community (DSE, 2009). Seagrass beds typically grow in shallow, sheltered waters on silt or sand. The beds bind together unstable sediments and provide substrate, habitat and food sources for many other organisms. Abundant small invertebrates, including marine worms (polychaetes), small crustaceans (amphipods, cumaceans and copepods), snails and bivalves (molluscs) shelter in the leafy canopy or in the sediment among the rhizomes. Large areas of seagrass are known to exist in Gippsland Lakes and Corner Inlet. In 1965, it was estimated that there were 11,900 ha of *Posidonia australis* growing in Corner Inlet (the largest area in southern Australia) as well as *Zostera* spp. and *Heterozostera* spp. (Morgan, 1986).

In April 2017, CarbonNet conducted a marine habitat assessment (using a towed underwater camera) in the waters off Golden Beach, which overlaps with the north-eastern part of the referral area (CarbonNet, 2018). Of the 71 sites sampled, 58 of them (82 per cent) were classified as soft sediment (fine to coarse sand and gravels/shell) (Advisian, 2017). Vegetation was not encountered at many of the 71 sites sampled. At some sites, isolated sparse seagrass beds and isolated sponge gardens were recorded. Brown macroalgae *Ecklonia radiata* and *Sargassum* spp. were found in the inshore reef area.

Beaches and soft sediment substrates form a distinctive group of marine habitats with their own biological communities. The soft substrates in deeper, subtidal waters can support diverse marine communities. Soft subtidal sediments commonly support sea pens, ascidians, hydroids, bryozoans and large, diverse sponge gardens. The animals within the marine sediments are predominately polychaete worms and crustaceans. Subordinate groups include bivalves, brittle stars, holothurians, sea urchins, gastropods, nematodes and nemertean.

The shores of Corner Inlet contain significant areas of saltmarsh and mangroves. Both are communities of limited distribution. A total of 61 shorebird species have been recorded in these habitats.

The islands of Corner Inlet, although not rich in plant diversity, are of high biogeographical significance as a result of their geological history and separation from the mainland since the last ice age. The islands contain significant areas of saltmarsh and mangroves, both of which are communities of limited distribution within the region.

4.3.8.1 Soil and Vegetation Characteristics

The Gippsland Basin is composed of a series of massive sediment flats, interspersed with small patches of reef, bedrock and consolidated sediment. Sandy plains are occasionally broken by low ribbons of reef, which formed as shorelines or sand dunes during ice ages when the sea level was lower than today.

The seabed is characterised by a variety of sediment types that are associated with tidal currents and wave energy. Nearshore sediments consist of coarse sands with isolated areas of gravels, shells and pebbles, and become progressively finer with distance from shore. Sediments can be grouped generally into three megafacies; dominated either by quartzose sand (inner shelf and around islands in Bass Strait), relict carbonate particles (mid shelf and nearshore islands in Bass Strait) or Holocene biogenic carbonate (inner to outer shelf) (Jones & Davies, 1983).

Sedimentation is generally low due to the small supply from rivers and the relatively low productivity of carbonate. Sedimentation rates are estimated at 50 to 160 mm per 100 years. In the Gippsland Basin, seabed material is predominantly calcium carbonate comprised of calcarenite marls and marine shales. Seaward, the sediments are composed primarily of sand (92 per cent) and silt/clay (eight per cent) (GEMS, 2005).

4.3.8.2 Seagrass and Macroalgae

Seagrass

The Victorian multi-regional seagrass health assessment surveys (2004-2007; Ball et al., 2010) monitored seagrass (*Heterozostera nigricaulis*, *Zostera muelleri* and *Posidonia australis*) in summer (November to January) and Autumn (March to June). The following seagrasses are found in Victoria (from VEAC, 2019b) and could potentially occur within the referral area (Appendix A - Figures, Figure 4), none of which are listed under the FFG Act:

- *Zostera muelleri* (intertidal/shallow subtidal)
- *Zostera capricornia* (0-2 m deep)
- *Zostera tasmanica* (formerly *Heterozostera tasmanica*) and *Zostera nigricaulis* (formerly *Heterozostera nigricaulis*) (0-8 m deep)
- *Amphibolis antarctica* (0-20 m deep in areas of moderate to strong wave energy)
- *Halophila australis* (0-23 m deep)
- *Posidonia australis* (0-15 m deep, most extensive in Corner Inlet)

These seven seagrass species support a diverse marine community (BMT WBM, n.d.). Seagrass beds typically grow in shallow, sheltered waters on silt or sand. Typically abundant small invertebrates, including marine worms (polychaetes), small crustaceans (amphipods, cumaceans and copepods), snails and bivalves (molluscs) shelter in the leafy canopy or in the sediment among the rhizomes (VEAC, 2019b).

Large areas of seagrass are known to exist in Gippsland Lakes and Corner Inlet. In 1965 it was estimated that there were 11,900 ha of *Posidonia australis* growing in Corner Inlet (the largest in southern Australia) as well as *Zostera* spp. and *Heterozostera* spp. (Morgan, 1986). *Zostera tasmanica* is widespread on exposed sandy seabed up to 30 m depth throughout Bass Strait, including the referral area. *Zostera tasmanica* typically has a sparse, patchy distribution.

The 'Corner Inlet *Posidonia* habitat' and 'Corner Inlet to Nooramunga *Zostera* habitat' are classified as marine assets of Victorian significance (VEAC, 2019b) by the DELWP. This classification is based on the area being the only place in Victoria where broad-leaf *Posidonia* forms large meadows.

A marine habitats assessment conducted in 2017 of the waters off Golden Beach (which overlaps the north eastern part of the referral area) found isolated seagrass beds and sponge gardens in a small percentage of the sites sampled, with 82 per cent of sites being classified as soft sediment (fine to coarse sand and gravel/shell) (Advisian, 2017). Brown macroalgae (*Ecklonia radiata* and *Sargassum* spp.) were found in the inshore reef area.

Macroalgae

Marine algae are not listed under the FFG Act.

Over 1,400 species of algae have been recorded from southern Australia, with 70 per cent endemic to the region (BMT WBM, n.d.). Typically, the shallow reefs (0 to 20 m) are dominated by kelps or other brown seaweeds. Bubble kelp *Phyllospora* sp. and leather kelp *Ecklonia* sp. combine to cover many of the reefs. *Sargassum* spp. and *Cystophora* spp. are dominant in more sheltered areas.

Macroalgae are mostly associated with hard substrates including rocky reef and shell/cobble but also occur as epiphytes on other species or as drift. Macroalgal diversity tends to be highest on rocky reefs with good light availability. The subtidal nearshore and offshore rocky reefs have low macroalgae abundance (Barton, Pope & Howe, 2012), likely due to low light caused by sediment resuspension.

Larger macroalgae (*Ecklonia radiata* kelp and other large brown algae) may be found along with a range of smaller red and green algae. Giant kelp *Macrocystis pyrifera* forests once occurred on many reefs in Bass Strait but their distribution has shrunk considerably (DSEWPaC, 2012). *Macrocystis* is unlikely to form consistent areas of dense forest and is not known to occur in the referral area.

4.3.8.3 Saltmarsh, Mangroves and Mudflats

The shores of Corner Inlet contain significant areas of saltmarsh and mangroves, both are communities of limited distribution. Saltmarsh typically occurs in the upper-intertidal zone and consists mainly of salt-tolerant vegetation (halophytes) including grasses, herbs, sedges, rushes and shrubs. The saltmarsh ecological community is inhabited by a wide range of infaunal and epifaunal invertebrates, as well as low and high tide visitors such as prawns, fish and birds (DSEWPaC, 2013a). In Corner Inlet, saltmarsh communities occur as a band along the landward edge of the mangrove zone and are common along the northern mainland shore of Corner Inlet (DSEWPaC, 2011) (Appendix A - Figures, Figure 3).

Corner Inlet is the world’s southernmost natural population of mangroves, and only one species, *Avicennia marina* ssp. *australasica* is known to occur in Victoria (VEAC, 2019b). Mangroves are areas of high productivity, providing a diverse range of habitats, stabilising sediments and contributing to fish production as nursery areas. Collectively coastal saltmarsh, mangroves and seagrasses are known as blue carbon ecosystems and have a key role in carbon sequestration.

The Corner Inlet to Nooramunga mudflat environment is an important ecosystem supporting feeding areas for large numbers of shorebirds. Microalgae within intertidal sediments of the mudflats are important areas of primary production (VEAC, 2019b).

4.3.9 Marine Invertebrates and Fish

4.3.9.1 Marine Invertebrates

The marine invertebrates listed as threatened under the FFG Act and that may occur in or near the referral area are listed in Table 4.9.

Table 4.9 Threatened marine invertebrate species

Common Name	Scientific Name	FFG Listed	BIA within referral area	Likelihood of occurrence*
Brittle star	<i>Amphiura triscacantha</i>	Threatened	No	Possible
Sea-cucumber	<i>Apsolidium densum</i>	Threatened	No	Possible
Sea-cucumber	<i>Apsolidium handrecki</i>	Threatened	No	Possible
Brittle star	<i>Ophiocomina australis</i>	Threatened	No	Possible
Sea-cucumber	<i>Pentocnus bursatus</i>	Threatened	No	Possible
Sea-cucumber	<i>Thyone nigra</i>	Threatened	No	Possible
Sea-cucumber	<i>Trochodota shepherdii</i>	Threatened	No	Possible
Stalked hydroid species	<i>Ralpharia coccinea</i>	Threatened	No	Possible
Chiton species	<i>Bassethullia glypta</i>	Threatened	No	Possible
Marine opisthobranch	<i>Platydorid galbana</i>	Threatened	No	Possible
Marine opisthobranch	<i>Rhodope</i> species	Threatened	No	Possible

*See Table 4.1 for likelihood of occurrence definitions.

There is little existing scientific information on the benthic ecology, and therefore distribution of benthic species within the referral area. However, benthic invertebrate communities in the Bass Strait are varied and are determined the by sea floor habitat, water depth and longitude (due to a range of factors including wave

energy and local geology). The brittle stars *Amphiura triscacantha* and *Clarkcoma australis* (previously *Ophiocomina australis*) are not endemic to Victoria, however their distribution is limited, and they are generally found in association with seagrass habitat (particularly *Posidonia* and *Heterozostera* sp.). In Victoria, *Amphiura triscacantha* has been recorded at Nooramaunga and Western Port Bay.

Only one species of the above-listed species of sea-cucumber known to occur in Victoria is endemic to the region, the *Apsolidium densum*. This species is likely to occur on algae covered surfaces rocky shallow and intertidal habitats (in up to 2 m water depth), with the closest recording to the referral area occurring in the Mushroom Reef Marine Sanctuary on the southern coast of Victoria.

Epifauna include a diverse range of sessile and motile invertebrates. Sessile invertebrates are predominantly filter-feeders and include sponges, hydroids, anthozoans (soft corals, gorgonians, anemones), bryozoans, bivalves, and colonial and solitary ascidians (sea-squirts). Sponges, hydroids, soft corals and anemones, bryozoans and ascidians typically attach to hard substrates including rocky reef, shell and gravel/cobble, though several of these groups have burrowing representatives. These sessile invertebrates increase habitat complexity which provide space and refuge for other sessile and mobile invertebrate species.

The Gippsland area is known to include habitat formed by dense growth of sessile invertebrates at spatial scales of less than 1 m² to tens or hundreds of square metres (Przeslawski et al., 2016a). Other sessile invertebrates live in sandy habitats with little hard substrate. The referral area is part of the range of the endemic and somewhat enigmatic soft-coral *Pseudogorgia godeffroyi* which occurs on sandy or gravel seabeds (Utinomi & Harada, 1973). The commercial scallop *Pecten fumatus* is considered to be common though sparsely distributed throughout the area, and is predominantly found on sandy seabeds (Pinzone, 2018; Przeslawski et al., 2016b). The doughboy scallop *Mimachlamys asperrima* forms dense aggregations in some areas (Przeslawski et al., 2016b) , as does the file shell *Limatula* sp. and introduced New Zealand screw shell *Maoricolpus roseus*.

Mobile benthic invertebrates likely to occur in the area include gastropods (which includes sea snails), crustaceans (e.g. crabs, hermit crabs, rock lobster), cephalopods (octopus) and echinoderms (sea stars, brittle stars, feather stars, sea cucumbers, sea-urchins). Mobile benthic invertebrates prey on sessile and mobile fauna (such as scallops and demersal fish) and graze on algae where present. Seastars including the eleven-arm seastar *Coscinasterias muricata* and the southern sands star *Luidia australiae* are common in the area and are key scallop predators.

The Ninety Mile Beach MNP reefs (Appendix A - Figures, Figure 2), to the north of the referral area, are dominated by invertebrates, including sponges, ascidians (sea squirts) and smaller bryozoans and hydroids (Barton et al., 2012).

4.3.9.2 Fish

Three species of fish are listed as threatened under the FFG Act and may occur in or near the referral area as listed in Table 4.10.

Table 4.10 Threatened fish species

Common Name	Scientific Name	FFG Listed	BIA within referral area	Likelihood of occurrence*
Great white shark ¹	<i>Carcharodon carcharias</i>	Threatened	Yes	Likely
Australian grayling	<i>Prototroctes maraena</i>	Threatened	No	Possible (larval and juvenile stage only)
Southern bluefin tuna	<i>Thunnus maccoyii</i>	Threatened	No	Possible

1. This is referred to as the white shark in the rest of this report, as this is the recognised common name.

* See Table 4.1 for likelihood of occurrence definitions.

4.3.9.2.1 Australian grayling

The Australian grayling is diadromous, migrating between rivers, estuaries and coastal seas and is endemic to south-eastern Australia.

Spawning occurs in freshwater from late summer to winter. Newly hatched larvae drift downstream and out to sea, where they remain for approximately six to ten months, and their habitat preference at this point is unknown. Juveniles then return to the freshwater environment (around November of their first year), where

they remain for the remainder of their lives (Backhouse et al., 2008). The Australian grayling predate upon small organisms, such as cladocerans (water fleas), insects, and algae.

Given the wide distribution and range of habitats used by the species throughout its life, the National Recovery Plan and National Conservation Values Atlas does not specify habitat that is critical to survival (BIAs) but some habitats such as spawning, refuge and juvenile habitats are likely to be limited in distribution in Australian waters (Backhouse et al., 2008).

Adult Australian grayling are not expected to occur in the referral area. Due to the proximity of the referral area to Corner Inlet, it is possible they will occur in the referral area during the larval and juvenile life stage.

4.3.9.2.2 White shark

The white shark is found in a variety of habitats, from close inshore to the outer continental shelf around reef and areas with high prey density such as pinniped colonies (DoE, 2019).

Five BIAs within the vicinity of the referral area have been created for the protection of the white shark (Appendix A - Figures, Figure 5). A "shark nursery area" and one distribution BIA overlap the referral area. The nursery BIA extends from the shoreline to the 50 m depth contour off the Gippsland coast and is likely to be frequented between the months of December and June (Holliday, 2003). The nursery area may represent critical habitat under the Recovery Plan for the Great White Shark (DSEWPaC, 2013b). One BIA is identified where foraging is known to occur in waters in close proximity to Australian sea lion and fur seal colonies offshore of Wilsons Promontory and islands in the Bass Strait.

Additional information on white sharks in the Gippsland area is provided in Section 4.2.8.2.2. The likelihood of occurrence of the white shark within the referral area is determined to be Likely.

4.3.9.2.3 Southern bluefin tuna

Off southern Australia, southern bluefin tuna form part of a single, highly migratory biological stock that spawns in the north-east Indian Ocean from September to April and migrates throughout the temperate southern oceans, supporting several international, Commonwealth and State-managed fisheries.

Southern bluefin tuna feed aggressively in the epipelagic layers of oceans, opportunistically targeting fish, crustaceans, cephalopods, salps and other marine animals (Ellis & Kiessling, 2016). Adults migrate south around Tasmania towards the end of spring/beginning of summer, moving across the south of Australia and then north along the western coastline of Australia to the spawning ground in the north-east Indian Ocean. Anecdotal reports indicate that southern bluefin tuna have been caught at depths of 40 m within the vicinity of the referral area by recreational fishers (Edmonds, 2016). The likelihood of occurrence of the southern bluefin tuna within the referral area is determined to be Possible.

4.3.9.2.4 Other important fish species

Twenty-nine species from the Syngnathidae family, consisting of seahorses, pipefishes and sea dragons are classified as listed marine species under the EPBC Act. Fish in this family are often monogamous, breeding in the summer after extensive courtship rituals. The preferred prey items for syngnathids are small benthic and pelagic crustaceans, such as mysids, copepods, amphipods and shrimp (Bray & Thompson, 2017). These species are listed in the PMST results provided in Appendix B - PMST Results.

The blue warehou, southern bluefin tuna and school shark are listed under the EPBC Act as Conservation Dependant and were identified by Atlantis and Fishwell (2019) as caught within the referral area by commercial fishers. These species and the redfish are managed under stock rebuilding strategies by the AFMA.

There are 29 species of commercial and recreational fishing importance identified for the referral area (Atlantis & Fishwell, 2019).

4.3.10 Marine Mammals and Turtles

4.3.10.1 Marine Mammals

There are four species of cetaceans listed as threatened under the FFG Act that may occur within, or migrate through, the referral area. These are listed in Table 4.11. The likelihood of occurrence in the Victorian

referral area is lower for these species than for the Commonwealth referral area due to behaviours and habitat preference for each species. Further detail is provided under each species below.

Table 4.11 Threatened marine mammal species

Common Name	Scientific Name	FFG Listed	BIA within referral area	Likelihood of occurrence*
Blue whale	<i>Balaenoptera musculus</i>	Threatened	Yes – Possible foraging and migration	Rare
Southern right whale	<i>Eubalaena australis</i>	Threatened	Yes – Migrating/ resting	Unlikely
Humpback whale	<i>Megaptera novaeangliae</i>	Threatened	No	Possible
Burrnan dolphin	<i>Tursiops australis</i>	Threatened	No	Rare

*See Table 4.1 for likelihood of occurrence definitions.

4.3.10.1.1 Blue whale

In Victoria, the blue whale is listed as threatened under the FFG Act (DELWP, 2019b). Possible foraging and migration BIAs for pygmy blue whales occur within Victorian waters (Appendix A - Figures, Figure 7). Detailed information on blue whales is provided in Section 4.2.9.1.1.

Given that pygmy blue whales generally migrate in water depths greater than 500 m and the absence of known upwelling events in south-western Gippsland, the likelihood of occurrence rating for the blue whale within the referral area is determined to be Rare.

4.3.10.1.2 Southern right whale

The southern right whale is considered critically endangered under the FFG Act (DELWP, 2019b). The referral area is within their coastal range including the BIA for migration and resting on migration, which extends across the entire Gippsland coast extending out to the 3 nm boundary (Appendix A - Figures, Figure 7). Detailed information about southern right whales in the Gippsland area is provided in Section 4.2.9.1.2.

It is possible that southern right whales may occur off the Gippsland coast in Victorian waters between April and October. Southern right whales generally occur within 2 km offshore in aggregation areas usually in waters less than 10 m. However, given the absence of known and/or emerging aggregation areas in the Gippsland, the likelihood of occurrence rating for the southern right whale within the referral area is determined to be Unlikely.

4.3.10.1.3 Humpback whale

The humpback whale is listed as threatened under the FFG Act (DELWP, 2019b) and vulnerable on the Advisory List (DSE, 2013). There are no BIAs for humpback whales that pass through or close to the referral area, with the closest one off the coast of New South Wales just above the Victorian border (Appendix A - Figures, Figure 9). Detailed information about humpback whales is provided in Section 4.2.9.1.3.

The likelihood of occurrence rating for the humpback whale within the referral area is determined to be Possible.

4.3.10.1.4 Burrnan dolphin

It was previously thought that only two species of bottlenose dolphins were present in Australian waters; the Indo-Pacific bottlenose dolphin and the common bottlenose dolphin (Möller & Beheregaray, 2001; Rice, 1998). However, in 2011 a third species was described in southern Australian waters, based on morphological and genetic evidence; the Burrnan dolphin (Charlton-Robb et al., 2011). The validity of this new species remains under debate with the Society of Marine Mammalogy (Perrin et al., 2013), despite the description of this new species sustained by genetic, morphological and foraging ecology evidence (Charlton-Robb et al., 2011; Möller et al., 2008; Owen et al., 2011).

The Burrnan dolphin is listed as threatened under the FFG Act and endangered on the Advisory List (DSE, 2013). The Burrnan dolphin is endemic to coastal and inshore waters of Victoria, Tasmania and South

Australia, and possibly southern Western Australia (Charlton-Robb et al., 2011; Möller et al., 2008; Owen et al., 2011). In Victoria the species appears to form two distinct inshore small populations, one of around 50 individuals in Port Phillip Bay and another of around 90 individuals in Gippsland Lakes (Charlton-Robb et al., 2011; Möller et al., 2008). It is unknown whether there is any movement between the Gippsland Lakes, Port Phillip Bay and Tasmanian populations, though it is unlikely given the large distances between these inshore populations.

The likelihood of occurrence rating for the Burrunan dolphin within the referral area is determined to be Rare.

4.3.10.1.5 Other key listed species

Cetaceans

Pygmy right whales are listed as migratory under the Commonwealth EPBC Act. Currently pygmy right whales are not listed under the FFG Act in Victoria. Pygmy right whales are found in temperate and sub-Antarctic waters in oceanic and inshore locations, thought to have a circumpolar distribution in the Southern Hemisphere. Pygmy right whales have been seen in sheltered shallow bays, but it appears that these are predominantly juveniles and sub-adults (DoEE, 2019b). Further detail on pygmy right whales is presented in Section 4.2.9.1.6. The likelihood of occurrence rating for the pygmy right whale within the referral area is determined to be Rare.

Killer whales are a listed migratory species under the EPBC Act. They are more common in cold, deep waters but have often been observed along the continental slope and shelf particularly near seal colonies (Bannister et al., 1996). In Victoria, sightings peak in June/July, where they have been observed feeding on sharks, sunfish, and Australian fur seals (Mustoe., 2008). Further detail on killer whales is presented in Section 4.2.9.1.8. The likelihood of occurrence of the killer whale within the referral area is determined to be Unlikely.

Dusky dolphins are listed as migratory under the EPBC Act but are not listed under the FFG Act. They predominantly occur in temperate sub-Antarctic zones inshore around New Zealand, but can also be pelagic at times (Bannister et al., 1996). Further detail on dusky dolphins is presented in Section 4.2.9.1.7. The likelihood of occurrence rating for the dusky dolphin within the referral area is determined to be Rare.

Bottlenose dolphins are a listed marine species under the EPBC Act. They have a worldwide distribution from tropical to temperate waters and can be found in coastal, estuarine, pelagic and oceanic habitats. Bottlenose dolphins are considered a widespread species comprised of both nearshore and offshore forms (Hoelzel et al., 1998; Rice, 1998). The total population size is not known but it is likely to be common in offshore waters of south-eastern and southern Australia (DoEE, 2019e). Due to the widespread distribution of this species documented, it may inhabit or traverse the referral area. Further detail on bottlenose dolphins is presented in Section 4.2.9.1.9. The likelihood of occurrence rating for the bottlenose dolphin within the referral area is determined to be Possible.

Pinnipeds

Two pinniped species, the Australian fur seal and the New Zealand fur seal (also known as the long-nosed fur seal) are known to occur in the Gippsland region. Neither species are listed under the FFG Act, however both species are listed marine species under the EPBC Act. The New Zealand fur seal is also listed as vulnerable under the Advisory List (DSE, 2013). These species have BIAs near the referral area (Appendix A - Figures, Figure 11). Additional information on Australian and New Zealand fur seals is provided in Section 4.2.9.1.9.

The likelihood of occurrence rating for the New Zealand fur seal within the referral area is determined to be Possible.

4.3.10.2 Turtles

No marine turtle BIAs are recognised within the referral area.

4.3.10.2.1 Leatherback turtle

The leatherback turtle is the only species of marine turtle listed as threatened under the FFG Act. Leatherback turtles in Victoria are listed in the Advisory List as critically endangered (DSE, 2013) and they are managed under the Recovery Plan for Marine Turtles in Australia (DEE, 2017).

Leatherback turtles are distributed throughout tropical, subtropical and temperate waters around the globe (Limpus, 2009a) and are most commonly observed in waters of the Northern Territory and south-western Western Australia. In the eastern states the species has been reported in coastal waters between southern Queensland and central New South Wales, and in southern waters from Tasmania, Victoria and eastern South Australia (Limpus, 2009a). Satellite tagging records indicate that leatherback turtles typically forage in warmer waters during autumn and spring, and forage in cooler southern waters during summer (November to February) (Bailey et al., 2012b). This is consistent with reports that leatherback turtles have been observed in the Bass Strait during summer (Limpus, 2009a).

The leatherback turtle is expected to occasionally visit the referral area, most likely in the summer months. The likelihood of occurrence rating for the leatherback turtle in the referral area is Unlikely.

4.3.10.2.2 Loggerhead and green turtle

The loggerhead turtle and the green turtle are not listed under the FFG Act, however both are listed as 'migratory' under the EPBC Act. There are no BIAs for either species in or within the vicinity of the referral area and their likelihood of occurrence within the referral area is considered Rare.

There is evidence that marine turtles utilise southern waters off South Australia, Victoria and Tasmania for foraging and migration to a greater extent than was previously thought. The South Australian Sea Turtle project, an initiative of the Centre for Integrative Ecology at Deakin University, has developed a database which compiles information from State and Commonwealth government wildlife databases, media articles, reports and historical anecdotal sightings from commercial and recreational fishers and other marine users, and the general public. Since 2014 when the study began a total of 209 sightings of five marine turtle species have been recorded in these southern waters(Appendix A - Figures, Figure 10). Two sightings (both leatherbacks) have been recorded within Victorian waters in the referral area (DELWP, 2019a).

4.3.11 Birds

4.3.11.1 Seabirds

Seabird species listed as threatened under the FFG Act that could occur within, or near, the referral area are listed in Table 4.12. There are no FFG listed species nesting within the referral area.

Table 4.12 Threatened seabird species

Common Name	Scientific Name	FFG Listed	BIA in the referral area	Likelihood of occurrence*
Shy albatross	<i>Thalassarche cauta</i>	Threatened	Yes	Likely
Buller's albatross	<i>Thalassarche bulleri</i>	Threatened	No	Likely
Sooty albatross	<i>Phoebastria fusca</i>	Threatened	No	Possible
Southern royal albatross	<i>Diomedea epomophora</i>	Threatened	No	Likely
Wandering albatross	<i>Diomedea exulans</i>	Threatened	No	Likely
Indian yellow-nosed albatross	<i>Thalassarche carteri</i>	Threatened	No	Likely
Grey-headed albatross	<i>Thalassarche chrysostoma</i>	Threatened	No	Unlikely
Southern giant-petrel	<i>Macronectes giganteus</i>	Threatened	No	Likely
Northern giant-petrel	<i>Macronectes halli</i>	Threatened	No	Likely
Little tern	<i>Sternula albifrons</i>	Threatened	No	Possible
Caspian tern	<i>Sterna caspia</i>	Threatened	No	Possible
Fairy tern	<i>Sterna nereis nereis</i>	Threatened	No	Possible

*See Table 4.1 for likelihood of occurrence definitions.

Bass Strait is a large and relatively shallow area of ocean ranging from 50 to 100 m deep and provides a range of seabird breeding and foraging habitats. The shallow water depths of the Strait result in a greater richness of seabird food resources compared with deeper offshore or pelagic waters (Ashmole, 1971; Brown, 1980; Schneider & Hunt, 1982). The edge of the continental shelf (or shelf break) is around 100 km east of the referral area. The continental shelf deflects deeper ocean currents away, leading to the occurrence of oceanic fronts and nutrient-rich, seasonal ‘upwelling’ that increases seabird prey resources such as bait fish. Foraging seabirds traverse large areas of oceanic habitat in search of prey (Reid, 2002). Although widespread, they tend to congregate in with high densities of prey, often in association with upwelling events along the continental shelf (Reid, 2002). The shelf break waters east and south east of referral area support a greater diversity of foraging seabirds than inshore (continental shelf) waters (Ashmole, 1971; Brown, 1980).

Many migratory seabird species return to Bass Strait islands, south-east of the referral area to breed each year. Colonies of seabirds occur to the west of the referral area in Corner Inlet, on the islands around Wilsons Promontory and to the east at the Skerries, Tullaberga Island and Gabo Island (Harris & Norman, 1981). Species that nest and breed on these islands include the little penguin, white-faced storm petrel, short-tailed shearwater, fairy prion, common diving petrel, black-faced cormorants, and the Pacific gull. Eastern Bass Strait is a foraging area for at least 15 species of albatross, three species of petrel and one species of skua.

Given their capacity for long distance movements, seabirds breeding in the area may fly over the referral area while foraging or in transit to breeding sites. Seabirds nesting on the islands around Wilsons Promontory are likely to move eastwards from these islands across the referral area to the rich marine foraging areas of the eastern Bass Strait continental shelf-break. At the end of a foraging period (lasting from one to several days), these birds would pass over the referral area to return to their breeding islands. The extent, location and numbers of birds involved in these movements is not well understood. However, preliminary information below on the breeding areas and numbers of seabirds on nearby islands provides some insight into this.

The portion of eastern Bass Strait between Wilsons Promontory and Lakes Entrance, closest to (but not within) the referral area supports several breeding sites for seabirds (Appendix A - Figures, Figure 12):

- The Seal Island Group, near the western part of the referral area
- The small granite islands of eastern Wilsons Promontory, including Rabbit Rocks and Rabbit Island on the east coast of Wilsons Promontory, and Bennison, Granite and Doughboy Islands within Corner Inlet
- The sandy barrier islands of the Nooramunga of the Nooramunga Marine and Coastal Park (Appendix A - Figures, Figure 2).
- The chain of islands between Wilsons Promontory and Flinders Island.

4.3.11.1 Other important marine seabirds

The little penguin is not listed under the FFG Act but is a listed marine species under the EPBC Act. There is a little penguin foraging BIA on Curtis Island in Commonwealth waters south-east of the referral area (Appendix A - Figures, Figure 12). The little penguin has breeding sites west of the referral area on the islands around Wilsons Promontory, and to the east at the Skerries, Tullaberga Island and Gabo Island.

The referral area also overlaps with a foraging BIA (Appendix A - Figures, Figure 12) for the short-tailed shearwater which is not listed under the FFG Act, but is listed as migratory under the EPBC Act. There are no breeding locations within the referral area. The closest is on Rag Island, 12 km from the referral area.

4.3.11.2 Shorebirds

The shorebirds listed as threatened under the FFG Act that could occur within or near the referral area are listed in Table 4.13.

Table 4.13 Threatened shorebird species

Common Name	Scientific Name	FFG Listed	BIA in the referral area	Likelihood of occurrence*
Curlew sandpiper	<i>Calidris ferruginea</i>	Threatened	No	Rare

Common Name	Scientific Name	FFG Listed	BIA in the referral area	Likelihood of occurrence*
Great knot	<i>Calidris tenuirostris</i>	Threatened	No	Rare
Eastern curlew	<i>Numenius madagascariensis</i>	Threatened	No	Rare
Hooded plover	<i>Thinornis cucullatus cucullatus</i>	Threatened	No	Likely
Terek sandpiper	<i>Xenus cinereus</i>	Threatened	No	Rare

*See Table 4.1 for likelihood of occurrence definitions.

Shorebirds or ‘waders’ are characterised by their extensive use of intertidal and adjacent coastal habitats in the region. The group includes both resident and non-breeding migratory species. The coastal environments between Wilsons Promontory and the Gippsland Lakes includes a range of nationally and internationally significant shorebird habitats, particularly in the following areas:

- Rocky intertidal shores of islands and Wilsons Promontory
- Sandy ocean beaches of Wilsons Promontory, the Nooramunga barrier islands and Ninety Mile Beach
- Corner Inlet and the Nooramunga Coastal and Marine Parks and similar areas of intertidal flats and sandy beach habitats around Barry Beach and Port Welshpool
- Coastal lakes, such as Lake Jack Smith, near Woodside and Lake Reeve near Seaspray.

Rocky intertidal shores occur from the northern point of Wilsons Promontory (Point Singapore) southwards to South Point and around Rabbit Island, and the Seal Islands provide foraging habitat for sooty oystercatchers and Pacific gulls. Seasonal movements of sooty oystercatchers between offshore rocky islands and the mainland coast in the region are likely to be concentrated in the western part of the region, closest to Wilsons Promontory, away from the referral area. Most Pacific gulls in Victoria occur between the Bellarine Peninsula and Lakes Entrance (Emison et al., 1987), with few breeding records away from the Wilsons Promontory islands. Birds are likely to pass over the referral area in transit from the Gippsland Lakes to the breeding islands around Wilsons Promontory.

The sandy ocean beaches of Wilsons Promontory, the Nooramunga barrier islands and Ninety Mile Beach are relatively infertile habitats for the majority of shorebird species. However, they provide suitable habitat for particular species of shorebirds, including the pied oystercatcher and hooded plover. The pied oystercatcher forages on sandy beaches and intertidal sand and mudflats; none of its regular movements would take it far from shore or over the referral area. The hooded plover breeds and forages on open, ocean sandy beaches along the entire Victorian coast, however this species rarely moves offshore and would confine its movements to the ocean coast and nearby sheltered wetlands in the region.

Migratory shorebirds may fly over or through the referral area, but this is likely to occur only on passage migration flights to and from their non-breeding habitat in south-eastern Australia, or in the course of longer distance flights in which they move between one Australian region and another, during the course of their annual sojourn in Australia. There is little or no empirical data about the flight routes of these birds that is of sufficient detail to indicate whether they fly through or over the referral area. Gulls, terns and cormorants forage in the referral area and may fly over it whilst on migration, but there is little existing data about the extent to which they may do so.

4.3.11.3 Migratory Land Birds

This group encompasses land birds that routinely migrate between Tasmania and mainland Australia (referred to as Bass Strait migrants) and may pass through the referral area on migration passages. Bass Strait migrants include a diversity of species including some raptors, parrots, cuckoos and passerines. They spend the warmer part of the year in Tasmania and/or on Bass Strait islands and migrate annually to mainland Australia. There is little conclusive information about the routes they use to fly across Bass Strait, however, some evidence suggests that particular species use specific flight paths. For example, a number of species such as swamp harriers and blue-wing parrots have been observed to aggregate in the north-eastern and north-western extremities of Tasmania prior to their departure from the island.

On their northward passage, orange-bellied parrots that breed only in south-western Tasmania, have often been observed to spend some days or weeks on King Island after they have left their breeding area. These observations are suggestive that species that behave in that way take the shortest available route to Victoria and/or ‘island-hop’, particularly during the northward, post-breeding migrations. On their southward

migration, some individually identified orange-bellied parrots *Neophema chrysogaster* have been noted arriving in south-western Tasmania within one or two days of having been observed in southern Victoria and it is thus feasible that they take a direct route on the southward passage.

Overall, for this group of birds, there is limited understanding of the routes they use across Bass Strait. While currently available information is not sufficient to indicate specifically whether any of these birds may fly through the referral area, their known behaviour patterns suggest that they would do so no more than twice per year during migrations.

The likelihood of occurrence of Bass Strait migrants listed under the FFG Act is in Table 4.14.

Table 4.14 Threatened land bird species relevant to the referral area

Common Name	Scientific Name	FFG Listed	BIA in the referral area	Likelihood of occurrence*
Swift parrot	<i>Lathamus discolor</i>	Threatened	No	Rare
Orange-bellied parrot	<i>Neophema chrysogaster</i>	Threatened	No	Rare
White-throated needletail	<i>Hirundapus caudacutus</i>	Threatened	No	Likely

*See Table 4.1 for likelihood of occurrence definitions.

4.4 Planned Baseline Surveys

4.4.1 Overview

The above summary of existing conditions has identified knowledge gaps in the existing information. In order to inform the baseline environment for the project, the following marine baseline surveys are planned, with some surveys already underway:

- Benthic Ecology (grab sampling and underwater video)
- Fish Ecology (stereo baited remote underwater video, demersal trawl and demersal gillnet)
- Marine Mammals (visual aerial surveys, acoustic monitoring and fur seal tagging studies)
- Seabirds and Shorebirds (digital aerial surveys, shorebird surveys, seabird tagging studies)

The 12-month baseline survey period runs from January to December 2020. A short summary of each survey scope is provided below. Full survey scopes are available for review and comment by DAWE and DELWP.

4.4.2 Benthic Ecology

The objective of the benthic ecology survey is to provide a robust baseline description of the benthic habitats and associated biological assemblages within the referral area to inform the impact assessment for the project. There is little existing detailed scientific information on benthic ecology or sediment physico-chemistry specific to the referral area. Two main complementary survey methods, underwater video and grab sampling, have been proposed in order to adequately characterise benthic ecology for a range of different seabed substrate types in and around the referral area. The surveys would provide ‘infill’ data to support assessment of the distribution of different substrate and habitat types in and around the referral area, and to ground-truth existing anecdotal information on benthic habitat types (e.g. reef, seagrass beds). Sampling would be stratified by factors including water depth, potential impact areas, and potential reference areas. A single survey period is planned during late summer / early Autumn 2020.

4.4.3 Fish Ecology

The objective of the fish ecology field surveys is to provide information on habitat and fish assemblages for a broad range of fish species in the referral area. Three established and complementary survey methods would be used: stereo baited remote underwater video; demersal trawl; and demersal gillnet. Two field surveys are planned to occur in autumn/winter and spring/summer 2020, with specifics of the survey design to be confirmed following consultation with commercial fishers and in collaboration with research partners.

4.4.4 Marine Mammals

The objective of the marine mammal surveys is to provide a robust baseline description of marine mammal species distributions and abundances in and around the referral area to inform the impact assessment for the project. A range of survey methods have been proposed in order to collect sufficient spatial and temporal data on marine mammals in and around the referral area. These survey methods are designed to target key species of conservation importance and other important populations that may use or pass through the referral areas. Visual aerial surveys targeting cetaceans are being conducted once a month, for 12 months, however other large marine megafauna (e.g. fur seals, sharks, turtles) would also be recorded. Tagging studies would be conducted on adult female Australian and New Zealand fur seals on Kanowna Island (the largest Australian fur seal population) and Rag Island (the closest population to the referral area) from late April to September. Population counts would be carried out for both fur seal species during summer and surveys for body condition assessment during summer and winter. Acoustic monitoring would be undertaken in the study area for 12 months, targeting all key marine mammal species.

4.4.5 Seabird and Shorebirds

The objective of the seabird and shorebird surveys is to determine the ecological significance of the referral area to birds that might occur there in order to determine the potential for direct or indirect impacts. The surveys aim to provide a baseline description of birds inhabiting the referral area; including population sizes and demographic parameters, temporal usage patterns of the referral area and flight behaviours (including frequency and heights) to inform the impact assessment for the project.

The survey methods proposed for seabirds include: 12 months of digital aerial surveys, tagging studies of key local species and population counts of locally breeding species, such as short-tailed shearwaters. The data collected from these surveys would inform the assessment of key impacts associated with the project, being collision risk, displacement and barrier effects and other indirect/long-term effect on birds.

The shorebird surveys have been designed to enable the collection of baseline data to inform the project impact assessment. They include monthly surveys of a section of Ninety Mile Beach where the export cables shore crossing is proposed and associated wetlands. A second shorebird survey is proposed if a link is established between the Licence Area and the Corner Inlet Ramsar Site through the coastal processes study. Should this be required, biannual boat-based surveys of the Ramsar site would be carried out to gather shorebird abundance data and monitor high-tide roosts and resident shorebird breeding sites. Such surveys would be supplemented with close engagement with BirdLife Australia and the Victorian Wader Study Group, who have undertaken regular monitoring in Corner Inlet for over 35 years. This study is largely to inform an impact assessment of potential indirect impacts to these habitats in the event of altered coastal processes, deposition and/or benthic ecology.

5 ASSESSMENT OF POTENTIAL IMPACTS – OVERVIEW

5.1 Overview of Potential Impacts

This section provides the results of a systematic review of the environmental aspects and potential offshore ecological impacts of the project as they relate to the marine and intertidal environment, for benthic habitats (Table 5.1), invertebrates and fish (Table 5.2), marine mammals (Table 5.3), marine turtles (Table 5.4) and birds (Table 5.5). Control measures are also provided in each table.

The systematic review of all potential aspects in the tables below supports a thorough assessment of individual and cumulative impacts. The assessment has considered both planned aspects (e.g. routine discharges) and unplanned events (e.g. chemical spills) for each receptor group. Further, the review has considered flow on effects through the food chain (i.e. an impact on benthic habitat leading to a reduction in prey species for the ultimate receptor). The overview of the assessment of potential impacts in this section forms the basis of the assessment of the significance of impacts provided in Section 6 (Commonwealth matters) and Section 7 (Victorian matters).

The control measures identified in the tables below are drawn from legislation and standard control measures which are implemented in the offshore environment. The implementation of these control measures has been assumed in determining the significance of potential impacts presented in Section 6 and Section 7. For potentially significant environmental impacts, or where some uncertainty exists in the level of potential impact, additional control measures would be identified during detailed environmental impact assessments.

Table 5.1 Overview of potential impacts to benthic habitats

Aspect	Potential impact description	Direct or indirect impact	Control measures
Routine vessel discharges	<ul style="list-style-type: none"> Routine discharges from vessels (including sewerage and oily water) during construction, operations or decommissioning could result in a potential decline in water and sediment quality. 	Direct – toxic impacts to benthic flora.	<ul style="list-style-type: none"> Standard maritime legislation for vessel discharges (e.g. MARPOL).
Physical presence of infrastructure – below water	<ul style="list-style-type: none"> Physical presence of subsea infrastructure reduces or disturbs benthic habitat. Physical presence of subsea infrastructure provides artificial substrate that results in creation of new benthic habitat and changes benthic habitat communities. 	Direct – removal/disturbance to benthic habitat, changes to benthic habitat communities.	<ul style="list-style-type: none"> Geophysical, geotechnical and benthic surveys would inform locations and micro-siting of infrastructure to avoid sensitive habitats where possible.
Suspended sediments and sediment deposition	<ul style="list-style-type: none"> Shore crossing activities and the installation, maintenance and decommissioning of subsea export and array cables, substation platform foundations, and WTGs foundations results in local turbidity and sedimentation in the water column or smothering of benthic habitat. Changes to wave and current regime around turbine foundations during operation causes local scour of seabed and potential changes to coastal sediment transport processes resulting in a loss or change to benthic habitat. 	<p>Direct – smothering and scour effects impact benthic habitats.</p> <p>Indirect – increased turbidity and changes to water quality impact benthic habitats; changes to coastal processes affects benthic habitat.</p>	<ul style="list-style-type: none"> Procedures for shutdown if water quality triggers met. Installation and maintenance of scour protection around foundations.

Aspect	Potential impact description	Direct or indirect impact	Control measures
IMS	<ul style="list-style-type: none"> Contaminated hulls and/ or ballast water discharges from vessels may result in the introduction and establishment of IMS that are harmful to benthic habitats. 	<p>Direct – mortality or reduction in health of benthic habitat.</p> <p>Indirect – IMS results in changes to benthic habitat community structure.</p>	<ul style="list-style-type: none"> <i>Biosecurity Act 2015 (Cth)</i>, specifically requirements related to hull biofouling and ballast water management. Australian ballast water management requirements. National biofouling guidance (e.g. biofouling risk assessment, record books, hull assessments etc).
Dropped objects/ unplanned waste overboard	<ul style="list-style-type: none"> Smothering or toxic impacts from unplanned dropped objects or wastes from vessels. 	<p>Direct – smothering and/or toxic effects on benthic flora or sediments.</p>	<ul style="list-style-type: none"> Contractor safe-lifting practices. Secure storage of equipment, tools, wastes and plastics onboard vessels. Recovery of overboard materials if practicable.
Unplanned fuel or chemical spills	<ul style="list-style-type: none"> Diesel or chemical spills due to vessel collisions, refuelling incidents, tank/equipment failure or grounding could result in sub-lethal or lethal effects to benthic habitat. Toxicity of drilling chemicals reduces water and sediment quality of benthic habitats. 	<p>Direct – smothering or toxic impacts to benthic flora and sediments.</p> <p>Indirect – reduced water quality resulting in effects on benthic flora.</p>	<ul style="list-style-type: none"> Standard maritime legislation (e.g. MARPOL), including requirements for communication processes and navigation aids. Engineering design of offshore infrastructure considers extreme environmental conditions over project lifetime. Notice to mariners and other stakeholder notifications. Simultaneous operations management plans. Refuelling procedures. Equipment maintenance to manufacturers specifications. Bunding and containment systems. Dry break couplings. Spill response plans.

Table 5.2 Overview of potential impacts to invertebrates and fish

Aspect	Potential impact description	Direct or indirect impact	Control measures
Routine vessel discharges	<ul style="list-style-type: none"> Toxicity effects to fish and invertebrates from routine vessel liquid discharges, including sewerage and oily water. 	<p>Direct – contact or ingestion of pollutants from routine vessel discharges.</p> <p>Indirect – reduced water quality impacts on habitats and prey.</p>	<ul style="list-style-type: none"> Standard maritime legislation for vessel discharges (e.g. MARPOL).
Underwater noise and vibration	<ul style="list-style-type: none"> Underwater noise and vibration from construction (piling or drilling) and operation of infrastructure may cause death, physical/auditory injury or behavioural disturbance to fish and invertebrates (e.g. sharks) and their prey species. Behavioural impacts could include: 	<p>Direct – physiological and behavioural impacts to fish and invertebrates.</p>	<ul style="list-style-type: none"> Application of the management principles of EPBC Act Policy Statement 2.1 Interaction between offshore seismic exploration and whales: Industry guidelines (i.e. soft start requirements).

Aspect	Potential impact description	Direct or indirect impact	Control measures
	<ul style="list-style-type: none"> Avoidance of feeding and spawning areas, and migration routes Changes due to masking of communication and orientation signals. 		
Physical presence of infrastructure – below water	<ul style="list-style-type: none"> Footprint of subsea infrastructure reduces habitat available to fish and invertebrates and their prey species. Physical presence of subsea infrastructure provides artificial substrate that increases available habitat and results in changes to communities that utilise benthic habitats. 	Indirect – reduction of available benthic habitat, or alternatively increase in benthic habitat that changes the fish and invertebrate community structure.	<ul style="list-style-type: none"> Subsea infrastructure located to minimise disturbance to important benthic habitat.
Suspended sediments and sediment deposition	<ul style="list-style-type: none"> Shore crossing activities and the installation, maintenance and decommissioning of subsea export and array cables, substation platforms and foundations, and WTGs and foundations, results in increased turbidity and sedimentation in the water column and on the seabed, which affects habitat and water quality for fish and invertebrates and their prey species. Changes to wave and current regime around turbine foundations during operation causing local scour of seabed and potential changes to coastal sediment transport processes resulting in a loss or change to benthic habitat for fish and invertebrates and their prey species. 	<p>Direct – reduction in water quality due to suspended sediments.</p> <p>Indirect – reduction of available habitat; changes to coastal processes affects habitat.</p>	<ul style="list-style-type: none"> Subsea infrastructure located to minimise disturbance to important benthic habitat. Installation and maintenance of scour protection around foundations.
Electromagnetic fields ('EMF')	<ul style="list-style-type: none"> EMF from subsea export and array cables results in localised behavioural impacts to fish and invertebrates or their prey species (e.g. masking of communication and orientation signals). 	Direct – impacts to cartilaginous fish (such as sharks and rays) and invertebrate behaviour and/or navigation.	<ul style="list-style-type: none"> Cable burial or protection Alternating current ('AC') export cables
IMS	<ul style="list-style-type: none"> Contaminated hulls and/ or ballast water discharges from vessels may result in the introduction and establishment of IMS that prey on, directly compete with fish and invertebrates or destroy habitat of importance to fish and invertebrates. 	<p>Direct – injury/death, competition for prey species.</p> <p>Indirect – reduction in available habitat.</p>	<ul style="list-style-type: none"> <i>Biosecurity Act 2015 (Cth)</i>, specifically requirements related to hull biofouling and ballast water management. Australian ballast water management requirements. National biofouling management guidance (e.g. biofouling risk assessment, record book, hull inspections).
Dropped objects/ unplanned waste overboard	<ul style="list-style-type: none"> Ingestion of materials or entanglement of fish and invertebrates potentially resulting in illness/death. 	Direct – ingestion of materials, or entanglement (e.g. by sharks).	<ul style="list-style-type: none"> Contractor safe-lifting practices. Secure storage of equipment, tools, wastes and plastics onboard vessels.

Aspect	Potential impact description	Direct or indirect impact	Control measures
		Indirect – ingestion of contaminated prey species (fish).	<ul style="list-style-type: none"> • Recovery of overboard materials if practicable.
Unplanned fuel or chemical spills	<ul style="list-style-type: none"> • Fuel or chemical spills due to vessel collisions, refuelling incidents, tank/equipment failure or grounding could result in sub-lethal or lethal effects to fish and invertebrates or their prey species. 	<p>Direct – ingestion or contact with unplanned spill.</p> <p>Indirect – ingestion of contaminated prey species.</p>	<ul style="list-style-type: none"> • Standard maritime legislation (e.g. MARPOL), including requirements for communication processes and navigation aids. • Engineering design of windfarm infrastructure considers extreme environmental conditions over project lifetime. • Notice to mariners and other stakeholder notifications. • Simultaneous operations management plans. • Refuelling procedures. • Equipment maintenance to manufacturers specifications. • Bunding and containment systems. • Dry break couplings. • Spill response plans.

Table 5.3 Overview of potential impacts to marine mammals

Aspect	Potential impact description	Direct or indirect impact	Control measures
Routine vessel discharges	<ul style="list-style-type: none"> • Toxicity effects due to direct contact or ingestion of pollutants by marine mammals or their prey species, resulting in illness and/ or mortality. 	<p>Direct – marine mammal ingestion of, or direct contact with pollutants.</p> <p>Indirect – toxicity effects on prey species such as fish and invertebrates.</p>	<ul style="list-style-type: none"> • Standard maritime legislation for vessel discharges (e.g. MARPOL).
Underwater noise and vibration	<ul style="list-style-type: none"> • Underwater noise and vibration from vessel activities, installation and removal of foundations (piling, drilling), or operation of subsea infrastructure could cause death, physical/ auditory injury or behavioural disturbances to marine mammals or their prey species. Behavioural impacts could include: <ul style="list-style-type: none"> – Avoidance or displacement from the area – Changes due to masking of communication and orientation signals. 	<p>Direct – physiological and behavioural impacts to marine mammals.</p> <p>Indirect – injury/death or behavioural disturbance to prey species such as fish and invertebrates.</p>	<ul style="list-style-type: none"> • EPBC Act guidelines for vessel interactions with whales and dolphins (e.g. minimum distances and vessel speeds). • Application of the management measures of EPBC Act Policy Statement 2.1 Interaction between offshore seismic exploration and whales: Industry guidelines (e.g. soft start requirements and shutdown zones).

Aspect	Potential impact description	Direct or indirect impact	Control measures
Physical presence of infrastructure – below water	<ul style="list-style-type: none"> Footprint of subsea infrastructure reduces habitat available to marine mammal prey species. Physical presence of subsea infrastructure provides artificial substrate that results in changes to community structure and availability of marine mammal prey species. 	Indirect – reduction of available benthic habitat, or alternatively increase in benthic habitat that changes marine mammal prey availability.	<ul style="list-style-type: none"> Subsea infrastructure located to minimise disturbance to important benthic habitat for marine mammals.
Suspended sediments and sediment deposition	<ul style="list-style-type: none"> Shore crossing activities and the installation, maintenance and decommissioning of subsea export and array cables, substation platform foundations and WTGs foundations, results in turbidity and sedimentation in the water column which displaces marine mammals or impairs foraging behaviour. Changes to wave and current regime around turbine foundations during operation causing local scour of seabed and potential changes to coastal sediment transport processes resulting in a loss or change to benthic habitat for marine mammals. 	<p>Direct – displacement or impairment of foraging behaviour.</p> <p>Indirect – reduction in habitat available to marine mammal prey species; changes to coastal processes habitat for prey species.</p>	
EMF	<ul style="list-style-type: none"> EMF from subsea export and array cables results in localised behavioural impacts to marine mammals or their prey species (e.g. masking of communication and orientation signals). 	<p>Direct – impacts on marine mammal behaviour and/or navigation.</p> <p>Indirect – impacts on prey species (such as cartilaginous fish) behaviour and/or navigation.</p>	<ul style="list-style-type: none"> Cable burial or protection. AC export cables.
Vessel strike	<ul style="list-style-type: none"> The presence of construction, maintenance and decommissioning vessels results in injury/death of marine mammals. 	Direct – injury/death of marine mammals.	<ul style="list-style-type: none"> EPBC Act regulations for travel speeds and safe distances for marine mammals.
IMS	<ul style="list-style-type: none"> Contaminated hulls and/ or ballast water discharges from vessels may result in the introduction and establishment of IMS which affect fur seal prey species or reduce the available habitat for prey species. 	<p>Indirect – impacts on fur seal prey species affects available food source.</p> <p>Indirect – reduction in habitat available to marine mammals or their prey species.</p>	<ul style="list-style-type: none"> <i>Biosecurity Act 2015</i> (Cth), specifically requirements related to hull biofouling and ballast water management. Australian ballast water management requirements. National biofouling guidance (e.g. Biofouling risk assessment, record books, hull assessments etc).
Dropped objects/ unplanned waste overboard	<ul style="list-style-type: none"> Ingestion of overboard materials or entanglement by marine mammals or their prey species could result in injury or mortality. 	<p>Direct – ingestion of, or entanglement.</p> <p>Indirect – ingestion or entanglement of prey species.</p>	<ul style="list-style-type: none"> Contractor safe-lifting practices. Secure storage of equipment, tools, wastes and plastics onboard vessels. Recovery of overboard materials if practicable.

Aspect	Potential impact description	Direct or indirect impact	Control measures
Unplanned fuel or chemical spills	<ul style="list-style-type: none"> Fuel or chemical spills due to vessel collisions, refuelling incidents, tank/ equipment failure or grounding could result in sub-lethal or lethal effects to marine mammals or their prey species. 	<p>Direct – ingestion or contact with unplanned spill.</p> <p>Indirect – ingestion of contaminated prey species.</p>	<ul style="list-style-type: none"> Standard maritime legislation (e.g. MARPOL), including requirements for communication processes and navigation aids. Engineering design of windfarm infrastructure considers extreme environmental conditions over project lifetime. Notice to mariners and other stakeholder notifications. Simultaneous operations management plans. Refuelling procedures. Equipment maintenance to manufacturers specifications. Bunding and containment systems. Dry break couplings. Spill response plans.

Table 5.4 Overview of potential impacts to marine turtles

Aspect	Potential impact description	Direct or indirect impact	Control measures
Routine vessel discharges	<ul style="list-style-type: none"> Toxicity effects due to direct contact or ingestion of pollutants by marine turtles or their prey species, resulting in illness and/or mortality. 	<p>Direct – marine turtle ingestion of, or direct contact with pollutants.</p> <p>Indirect – toxicity effects on prey species such as fish and invertebrates.</p>	<ul style="list-style-type: none"> Standard maritime legislation for vessel discharges (e.g. MARPOL).
Underwater noise and vibration	<ul style="list-style-type: none"> Underwater noise and vibration from vessel activities, installation and removal of foundations (piling, drilling), or operation of subsea infrastructure could cause death, physical/auditory injury, or behavioural disturbances to marine turtles or their prey species. 	<p>Direct – injury or behavioural disturbance to marine turtles.</p> <p>Indirect – injury or behavioural disturbance to prey species such as fish and invertebrates.</p>	<ul style="list-style-type: none"> Application of the management principles of EPBC Act Policy Statement 2.1 Interaction between offshore seismic exploration and whales: Industry guidelines (specifically soft start requirements).
Physical presence of infrastructure – below water	<ul style="list-style-type: none"> Footprint of subsea infrastructure reduces habitat available to marine turtle prey species. Physical presence of subsea infrastructure provides artificial substrate that results in changes to community structure and availability of marine turtle prey species. 	<p>Indirect – reduction of available benthic habitat, or alternatively increase in benthic habitat that changes marine turtle prey availability.</p>	<ul style="list-style-type: none"> Subsea infrastructure located to minimise disturbance to important benthic habitat.

Aspect	Potential impact description	Direct or indirect impact	Control measures
Suspended sediments and sediment deposition	<ul style="list-style-type: none"> Shore crossing activities and the installation, maintenance and decommissioning of subsea export and array cables, substation platform foundations and WTGs foundations, results in turbidity and sedimentation in the water column which displaces marine turtles or impairs foraging behaviour. Changes to wave and current regime around turbine foundations during operation causing local scour of seabed and potential changes to coastal sediment transport processes resulting in a loss or change to benthic habitat available to marine turtles and their prey species. 	<p>Direct – displacement of, or impairment of foraging behaviour.</p> <p>Indirect – reduction in habitat available to marine turtle prey species; changes to coastal processes affects habitat.</p>	
Artificial lighting	<ul style="list-style-type: none"> Light from navigation buoys, construction and operational vessels, operational infrastructure (WTGs, substation platforms) during construction, operation and decommissioning may directly impact turtle movements and also affect marine turtle feeding behaviour if prey species are attracted to vessel lighting. 	<p>Direct – attraction to lighting or deterrence from habitat.</p> <p>Indirect – impacts on prey species.</p>	<ul style="list-style-type: none"> Lighting limited to that required for safe operations.
EMF	<ul style="list-style-type: none"> EMF from subsea export and array cables results in localised behavioural impacts to fish and invertebrates or their prey species (e.g. masking of communication and orientation signals). 	<p>Direct – impacts on marine turtle behaviour and/ or navigation.</p> <p>Indirect – impacts on prey species behaviour and/ or navigation.</p>	<ul style="list-style-type: none"> Cable burial or protection. AC export cables.
Vessel strike	<ul style="list-style-type: none"> The presence of construction, maintenance and decommissioning vessels results in injury/death of marine turtles. 	<p>Direct – injury/death of marine turtles.</p>	<ul style="list-style-type: none"> No legislative or other standard control measures. The requirement for specific controls would be determined during the detailed environmental risk assessment stage.
IMS	<ul style="list-style-type: none"> Contaminated hulls and/ or ballast water discharges from vessels may result in the introduction and establishment of IMS which result in illness/ death of marine turtle prey species or reduce the available habitat for marine turtles or their prey species. 	<p>Indirect – illness/ death of marine turtle prey species affects available marine turtle food source.</p> <p>Indirect – reduction in habitat available to marine turtles or their prey species.</p>	<ul style="list-style-type: none"> <i>Biosecurity Act 2015</i> (Cth), specifically requirements related to hull biofouling and ballast water management. Australian ballast water management requirements. National biofouling guidance (e.g. Biofouling risk assessment, record books, hull assessments etc).
Dropped objects/ unplanned waste overboard	<ul style="list-style-type: none"> Ingestion of overboard materials or entanglement of marine turtles, or their prey species could result in injury or mortality. 	<p>Direct – ingestion of, or entanglement.</p> <p>Indirect – ingestion or entanglement of prey species.</p>	<ul style="list-style-type: none"> Contractor safe-lifting practices. Secure storage of equipment, tools, wastes and plastics onboard vessels. Recovery of overboard materials if practicable.

Aspect	Potential impact description	Direct or indirect impact	Control measures
Unplanned fuel or chemical spills	<ul style="list-style-type: none"> Fuel or chemical spills due to vessel collisions, refuelling incidents, tank/ equipment failure or grounding could result in sub-lethal or lethal effects to marine turtles. 	<p>Direct – marine turtle ingestion or contact with unplanned spill.</p> <p>Indirect – ingestion of contaminated prey species.</p>	<ul style="list-style-type: none"> Standard maritime legislation (e.g. MARPOL), including requirements for communication processes and navigation aids. Engineering design of windfarm infrastructure considers extreme environmental conditions over project lifetime. Notice to mariners and other stakeholder notifications. Simultaneous operations management plans. Refuelling procedures. Equipment maintenance to manufacturers specifications Bunding and containment systems. Dry break couplings. Spill response plans.

Table 5.5 Overview of potential impacts to birds

Aspect	Potential impact description	Direct or indirect impact	Control measures
Routine vessel discharges	<ul style="list-style-type: none"> Toxicity effects due to direct contact or ingestion of pollutants by birds or their prey species, resulting in illness and/or mortality. 	<p>Direct – ingestion of, or direct contact with pollutants.</p> <p>Indirect – toxicity effects on prey species such as fish and invertebrates.</p>	<ul style="list-style-type: none"> Standard maritime legislation for vessel discharges (e.g. MARPOL).
Underwater noise and vibration	<ul style="list-style-type: none"> Underwater noise and vibration from: <ul style="list-style-type: none"> Vessel activities during construction, operations and decommissioning. Shore crossing activities. Installation of foundations during construction (piling in particular). Removal of foundations during decommissioning. <p>could cause physical/ auditory injury or behavioural disturbances to diving birds or their prey species.</p>	<p>Direct – injury or behavioural disturbance to diving birds.</p> <p>Indirect – injury or behavioural disturbance to prey species such as fish and invertebrates.</p>	<ul style="list-style-type: none"> Application of the management principles of EPBC Act Policy Statement 2.1 Interaction between offshore seismic exploration and whales: Industry guidelines (specifically soft start requirements).
Physical presence of infrastructure – below water	<ul style="list-style-type: none"> Footprint of subsea infrastructure reduces habitat available to bird prey species. Physical presence of subsea infrastructure provides artificial substrate that results in changes to community structure and availability of prey species. 	<p>Indirect – reduction of available benthic habitat, or alternatively increase in benthic habitat that changes bird prey availability.</p>	<ul style="list-style-type: none"> Subsea infrastructure located to minimise disturbance to important benthic habitat for birds.
Suspended sediments and sediment deposition	<ul style="list-style-type: none"> Shore crossing activities and the installation, maintenance and decommissioning of subsea export and array cables, 	<p>Direct – displacement of, or impairment of diving behaviour.</p>	

Aspect	Potential impact description	Direct or indirect impact	Control measures
	<p>substation platform foundations and WTGs foundations, results in turbidity and sedimentation in the water column which displaces birds or impairs foraging (diving) behaviour.</p> <ul style="list-style-type: none"> Changes to wave and current regime around turbine foundations during operation causing local scour of seabed and potential changes to coastal sediment transport processes resulting in a loss or change to bird roosting and foraging habitat in adjacent coastal areas. 	Indirect – reduction in habitat available to prey species or changes to bird roosting/foraging habitat.	
Physical presence of offshore infrastructure – above water	<ul style="list-style-type: none"> Collision risk – physical presence of WTGs in operation results in collision with turbine blades. Displacement – presence of WTGs and substation platforms displaces birds from their foraging habitat. Barrier effects – avoidance or diversion of birds from their normal flight paths increases flight paths/migratory distances. 	Direct – collision risk results in injury/death of individuals, displacement impacts on foraging, barrier effects, impacts on migration patterns.	<ul style="list-style-type: none"> Increase the visibility of rotor blades during daytime. Use of infrared aviation lighting to avoid attraction to offshore infrastructure.
Artificial lighting	<ul style="list-style-type: none"> Light from navigation buoys, construction and operational vessels, infrastructure (WTGs, substation platforms) during construction, operation and decommissioning may attract birds at night increasing bird strike and may cause change in feeding behaviour of birds if prey species aggregate around light on water. 	Direct – injury/death of individuals or changes to feeding behaviour.	<ul style="list-style-type: none"> Lighting limited to that required for safe operations and use of infrared aviation lighting.
IMS	<ul style="list-style-type: none"> Contaminated hulls and/ or ballast water discharges from vessels may result in the introduction and establishment of IMS which could reduce available habitat for prey species. 	Indirect – reduction in habitat available to prey species.	<ul style="list-style-type: none"> <i>Biosecurity Act 2015</i> (Cth), specifically requirements related to hull biofouling and ballast water management. Australian ballast water management requirements. National biofouling guidance (e.g. biofouling risk assessment, record books, hull assessments etc).
Dropped objects/ unplanned waste overboard	<ul style="list-style-type: none"> Ingestion of overboard materials or entanglement by seabirds/ shorebirds or their prey species could result in injury or mortality. 	<p>Direct – ingestion or entanglement.</p> <p>Indirect – ingestion or entanglement of prey species.</p>	<ul style="list-style-type: none"> Contractor safe-lifting practices. Secure storage of equipment, tools, wastes and plastics onboard vessels. Recovery of overboard materials if practicable.
Unplanned fuel or chemical spills	<ul style="list-style-type: none"> Diesel or chemical spills due to vessel collisions, refuelling incidents, tank/equipment failure or grounding could result in sub-lethal or lethal effects to 	<p>Direct – ingestion or contact with unplanned spill.</p> <p>Indirect – ingestion of contaminated prey</p>	<ul style="list-style-type: none"> Standard maritime legislation (e.g. MARPOL), including requirements for communication processes and navigation aids.

Aspect	Potential impact description	Direct or indirect impact	Control measures
	birds, their prey species or breeding and foraging areas.	species (fish), contamination of nesting sites.	<ul style="list-style-type: none"> • Engineering design of windfarm infrastructure considers extreme environmental conditions over project lifetime. • Notice to mariners and other stakeholder notifications. • Simultaneous operations management plans. • Refuelling procedures. • Equipment maintenance to manufacturers specifications. • Bunding and containment systems. • Dry break couplings. • Spill response plans.

5.2 Impact Assessment Studies

The impact assessment process for the project will include an assessment of the impacts and proposed mitigations and controls for following specialist topics:

- Coastal processes
- Benthic ecology
- Fish and invertebrates
- Marine mammals and turtles
- Seabird, shorebirds and migratory land birds
- Protected areas
- Commercial and recreational fisheries
- Shipping and navigation
- Maritime heritage
- Business and tourism
- Infrastructure and co-existence with other users.

The following specialist studies and modelling would also be carried out to inform the impact assessment:

- Coastal processes modelling
- Underwater noise modelling study
- Collision risk modelling
- Oil spill trajectory modelling
- Landscape and visual impact assessment.

6 ASSESSMENT OF POTENTIAL SIGNIFICANT IMPACTS – COMMONWEALTH MATTERS

This section sets out an assessment of potential significant impacts for the following four Commonwealth matters:

- Wetlands of international importance
- Listed threatened species and ecological communities
- Listed migratory species
- The Commonwealth marine area.

The assessment of whether significant impact was likely was undertaken in accordance with the Matters of National Environmental Significance - Significant Impact Guidelines 1.1 (DoE, 2013) and based on the assessment of potential impacts as set out in Section 5 as well as the implementation of the legislative and standard control measures described in Section 5.

In accordance with the guidelines, “a ‘significant impact’ is an impact which is important, notable, or of consequence, having regard to its context or intensity.” Furthermore, the guidelines state that “to be ‘likely’, it is not necessary for a significant impact to have a greater than 50 per cent chance of happening; it is sufficient if a significant impact on the environment is a real or not remote chance or possibility.”

6.1 Wetlands of International Importance

One wetland of international importance lies in the vicinity of, but not within the referral area – the Corner Inlet Ramsar site. At its closest point, the north-eastern part of the wetland lies 200 m from the referral area (see Appendix A - Figures, Figure 2). Table 6.1 provides the assessment against the significant impact criteria for wetlands of international importance.

Table 6.1 Significant impact assessment for wetlands of international importance

Criterion	Assessment
Areas of the wetland being destroyed or substantially modified	<p>Unlikely.</p> <p>The referral area lies adjacent to, but not within, the most north-eastern edge of the Corner Inlet Ramsar site (see Appendix A - Figures, Figure 2). Therefore, the proposed construction, operation and decommissioning activities would be unlikely to result in any areas of the wetland being directly destroyed or substantially modified.</p> <p>Indirect effects on the wetland are possible as a result of installation activities for the export cables and shore crossing, and discharges from support vessels. Increased levels of sedimentation and turbidity in the water column from installation activities are likely to be localised and dissipate rapidly. With implementation of the legislative and standard control measures summarised in Section 5, cable installation works and vessel discharges would result in negligible impacts to the wetland.</p> <p>Indirect impacts on the wetland as a result of the physical presence of the offshore infrastructure (such as WTG and substation platform foundations) in Commonwealth waters may result in local changes to the wave and current regime and sediment transport processes. It is not expected that these changes would result in areas of the wetland being destroyed or substantially modified, however this will require further assessment in the project environmental impact assessment. Coastal processes modelling is proposed to inform the impact assessment.</p> <p>Should mass flow excavation or drilling be required to install turbine foundations, further assessment and modelling would be required to inform the potential impacts and control measures required to protect the Corner Inlet Ramsar site.</p> <p>Unplanned oil or chemical spills associated with construction, operations or decommissioning activities could also result in impacts on the wetland. There is also the risk that IMS are introduced to the referral area as a result of vessel activities and establish and encroach on the wetland (depending on the introduced species). Given the legislative and standard control measures summarised in Section 5 and the low likelihood of such unplanned incidents, these impacts are unlikely to destroy or substantially modify the Corner Inlet Ramsar site.</p>
A substantial and measurable change in	<p>Unlikely.</p>

Criterion	Assessment
<p>the hydrological regime of the wetland, for example, a substantial change to the volume, timing, duration and frequency of ground and surface water flows to and within the wetland</p>	<p>Indirect impacts on the wetland as a result of the physical presence of the offshore infrastructure (such as WTG and substation platform foundations) in Commonwealth waters may result in local changes to the wave and current regime and sediment transport processes. It is not expected that these changes would result in substantial and measurable change in the hydrological regime of the wetland, however this will require further assessment in the project environmental impact assessment. Coastal processes modelling is proposed to inform the impact assessment.</p> <p>Pre-construction geophysical and geotechnical surveys are planned along with benthic habitat baseline surveys to characterise the sediment and benthic habitat types. These surveys will supplement the coastal processes modelling to inform the assessment of any change in coastal processes and the marine hydrological regime.</p> <p>Subsea infrastructure would not be installed in waters shallow enough to cause an effect on ground and surface water flows in wetland habitats.</p> <p>Whilst it is unlikely that offshore infrastructure would result in substantial and measurable change in the hydrological regime of the wetland, this will require further assessment in the project environmental impact assessment.</p>
<p>The habitat or lifecycle of native species, including invertebrate fauna and fish species, dependent upon the wetland being seriously affected</p>	<p>Unlikely.</p> <p>The referral area does not overlap with the Corner Inlet Ramsar site, therefore there would be no direct impacts on the habitat or the lifecycle of native species of sessile marine fauna and flora that are dependent on the wetland.</p> <p>There could be direct behavioural impacts (e.g. avoidance behaviour) to mobile marine fauna from noise and vibration associated with vessel activities, foundation installation or unexploded ordnance ('UXO') clearance (if required) during construction. However, these impacts are unlikely to affect the lifecycle of marine fauna that depend on the wetland.</p> <p>Vessel noise and vibration would likely result in temporary displacement similar in nature to general vessel activities in the region. Behavioural impacts on mobile marine fauna from foundation installation would be restricted to the duration of the activity during the construction phase. Noise and vibration associated with UXO removal would only result if detonation is required and impacts would be short-term. These impacts are unlikely to seriously affect the habitat or lifecycle of marine fauna that depend on the wetland.</p> <p>Unplanned oil or chemical spills associated with construction, operations or decommissioning activities could result in toxicity impacts on wetland habitat or the species that inhabit it. There is also the risk that IMS are introduced to the referral area as a result of vessel activities and establish and encroach on native species habitat within the wetland or affect the lifecycle or native species (depending on the introduced species). Given the legislative and standard control measures for spills and IMS summarised in Section 5, and the low likelihood of such incidents, these unplanned activities are unlikely to seriously affect the habitat or lifecycle of native species that are dependent on the wetland.</p>
<p>A substantial and measurable change in the water quality of the wetland – for example, a substantial change in the level of salinity, pollutants, or nutrients in the wetland, or water temperature which may adversely impact on biodiversity, ecological integrity, social amenity or human health</p>	<p>Unlikely.</p> <p>The water and sediment quality of the wetland could be affected by routine vessel discharges, accidental spills, subsea export cables installation and shore crossing, or the installation and removal of WTG and substation platform foundations. The WTGs and substation platforms would be located in Commonwealth waters >5.6 km from the wetland and the changes are unlikely to cause a substantial change in the level of salinity, pollutants, or nutrients in the wetland, or water temperature which may adversely impact on biodiversity, ecological integrity, social amenity or human health.</p>
<p>An invasive species that is harmful to the ecological character of the wetland being established (or an existing invasive species being spread) in the wetland</p>	<p>Unlikely.</p> <p>There are currently no known IMS within the referral area, however it is possible that such species could be identified during planned fish and invertebrate and benthic habitat baseline surveys. IMS could also be introduced as a result of vessel activities occurring within the referral area and could establish and encroach on native species habitat within the wetland. Whether or not the species would affect the ecological character of the wetland would depend on the species and its persistence or survival in the wetland. However, given the legislative and standard control measures for managing vessel hull fouling, ballast water and topsides biosecurity that are summarised in Section 5, there is a low likelihood that such an incident would occur to the extent that the wetlands are affected.</p>

6.2 Listed threatened ecological communities

An ecological community is a naturally occurring group of native plants, animals and other organisms that are interacting in a unique habitat (DoEE, 2019a). TECs are protected under the EPBC Act. Low resolution data obtained from the DoEE (DoEE, 2020) indicates that the referral area could overlap with the Subtropical and Temperate Coastal Saltmarsh TEC (see Appendix A - Figures, Figure 3) which is identified in the PMST results (Appendix B - PMST Results) as a TEC in the vulnerable category. However, finer scale data from the University of Tasmania (Ierodiaconou, 2017) indicates there is no overlap. The extent of overlap would be further investigated as part of the project environmental impact assessment.

The Subtropical and Temperate Coastal Saltmarsh is generally found along coastal areas under regular or intermittent tidal influence (DSEWPac, 2013a). Saltmarsh typically occurs in the upper-intertidal zone and consists mainly of salt-tolerant vegetation (halophytes) including grasses, herbs, sedges, rushes and shrubs. The saltmarsh ecological community is inhabited by a wide range of infaunal and epifaunal invertebrates, as well as low and high tide visitors such as prawns, fish and birds (DSEWPac, 2013a). In Corner Inlet saltmarsh communities occur as a band along the landward edge of the mangrove zone and are common along the northern mainland shore of Corner Inlet (DSEWPac, 2011).

As identified in the Matters of National Environmental Significance - Significant impact guidelines 1.1 (DoE, 2013), "listed ecological communities in the vulnerable category of ecological communities listed under the EPBC Act, are not matters of national environmental significance for the purposes of Part 3 of the EPBC Act". A detailed assessment of significant impact has therefore not been performed for the subtropical and temperate coastal saltmarsh TEC.

6.3 Listed threatened species

6.3.1 Critically endangered and endangered species

The PMST results showed four critically endangered and 11 endangered species that could occur in the referral area. Table 6.2 lists the critically endangered and endangered species that were considered in the significant impact assessment. The assessment is provided in Table 6.3.

Table 6.2 EPBC Act listed critically endangered and endangered species

Category	Species
Marine turtles	Critically endangered: None. Endangered: Loggerhead turtle <i>Caretta caretta</i> , leatherback turtle <i>Dermochelys coriacea</i> .
Marine mammals	Critically endangered: None. Endangered: Blue whale <i>Balaenoptera musculus</i> , southern right whale <i>Eubalaena australis</i> .
Seabirds	Critically endangered: None. Endangered: Northern royal albatross <i>Diomedea sanfordi</i> , grey-headed albatross <i>Thalassarche chrysostoma</i> , southern giant-petrel <i>Macronectes giganteus</i> , Gould's petrel <i>Pterodroma leucoptera</i> .
Shorebirds	Critically endangered: Great knot <i>Calidris tenuirostris</i> , curlew sandpiper <i>Calidris ferruginea</i> , Northern Siberian bar-tailed godwit <i>Limosa lapponica menzbieri</i> , eastern curlew <i>Numenius madagascariensis</i> . Endangered: Red knot <i>Calidris canutus</i> , lesser sand plover <i>Charadrius mongolus</i> , Australian painted snipe <i>Rostratula australis</i> .
Migratory land birds	Critically endangered: Swift parrot <i>Lathamus discolor</i> , orange-bellied parrot <i>Neophema chrysogaster</i> . Endangered: None

Table 6.3 Significant impact assessment for critically endangered and endangered species

Criterion	Assessment
Lead to a long-term decrease in the size of a population	Underwater noise and vibration, benthic habitat disturbance, electromagnetic interference, the physical presence of infrastructure during operations, oil and chemical spills, IMS, or collisions associated with vessel movements could result in impacts to the size of population of critically endangered and endangered species that occur in the referral area.

Criterion	Assessment
	<p>Fish and invertebrates. No significant impact.</p> <p>There are no fish or invertebrates listed as critically endangered or endangered within the referral area.</p> <p>Marine turtles. Unlikely.</p> <p>The loggerhead turtle and leatherback turtle are listed as endangered. The loggerhead turtle is unlikely to be encountered in the referral area (likelihood of occurrence is Rare) and leatherback turtles are only expected to be occasional visitors (likelihood of occurrence is Unlikely). The referral area does not support significant numbers of these species, and with control measures in place, the project would be unlikely to lead to a long-term decrease in the size of their populations.</p> <p>Marine mammals. Unlikely.</p> <p>The pygmy blue whale and southern right whale are listed as endangered and are considered Likely to occur in the referral area. The referral area falls within the pygmy blue whale possible foraging area BIA and distribution and migration BIA (see Appendix A - Figures, Figure 7), and the southern right whale migration and resting on migration BIA and distribution BIA (see Appendix A - Figures, Figure 7).</p> <p>Underwater noise and vibration during the installation of foundations could cause physical/auditory injury, behavioural disturbance, masking or displacement to these species or their prey species. With the implementation of industry standard controls such as soft starts and noise management observation, low power and shut-down zones, physical/auditory injury impacts are expected to be mitigated, however some injury could still occur.</p> <p>It is anticipated that the pygmy blue whale and southern right whale will show behavioural disturbance and displacement from the referral area and the surrounding areas during the construction period (particularly during piling of foundations) and it is expected that these species would return to the area following installation activities. Given the expected area of displacement is likely to be small in relation to the wider available habitat and distribution of the species, it is not expected that this would lead to a long-term decrease in the size of a population. This will require further assessment in the project environmental impact assessment and underwater noise modelling and data from the baseline surveys will be used to inform this assessment.</p> <p>The risk of vessel strike is low and with the implementation of the legislative and standard control measures summarised in Section 5, such as vessel speeds and minimum distances, is unlikely to impact the size of the populations of these species in the long-term.</p> <p>There could be toxicity effects to these whales or their prey species due to large unplanned oil or chemical spills or releases, however with preventative control measures in place such events are generally rare. Oil spill modelling would be undertaken to inform the impact assessment.</p> <p>IMS (if introduced as a result of vessel activities) could impact populations of these whale species or their prey species depending on the introduced species and its persistence or survival. However, given the legislative and standard control measures for managing hull fouling and ballast water that are summarised in Section 5, there is a low likelihood that such an incident would occur.</p> <p>It is possible that impacts to benthic habitats that support prey species for the pygmy blue and southern right whales could affect the presence and abundance of these species in the referral area, particularly given the referral area overlaps with the pygmy blue whale possible foraging area BIA. Benthic habitats within the referral area could be directly disturbed by the installation of offshore subsea infrastructure (i.e. subsea export and array cables, substation platform foundations and WTG foundations). The physical presence of infrastructure would also provide artificial structures that benthic species are likely to inhabit in the longer-term. Changes in benthic habitats in the referral area could change the community composition of prey species fed on by pygmy blue whales. Given the referral area is small in relation to the wider available habitat and distribution of the species, it is not expected that changes in benthic habitat would lead to a long-term decrease in the size of a population.</p> <p>Unplanned events such as dropped objects from vessels, the introduction of IMS, vessel grounding in shallower waters, effects on water or sediment quality from oil or chemical spills, etc. could also impact benthic habitats that support prey species for the pygmy blue whale or the southern right whale. However, given the legislative and standard control measures summarised in Section 5, there is a low likelihood that unplanned events would lead to a long-term decrease in the size of a population.</p> <p>Overall, it is unlikely that the aspects described above would lead to a long-term decrease in the size of a populations of pygmy blue whales or southern right whales, however as there is some uncertainty on the presence/absence of these whale species in, and their use of, the referral area. Marine mammal baseline surveys are being undertaken to provide additional information on their utilisation of the referral area and surrounding habitat. This information would be used in</p>

Criterion	Assessment
	<p>the project environmental impact assessment to inform a more detailed assessment of the potential impacts on their populations.</p> <p>Seabirds. Potential for significant impact.</p> <p>There are no seabirds listed as critically endangered and four that are listed as endangered as shown in Table 6.2. Of these, the southern giant-petrel and Gould's petrel are considered Likely to occur in the referral area, however there are no BIAs for these species. The physical presence of the offshore infrastructure (WTGs and substation platforms), noise and vibration of construction, operation and decommissioning activities and lighting could result in barrier effects to flight paths or displace them from foraging habitat within the referral area, however these are unlikely to lead to a long-term decrease in the size of a population.</p> <p>The operation of WTGs would result in risk of collision of seabirds. It is uncertain at this stage the level of impact associated with collision of seabirds for the project and the data from the baseline surveys and collision risk modelling will be used to inform the impact assessment. Based on assessments from offshore wind farms in the United Kingdom ('UK') and Europe it is unlikely that the level of collision will lead to a long-term decrease in the size of a population, however this will need to be assessed based on local species, their flight and migratory behaviour and the size and importance of the regional population during the project environmental impact assessment. Seabird and shorebird baseline surveys are in progress to gather additional information on species presence and abundance within and near the referral area. This information would be used in the impact assessment alongside collision risk modelling to inform a more detailed assessment of the potential impacts on seabirds and their populations.</p> <p>Shorebirds. Potential for significant impact.</p> <p>Four shorebird species are identified as critically endangered and three listed as endangered, however all species are unlikely be present in the referral area (likelihood of occurrence is Rare). According to conservation advices (https://www.environment.gov.au/biodiversity/threatened/conservation-advices) for the four critically endangered shorebirds listed in Table 6.2, they are recorded from all states in Australia and are considered widespread.</p> <p>Corner Inlet is a stronghold for the eastern curlew in Victoria, along with Western Port Bay (DoE, 2015d). Populations are also located in Port Phillip Bay and elsewhere along the coast. Corner Inlet is considered internationally important for this species, representing ≥1 % of the East-Asian – Australasian flyway population (DoE, 2014). This species does not breed in Australia.</p> <p>Further assessment is required to understand the impacts to migratory shorebirds and their risk of collision on migration. Assessments from offshore wind farms overseas show migratory species to typically fly above turbine rotor height, however given little information is known on the flight behaviour of migratory shorebirds in the referral area and wider Gippsland region, further details on flight behaviour from the baseline surveys is required to inform the impact assessment.</p> <p>Migratory land birds. Potential for significant impact.</p> <p>Two migratory land birds (the swift parrot and orange-bellied parrot) are identified as critically endangered; however, they are unlikely to be present in the referral area (likelihood of occurrence is Rare). These species breed in Tasmania and migrate north to mainland Australia for the winter. The orange-bellied parrot's probable migration route extends from Tasmania to mainland locations from Corner Inlet, west to Peterborough.</p> <p>Non-breeding orange-bellied parrots have been recorded in South Australia, Victoria (including Corner Inlet) and to a lesser extent in New South Wales. On the mainland they forage in coastal saltmarshes, dunes and adjacent shrubby areas and pastures. Non-breeding locations occupied repeatedly by the species over several years are considered critical for their survival. There are no known non-breeding locations repeatedly occupied by this species within the referral area, however this would need to be investigated in more detail during the project impact assessment.</p> <p>The swift parrot disperses widely to forage in eucalypt woodlands and forests on the mainland, with records from South Australia, Victoria, New South Wales, Australian Capital Territory and Queensland. In Victoria, swift parrots are predominantly found in the dry forests and woodlands of the box-ironbark region on the inland slopes of the Great Dividing Range. There are a few records each year from the Melbourne and Geelong districts, and they are occasionally recorded south of the divide in the Gippsland region. There are no areas of critical habitat within the referral area.</p> <p>These species could collide with wind turbines during operation of the wind farm if flying through the referral area during their northward and/or southward migrations. Since they would rarely be present within the referral area, and breeding occurs in Tasmania, impacts are unlikely to lead to a long-term decrease in their populations. However, as there is some uncertainty regarding their migratory paths and flight behaviour (e.g. flight height), further assessment is required during the project environmental impact assessment.</p>

Criterion	Assessment
<p>Reduce the area of occupancy of the species</p>	<p>The area of occupancy of the critically endangered and endangered species listed in Table 6.2 would be reduced to some extent during construction and installation activities associated with the project. Unplanned oil or chemical spills, if significant, could indirectly affect these species if habitat within the referral area that they utilise for feeding, breeding or migratory behaviours is degraded or disturbed.</p> <p>Fish and invertebrates. No significant impact.</p> <p>There are no fish or invertebrates listed as critically endangered or endangered within the referral area.</p> <p>Marine turtles. Unlikely.</p> <p>The loggerhead turtle is Unlikely to be encountered in the referral area and leatherback turtles are only expected to be occasional visitors and do not occupy the referral area. Whilst individuals could be displaced from the area, the project activities would be unlikely to reduce the occupancy of the species.</p> <p>Marine mammals. Likely.</p> <p>During construction, the pygmy blue whale and southern right whale could be displaced from areas they utilise for foraging, migration or resting, reducing their area of occupancy. Aspects that could deter these species from the referral area include the routine vessel activities and underwater noise and vibration associated with the construction of the project. These aspects will likely result in the reduced the area of occupancy of the species during construction. The importance of the referral area to these species and their activities is currently unknown. Marine mammal baseline surveys are in progress to gather additional information on species presence, abundance and utilisation of the site within and near the referral area. This information will inform the project impact assessment.</p> <p>Birds. Potential for significant impact.</p> <p>Construction, operation and decommissioning activities could displace birds from using the referral area for foraging and the presence of the offshore infrastructure could result in barrier effects for birds on migration or during foraging trips to and from their breeding sites. Installation activities of offshore infrastructure and for the shore crossing could also disturb shorebird and migratory land bird utilisation of the Corner Inlet Ramsar site and coastal areas adjacent the shore crossing.</p> <p>Seabird and shorebird baseline surveys are in progress to gather additional information on species presence, abundance and utilisation of the site within and near the referral area. This information will inform the potential impacts of the project on seabird and shorebird occupancy of the referral area. Migratory land birds will be further investigated and assessed during the project impact assessment.</p>
<p>Fragment an existing population into two or more populations</p>	<p>Unlikely.</p> <p>It is unlikely the project would result in the fragmentation of an existing population into two or more populations. The species listed in Table 6.2 are mobile species, they are known to move over or around areas of unsuitable habitat and are wide-ranging.</p>
<p>Adversely affect habitat critical to the survival of a species</p>	<p>Unlikely.</p> <p>The referral area overlaps with BIAs for the pygmy blue whale and southern right whale; however, the referral area is not identified as critical habitat for these species and is relatively small compared to the overall area of the BIAs. The project would therefore be unlikely to adversely affect habitat critical to the survival of these species.</p> <p>There are no other habitats critical to the survival of the species listed in Table 6.2 located within the referral area, with the exception of the southern giant-petrel. The National Recovery Plan for Threatened Albatrosses and Giant Petrels 2011-2016 (DSEWPaC, 2011b) notes that waters south of 25 degrees are ‘the most critical foraging habitat and where most of these species spend the majority of their foraging time’. This includes the referral area. Given the large extent of the area of critical habitat identified, relative to the referral area, impacts associated with the project are unlikely to adversely affect habitat critical to the survival of the southern giant-petrel.</p> <p>Seabird and shorebird baseline surveys are in progress to gather additional information on species presence and abundance within and near the referral area, including any southern giant-petrels that could be present. This information will inform the potential impacts of the project on their population.</p>

Criterion	Assessment
Disrupt the breeding cycle of a population	<p>Unlikely.</p> <p>The referral area does not overlap with any breeding BIAs for the pygmy blue whale or the southern right whale. Given displacement impacts are likely to be short-term and localised compared to the wider habitat available for the species, the project would be unlikely to affect the breeding cycles of these species.</p> <p>The referral area is unlikely to support significant numbers of the leatherback or loggerhead turtles and they are not known to breed in the referral area.</p> <p>The species of birds listed in Table 6.2 referral area do not breed locally therefore their breeding cycles would not be affected by the project.</p>
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	<p>Unlikely.</p> <p>Several of the environmental aspects described in Section 5 could result in impacts that adversely affect habitat that is utilised by the species listed in Table 6.2 including seabed disturbance, impacts on water quality, sediment quality and changes to coastal processes from the installation and removal of cables and foundations, and the physical presence of infrastructure resulting in changes to benthic habitat communities.</p> <p>It is possible that impacts to benthic environment could affect the presence and abundance of species in the referral area. Benthic habitats within the referral area could be directly disturbed by the installation of offshore subsea infrastructure (i.e. subsea export and array cables, substation platform foundations and WTG foundations). The physical presence of infrastructure would also provide artificial structures that benthic species are likely to inhabit in the longer-term. Changes in benthic habitats in the referral area could change the community composition of marine fauna prey species.</p> <p>However, given the referral area is small in relation to the wider available habitat and distribution species, it is unlikely that habitat would be modified, destroyed, removed, isolated or the availability or quality decreased to the extent that the species listed in Table 6.2 are likely to decline.</p>
Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat	<p>Unlikely.</p> <p>IMS (if introduced as a result of vessel activities) could impact the critically endangered or endangered species listed in Table 6.2 or their prey species or habitat, depending on the introduced species and its persistence or survival. However, given the legislative and standard control measures for managing hull fouling and ballast water that are summarised in Section 5, there is a low likelihood that such an incident would occur.</p>
Introduce disease that may cause the species to decline	<p>Unlikely.</p> <p>The project could result in the introduction of diseases such as pathogens (viruses, bacteria, fungi, protozoa and parasites) via vessel activities that could have adverse impacts on critically endangered and endangered species. With the implementation of legislative and standard control measures for managing biosecurity (see Section 5), this is unlikely to occur.</p>
Interfere with the recovery of the species.	<p>Unlikely.</p> <p>Recovery plans, conservation management plans and conservation advices for the species listed in Table 6.2 identify the following threatening processes that are relevant to the project:</p> <ul style="list-style-type: none"> • Marine turtles – marine debris, chemical discharges, light pollution, vessel disturbance, noise interference, diseases and pathogens. • Marine mammals – anthropogenic noise and acoustic disturbance, habitat degradation, marine pollution, vessel strike, entanglement (marine debris). • Birds – marine pollution, invasive species, marine debris, incidental collisions, human disturbance, habitat loss and degradation, changes to water regime of habitats, deterioration of water quality. <p>Project activities could have adverse impacts on these species. However, they are unlikely to interfere with their recovery as actions within plans and advices that are relevant to the project would be adopted in order to align with their recovery objectives.</p>

6.3.2 Vulnerable species

The PMST results showed 27 vulnerable species that could occur in the referral area. Table 6.4 lists the vulnerable species that were considered in the significant impact assessment. The assessment is provided in Table 6.5.

Table 6.4 EPBC Act listed vulnerable species

Category	Species
Fish	White shark <i>Carcharodon Carcharias</i> , whale shark <i>Rhincodon typus</i> , Australian grayling <i>Prototroctes maraena</i>
Marine turtles	Green turtle <i>Chelonia mydas</i> .
Marine mammals	Humpback whale <i>Megaptera novaeangliae</i> , fin whale <i>Balaenoptera physalus</i> , sei whale <i>Balaenoptera borealis</i> .
Seabirds	Antipodean albatross <i>Diomedea antipodensis</i> , Gibson's albatross <i>Diomedea antipodensis gibsoni</i> , southern royal albatross <i>Diomedea epomophora</i> , wandering albatross <i>Diomedea exulans</i> , sooty albatross <i>Phoebetria fusca</i> , Buller's albatross <i>Thalassarche bulleri</i> , northern Buller's albatross <i>Thalassarche bulleri platei</i> , shy albatross <i>Thalassarche cauta</i> , white-capped albatross <i>Thalassarche cauta steadi</i> , Campbell albatross <i>Thalassarche impavida</i> , black-browed albatross <i>Thalassarche melanophris</i> , Salvin's albatross <i>Thalassarche salvini</i> , white-bellied storm-petrel <i>Fregetta grallaria</i> , blue petrel <i>Halobaena caerulea</i> , northern giant-petrel <i>Macronectes halli</i> , fairy prion <i>Pachyptila turtur subantarctica</i> , Australian fairy tern <i>Sternula nereis</i> .
Shorebirds	Greater sand plover <i>Charadrius leschenaultii</i> , hooded plover <i>Thinornis rubricollis</i> and bar-tailed godwit (baueri) <i>Limosa lapponica baueri</i> .
Migratory land birds	White-throated needletail <i>Hirundapus caudacutus</i> .

Table 6.5 Significant impact assessment for vulnerable species

Criterion	Assessment
Lead to a long-term decrease in the size of an important population of a species	<p>Fish and invertebrates. Potential for significant impact.</p> <p>Of the fish listed in Table 6.4, the Australian grayling is Likely to occur in shallow waters of referral area during its larval and juvenile stages and the white shark is Likely to occur in the referral area (>50 per cent likelihood of occurrence). The referral area overlaps with the white shark breeding (nursery area) BIA (Appendix A - Figures, Figure 5), which may represent critical habitat under the Recovery Plan for the Great White Shark (DSEWPaC, 2013b).</p> <p>Habitat disturbance associated with the installation and presence of subsea infrastructure or unplanned activities such as spills, vessel grounding, etc. could reduce the abundance of prey species and the presence and abundance of the Australian grayling and white shark within the referral area. However, the physical presence of infrastructure would provide artificial structures that prey species are likely to inhabit in the longer-term.</p> <p>There could be adverse impacts on these species or their habitat, and given the extent of utilisation of the referral area by the white shark and the Australian grayling is currently uncertain, impacts associated with these species will require further assessment in the project environmental impact assessment. Fish baseline surveys are planned, which will provide more information to determine the presence or absence of these species within the referral area and the habitats they are currently using. This information would be used in the project environmental impact assessment to inform a more detailed assessment of the potential impacts on their populations.</p> <p>Marine turtles. No significant impact.</p> <p>The green turtle is unlikely to be encountered in the referral area (likelihood of occurrence is Rare). The referral area is unlikely to support significant numbers of these species, and the project would not lead to a long-term decrease in the size of their populations.</p> <p>Marine mammals. Unlikely.</p> <p>The humpback whale, sei whale and fin whale are listed as vulnerable under the EPBC Act. There are no BIAs that overlap with the referral area and the referral area is not considered critical habitat for these species. The humpback whale is Likely to occur within the referral area, either transiting or exhibiting searching behaviour. The sei whale and fin</p>

Criterion	Assessment
	<p>whale are considered Rare and Unlikely (respectively), in terms of their likelihood of occurrence within the referral area.</p> <p>The project is unlikely to lead to a long-term decrease of an important population of these species; however, it is acknowledged that there is uncertainty on the presence/absence of these whale species in, and their use of, the referral area. Marine mammal baseline surveys are in progress, which will provide additional information on the utilisation of the referral area and surrounding habitat by these species. This information would be used in the impact assessment to inform a more detailed assessment of the potential impacts of the project on their populations.</p> <p>Birds. Potential for significant impact.</p> <p>There are 12 species of albatross listed as vulnerable that could occur within or near the referral area. The Northern giant-petrel, fairy prion and Australian fairy tern are also Possible or Likely to occur in the referral area. Of the albatross species, six are Possible or Likely to occur within the referral area (Southern royal albatross, wandering albatross, sooty albatross, Buller’s albatross, shy albatross and black-browed albatross). The referral area overlaps with foraging area BIAs for the shy albatross, Buller’s albatross, black-browed albatross and the wandering albatross (Appendix A - Figures, Figure 12).</p> <p>Of the three shorebird species listed as vulnerable in Table 6.4, only the hooded plover is Likely to occur in the referral area. The white-throated needletail is the only land bird in Table 6.4 and is likely to occur in the referral area.</p> <p>The physical presence of the offshore infrastructure (WTGs and substation platforms), noise and vibration during construction, operation and decommissioning activities and lighting could result in barrier effects from migratory flight paths or displace them from foraging habitat within the referral area, however these are unlikely to lead to a long-term decrease in the size of a population. Shore crossing activities could result in changes to coastal processes that result in changes to shorebird and migratory land bird roosting and foraging habitat in adjacent coastal habitat.</p> <p>The operation of WTGs would result in risk of collision of birds. It is uncertain at this stage the level of impact associated with collision for the project and the data from the baseline surveys and collision risk modelling will be used to inform the impact assessment. Based on assessments from offshore wind farms in the UK and Europe it is unlikely that the level of collision will lead to a long-term decrease in the size of a population, however this will need to be assessed based on local species, their flight and migratory behaviour and the size and importance of the regional population during the project environmental impact assessment.</p>
<p>Reduce the area of occupancy of an important population</p>	<p>Likely.</p> <p>The area of occupancy for some of the vulnerable species listed in Table 6.4 would likely be reduced to some extent, as a result of the project. Construction and installation activities, the presence of offshore infrastructure during operations (particularly the WTGs) and decommissioning activities associated with the removal of infrastructure could displace species from the referral area. Unplanned oil or chemical spills, if significant, could indirectly affect these species if habitat within the referral area that they utilise for feeding, breeding or migratory behaviours is disturbed.</p> <p>Whilst the project is unlikely to affect the survival of vulnerable species, the area of occupancy for some species would likely be reduced to some extent both temporarily during construction, and over the long-term by the presence of the offshore infrastructure. This will require further assessment in the project environmental impact assessment and data from baseline surveys will be used to inform this assessment.</p> <p>Fish and invertebrates</p> <p>The Australian grayling and the white shark are Likely to occur and could be displaced from the referral area, particularly during construction.</p> <p>Marine turtles</p> <p>The green turtle is unlikely to be encountered in the referral area, therefore only transiting individuals would be displaced from the area.</p> <p>Marine mammals</p> <p>Humpback, fin and sei whales use of the referral area is currently unknown, however it is likely that humpback whales could transit through on their northern or southern migrations. It is unlikely that these species are restricted to the referral area on their migrations, so even if displaced from the area, it is unlikely that this would constrain the migratory corridors. It is unlikely that important populations of these three species utilise the referred area specifically due to the absence of areas and/or conditions (e.g. upwelling events) for foraging, breeding, or resting, however as there is uncertainty regarding their use of the</p>

Criterion	Assessment
	<p>referral area, marine mammal baseline surveys are underway and will provide more information to inform the project impact assessment..</p> <p>Birds</p> <p>The physical presence of WTGs from installation through to decommissioning could reduce the area of occupancy of the bird species listed in Table 6.4, particularly if the presence of the wind farm disrupts their migration, foraging patterns or displaces them from foraging habitat within the referral area. The risk of collision with wind turbines could also affect the area of occupancy of birds.</p>
<p>Fragment an existing important population into two or more populations</p>	<p>Unlikely.</p> <p>It is unlikely the project would result in the fragmentation of an existing population into two or more populations. The species listed in Table 6.4 are mobile species, they are known to move over or around areas of unsuitable habitat and are wide-ranging. The Australian grayling is slightly different, since the species would only be present offshore during its larval and juvenile life stages. However, this species is also highly mobile. Larvae would disperse broadly across the Gippsland Basin and current flow through the referral area is unlikely to disrupt the movement and dispersal of larvae.</p>
<p>Adversely affect habitat critical to the survival of a species</p>	<p>Potential for significant impact.</p> <p>The referral area overlaps with the following habitats for the vulnerable species in Table 6.4:</p> <ul style="list-style-type: none"> • White shark nursery area BIA (Appendix A - Figures, Figure 5) (may represent critical habitat). • Waters south of 25 degrees (identified as critical foraging habitat for albatrosses and giant petrels). <p>There are no critical habitats for the turtle or marine mammal species listed in Table 6.4 that overlap with the referral area.</p> <p>The white shark breeding (nursery area) BIA may represent critical habitat, as described in the Recovery Plan for the Great White Shark (DSEWPaC, 2013b). Habitat within the BIA could be affected by the installation of subsea infrastructure or unplanned activities such as spills. There is uncertainty regarding the extent of utilisation of the referral area for white shark breeding, therefore fish baseline surveys and benthic habitat baseline surveys are planned, which will inform use of the nursery area by white sharks and potential impacts of the project on this habitat.</p> <p>The National Recovery Plan for Threatened Albatrosses and Giant Petrels 2011-2016 (DSEWPaC, 2011b) notes that waters south of 25 degrees latitude are 'critical foraging habitat and where most of these species spend the majority of their foraging time'. This area extends across southern Australia and is not limited to the referral area. Similarly, the BIAs for the shy albatross, black-browed albatross, Buller's albatross, Campbell albatross and the wandering albatross are not limited to the referral area or the immediate vicinity of the referral area. They are extensive and cover large areas of the southern coast of Australia.</p> <p>It is acknowledged that there is uncertainty regarding the presence/absence of these species, and their use of habitat within and near the referral area. Due to the uncertainties associated with how these species use this habitat this will require further assessment in the project environmental impact assessment and data from the baseline surveys will be used to inform this assessment.</p>
<p>Disrupt the breeding cycle of an important population</p>	<p>Potential for significant impact.</p> <p>The referral area does not overlap with any breeding BIAs for the marine mammals, marine turtle and bird species listed in Table 6.4 and there are no known breeding locations for these species within the referral area.</p> <p>Whilst bird breeding behaviours would not be affected within the referral area, breeding outside the referral area (e.g. on nearby islands) could be affected if bird fitness is reduced, from being displaced from foraging areas or having to divert from their usual flight paths to avoid the wind farm. Collision risk could also affect the number of breeding individuals in the population. Seabird and shorebird baseline surveys are in progress to gather additional information on species presence and abundance within and near the referral area. This information would be used in the project environmental impact assessment to conduct a more detailed assessment of the potential impacts of the project on breeding cycles.</p> <p>The referral area overlaps with the white shark breeding (nursery area) BIA. It is possible that project activities could have adverse impacts on white shark breeding behaviour within and near the referral area. Planned installation activities or unplanned activities such as spills could affect the abundance of prey species and the presence and abundance of the white shark within the referral area. There is uncertainty regarding the extent of utilisation</p>

Criterion	Assessment
	<p>of the referral area as a white shark nursery area, therefore fish baseline surveys are planned. This information would be used in the project environmental impact assessment to conduct a more detailed assessment of the potential impacts on the breeding cycle of the white shark.</p> <p>Due to the uncertainties associated with how these species use the referral area, this will require further assessment in the project environmental impact assessment and data from the baseline surveys will be used to inform this assessment.</p>
<p>Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline</p>	<p>Potential for significant impact.</p> <p>Several of the environmental aspects described in Section 5 could result in impacts that adversely affect habitat that is utilised by the species listed in Table 6.4 including seabed disturbance or impacts on water and sediment quality from the installation and removal of subsea export and array cables and WTG and substation platform foundations, and the physical presence of infrastructure resulting in changes to benthic habitat communities. The referral area overlaps with the following important habitats for the vulnerable species in Table 6.4:</p> <ul style="list-style-type: none"> • White shark nursery area BIA (Appendix A - Figures, Figure 5) • Waters south of 25 degrees (identified as critical foraging habitat for albatrosses and giant petrels) • Foraging BIAs for the shy albatross, black-browed albatross, Buller’s albatross, Campbell albatross and wandering albatross (Appendix A - Figures, Figure 12) <p>There are no important habitats for the turtle or marine mammal species listed in Table 6.4 that overlap with the referral area.</p> <p>The white shark breeding (nursery area) BIA could be affected by the installation of subsea infrastructure or unplanned activities such as spills. There is uncertainty regarding the importance of this nursery BIA as critical habitat for the survival of the white shark, as well as the extent to which the white shark uses the referral area, particularly for breeding. Fish baseline surveys are planned, which will provide more information to determine the presence or absence of these species and the habitats they are currently using. This information would be used in the impact assessment to conduct a more detailed assessment of the potential impacts on their populations.</p> <p>The critical habitat for the albatross species in Table 6.4 is extensive and covers large areas of the southern coast of Australia. There is uncertainty regarding the presence/absence of albatrosses, and their use of habitat within and near the referral area. Seabird and shorebird baseline surveys are in progress to gather additional information on species presence and abundance. This information would be used in the project environmental impact assessment to inform a more detailed assessment of the potential impacts on their populations.</p>
<p>Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species’ habitat</p>	<p>Unlikely.</p> <p>IMS (if introduced as a result of vessel activities) could impact the vulnerable species listed in Table 6.4 or their prey species or habitat, depending on the introduced species and its persistence or survival. With the implementation of legislative and standard control measures for managing hull fouling and ballast water that are summarised in Section 5, there is a low likelihood that such an incident would occur.</p>
<p>Introduce disease that may cause the species to decline</p>	<p>Unlikely.</p> <p>The project could result in the introduction of diseases such as pathogens (viruses, bacteria, fungi, protozoa and parasites) via vessel activities that could have adverse impacts on vulnerable species. With the implementation of legislative and standard control measures for managing biosecurity (see Section 5), this is unlikely to occur.</p>
<p>Interfere substantially with the recovery of the species</p>	<p>Unlikely.</p> <p>Recovery plans, conservation management plans and conservation advices for the species listed in Table 6.4 identify the following threatening processes that are relevant to the project:</p> <ul style="list-style-type: none"> • Marine turtles – marine debris, chemical discharges, light pollution, vessel disturbance, noise interference, diseases and pathogens • Marine mammals – anthropogenic noise and acoustic disturbance, habitat degradation, marine pollution, vessel strike, entanglement (marine debris) • Birds – marine pollution, invasive species, marine debris, incidental collisions, human disturbance, habitat loss and degradation, changes to water regime of habitats, deterioration of water quality, disturbance at nesting sites.

Criterion	Assessment
	Project activities could have adverse impacts on these species; however, they are unlikely to interfere with their recovery as actions within plans and advices that are relevant to the project would be adopted in order to align with their recovery objectives.

6.4 Listed migratory species

The PMST results identified 68 listed migratory species that could occur in the referral area (see Table 6.6). The significant impact assessment is provided in Table 6.7.

Table 6.6 EPBC Act listed migratory species

Category	Species
Fish	White shark <i>Carcharodon Carcharias</i> , whale shark <i>Rhincodon typus</i> , shortfin mako shark <i>Isurus oxyrinchus</i> , porbeagle shark <i>Lamna nasus</i> .
Marine turtles	Loggerhead turtle <i>Caretta caretta</i> , green turtle <i>Chelonia mydas</i> , leatherback turtle <i>Dermochelys coriacea</i> .
Marine mammals	Blue whale <i>Balaenoptera musculus</i> , southern right whale <i>Eubalaena australis</i> , humpback whale <i>Megaptera novaeangliae</i> , fin whale <i>Balaenoptera physalus</i> , sei whale <i>Balaenoptera borealis</i> , pygmy right whale <i>Caperea marginate</i> , dusky dolphin <i>Lagenorhynchus obscurus</i> , killer whale <i>Orcinus orca</i> .
Seabirds	Antipodean albatross <i>Diomedea antipodensis</i> , southern royal albatross <i>Diomedea epomophora</i> , wandering albatross <i>Diomedea exulans</i> , northern royal albatross <i>Diomedea sanfordi</i> , sooty albatross <i>Phoebetria fusca</i> , Buller's albatross <i>Thalassarche bulleri</i> , shy albatross <i>Thalassarche cauta</i> , white-capped albatross <i>Thalassarche cauta steadi</i> , grey-headed albatross <i>Thalassarche chrysostoma</i> , Campbell albatross <i>Thalassarche salvini</i> , black-browed albatross <i>Thalassarche melanophris</i> , Salvin's albatross <i>Thalassarche salvini</i> , southern giant-petrel <i>Macronectes giganteus</i> , northern giant-petrel <i>Macronectes halli</i> , little tern <i>Sternula albifrons</i> , flesh-footed shearwater <i>Ardenna carneipes</i> , sooty shearwater <i>Ardenna grisea</i> , short-tailed shearwater <i>Ardenna tenuirostris</i> .
Shorebirds	Red knot <i>Calidris canutus</i> , great knot <i>Calidris tenuirostris</i> , curlew sandpiper <i>Calidris ferruginea</i> , common sandpiper <i>Actitis hypoleucos</i> , sharp-tailed sandpiper <i>Calidris acuminata</i> , pectoral sandpiper <i>Calidris melanotos</i> , greater sand plover <i>Charadrius leschenaultia</i> , lesser sand plover <i>Charadrius mongolus</i> , double-banded plover <i>Charadrius bicinctus</i> , oriental plover <i>Charadrius veredus</i> , grey plover <i>Pluvialis squatarola</i> , pacific golden plover <i>Pluvialis fulva</i> , bar-tailed godwit <i>Limosa lapponica baueri</i> , northern Siberian bar-tailed godwit <i>Limosa lapponica menzibieri</i> , black-tailed godwit <i>Limosa limosa</i> , eastern curlew <i>Numenius madagascariensis</i> , little curlew <i>Numenius minutus</i> , Latham's snipe <i>Gallinago hardwickii</i> , Swinhoe's snipe <i>Gallinago megala</i> , pin-tailed snipe <i>Gallinago stenura</i> , fork-tailed swift <i>Apus pacificus</i> , ruddy turnstone <i>Arenaria interpres</i> , sanderling <i>Calidris alba</i> , red-necked stint <i>Calidris ruficollis</i> , ruff (Reeve) <i>Philomachus pugnax</i> , crested tern <i>Thalasseus bergii</i> , wood sandpiper <i>Tringa glareola</i> , marsh sandpiper <i>Tringa stagnatilis</i> , terek sandpiper <i>Xenus cinereus</i> , whimbrel <i>Numenius phaeopus</i> , osprey <i>Pandion haliaetus</i> , grey-tailed tattler <i>Tringa brevipes</i> , common greenshank <i>Tringa nebularia</i> .
Migratory land birds	Glossy ibis <i>Plegadis falcinellus</i> , satin flycatcher <i>Myiagra cyanoleuca</i> .

Table 6.7 Significant impact assessment for migratory species

Criterion	Assessment
Substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species	<p>Potential for significant impact.</p> <p>Of the species listed in Table 6.6 the blue whale, southern right whale, humpback whale, white shark, shortfin mako shark, several species of albatross, petrels, terns or shearwaters, knots, sandpipers, plovers, etc. are either Possible or Likely to occur. The likelihood of occurrence of the remaining species (Table 6.6) is either Unlikely or Rare.</p> <p>There are BIAs for the pygmy blue whale, southern right whale, white shark, short-tailed shearwater, shy albatross, black-browed albatross, Buller's albatross, Campbell albatross and the wandering albatross that overlap the referral area. These BIAs are not limited to the referral area or the immediate vicinity of the referral area, they are extensive and cover large areas of the southern coast of Australia.</p>

Criterion	Assessment
	<p>The physical presence of infrastructure would provide artificial structures that benthic species are likely to inhabit in the longer-term, increasing available habitat. Changes in benthic habitats in the referral area could change the community composition of species of fish and invertebrates, which are prey for other migratory species.</p> <p>Based on current information the referral area is not known to include important habitat for these species, with the exception of the white shark breeding (nursery area) BIA, which may represent critical habitat under the Recovery Plan for the Great White Shark (DSEWPaC, 2013b) and waters south of 25 degrees latitude which represent critical foraging habitat for albatrosses and giant petrels.</p> <p>Habitat disturbance associated with the installation and presence of subsea infrastructure or unplanned activities such as spills could affect the abundance of prey species and the presence and abundance of the white shark within the referral area.</p> <p>The physical presence of infrastructure would provide artificial structures that benthic species are likely to inhabit in the longer-term, increasing available habitat. Changes in benthic habitats in the referral area could change the community composition of species of fish and invertebrates, which are prey for other migratory species.</p> <p>There is uncertainty regarding the extent to which the white shark uses the referral area, particularly for breeding. Fish baseline surveys are planned, which will provide more information to determine the presence or absence of these species and the habitats they use. Benthic habitat baseline surveys are also planned to provide additional information on the habitats that are representative of the referral area, in order to more accurately assess their potential importance. This information would be used in the project environmental impact assessment to inform a more detailed assessment of the potential impacts on their populations.</p> <p>The critical habitat for albatross and giant petrels foraging is extensive and covers large areas of the southern coast of Australia. There is uncertainty regarding the presence or absence of albatrosses, and their use of habitat within and near the referral area. Seabird and shorebird baseline surveys are in progress to gather additional information on species presence and abundance. This information would be used in the impact assessment to conduct a more detailed assessment of the potential impacts on their populations.</p> <p>Corner Inlet supports significant populations of the eastern curlew and the short-tailed shearwater. It is considered internationally important for the eastern curlew, with the population in Corner Inlet representing ≥ 1 % of the East-Asian – Australasian flyway population (DoE, 2014). This species does not breed in Australia. An ecologically significant proportion of short-tailed shearwaters occurs in the region, particularly in Corner Inlet, on the islands around Wilsons Promontory and to the east, over 200 km from the referral area at the Skerries, Tullaberga Island and Gabo Island (Harris & Norman, 1981) . Approximately 230,000 short-tailed shearwater breeding pairs are likely to forage over the waters of the continental shelf in eastern Bass Strait and further afield, including over the offshore wind farm. In addition, many of the islands around Wilson’s Promontory support another 1,000,000 breeding pairs (Harris & Norman, 1981), which are likely to join these birds. Corner Inlet and the islands around Wilson’s Promontory would not be directly impacted by the project and indirect impacts are unlikely. With legislative and standard control measures in place, the likelihood of a substantial spill is low.</p>
<p>Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species</p>	<p>Unlikely.</p> <p>There are currently no known IMS within the referral area, however it is possible that such species could be identified during marine fish and invertebrate and benthic habitat baseline surveys. IMS could be introduced as a result of vessel activities occurring within the referral area and could possibly establish and encroach on areas of important habitat for migratory species (most notably the nursery area BIA for the white shark). However, given the legislative and standard control measures for managing hull fouling and ballast water that are summarised in Section 5, there is a low likelihood that such an incident would occur. If IMS are identified during planned baseline surveys, additional control measures may be required to limit the potential for them to spread within the referral area.</p>
<p>Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species</p>	<p>Potential for significant impact.</p> <p>The referral area is not known to support an ecologically significant proportion of the populations of migratory species listed in Table 6.6. An ecologically significant proportion of short-tailed shearwaters occurs in the region, particularly in Corner Inlet, on the islands around Wilsons Promontory and to the east, over 200 km from the referral area at the Skerries, Tullaberga Island and Gabo Island (Harris & Norman, 1981) . Approximately 230,000 short-tailed shearwater breeding pairs are likely to forage over the waters of the continental shelf in eastern Bass Strait and further afield, including over the offshore wind</p>

Criterion	Assessment
	<p>farm. In addition, many of the islands around Wilson’s Promontory support another 1,000,000 breeding pairs (Harris & Norman, 1981), which are likely to join these birds. This species disperses to forage as far south as Antarctic waters and it is possible that significantly large numbers of individuals could fly over the wind farm on their return migration to the region. The presence of the wind farm could disrupt their migration, foraging patterns or displace them from foraging habitat within the referral area. This species may be vulnerable to collision with wind turbines which could affect the number of breeding individuals. Whilst short-tailed shearwater breeding would not be affected within the referral area, breeding on nearby islands could be affected if bird fitness is reduced, from being displaced from foraging areas or having to divert from their usual flight paths to avoid the wind farm.</p> <p>Seabird and shorebird baseline surveys are in progress to gather additional information on the presence and abundance of birds within and near the referral area. This information would be used in the project environmental impact assessment to conduct a more detailed assessment of the potential impacts of the project on this species.</p>

6.5 Commonwealth marine area

In addition to the species listed in Sections 6.3 to 6.4, species listed as marine under the EPBC Act were considered in the significant impact assessment for the Commonwealth marine area in Table 6.8 below. Species listed as threatened under the FFG Act have been noted but were not assessed against the significant impact criteria.

Table 6.8 Significant impact assessment for the Commonwealth marine area

Criterion	Assessment
Result in a known or potential pest species becoming established in the Commonwealth marine area	<p>Unlikely.</p> <p>There are currently no known IMS within the referral area, however it is possible that such species could be identified during marine fish and invertebrate and benthic habitat baseline surveys. IMS could be introduced as a result of vessel activities occurring within the referral area and could possibly establish and encroach on areas of important habitat for species. With the implementation of legislative and standard control measures for managing hull fouling and ballast water that are summarised in Section 5, there is a low likelihood that such an incident would occur. If IMS are identified during planned baseline surveys, additional control measures may be required to limit the potential for them to spread within the referral area.</p>
Modify, destroy, fragment, isolate or disturb an important or substantial area of habitat such that an adverse impact on marine ecosystem functioning or integrity in a Commonwealth marine area results	<p>Unlikely.</p> <p>Several of the environmental aspects described in Section 5 could result in impacts that adversely affect habitat in the Commonwealth marine area including seabed disturbance or impacts on water and sediment quality from the installation and removal of subsea export and array cables and WTG and substation platform foundations, and the physical presence of infrastructure resulting in changes to benthic habitat communities.</p> <p>There are no marine protected areas within or adjacent to the Commonwealth marine waters of the referral area.</p> <p>The following habitats have been identified as either critical or of potential importance within or in the vicinity of the referral area (see Appendix A - Figures, Figure 2):</p> <ul style="list-style-type: none"> • White shark nursery area BIA (may represent critical habitat), and three distribution BIAs • Migration and resting on migration BIA and distribution BIA for the southern right whale • Distribution and possible foraging BIAs for the pygmy blue whale • Waters south of 25 degrees latitude (identified as the most critical foraging habitat for albatrosses and giant petrels) • Foraging BIAs for the white-faced storm-petrel, short-tailed shearwater, shy albatross, common diving- petrel, black-browed albatross, Buller’s albatross, Campbell albatross and wandering albatross • Breeding locations for the common diving-petrel, short-tailed shearwater and little penguin (not located within the referral area). <p>These habitats within the referral area are not known to support ecologically significant proportions of these species’ populations, do not represent habitat that is at the limit of</p>

Criterion	Assessment
	<p>listed species' range and do not represent habitat where species are known to be declining. The exception is the white shark nursery area, which is of importance during the juvenile life stage of this species.</p> <p>Habitat disturbance associated with the installation and presence of subsea infrastructure or unplanned activities such as the introduction and establishment of IMS, spills, etc. could affect the abundance of prey species and the presence and abundance of the white shark within the referral area. The referral area overlaps with a relatively small portion (14.7 per cent) of the overall nursery area BIA (see Appendix A - Figures, Figure 5) and it is considered unlikely that the white shark nursery area BIA would be substantially modified, destroyed, fragmented or isolated such that marine ecosystem functioning or integrity is threatened. Due to the uncertainties associated with how these species use this habitat this will require further assessment in the project environmental impact assessment.</p> <p>Fish baseline surveys are planned which will provide more information to determine the extent of the potential impact the project could have on white shark activity within the nursery area. Benthic habitat baseline surveys are also planned to provide additional information on the habitats that are representative of the referral area, in order to assess their potential importance.</p>
<p>Have a substantial adverse effect on a population of a marine species or cetacean including its life cycle (for example, breeding, feeding, migration behaviour, life expectancy) and spatial distribution</p>	<p>Potential for significant impact.</p> <p>Fish and invertebrates</p> <p>In addition to the migratory species of fish listed in Table 6.6 there are 29 species of seahorses, pipefishes and sea dragons listed as marine species under the EPBC Act that could occur within the referral area. There are also species of commercial and recreational fisheries importance that could occur within the referral area, including the blue warehou, southern bluefin tuna and school shark, which are listed as conservation dependent.</p> <p>Benthic habitats within the referral area that support these species (and their prey species) could be directly disturbed by the installation of offshore subsea infrastructure (i.e. subsea export and array cables and WTG and substation platform foundations). The physical presence of infrastructure could also provide artificial structures that could change the community composition of species in the referral area.</p> <p>Unplanned events such as dropped objects from vessels, the introduction of IMS, vessel grounding in shallower waters and effects on water or sediment quality from oil or chemical spills could also impact benthic habitats that support prey species. However, with legislative and standard control measures in place (see Section 5) these unplanned events are unlikely.</p> <p>There is uncertainty regarding the fish and invertebrate populations that inhabit the referral area, therefore fish baseline surveys are planned, which will provide additional information on the presence, abundance and distribution of these marine species within and near the referral area. This information would be used in the project environmental impact assessment to conduct a more detailed assessment of the potential impacts on fish and invertebrate populations.</p> <p>Marine turtles</p> <p>There are no further species of marine turtles in the region that are listed under the EPBC Act that have not already been assessed under the threatened or migratory species significant impact criteria.</p> <p>Marine mammals</p> <p>In addition to the marine mammals listed as threatened or migratory under the EPBC Act, the bottlenose dolphin, minke whale, Australian fur seal and New Zealand fur seal are listed as marine species and could occur within the referral area.</p> <p>The bottlenose dolphin is listed as a marine species under the EPBC Act and is Likely to occur in the referral area. However, it is widespread in Australian waters, therefore the project would be unlikely to have a substantial adverse effect on their population.</p> <p>The minke whale is listed as a marine species under the EPBC Act and could traverse the referral area, but this is considered unlikely. Due to the low likelihood of occurrence within or near the referral area, it is unlikely the minke whale population would be substantially affected by project activities.</p> <p>The Australian fur seal is Likely to occur, and it is Possible the New Zealand fur seal will occur within the referral area. There are no breeding colonies or haul out sites for these species within the referral area (Appendix A - Figures, Figure 11). There are sites outside the referral area where these behaviours are known to occur for both species (e.g. Rag Island for Australian fur seals and Kanowna Island for Australian and New Zealand fur</p>

Criterion	Assessment
	<p>seals, 12 km and 49 km from the referral area respectively). Kanowna Island is an important breeding site for Australian fur seals in the region. Most breeding for the New Zealand fur seal occurs outside Victoria, therefore project activities would be unlikely to substantially affect this species' population. The physical presence of infrastructure would provide artificial structures that would attract prey resources for fur seals.</p> <p>The Burranan dolphin is not listed under the EPBC Act but is listed as threatened under the FFG Act. This species is found in inshore and coastal waters of southern Australia, including Victoria, with an important population known to be restricted to Gippsland Lakes. The likelihood of its occurrence in the referral area is considered Rare (see Table 4.3). Due to the low likelihood of occurrence within or near the referral area, it is unlikely the Burranan dolphin populations would be substantially affected by project activities.</p> <p>Underwater noise and vibration during the installation of foundations could cause physical/auditory injury, behavioural disturbance or displacement to marine mammal or their prey species. With the implementation of industry standard controls such as soft starts and observation zones physical/auditory injury impacts are expected to be mitigated. It is anticipated that marine mammal species will show behavioural disturbance and displacement from the referral area and the surrounding areas during the construction period (particularly during piling of foundations) and it is expected that these species would return to the area following installation activities. Given the expected area of displacement is likely to be small in relation to the wider available habitat and distribution of the species, it is not expected that this would lead to a long-term decrease in the size of a population. This will require further assessment in the project environmental impact assessment and underwater noise modelling and data from the baseline surveys will be used to inform this assessment.</p> <p>The risk of vessel strike with the implementation of EPBC Act regulations for vessel speeds and minimum distances that must be maintained is unlikely to impact the size of the populations of these species.</p> <p>There could be toxicity effects to marine mammals or their prey species due to large unplanned oil or chemical spills or releases, however with preventative control measures in place such events are generally rare. The volumes of oil and chemicals associated with project activities is not currently known. However, oil spill modelling would be undertaken for the project to inform the impact assessment.</p> <p>IMS (if introduced as a result of vessel activities) could impact populations of marine mammals or their prey species depending on the introduced species and its persistence or survival. With the implementation of the legislative and standard control measures for managing hull fouling and ballast water that are summarised in Section 5, there is a low likelihood that such an incident would occur.</p> <p>It is possible that impacts to benthic habitats that support prey species for marine mammals could affect the presence and abundance of these species in the referral area. Benthic habitats within the referral area could be directly disturbed by the installation of offshore subsea infrastructure (i.e. subsea export and array cables and WTG and substation platform foundations) and the physical presence of infrastructure provides artificial structures that could change the community composition of prey species. Unplanned events such as dropped objects from vessels, the introduction of IMS, vessel grounding in shallower waters, effects on water or sediment quality from oil or chemical spills could also impact benthic habitats however with the legislative and standard control measures in place (Section 5) these events are unlikely.</p> <p>It is possible that the above aspects could reduce the populations of marine mammals if substantial numbers are displaced, disturbed or injured however given the referral area is a small proportion of the available habitat for these species, this is considered unlikely. As there is some uncertainty regarding the use of the referral area by marine mammals, baseline surveys are in progress, which will provide additional information that would be used in the project environmental impact assessment to conduct a more detailed assessment of the potential impacts on their populations.</p> <p>Birds</p> <p>In addition to the threatened and migratory seabird species described in the previous sections, the little tern, flesh-footed shearwater, sooty shearwater, short-tailed shearwater, little penguin, black-faced cormorant, common diving petrel, Pacific gull, yellow-nosed albatross, great-winged petrel and white-chinned petrel are listed as marine under the EPBC Act. The short-tailed shearwater is Likely to occur within the referral area, and as shown in Appendix A - Figures, Figure 12 there are known breeding locations for this species to the south and west of the referral area (e.g. the Hogan Group of islands, Rodondo Island, Kanowna Island, etc.). The referral area overlaps with the short-tailed shearwater foraging BIA. In addition, there are breeding locations for the common diving</p>

Criterion	Assessment
	<p>petrel on Rag Island, and the little penguin on islands within the Seal Island group (Seal Island, Clifty Island), Rabbit Island and Curtis Island, and known breeding sites for the black-faced cormorant and Pacific gull in Corner Inlet and islands around Wilsons Promontory.</p> <p>Installation activities and the physical presence of the wind farm could displace seabird foraging within the referral area or affect bird migration to and from breeding islands off Wilson’s Promontory and habitats in Corner Inlet. Shore crossing activities could result in changes to coastal processes that result in changes to shorebird and migratory land bird roosting and foraging habitat in adjacent coastal habitat.</p> <p>The operation of WTGs would result in risk of collision of birds which may have an adverse effect on a population. It is uncertain at this stage the level of impact associated with collision of birds for the project and the data from the baseline surveys and collision risk modelling will be used to inform the impact assessment. Based on assessments from offshore wind farms in the UK and Europe, it is unlikely that the level of collision would have a substantial adverse effect on a population, however this will need to be assessed based on local species, their population trends, and the size and importance of the regional population in the project environmental impact assessment.</p> <p>It is acknowledged that there is uncertainty regarding the presence/absence of birds in the referral area. Seabird and shorebird baseline surveys are in progress to gather additional information on species presence and abundance. This information would be used in the project environmental impact assessment to conduct a more detailed assessment of the potential impacts on their populations.</p>
<p>Result in a substantial change in air quality or water quality (including temperature) which may adversely impact on biodiversity, ecological integrity; social amenity or human health</p>	<p>Unlikely.</p> <p>Atmospheric emissions associated with the project (i.e. from vessel activities and the operation of topsides/above water infrastructure) would be minor and unlikely to adversely impact biodiversity, ecological integrity, social amenity or human health.</p> <p>Water quality within or near the referral area could be affected by routine vessel discharges, accidental spills, shore crossing activities for the installation of subsea export and array cables, or the installation and removal of WTG and substation platform foundations. These are expected to be short-term and localised.</p> <p>Unplanned oil or chemical spills associated with construction, operations or decommissioning activities could impact water quality, and if substantial, could have adverse effects on biodiversity, ecological integrity, social amenity or human health. With preventative control measures in place, such large-scale spills are unlikely, and the extent of the impacts mitigated by the implementation of spill response procedures. Oil spill modelling would be undertaken for the project to inform the impact assessment.</p>
<p>Result in persistent organic chemicals, heavy metals, or other potentially harmful chemicals accumulating in the marine environment such that biodiversity, ecological integrity, social amenity or human health may be adversely affected</p>	<p>Unlikely.</p> <p>There are no planned discharges of organic chemicals, heavy metals, or other potentially harmful chemicals to the Commonwealth marine environment.</p> <p>Chemicals and hydrocarbons would be associated with vessel activities for the duration of the project. A substantial unplanned oil or chemical spill could reduce water and sediment quality, and if it persists could adversely affect biodiversity, ecological integrity, social amenity or human health. However, with preventative control measures in place, such events are unlikely. Oil spill modelling would be undertaken for the project to inform the impact assessment.</p>
<p>Have a substantial adverse impact on heritage values of the Commonwealth marine area, including damage or destruction of an historic shipwreck</p>	<p>Unlikely.</p> <p>The referral area does not currently include any Commonwealth Heritage Places.</p> <p>Four known historic shipwreck sites are located outside the referral area (approximately six to nine km). Geophysical and geotechnical surveys, as well as benthic habitat baseline surveys are planned which will provide data to inform the location of any unknown historic wrecks.</p> <p>If shipwrecks or other places of cultural significance are identified within the referral area, offshore infrastructure would be sited to minimise impacts. Additional risks would be increased levels of turbidity and sedimentation and unplanned dropped objects from vessels transiting in the waters above. However, given the legislative and standard control measures for managing dropped objects summarised in Section 5, there is a low likelihood that such an incident would occur. In addition, a Cultural Heritage Management Plan would be prepared and recommendations and commitments from within that plan would be implemented during construction, operations and decommissioning.</p> <p>Therefore, the project would be unlikely to have a substantial adverse impact on heritage values of the Commonwealth marine area, including damage or destruction of an historic shipwreck.</p>

7 ASSESSMENT OF POTENTIAL IMPACTS – VICTORIAN MATTERS

The EE Act lists individual referral criteria (Table 7.1) and referral criteria relating to combinations of potential effects (Table 7.2), as triggers for preparing an Environment Effects Statement (EES) for assessment. The criteria relevant to an assessing the potential impacts of offshore development in Victorian waters are listed below, with an assessment of the potential for significant effect on the environment under the EE Act provided for each referral criteria. The assessment has been carried out based on the implementation of legislative and standard control measures as described in Section 5.

Table 7.1 Referral criteria: individual potential environmental effects

Referral criteria	Criteria met (Yes/No/Unlikely) and Justification
<p>(A) Potential clearing of 10 ha or more of native vegetation from an area that:</p> <ul style="list-style-type: none"> Is of an Ecological Vegetation Class ('EVC') identified as endangered by the Department of Sustainability and Environment (in accordance with Appendix 2 of Victoria's Native Vegetation Management Framework); or Is, or is likely to be, of very high conservation significance (as defined in accordance with Appendix 3 of Victoria's Native Vegetation Management Framework); or Is not authorised under an approved Forest Management Plan or Fire Protection Plan 	<p>No</p> <p>Review of the available information on the existing environment did not identify any EVCs categorised as endangered or 'very high' conservation within the referral area (using FFG Act – Threatened List and the distribution of EVCs across the state as shown in NatureKit (http://maps.biodiversity.vic.gov.au/viewer/?viewer=NatureKit) and the EPBC PMST results). The clearing or damage of ≥10 ha native vegetation would not occur as a result of the planned activities within the referral area.</p> <p>The review also did not identify any EVCs identified as endangered within the vicinity of the referral area. The nearest EVCs identified as of 'very high' conservation value are in the Corner Inlet Ramsar site (and the Corner Inlet wetland which sits within the Ramsar site), based on "other attributes" for determining conservation significance of an EVC (Appendix 3 of Victoria's Native Vegetation Management Framework). Potential indirect impacts to the EVCs are not expected to result in clearing or loss of ≥10 ha of native vegetation. See further detail on the potential indirect impact to Corner Inlet under referral criteria (C), below. The project is not authorised to clear native vegetation under an approved Forest Management Plan or Fire Protection Plan.</p>
<p>(B) Potential long-term loss of a significant proportion (e.g. 1 to 5 % depending on the conservation status of the species) of known remaining habitat or population of a threatened species within Victoria</p>	<p>Unlikely.</p> <p>Habitat of species listed as threatened under the FFG Act</p> <p>The BIAs relevant to species listed as threatened under the FFG Act that overlap the referral area are:</p> <ul style="list-style-type: none"> White shark: one breeding (nursery area) BIA and three distribution BIAs (Appendix A - Figures, Figure 5). The foraging BIA for this species does not overlap the referral area being approximately 20 km south towards Wilson's Promontory. Pygmy blue whale: one possible foraging area BIA and one distribution and migration BIA (Appendix A - Figures, Figure 7). These large BIAs extend from the Perth Canyon in Western Australia, along the southern coast of Australia to offshore of Eden and Merimbula in New South Wales. Southern right whale: the resting and migration BIA and distribution BIA (Appendix A - Figures, Figure 7). Seabirds: foraging BIA for the Shy albatross (Appendix A - Figures, Figure 12). <p>BIA's relevant to species listed under the FFG Act that are located within 20 km of the referral area are:</p> <ul style="list-style-type: none"> White shark: foraging BIA approximately 20 km south towards Wilson's Promontory (Appendix A - Figures, Figure 5).

Referral criteria	Criteria met (Yes/No/Unlikely) and Justification
	<ul style="list-style-type: none"> • Seabirds: foraging BIAs Buller's albatross, Indian yellow-nosed albatross and wandering albatross immediately adjacent to the referral area (Appendix A - Figures, Figure 12). <p>The white shark breeding (nursery area) BIA, may represent critical habitat under the Recovery Plan for the Great White Shark (DSEWPaC, 2013b).</p> <p>Direct habitat impact within the referral area would be limited to that for the installation of the subsea export cables and trenchless shore crossing. Indirect impacts to habitat within the referral area could result from routine vessel discharges during construction, operation and decommissioning, and impacts to water or sediment quality from the installation of subsea export cables within the referral area and offshore infrastructure within Commonwealth waters (such as foundations and cables) outside the referral area. With the implementation of the legislative and standard control measures presented in Section 5, these impacts would be localised and/or short term and are not expected to result in long-term loss of a significant proportion of habitat.</p> <p>A substantial unplanned oil or chemical spill associated with construction, operations or decommissioning activities could have an indirect impact on habitat. There is also the risk that IMS are introduced and establish in the referral area as a result of vessel activities, (depending on the introduced species). However, given the low likelihood of these unplanned events, and the implementation of the legislative and standard control measures presented in Section 5, long-term loss of a significant proportion of habitat is unlikely.</p> <p>Species listed as threatened under the FFG Act</p> <p>Sections 4.3.9, 4.3.10 and 4.3.11 describe all species listed as threatened under the FFG Act which may occur in the area, along with a determination of the likelihood of occurrence for each species.</p> <p>Fish and invertebrates. Unlikely</p> <p>Three fish species are listed as threatened under the FFG Act: the white shark (likelihood of occurrence rating is Likely), Australian grayling (likelihood of occurrence rating is Possible), and southern bluefish tuna (likelihood of occurrence rating is Possible).</p> <p>Habitat disturbance associated with the installation and presence of subsea infrastructure or unplanned activities such as spills, vessel grounding, etc. could affect the abundance of prey species and the presence and abundance of the Australian grayling, white shark and the southern bluefish tuna within the referral area. These aspects could also temporarily displace these species from the referral area during the construction phase. There is uncertainty regarding the extent to which these species use the referral area. Fish baseline surveys are planned, which will provide more information to determine the presence or absence of these species and the habitats they use. Benthic habitat baseline surveys are also planned to provide additional information on the habitats that are representative of the referral area. This information would be used in the project environmental impact assessment to inform a more detailed assessment of the potential impacts on habitat and populations of these species.</p> <p>There are 11 marine invertebrate taxa listed as threatened under the FFG Act; five sea cucumbers, two brittle star, two marine opisthobranchs, one stalked hydroid species and one chiton species. There is little existing scientific information on the benthic ecology and distribution of benthic species within the referral area, and it is assumed they may occur in the offshore referral area. If the threatened marine invertebrates occur in the referral area, they would only be exposed to localised disturbance as extensive or major effects are not predicted for the export cables and shore crossing.</p> <p>Marine turtles. No</p> <p>The leatherback turtle is the only species of marine turtle listed as 'threatened' under the FFG Act. Leatherback turtles are only expected to be occasional visitors (likelihood of occurrence rating is Unlikely). The referral area is unlikely to support significant numbers of this species, and with the implementation of legislative and standard control measures as presented in Section 5, the project would be unlikely to lead to a long-term decrease in the size of their population.</p> <p>Marine mammals. Unlikely</p> <p>The pygmy blue whale (likelihood of occurrence rating of Rare), southern right whale (likelihood of occurrence rating of Unlikely), humpback whale (likelihood of occurrence rating of Possible), and the Burrunan dolphin (likelihood of occurrence rating of Rare) are listed as threatened under the FFG Act.</p> <p>The referral area falls within the pygmy blue whale possible foraging area BIA and migration BIA, and the southern right whale migration and resting on migration BIA (Appendix A - Figures, Figure 7). There are no humpback whale BIAs that overlap with the referral area</p>

Referral criteria	Criteria met (Yes/No/Unlikely) and Justification
	<p>and the referral area is not considered important habitat for these species. The likelihood of occurrence for the humpback whale in the referral area is Possible, either transiting or searching. The Burrunan dolphin is found in inshore and coastal waters of southern Australia, including Victoria. It has not been recorded in the referral area or nearby Corner Inlet but may pass through coastal parts of the area.</p> <p>Direct impacts within the referral area would be limited to that for the installation of the export cables and shore crossing. Indirect impacts within the referral area could result from routine vessel discharges during construction, operation and decommissioning, and impacts to water or sediment quality from the installation of export cables within the referral area.</p> <p>Indirect impacts associated with offshore infrastructure within Commonwealth waters (such as foundations and cables) outside the referral area include underwater noise and vibration during the installation of foundations that could cause behavioural disturbance or displacement to marine mammal or their prey species within the referral area. It is anticipated that marine mammal species will show behavioural disturbance and displacement from the referral area during the construction period (particularly during piling of foundations) and it is expected that these species would return to the area following installation activities. Given the expected area of displacement is likely to be small in relation to the wider available habitat and distribution of the species, it is not expected that this would lead to potential long-term loss of a significant proportion of known remaining habitat or population of a threatened species. This will require further assessment in the project environmental impact assessment and underwater noise modelling and data from the baseline surveys will be used to inform this assessment. These impacts will be assessed under the EPBC Act.</p> <p>With the implementation of EPBC Act regulations for vessel speeds and minimum distances that must be maintained, the risk of vessel strike is low and unlikely to impact the size of the populations of these species in the long-term.</p> <p>There could be toxicity effects to these whales or their prey species due to large unplanned oil or chemical spills or releases, however with preventative control measures in place such events are generally rare. The volumes of oil and chemicals associated with project activities is not currently known, however, oil spill modelling would be undertaken to inform the impact assessment.</p> <p>IMS (if introduced as a result of vessel activities) could impact populations of these marine mammal species or their prey species depending on the introduced species and its persistence or survival. With the implementation of legislative and standard control measures for managing hull fouling and ballast water that are summarised in Section 5, there would be a low likelihood of such an incident occurring.</p> <p>Therefore, it is unlikely that these aspects would reduce the populations of pygmy blue whales, southern right whales, humpback whales or the Burrunan dolphin, since avoidance of the area would be limited to the construction phase and are not anticipated to be long-term. Marine mammal baseline surveys in progress which would provide additional information on the utilisation of the referral area and surrounding habitat by marine mammal species. This information would be used to assess the potential impacts of the project on their populations.</p> <p>Birds. Unlikely</p> <p>There are 12 species of seabird listed as threatened under the FFG Act that could occur within or near the referral area. The species include seven albatrosses (five Likely to occur in the referral area and one Unlikely to occur). The BIA of one species, the Shy Albatross, overlaps the referral area. As indicated above, foraging BIA's for the Buller's albatross, Indian yellow-nosed albatross and wandering albatross occur immediately adjacent to the referral area, overlapping with the location of the Licence Area. The southern giant petrel and the northern giant petrel are Likely to occur in the referral area and it is Possible that the Little tern, Caspian tern and fairy tern will occur in the referral area.</p> <p>There are five species of shorebirds listed as threatened under the FFG Act that could occur within or near the referral area: curlew sandpiper, great knot, eastern curlew, hooded plover, and the terek sandpiper. There are no BIA's for these species in or adjacent to the referral area and only one species, the hooded plover, has a likelihood of occurrence rating of Likely. Corner Inlet is a stronghold for the eastern curlew in Victoria, along with Western Port Bay (DoE, 2015d). Populations are also located in Port Phillip Bay and elsewhere along the coast. Corner Inlet is considered internationally important for this species, with the population in Corner Inlet representing ≥ 1 % of the East-Asian – Australasian flyway population (DoE, 2014). This species does not breed in Australia and as previously mentioned the likelihood of occurrence in the referral area is Rare.</p>

Referral criteria	Criteria met (Yes/No/Unlikely) and Justification
	<p>There are three species of migratory land birds listed under the FFG Act that could occur in the referral area: swift parrot, orange-bellied parrot and the white-throated needletail. These species do not breed within Victoria but could fly over the wind farm during their migrations to and from breeding locations. Of these species only the white-throated needletail is likely to occur in the referral area, with the other two species categorised as Rare to occur. There are no known critical habitats for these species within the referral area.</p> <p>Listed birds within the referral area could be disturbed by the installation of subsea export cables and cable protection measures. Indirect impacts from the physical presence of the offshore infrastructure (WTGs and substation platforms) in Commonwealth waters, noise and vibration of construction, operation and decommissioning activities and lighting could divert birds from their typical migratory flight paths or displace them from foraging habitat within the referral area. Shore crossing activities could result in changes to coastal processes that result in changes to shorebird and migratory land bird roosting and foraging habitat in adjacent coastal habitat.</p> <p>Indirect impacts associated with the collision risk with WTGs in Commonwealth waters could also affect birds. It is uncertain at this stage the level of impact associated with collision of birds for the project and the data from the baseline surveys and collision risk modelling will be used to inform the impact assessment. Based on assessments from offshore wind farms in the UK and Europe, it is unlikely that the level of collision would lead to long-term loss of a population of a threatened species. This will be assessed based on local species, their population trends, and the size and importance of the regional population in the project environmental impact assessment. These impacts will be assessed under the EPBC Act.</p> <p>Seabird and shorebird baseline surveys are in progress to gather additional information on species presence and abundance within and near the referral area. This information will inform potential impacts of the project on their populations.</p>
<p>(C) Potential long-term change to the ecological character of a wetland listed under the Ramsar Convention or in 'A Directory of Important Wetlands in Australia'</p>	<p>Unlikely.</p> <p>As shown in Appendix A - Figures, Figure 2, the referral area does not overlap any wetland listed under the Ramsar Convention.</p> <p>The referral area is adjacent to The Corner Inlet Ramsar site. The Gippsland Lakes Ramsar site is located approximately 13 km from the referral area (Appendix A - Figures, Figure 2). There would be no direct impacts on these sites.</p> <p>Wetlands which are adjacent to the referral area and are listed in the Directory of Important Wetlands in Australia are also shown in (Appendix A - Figures, Figure 2) and are:</p> <ul style="list-style-type: none"> • Corner Inlet. • Jack Smith Lake State Game Reserve. <p>The Jack Smith Lake State Game Reserve lies on an emerged coastal plain and is now isolated from the sea (http://www.environment.gov.au/cgi-bin/wetlands/report.pl?smode=DOIW;doiw_refcodelist=VIC069). The Corner Inlet site sits within the Corner Inlet Ramsar site.</p> <p>Indirect effects on the Corner Inlet wetland are possible as a result of shore crossing activities for the installation of export cables including:</p> <ul style="list-style-type: none"> • Increased levels of suspended sediments in the water column during construction. • Routine discharges from support vessels. • Noise and vibration associated with construction and decommissioning. <p>Increased levels of sedimentation from export cables and shore crossing and routine vessel discharges will be localised and short term. There could be behavioural impacts (e.g. avoidance behaviour) to mobile marine fauna associated with Corner Inlet due to noise and vibration associated with vessel activities, installation activities or UXO clearance during construction and decommissioning (if required). These temporary impacts would be unlikely to affect the lifecycle of marine fauna that depend on the wetland.</p> <p>The physical presence of offshore infrastructure in Commonwealth waters outside the referral area could affect bird foraging and migration to and from Corner Inlet and Jack Smith Lake State Game Reserve. Noise and vibration or night-time lighting could divert birds from their normal flight paths and collision risk could also affect birds, however these impacts would be unlikely to affect species at a population level.</p> <p>Indirect impacts on the wetland as a result of the physical presence of the offshore infrastructure (such as subsea export and array cables and WTG and substation platform foundations) in Commonwealth waters may result in changes to the wave and current regime and sediment transport processes. It is not expected that these will result in potential long-term change to the ecological character of a wetland, however this will require further assessment in the project environmental impact assessment. Coastal processes modelling</p>

Referral criteria	Criteria met (Yes/No/Unlikely) and Justification
	<p>is proposed to inform the impact assessment. These impacts will be assessed under the EPBC Act.</p> <p>Unplanned oil or chemical spills associated with construction, operations or decommissioning activities could result in impacts on the wetland. There is also the risk that IMS are introduced to the referral area as a result of vessel activities and establish and encroach on the wetland (depending on the introduced species).</p> <p>Given the implementation of legislative and standard control measures presented in Section 5 the indirect impacts discussed above are unlikely to result in long-term change to the ecological character of the Corner Inlet Ramsar site or the Corner Inlet site as listed in the Directory of Important Wetlands.</p>
<p>(D) Potential extensive or major effects on the health or biodiversity of aquatic, estuarine or marine ecosystems, over the long term</p>	<p>Unlikely.</p> <p>The referral area does not overlap with the inland aquatic or estuarine ecosystems, therefore there would be no direct impacts on these ecosystems.</p> <p>Several of the environmental aspects described in Section 5 such as the installation and presence of infrastructure, changes to benthic community composition, increased levels of suspended sediments, discharges from support vessels and unplanned events such as fuel or chemical spills and the introduction of IMS could result in impacts that directly affect marine ecosystems and indirect effects may occur on both estuarine and marine ecosystems; however, none of these are considered extensive.</p> <p>Localised and short-term effects on the marine environment would occur as a result of shore crossing activities for the installation of export cables and discharges from support vessels. The presence of infrastructure, including export cables and cable protection, would create additional hard substrates within the referral area that would support the development of localised biofouling assemblages. These localised changes in the distribution of species which prefer hard substrates would not have major or extensive effects on the marine ecosystems.</p> <p>Unplanned fuel or chemical spills associated with construction, operations or decommissioning activities could result in offsite impacts on the Corner inlet wetland, as described above, and associated ecosystem. There is also the risk that IMS are introduced to the referral area as a result of vessel activities and establish and encroach within marine and estuarine ecosystems (depending on the introduced species).</p> <p>With the implementation of the legislative and standard control measures presented in Section 5, extensive or major effects on the health of biodiversity of marine or estuarine ecosystems would be unlikely.</p>
<p>(E) Potential extensive or major effects on the health, safety or well-being of a human community, due to emissions to air or water or chemical hazards or displacement of residences</p>	<p>No.</p> <p>No extensive or major effects on human health, safety or well-being are predicted due to the offshore activities and infrastructure within the referral area (subsea export cables and cable protection) due or indirect effects of the offshore activities and infrastructure in Commonwealth waters.</p> <p>The nearest human community is approximately 7 km from the referral area at McLoughlins Beach (population approximately 106 in 2016). and There are numerous small towns located up and down the Victorian coastline from McLoughlins Beach.</p> <p>Potential effects on human health, safety and well-being include above-water and subsea noise, electro-magnetic radiation, planned discharges and unplanned leaks and spills. Effects of light glow/visual amenity on human communities are discussed in Table 7.2 below.</p> <p>Above-water and subsea noise: Given the distance to the shore and presence of sand dunes and vegetation, the operational noise of the offshore activities and infrastructure would not have an impact on the health, safety or well-being of human communities.</p> <p>Underwater noise associated with foundation installation (impact piling) has the potential to impact divers and simultaneous operations plans will be required if any diving is planned during this time. Noise modelling will assist assessment of noise levels likely in coastal areas against relevant guidelines. Mitigation may require swimmers and divers be excluded from the water at certain times/locations.</p> <p>The presence of WTGs: The presence of offshore WTGs can interfere with radar and navigation systems including military radar, maritime automatic identification systems, and radio signals such as shore based radio direction finders. Such interference can result in false/masked targets, clutter and refraction.</p> <p>Sensitive receptors (such as nearby shipping lanes, airports, defence systems and weather stations) will be considered in the impact assessment. Legislative and standard control measures presented in Section 5 include redundant navigation and control systems on</p>

Referral criteria	Criteria met (Yes/No/Unlikely) and Justification
	<p>vessels to prevent collisions, exclusion of navigation into the offshore turbine array (within the Licence Area) for certain vessel types, exclusion zones around construction activities, navigation and communication equipment and procedures required under marine regulations.</p> <p>Given the legislative and standard control measures presented in Section 5 and location of the offshore infrastructure being remote from shipping lanes and onshore receptors, extensive or major effects on the safety of a human community present in the offshore environment due to the presence of WTGs is unlikely.</p> <p>Planned discharges and unplanned leaks/spills:</p> <p>Risks to human communities from planned discharges (such as cooling water and sewage from vessels) would be managed through the implementation of legislation and standard controls as presented in Section 5. Such impacts are local and temporary and initial risk assessments indicate no risk to human communities.</p> <p>Unplanned refuelling incidents, storage leakage, dropped objects and vessels colliding or grounding could result in the exposure of coastal human communities to hydrocarbons or chemicals. The risk to human communities would depend on the nature, size and location of the discharge, prevailing environmental conditions and spill response activities.</p> <p>Temporary exclusions from in-water activities (such as swimming and diving) and restrictions on the consumption of contaminated fish/crustacea catches may apply to coastal communities and fishing communities following a large nearshore spill.</p> <p>Oil spill modelling would be undertaken during to inform the impact assessment and the preparation of spill response planning. A large spill has potential to impact human communities but with the legislative and standard control measures presented in Section 5, no extensive or major effects on the health, safety or well-being of a human community, due to emissions to air or water are expected.</p>
(F) Potential greenhouse gas ('GHG') emissions exceeding 200,000 t of carbon dioxide equivalent per annum, directly attributable to the operation of the facility.	<p>No.</p> <p>Emissions of GHG would be generated through fuel combustion (typically marine diesel and fuel oil) by construction, maintenance and support vessels (e.g. transport of people and equipment) and in offshore diesel generators. There may be unplanned releases of gases used in electrical connections (to prevent short circuits and for insulation) resulting from equipment failure or maintenance activities. These are expected to be of low levels and will not exceed 200,000 t of carbon dioxide equivalent per annum.</p> <p>As an operating renewable energy project, the project would help reduce Victoria's energy generation emissions.</p>

The assessment below addresses each of the individual effects criteria for which two or more need to be predicted for the EES to be triggered. No individual criterion is met and therefore, no cumulative impacts trigger the requirement for an EES.

Table 7.2 Referral criteria: a combination of two or more of the following types of potential effects on the environment that might be of regional or State significance

Referral criteria	Referral criteria triggered (Yes/No/Unlikely) and Justification
Potential clearing of 10 ha (i.e. 100,000 m ²) or more of native vegetation, unless authorised under an approved Forest Management Plan or Fire Protection Plan	<p>No.</p> <p>There would be no planned clearing of native vegetation in the referral area.</p> <p>Indirect effects on native vegetation are possible as a result of shore crossing activities for the installation of export cables (increase in turbidity and sedimentation) and discharges from support vessels. However, with the legislative and standard control measures presented in Section 5, vessel discharges would dissipate rapidly and result in negligible impacts to the wetland.</p> <p>Unplanned oil or chemical spills associated with construction, operations or decommissioning activities could also result in impacts on native vegetation. There is also the risk that IMS are introduced to the referral area as a result of vessel activities and establish and encroach on intertidal areas (depending on the introduced species).</p> <p>Given the legislative and standard control measures presented in Section 5 and the low likelihood of such unplanned incidents, these indirect impacts would be unlikely to result in loss of 10 ha or more of native vegetation.</p>

Referral criteria	Referral criteria triggered (Yes/No/Unlikely) and Justification
-------------------	---

The project is not authorised to clear native vegetation under an approved Forest Management Plan or Fire Protection Plan.

<p>Matters listed under the <i>Flora and Fauna Guarantee (FFG) Act 1988</i>:</p> <ul style="list-style-type: none"> potential loss of a significant area of a listed ecological community; or 	<p>No.</p> <p>Review of the FFG Act Threatened List (https://www.environment.vic.gov.au/_data/assets/pdf_file/0018/50418/04072019-Flora-and-Fauna-Guarantee-Characteristics-of-Threatened-Communities-3.pdf) confirms that the referral area does not overlap with any ecological communities listed under the FFG Act.</p> <p>The closest listed TEC within the marine or inter-tidal zone is the San Remo Marine community which is 150 km from the referral area. No direct or indirect impacts are expected to occur to this community.</p>
<ul style="list-style-type: none"> potential loss of a genetically important population of an endangered or threatened species (listed or nominated for listing), including as a result of loss or fragmentation of habitats; or 	<p>No.</p> <p>Habitat fragmentation is recognised as a threatening process for terrestrial flora and fauna in Victoria; however, this is less of an issue for marine flora and fauna due to the connectivity of adjacent parts of the coast and the ability of migrating fauna to find alternative routes if disturbed.</p> <p>The small areas of disturbance in the referral area associated with the project activities would be unlikely to affect the ecological connection between various parts of marine habitats along the Gippsland coast and would not lead to loss of genetically important populations of threatened marine species.</p> <p>Habitat disturbance associated with the installation and presence of subsea infrastructure or unplanned activities such as spills could reduce white shark nursery habitat. There is uncertainty regarding the extent to which the white shark uses the referral area. Fish and benthic habitat baseline surveys are planned, which would provide more information to determine the presence or absence of these species and their use of the nursery area. This information would be used in the project environmental impact assessment to support a more detailed assessment of the potential impacts on habitat and populations of these species.</p> <p>Marine mammals such as the pygmy blue whale, southern right whale and humpback whale that are migrating or could be foraging in the referral area, may be displaced during construction from the referral area (due to noise, suspended sediments or disturbance to benthic habitat and prey species), however this would be short-term and it is expected marine mammal species would return following construction. These marine mammals have extensive distributions around Australia and the referral area is a negligible part of their range and available habitat for migrating and foraging. Impacts associated with infrastructure outside the referral area in Commonwealth waters will be assessed under the EPBC Act.</p> <p>The Burrunan dolphin is endemic to Victorian coastal waters and has been recorded in the Gippsland Lakes. It has not been recorded in the referral area or nearby Corner Inlet. It is not predicted to occur in most of the referral area but may pass through coastal parts of the area. Fragmentation of the Burrunan dolphin habitat and population effects from actions in Victorian waters would be unlikely.</p> <p>There are several birds listed under the FFG Act (Section 4.3.11 that could utilise the referral area for foraging or for passing through on daily foraging trips or migration.</p> <p>Indirect impacts on birds listed under the FFG Act could result during operation from collision, displacement and barrier effects associated with WTGs located outside the referral area. These impacts will be assessed under the EPBC Act.</p> <p>The distributions of FFG Act listed species within and beyond the referral area are extensive. Temporary displacement during construction is possible; however, normal behavioural patterns would be likely to return soon after the construction period. As such no loss of a genetically important population of an endangered or threatened species (listed or nominated for listing), and no loss or fragmentation of habitats is likely.</p>

Referral criteria	Referral criteria triggered (Yes/No/Unlikely) and Justification
	<p>Marine mammals baseline surveys, seabirds and shorebirds baseline surveys, underwater noise modelling and collision risk modelling would inform the assessment of the potential displacement of FFG Act listed fauna from the referral area. .</p>
<ul style="list-style-type: none"> potential loss of critical habitat; or 	<p>Yes.</p> <p>The white shark breeding (nursery area) BIA, may represent critical habitat under the Recovery Plan for the Great White Shark (DSEWPaC, 2013b). There is uncertainty regarding the extent of utilisation of the referral area for white shark breeding, therefore fish baseline surveys are planned, which will inform use of the nursery area by white sharks and potential impacts of the project on this habitat.</p> <p>The critical habitat for the albatross species is extensive and covers large areas of the southern coast of Australia. Seabird baseline surveys are in progress to gather additional information on species presence and abundance. This information would be used in the impact assessment to conduct a more detailed assessment of the potential impacts on critical habitat of albatross species.</p> <p>Direct habitat impact within the referral area would be limited to that for the installation of the export cables.</p> <p>Indirect habitat damage within the referral area could result from routine vessel discharges during construction, operations and decommissioning, and impacts to water or sediment quality from the installation of export cables and the windfarm subsea infrastructure. Given the legislative and standard control measures presented in Section 5, these impacts would be localised and/or short term and are not expected to result in long-term loss of a significant proportion of habitat.</p> <p>A substantial unplanned oil or chemical spill associated with construction, operations or decommissioning activities could have an indirect impact on habitat. There is also the risk that IMS are introduced and establish in the referral area as a result of vessel activities, (depending on the introduced species). However, given the implementation of the legislative and standard control measures presented in Section 5, long-term loss of a significant proportion of habitat is unlikely.</p>
<ul style="list-style-type: none"> potential significant effects on habitat values of a wetland supporting migratory bird species 	<p>Unlikely.</p> <p>As shown in Appendix A - Figures, Figure 2, the referral area does not overlap any wetland listed under the Ramsar Convention.</p> <p>The referral area is adjacent to The Corner Inlet Ramsar site. The Gippsland Lakes Ramsar site is located approximately 13 km from the referral area (Appendix A - Figures, Figure 2). There would be no direct impacts on these sites.</p> <p>Wetlands which are adjacent to the referral area and are listed in the Directory of Important Wetlands in Australia are also shown in (Appendix A - Figures, Figure 2) and are:</p> <ul style="list-style-type: none"> Corner Inlet. Jack Smith Lake State Game Reserve. <p>The potential indirect effects on wetlands adjacent to the referral area and listed under the Ramsar Convention or in 'A Directory of Important Wetlands in Australia' are discussed above in Table 7.1, criteria (C).</p> <p>Given the implementation of legislative and standard control measures presented in Section 5, indirect impacts from activities and infrastructure within both the referral area and the broader Commonwealth waters are unlikely to significantly effect habitat values of a wetland supporting migratory bird species.</p>
<p>Potential extensive or major effects on landscape values of regional importance, especially where recognised by a planning scheme overlay or within or adjoining land reserved under the <i>National Parks Act 1975</i></p>	<p>Unlikely.</p> <p>There are no 'distinctive areas and landscapes' listed under the <i>Amendment (Distinctive Areas and Landscapes) Act 2018</i> that are in the vicinity of the referral area. There are no planning scheme overlays in the referral area under the Wellington Planning Scheme.</p> <p>The referral area does not overlap any land reserved under the <i>National Parks Act 1975</i>. Corner Inlet Marine National Park, Corner Inlet Marine and Coastal Park, Nooramunga Marine and Coastal Park and Ninety Mile Beach Marine National Park are the closest areas reserved under the <i>National Parks Act 1975</i> (Appendix A - Figures, Figure 2).</p> <p>A preliminary landscape and visual impact assessment was conducted to determine the potential for visual impacts at three sites in the vicinity of the referral area: Port Albert,</p>

Referral criteria	Referral criteria triggered (Yes/No/Unlikely) and Justification
	<p>McLoughlins Beach and Woodside Beach. It was identified there would be a level of visual impact as a result of the offshore wind farm however the extent of the impact is uncertain. A detailed landscape and visual impact assessment is planned, which would identify potential sensitive receptors, assess the extent of visual impacts and identify measures to mitigate visual impacts if they are required.</p>
<p>Potential extensive or major effects on land stability, acid sulphate soils or highly erodible soils over the short or long term</p>	<p>No. Offshore infrastructure would be located in Commonwealth waters with the export cables and shore crossing in Victorian waters. Any effects from the installation of the export cables and cable protection in the referral area would be localised. Whilst there is the potential for changes to coastal processes associated with the construction and installation of subsea infrastructure, the implementation of legislative and standard control measures presented in Section 5 would reduce the potential for land instability and erosion. As such, no extensive or major effects on land stability, acid sulphate soils or highly erodible soils over the short or long term are likely.</p>
<p>Potential extensive or major effects on beneficial uses of waterbodies over the long term due to changes in water quality, stream flows or regional groundwater levels</p>	<p>Unlikely. Offshore infrastructures such as WTGs and foundations, substation platforms and foundations and subsea array cables would be located in Commonwealth waters with the shore crossing sited in Victorian waters. The subsea export cables would be located in both Commonwealth and Victorian waters. There would be temporary displacement of users at the shore crossing site during construction. Exclusion zones would also be in place during construction and operations and decommissioning of the infrastructure in Commonwealth waters. Beneficial uses such as recreational activities such as diving and swimming, tourism and recreational and commercial fishing would therefore be restricted. In the unlikely event of a fuel spill, temporary exclusions from in-water activities (such as swimming, diving and fishing) may be implemented. Oil spill modelling would be undertaken during to inform the impact assessment and the preparation of spill response planning. With the implementation of the legislative and standard control measures presented in Section 5, extensive or major effects on beneficial uses of the marine environment are unlikely. No impacts to regional groundwater or surface water are predicted.</p>
<p>Potential extensive or major effects on social or economic well-being due to direct or indirect displacement of non-residential land use activities</p>	<p>Unlikely. There would be temporary displacement of users at the shore crossing during construction and decommissioning. In the unlikely event of an extensive fuel spill resulting from a vessel collision or grounding coming ashore at populated areas, temporary closures of swimming beaches and areas involved in spill response may be imposed by health regulators. As such, given the temporary nature and small area of exclusion zones, no extensive or major effects on social or economic well-being due to direct or indirect displacement of non-residential land use activities is likely.</p>
<p>Potential for extensive displacement of residences or severance of residential access to community resources due to infrastructure development</p>	<p>No. There would be no restriction to residential access to community resources in the marine environment.</p>
<p>Potential significant effects on the amenity of a substantial number of residents, due to extensive or major, long-term changes in visual, noise and traffic conditions</p>	<p>Unlikely. Offshore infrastructure outside of the referral area such as WTG and substation platforms (in Commonwealth waters) will be visible from shore. Light glow from construction, operations and decommissioning vessels, buoys and the infrastructure (such as the WTG and substation platforms) would be visible from the coast and possibly a number of residents from parts of towns and public areas such as McLoughlins Beach (population 104, 2016 Census). The seascape would change for the duration of the project including the construction period and for the operation lifespan of 25 – 50 years. A preliminary landscape and visual impact assessment was conducted to determine the potential for visual impacts at three sites in the vicinity of the referral area: Port Albert, McLoughlins Beach and Woodside Beach. It was identified there would be a level of visual impact as a result of the offshore wind farm however the extent of the impact is uncertain. A detailed landscape and visual impact assessment is planned, which would identify potential</p>

Referral criteria	Referral criteria triggered (Yes/No/Unlikely) and Justification
	<p>sensitive receptors, assess the extent of visual impacts and identify measures to mitigate visual impacts if they are required. Offshore activities resulting in noise are temporary during construction (e.g. piling). Noise from the offshore aspects of the operational wind farm are not expected to be detectable from shore.</p> <p>Numerous vessels will be within the referral area during construction and decommissioning phases of the project.</p>
<p>Potential exposure of a human community to severe or chronic health or safety hazards over the short or long term, due to emissions to air or water or noise or chemical hazards or associated transport</p>	<p>Unlikely.</p> <p>The nearest human community is McLoughlins Beach (population 104, 2016 Census) approximately 7 km from the referral area with numerous smaller settlements such as Woodside Beach scattered along the Victorian coastline. Recreational vessels and other craft may use ports and boat ramps such as Port of Hastings, Port Anthony, Barry Beach and Corner Inlet.</p> <p>Health or safety hazards due to emissions to air and water, noise, chemical hazards or transport can result from vessel fuel combustion emissions and leaks, planned discharges and unplanned spills of chemicals and fuel, above-water and subsea noise, and vessel collisions.</p> <p>Emissions to air: Emissions from the combustion of fuel oil and diesel by construction, operation and decommission vessels and onboard machinery within the referral area would result in a localised, temporary reduction in air quality throughout the installation, operation and decommissioning phases of the project. Given the open marine environment, no exposure of any human community to severe or chronic health hazards over the short or long term, due to emissions to air is likely.</p> <p>Planned discharges and unplanned spills:</p> <p>Risks to human communities from planned discharges from vessels (such as cooling water and sewage from vessels) would be managed through adherence to international conventions (such as MARPOL) and Commonwealth legislation (such as the <i>Protection of the Sea (Prevention of Pollution from Ships Act 1983) (Cth)</i>). Such impacts would be localised and temporary and given the distances to shore and open ocean environment, no exposure of a human community to severe or chronic health or safety hazards over the short or long term, due to planned emissions to water is likely.</p> <p>Unplanned refuelling incidents, storage leakage, dropped objects and vessels collisions or grounding could result in the exposure of coastal human communities to hydrocarbons or chemicals depending on the nature, size and location of the discharge and prevailing environmental conditions and spill response.</p> <p>Legislative and standard control measures, as presented in Section 5, would reduce the likelihood of a spill occurring. Controls include establishing exclusion zones around construction vessels and infrastructure, standard maritime communication processes and navigation aids, notice to mariners, stakeholder notifications, spill response plans, simultaneous operations management plans, refuelling procedures, and engineering design (e.g. secondary containment). Vessel and shoreline spill response plans would minimise the effects should a spill occur. The engineering design of project infrastructure would consider the environmental conditions over the life of the project such as materials of construction, preventative maintenance requirements and the provision of secondary containment.</p> <p>Temporary exclusions from in-water activities (such as swimming and diving) and restrictions on the consumption of potentially contaminated fish/crustacea catches may apply to coastal communities and fishing communities following a large spill.</p> <p>Worst case modelling would be undertaken to inform the impact assessment to assist the preparation of spill response planning. A large spill has potential to impact human communities but with the controls and the legislated and best practice controls, no extensive or major effects on the health, safety or well-being of a human community, due to emissions to water or chemical hazards are likely.</p> <p>Above-water and subsea noise:</p> <p>Given the distance to the shore and presence of sand dunes and vegetation, it is unlikely the noise from the installation, operation and decommissioning of the offshore infrastructure and associated marine facilities would have potential extensive or major effects on the health, safety or wellbeing of human communities. Noise modelling studies undertaken to inform the impact assessment would determine likely sound power levels for human communities under a variety of weather conditions this would inform mitigation if necessary.</p> <p>Underwater noise associated with foundation installation (impact piling) has the potential to impact divers and SIMOPS plans would be required if any diving is planned during this time. Noise modelling would assist assessment of noise levels likely in coastal areas against</p>

Referral criteria	Referral criteria triggered (Yes/No/Unlikely) and Justification
	<p>relevant guidelines. Mitigation may require swimmers and divers be excluded from the water at certain times/locations.</p> <p>Collision of recreational and other craft with project vessels: Numerous craft would transit the referral area in Victorian water and Commonwealth waters during construction, operations and decommissioning phases of the project, hence there is a risk of collision with project vessels or infrastructure. Local ports and boat ramps include Port of Hastings, Port Anthony, Barry Beach and from Corner Inlet. With the implementation of legislative and standard control measures presented in Section 5, vessel collisions are considered unlikely.</p>
<p>Potential extensive or major effects on Aboriginal cultural heritage</p>	<p>No.</p> <p>The referral area may contain sites of Aboriginal cultural heritage which have not yet been discovered. A search of the Victorian Heritage Database, Commonwealth Heritage Register and Archaeological inventory under the <i>Heritage Act 1995 (Vic)</i> and the DELWP datasets did not identify any Aboriginal cultural heritage sites or objects in the referral area.</p>
<p>Potential extensive or major effects on cultural heritage places listed on the Heritage Register or the Archaeological Inventory under the <i>Heritage Act 1995</i>.</p>	<p>No.</p> <p>A search of the Victorian Heritage Database, Commonwealth Heritage Register and Archaeological inventory under the <i>Heritage Act 1995</i> and the DELWP datasets did not identify any significant heritage places, shipwrecks or other maritime cultural heritage sites or objects in the referral area.</p> <p>The referral area may contain historic shipwrecks or other underwater cultural heritage sites which have not yet been discovered. A geophysical and geotechnical survey will assist in identifying potential heritage sites, including shipwreck sites and all known sites will be avoided.</p>

8 MANAGEMENT AND MITIGATION

Star of the South would implement a suite of control measures to ensure that potential direct and indirect environmental impacts and risks associated with the project are either avoided or reduced to as low as reasonably practicable and are managed for the duration of the project. The mitigation of impacts would occur throughout the project as part of continual improvement.

Key legislative and standard control measures have been identified as part of the assessment of significant impacts and effects in this report (see Section 5.1). These are considered the minimum controls that would be implemented for the project.

Design measures would include siting of the project infrastructure to reduce impacts to critical habitats and on matters protected under Commonwealth and Victorian legislation. The installation and maintenance of scour protection around the WTG and substation platform foundations and cable burial are other examples of design measures that would be implemented to reduce the potential impacts on the marine ecology within the referral area. The design of offshore infrastructure would also account for extreme metocean conditions over the lifetime of the project to reduce the potential for unplanned impacts.

The desktop literature review and significant impact assessment summarised in this report, identified there are key data gaps and that uncertainties exist where there is insufficient baseline data/information to support a definitive evaluation of potential impacts from the project. Star of the South has identified marine ecological baseline surveys and further environmental impact assessment studies (see Section 4.4 and Section 5.2 respectively) that would be undertaken to close knowledge gaps and reduce the uncertainty that exists. The outcomes of these surveys and studies would be used in the impact assessment to conduct a more detailed assessment of the potential impacts of the project and importantly to identify further control measures that would be required to avoid or reduce impacts to as low as reasonably practicable.

9 CONCLUSION

The assessment against the Commonwealth and Victorian referral criteria has identified several aspects associated with the project where there is the potential for significant impacts or effects.

Commonwealth protected matters

The following MNES were identified in the literature review as being relevant to the Commonwealth referral area and were considered in the impact assessment:

- The Corner Inlet Ramsar site (listed as a Wetland of international importance)
- 45 listed threatened species (six critically endangered, 11 endangered and 28 vulnerable species)
- 68 listed migratory species
- The Commonwealth marine area.

The Corner Inlet Ramsar site is a wetland of international importance that lies adjacent to the referral area. As described in Section 6.1, it is unlikely that the project would have a significant impact on this wetland.

Of the threatened species considered in the assessment, it was determined there is the potential for significant impact for the following criteria (see Section 6.3):

- The project has the potential to lead to a long-term decrease in the size of a population of the white shark and threatened birds. The referral area overlaps with the white shark nursery area BIA which may be critical habitat. Construction activities, operations and decommissioning activities could affect white shark behaviour, including breeding, which could impact their population. The extent of utilisation of the referral area by the white shark is uncertain, therefore impacts associated with these species will require further assessment in the project environmental impact assessment. Fish baseline surveys are planned, which will provide more information to determine the presence or absence of these species within the referral area. The operation of the WTGs would result in risk of collision of seabirds and migratory shorebirds and migratory land birds and the level of impact is uncertain at this stage. Data from baseline surveys and collision risk modelling would be used to inform the project impact assessment.
- The project is likely to reduce the area of occupancy of the white shark, Australian grayling, pygmy blue whale, southern right whale and threatened species of seabirds or shorebirds. Construction activities, the presence of offshore infrastructure and decommissioning activities could displace these species from areas they utilise for foraging, migration or resting.
- The project has the potential to adversely affect habitat critical to the survival of a species. The referral area overlaps with the white shark nursery area BIA which may be critical habitat, and waters south of 25 degrees latitude which are considered critical foraging habitat for threatened albatrosses and petrels. These habitats could be disturbed by the installation of subsea infrastructure or unplanned activities such as spills. There is uncertainty regarding the extent of utilisation of these areas by the respective species. Information gathered during baseline surveys would be used to inform the project impact assessment.
- The project has the potential to disrupt the breeding cycle of an important population of the white shark and threatened species of birds that breed in the area. Breeding could be affected by the installation of offshore infrastructure or unplanned activities such as spills. Whilst birds are not known to breed in the referral area, breeding outside the referral area (e.g. on nearby islands) could be affected if bird fitness is reduced. Collision risk could also affect the number of breeding individuals in the population. There is uncertainty regarding the extent of breeding of the white shark and birds within and near the referral area. Information gathered during baseline surveys would therefore be used to inform the project impact assessment.
- The project has the potential to modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the white shark is likely to decline. The referral area overlaps with the white shark nursery area BIA which may be critical habitat. Construction activities, such as the installation of foundations, and the removal of infrastructure during decommissioning, or an unplanned event such as a large spill could affect white shark habitat and their behaviour, including breeding, which could impact their population. The extent of utilisation of the referral area by the white shark is uncertain, therefore impacts associated with these species will require further assessment in the project environmental

impact assessment. Fish baseline surveys are planned, which will provide more information on the presence or absence of these species within the referral area and their habitat.

Of the migratory species considered in the assessment, it was determined there was the potential for significant impact for the following criteria (see Section 6.4):

- The project has the potential to seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of the short-tailed shearwater. Corner Inlet supports an ecologically significant proportion of the population of short-tailed shearwaters. The presence of the wind farm could disrupt their migration, foraging patterns or displace them from foraging habitat within the referral area. Seabird and shorebird baseline surveys are in progress and the data would be used to inform the project environmental impact assessment.
- The project has the potential to substantially modify, destroy or isolate an area of important habitat for the white shark. The referral area overlaps with the white shark nursery area BIA which may be critical habitat. This habitat could be disturbed by the installation of subsea infrastructure or unplanned activities such as spills. There is uncertainty regarding the extent of utilisation of the referral area by the white shark. Information gathered during baseline surveys would be used to inform the project impact assessment.

The project has the potential to have significant impact on the Commonwealth marine area, with the potential for a substantial adverse effect on a population of a marine species or cetacean (see Section 6.5).

Victorian protected matters

The assessment of Victorian protected matters considered the following key receptors:

- Marine protected areas
- Nationally important wetlands
- Australian marine parks
- Victorian marine assets
- 38 threatened species and their habitat (11 marine invertebrates, three fish species, four marine mammal species, one marine turtle species, 12 seabird species, five shorebird species and three migratory land birds)
- EVCs and native vegetation
- Threatened ecological communities
- Landscape values and visual amenity
- Human community and residences
- Aboriginal cultural heritage
- Cultural heritage places.

The assessment determined there was the potential for significant effects for the following criteria (see Section 7):

- The project has the potential to result in the loss of critical habitat. The referral area overlaps with the white shark nursery area BIA which may be critical habitat, and waters south of 25 degrees which are considered critical foraging habitat for threatened albatrosses and petrels. These habitats could be disturbed by the installation of subsea infrastructure or unplanned activities such as spills. There is uncertainty regarding the extent of utilisation of these areas by the respective species. Information gathered during baseline surveys would be used to inform the project impact assessment.

The remaining Victorian referral criteria were assessed as either the project would have 'no' significant effects or 'unlikely' to result in significant environmental effects.

Surveys and further studies

It is acknowledged there are uncertainties regarding the presence and absence of species within the referral area and the habitat within the referral area. The following marine baseline surveys are planned, with some surveys already underway (see Section 4.4 for details):

- Benthic Ecology (grab sampling and underwater video)
- Fish Ecology (stereo baited remote underwater video, demersal trawl and demersal gillnet)
- Marine Mammals (visual aerial surveys, acoustic monitoring and fur seal tagging studies)
- Seabirds and Shorebirds (digital aerial surveys, shorebird surveys, seabird tagging studies).

The following modelling studies would also be conducted:

- Coastal processes modelling
- Underwater noise modelling
- Collision risk modelling
- Oil spill trajectory modelling.

Data from baseline surveys and the modelling studies would be used to inform the project impact assessment so that a more detailed assessment of the potential impacts on protected species and their habitats can be conducted. The detailed impact assessment would determine the control measures to be adopted to ensure that potential impacts on the marine environment are either avoided, or alternatively reduced to as low as reasonably practicable.

10 REFERENCES

- Acevedo-Gutiérrez, A, Croll, DA & Tershy, BR 2002, 'High feeding costs limit dive time in the largest whales', *Journal of Experimental Biology*, vol. 205, no. 12, pp.1747–1753.
- Advisian 2017, *Pelican Marine Seismic Survey Habitat Survey. Report prepared by Advisian and CEE for CarbonNet. Report 301010-01498*.
- Andrews-Goff, V., Bestley, S, Gales, NJ, Laverick, SM, Paton, D, Polanowski, AM, Schmitt, NT & Double, MC 2018, 'Humpback whale migrations to Antarctic summer foraging grounds through the southwest Pacific Ocean', *Scientific Reports*, vol. 8, no. 1, p.12333. Available from: <http://www.nature.com/articles/s41598-018-30748-4>.
- Arnould, JPY, Monk, J, Ierodiaconou, D, Hindell, MA, Semmens, J, Hoskins, AJ, Costa, DP, Abernathy, K & Marshall, GJ 2015, 'Use of anthropogenic sea floor structures by Australian fur seals: potential positive ecological impacts of marine industrial development?', *PLoS One*, vol. 10, no. 7.
- Ashmole, NP 1971, 'Seabird ecology and the marine environment', *Avian biology*, vol. 1, pp.223–286.
- Atlantis & Fishwell 2019, *Commercial fishing catch and value in the Star of the South footprint. Prepared for [Star of the South] by Atlantis Fisheries Consulting Group and Fishwell Consulting, Queenscliff, Victoria*.
- Attard, CRM, Beheregaray, LB, Jenner, C, Gill, P, Jenner, M, Morrice, MG, Bannister, J, LeDuc, R & Möller, L 2010, 'Genetic diversity and structure of blue whales (*Balaenoptera musculus*) in Australian feeding aggregations', *Conservation Genetics*, vol. 11, no. 6, pp.2437–2441.
- Aulich, MG, McCauley, RD, Saunders, BJ & Parsons, MJG 2019, 'Fin whale (*Balaenoptera physalus*) migration in Australian waters using passive acoustic monitoring', *Scientific reports*, vol. 9, no. 1, pp.1–12.
- Backhouse, G, Jackson, J & O'Connor, J 2008, *National Recovery Plan for the Environment, Australian Grayling *Prototroctes maraena**, Melbourne.
- Bailey, H, Benson, SR, Shillinger, GL, Bograd, SJ, Dutton, PH, Eckert, SA, Morreale, SJ, Paladino, F V., Eguchi, T, Foley, DG, Block, BA, Piedra, R, Hitipeuw, C, Tapilatu, RF & Spotila, JR 2012a, 'Identification of distinct movement patterns in Pacific leatherback turtle populations influenced by ocean conditions', *Ecological Applications*, vol. 22, no. 3, pp.735–747.
- Bailey, H, Benson, SR, Shillinger, GL, Bograd, SJ, Dutton, PH, Eckert, SA, Morreale, SJ, Paladino, F V., Eguchi, T & Foley, DG 2012b, 'Identification of distinct movement patterns in Pacific leatherback turtle populations influenced by ocean conditions', *Ecological Applications*, vol. 22, no. 3, pp.735–747.
- Baker, AN 1985, 'Pygmy right whale, *Caperea marginata* (Gray, 1846)', *Handbook of Marine Mammals, vol. 3, The Sireniacs and Baleen Whales*.
- Balcazar, NE, Tripovich, JS, Klinck, H, Nieukirk, SL, Mellinger, DK, Dziak, RP & Rogers, TL 2015, 'Calls reveal population structure of blue whales across the southeast Indian Ocean and the southwest Pacific Ocean', *Journal of mammalogy*, vol. 96, no. 6, pp.1184–1193.
- Ball, D, Parry, G, Heislars, S, Blake, S & Werner, G 2010, *Analysis of Victorian seagrass health at a multi-regional level 2004–07. NHT Statewide Project No. 202243*, Queenscliff, Australia.
- Bannister, JL 2017, 'Project A7-Monitoring Population Dynamics of 'Western' Right Whales off Southern Australia 2015-2018', *Final report to National Environment Science Program, Australian Commonwealth Government*.
- Bannister, JL, Kemper, CM & Warneke, RM 1996, *The Action Plan for Australian Cetaceans*.
- Barton, J, Pope, A & Howe, S 2012, *Marine protected areas of the central Victoria bioregion, Parks Victoria, Melbourne, Vic*.
- Bax, NJ & Williams, A 2001, 'Seabed habitat on the south-eastern Australian continental shelf: context, vulnerability and monitoring', *Marine and Freshwater Research*, no. 52, pp.491–512.
- BMT WBM n.d., *Ecological Character Description of the Corner Inlet Ramsar Site – Final Report*, Canberra.
- Bone, C 1998, *Preliminary Investigation Into Leatherback Turtle, Dermochelys Coriacea (L.), Distribution, Abundance and Interactions with Fisheries in Tasmanian Waters*, Tasmanian Parks and Wildlife

Service.

- Boyle, MC, FitzSimmons, NN, Limpus, CJ, Kelez, S, Velez-Zuazo, X & Waycott, M 2009, 'Evidence for transoceanic migrations by loggerhead sea turtles in the southern Pacific Ocean', *Proceedings of the Royal Society B: Biological Sciences*, vol. 276, no. 1664, pp.1993–1999.
- Bray, DJ & Thompson, V. 2017, *Fishes of Australia*. Available from: <http://fishesofaustralia.net.au/>.
- Brown, RGB 1980, "Seabirds as marine animals" in *Behavior of marine animals*, Springer, Springer, pp.1–39.
- Bruce, BD & Bradford, RW 2012, 'Habitat use and spatial dynamics of juvenile white sharks, *Carcharodon carcharias*, in eastern Australia', *Global perspectives on the biology and life history of the white shark*, pp.225–254.
- Burnell, SR 2001, 'Aspects of the reproductive biology, movements and site fidelity of right whales off Australia', *Journal of Cetacean Research and Management Special Issue*, vol. 2, pp.89–102.
- Butler, A, Althaus, F, Furlani, D & Ridgway, K 2002, *Assessment of the conservation values of the Bonney upwelling area: a component of the Commonwealth Marine Conservation Assessment Program 2002–2004: report to Environment Australia*.
- Butt, R 2001, *Unpublished data held by author. Cat Ballou Cruises*.
- Cailliet, G., Cavanagh, R., Kulka, D., Stevens, J., Soldo, A, Clo, S, Macias, D, Baum, J, Kohin, S, Duarte, A, Holtzhausen, J., Acuña, E, Amorim, A & Domingo, A 2009, *Isurus oxyrinchus*.
- Campana, SE & Joyce, WN 2004, 'Temperature and depth associations of porbeagle shark (*Lamna nasus*) in the northwest Atlantic', *Fisheries Oceanography*, vol. 13, no. 1, pp.52–64.
- CarbonNet 2018, *Pelican 3D Marine Seismic Survey. Environmental Plan Summary*.
- Carroll, E, Baker, CS, Watson, M, Alderman, R, Bannister, J, Gaggiotti, OE, Gröcke, DR, Patenaude, N & Harcourt, R 2015, 'Cultural traditions across a migratory network shape the genetic structure of southern right whales around Australia and New Zealand', *Scientific reports*, vol. 5, p.16182.
- Carroll, E, Patenaude, N, Alexander, A, Steel, D, Harcourt, R, Childerhouse, S, Smith, S, Bannister, J, Constantine, R & Baker, CS 2011, 'Population structure and individual movement of southern right whales around New Zealand and Australia', *Marine Ecology Progress Series*, vol. 432, pp.257–268.
- CES 2009, *Marine Water Quality: What we do on land affects the sea. February 2009 Fact Sheet No.1..* Available from: www.ces.vic.gov.au. [21 February 2020].
- Charlton-Robb, K., Gershwin, L-A., Thompson, R., Austin, J., Owen, K., McKechnie, S. 2011, 'A New Dolphin Species, the Burrunan Dolphin *Tursiops australis* sp. nov., Endemic to Southern Australian Coastal Waters', *PLoS ONE* Available from: <https://doi.org/10.1371/journal.pone.0024047>.
- Chilvers, BL 2018, "New Zealand Fur Seal: *Arctocephalus forsteri*" in *Encyclopedia of Marine Mammals*, Elsevier, Elsevier, pp.632–634.
- CSIRO 2017, *Atlas of Living Australia*. Available from: <https://bie.ala.org.au/species/urn:lsid:biodiversity.org.au:afd.taxon:9b31383c-4745-4b8f-a3bd-8b9e91619e47>. [10 December 2019].
- CSIRO 2019, *Atlas of Living Australia*. Available from: <https://bie.ala.org.au/species/urn:lsid:biodiversity.org.au:afd.taxon:9b31383c-4745-4b8f-a3bd-8b9e91619e47>.
- DAWE 2020a, *Biologically Important Areas of Regionally Significant Marine Species*. Available from: <https://www.environment.gov.au/marine/marine-species/bias>. [18 February 2020].
- DAWE 2020b, *Marine Invertebrates*. Available from: <https://www.environment.gov.au/marine/marine-species/marine-invertebrates>. [24 February 2020].
- DAWE 2020c, *Directory of Important Wetlands in Australia*. Available from: <https://www.environment.gov.au/water/wetlands/australian-wetlands-database/directory-important-wetlands>. [19 February 2020].
- Deakin University 2019, *South Australian Sea Turtles (SAST)*. Available from: <https://www.deakin.edu.au/cie/our-research/southern-australian-sea-turtles>. [5 December 2019].

REPORT

- DEH 2005, *NON-CURRENT Whale Shark (Rhincodon typus) Recovery Plan 2005–2010*. Available from: <http://www.environment.gov.au/biodiversity/threatened/publications/recovery/r-typus/index.html>.
- DELWP 2015, *Gippsland Regional Coastal Plan 2015-2020*, Melbourne, Vic.
- DELWP 2019a, 'Victorian Biodiversity Atlas' *The State of Victoria*. Available from: <https://vba.dse.vic.gov.au/vba/index.jsp>. [10 December 2019].
- DELWP 2019b, *Department of Environment, Land, Water & Planning Flora and Fauna Guarantee Act 1988 Threatened List November 2019*, Victoria. Available from: https://www.environment.vic.gov.au/__data/assets/pdf_file/0024/115827/20191114-FFG-Threatened-List.pdf.
- DELWP 2020, *NatureKit*, Melbourne, Vic.. Available from: <http://maps.biodiversity.vic.gov.au/viewer/?viewer=NatureKit>. [21 February 2020].
- Department of Agriculture/DoE 2015, *Anti-fouling and in-water cleaning guidelines*, Canberra, Australian Capital Territory.
- Department of Agriculture and Water Resources 2017, *Ballast Water Management Requirements*, Canberra, Australian Capital Territory.
- DEPI 2013, *Corner Inlet Ramsar Site Boundary Description Technical Report*, East Melbourne, Vic.
- DEWR 2005, *Australian Wetlands Database*. Available from: <https://www.environment.gov.au/water/wetlands/australian-wetlands-database>. [21 February 2020].
- DoE 2013, *EPBC Act Policy Statement 1.1 – Significant Impact Guidelines – Matters of National Environmental Significance*, Canberra.
- DoE 2014, *Consultation Document on Listing Eligibility and Conservation Actions Numenius madagascariensis (eastern curlew)*, Canberra, ACT.
- DoE 2015a, *South-east marine region profile: A description of the ecosystems, conservation values and uses of the South-east Marine Region*. Available from: <http://www.environment.gov.au/system/files/resources/7a110303-f9c7-44e4-b337-00cb2e4b9fbf/files/south-east-marine-region-profile.pdf>.
- DoE 2015b, *South-east marine region profile: A description of the ecosystems, conservation values and uses of the South-east Marine Region*, Canberra, ACT.
- DoE 2015c, *Conservation Management Plan for the Blue Whale - A Recovery Plan under the Environment Protection and Biodiversity Conservation Act 1999*.
- DoE 2015d, *Conservation Advice – Numenius madagascariensis Eastern Curlew*, Canberra, ACT.
- DoE 2017, *Recovery Plan for Marine Turtles in Australia*.
- DoE 2019, 'Carcharodon carcharias in Species Profile and Threats Database' *Department of Environment, Canberra*. Available from: <http://www.environment.gov.au/sprat>.
- DoE 2020a, *Lagenorhynchus obscurus in Species Profile and Threats Database*, Canberra. Available from: <http://www.environment.gov.au/sprat>.
- DoE 2020b, *Orcinus orca in Species Profile and Threats Database*, Canberra. Available from: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=46.
- DoEE 2017, *Recovery Plan for Marine Turtles in Australia*.
- DoEE 2019a, 'Protected Matters Search Tool' *Australian Government*. Available from: <https://www.environment.gov.au/webgis-framework/apps/pmst/pmst.jsf>. [28 January 2019].
- DoEE 2019b, 'Species Profile and Threats Database' *SPRAT*. Available from: <http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl>. [11 December 2019].
- DoEE 2019c, *Species Profile and Threats Database – Pygmy Right Whale. Department of Environment and Energy*. Available from: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=39.
- DoEE 2019d, *Species Profile and Threats Database - Bottlenose Dolphin. Department of Environment and Energy*. Available from: <http://www.environment.gov.au/cgi->

bin/sprat/public/publicspecies.pl?taxon_id=68417.

DoEE 2019e, *Dermochelys coriacea in Species Profile and Threats Database, Department of the Environment and Energy*. Available from: https://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=1768.

DoEE 2020, *Subtropical and Temperate Coastal Saltmarsh in Community and Species Profile and Threats, Department of the Environment, Canberra*. Available from: <http://www.environment.gov.au/sprat>. [5 March 2020].

Double, MC, Andrews-Goff, V, Jenner, C, Jenner, M, Laverick, SM, Branch, TA & Gales, NJ 2014, 'Migratory movements of pygmy blue whales (*Balaenoptera musculus brevicauda*) between Australia and Indonesia as revealed by satellite telemetry', *PloS one*, vol. 9, no. 4, p.e93578.

DPI 2018, 'Fisheries NSW Shark Tracking' *Seaturtle.org*. Available from: http://www.seaturtle.org/tracking/index.shtml?project_id=1141.

DSE 2009, *Advisory List of Threatened Invertebrate Fauna in Victoria*, Melbourne, Vic. Available from: https://www.environment.vic.gov.au/__data/assets/pdf_file/0016/50452/Advisory_List_of_Threatened_Invertebrate_Fauna_2009_FINAL_Sept_2009.pdf.

DSE 2013, *Advisory List of Threatened Vertebrate Fauna in Victoria. Department of Sustainability and Environment*, Victoria.

DSEWPaC 2011a, *Corner Inlet Ramsar Site Ecological Character Description*. Available from: <https://www.environment.gov.au/system/files/resources/97f19db6-cc7c-429b-9431-7577f1d99907/files/13-ecd.pdf>.

DSEWPaC 2011b, *The National Recovery Plan for Threatened Albatrosses and Giant Petrels 2011-2016*, Canberra, ACT.

DSEWPaC 2012a, *Conservation Management Plan for the Southern Right Whale-A recovery plan under the Environment Protection and Biodiversity Conservation Act 1999*.

DSEWPaC 2012b, *Marine bioregional plan for the Temperate East Marine Region; prepared under the Environment Protection and Biodiversity Conservation act 1999*.

DSEWPaC 2013a, *Recovery Plan for the Great White Shark (Carcharodon carcharias)*, Canberra, ACT.

DSEWPaC 2013b, *Conservation Advice for Subtropical and Temperate Coastal Saltmarsh*, Canberra.

ECC 2000, *Marine Coastal and Estuarine Investigation. Final Report*, East Melbourne, Vic.

Eckert, SA, Eckert, KL, Ponganis, P & Kooyman, GL 1989, 'Diving and foraging behavior of leatherback sea turtles (*Dermochelys coriacea*)', *Canadian journal of zoology*, vol. 67, no. 11, pp.2834–2840.

Edmonds, C 2016, "Around the bay – 6/9/2016", *South Gippsland Sentinel Times*. Available from: <https://sgst.com.au/2016/09/around-bay-692016/>.

Ellis, D & Kiessling, I 2016, "Ranching of southern bluefin tuna in Australia" in *Advances in Tuna Aquaculture*, Elsevier, Elsevier, pp.217–232.

Emison, WB, Beardsell, CM, Norman, FI, Loyn, RH & Bennett, SC 1987, *Atlas of Victorian Birds*, Department of Conservation, Forests and Lands & Royal Australasian Ornithologists Union, Melbourne, Vic.

Ensor, P, Sekiguchi, J, Cotton, R, Hucke-Gaete, T, Kariya, Komiya, H, Ljungblad, D, Marite, H, Olson, P & Rankin, S 2002, *2001-2002 IWC-Southern Ocean Whale and Ecosystem Research (IWC-SOWER) Circumpolar Cruises, Area V*. Available from the IWC secretariat.

EPA 2016, *Environmental Factor Guideline: Benthic Communities and Habitats*, Perth, WA. Available from: http://www.epa.wa.gov.au/sites/default/files/Policies_and_Guidance/Guideline-Benthic-Communities-Habitats-131216_2.pdf.

Garcia-Rojas, M, Jenner, C, Gill, PC, Jenner, M, Sutton, AL & McCauley, RD 2018, 'Environmental evidence for a pygmy blue whale aggregation area in the Subtropical Convergence Zone south of Australia', *Marine Mammal Science*, vol. 34, no. 4, pp.901–923.

GEMS 2005, *Nexus Petroleum. Oil Spill Risk Assessment Longtom-3 Bass Strait VIC*.

Gibbs, CF, Tomczak Jr, M & Longmore, AR 1986, 'The nutrient regime of Bass Strait', *Marine and*

- Freshwater Research*, vol. 37, no. 4, pp.451–466.
- Gill, PC 2002, 'A blue whale (*Balaenoptera musculus*) feeding ground in a southern Australian coastal upwelling zone', *Journal of Cetacean Research and Management*, vol. 4, no. 2, pp.179–184.
- Gill, PC, Kemper, CM, Talbot, M & Lyons, SA 2008, 'Large group of pygmy right whales seen in a shelf upwelling region off Victoria, Australia', *Marine Mammal Science*, vol. 24, no. 4, pp.962–968.
- Gill, PC, Morrice, MG, Page, B, Pirzl, R, Levings, AH & Coyne, M 2011, 'Blue whale habitat selection and within-season distribution in a regional upwelling system off southern Australia', *Marine Ecology Progress Series*, vol. 421, pp.243–263.
- Gill, PC, Pirzl, R, Morrice, MG & Lawton, K 2015, 'Cetacean diversity of the continental shelf and slope off southern Australia', *The Journal of Wildlife Management*, vol. 79, no. 4, pp.672–681.
- Gill, PC, Ross, GJB, Dawbin, WH & Wapstra, H 2000, 'Confirmed sightings of dusky dolphins (*Lagenorhynchus obscurus*) in southern Australian waters', *Marine mammal science*, vol. 16, no. 2, pp.452–459.
- Goldsworthy, S & Gales, N 2008, 'IUCN SSC Pinniped Specialist Group. *Arctocephalus forsteri*.' *IUCN 2013. IUCN Red List of Threatened Species. Version 2013.2*. Available from: www.iucnredlist.org.
- Harris, MP & Norman, FI 1981, *Distribution and status of coastal colonies of seabirds in Victoria*.
- Hemer, MA, Church, JA & Hunter, JR 2007, 'Waves and climate change on the Australian coast', *Journal of Coastal Research*, pp.432–437.
- Hoelzel, AR, Potter, CW & Best, PB 1998, 'Genetic differentiation between parapatric 'nearshore' and 'offshore' populations of the bottlenose dolphin', *Proceedings of the Royal Society of London. Series B: Biological Sciences*, vol. 265, no. 1402, pp.1177–1183.
- Holliday, I 2003, *Great White Shark (Carcharodon carcharias) Action Statement No. 185*, Melbourne.
- Houghton, JD, Doyle, TK, Wilson, MW, Davenport, J & Hays, GC 2006, 'Jellyfish aggregations and leatherback turtle foraging patterns in a temperate coastal environment', *Ecology*, vol. 87, no. 8, pp.1967–1972.
- Hume F., Hindell M.A., Pemberton D. and Gales R. 2004, 'Spatial and temporal variation in the diet of a high trophic level predator, the Australian fur seal (*Arctocephalus pusillus doriferus*)', *Marine Biology*, vol. 144, no. 3, pp.407–415.
- Ierodiaconou, D 2017, *Victorian Benthic Habitats - Open Coasts*. Available from: <http://metadata.imas.utas.edu.au/geonetwork/srv/en/metadata.show?uuid=f07ac004-dc40-48ec-90f9-c90835d323a6>.
- Jones, HA & Davies, PJ 1983, 'Superficial sediments of the Tasmanian continental shelf and part of Bass Strait. Bureau of Mineral Resources', *Geology and Geophysics Bulletin*, vol. 218.
- Kemper, CM 2002, 'Distribution of the pygmy right whale, *Caperea marginata*, in the Australasian region', *Marine Mammal Science*, vol. 18, no. 1, pp.99–111.
- Kemper, CM, Mole, J, Warneke, RM, Ling, JK, Needham, DJ & Wapstra, JE 1997, "Southern right whales in south-eastern Australia – aerial surveys during 1991-93 and incidental information from 1904" in *Marine Mammal Research in the Southern Hemisphere, Vol. 1: Status, Ecology and Medicine*, eds.M Hindell & C Kemper, Surrey Beatty & Sons, Surrey Beatty & Sons.
- Kirkwood, R & Arnould, JPY 2008, 'Australian fur seal', *The mammals of Australia*, pp.723–725.
- Kirkwood, R, Pemberton, D, Gales, R, Hoskins, AJ, Mitchell, T, Shaughnessy, PD & Arnould, JPY 2010, 'Continued population recovery by Australian fur seals', *Marine and Freshwater Research*, vol. 61, no. 6, pp.695–701. Available from: <https://doi.org/10.1071/MF09213>.
- Kirkwood, R, Warneke, R & Arnould, J 2009, 'Recolonization of Bass Strait, Australia, by the New Zealand fur seal, *Arctocephalus forsteri*', *Marine Mammal Science*, vol. 25, pp.441–449.
- Last, PR & Stevens, JD 1994, *Sharks and Rays of Australia*, CSIRO Australia.
- Last, PR & Stevens, JD 2009, *Sharks and Rays of Australia*, 2nd editio., CSIRO Publishing, Collingwood, Victoria.
- LCC 1993, *Marine and coastal special investigation descriptive report*, Melbourne, Vic.

- Limpus, Colin J 2008a, *A Biological Review of Australian Marine Turtle Species. 1. Loggerhead turtle, Caretta caretta (Linnaeus)*, Queensland Environmental Protection Agency.
- Limpus, Colin J 2008b, *A Biological Review of Australian Marine Turtle Species. 1. Loggerhead turtle, Caretta caretta (Linnaeus)*, Queensland Environmental Protection Agency.
- Limpus, C J 2008, 'A biological review of Australian marine turtles. 2. Green turtle *Chelonia mydas* (Linnaeus)', *Queensland Environmental Protection Agency*, vol. 96.
- Limpus, Colin J 2008c, *A biological review of Australian marine turtles. 2. Green turtle, Chelonia mydas*, Queensland Environmental Protection Agency.
- Limpus, CJ 2009a, *A Biological Review Of Australian Marine Turtles: 6. Leatherback Turtle - Dermochelys coriacea (Vandelli)*.
- Limpus, CJ 2009b, 'A biological review of Australian marine turtles', *Environmental Protection Agency, Brisbane*.
- Limpus, CJ, Couper, PJ & Read, MA 1994, 'The loggerhead turtle, *Caretta caretta*, in Queensland: population structure in a warm temperate feeding area', *Memoirs of the Queensland Museum, Brisbane*, vol. 37, no. 1, pp.195–204.
- Limpus, CJ, Miller, JD, Paramenter, CJ, Reimer, D, McLachlan, N & Webb, R 1992, 'Migration of green (*Chelonia mydas*) and loggerhead (*Caretta caretta*) turtles to and from eastern Australian rookeries', *Wildlife Research*, vol. 19, no. 3, pp.347–357.
- Limpus, CJ & Reed, PC 1985, 'Green Sea Turtles Stranded by Cyclone Kathy on the South-Western Coast of the Gulf of Carpentaria', *Wildlife Research*, vol. 12, no. 3, pp.523–533.
- Mackay, AI, Bailluel, F, Childerhouse, S, Donnelly, D, Harcourt, R, Parra, GJ & Goldsworthy, S 2015, *Offshore migratory movement of southern right whales: informing critical conservation and management needs. SARDI Publication No. F2015/000526-1. SARDI Research Report Series No. 859*, Australian Research and Development Institute (Aquatic Sciences), South Adelaide, Australia.
- McCauley, RD, Gavrilov, AN, Jolliffe, CD, Ward, R & Gill, PC 2018, 'Pygmy blue and Antarctic blue whale presence, distribution and population parameters in southern Australia based on passive acoustics', *Deep Sea Research Part II: Topical Studies in Oceanography*, vol. 157, pp.154–168.
- McIntosh, RR, Kirkman, SP, Thalmann, S, Sutherland, DR, Mitchell, A, Arnould, JPY, Salton, M, Slip, DJ, Dann, P & Kirkwood, R 2018, 'Understanding meta-population trends of the Australian fur seal, with insights for adaptive monitoring', *PLoS one*, vol. 13, no. 9, p.e0200253.
- Miller, BS, Kelly, N, Double, MC, Childerhouse, S, Laverick, S & Gales, N 2012, 'Cruise report on SORP 2012 blue whale voyages: Development of acoustic methods'.
- Minke Whale Project 2018, *Dwarf minke whale biology and distribution*. Available from: <http://www.minkewhaleproject.org/>. [26 September 2018].
- Möller, LM & Beheregaray, LB 2001, 'Coastal bottlenose dolphins from southeastern Australia are *Tursiops aduncus* according to sequences of the mitochondrial DNA control region', *Marine Mammal Science*, vol. 17, no. 2, pp.249–263.
- Möller, LM, Bilgmann, K, Charlton-Robb, K & Beheregaray, L 2008, 'Multi-gene evidence for a new bottlenose dolphin species in southern Australia', *Molecular phylogenetics and evolution*, vol. 49, no. 2, pp.674–681.
- Morgan, GJ 1986, *A Survey of Macrobenthos in the Waters of Corner Inlet and the Nooramunga, Southern Victoria, with an Assessment of the Extent of Posidonia Seagrass*, Fisheries and Wildlife Service, Victoria.
- Morrice, MG 2004, 'Killer whales (*Orcinus orca*) in Australian territorial waters', *Technical Paper. Deakin University, Victoria. Australia*.
- Mustoe S. 2008, 'Killer Whale *Orcinus orca* sightings in coastal Victoria', *The Victorian Naturalist*, vol. 125, no. 3, pp.76–81.
- Mustoe, S 2008, 'Killer Whale *Orcinus orca* Sightings in Coastal Victoria', *Victorian Naturalist, The*, vol. 125, no. 3, p.76.
- NCRIS 2020, *Integrated Marine Observing System: Continental Shelf and Coastal Processes*. Available

- from: <http://imos.org.au/httpimosorgautassci4html/>. [21 February 2020].
- Noad, MJ & Cato, DH 2007, 'Swimming speeds of singing and non-singing humpback whales during migration', *Marine Mammal Science*, vol. 23, no. 3, pp.481–495.
- Noad, MJ, Dunlop, RA, Paton, D & Cato, DH 2011, 'Absolute and relative abundance estimates of Australian east coast humpback whales (*Megaptera novaeangliae*)', *J. Cetacean Res. Manage. (special issue 3)*, vol. 243, p.252.
- NSWDPI 2018, *Assessing the size of Australia's white shark populations*. Available from: [https://www.nespmarine.edu.au/system/files/White shark fact sheet 8 Feb 2018.pdf](https://www.nespmarine.edu.au/system/files/White%20shark%20fact%20sheet%208%20Feb%202018.pdf).
- Owen, K, Charlton-Robb, K & Thompson, R 2011, 'Resolving the trophic relations of cryptic species: An example using stable isotope analysis of dolphin teeth', *PLoS One*, vol. 6, no. 2, p.e16457.
- Parks Victoria 2013, *Parks Victoria Marine Protected Areas Program Plan 2012-2014*, Melbourne, Vic. Available from: [http://nbsapforum.net/sites/default/files/Victoria Parks MPA-Program-Plan-June-2013-14 %281%29.pdf](http://nbsapforum.net/sites/default/files/Victoria%20Parks%20MPA-Program-Plan-June-2013-14%20281%29.pdf).
- Parry, GD, Campbell, SJ & Hobday, DK 1990, *Marine resources off east Gippsland, southeastern Australia*, southeastern Australia. Technical Report.
- Paterson, R, Paterson, P & Cato, DH 1994, 'The status of humpback whales *Megaptera novaeangliae* in east Australia thirty years after whaling', *Biological Conservation*, vol. 70, no. 2, pp.135–142.
- Perrin, WF, Rosel, PE & Cipriano, F 2013, 'How to contend with paraphyly in the taxonomy of the delphinine cetaceans?', *Marine Mammal Science*, vol. 29, no. 4, pp.567–588.
- Pirzl, R 2008, *Spatial ecology of E. australis: habitat selection at multiple scales*, Deakin University.
- Przeslawski, R., Bruce, B, Carroll, A, Anderson, J, Bradford, R, Durrant, A, Edmunds, M, Foster, S, Huang, Z, Hurt, L, Lansdell, M, Lee, K, Lees, C, Nichols, P & Williams, S 2016, 'Marine Seismic Survey Impacts on Fish and Invertebrates: Final Report for the Gippsland Marine Environmental Monitoring Project', *Geoscience Australia, Canberra*, vol. Record 201.
- Przeslawski, Rachel, Hurt, L, Forrest, A & Carroll, A 2016, 'Potential short-term impacts of marine seismic surveys on scallops in the Gippsland Basin', *Fisheries Research and Development Corporation, Canberra*, p.60.
- Reid, TA 2002, *Seabird Atlas of South-eastern Australian Waters*, Birds Australia, East Hawthorn, Vic.
- Reilly, S.B., Bannister, J.L., Best, P.B., Brown, M., Brownell Jr, R.L., Butterworth, D.S, Clapham, D.J., Cooke, J., Donovan, G.P., Urbán, J. and Zerbini, A.N. 2008, *Caperea marginata*. In: *IUCN Red List of Threatened Species. Version 2011.2*.
- Rice, DW 1998, 'Marine mammals of the world', *Systematics and distribution*.
- Right, W & Bannister, J 2017, *Project A7 Monitoring Population Dynamics of 'Western' Right Whales off Southern Australia 2015-2018. Final Report on Activities March 2017, Research Plan Rpv2 (2017). Report to the National Environmental Science Programme, Marine Biodiversity Hub*.
- Robson, NA, Hetzel, Y, Whiting, S, Wijeratne, S, Pattiaratchi, CB, Withers, P & Thums, M 2017, 'Use of particle tracking to determine optimal release dates and locations for rehabilitated neonate sea turtles', *Frontiers in Marine Science*, vol. 4, p.173.
- Rogers, PJ & Bailleul, F 2015, 'Innovative ways to ensure the future sustainability of the recreational fishery for shortfin makos in Victoria', *SARDI Research Report Series-South Australian Research and Development Institute*, no. 872.
- Schmitt, NT, Double, MC, Jarman, SN, Gales, N, Marthick, JR, Polanowski, AM, Scott Baker, C, Steel, D, Jenner, KCS, Jenner, M-NM, Gales, R, Paton, D & Peakall, R 2014, 'Low levels of genetic differentiation characterize Australian humpback whale (*Megaptera novaeangliae*) populations', *Marine Mammal Science*, vol. 30, no. 1, pp.221–241. Available from: <https://doi.org/10.1111/mms.12045>.
- Schneider, D & Hunt, GL 1982, 'Carbon flux to seabirds in waters with different mixing regimes in the southeastern Bering Sea', *Marine Biology*, vol. 67, no. 3, pp.337–344.
- Sekiguchi, K., Best, PB & Kaczmaruk, BZ 1992, 'New information on the feeding habits and baleen morphology of the pygmy right whale *Caperea marginata*', *Marine Mammal Science*, vol. 8, no. July, pp.288–293.

REPORT

- Shaughnessy, P.D. 1999, 'The action plan for Australian seals', *CSIRO Wildlife and Ecology*.
- Speirs, M 2002, *A study of marine turtle populations at the Julian Rocks Aquatic Reserve, northern New South Wales*. B. Sc.
- SWIFFT 2019a, *Southern Right Whale - State Wide Integrated Flora and Fauna Teams (SWIFFT)*. Available from: https://www.swiff.net.au/cb_pages/sp_southern_right_whale.php. [5 December 2019].
- SWIFFT 2019b, *Southern Right Whale research and monitoring project*. Available from: https://www.swiff.net.au/cb_pages/team_southern_right_whale_south_eastern_australia_monitoring.php. [6 January 2020].
- TSSC 2015a, *Conservation Advice Megaptera novaeangliae (humpback whale)*, Canberra.
- TSSC 2015b, *Threatened species scientific committee. Conservation Advice –fin whale (Balaenoptera physalus)*. Available from: <http://www.environment.gov.au/biodiversity/threatened/species/pubs/34-conservation-advice-01102015.pdf>.
- TSSC 2015c, *Balaenoptera borealis (sei whale) conservation advice*.
- Utinomi, H & Harada, E 1973, *Rediscovery of an enigmatic octocoral, Pseudogorgia godeffroyi kolliker, from southern Australia and a discussion on its systematic position*.
- VEAC 2019a, *Assessment of the Values of Victoria's Marine Environment – Report*, Melbourne.
- VEAC 2019b, *Assessment of the Values of Victoria's Marine Environment Report*.
- Ward, R, Charlton, C & Guggenheimer, S 2014, *Centre for Marine Science and Technology Southern Right Whale (Eubalanea australis) Acoustics at Fowlers Bay, South Australia Data Summary of Preliminary Recordings From August 2013*.
- Wildlifecoast Cruises 2020, *Wilson's Prom Whale Cruise*. Available from: <https://www.wildlifecoastcruises.com.au/cruises/wilsons-prom-whale-cruise/>. [19 February 2020].
- Wilson, R & Poore, G 1987, 'The Bass Strait survey: biological sampling stations, 1979-1984', *Occasional papers from the Museum of Victoria*, vol. 3, pp.1–14.

Appendix A - Figures

Figure 1 Location of the referral area, including the Licence Area.....	2
Figure 2 Commonwealth and Victorian protected areas	3
Figure 3 Commonwealth Threatened Ecological Communities	4
Figure 4 Indicative map of habitat types in the region.....	5
Figure 5 Biologically Important Areas for white sharks in the vicinity of the referral area.....	6
Figure 6 Satellite track from Shark 57, a juvenile great white shark tagged in Ballina, NSW in 2016	7
Figure 7 Biologically Important areas for Pygmy Blue Whales and Southern Right Whales	8
Figure 8 Pygmy Blue Whale migration routes (DoE 2015c).....	9
Figure 9 Humpback Whale migration routes (TSSC, 2015a).....	10
Figure 10 Marine turtle sightings recorded by the South Australian Sea Turtle Project	11
Figure 11 Important areas for Australian and New Zealand Fur Seals	12
Figure 12 Biologically Important Areas for seabirds.....	13

REPORT

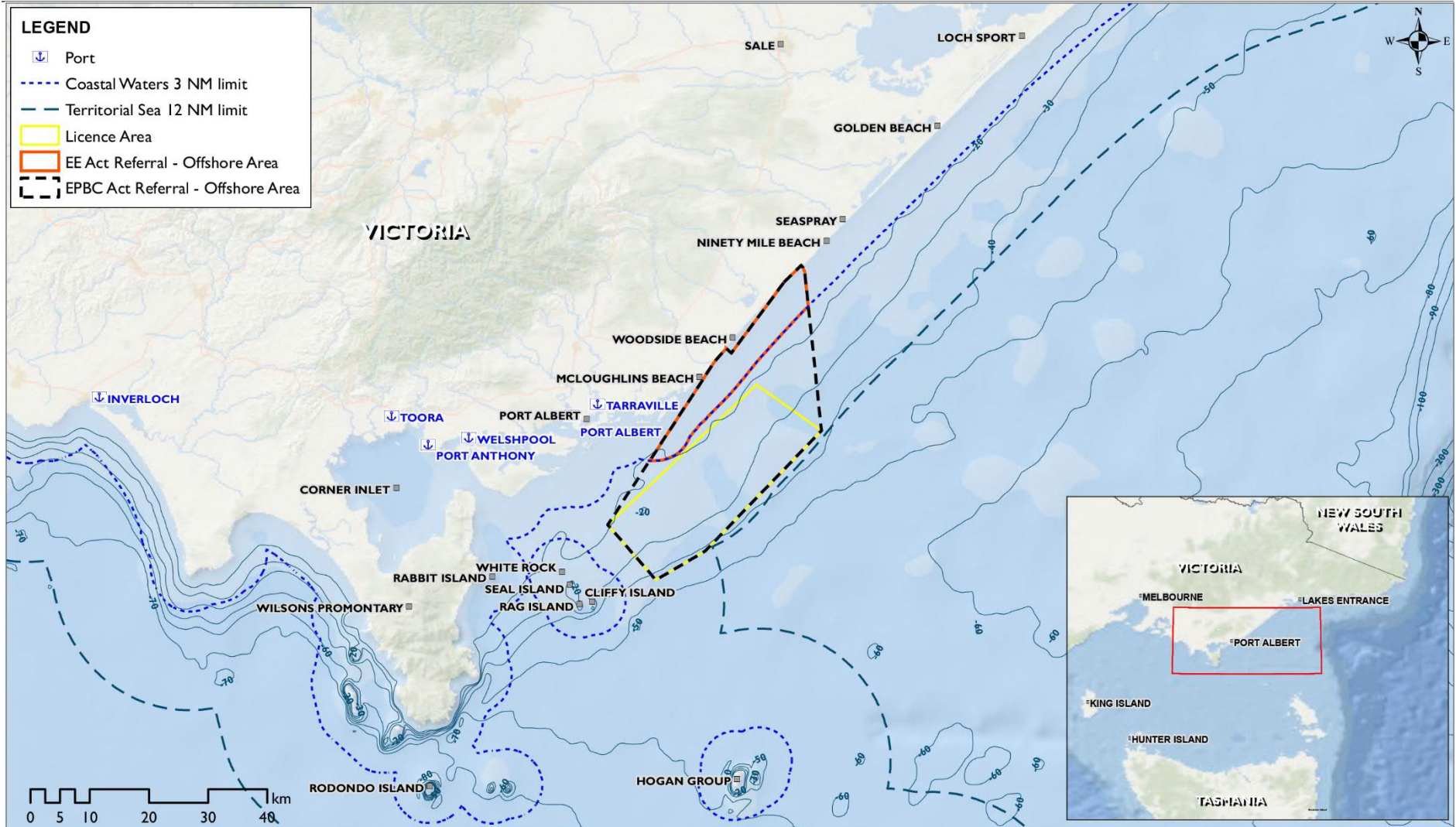


Figure 1 Location of the referral area, including the Licence Area

REPORT

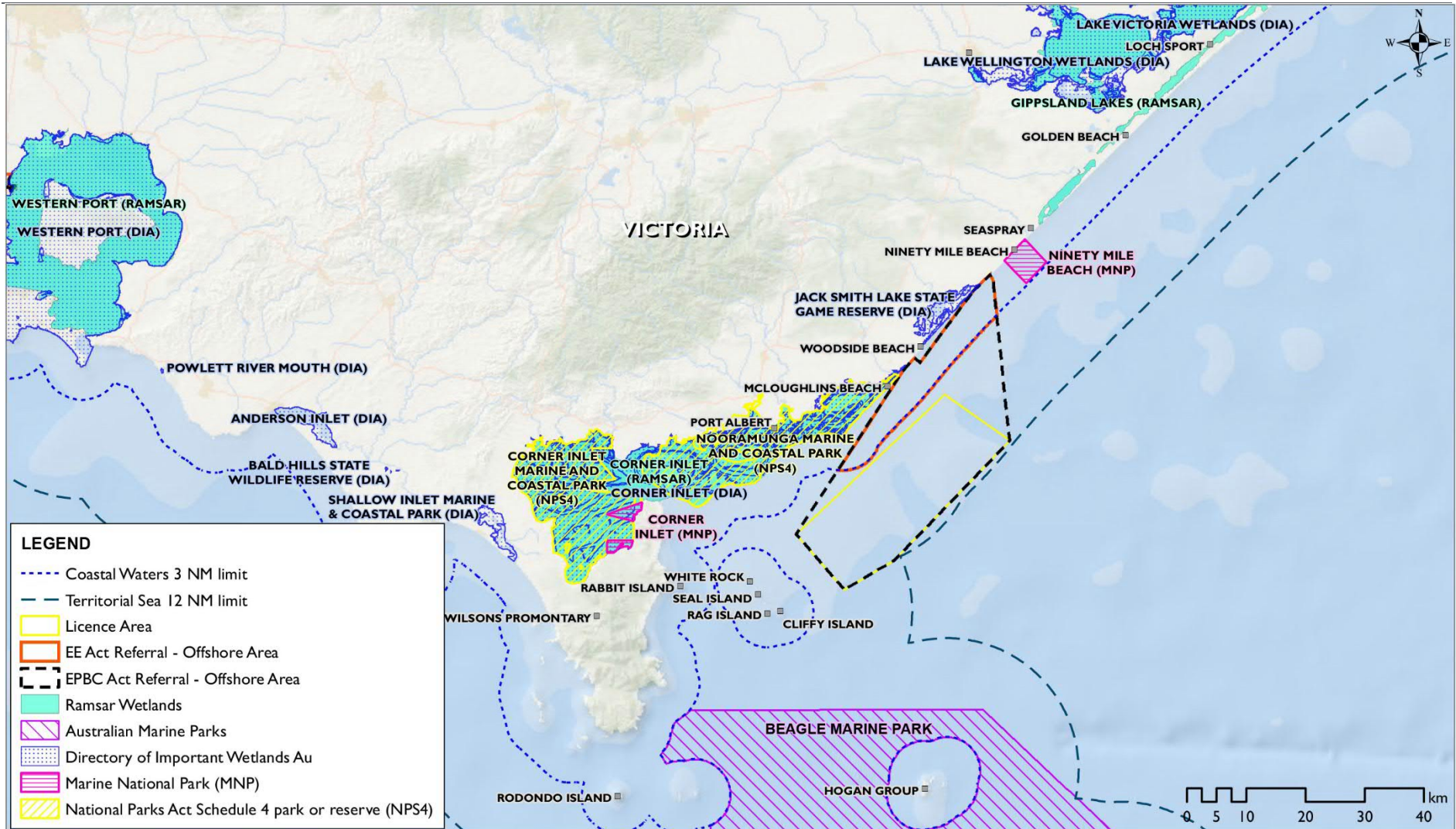


Figure 2 Commonwealth and Victorian protected areas

REPORT

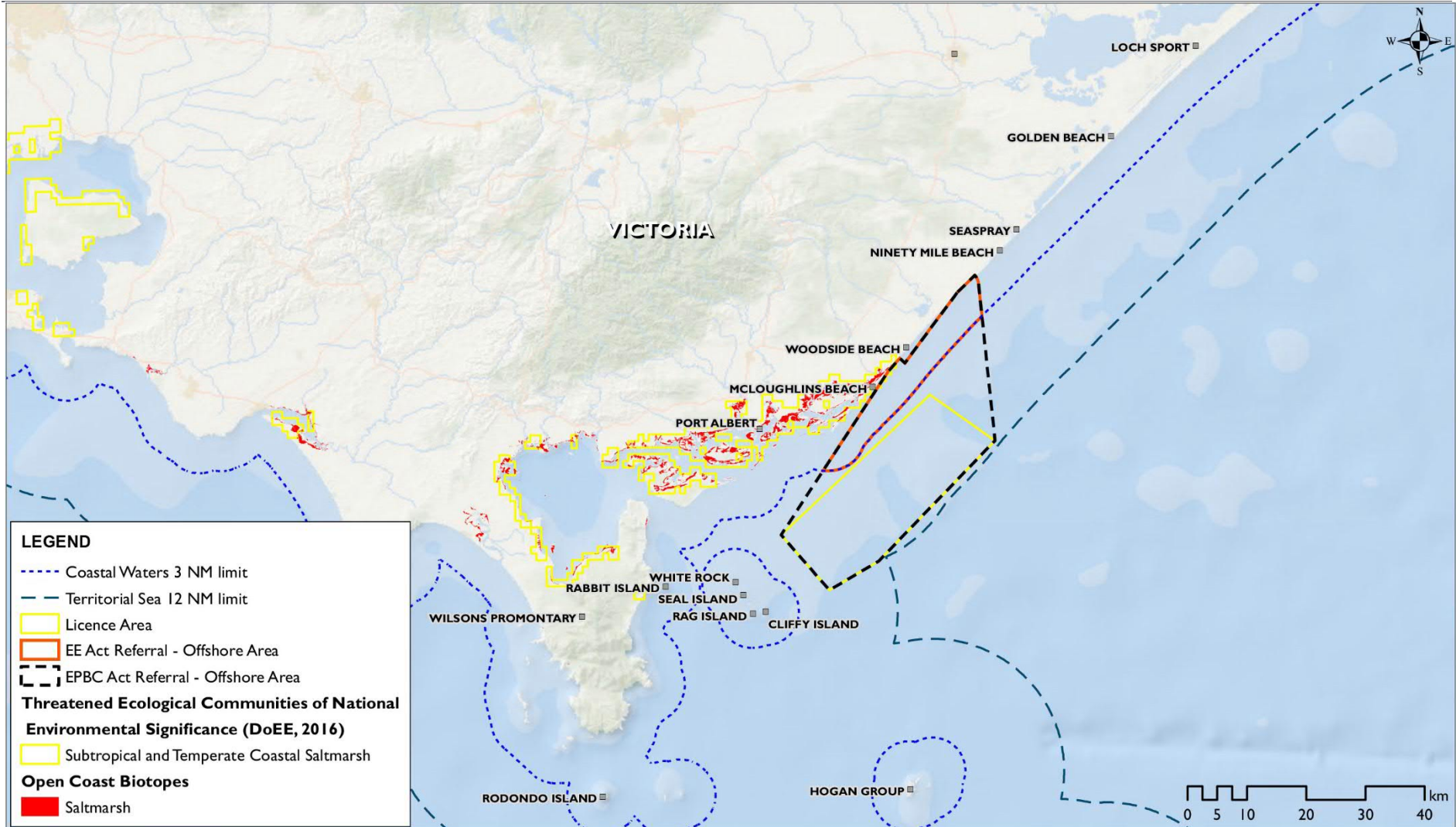


Figure 3 Commonwealth Threatened Ecological Communities

REPORT

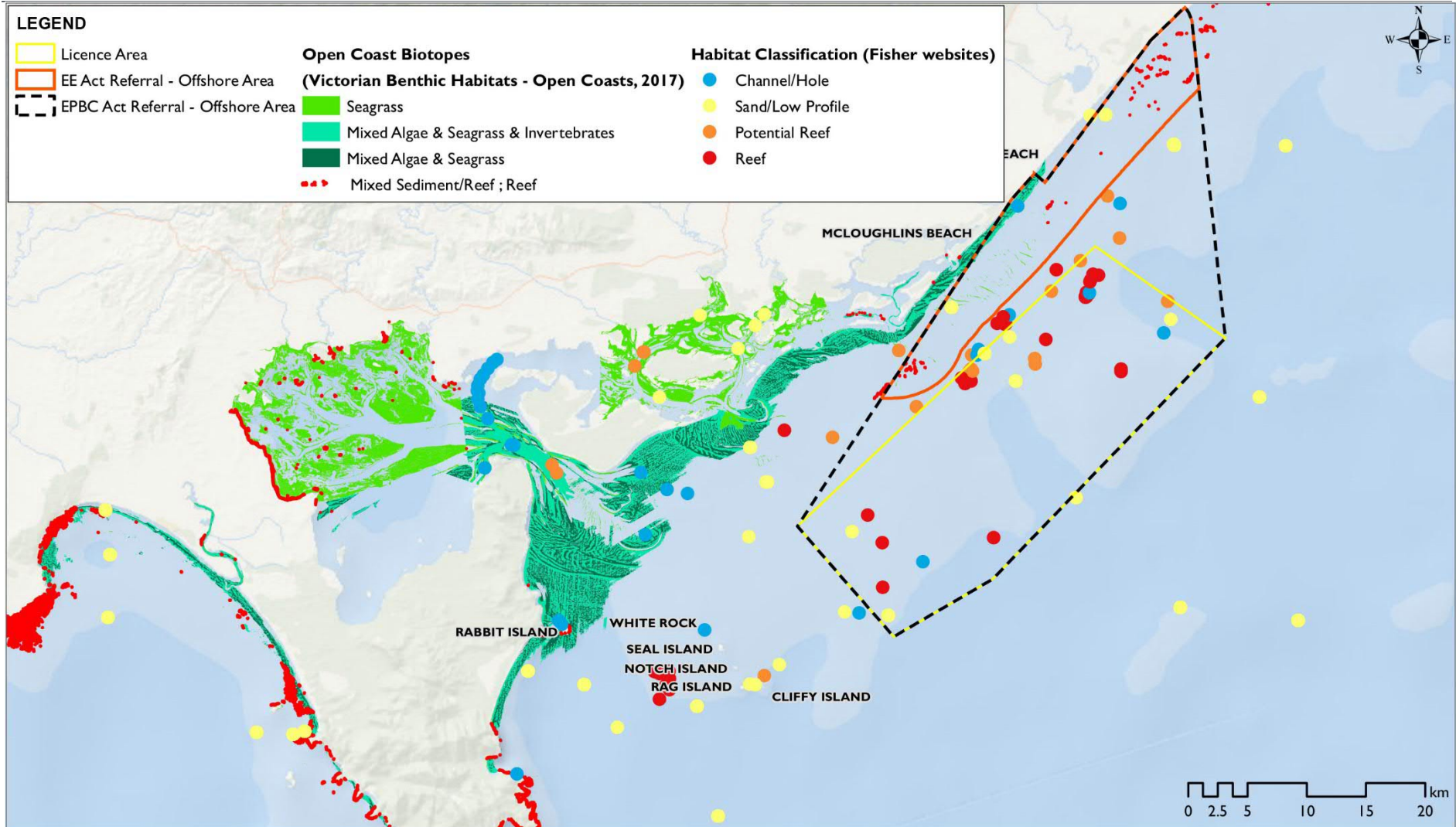


Figure 4 Indicative map of habitat types in the region

REPORT

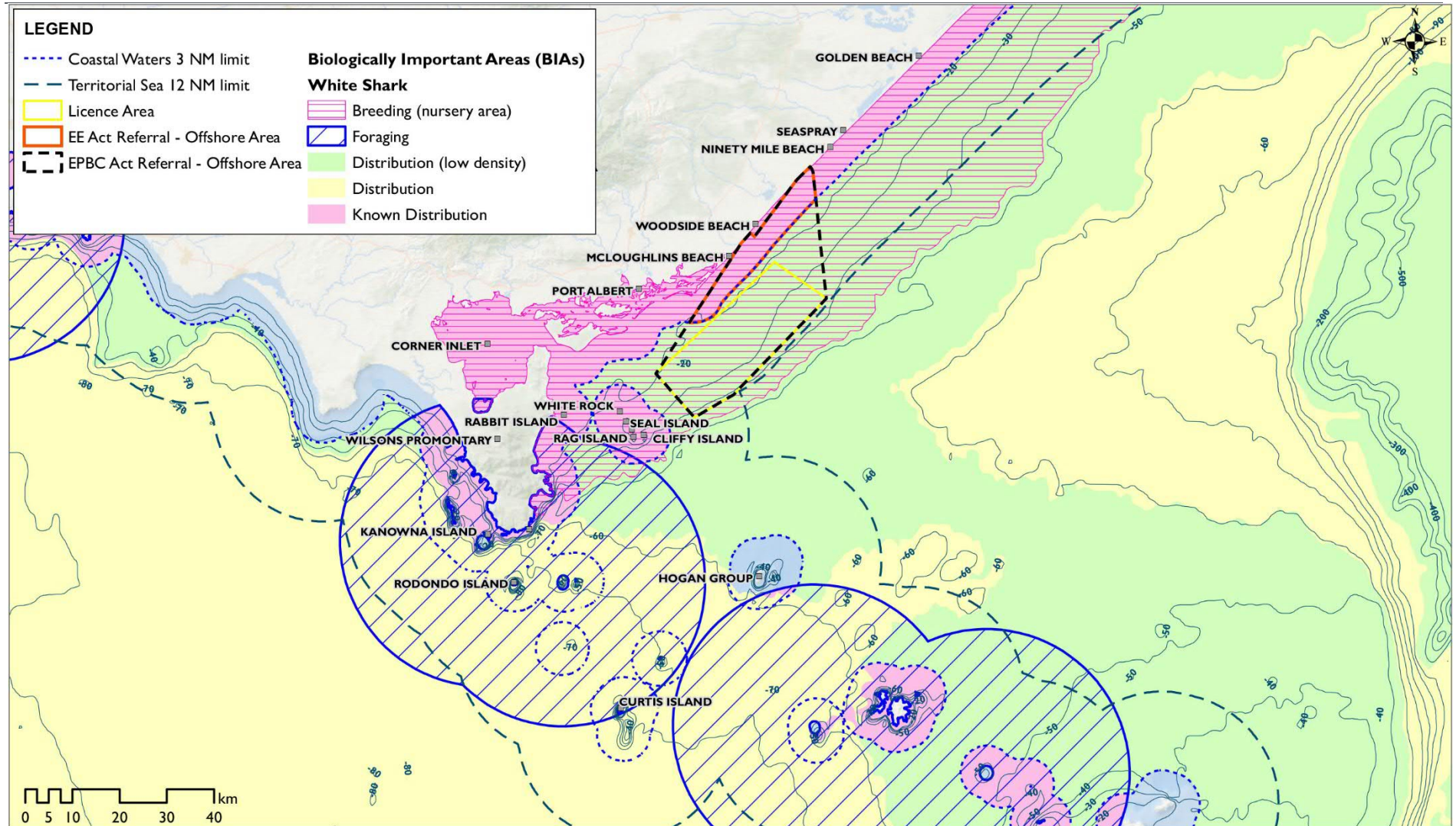


Figure 5 Biologically Important Areas for white sharks in the vicinity of the referral area

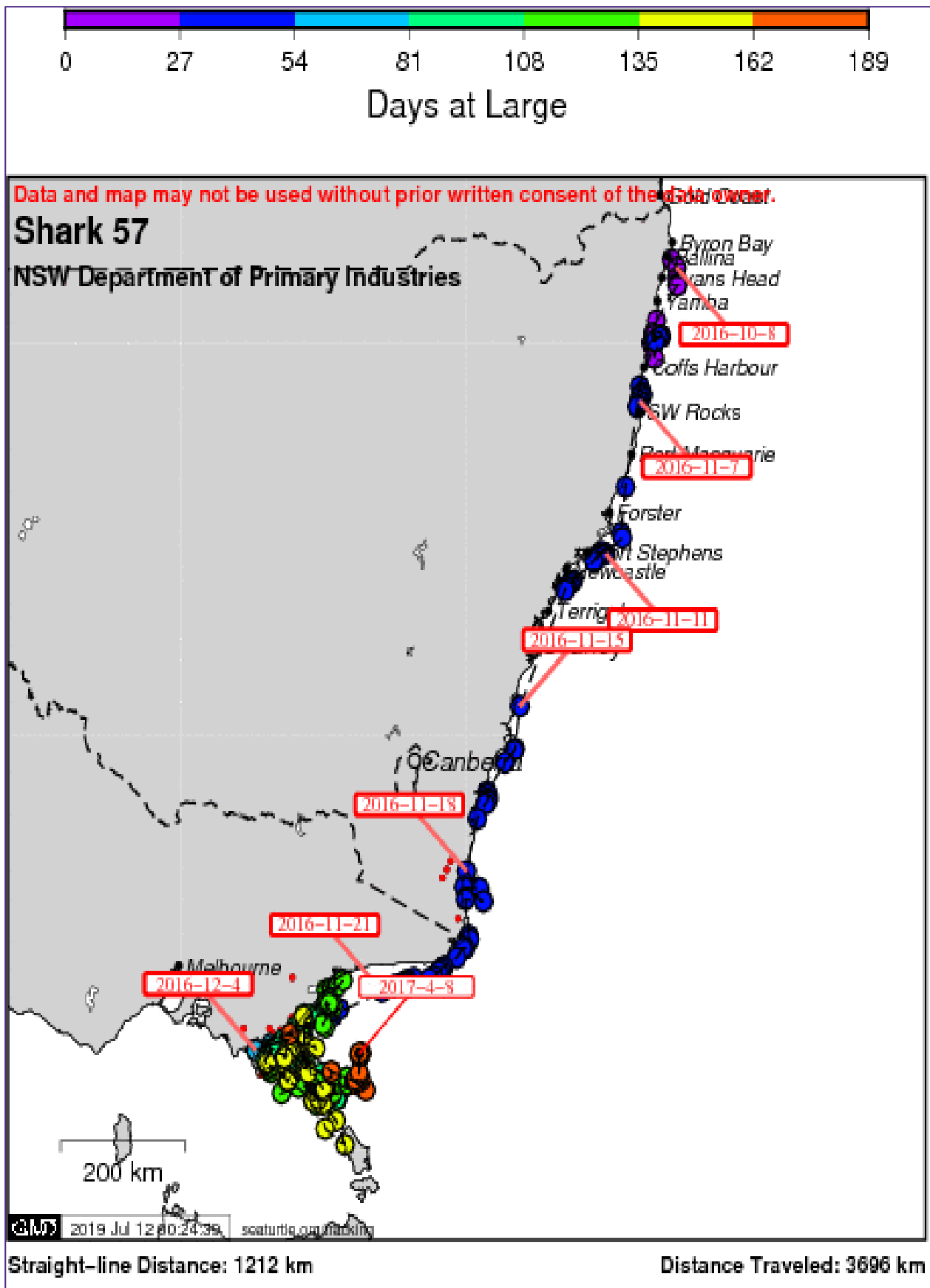


Figure 6 Satellite track from Shark 57, a juvenile white shark tagged in Ballina, NSW in 2016

REPORT

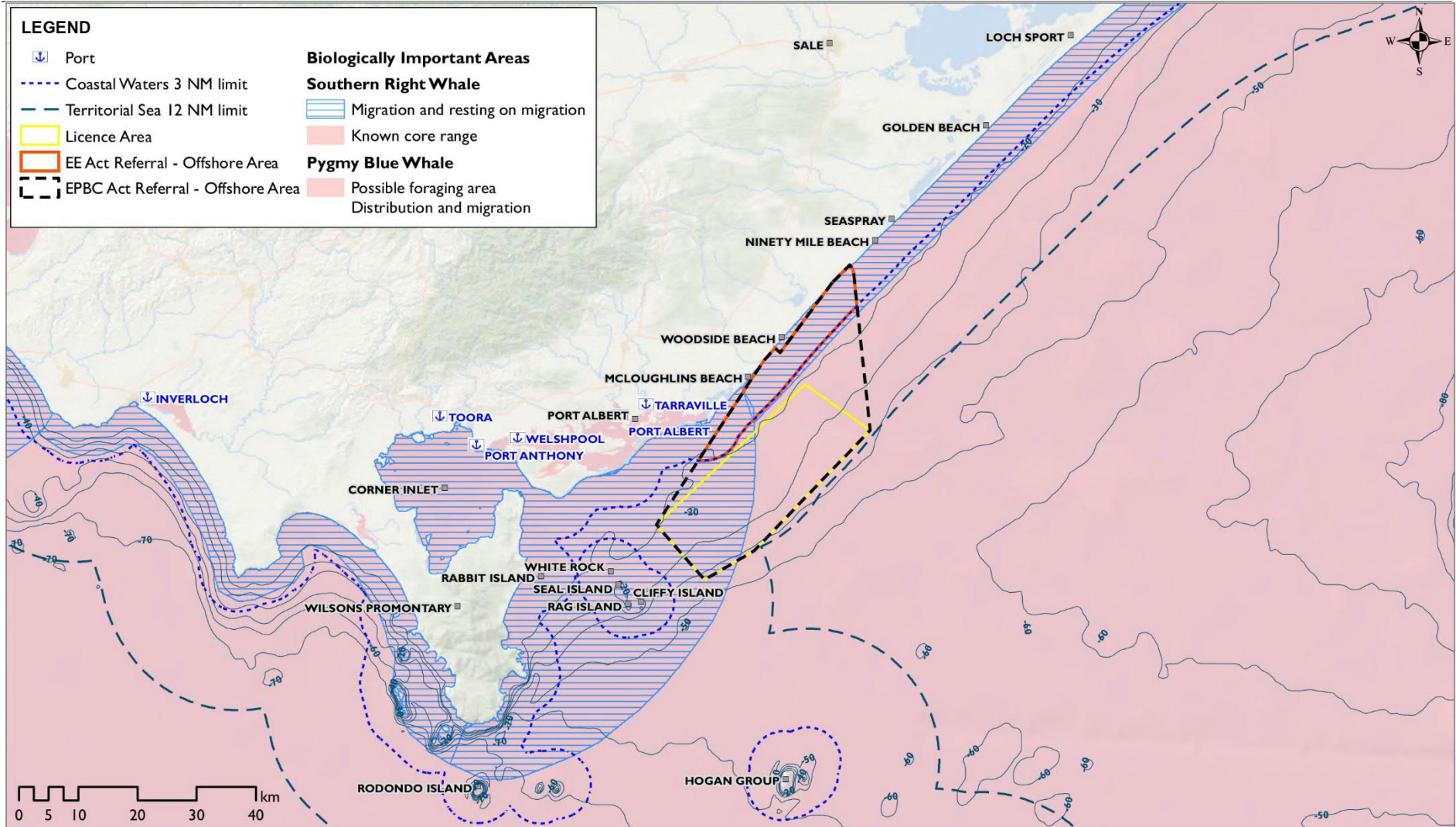


Figure 7 Biologically Important Areas for pygmy blue whales and southern right whales

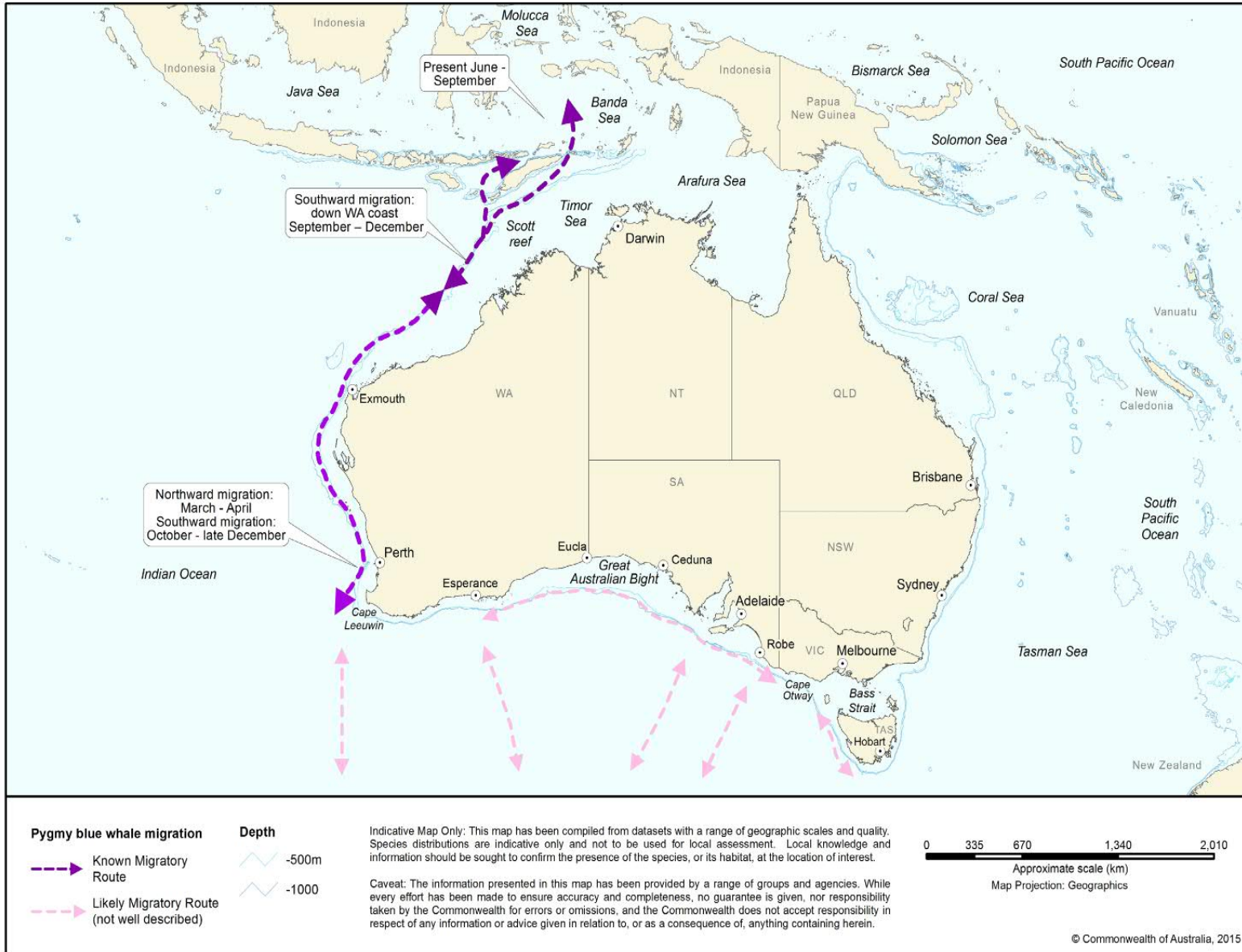
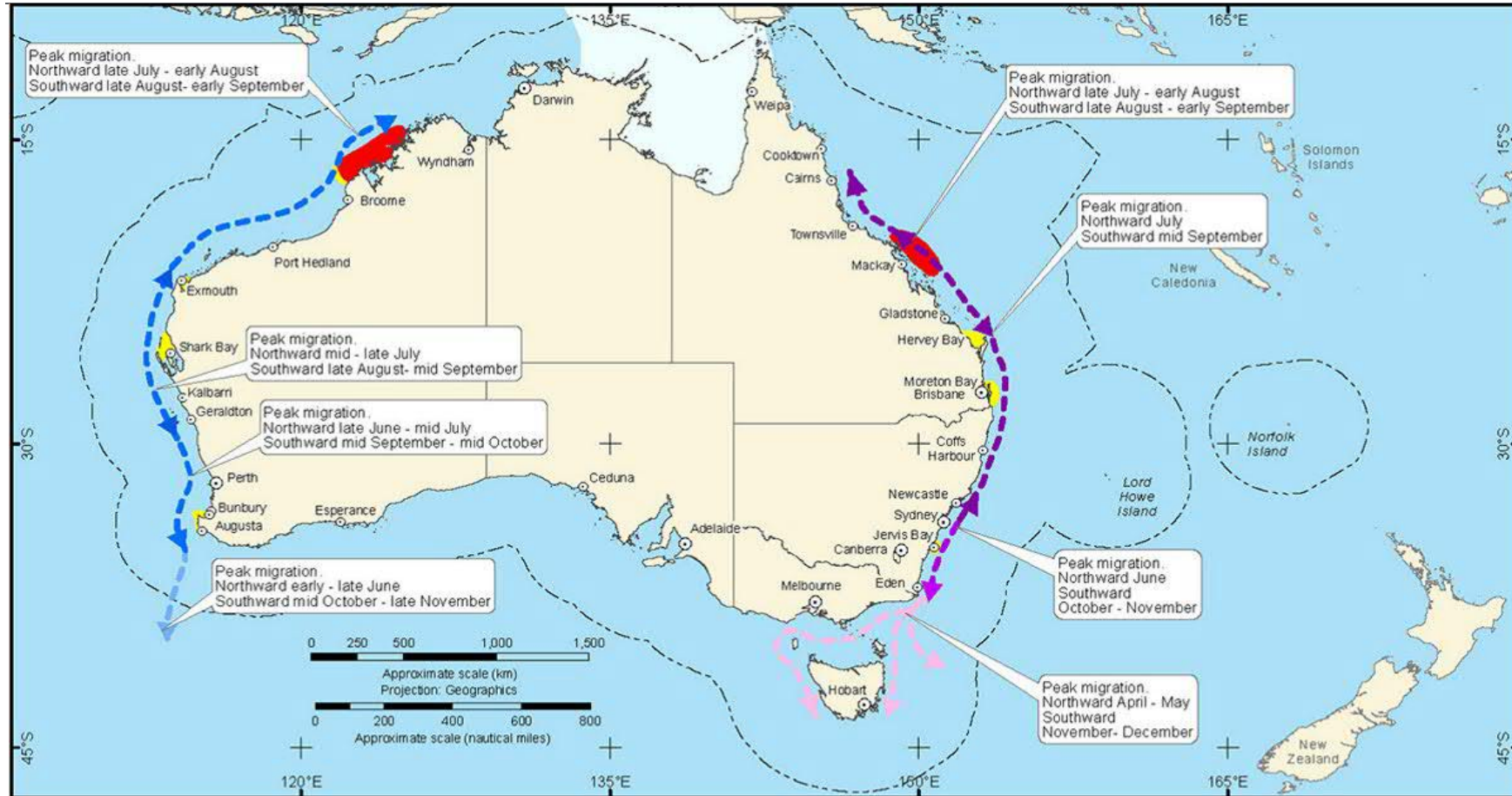


Figure 8 Pygmy Blue Whale migration routes (DoE 2015c)

REPORT



Humpback whale (*Megaptera novaeangliae*) Migration Routes

Indicative Map Only: This map has been compiled from datasets with a range of geographic scales and quality. Species distributions are indicative only and not to be used for local assessment. Local knowledge and information should be sought to confirm the presence of the species, or its habitat, at the location of interest.

Caveat: The information presented in this map has been provided by a range of groups and agencies. While every effort has been made to ensure accuracy and completeness, no guarantee is given, nor responsibility taken by the Commonwealth for errors or omissions, and the Commonwealth does not accept responsibility in respect of any information or advice given in relation to, or as a consequence of, anything containing herein.

Humpback whale (*Megaptera novaeangliae*)

- Likely distribution for humpback whales
- Important resting areas
- Core calving area

Maritime boundaries

- Limit of Australian exclusive economic zone

Australian Government data sources:
 DSEWPac (2013): Distribution, migration and aggregation areas for humpback whale (recovery plan). DSEWPac (2005): Species of National Environmental Significance Database
 DSEWPac (2010): Biologically Important Areas in the South-west Marine Region
 DSEWPac (2011): Biologically Important Areas in the North-west Marine Region
 Geoscience Australia (2006): Australian Maritime Boundaries (AMB) v2.0
 Geoscience Australia (2003): GEODATA TOPO 2.5M

Produced by the Environmental Resources Information Network (ERIN), Australian Government Department of Sustainability, Environment, Water, Population and Communities. © Commonwealth of Australia 2015

Figure 9 Humpback whale migration routes (TSSC, 2015a)

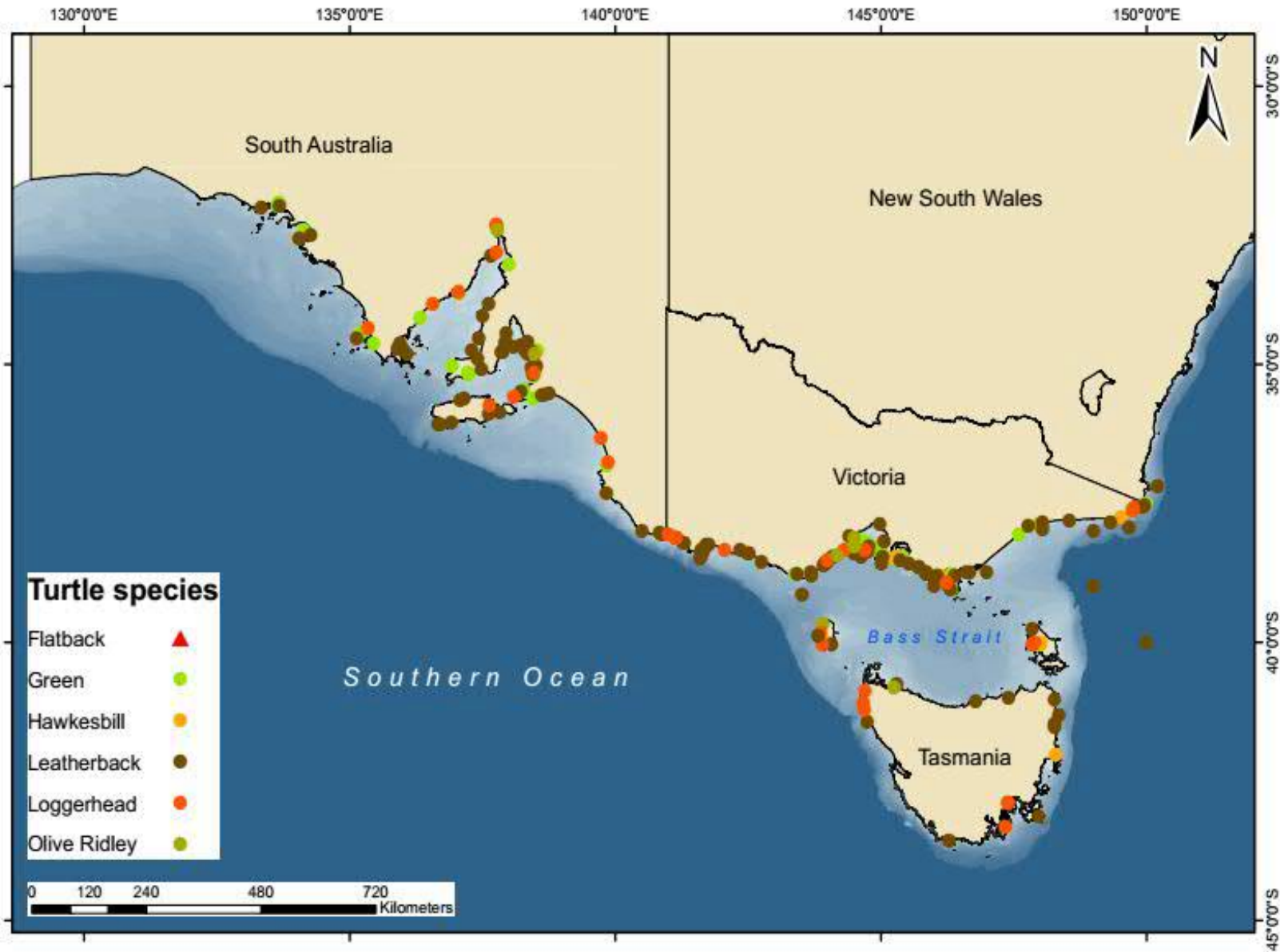


Figure 10 Marine turtle sightings recorded by the South Australian Sea Turtle Project

REPORT

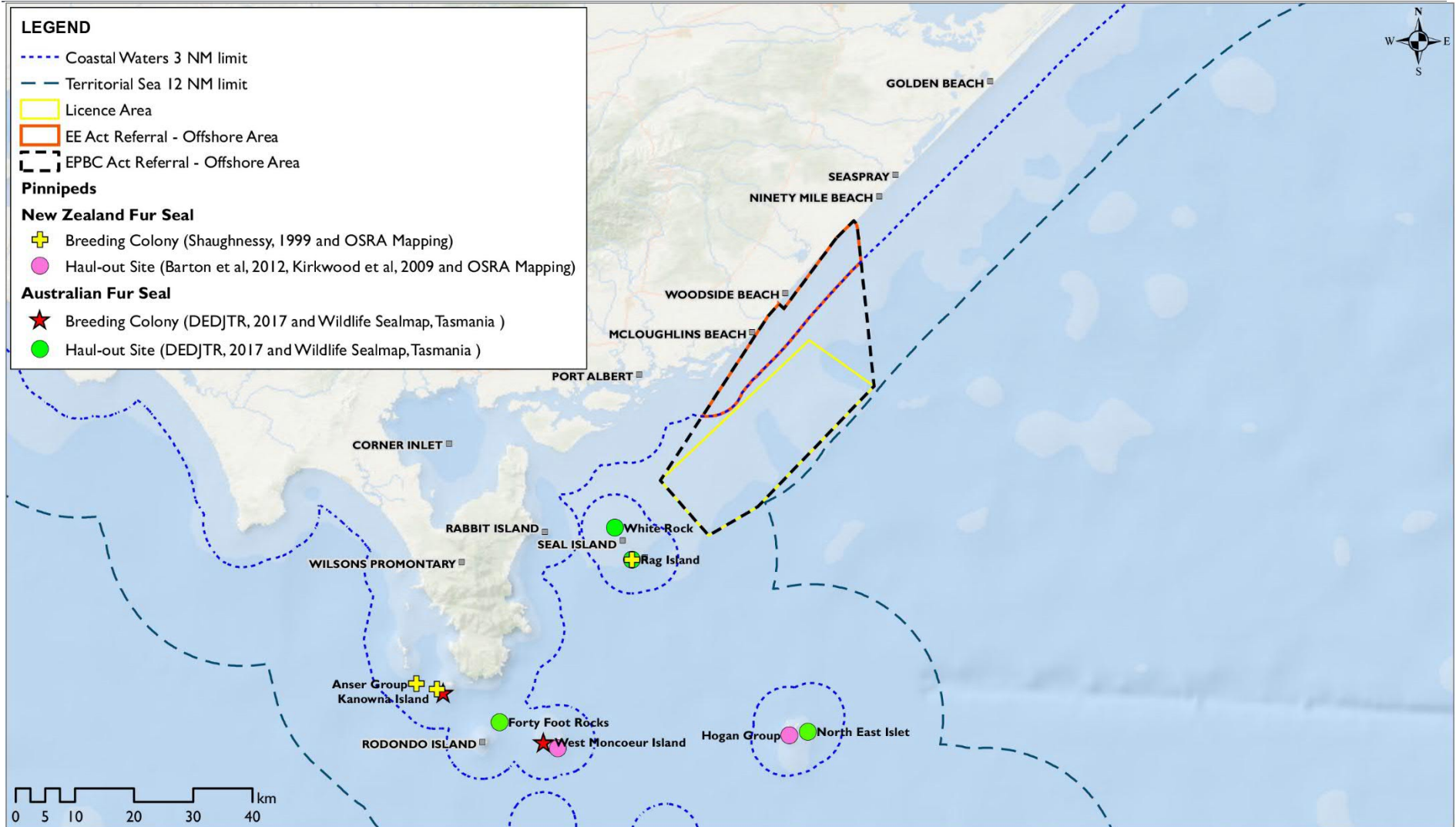


Figure 11 Important areas for Australian and New Zealand fur seals

REPORT

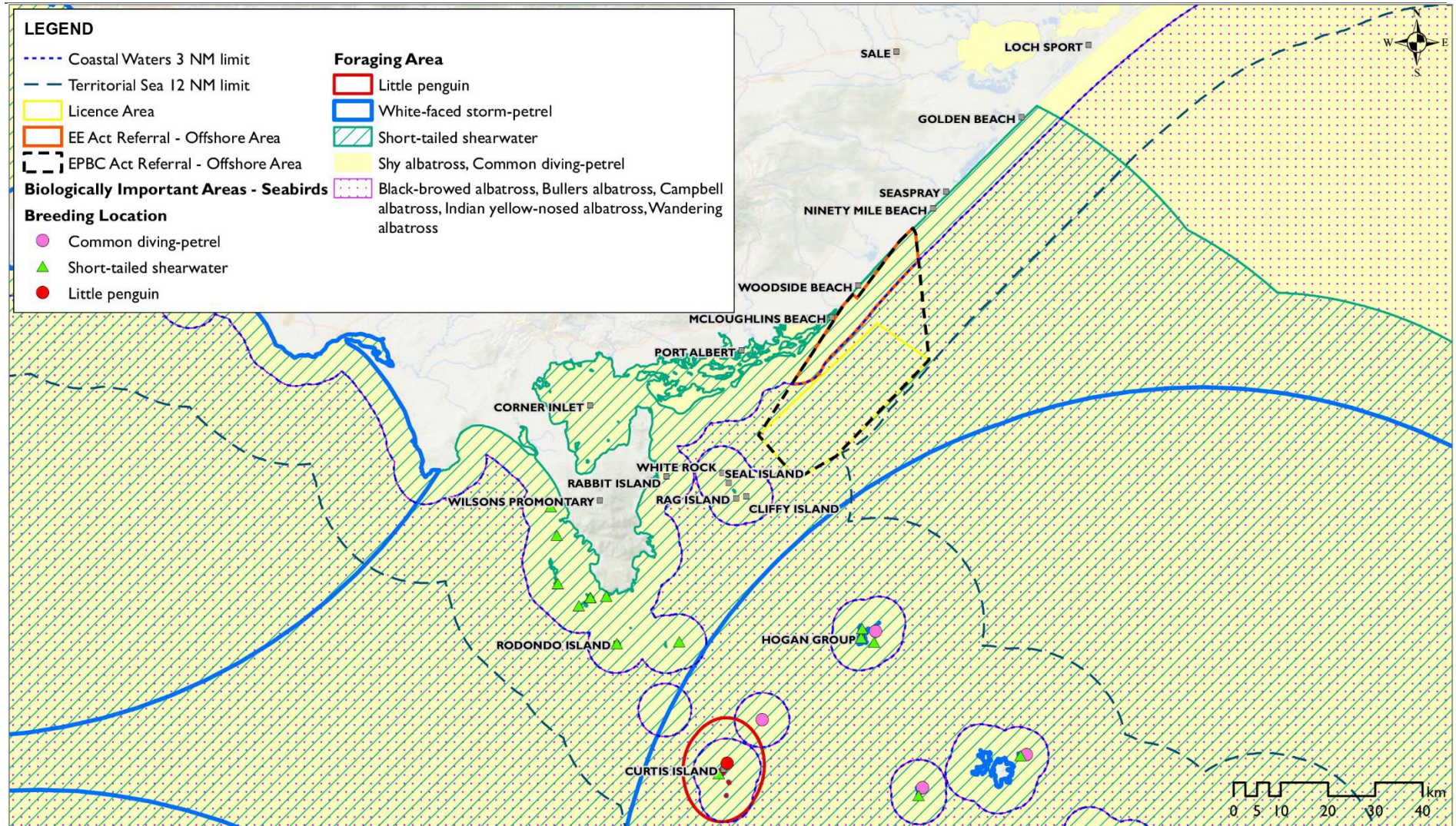


Figure 12 Biologically Important Areas for seabirds

Appendix B - PMST Results



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.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about [Environment Assessments](#) and the EPBC Act including significance guidelines, forms and application process details.

Report created: 28/01/20 11:43:31

[Summary](#)

[Details](#)

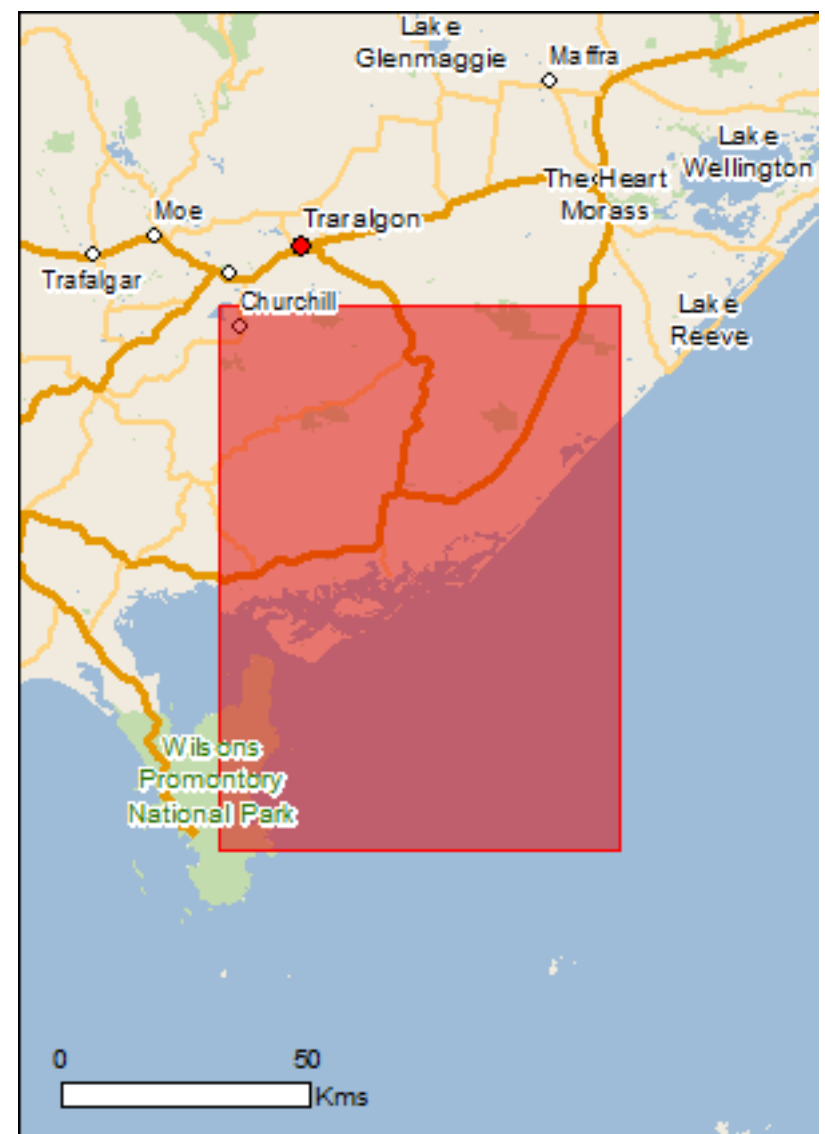
[Matters of NES](#)

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

[Extra Information](#)

[Caveat](#)

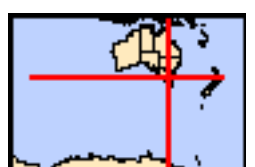
[Acknowledgements](#)



This map may contain data which are ©Commonwealth of Australia (Geoscience Australia), ©PSMA 2010

[Coordinates](#)

Buffer: 5.0Km



Summary

Matters of National Environmental Significance

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

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	2
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	1
Listed Threatened Ecological Communities:	4
Listed Threatened Species:	78
Listed Migratory Species:	70

Other Matters Protected by the EPBC Act

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

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

Commonwealth Land:	1
Commonwealth Heritage Places:	None
Listed Marine Species:	113
Whales and Other Cetaceans:	14
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	1

Extra Information

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

State and Territory Reserves:	107
Regional Forest Agreements:	1
Invasive Species:	42
Nationally Important Wetlands:	2
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Wetlands of International Importance (Ramsar)

[\[Resource Information \]](#)

Name	Proximity
Corner inlet	Within Ramsar site
Gippsland lakes	Within 10km of Ramsar

Commonwealth Marine Area

[\[Resource Information \]](#)

Approval is required for a proposed activity that is located within the Commonwealth Marine Area which has, will have, or is likely to have a significant impact on the environment. Approval may be required for a proposed action taken outside the Commonwealth Marine Area but which has, may have or is likely to have a significant impact on the environment in the Commonwealth Marine Area. Generally the Commonwealth Marine Area stretches from three nautical miles to two hundred nautical miles from the coast.

Name

EEZ and Territorial Sea

Marine Regions

[\[Resource Information \]](#)

If you are planning to undertake action in an area in or close to the Commonwealth Marine Area, and a marine bioregional plan has been prepared for the Commonwealth Marine Area in that area, the marine bioregional plan may inform your decision as to whether to refer your proposed action under the EPBC Act.

Name

[South-east](#)

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.

Name	Status	Type of Presence
Assemblages of species associated with open-coast salt-wedge estuaries of western and central Victoria ecological community	Endangered	Community likely to occur within area
Gippsland Red Gum (<i>Eucalyptus tereticornis</i> subsp. <i>mediana</i>) Grassy Woodland and Associated Native Grassland	Critically Endangered	Community likely to occur within area
Natural Damp Grassland of the Victorian Coastal Plains	Critically Endangered	Community likely to occur within area
Subtropical and Temperate Coastal Saltmarsh	Vulnerable	Community likely to occur within area

Listed Threatened Species

[\[Resource Information \]](#)

Name	Status	Type of Presence
Birds		
Anthochaera phrygia Regent Honeyeater [82338]	Critically Endangered	Foraging, feeding or related behaviour likely to occur within area
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area

Name	Status	Type of Presence
Calidris tenuirostris Great Knot [862]	Critically Endangered	Roosting known to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Roosting known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Roosting known to occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea antipodensis gibsoni Gibson's Albatross [82270]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Fregetta grallaria grallaria White-bellied Storm-Petrel (Tasman Sea), White-bellied Storm-Petrel (Australasian) [64438]	Vulnerable	Species or species habitat likely to occur within area
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat may occur within area
Halobaena caerulea Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat known to occur within area
Limosa lapponica baueri Bar-tailed Godwit (baueri), Western Alaskan Bar-tailed Godwit [86380]	Vulnerable	Species or species habitat may occur within area
Limosa lapponica menzbieri Northern Siberian Bar-tailed Godwit, Bar-tailed Godwit (menzbieri) [86432]	Critically Endangered	Species or species habitat may occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Neophema chrysogaster Orange-bellied Parrot [747]	Critically Endangered	Species or species habitat known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area

Name	Status	Type of Presence
Pachyptila turtur subantarctica Fairy Prion (southern) [64445]	Vulnerable	Species or species habitat known to occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat likely to occur within area
Pterodroma leucoptera leucoptera Gould's Petrel, Australian Gould's Petrel [26033]	Endangered	Species or species habitat may occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Species or species habitat known to occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area
Thalassarche bulleri platei Northern Buller's Albatross, Pacific Albatross [82273]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta cauta Shy Albatross [82345]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche cauta steadi White-capped Albatross [82344]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche chrysostoma Grey-headed Albatross [66491]	Endangered	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thinornis rubricollis rubricollis Hooded Plover (eastern) [66726]	Vulnerable	Species or species habitat known to occur within area
Fish		
Galaxiella pusilla Eastern Dwarf Galaxias, Dwarf Galaxias [56790]	Vulnerable	Species or species habitat known to occur within area
Prototroctes maraena Australian Grayling [26179]	Vulnerable	Species or species habitat known to occur within area
Frogs		
Litoria aurea Green and Golden Bell Frog [1870]	Vulnerable	Species or species habitat may occur within area
Litoria raniformis Growling Grass Frog, Southern Bell Frog, Green and Golden Frog, Warty Swamp Frog [1828]	Vulnerable	Species or species habitat known to occur

Name	Status	Type of Presence within area
Insects		
Synemon plana Golden Sun Moth [25234]	Critically Endangered	Species or species habitat may occur within area
Mammals		
Antechinus minimus maritimus Swamp Antechinus (mainland) [83086]	Vulnerable	Species or species habitat known to occur within area
Balaenoptera borealis Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Dasyurus maculatus maculatus (SE mainland population) Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat known to occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat known to occur within area
Isodon obesulus obesulus Southern Brown Bandicoot (eastern), Southern Brown Bandicoot (south-eastern) [68050]	Endangered	Species or species habitat known to occur within area
Mastacomys fuscus mordicus Broad-toothed Rat (mainland), Tooarrana [87617]	Vulnerable	Species or species habitat known to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Petauroides volans Greater Glider [254]	Vulnerable	Species or species habitat known to occur within area
Potorous tridactylus tridactylus Long-nosed Potoroo (SE Mainland) [66645]	Vulnerable	Species or species habitat known to occur within area
Pseudomys novaehollandiae New Holland Mouse, Pookila [96]	Vulnerable	Species or species habitat may occur within area
Pteropus poliocephalus Grey-headed Flying-fox [186]	Vulnerable	Foraging, feeding or related behaviour may occur within area
Plants		
Amphibromus fluitans River Swamp Wallaby-grass, Floating Swamp Wallaby-grass [19215]	Vulnerable	Species or species habitat known to occur within area
Caladenia orientalis Eastern Spider Orchid [83410]	Endangered	Species or species habitat likely to occur within area
Caladenia tessellata Thick-lipped Spider-orchid, Daddy Long-legs [2119]	Vulnerable	Species or species habitat known to occur within area

Name	Status	Type of Presence
Commersonia prostrata Dwarf Kerrawang [87152]	Endangered	Species or species habitat known to occur within area
Dianella amoena Matted Flax-lily [64886]	Endangered	Species or species habitat known to occur within area
Dodonaea procumbens Trailing Hop-bush [12149]	Vulnerable	Species or species habitat likely to occur within area
Eucalyptus strzeleckii Strzelecki Gum [55400]	Vulnerable	Species or species habitat known to occur within area
Glycine latrobeana Clover Glycine, Purple Clover [13910]	Vulnerable	Species or species habitat likely to occur within area
Prasophyllum frenchii Maroon Leek-orchid, Slaty Leek-orchid, Stout Leek-orchid, French's Leek-orchid, Swamp Leek-orchid [9704]	Endangered	Species or species habitat likely to occur within area
Prasophyllum spicatum Dense Leek-orchid [55146]	Vulnerable	Species or species habitat likely to occur within area
Prostanthera galbraithiae Wellington Mintbush [64959]	Vulnerable	Species or species habitat known to occur within area
Pterostylis chlorogramma Green-striped Greenhood [56510]	Vulnerable	Species or species habitat known to occur within area
Pterostylis cucullata Leafy Greenhood [15459]	Vulnerable	Species or species habitat likely to occur within area
Pterostylis tenuissima Swamp Greenhood, Dainty Swamp Orchid [13139]	Vulnerable	Species or species habitat known to occur within area
Senecio psilocarpus Swamp Fireweed, Smooth-fruited Groundsel [64976]	Vulnerable	Species or species habitat likely to occur within area
Thelymitra epipactoides Metallic Sun-orchid [11896]	Endangered	Species or species habitat may occur within area
Thelymitra matthewsii Spiral Sun-orchid [4168]	Vulnerable	Species or species habitat likely to occur within area
Xerochrysum palustre Swamp Everlasting, Swamp Paper Daisy [76215]	Vulnerable	Species or species habitat known to occur within area
Reptiles		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area

Name	Status	Type of Presence
Sharks		
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Breeding known to occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area
Listed Migratory Species		[Resource Information]
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardenna carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Foraging, feeding or related behaviour likely to occur within area
Ardenna grisea Sooty Shearwater [82651]		Species or species habitat may occur within area
Ardenna tenuirostris Short-tailed Shearwater [82652]		Breeding known to occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat likely to occur within area
Sternula albifrons Little Tern [82849]		Species or species habitat may occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta Shy Albatross [89224]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Thalassarche chrysostoma Grey-headed Albatross [66491]	Endangered	Species or species habitat may occur within area

Name	Threatened	Type of Presence
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Migratory Marine Species		
Balaena glacialis australis Southern Right Whale [75529]	Endangered*	Species or species habitat known to occur within area
Balaenoptera borealis Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Caperea marginata Pygmy Right Whale [39]		Foraging, feeding or related behaviour may occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Breeding known to occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area
Isurus oxyrinchus Shortfin Mako, Mako Shark [79073]		Species or species habitat likely to occur within area
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat may occur within area
Lamna nasus Porbeagle, Mackerel Shark [83288]		Species or species habitat likely to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat likely to occur within area

Name	Threatened	Type of Presence
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area
Migratory Terrestrial Species		
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Breeding known to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Arenaria interpres Ruddy Turnstone [872]		Roosting known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Roosting known to occur within area
Calidris alba Sanderling [875]		Roosting known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat known to occur within area
Calidris ruficollis Red-necked Stint [860]		Roosting known to occur within area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Roosting known to occur within area
Charadrius bicinctus Double-banded Plover [895]		Roosting known to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Roosting known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Roosting known to occur within area
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Species or species habitat known to occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Roosting may occur within area

Name	Threatened	Type of Presence
Gallinago megala Swinhoe's Snipe [864]		Roosting likely to occur within area
Gallinago stenura Pin-tailed Snipe [841]		Roosting likely to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Limosa limosa Black-tailed Godwit [845]		Roosting known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Numenius minutus Little Curlew, Little Whimbrel [848]		Roosting likely to occur within area
Numenius phaeopus Whimbrel [849]		Roosting known to occur within area
Pandion haliaetus Osprey [952]		Species or species habitat known to occur within area
Philomachus pugnax Ruff (Reeve) [850]		Roosting known to occur within area
Pluvialis fulva Pacific Golden Plover [25545]		Roosting known to occur within area
Pluvialis squatarola Grey Plover [865]		Roosting known to occur within area
Thalasseus bergii Crested Tern [83000]		Breeding known to occur within area
Tringa brevipes Grey-tailed Tattler [851]		Roosting known to occur within area
Tringa glareola Wood Sandpiper [829]		Roosting known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Roosting known to occur within area
Xenus cinereus Terek Sandpiper [59300]		Roosting known to occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land

[\[Resource Information \]](#)

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.

Name

Commonwealth Land -

Listed Marine Species

[\[Resource Information \]](#)

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name

Threatened

Type of Presence

Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Breeding known to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Arenaria interpres Ruddy Turnstone [872]		Roosting known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Roosting known to occur within area
Calidris alba Sanderling [875]		Roosting known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat known to occur within area
Calidris ruficollis Red-necked Stint [860]		Roosting known to occur within area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Roosting known to occur within area
Catharacta skua Great Skua [59472]		Species or species habitat may occur within area
Charadrius bicinctus Double-banded Plover [895]		Roosting known to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Roosting known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Roosting known to occur within area
Charadrius ruficapillus Red-capped Plover [881]		Roosting known to occur within area
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Species or species habitat known to occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area

Name	Threatened	Type of Presence
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea gibsoni Gibson's Albatross [64466]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Eudyptula minor Little Penguin [1085]		Breeding known to occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Roosting may occur within area
Gallinago megala Swinhoe's Snipe [864]		Roosting likely to occur within area
Gallinago stenura Pin-tailed Snipe [841]		Roosting likely to occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Breeding known to occur within area
Halobaena caerulea Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area
Heteroscelus brevipes Grey-tailed Tattler [59311]		Roosting known to occur within area
Himantopus himantopus Pied Stilt, Black-winged Stilt [870]		Roosting known to occur within area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area
Larus novaehollandiae Silver Gull [810]		Breeding known to occur within area
Larus pacificus Pacific Gull [811]		Breeding known to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat known to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Limosa limosa Black-tailed Godwit [845]		Roosting known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur

Name	Threatened	Type of Presence
Motacilla flava Yellow Wagtail [644]		within area Species or species habitat may occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Breeding known to occur within area
Neophema chrysogaster Orange-bellied Parrot [747]	Critically Endangered	Species or species habitat known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Numenius minutus Little Curlew, Little Whimbrel [848]		Roosting likely to occur within area
Numenius phaeopus Whimbrel [849]		Roosting known to occur within area
Pachyptila turtur Fairy Prion [1066]		Species or species habitat known to occur within area
Pandion haliaetus Osprey [952]		Species or species habitat known to occur within area
Pelecanoides urinatrix Common Diving-Petrel [1018]		Breeding known to occur within area
Phalacrocorax fuscescens Black-faced Cormorant [59660]		Breeding known to occur within area
Philomachus pugnax Ruff (Reeve) [850]		Roosting known to occur within area
Phoebastria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat likely to occur within area
Pluvialis fulva Pacific Golden Plover [25545]		Roosting known to occur within area
Pluvialis squatarola Grey Plover [865]		Roosting known to occur within area
Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [1043]		Foraging, feeding or related behaviour likely to occur within area
Puffinus griseus Sooty Shearwater [1024]		Species or species habitat may occur within area
Puffinus tenuirostris Short-tailed Shearwater [1029]		Breeding known to occur within area
Recurvirostra novaehollandiae Red-necked Avocet [871]		Roosting known to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat likely to occur within area

Name	Threatened	Type of Presence
Sterna albifrons Little Tern [813]		Species or species habitat may occur within area
Sterna bergii Crested Tern [816]		Breeding known to occur within area
Sterna fuscata Sooty Tern [794]		Breeding known to occur within area
Sterna nereis Fairy Tern [796]		Breeding known to occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta Shy Albatross [89224]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Thalassarche chrysostoma Grey-headed Albatross [66491]	Endangered	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche sp. nov. Pacific Albatross [66511]	Vulnerable*	Species or species habitat may occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Thinornis rubricollis Hooded Plover [59510]		Species or species habitat known to occur within area
Thinornis rubricollis rubricollis Hooded Plover (eastern) [66726]	Vulnerable	Species or species habitat known to occur within area
Tringa glareola Wood Sandpiper [829]		Roosting known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Roosting known to occur within area
Xenus cinereus Terek Sandpiper [59300]		Roosting known to occur within area
Fish		
Heraldia nocturna Upside-down Pipefish, Eastern Upside-down Pipefish, Eastern Upside-down Pipefish [66227]		Species or species habitat may occur within area
Hippocampus abdominalis Big-belly Seahorse, Eastern Potbelly Seahorse,		Species or species

Name	Threatened	Type of Presence
New Zealand Potbelly Seahorse [66233]		habitat may occur within area
Hippocampus breviceps Short-head Seahorse, Short-snouted Seahorse [66235]		Species or species habitat may occur within area
Hippocampus minotaur Bullneck Seahorse [66705]		Species or species habitat may occur within area
Histiogamphelus briggsii Crested Pipefish, Briggs' Crested Pipefish, Briggs' Pipefish [66242]		Species or species habitat may occur within area
Histiogamphelus cristatus Rhino Pipefish, Macleay's Crested Pipefish, Ring-back Pipefish [66243]		Species or species habitat may occur within area
Hypselognathus rostratus Knifesnout Pipefish, Knife-snouted Pipefish [66245]		Species or species habitat may occur within area
Kaupus costatus Deepbody Pipefish, Deep-bodied Pipefish [66246]		Species or species habitat may occur within area
Kimblaeus bassensis Trawl Pipefish, Bass Strait Pipefish [66247]		Species or species habitat may occur within area
Leptoichthys fistularius Brushtail Pipefish [66248]		Species or species habitat may occur within area
Lissocampus caudalis Australian Smooth Pipefish, Smooth Pipefish [66249]		Species or species habitat may occur within area
Lissocampus runa Javelin Pipefish [66251]		Species or species habitat may occur within area
Maroubra perserrata Sawtooth Pipefish [66252]		Species or species habitat may occur within area
Mitotichthys semistriatus Halfbanded Pipefish [66261]		Species or species habitat may occur within area
Mitotichthys tuckeri Tucker's Pipefish [66262]		Species or species habitat may occur within area
Notiocampus ruber Red Pipefish [66265]		Species or species habitat may occur within area
Phycodurus eques Leafy Seadragon [66267]		Species or species habitat may occur within area
Phyllopteryx taeniolatus Common Seadragon, Weedy Seadragon [66268]		Species or species habitat may occur within area
Pugnaso curtirostris Pugnose Pipefish, Pug-nosed Pipefish [66269]		Species or species habitat may occur within area
Solegnathus robustus Robust Pipehorse, Robust Spiny Pipehorse [66274]		Species or species habitat may occur within

Name	Threatened	Type of Presence area
Solegnathus spinosissimus Spiny Pipehorse, Australian Spiny Pipehorse [66275]		Species or species habitat may occur within area
Stigmatopora argus Spotted Pipefish, Gulf Pipefish, Peacock Pipefish [66276]		Species or species habitat may occur within area
Stigmatopora nigra Widebody Pipefish, Wide-bodied Pipefish, Black Pipefish [66277]		Species or species habitat may occur within area
Stipecampus cristatus Ringback Pipefish, Ring-backed Pipefish [66278]		Species or species habitat may occur within area
Syngnathoides biaculeatus Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area
Urocampus carinirostris Hairy Pipefish [66282]		Species or species habitat may occur within area
Vanacampus margaritifer Mother-of-pearl Pipefish [66283]		Species or species habitat may occur within area
Vanacampus phillipi Port Phillip Pipefish [66284]		Species or species habitat may occur within area
Vanacampus poecilolaemus Longsnout Pipefish, Australian Long-snout Pipefish, Long-snouted Pipefish [66285]		Species or species habitat may occur within area
Mammals		
Arctocephalus forsteri Long-nosed Fur-seal, New Zealand Fur-seal [20]		Species or species habitat may occur within area
Arctocephalus pusillus Australian Fur-seal, Australo-African Fur-seal [21]		Species or species habitat likely to occur within area
Reptiles		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area
Whales and other Cetaceans		
		[Resource Information]
Name	Status	Type of Presence
Mammals		
Balaenoptera acutorostrata Minke Whale [33]		Species or species habitat may occur within area
Balaenoptera borealis Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area

Name	Status	Type of Presence
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Caperea marginata Pygmy Right Whale [39]		Foraging, feeding or related behaviour may occur within area
Delphinus delphis Common Dophin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat known to occur within area
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat likely to occur within area
Pseudorca crassidens False Killer Whale [48]		Species or species habitat likely to occur within area
Tursiops aduncus Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area

Australian Marine Parks [Resource Information]

Name	Label
Beagle	Multiple Use Zone (IUCN VI)

Extra Information

State and Territory Reserves [Resource Information]

Name	State
Agnes Falls S.R.	VIC
Binginwarri H15 B.R	VIC
Binginwarri H18 B.R	VIC
Binginwarri H19 B.R	VIC
Binginwarri H43 B.R	VIC
Bruthen Creek SS.R.	VIC
Bruthen F.R	VIC
Budgerie B.R.	VIC
Callignee B.R	VIC
Callignee W.R	VIC
Carrajung H23 B.R	VIC
Carrajung H34 B.R	VIC
Cooks Gully F.R	VIC
Darriman H29 B.R	VIC

Name	State
Darriman H33 B.R	VIC
Devon B.R.	VIC
Entrance Point	VIC
Fresh-water Swamp, Woodside Beach W.R	VIC
Giffard (Rifle Range) F.R.	VIC
Giffard H30 B.R	VIC
Giffard H31 B.R	VIC
Gormandale F.R	VIC
Greig Creek SS.R.	VIC
Holey Plains	VIC
Jack River SS.R.	VIC
Jack Smith Lake W.R	VIC
Kangaroo Swamp N.C.R.	VIC
Lake Denison W.R	VIC
Macks Creek	VIC
Merrimans Creek F.R.	VIC
Morwell	VIC
Mount Vereker Creek	VIC
Mullungdung	VIC
Mullungdung F.F.R	VIC
Seal Islands W.R.	VIC
Southern Wilsons Promontory	VIC
Stradbroke F.F.R.	VIC
Tarra River SS.R.	VIC
Tarra Tarra B.R	VIC
Tarra-Bulga	VIC
Toms Cap S.R.	VIC
Toora H37 B.R	VIC
Toora H41 B.R	VIC
Traralgon Creek (Yerang Park) F.R.	VIC
Traralgon South F.F.R.	VIC
Traralgon South F.R	VIC
Unnamed C0017	VIC
Unnamed C0077	VIC
Unnamed C0108	VIC
Unnamed C0109	VIC
Unnamed C0110	VIC
Unnamed C0111	VIC
Unnamed C0112	VIC
Unnamed C0186	VIC
Unnamed C0261	VIC
Unnamed C0301	VIC
Unnamed C0406	VIC
Unnamed C0460	VIC
Unnamed C0532	VIC
Unnamed C0609	VIC
Unnamed C0691	VIC
Unnamed C0709	VIC
Unnamed C0781	VIC
Unnamed C0782	VIC
Unnamed C0805	VIC
Unnamed C0822	VIC
Unnamed C0838	VIC
Unnamed C0870	VIC
Unnamed C0877	VIC
Unnamed C1083	VIC
Unnamed C1138	VIC
Unnamed C1185	VIC
Unnamed C1222	VIC
Unnamed C1254	VIC
Unnamed C1258	VIC
Unnamed C1362	VIC
Unnamed C1389	VIC
Unnamed C1398	VIC
Unnamed C1484	VIC
Unnamed C1622	VIC

Name	State
Unnamed C1648	VIC
Unnamed C1688	VIC
Unnamed C1692	VIC
Unnamed C1694	VIC
Unnamed C1734	VIC
Unnamed C1893	VIC
Unnamed P0155	VIC
Unnamed P0267	VIC
Vereker Creek	VIC
Warrigal Creek SS.R.	VIC
Welshpool H16 B.R	VIC
Welshpool H17 B.R	VIC
Willung B.R	VIC
Willung South B.R.	VIC
Wilson's Promontory	VIC
Wilson's Promontory	VIC
Wilson's Promontory Islands	VIC
Won Wron F.R	VIC
Won Wron H21 B.R	VIC
Won Wron H22 B.R	VIC
Woodside F.R	VIC
Woodside H25 B.R	VIC
Woodside H26 B.R.	VIC
Woodside H27 B.R	VIC
Woodside H28 B.R	VIC
Woranga B.R	VIC
Yinnar B.R	VIC

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

Note that all areas with completed RFAs have been included.

Name	State
Gippsland RFA	Victoria

Invasive Species [\[Resource Information \]](#)

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resources Audit, 2001.

Name	Status	Type of Presence
Birds		
Acridotheres tristis Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
Alauda arvensis Skylark [656]		Species or species habitat likely to occur within area
Anas platyrhynchos Mallard [974]		Species or species habitat likely to occur within area
Carduelis carduelis European Goldfinch [403]		Species or species habitat likely to occur within area
Carduelis chloris European Greenfinch [404]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Passer montanus Eurasian Tree Sparrow [406]		Species or species habitat likely to occur within area
Pycnonotus jocosus Red-whiskered Bulbul [631]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Turdus merula Common Blackbird, Eurasian Blackbird [596]		Species or species habitat likely to occur within area
Turdus philomelos Song Thrush [597]		Species or species habitat likely to occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Capra hircus Goat [2]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Feral deer Feral deer species in Australia [85733]		Species or species habitat likely to occur within area
Lepus capensis Brown Hare [127]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus norvegicus Brown Rat, Norway Rat [83]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Plants		
Asparagus asparagoides Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
Asparagus scandens Asparagus Fern, Climbing Asparagus Fern [23255]		Species or species habitat likely to occur within area
Carrichtera annua Ward's Weed [9511]		Species or species habitat may occur within area
Chrysanthemoides monilifera Bitou Bush, Boneseed [18983]		Species or species habitat may occur within area
Chrysanthemoides monilifera subsp. monilifera Boneseed [16905]		Species or species habitat likely to occur within area
Cytisus scoparius Broom, English Broom, Scotch Broom, Common Broom, Scottish Broom, Spanish Broom [5934]		Species or species habitat likely to occur within area
Genista linifolia Flax-leaved Broom, Mediterranean Broom, Flax Broom [2800]		Species or species habitat likely to occur within area
Genista monspessulana Montpellier Broom, Cape Broom, Canary Broom, Common Broom, French Broom, Soft Broom [20126]		Species or species habitat likely to occur within area
Genista sp. X Genista monspessulana Broom [67538]		Species or species habitat may occur within area
Lycium ferocissimum African Boxthorn, Boxthorn [19235]		Species or species habitat likely to occur within area
Nassella neesiana Chilean Needle grass [67699]		Species or species habitat likely to occur within area
Nassella trichotoma Serrated Tussock, Yass River Tussock, Yass Tussock, Nassella Tussock (NZ) [18884]		Species or species habitat likely to occur within area
Olea europaea Olive, Common Olive [9160]		Species or species habitat may occur within area
Opuntia spp. Prickly Pears [82753]		Species or species habitat likely to occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area
Ulex europaeus Gorse, Furze [7693]		Species or species habitat likely to occur within area

Nationally Important Wetlands

[[Resource Information](#)]

Name	State
Corner Inlet	VIC

Name

State

[Jack Smith Lake State Game Reserve](#)

VIC

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

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.

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

Where very little information is available for 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 reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

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

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

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

Coordinates

-38.27981 146.37696,-38.27981 147.1048,-39.0561 147.1048,-39.0561 146.37696,-38.27981 146.37696

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.