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Environment Plan

Offshore Gas Victoria

Well Completions, Well Interventions and Plugging and Abandonment Activities Environment Plan

Review record (record the last 3 revisions here or the revisions required to achieve current approval version)

Revision	Date	Reason for issue	Reviewer/s	Consolidator	Approver
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THE THREE WHATS
What can go wrong?
What could cause it to go wrong?
What can I do to prevent it?

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Acronyms

Terms/acronym	Definition/Expansion
AAD	Australian Antarctic Division
ABARES	Australian Bureau of Agricultural and Resource Economics and Sciences
ABS	Australian Bureau of Statistics
ADAPS	Anchor Distance and Positioning
ADIOS	Automated Data Inquiry for Oil Spills
AEP	Australian Energy Producers
AFMA	Australian Fisheries Management Authority
AFZ	Australian Fishing Zone
AGL	Australian Gas Light
AHA	Aboriginal Heritage Act
AHO	Australian Hydrographic office
AHS	Australian Hydrological Service
AHTS	Anchor handling and tow support vessels
AIATSIS	Australian Institute of Aboriginal and Torres Strait Islander Studies
AIS	Australian Information Systems
ALARP	As Low as Reasonably Practicable
AMOSC	Australian Marine Oil Spill Centre
AMP	Australian Marine Park
AMSA	Australian Maritime Safety Authority
AMSIS	Australian Marine Spatial Information System
ANZECC	Australian and New Zealand Environment and Conservation Council
ANZG	Australian and New Zealand Governments
API	American Petroleum Institute
ARS	area-restricted searches
ASAP	As Soon As Practicable
AUCHD	Australasian Underwater Cultural Heritage Database
AUD	Australian Dollar
AUSCOAST	Coastal Navigational Warnings
Bass Strait CZSF	Bass Strait Central Zone Scallop Fishery
bbl	Barrel
Beach	Beach Energy (Operations) Limited
BIA	Biologically Important Area
BLCAC	Bunurong Land Council Aboriginal Corporation
BML	Below Mud Line
BOM	Bureau of Meteorology

Terms/acronym	Definition/Expansion
BOP	Blow-Out Preventer
BRS	Bureau of Rural Sciences
BSCZSF	Bass Strait Central Zone Scallop Fishery
CCS	Carbon Capture and Storage
CGR	Condensate Gas Ratio
CH4	Methane
CHMP	Cultural Heritage Management Plans
CIA	Cumulative impact assessment
CM	Control Measure
CMMS	Computerised Maintenance Management System
CMP	Conservation Management Plan
CMT	Crisis Management Team
CO2	Carbon Dioxide
CoA	Commonwealth of Australia
COLREG	Convention on the International Regulations for Preventing Collisions At Sea
CPUE	Catch per Unit Effort
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CSS	Capping Stack System
CTS	Commonwealth Trawl Sector
DAFF	Department of Agriculture, Fisheries and Forestry (Cwth)
DAWE	Department of Agriculture, Water and the Environment
DCCEEW	Department of Climate Change, Energy, the Environment and Wate
DEDJTR	The Department of Jobs, Skills, Industry and Regions
DEECA	Department of Energy, Environment and Climate Action
DELWP	Department of Environment, Land, Water and Planning
DEWHA	Department of the Environment, Heritage, Water and the Arts
DNA	Deoxyribonucleic Acid
DNP	Commonwealth Director of National Parks
DNRET	Department of Natural Resources and Environment Tasmania
DO	Dissolved Oxygen
DoD	Department of Defence
DoE	Department of the Environment
DoEE	Department of the Environment and Energy
DP	Dynamic Positioning
DPI	Department of Primary Industries
DPIPWE	Department of Primary Industries, Parks, Water and Environment

Terms/acronym	Definition/Expansion
DPIRD	Department of Primary Industries and Regional Development
DSE	Department of Sustainability and Environment
DSEWPC	Department of Sustainability, Environment, Water, Population and Communities
DWH	Deepwater Horizon
EAC	East Australian Current
ECC	Environmental Conservation Council
EHS	Environmental Health and Safety
EIA	Environmental Impact assessment
EMAC	Eastern Maar Aboriginal Corporation
EMBA	Environment that May Be Affected
EMP	Emergency Management Plan
EMPCA	Environmental Management and Pollution Control Act 1994
EMT	Emergency Management Team
ENSO	El Niño – Southern Oscillation
EP	Environment Plan
EPA	Environmental Protection Authority
EPBC	Environment Protection and Biodiversity Conservation Act 1999
EPO	Environment Protection Order or Environment Performance Outcome
EPS	Environment Performance Standard
ERP	Emergency Response Plan
ERR	Earth Resources Regulation
ERT	Emergency Response Team
ESD	Ecologically Sustainable Development
ETBF	Eastern Tuna and Billfish Fishery
FFG	Flora and Fauna Guarantee Act
FLNG	Floating Liquefied Natural Gas
FRDC	Fisheries Research and Development Corporation
FWCAC	Far West Coast Aboriginal Corporation
GHG	Greenhouse Gases
GHTS	Gillnet, Hook and Trap Sector
GLAWAC	Gunaikurnai Land and Waters Aboriginal Corporation
GMTOAC	Gunditj Mirring Traditional Owners Aboriginal Corporation
GPS	Global Positioning System
GSACUS	Great Southern Australian Coastal Upwelling System
GVI	General Visual Inspection
GVP	Gross Value Product

Terms/acronym	Definition/Expansion
HAZID	Hazard Identification
HAZOP	Hazard and Operability Analysis
HCTS	Habitat Critical to Survival
HF	High Frequency
HP	High Pressure
HSE	Health, Safety and Environment
HSEMS	Health, Safety and Environment Management System
IALA	International Association of Marine Aids to Navigation and Lighthouse Authorities
ID	Internal Diameter
IFC	International Finance Corporation
ILUA	Indigenous Land Use Agreements
IMAS	Institue for Marine and Antarctic Studies
IMCRA	Integrated Marine and Coastal Regionalisation of Australia
IMO	International Maritime Organisation
IMOS	Integrated Marine Observing System
IMS	Invasive Marine Species
IOGP	International association of Oil and Gas Producers
IPA	Indigenous Protected Area
IPCC	Intergovernmental Panel on Climate Change
IPIECA	International Petroleum Industry Environmental Conservation Association
ITOPF	International Tank Owners Pollution Federation
IUCN	International Union for Conservation of Nature
IWC	International Whaling Commission
JASCO	Jasco Applied Sciences
JRCC	Joint Rescue Coordination Centre
KEF	Key Ecological Feature
km	Kilometre
L	Litre
LE	Equivalent Sound Level
LF	Low Frequency
LOC	Loss of Containment
LOR	Lowest Observable Reading
LOWC	Loss of Well Control
LP	Low Pressure
LPG	Liquefied Petroleum Gas
m	Metre

Terms/acronym	Definition/Expansion
MARPOL	International Convention for the Prevention of Pollution from Ships
MDO	Marine Diesel Oil
MEG	Monoethylene Glycol
MEPC	Marine Environment Protection Committee
MFO	Marine Fauna Observer
MMO	Marine Mammal Observer
MMSI	Maritime Mobile Service Identity
MNES	Matters of National Environmental Significance
MO	# Species of Species Habitat May Occur Within Area or Marine Orders
MoC	Management of Change
MODIS	Moderate Resolution Imaging Spectroradiometer
MODU	Mobile offshore Drilling Unit
MoU	Mobile Offshore Unit
MP	Environment Protection Authority
MSS	Marine Seismic Survey
MT	Metric Tonne
NA	Not Applicable
NEBA	Net Environmental Benefit Analysis
NERA	National Energy Resources Australia
NGER	National Greenhouse and Energy Reporting
nm	Nautical Mile
NMFS	National Marine Fisheries Service
NNTT	National Native Title Tribunal
NO3	Nitrogen
NOAA	National Oceanic and Atmospheric Administration
NOO	National Oceans Office
NOPSEMA	National offshore Petroleum Safety and Environmental Management Authority
NOPTA	National offshore Petroleum Titles Administrator
NOTMAR	Notices to Mariners
NPI	National Pollution Inventory
NRDA	Natural Resource Damage Assessment
NRE	Department of Natural Resources and Environment (Tas)
NSW	New South Wales
NW	North-West
NWS	North-west Shelf
NZS	New Zealand Standard

Terms/acronym	Definition/Expansion
OCNS	Offshore Chemical Notification Scheme
OCS	Offshore Constitutional Settlement
ODS	Ozone Depleting Substance
OEI	Offshore Electricity Infrastructure
OEMS	Operations Excellence Management System
OEUK	UK Offshore Energies
OGPP	Otway Gas Production Pipeline
OGUK	Oil and Gas UK
OGV	Offshore Gas Victoria
OIW	Oil In Water
OPEP	Oil Pollution Emergency Plan
OPGGS	Offshore Petroleum and Greenhouse Gas Storage (Act 2006)
OPP	Offshore Project Proposal
ORP	Oxidation-Reduction Potential
OSMP	Operational and Scientific Monitoring Plan
OSPAR	Oslo/Paris convention (for the Protection of the Marine Environment of the North-East Atlantic)
OSTM	Oil Spill Trajectory Modelling
OSV	Offshore Support Vessel
OWR	Oiled Wildlife Response
P&A	Plug and Abandon
PAH	Polycyclic Aromatic Hydrocarbons
PAM	Passive Acoustic Monitoring
PCE	Pressure Control Equipment
PIRSA	Department of Primary Industries and Regions South Australia
PJ	Petajoule
PLONOR	Pose Little or No Risk to the Environment
PM	Particulate Matter
PMST	EPBC Act Protected Matters Search Tool
POB	Persons on Board
POLREP	Marine Pollution Report
POWBONS	Pollution of Waters by Oil and Noxious Substances Act
PSSR	Pre-startup Safety Review
PSZ	Petroleum Safety Zone
PTS	Permanent Threshold Shift
PWS	Parks and Wildlife Service Department of Primary Industries

Terms/acronym	Definition/Expansion
QLD	Queensland
RAP	Reconciliation Action Plan
RAR	Anchor Release System
RNTBC	Registered Native Title Body Corporate
RO	Reverse Osmosis
ROC	Retailed Oil on Cuttings
ROV	Remote Observation Vehicle
SA	South Australia
SBDF	Synthetic Based Drilling Fluid
SBM	Synthetic Based Mud
SBTF	Southern Bluefin Tuna Fishery
SCCP	Source Control Contingency Plan
SCM	Subsea Control Module
SE	South-East
SEEMP	Ship Energy Efficiency Management Plan
SEL	Sound Exposure Level
SEMR	South-East Marine Region
SESSF	Southern and Eastern Scalefish and Shark Fishery
SETFIA	South East Trawl Fishing Industry Association
SFRT	Subsea First Response Toolkit
SGSHS	Shark Gillnet and Shark Hook Sector
SHS	Scalefish Hook Sector
SMPEP	Shipboard Marine Pollution Emergency Plan
SOLAS	Safety of Life At Sea
SOPEP	Shipboard Oil Pollution Emergency Plan
SPE	Society of Petroleum Engineers
SPF	Small Pelagic Fishery
SPL	Sound Pressure Level
SPRAT	Species profile and threats database
SRL	Southern Rock Lobster
SRW	Southern Right Whale
SSDI	Subsea dispersant injection
SSJF	Southern Squid Jig Fishery
SSSV	Sub-surface Safety Valve
SST	Sea Surface Temperature
TAC	Total Allowable Catch

Terms/acronym	Definition/Expansion
TACC	Total Allowable Commercial Catch
TAS	Tasmania
TEC	Threatened Ecological Community
TRP	Technical Response Plan
TSEM	Temporary Subsea Electronic Module
TSIC	Tasmanian Seafood Industry Council
TSSC	Threatened Species Scientific Committee
TTS	Temporary Hearing Threshold Shift
UK	United Kingdom
UNCLOS	United Nations Convention on the Law of the Sea 1982
UNFSA	United Nations Fish Stocks Agreements
UOM	Unit of Measurement
USA	United States of America
UTAS	University of Tasmania
UXO	Unexploded ordnance
VFA	Victorian Fisheries Authority
VHF	Very High Frequency
VIC	Victoria
WA	Western Australia
WBCU	Wellbore clean-up
WBDF	Water-based Drilling Fluid
WBM	Water Based Mud
WBTF	Western Tuna and Billfish Fishery
WDCS	Whale and Dolphin Conservation Society
WECS	Well Engineering and Construction Management System
WET	Whole Effluent Toxicity or wells emergency team
WMO	World Meteorological Organisation
WMP	Whale Management Procedure
WMSOP	Whale Management Standard Operating Procedure
WOMP	Well Operations Management Plan
XT	Subsea production tree

1 Overview of the Activity

Beach Energy (Operations) Limited (Beach), proposes to undertake well completions, well interventions and contingent plug and abandonment (P&A) activities within Commonwealth waters of the Otway Basin (the Program).

The proposed scope of the Program covered by this EP consists of:

- Subsea production tree (XT) installation, completion installation, Mobile Offshore Drilling Unit (MODU)-based well flowback/clean-up, with a MODU in wells in VIC/L35 (2 locations), VIC/L36 (1 location), VIC/P43 (1 location), a total of up to 4 locations
- Interventions at up to 2 existing well locations in T/L2
- P&A and removal of wellhead below the mudline for 1 location in VIC/L35 (contingency if decision made not to complete Artisan 1)

Well completion including well flowback/clean-up (flaring), well intervention and contingency P&A activities will be undertaken within a 3 km radius around the well sites whilst the MODU is moored on location. The 3 km radius encompasses both the outer extent of mooring equipment on the seabed, and the 500 m petroleum safety zone (PSZ).

The Operational Area is where planned activities will occur. The Operational Area for the Program activities includes a 3 km radius around the well sites whilst the MODU is moored on location. The 3 km radius encompasses both the outer extent of mooring equipment on the seabed and the 500 m petroleum safety zone (PSZ).

Estimated timing for each activity, depending on the final work program and potential operational delays, are:

- Installation of XTs and well completions at up to 4 locations:

  100 days total comprising of 25 days per well

  This includes MODU-based well flowback/clean-up activities of 24 hours per well

- Well interventions at 2 existing well locations

  30 days total comprising of 15 days per well

- Contingency P&A at one location (Artisan 1) – 15 - 20 days.

Activities will be conducted on a 24 hours per day, 7 days per week basis. The above timings equate to approximately 150 days of activity for the full Program and will be undertaken within the period of 01 October 2025 to 31 December 2026.

Proposed activities will be undertaken with a single moored semi-submersible drill rig with a thruster assisted mooring system (MODU). The MODU will be supported with up to three vessels.

Activities included in the scope of this EP are detailed in Section 3.

Activities excluded from the scope of this EP are:

- Exploration and appraisal drilling of wells are covered in Offshore Gas Victoria Drilling and P&A Activities EP (V-1000-P1-RP-0002)
- Operation and maintenance of Thylacine West 1 and Thylacine North 1 which is covered under accepted Otway Offshore Operations EP (CDN/ID17275058)
- Vessels transiting to or from Operational Area. The vessels are deemed to be operating under the Commonwealth Navigation Act 2012 and not performing a petroleum activity whilst outside the Operational Area
- Mobilisation of the MODU and vessels into Australian Commonwealth waters and Victorian State waters, and associated biosecurity and ballast water management prior to the arrival of the MODU and vessels into the Operational Area. The MODU and vessels are subject to biosecurity control on entering Australian territory (12 nm offshore) in accordance with the Biosecurity Act 2015. Biosecurity and ballast water management of the MODU and vessels prior to their movement into the Operational Area is managed directly by and remains the responsibility of the MODU and vessel contractor.

1.1 Environment Plan Summary

This Offshore Gas Victoria – Completions Program EP Summary has been prepared from material provided in this EP. The summary consists of the following in Table 1-1, as required by the Commonwealth Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2023 (OPGGS(E)R).

Table 1-1: EP summary of material requirements

EP Summary Material Requirement	Relevant Section of EP Containing EP Summary Material
The location of the activity	Section 3.1
A description of the receiving environment	Section 5.1
A description of the activity	Section 3
Details of the environmental impacts and risks	Section 7
A summary of the control measures for the activity	Section 7.15
A summary of the arrangements for ongoing monitoring of the titleholder’s environmental performance	Section 8.3
A summary of the response arrangements in the oil pollution emergency plan	See OPEP
Details of consultation already undertaken and plans for ongoing consultation	Section 4
Details of the titleholders nominated liaison person for the activity	Section 1.2

1.2 Titleholder and Liaison Person Details

Beach Energy (Operations) Limited, a company wholly owned by Beach Energy Limited (Beach), is the operator of the petroleum assets located in the Otway Basin. Table 1-2 details the titleholders and the liaison person for the title applicable to the activity.

Beach is an Australian Stock Exchange listed oil and gas exploration and production company headquartered in Adelaide, South Australia. Beach has operated and non-operated, onshore, and offshore oil and gas production assets in five producing basins across Australia and New Zealand and is a key supplier to the Australian east coast gas market.

Beach's asset portfolio includes ownership interests in strategic oil and gas infrastructure, as well as a suite of high potential exploration prospects. Beach's gas exploration and production portfolio includes acreage in the Otway, Bass, Cooper/Eromanga, Perth, Browse and Bonaparte basins in Australia, as well as the Taranaki basin in New Zealand (Figure 1-).

Beach will notify National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) of any change in titleholder, a change in the titleholder's nominated liaison for the activity, or a change in the contact details for either the titleholder or the nominated liaison as soon as practicable after such a change takes place.

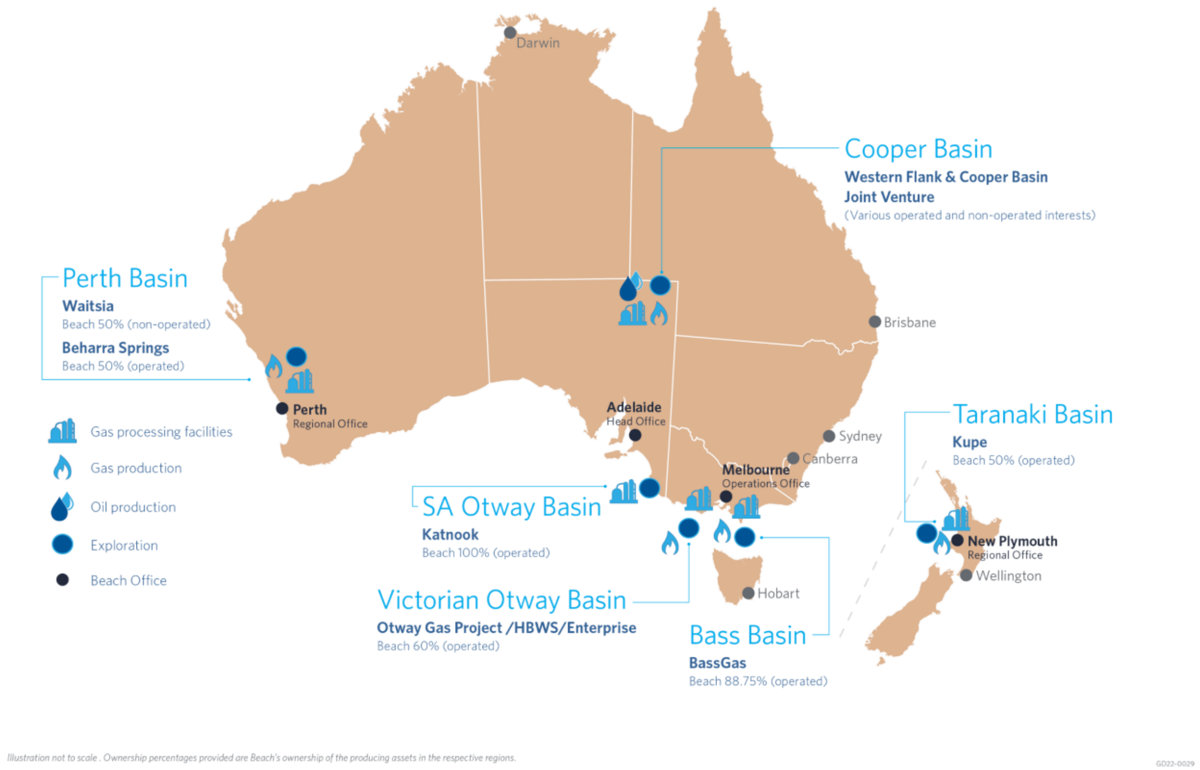


Figure 1-1: Beach operations

Table 1-2: Details of titleholder and liaison person

Petroleum Title(s)	Titleholders	
VIC/L35 VIC/L36 VIC/P43	Beach Energy (Operations) Limited – Operator OGOG (Otway) Pty Ltd	
T/L2	Beach Energy (Operations) Limited – Operator OGOG (Otway) Pty Ltd Beach Energy (Otway) Limited	
Titleholder Details		
Beach Energy (Operations) Limited – Operator	Business address	Level 8 80 Flinders Street Adelaide South Australia 5000
	Telephone number	(08) 8338 2833
	Email address	info@beachenergy.com.au
	Australian Company Number	007 845 338
Titleholder Liaison Person		
Brad Muir Offshore GM Offshore Drilling and Completions	Business address	Level 8 80 Flinders Street Adelaide South Australia 5000
	Telephone number	(08) 8338 2833
	Email address	info@beachenergy.com.au

2 Environmental Impact and Risk Assessment Methodology

2.1 Overview

This section outlines the environmental impact and risk assessment methodology used for the assessment of the program activities. The methodology is consistent with the Australian and New Zealand Standard for Risk Management (AS/NZS ISO 31000:2018, Risk Management – Principles and Guidelines). Figure 2-1 outlines this risk assessment process.

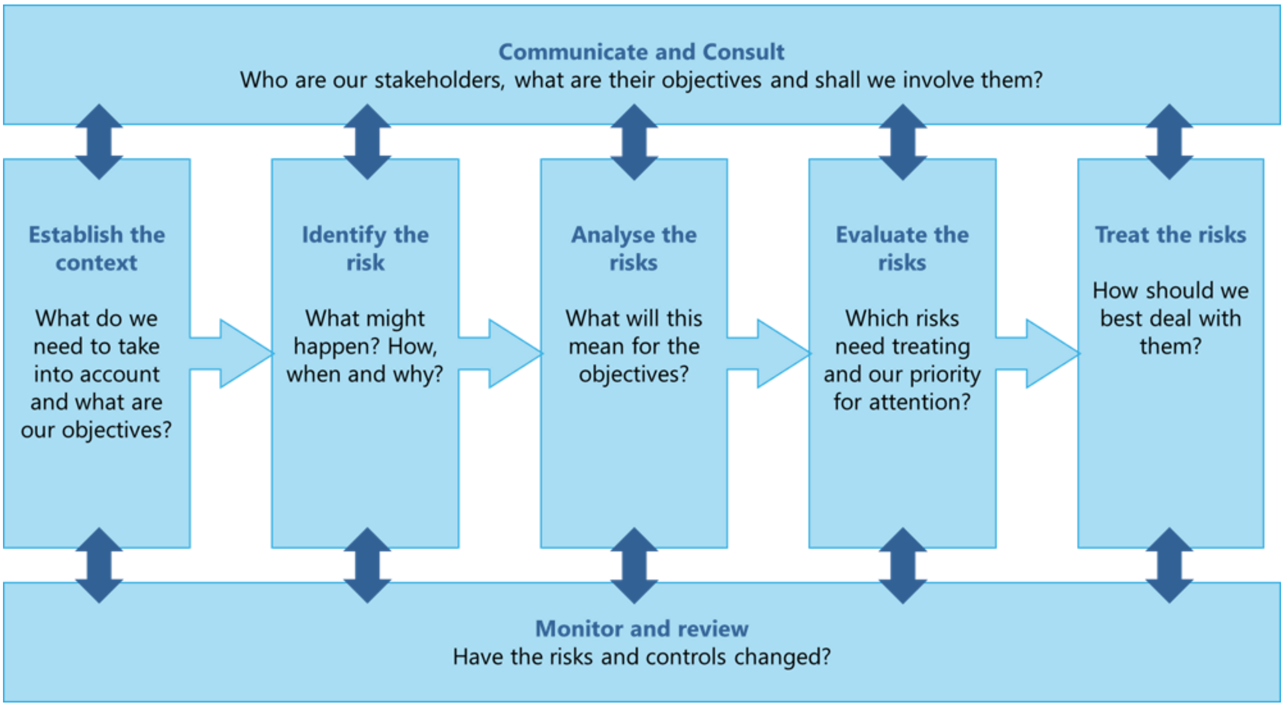


Figure 2-1: Risk assessment process

2.1.1 Definitions

Definitions of the term used in the risk assessment process are detailed in Table 2-1.

Table 2-1: Term definitions

Term	Definition
Activity	Refers to a 'petroleum activity' as defined under the OPGGS(E)R as: *petroleum activity means operations or works in an offshore area undertaken for the purpose of:* *exercising a right conferred on a petroleum titleholder under the Act* by a petroleum title; or* *discharging an obligation imposed on a petroleum titleholder by the Act or a legislative instrument under the Act*.* *Act is this context is the OPGGS Act.
Consequence	The consequence of an environmental impact or risk is the potential outcome of the event on affected receptors (particular values and sensitivities). Consequence can be positive or negative.
Control measure	Defined under the OPGGS(E)R as *a system, an item of equipment, a person or a procedure, that is used as a basis for managing environmental impacts and risks.*

Emergency condition	An unplanned event that has the potential to cause significant environmental damage or harm to a Matter of National Environmental Significance (MNES). An environmental emergency condition may, or may not, correspond with a safety incident considered to be a Major Accident Event.
Environment	Under the OPGGS(E)R means: *(a) ecosystems and their constituent parts, including people and communities; and* *(b) natural and physical resources; and* *(c) the qualities and characteristics of locations, places and areas; and* *(d) the heritage value of places;* *and includes* *(e) the social, economic and cultural features of the matters mentioned in paragraphs (a), (b), (c) and (d).*
Environmental aspect	An element or characteristic of an operation, product, or service that interacts or can interact with the environment. Environmental aspects can cause environmental impacts.
Environmental impact	Defined under the OPGGS(E)R *as any change to the environment, whether adverse or beneficial, that wholly or partially results from an activity.*
Environmental performance outcome (EPO)	Defined under the OPGGS(E)R as *a measurable level of performance required for the management of environmental aspects of an activity to ensure that environmental impacts and risks will be of an acceptable level.*
Environmental performance standard (EPS)	Defined under the OPGGS(E)R *as a statement of the performance required of a control measure.*
Environment receptors (or receptors)	Features of the environment that may be affected by impacts and risks.
Environmental risk	An unplanned environmental impact has the potential to occur, due either directly or indirectly from undertaking the activity.
Likelihood	The is the chance of the impact occurring.
Measurement criteria	Is a verifiable mechanism for determining control measures are performing as required.
Receptor	A receptor is a component of the environment that may be affected by the activity.
Residual risk	The risk remaining after control measures have been applied (i.e. after risk treatment).

2.2 Communicate and Consult

In accordance with the requirements of the OPGGS(E)R, during the development of this EP, Beach has consulted with relevant persons to obtain information in relation to their functions, interests and activities associated with the activity and potential impacts and risks. This information has been used to inform the EP and the impact and risk assessment undertaken for the activity.

2.3 Establish the Context

Context for the risk assessment process is established by:

- Identifying the environmental aspects of the activity that will or may cause environmental impacts or may present risks to the environment based on the 'Description of the Activity' in Section 3.
- Understanding the objections or claims of relevant persons and incorporating their feedback and any information provided into the design of the activity where appropriate as outlined in Section 4, 'Stakeholder Consultation'.
- Understanding the regulatory framework in which the activity takes place as described in Section 5, 'Environment Requirements'.
- Identifying the environment that may be affected (EMBA), either directly or indirectly, by the activity, as described in the 'Description of the Environment' in Section 6).

2.4 Identify the Potential Impacts and Risks

Potential impacts (planned) and risks (unplanned) associated with the environmental aspects of the activity are identified in relation to the receptors that may be affected, either directly or indirectly, by one or multiple aspects of the activity i.e., identifying the cause-effect pathway by which environmental and social receptors may be impacted. Table 7-1 details the aspects identified for the activity.

2.5 Analyse the Potential Impacts and Risks

Once impacts and risks have been identified, an analysis of the nature and scale of the impact or risk is undertaken. This involves determining the possible contributing factors associated with the impact or risk. Each possible cause should be identified separately, particularly where controls to manage the impact or risk differ. In this way, the controls can be directly linked to the impact or risk.

2.5.1 Establish Environmental Performance Outcomes

Environmental performance outcomes (EPOs) are developed to provide a measurable level of performance for the management of environmental aspects of an activity to ensure that environmental impacts and risks will be of an acceptable level. The process of defining an appropriate EPO, has relied on the required levels of performance set either in legislation (such as the OPGGS Act), Government guidance notes such as the Matters of National Environmental Significance–Significant Impact Guidelines (CoA 2013), Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) recovery/management plans or may be the result of consultation with relevant persons and/ or organisations (e.g. fishers, marine users, First Nations).

EPOs for Program activities have been set within the Offshore Project Proposal for Otway Offshore Gas Victoria Project (Beach 2025), referred to as the OPP. The EPOs in the OPP was assessed to meet the requirements of the OPGGS(E)R to be appropriate, consistent with the principles of ecologically sustainable development (ESD) and to demonstrate that the environmental impacts and risks of the Otway Offshore Gas Victoria Project will be managed to an acceptable level.

EPs must provide for appropriate EPOs in accordance with Paragraph 34(d) of the OPGGS(E)R. EPs that relate to an activity that is, or is part of, an offshore project must include EPOs that are appropriate in the context of the EPOs set out in the accepted OPP. The Explanatory Statement for the OPGGS(E)R states that a titleholder may refine the EPOs, after an OPP has been accepted however the EPOs will still need to demonstrate that environmental impacts and risks will be managed to an acceptable level (refer to Sections 2.6 and 2.8 for details on identifying controls measures and establishing Environmental Performance Standards (EPS) for management of impacts and risks to acceptable levels).

Table 2-2: Comparison of EP EPOs to relevant OPP EPOs

Aspect	EPOs in this EP	Relevant EPOs from Otway OPP	Comparison
Planned Activities			
Light Emissions (7.2)	EPO2: No death or injury to listed threatened or migratory species from the activity	OPP-EPO7: No death or injury to listed threatened or migratory species from Project activities.	EPO2 is equivalent to OPP-EPO7 given both provide the same statements.
	EPO3: Biologically important behaviours can continue while the activity is being undertaken.	OPP-EPO8: Biologically important behaviours can continue while Project Activities are being undertaken.	EPO3 is equivalent to OPP EPO8 given both provide the same statements.
Atmospheric Emissions (7.3)	EPO5: No substantial reduction of air quality within local airshed caused by atmospheric emissions produced during the activity.	OPP-EPO13: Manage atmospheric emissions from the combustion of fuel during vessel and MODU operations in accordance with MARPOL Annex VI (Prevention of Air Pollution from Ships) enacted in the Navigation Act 2012.	EPO5 is equivalent to OPP-EPO13 as it manages atmospheric emissions from the combustion of fuel during vessel and MODU operations in accordance with MARPOL Annex VI (Prevention of Air Pollution from Ships) enacted in the Navigation Act 2012 and therefore ensures no substantial reduction of air quality within local airshed caused by atmospheric emissions produced during the activity.
Underwater Sound (7.4)	EPO2: No death or injury to listed threatened or migratory species from the activity.	OPP-EPO7: No death or injury to listed threatened or migratory species from Project activities.	Refer above.
	EPO3: Biologically important behaviours can continue while the activity is being undertaken.	OPP-EPO8: Biologically important behaviours can continue while Project Activities are being undertaken.	Refer above.
	EPO4: Anthropogenic noise in biologically important areas and habitat critical to the survival of a species will be managed such that:	OPP-EPO10: Anthropogenic noise in biologically important areas and habitat critical to the survival of a species will be managed such that:	EPO4 is equivalent to OPP-EPO8 given both provide the same statements.

Aspect	EPOs in this EP	Relevant EPOs from Otway OPP	Comparison
	• Any blue whale continues to utilise biologically important areas without injury and is not displaced from a foraging area. • It does not prevent any southern right whale from utilising biologically important areas or habitat critical to the survival of a species or cause auditory impairment (TTS and PTS).	• Any blue whale continues to utilise biologically important areas without injury, and is not displaced from a foraging area. • It does not prevent any southern right whale from utilising biologically important areas or habitat critical to the survival of a species or cause auditory impairment (TTS and PTS).	
Physical Presence (7.5)	EPO1: Undertake the activity in a manner that will not interfere with other marine users to a greater extent than is necessary for the exercise of right conferred by the titles granted.	OPP-EPO1: Implement CM05 and CM06 for the establishment and maintenance of petroleum safety zones, temporary exclusion zones and cautionary zones.	EPO1 is equivalent to OPP-EPO1 because the establishment and maintenance of petroleum safety zones, temporary exclusion zones and cautionary zones will ensure no interference with other marine users to a greater extent than is necessary for the exercise of right conferred by the titles granted. Both EPOs align with the OPGGS Act.
Seabed Disturbance (7.6)	EPO6: No substantial or unrecoverable change in seabed quality which may adversely impact on biodiversity, ecological integrity, social amenity, cultural values or human health.	OPP-EPO3: Implement CM08 Project Execution Plans and CM09 MODU and Vessel Anchoring Plan to ensure placement of infrastructure and anchors will avoid unique seafloor habitats in the Project Area.	EPO6 is equivalent to OPP-EPO3 as the limitation of the seabed disturbance footprint to the planned well and infrastructure locations will promote no substantial or unrecoverable change in seabed quality which may adversely impact on biodiversity, ecological integrity, social amenity, cultural values or human health.
	EPO7: No impact to submerged cultural heritage.	OPP-EPO5: No impact on underwater cultural heritage.	EPO7 is equivalent to OPP-EPO5 as cultural heritage assessments will identify underwater archaeology and cultural heritage to inform protection priorities and develop management measures to promote no impact to submerged cultural heritage.

Aspect	EPOs in this EP	Relevant EPOs from Otway OPP	Comparison
Planned Marine Discharges – MODU and vessels (7.7)	EPO8: No impact to water quality at a distance > 500 m from the vessel or MODU from planned marine discharges.	OPP-EPO17: Implement CM29 Chemical selection process to ensure chemicals used are environmentally acceptable whilst also meeting technical requirements OPP-EPO24: Implement CM35 Marine orders to manage routine discharges of operational wastes from vessels in accordance with Marine Orders 91 and 95.	EPO8 is equivalent to OPP-EPOs 17 and 24 given the implementation of these control measures will sure no impacts to water quality at distances greater than 500 m from the vessel of MODU from planned marine discharges.
Planned Marine Discharges – Completions, Interventions, P&A (7.8)	EPO8: No impact to water quality at a distance > 500 m from the vessel or MODU from planned marine discharges.	OPP-EPO16: Implement CM28 Well design to ensure all wells to be drilled with WBDF, with SBDF only to be used where technical requirements preclude the use of WBDF. OPP-EPO17: Implement CM29 Chemical selection process to ensure chemicals used are environmentally acceptable whilst also meeting technical requirements OPP-EPO18: Implement CM30 Drilling fluid inventory to reduce or avoid discharge of bulk materials including excess powders, brines, and drilling fluids. OPP-EPO19: Implement CM31 Solids control equipment to recover and reduce residual SBDF content prior to overboard discharge, if SBDF is used. OPP-EPO20: Implement CM32 Minamata convention to ensure drilling fluids will have concentrations of mercury and cadmium less than 1 mg/kg and 3 mg/kg respectively in stock barite (WBM and SBM)	EPO8 is equivalent to OPP-EPOs 16 to 20 given the implementation of these control measures will ensure no impacts to water quality at distances greater than 500 m from the vessel of MODU from planned marine discharges.

Aspect	EPOs in this EP	Relevant EPOs from Otway OPP	Comparison
Solid Waste Management (7.9)	EPO10: No unplanned discharge of materials or waste to the marine environment.	OPP-EPO26: No unplanned discharge of materials or waste to the marine environment.	EPO10 and EPO11 are equivalent to OPP-EPO26 given the same statement is provided for against EPO10 and OPP-EPO26. Also, by meeting EPO11, OPP-EPO26 is inherently met.
	EPO11: Waste generated will be segregated and disposed of onshore in accordance with relevant legislation.		
Unplanned Activities			
Establishment of Invasive Marine Species (7.10)	EPO9: No introduction of a known or potential invasive marine species.	OPP-EPO15: No introduction of a known or potential invasive marine species.	EPO9 is equivalent to OPP-EPO15 given both provide the same statements.
Fauna Interaction (7.11)	EPO2: No death or injury to listed threatened or migratory species from the activity.	OPP-EPO7: No death or injury to listed threatened or migratory species from Project activities.	Refer above.
Loss of Materials and Waste (7.12)	EPO2: No death or injury to listed threatened or migratory species from the activity.	OPP-EPO7: No death or injury to listed threatened or migratory species from Project activities.	Refer above.
	EPO10: No unplanned discharge of materials or waste to the marine environment.	OPP-EPO26: No unplanned discharge of materials or waste to the marine environment.	Refer above.
Loss of Containment (7.13)	EPO1: Undertake the activity in a manner that will not interfere with other marine users to a greater extent than is necessary for the exercise of right conferred by the titles granted.	OPP-EPO1: Implement CM5 and CM6 for the establishment and maintenance of petroleum safety zones, temporary exclusion zones and cautionary zones.	Refer above.

Aspect	EPOs in this EP	Relevant EPOs from Otway OPP	Comparison
	EPO2: No death or injury to listed threatened or migratory species from the activity.	OPP-EPO7: No death or injury to listed threatened or migratory species from Project activities.	Refer above.
	EPO12: No unplanned loss of containment of hydrocarbons or chemicals to the marine environment.	OPP-EPO27: No unplanned loss of containment of hydrocarbons or chemicals to the marine environment during Project activities.	EPO12 is equivalent to OPP-EPO27 given both provide the same statements.

2.6 Evaluate and Treat the Potential Impacts and Risks

The following steps are undertaken using the Beach Risk Matrix (Table 2-3) to evaluate the potential impacts and risks:

- Identify the consequences of each potential environmental impact, corresponding to the maximum credible impact.
- For unplanned events (risks), identify the likelihood (probability) of unplanned environmental impacts occurring.
- For unplanned events (risks), assign a level of risk to each potential environmental impact using the risk matrix.
- Identify control measures to manage potential impacts and risks to as low as reasonably practicable (ALARP) (Section 2.7) and an acceptable level (Section 2.8).
- Establish EPS for each of the identified control measures.

Table 2-3: Beach risk matrix

CDN 14740489 Beach Risk Matrix

Risk Matrix

CONSEQUENCE	CONSEQUENCE CATEGORY: PEOPLE	ENVIRONMENT	REPUTATION	FINANCIAL[1]	LEGAL	LIKELIHOOD: A. Remote	B. Highly Unlikely	C. Unlikely	D. Possible	E. Likely	F. Almost Certain
	Impact to Beach or contracting personnel	Natural environment	Community safety, reputation/social licence. media, items of cultural significance.	Financial impact (e.g. due to loss of revenue, business interruption, asset loss etc.)	Breach of law, prosecution, civil action	<1% chance of occurring within the next year. Requires exceptional circumstances, unlikely event in the long-term future. Only occur as a 100-year event.	>1% chance of occurring within the next year. May occur but not anticipated. Could occur years to decades.	>5% chance of occurring within the next year. May occur but not for a while. Could occur within a few years.	>10% chance of occurring within the next year. May occur shortly but a distinct probability it won't. Could occur within months to years.	>50% chance of occurring within the next year. Balance of probability will occur. Could occur within weeks to months.	99% chance of occurring within the next year. Impact is occurring now. Could occur within days to weeks.
6 Catastrophic	Multiple fatalities >4 or severe irreversible disability to large group of people (>10)	Catastrophic offsite or onsite release or spill; long-term destruction of highly significant ecosystems; significant effects on endangered species or habitats; irreversible or very long-term impact	Multiple community fatalities; complete loss of social licence; prolonged negative national media; complete loss of items of cultural significance	>$500m	Prolonged and complex civil and/or regulatory litigation; potential jail terms and/or very high fines and/or damages claim	HIGH	HIGH	VERY HIGH	VERY HIGH	VERY HIGH	VERY HIGH
5 Critical	1-3 fatalities or serious irreversible disability (>30%) to multiple persons (<10)	Significant offsite or onsite release or spill; eradication or impairment of the ecosystem; significant impact on highly valued species or habitats; widespread long-term impact	Community fatality; significant loss of social licence; negative national media for 2 or more days; significant damage to items of cultural significance	$100m-$500m	Civil and/or regulatory litigation; potential significant fines and/or damages claim	MEDIUM	MEDIUM	HIGH	HIGH	VERY HIGH	VERY HIGH
4 Major	Serious permanent injury/ illness or moderate irreversible disability (<30%) to one or more persons	Major offsite or onsite release or spill; very serious environmental effects, such as displacement of species and partial impairment of ecosystem; major impact on highly valued species or habitats; widespread medium and some long-term impact	Serious permanent injury to community member; major damage to social licence; negative national media; major damage to items of cultural significance	$10m-$100m	Civil and/or regulatory litigation; potential major fine and damages claim	MEDIUM	MEDIUM	MEDIUM	HIGH	HIGH	VERY HIGH
3 Serious	Serious reversible/ temporary injury/illness; Lost Time Injury >5 days or Alternate/Restricted Duties >1 month	Minor offsite or onsite release or spill; serious short-term effect to ecosystem functions; serious impact on valued species or habitats; moderate effects on biological or physical environment	Serious reversible injury to community member; serious damage to social licence; negative state media; serious damage to items of cultural significance	$1m-$10m	Serious potential breach of law; report and investigation by regulator; possible prosecution or regulatory notice (e.g. improvement notice or equivalent), or possible civil litigation and serious damages claim	LOW	MEDIUM	MEDIUM	MEDIUM	HIGH	HIGH
2 Moderate	Reversible temporary injury/ illness requiring Medical Treatment; Lost Time Injury ≤5 days or Alternate/Restricted Duties for ≤1 month	Event contained within site; short-term effects but not affecting ecosystem functions; some impact on valued species or habitats; minor short-term damage to biological and/or physical environment	Moderate injury to community member; moderate impact to social licence; negative local media; moderate damage to items of cultural significance	$100k-$1m	Potential breach of law or non-compliance; inquiry by a regulator leading to Low-level legal issues; possible civil litigation and moderate damages claim	LOW	LOW	MEDIUM	MEDIUM	MEDIUM	HIGH
1 Minor	First Aid Injury/illness	Spill limited to release location; minor effects but not affecting ecosystem functions; no impact on valued species or habitats; low-level impacts on biological and physical environment	Minor injury to community member, public concern restricted to local complaints, minor damage to items of cultural significance	≤$100k	Minor potential breach of law; not reportable to a regulator; on the spot fine or technical non-compliance	LOW	LOW	LOW	MEDIUM	MEDIUM	MEDIUM

2.7 Demonstration of ALARP

Beach's approach to demonstration of ALARP includes:

- Systematically identify and assess all potential environmental impacts and risks associated with the activity.
- Where relevant, apply industry 'good practice' controls to manage impacts and risks.
- Assess the effectiveness of the controls in place and determine whether the controls are adequate according to the 'hierarchy of control' principle.
- For higher order impacts and risks undertake a layer of protection analysis and implement further controls if both feasible and reasonably practicable to do so.

NOPSEMA's EP decision making guideline (NOPSEMA 2024) states that in order to demonstrate ALARP, a titleholder must be able to implement all available control measures where the cost is not grossly disproportionate to the environmental benefit gained from implementing the control measure.

For this EP, the guidance provided in NOPSEMA's EP decision making guideline (NOPSEMA 2024) has been applied, whereby the level of ALARP assessment is dependent upon the:

- Residual impact and risk level (high versus low).
- The degree of uncertainty associated with the assessed impact or risk.

2.7.1 Residual Impact and Risk Levels

The Beach Risk Matrix (Table 2-3) provides a six-level scale for assessing both consequence and likelihood which leads to an overall risk level which can be Low, Medium, High or Very High. Consequence and likelihood levels are defined in Table 2-3, whereas the risk levels can be understood as follows:

- Low: risks can be considered broadly acceptable and are required to be reviewed annually by the risk owner. Compliance with 'good industry practice' is generally sufficient for these risks to be considered acceptable by the Site Activity Manager. No further controls are required for risks at this level.
- Medium: risks can be considered broadly acceptable and are required to be reviewed annually by the risk owner. In addition to 'good industry practice', further controls may be considered for risks at this level to be reduced to a level deemed acceptable by the Asset/Project/Site Manager.
- High: Beach considers High risks to be material risks which require regular quarterly reviews to ensure they are being managed effectively. Further controls will be considered for risks at this level to be reduced to a level deemed acceptable
- Very High: Beach considers Very High risks to be material risks which require regular monthly reviews to ensure they are being managed effectively. Further controls and high level oversight is maintained for risks at this level.

2.7.1.1 Lower-order Environmental Impacts and Risks

NOPSEMA defines lower-order environmental impacts and risks as those where the environment or receptor is not formally managed, less vulnerable, widely distributed, not protected and/or threatened and there is confidence in the effectiveness of adopted control measures.

Impacts and risks are considered to be lower-order and ALARP when, using the Beach Environmental Risk Assessment Matrix (Table 2-3), the impact consequence is rated as 'minor' or 'moderate' or risks are rated as 'low' or 'medium'. In these cases, applying 'good industry practice' (as defined in Section 2.7.2.1) is sufficient to manage the impact or risk to ALARP.

2.7.1.2 Higher-order Environmental Impact and Risks

NOPSEMA defines higher-order environmental impacts and risks as those that are not lower order risks or impacts (i.e., where the environment or receptor is formally managed, vulnerable, restricted in distribution, protected, or threatened and there is little confidence in the effectiveness of adopted control measures).

Impacts and risks are considered higher-order when, using the Beach Environmental Risk Assessment Matrix (Table 2-3), the impact consequence is rated as 'serious', 'major', 'critical' or 'catastrophic', or when the risk is rated as 'high' or 'very high'. In these cases, further controls must be considered as per Section 2.7.2.

An iterative risk evaluation process is employed until such time as any further reduction in the residual risk ranking is not reasonably practicable to implement. At this point, the impact or risk is reduced to ALARP. The determination of ALARP for the consequence of planned operations and the risks of unplanned events is outlined in Table 2-4.

Table 2-4: ALARP determination for consequence (planned operations) and risk (unplanned events)

Consequence Ranking	Minor	Moderate	Serious	Major	Critical	Catastrophic
Planned operation	Broadly acceptable	Tolerable if ALARP		Intolerable		
Residual impact category	Lower order impacts		Higher order impacts			
Risk ranking	Low	Medium	High	Very High		
Unplanned event	Broadly acceptable	Tolerable if ALARP		Intolerable		
Residual risk category	Lower order risks		Higher order risks			

2.7.2 Uncertainty of Impacts and Risks

In addition to the evaluation of residual impacts and risks as described above, the relative level of uncertainty associated with the impact or risk is also used to inform whether the application of industry good practice is sufficient to manage impacts and risks to ALARP, or if the evaluation of further controls is required.

In alignment with NOPSEMA's ALARP Guidance Note (NOPSEMA 2022a), Beach have adapted the approach developed by Oil and Gas UK (OGUK) (OGUK 2014) for use in an environmental context to determine the assessment technique required to demonstrate that potential impacts and risks are ALARP (Figure 2-2). Specifically, the framework considers impact severity and several guiding factors:

- Activity type
- Risk and uncertainty
- Stakeholder influence

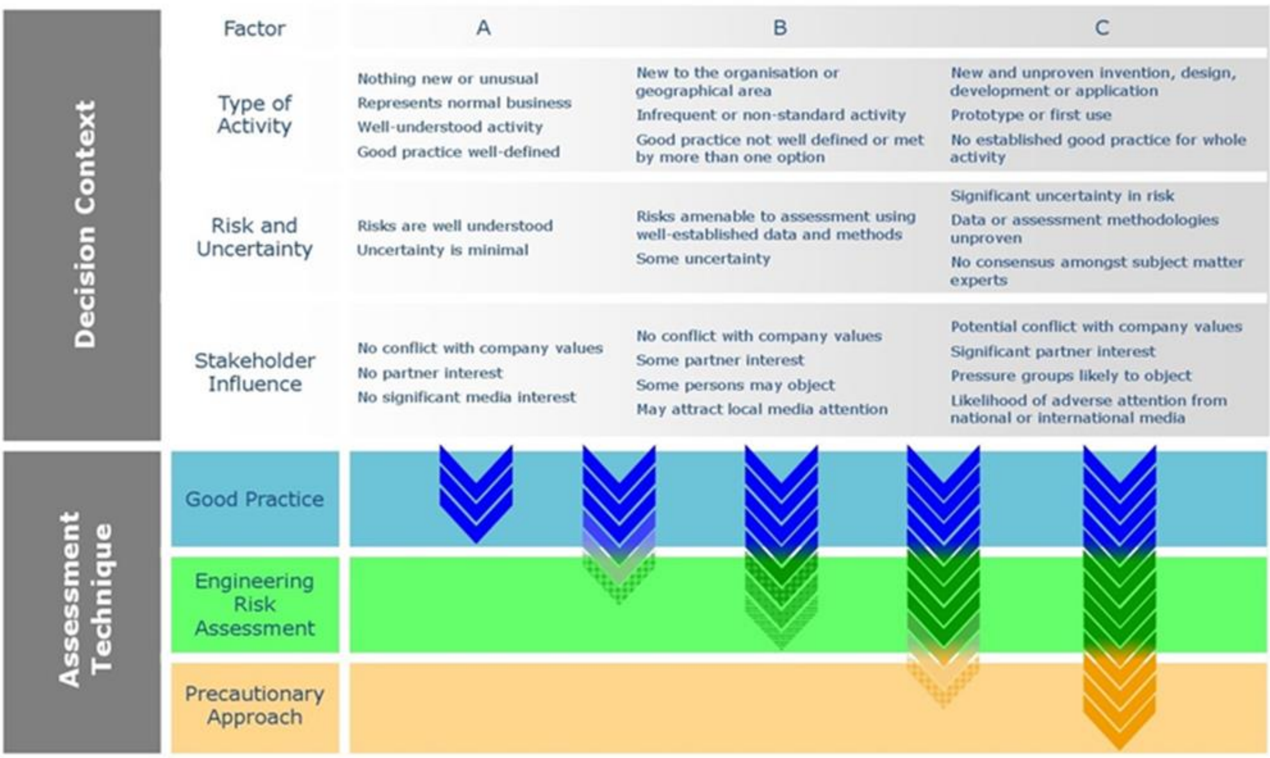


Figure 2-2: OGUK (2014) decision support framework

A **Type A** decision is made if the risk is relatively well understood, the potential impacts are low, activities are well practised, and there are no conflicts with company values, no partner interests, and no significant media interests. However, if good practice is not sufficiently well-defined, additional assessment may be required.

A **Type B** decision is made if there is greater uncertainty or complexity around the activity and/or risk, the potential impact is moderate, and there are no conflict with company values, although there may be some partner interest, some persons may object, and it may attract local media attention. In this instance, established good practice is not considered sufficient and further assessment is required to support the decision and ensure the risk is ALARP.

A **Type C** decision typically involves sufficient complexity, high potential impact, uncertainty, or stakeholder influence to require a precautionary approach. In this case, relevant good practice still must be met, additional assessment is required, and the precautionary approach applied for those controls that only have a marginal cost benefit.

In accordance with the regulatory requirement to demonstrate that environmental impacts and risks are ALARP, Beach has considered the above decision context in determining the level of assessment required.

The levels of assessment techniques considered include:

- Good practice
- Engineering risk assessment
- Precautionary approach

2.7.2.1 Good Practice

OGUK (2014) defines 'good practice' as the recognised risk management practices and measures that are used by competent organisations to manage well-understood impacts and risks arising from their activities.

'Good practice' can also be used as the generic term for those measures that are recognised as satisfying the law. For this EP, sources of good practice include:

- Requirements from Australian legislation and regulations.
- Relevant Australian policies.
- Relevant Australian Government guidance.
- Relevant industry standards and/or guidance material.
- Relevant international conventions.

If the ALARP technique is determined to be 'good practice', further assessment ('engineering risk assessment') is not required to identify additional controls. However, additional controls that provide a suitable environmental benefit for an insignificant cost are also identified at this point.

2.7.2.2 Engineering Risk Assessment

All potential impacts and risks that require further assessment are subject to an 'engineering risk assessment'. Based on the various approaches recommended in OGUK (2014), Beach believes the methodology most suited to this activity is a comparative assessment of risks, costs, and environmental benefit. A cost–benefit analysis should show the balance between the risk benefit (or environmental benefit) and the cost of implementing the identified measure, with differentiation required such that the benefit of the control can be seen and the reason for the benefit understood.

2.7.2.3 Precautionary Approach

OGUK (2014) states that if the assessment, considering all available engineering and scientific evidence, is insufficient, inconclusive, or uncertain, then a precautionary approach to impact and risk management is needed. A precautionary approach will mean that uncertain analysis is replaced by conservative assumptions that will result in control measures being more likely to be implemented.

That is, environmental considerations are expected to take precedence over economic considerations, meaning that a control measure that may reduce environmental impact is more likely to be implemented. In this decision context, the decision could have significant economic consequences to an organisation.

2.8 Demonstration of Acceptability

The OPGGS(E)R requires demonstration that environmental impacts and risks are of an acceptable level.

The acceptability of the for Otway Offshore Gas Victoria Project, including Program activities described in this EP, was demonstrated in the OPP in accordance with Regulation 13 of the OPGGS(E)R. The EPOs set out in the accepted OPP demonstrates that environmental impacts and risks will be managed to an acceptable level. The impacts and risks of the Otway Offshore Gas Victoria Project were determined to be acceptable in the OPP through consideration of the following evaluation criteria (as defined in Section 5.8 of the OPP):

- The principles of ecologically sustainable development (ESD) as defined under the EPBC Act (Section 2.8.1)
- Other requirements (e.g. laws, policies, standards, conventions etc.), including significant impacts to MNES
- Internal context
- External context
- Comparison of predicted impact or risk against the defined acceptable level.

In this EP, Beach demonstrates the defined acceptable levels in the OPP have been met by providing an acceptability assessment for the above listed criteria in addition to the following considerations:

- Using relevant OPP EPOs and control measures or their equivalents (Table 2-2)
- Using identified EP specific control measures (Section 2.6)
- Implementing the above control measures to ensure impact and risk rankings in this EP are equal to or less than those defined in the OPP, to meet the established EPOs for this EP and the OPP
- Assessment of the internal and external context relevant to this EP, which incorporates EP-specific consultation.

2.8.1 Principles of Ecologically Sustainable Development

Based on Australia's National Strategy for Ecologically Sustainable Development (ESD) (Council of Australian Governments 1992), Section 3A of the EPBC Act defines ecologically sustainable development as:

Using, conserving and enhancing the community's resources so that ecological processes, on which life depends, are maintained and the total quality of life, now and in the future, can be increased.

The principles of ecologically sustainable development as defined under the EPBC Act and in alignment with NOPSEMA's OPP Decision Making Guideline (NOPSEMA 2024) are provided in Table 2-5.

Table 2-5: Relevant ESD principles

Principle	Definition	Beach Implementation
A 'Integration principle'	Decision making processes should effectively integrate both long term and short term economic, environmental, social, and equitable considerations.	Consideration of the integration principle was provided in the accepted OPP against each defined acceptable level and all impact and risk acceptability demonstration evaluations in the OPP through the incorporation of consultation feedback. Given this EP is part of the OPP for Otway Offshore Gas Victoria Project, this principle is inherently met through the EP development process and acceptability assessment against the external context criterion, as such this principal is not considered separately for each acceptability evaluation.
B 'Precautionary principle'	If there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.	Serious or irreversible environmental damage equates to higher-order environmental impacts and risks. Impacts and risks are considered higher-order when, using the Beach risk matrix (Table 2-3) the impact consequence is rated as 'serious', 'major', 'critical' or 'catastrophic', or when the risk is rated as 'high' or 'very high'. Impacts and risks for this EP were assessed for consistency against the precautionary principle of ESD. If a higher-order impact or risk is identified, then the project shall assess whether there is significant uncertainty in the evaluation, and if so, whether the precautionary approach should be applied.
C 'Intergenerational principle'	The principle of inter-generational equity — that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations.	The EP risk assessment methodology ensures that potential impacts and risks are ALARP, where the potential impacts and risks are determined to be serious or irreversible the precautionary principle is implemented to ensure the environment is maintained for the benefit of future generations. Consequently, this principal is not considered separately for each acceptability evaluation.
D 'Biodiversity principle'	The conservation of biological diversity and ecological integrity should be a fundamental consideration in decision making.	Evaluation that the predicted impacts and risks (including impacts and risks to MNES identified within regulation 7(3) of the Environment Regulations) will be managed to an acceptable level that will not affect the conservation of biological diversity and ecological integrity. Beach considers if there is the potential to affect biological diversity and ecological integrity through the impact and risk assessment process.
E 'Valuation principle'	Improved valuation, pricing and incentive mechanisms should be promoted.	Consideration of the valuation principle of ESD is factored into the maintenance of project financial assurances to prove Beach's capacity to meet costs, expenses and liabilities associated with the Project. As part Project financial assurances, Beach will bear the cost of environmental management for the whole of project life to ensure that the environmental impacts and risks are managed to an acceptable level. Financial assurance obligations includes consideration of costs associated with: The polluter pays principle: eliminating or controlling the escape of petroleum, cleaning up the escaped

	petroleum and remediating any resulting damage to the environment and carrying out environmental monitoring of the impact of the escape on the environment. Maintenance and removal of property: Section 572 of the OPGGS Act places requirements on titleholders in relation to the maintenance and removal of structures, equipment and other property brought into a title area. Safeguard mechanism: Scope 1 emissions associated with gas production from the Project would be reported at the individual facility (NGER) level and are forecast to be below the Safeguard Mechanism threshold. For the OPP, Beach have engaged with the Clean Energy Regulator to discuss the Safeguard Mechanism boundary. Beach will continue these discussions with the Clean Energy Regulator as the Project progresses. In accordance with the OPGGS Act, Beach will demonstrate compliance with the financial assurance obligations under the OPGGS Act to NOPSEMA prior to acceptance of this EP. No further consideration of the valuation principle of ESD has been provided in this EP.

2.8.2 Other Requirements

Aside from internal and external context, other requirements must be considered in the assessment of acceptability. These include:

- Environmental legislation (described in Section 5)
- Policies and guidelines (described in Section 5)
- International agreements (described in Section 5)
- EPBC Management Plans (described in Section 5.1)
- Australian Marine Park designations (described in Section 6.2.2)

These acceptance criteria are met when: compliance with specific laws or standards is demonstrated; management of the impact or risk is consistent with relevant industry practices; and the proposed impact or risk controls, EPOs and environmental performance standards (EPS) are consistent with the nature of the receiving environment based upon formal management plans.

2.8.3 Internal Context

Beach's OEMS includes Elements and Standards relevant to the way Beach operates.

At the core of the OEMS are 11 Elements (see Section 8.1.1) which detail specific performance requirements for the implementation of Beach's Environment Policy and management of potential HSE impacts and risks.

Elements and Standards in the OEMS which are relevant to either the activity, impact, control or receptor will be described within the internal context and contribute towards the assessment of acceptability.

To meet this acceptance criteria, the impact or risk must be compliant with the objectives of Beach's Environment Policy. Where specific internal procedures, guidelines, expectations are in place for management of the impact or risk in question, acceptability is demonstrated.

2.8.4 External Context

External context considers stakeholder expectations, obtained from stakeholder consultation.

Beach has undertaken stakeholder consultation, which is described in detail in Section 4. Where objections or claims have been raised, these are considered in the assessment of acceptability of related impacts and risks.

To meet this acceptance criteria, the merits of claims or objections raised by a relevant stakeholder must have been adequately assessed and additional controls adopted where appropriate.

2.9 Monitoring and Review

Monitoring and review activities are incorporated into the impact and risk management process to ensure that controls are effective and efficient in both design and operation. This is achieved through the EPO, EPS and measurement criteria that are described for each environmental impact or risk. Monitoring and review are described in detail in the Implementation Strategy (Section 8).

3 Description of the Activity

Beach plans to undertake exploration and appraisal drilling activities within Commonwealth waters of the Otway Basin commencing in Q2 of 2025. The drilling activities are the subject of a separate EP – OGV Drilling and P&A Activities (V-1000-P1-RP-0002) and includes drilling and either P&A or suspension of well for future production in a success case (the OGV Drilling program).

This EP covers the planned well completions of successful wells drilled in the OGV Drilling program as well as Artisan 1 which was drilled and suspended in 2021.

The proposed scope of activities covered by this EP includes:

- Well completion of up to 4 wells in the Otway Basin as part of the Offshore Gas Victoria (OGV) Project including:

  Wellbore flowback, clean-up and fluid/gas sampling

  Contingent evaluation of the cement bond for barrier and/or zonal isolation confirmation

  Installation and suspension with a subsea production tree (XT)
- Well intervention of up to 2 wells
- P&A and removal of well infrastructure below the mudline for one well:

  P&A and removal activities at Artisan 1 are included as a contingency should Beach decide not to complete and develop this well. Inclusion of P&A and removal activities within this EP does not commit the titleholder to undertake such activities.
- Associated MODU and support operations
- Visual inspection of completed wells

Details of the wells involved within the scope of this EP including, indicative locations are detailed in Table 3-1 and Figure 3-1.

Table 3-1: Well details and locations

Well Name	Activity Summary	Well Locations (GDA2020)		Petroleum Title	Water Depth (~m)	Distance from Port Campbell (~km)
		Latitude	Longitude			
Artisan 1	Completion, XT installation, well flowback/clean-up or Contingent P&A	38° 53' 29.40" S	142° 52' 56.88" E	VIC/L35	69	31.8
Hercules 1	Completion, XT installation, well flowback/clean-up	38° 56' 00.84" S	142° 52' 58.76" E	VIC/P43	73	36.3

Doris 1	Completion, XT installation, well flowback/clean-up	38° 51' 18.30" S	142° 50' 16.15" E	VIC/L35	68	29.6
La Bella 2	Completion, XT installation, well flowback/clean-up	39° 00' 13.47" S	142° 41' 57.04" E	VIC/L36	92	49.9
Thylacine West 1	Well intervention	39° 13' 20.28" S	142° 50' 19.08" E	T/L2	103	68.3
Thylacine North 1	Well intervention	39° 12' 30.60" S	142° 52' 29.76" E	T/L2	99	66.3

3.1 Operational Area

The Operational Area is where planned activities will occur (Figure 3-1). The Operational Area for the Program includes a 3 km radius around the well sites which encompasses both the outer extent of MODU mooring equipment on the seabed and the 500 m petroleum safety zone (PSZ). Final well locations for new wells (Hercules 1, Doris 1 and La Bella 2) are subject to seabed survey and final drilling locations.

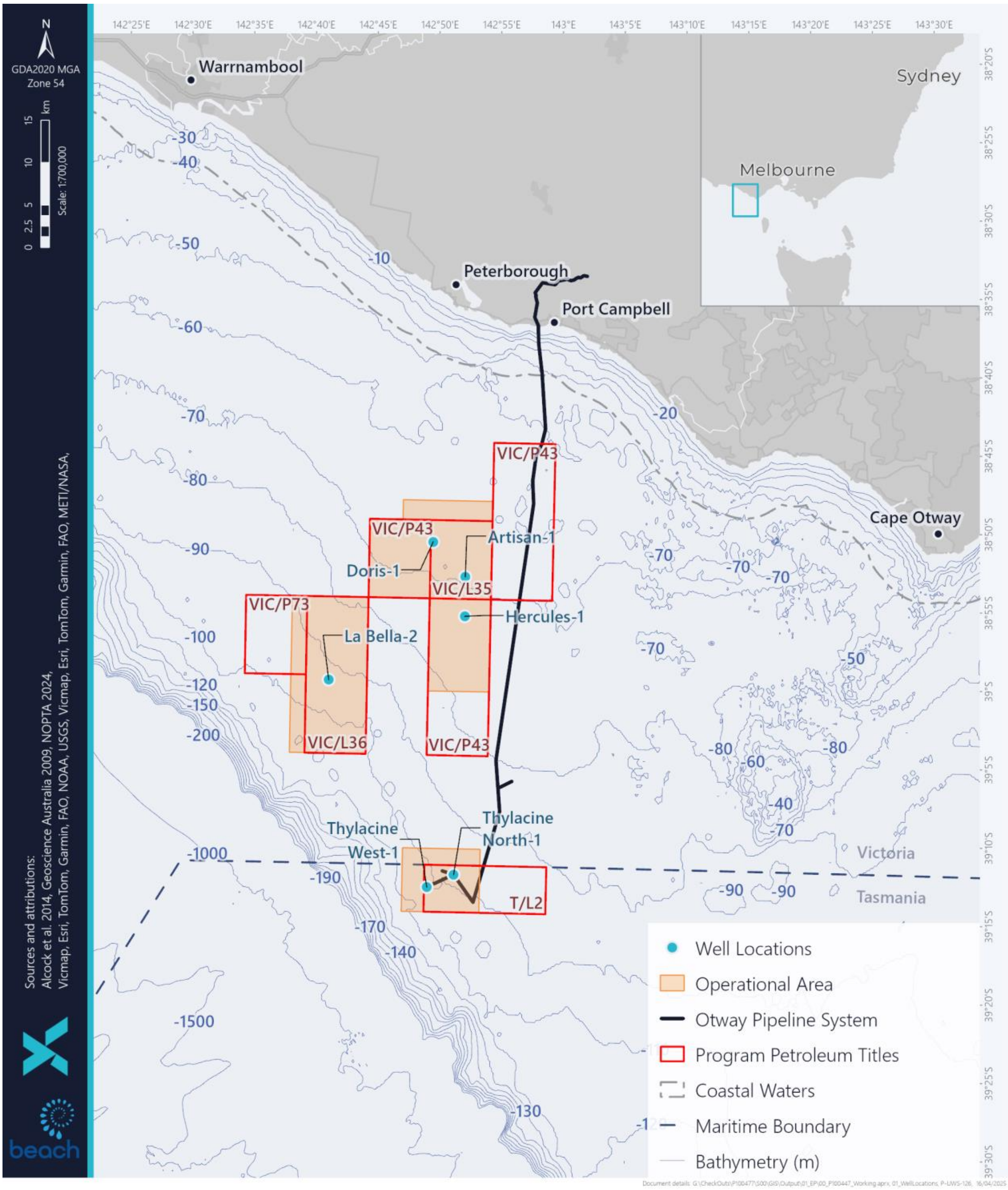


Figure 3-1: Operational Area and Program well locations

3.2 Activity Timing

The estimated timings for each activity are:

- Installation of XT, well completions and well flowback/clean-up activities (25 days per well) at:

  Artisan 1

  Hercules 1

  Doris 1

  La Bella 2 (if not already installed during drilling operations under Drilling and P&A EP (V-1000-P1-RP-0002))

- Well interventions at up to 2 existing well locations (15 days per well) at:

  Thylacine West 1

  Thylacine North 1

- Contingency P&A (15 - 20 days) at:

  Artisan 1

- Support operations

  Anchor pre-lay (9-13 days)

These estimates are dependent on the final work program (to be determined from evaluations of exploration and appraisal drilling) and potential operational delays. Activities covered by this EP will likely occur within an operational window of 01 October 2025 to 31 December 2026 with anchor pre-lay 1 to 3 months prior to MODU commencement (see Section 3.4). The Program will consist of approximately 150 days of activity, excluding unforeseen delays due to technical difficulties and extreme weather events. Activities will be conducted on a 24-hour, 7 days per week basis for the duration of the Program.

The mobilisation of the MODU and commencement of activities is dependent on the release of the MODU by its previous operator. Beach is part of a consortium with 3 other operators, all of which are planning campaigns in the Otway with the same MODU. The schedule of activities detailed in this EP is dependent on the actual MODU commencement date and sequencing of well operation programs agreed by all the operators within the consortium.

In addition to the operational window for the well completion activity, the EP also includes visual inspections of the completed wells (Section 3.11). To account for visual well inspections and to ensure that the completed wells are covered by an accepted EP, this EP is likely to continue for up to 5 years or when completed wells are part of a subsequent EPs for other activities under the accepted OPP.

3.2.1 Concurrent Activities

Program activities will all be undertaken from the same MODU (refer to Section 3.3). Therefore, concurrent planned activities by the single MODU are not possible for this petroleum activity.

It is possible that a vessel will be undertaking preparation activities at a well location, i.e. anchor pre-lay, while the MODU is operating elsewhere within the Operational Area. The closest well locations covered by this EP are Thylacine West 1 and Thylacine North 1 (approximately 3.5 km apart). In the event that a MODU is operating at Thylacine West 1 while pre-lay is taking place at Thylacine North 1 (or vice versa), one anchor-handling vessel and one MODU (with its 3 support vessels) would be operating within approximately 3.5 km of each other for a duration of anchor pre-lay activities (~9 to 13 days). Therefore, for the purposes of cumulative impacts (Section 7.1.1), this scenario is considered the most credible worst-case for concurrent activities.

3.3 Mobile Offshore Drilling Unit (MODU)

The Program is proposed to be undertaken using a single moored semi-submersible drill rig with a thruster assisted mooring system, referred to as a MODU.

Beach has undertaken a detailed selection process for the MODU. The Transocean Equinox MODU has been screened for operations in water depths covered by this EP. Transocean was provided metocean data and water depths as part of the MODU tender and have subsequently demonstrated, in conjunction with their mooring contractor, that the Equinox is capable of being safely moored in the range of water depths associated with the wells in the Program.

Independent mooring analysis has been completed demonstrating the selected MODU can be moored in water depths as shallow as 60 m following recommended practices and standards of ISO19901-7 and/or API RP2SK. This analysis used conservative metocean and soil assumptions to confirm suitability. Independent riser analysis has been completed demonstrating the MODU can operate in the range of water depths of the Program and following recommended practices and standards of NORSOK U001 / D010 (design load scenarios), ISO13628-7 (structural integrity) and DNVGL RP C203 (fatigue integrity).

Site specific mooring analysis and riser analysis will be conducted for each location prior to arrival of the selected MODU. Well specific operating guidelines will be provided by Transocean based on these studies in conjunction with other Transocean MODU specific documents. This will also be covered in the MODU Safety Case Revision.

The MODU may have ~140 persons on board (POB) at any given time and will be equipped with marine–standard catering and ablution facilities. Capacity for fuel oil is expected to be up to ~3500 m^3 and the MODU is expected to use ~15 m^3 of diesel per day.

The Transocean Equinox has been used to inform relevant aspects of the environmental impact and risk assessment (Section 7) of this EP, as either this MODU or one with similar capabilities, design and capacities will be used for the Program. Environmental aspects include:

- Bunkering / bulk transfer of fuel, chemicals, and supplies
- Transfer of waste to supply vessels
- Bilge water discharge
- Sewage, greywater and food waste discharge
- Cooling water, bilge and reverse osmosis (RO) brine discharge

While on location, a temporary exclusion zone will be gazetted in accordance with the OPGGS Act (500 m radius around the MODU). The purpose of the exclusion zone is to maintain a safe distance between the drilling campaign areas and fishing boats and other vessels that may operate in the area.

3.4 MODU Positioning

The MODU will either mobilise to the required Operational Area with its own propulsion system or be towed by vessels and anchored or connected to pre-laid anchors prior to commencing activities. Anchors may be positioned (pre-laid) on the sea floor typically 1 month and up to 3 months prior to the MODU being on location.

The MODU will be moored with 8 or 12 anchors, with weight ranging from 15 to 30 MT each, resulting in an individual footprint of ~30 to 60 m^2. A mooring analysis will be undertaken to determine specific mooring requirements for each well location. The mooring analysis will incorporate the results from the geophysical and geotechnical survey obtained prior to MODU mobilisation which is subject to a separate EP (Offshore Gas Victoria Geophysical and Geotechnical Seabed Survey Environment Plan CDN/ID V-1000-P1-MP-0011).

Anchors are attached to the MODU by a chain or chain / wire system. The anchors will be positioned at ~2 km (ranging from 1.5–2.1 km) from the MODU. The MODU is equipped with a thruster assisted mooring system to mitigate mooring fatigue in heavy sea states / poor weather conditions.

Transponders may be required to inform anchor positioning. The transponders for mooring are called ADAPS (Anchor Distance and Positioning) – they can be acoustically interrogated for GPS position and anchor orientation. They are affixed to the anchor so are deployed and recovered in the same timeframes as the anchor installation.

Each pre-laid anchor consists of:

- Anchor covering an area ~60 m^2.
- Anchor chain including swivels and shackles. Typically, the anchor chain consists of 82–120 mm links. 300 m of chain is laid on the seabed with a pennant wire in the water column attached to a surface buoy. This equates to ~87 m^2 footprint based on the chain being ~290 mm wide.
- Surface buoy with a navigation light.

The total footprint for each anchor and chain will be less than 200 m^2.

An array of long baseline and/or ultra-short baseline transponders for metrology and positioning may be installed on the seabed, within a radius of 500 m from the well locations. This positioning system is only expected to be used on selected wells and only if required.

Transponders, if used, will be moored to the seabed by a clump weight. Clump weights are typically made of cement or steel with a footprint of ~0.2 m^2. On completion of the positioning operation, transponders and associated equipment will be removed.

3.5 Blow-out Preventer Installation and Function Testing

A blow-out preventer (BOP) consists of a series of hydraulically operated valves and sealing mechanisms (annular preventers and ram preventers). The BOP is used to close in the well in the event of an influx of hydrocarbons from the formation into the wellbore. The annular and ram preventers are used to shut in around various tubulars in the well, while the blind shear rams are designed to shear the pipe. Both types of preventers will seal the well.

Once the BOP is installed, regular function and pressure tests are undertaken to confirm continued operability. Function tests are generally undertaken every 7 days, and pressure tests on a 21-day basis, in accordance with industry standards and the Drilling Contractor's maintenance system. Function testing is undertaken by activating the hydraulic control system onboard the MODU to confirm functionality of the BOP systems, whilst a pressure test is undertaken to verify the seals on the BOP stack.

The BOP control system discharges control fluid into the sea upon operation. A full function test to close and open all ram and annular preventers discharges ~2,200 L of potable water with 1-3% water-soluble control fluid. Smaller volumes are discharged for pressure testing and when latching and unlatching the BOP at the start and end of each well.

3.6 Well Completion

Well completion is a sub-component of the well construction process and describe the process of preparing a well, once drilled to total depth, for production. Whilst a "completion" specifically refers to the production and flow control equipment within the wellbore, well completion activities include various operations which are required to prepare the well, once drilled, for the completion to be installed and may include installation of the XT.

Completion activities may be undertaken at Hercules 1, Doris 1, La Bella 2 and Artisan 1 well locations.

Well completion activities can commence immediately after the well is drilled and cemented (as required), as the case will be for La Bella 2, or they can commence when returning to a drilled and suspended well, as the case will be for Artisan 1, Hercules 1 or Doris 1.

Well completion activities during OGV are expected to include:

1. Installation of a subsea production tree (or XT) which is an assembly of valves, spools, and fittings used to regulate and shut-in hydrocarbon flow from a well. As a horizontal type XT, it must be installed prior to the completion, and will be connected directly onto the wellhead, positioned immediately above the seabed.
2. Removal of downhole (cement) barriers, initially installed during the drilling phase to secure the well prior to the MODU moving off location.
   a. This is applicable to Artisan 1, Hercules 1 and Doris 1 only.
3. A wellbore clean-up operation where the drilling fluid (and any residue, debris or solid material) is displaced from the wellbore and replaced with a filtered completion fluid (brine).
4. Contingency evaluation of the cement bond for barrier and/or zonal isolation confirmation.
   a. An option is for this to be performed prior to wellbore clean-up.
5. Contingency inflow test to confirm the integrity of the production liner envelope.
   a. This may be incorporated into the wellbore clean-up operation.
6. Perforation of cemented production casing or liner with explosive shaped charges. This activity creates a communication path from the reservoir to the wellbore.
   a. Perforating guns are expected to be deployed into the well via wireline (and set within the production liner) prior to installing the completion. In Hercules 1 and La Bella 2 (and/or other), however, it is possible for them to be deployed and set after the completion is installed.
   b. Detonation of the perforating guns will not occur until the upper completion is set and tested.
7. Installation of the upper completion consisting of the production tubing, tubing hanger, surface-controlled subsurface safety valve (SSSV) and production packer. The completion may also include installation of downhole monitoring capability and flow control equipment.

   a. Once the completion is deployed to the required depth the wellbore fluids inside and outside the completion will be changed out, as described in greater detail below, the production packer will be set and the integrity of the completion confirmed via a series of pressure tests.

8. Intervention activities such as wireline (electric line and slickline), will be required as various points during the above noted operations, primarily during items 4, 6 and 7.

9. In the event the target reservoir is not expected to (or is not able to) unload the fluid contained within the production tubing and liner, coil hose may be deployed within the wellbore and displace a portion or the existing fluid to nitrogen, thereby reducing the hydrostatic head acting on the reservoir and achieving the necessary underbalance for the well to flow.

   Coil hose may be deployed and nitrogen displaced into the tubing either before the perforating guns are detonated or after detonation, whilst the well is being flowed back/cleaned up to the MODU based well test package.

   Coil hose (and the use of nitrogen) is another type of intervention activity.

3.6.1 Installation of Subsea Production Tree (XT)

Each well will have a wellhead, which provides means for hanging the production well casing and installation of well control equipment (BOP) and the XT. A XT is an assembly of fittings and valves which is installed directly onto the wellhead to regulate and shut-in hydrocarbon flow from a well. The installation of XTs has been considered at 4 well locations as detailed in Table 3-2.

Table 3-2: Subsea production tree (XT) installation locations.

Well Name	Petroleum Title
Artisan 1	VIC/L35
Hercules 1	VIC/P43
Doris 1	VIC/L35
La Bella 2	VIC/L36

The XT facilitates the flow of reservoir fluids from the well to the subsea production facilities and flowlines. It is also used to manage chemical injection and monitor production dynamics. Hydraulically controlled valves and chokes are used to control flow rates and provide a well shut-off mechanism.

The XT design incorporates direct hydraulic functionality. This essentially means that the subsea control module (SCM) (the device used to operate and monitor XT functions) is located externally to the XT, whereas the existing XTs in Beach's portfolio have a SCM embedded in the XT structure. The SCM receives hydraulic and electrical signals from the topside facility and communicates this to a specific XT function via leads connected to the XT. The hydraulic system operates with low pressure (LP), high pressure (HP) and chemical injection capabilities.

XTs are typically designed with open-loop hydraulic systems with actuation fluid which will vent to sea via the SCM. Included in the system are accumulators which are mounted on the XT frame which are used to supply and open actuators fitted to each hydraulic valve (fail safe closed type). The hydraulic fluid used to fill the actuator open side (to compress a spring) will be vented to sea when it is closed.

All XT valves and functions are typically tested prior to its installation. Re-testing of all valves is not repeated at the time of installation. Only the connection between the XT and the wellhead and valves which are functioned during well construction (completion) operations are tested at this time. The volume of actuation fluid which is vented to the marine environment is variable depending on the XT type and size. The fluid used to operate these valves and functions is water-soluble and readily disperses in the receiving waters after discharge.

The XT operating fluid discharges are described in Section 3.6.8.2

Prior to the installation of the XT on each of the development wells, suitable well barriers must be in place. This may require a retrievable packer to be is installed within the wellbore ensuring well integrity is maintained when the BOP is removed. Once the XT is in place, the BOP is reinstalled and tested, upon which the retrievable packer can be removed prior to well completion operations. This will be in accordance with the NOPSEMA accepted WOMP.

3.6.2 Removal of Downhole Barriers

In the case of the Artisan 1 (and possibly Hercules 1 or Doris 1), well operations will be performed as a re-entry into an existing suspended well. In 2021 Artisan 1 was drilled, and following formation evaluation, a production liner was installed having successfully encountered a hydrocarbon resource. The well was suspended with cement barriers isolating the hydrocarbon formations and a suspension brine throughout the wellbore. The suspension brine is inhibited and of similar composition to packer fluid described below.

As noted, Artisan 1 (and possibly Hercules 1 or others, should they be successful) has been suspended with the use of cement barriers in the wellbore. Once the MODU is on location and replacement barriers have been implemented, the cement barriers will be removed via drilling. This activity is likely to be undertaken with a brine-based fluid. In order to achieve the necessary overbalance at barrier depth, the brine may need to be supplemented with a weighting agent such as barite or by using a specialist brine system which may include brines such as sodium bromide or potassium formate. Further, additives such as viscosifiers will be added to provide sufficient carrying capacity to the fluid to lift the drilled cement fragments and debris to surface.

The fluids used in this operation as well as the pre-existing suspension brine are intended to be discharged once tested and the necessary criteria is achieved, which may include dilution.

The expected discharge volumes from the removal of downhole barriers are as per Item (1) in Section 3.6.8.1.

3.6.3 Inflow Testing

Inflow testing is an operation performed to confirm the integrity of a barrier element, or envelope, by testing it in the direction of flow, typically against the reservoir (acting as the pressure source). Inflow testing is typically performed prior to displacing the well to an underbalance fluid, and in the case of for Project activities it may be performed to confirm the integrity of the production liner envelope including the liner hanger packer, the liner connections and the shoe track floats/cement. The inflow test is often incorporated into the WBCU operation however this may not be possible in cases when cement is to be drilled/removed such as Artisan 1 (and potentially Hercules 1 and/or other).

The inflow test will utilise an underbalance fluid which will be underbalanced against the formation such as water, base oil or diesel. The underbalance fluid will be pumped down the workstring to a depth sufficient to achieve the necessary pressure differential against the formation. Once the test has been performed, the underbalance fluid will be circulated from the workstring and replaced with completion brine. The underbalance fluid will either be stored for later use (or disposal) or in the case of water, it may be discharged. The expected discharge volume is as per Item (2) in Section 3.6.8.1.

3.6.4 Wellbore Clean-Up

Wellbore clean-up (WBCU) is an operation whereby the existing well contents (drilling fluid or suspension fluid) is removed from the well and replaced with a completion fluid, most commonly, brine.

The objective of a WBCU operation is to ensure the well is full of a clean fluid which is compatible with the completion equipment and its operating system as well as the formation (non-damaging). The wellbore clean-up operation is essentially a circulating operation which is undertaken once the WBCU workstring and cleaning tools are run to the appropriate depth in the well, typically as close as reasonably practical to well total depth.

The completion brine will consist of either sodium chloride (NaCl), potassium chloride (KCl) or a blend of the two. If a heavy brine (>approximately 9.8 ppg density) is deemed necessary, a specialist brine such as sodium bromide (NaBr) or potassium formate may also be used. The brine may be partially inhibited (typically with biocide and/or oxygen scavenger) to prevent contamination of the formation and any subsea or surface process equipment with anaerobic or aerobic bacteria and to limit their growth.

At the beginning of the circulation process, viscosifiers and surfactants are added to a finite volume of the clean completion brine (approximately 500 bbls) to create a “pill” which facilitates the removal of drilling/suspension fluid, drilling fluid residue and debris from the wellbore. These fluids will be circulated throughout the wellbore, returned to surface and discharged as described below in Section 3.6.8.1 (Item 4).

Once the existing wellbore fluid (in place prior to the wellbore clean-up) is displaced from the well it will be either stored for further use or discharged. The completion fluid (brine) used to perform the displacement will continue to be circulated through the well. As the brine is continued to be circulated the returns at surface will be tested for cleanliness. Depending on the brine cleanliness it will be either storedand/or filtered such that it can continue to be used in the circulating process. If the returned brine is not suitable to continue to be circulated into the well (typically meaning it is dirty and not suitable as completion brine) it will be replaced in the circulating process with clean brine. Once the specific fluid cleanliness criteria is achieved, circulation will stop and the operation deemed complete.

For La Bella 2 the fluid which will be replaced as part of the WBCU will be drilling fluid (WBDF). For Artisan 1 it will be suspension brine, as detailed in Section 3.6.2. For Hercules 1 and Doris 1, it will also likely be a suspension brine. Expected discharges are described below in Section 3.6.8.1 (Items 3 and 4).

3.6.5 Perforating

Wellbore perforating equipment consists of explosive shaped charges which are deployed within the wellbore in specifically manufactured hollow steel carriers. The perforating carriers will be pre-set within the production liner adjacent the production interval (isolated behind the cemented production liner) and not detonated until after completion installation operations have been completed and well integrity is confirmed. Upon receiving a signal from surface, typically an application of pressure, the perforating gun firing head will be activated, and after a specified period of time, the perforating shaped charges will detonate, thereby creating perforation "tunnels" which extend through the production liner, cement and into the reservoir, through which reservoir fluid flows into the wellbore.

All explosive material disintegrates during the explosive event however remnants of steel and formation do remain, commonly referred to as debris, which can often be flowed up the well once flowback/production commences.

3.6.6 Completion Installation

The well completion will consist of the production tubing, tubing hanger, surface-controlled SSSV and production packer and may include downhole monitoring capability and flow control equipment.

With the completion installed and the wellbore full of completion brine a pumping operation will be performed which will involve a circulation of well fluids which will displace the production annulus from completion brine to a "packer fluid" and the production tubing bore to a low-density fluid (such as base oil, diesel or nitrogen). The completion brine which is displaced from the well will be returned to the MODU fluid tanks. The returned brine may be stored for later use or diluted and discharged. Completion brine volume forms part of discharge (Item 3) in Section 3.6.8.1.

With the displacement fluids positioned appropriately in the wellbore the production packer will be set by pressurising fluid in the well. Once the packer is set, the packer fluid will be isolated within the production (A) annulus with the intention for it to remain in place throughout the well's production life. Packer fluid contains additives which protect the casing/tubing from degradation. The packer fluid discharges are described in Section 3.6.8.1 as discharge (Item 5).

As the production packer is set the entire upper completion will be pressure tested to confirm well integrity. The well will then be in a state ready to undertake well flowback and clean-up operations.

The low-density fluid will provide sufficient underbalance against the production formation such that when surface pressure is slowly removed to begin flow back, reservoir fluids (gas) will enter the well and push the wellbore and tubing contents from the well. The well contents will be managed using a surface well test package installed on the MODU. Flowback will continue until sufficient well construction fluids have been removed until such time that certain criteria has been achieved. With the criteria met, the well will be shut in.

At this time a hydrate inhibiting fluid will be placed inside the production tubing above the closed SSSV and throughout the XT. This fluid is typically a mixture of glycol and water. Excess unused hydrate inhibiting fluids will be discharged in Section 3.6.8.1 (Item 6).

To inhibit marine growth or corrosion, a biocide and corrosion inhibitor may either be injected or placed within the XT cap. The XT cap can hold approximately 210 L of dilute corrosion/biocide mixture. Typically used as for long term application additives included can be a mixture of corrosion inhibitor, biocide and water. At the time the corrosion/biocide mixture is placed within the XT cap, there is no planned release to the marine environment; however, the fluid will be discharged to the marine environment when the XT cap is removed for subsequent re-entry or end of well life operations such as workover, intervention and/or abandonment (subject to a separate EP).

Following well completion operations including the MODU-based flowback/clean-up operation, the well is secured by installing suspension/production barriers, and the final integrity confirmed as per the NOPSEMA-accepted WOMP. The well will be handed over to the Beach Production group after MODU release for subsequent tie-in activities of subsea infrastructure and flowlines (long-term production). The tie-in activities are covered by a separate EP.

3.6.7 Intervention Activities

The aforementioned activities will require intervention techniques in order to facilitate and execute. This primarily includes electric line and slickline activities which will be used to deploy perforating guns, recover the XT tubing hanger straddle sleeve, install of the XT tubing hanger bore protector and recover same after flowback/clean-up.

Further, there are various contingency operations which involve the use of wireline. These operations could include activities such as setting/recovering a downhole tubing plug, manipulation of the sub-surface safety valve, performing cement evaluation or releasing the production packer.

Fluids are typically used during intervention activities to pressure test the intervention pressure control equipment and fluids discharged when XT valves are operated. The fluid type typically used for pressure testing is water with a hydrate inhibitor such as MEG (monoethylene glycol). and that required to function the XT valves is MacDermid Oceanic HW443. For further details regarding HW443 refer to Section 3.6.8.2 XT Control System Discharges.

3.6.8 Discharges

3.6.8.1 Well completion activity discharges include:

10. Well suspension brine which is returned to the MODU during de-suspension and / or wellbore clean-up activities will be discharged (up to approximately 1,500 bbl / 240 m^3). The well suspension brine contains brine (chlorides of potassium or sodium) with additives that may include amine-type corrosion inhibitors, oxygen scavengers, biocide, and soda ash or caustic soda for pH (alkalinity) control.

11. Inflow testing (underbalance) fluid, used to provide a sufficient pressure differential, will be returned to the MODU. A water underbalance fluid will be subject to testing and treatment (if necessary) prior to discharge. Expected volume of discharge is 600 bbls (96 m^3). Note: if base oil or diesel is used to inflow test, this fluid will be stored and potentially used as the underbalance fluid for flowback or returned to shore for disposal.

12. During wellbore clean-up, completion fluids are circulated back to the MODU. Fluids which are suitable will be subject to treatment prior to discharge to the marine environment. Discharge may also include any excess completion brine remaining in the MODU tank system discharged to sea as per standard operating procedures. Expected volume of discharge is approximately 5,000 bbl (800 m^3) with <10 m^3 being formation water. The completion fluids will be tested and discharged only if the OIW content is below 30 ppm. Fluids not meeting this criterion will be stored for onshore disposal.

Drilling fluid (WBDF) returned to the MODU, which will be the case for La Bella 2, will be treated as per OGV Drilling Program EP in EP#1 (V-1000-P1-RP-0002). This could be up to 700 bbls (112 m^3).

13. Viscosifiers and surfactants, when returned to the MODU, will be stored and later discharged to the marine environment. Expected discharge volume is approximately 1,500 bbl (240 m^3).

14. Excess packer fluid at the end of completion operations will be discharged to the marine environment (approximately 225 bbl / 36 m^3). The packer fluid contains brine (chlorides of calcium, potassium or sodium or a bromide solution) with additives that may include amine-type corrosion inhibitors, oxygen scavengers, biocide, and soda ash or caustic soda for pH (alkalinity) control.

15. An excess of completion hydrate inhibiting fluid will be discharged to the marine environment (approximately 150 bbl / 24 m^3). The hydrate inhibiting fluid typically includes a solution of water and hydrate inhibitor (monoethylene glycol (MEG)).

16. Cartridge filters are used to filter the completion fluid prior to, during the clean-up operations and any subsequent circulating operation. The filters will be returned to shore for appropriate disposal. Any debris recovered during the clean-up operations and completion Program such as metal shavings and rubber material will be consolidated and sent for onshore disposal.

17. Intervention activities such as wireline, described in Section 3.6 (Item 8) performed during completion activities, are not expected to require fluid discharges above what is already noted above, Section 3.7 and Section 3.6.8.2.

3.6.8.2 XT Control System Discharges

Each of the XTs deployed will utilise a direct hydraulic control system. The OP4 XTs included an integral control system which was housed within the XT frame however the OGV XT controls will be separate from the XT itself. The OGV control system will be a temporary installation, meaning it will be deployed to allow the XT valves and functions to be operated whilst completion and well flow back/cleanup operations are performed, and then recovered to the MODU prior to it moving off location. Upon tie-in and commissioning activities a production-type SEM will be installed to provide XT control throughout the Operate and Maintain phase of well life.

The OGV XT control system (or TSEM, Temporary Subsea Electronic Module) discharges operating control fluid into the marine environment upon operation of valves positioned within the XT frame. These include the Upper Master and Production Wing Valves, and also valves which are associated with the downhole completion. The downhole valve functions which emit control fluid to the marine environment include the SSSV. The expected volume of control fluid to be discharged throughout the OGV Project is expected to be in the order of 60 L for each completion operation and 20 L for each intervention operation. The control fluid used for operation of these valves is expected to be MacDermid Oceanic HW 443 (or similar), which is a water-based hydraulic fluid commonly used in subsea production control systems including in existing Beach subsea infrastructure. This control fluid has an OCNS Group rating of ‘D’ (refer to Section 7.8 for details in regard to acceptance criteria). The fluid is biodegradable and will readily disperse after discharge from the XT/SCM into the marine environment.

The TSEM will be mounted on the drilling/MODU BOP and therefore whilst separate to the XT frame will not be on the sea floor. Items which may be temporarily positioned on the sea floor (in a subsea basket) during completion and well flow back/clean-up operations include:

- Electrical and hydraulic flying leads.
- Debris caps.
- Marine growth covers.
- ROV tooling.
- The above items, including the subsea basket, will be recovered to surface at the conclusion of completion and well flowback operations.
- A XT debris canopy, complete with the XT debris cap, intended to be used on Artisan 1 but may be used on any well, may be stored on the sea floor until it is installed at the conclusion of operations.

3.7 Well Flowback and Clean-Up to MODU

Well flowback and clean-up is expected to be performed on each well which is completed. This could include Artisan 1, Hercules 1, La Bella 2 and Doris 1.

Well clean-up is performed once the well completion process has finished and is the process of removing well construction fluid from the well and bringing reservoir fluid (oil, condensate and/or gas) to the surface and managed by a MODU based well clean-up/test package. If necessary, production testing (to evaluate the reservoir potential) may also be performed once the well is clean however this is not envisaged for this programme. Sampling of the reservoir fluids will occur to understand its properties, composition and to detect for the presence of any contaminants.

The well construction fluid which is returned during the initial phase of the flowback is typically a mixture of completion fluid (completion brine and any formation water or condensate present in the wellbore) and underbalance/low density fluid (base oil, diesel or nitrogen), plus remnants of drilling mud and loss-circulation materials. Depending on the formation and well construction process there could also be solids such as formation and perforating debris. As the well construction fluid exits the well, reservoir fluid becomes more prominent in the flow stream consisting of hydrocarbons and native groundwater present in the formation.

The flowback fluid is expected to consist of:

- Low density (underbalance) fluid (base oil, diesel or nitrogen).
- Completion brine (sodium chloride (NaCl), potassium chloride (KCl) and/or sodium bromide (NaBr) blend).
- Drilling fluid or suspension fluid filtrate.
- Reservoir fluid (hydrocarbon gas, condensate, formation and condensed water).
- Depending on the formation and well construction process, minimal amounts of solids such as formation and perforating debris could also be present in the flowback fluid stream.

Reservoir fluids recovered during well flow back and clean-up will be directed to a MODU-based well test package where the fluids will be separated, measured, and then either flared (hydrocarbons) or treated for overboard discharge (non-hydrocarbons).

Fluids that cannot be flared (typically produced water with negligible condensate concentration) are processed through a water filtration system to achieve <30 ppm OIW content prior to overboard discharge. Produced aqueous fluids not meeting the necessary OIW criteria will be transferred to tanks and transported onshore for appropriate disposal.

There is no planned cold venting of hydrocarbons to atmosphere during flowback and clean-up operations. There will be incidental unburnt hydrocarbon gas emitted via the surge tank, when taking reservoir fluid testing and sampling and when lines are purged following the conclusion of the well clean-up operations.

Flowback and clean-up operations are likely to occur until such time that produced fluid cleanliness is measured to be within pre-defined criteria. The criteria is based on levels deemed suitable such that the initial produced fluid post tie-in will not foul the subsea infrastructure or the Otway Gas Plant. The maximum expected flare rate will be up to 65 MMscf/day with the entire flowback operation expected to occur for a period of 24 hours for each well but up to 48 hours.

If any well does not flow or is assessed as a high risk of not flowing, even with the use of an underbalance fluid, a contingency operation to use coil tubing/hose and lift the well with nitrogen may be necessary. This would result in nitrogen emissions being processed through the surface well test package and vented to atmosphere. This is a contingency scenario and is currently not envisaged as being required.

The flare for the recovered reservoir fluids will be lit via a pilot light which is located at the outlet of the burner heads. The pilot light source is from LPG located on the MODU in 45 kg cylinders, each containing 88.2 L of LPG.

Table 3-3 details the predicted emissions and discharges for the well flowback and clean-up operations.

Table 3-3: Estimated well flowback and clean-up emissions and discharges per well

Emission Parameter	Unit of Measurement (UOM)	Amount	Discharge Location
Volume of gas	MMscf	115	Atmosphere via flare
Volume of water	bbl/m^3	115/18	Sea following filtration and/or testing
Volume of condensate	bbl/m^3	1,150/183	Atmosphere via flare
Volume of low-density fluid (base oil or diesel)	bbl/m^3	190/30	Re-use or to atmosphere via flare
Volume of brine, well flowback	bbl/m^3	60/8	Atmosphere via flare, re-use or sea following filtration
Volume of methanol	L	1,700	Atmosphere via flare
Volume of MEG	L	300	Atmosphere via flare
Volume of nitrogen	L	10,000	Atmosphere via flare
LPG pilot light	L	380	Atmosphere via flare
Duration of well flaring	hours	48	N/A

3.8 Well Intervention

Intervention activities at Thylacine West 1 and / or Thylacine North 1 wells (both located in petroleum title T/L2), will be completed per industry best practice, applicable Beach and industry standards and in accordance with the NOPSEMA accepted WOMP.

The proposed intervention activities will be executed whilst the well is live utilising both slickline and electric line techniques. A subsea landing string combined with surface intervention pressure control equipment (PCE) will be used as a temporary extension of the well from the XT to the MODU, in the same manner as intervention activities are conducted on live/underbalanced wells during OGV completion operations. After each well entry, with the downhole intervention tools at surface, the well will be shut-in utilising temporarily installed surface valves, thereby isolating the surface work area (MODU) from the reservoir. The pressure within the PCE (above the well isolations) must be bled off to zero to enable the safe removal of the downhole tools. As such, the volume of hydrocarbon gas within the PCE and subsea landing string (above the isolations) will be cold vented to atmosphere.

Intervention activities will include:

1. Position the MODU over the well and anchor or connect to pre-laid anchors. Remove the XT debris cap and canopy.
2. Install the MODU BOP on marine riser and pressure test the BOP-XT connector.
3. Install the subsea workover riser system and MODU up wireline including intervention pressure control equipment. De-suspend the well by recovering the XT crown plugs.
4. Using wireline, access Unit 5 reserves by removing the plug installed in the completion tailpipe. Alternatively, rather than recover the plug, sever or perforate the tailpipe (Thylacine West 1 only).
5. Using wireline, manipulate downhole interval control valve/s to isolate (and potentially re-open) the applicable production zone (Thylacine North 1).
6. Contingent: Using wireline, manipulate downhole interval control valve to isolate (and potentially re-open) the applicable production zone (Thylacine West 1).
7. Contingent: using coil hose, clean out debris from above downhole flow control devices.
8. Using wireline, re-suspend the well by installing crown plugs in the XT. Confirm plug integrity.
9. Recover the BOP on marine riser.
10. Release the MODU from mooring spread and leave location.

The intervention program for each well will be included in the WOMP which must be accepted by NOPSEMA prior to commencement of activity.

- As noted above the XT debris cap/canopies are required to be removed from the XTs prior to installing the MODU BOP. The debris caps/canopies will be placed on the sea floor during the intervention until such time that “in-wellbore” intervention activities are complete. Once the MODU

BOP is recovered to surface, the debris cap c/w canopy will be re-instated on the wells prior to the MODU moving off location.

At this time a hydrate inhibiting fluid will be placed inside the production tubing above the closed SSSV and throughout the XT. This fluid is typically a mixture of glycol and water. Excess unused hydrate inhibiting fluids will be discharged in Section 3.6.8.1 (Item 6).

To inhibit marine growth or corrosion, a biocide and corrosion inhibitor may either be injected or placed within the XT cap. The XT cap can hold approximately 210 L of dilute corrosion/biocide mixture. Typically used as for long term application additives included can be a mixture of corrosion inhibitor, biocide and water. At the time the corrosion/biocide mixture is placed within the XT cap, there is no planned release to the marine environment; however, the fluid will be discharged to the marine environment when the XT cap is removed for subsequent re-entry or end of well life operations such as workover, intervention and/or abandonment (subject to a separate EP).

Well intervention activities may also include:

- A completion hydrate inhibiting fluid (as described in Section 3.6.8.1) placed inside the production tubing, above the closed SSSV and throughout the XT. Excess unused suspension fluids will be discharged. Completion suspension fluid is expected to be water and 50% hydrate inhibitor (MEG).
- The intervention will require valves within the XT to be functioned during the operation. As per details depicted in Section 3.6.8.2 this results in hydraulic control fluid being discharged to sea after each function.
- Prior to installation of permanent surface well barriers, the SSSV will be closed and the volume of gas above the valve may need to be cold vented to atmosphere. A completion hydrate inhibiting fluid may then be placed on top of the closed SSSV and throughout the XT production bore. If this fluid is necessary, there will be an excess remaining at the conclusion of operations which will be discharged to the marine environment. As per the Well Completion Activities described above, hydrate-inhibiting fluid is typically a mixture of water and MEG.
- Contingency kill fluid (brine) will be carried for the intervention activities. This volume may be discharged at conclusion of operations and is likely to be a KCl and/or NaCl brine. There is an option that K formate brine may be held should a volume be left over from previous operations.
- Contingency well clean out fluid used to lift debris which may have accumulated above the deep set plug. The fluid would be drill water which may include some KCl (up to 8%), friction reducer and incorporate high viscosity polymer sweeps to lift the debris. Biocide and/or oxygen scavenger may be included to partially inhibit the fluid against bacteria contamination. A volume of up to 500 bbls would be required if this contingency was necessary.
  - If a clean out is undertaken it may be necessary to remove the well fluids by cleaning the well up to the well clean-up package. The discharges which would result from this operation are contained within the volumes noted in Table 3-3.

The predicted emissions and discharges for the well intervention operations are detailed in Table 3-4.

Table 3-4: Estimated well intervention emissions and discharges per well.

Emission Parameter	UOM	Amount	Discharge Location
Volume of gas	MMscf	0.8	Atmosphere
Volume of hydrate inhibiting fluid	bbl	50	Discharged to sea
Volume of XT & completion control fluid	L	20	Discharged to sea
Volume of kill weight brine	bbl	500	Contingency only
Volume of clean out fluid	bbl	500	Contingency only

3.9 Plug and Abandonment

3.9.1 Infrastructure Overview

P&A activities may be undertaken at Artisan 1 if the decision is made not to complete the well. The well was drilled vertically to explore prospective geological structures and subsequently suspended as a potential future production well. The Artisan 1 well has not been completed or used for commercial hydrocarbon production at any point. Therefore, Artisan 1 has not been connected to an existing pipeline or production facility. A full casing string or liner was cemented across the open hole section. Artisan 1 was suspended with the placement of a number of cement plugs as barriers in the wellbore.

The WOMP in force for the suspended well at Artisan 1 (CDN/ID19009884) states that permanent abandonment of the wells will commence by end of 2026. This is in the scenario where the Artisan 1 well is not completed.

A summary of Artisan 1 is provided in Table 3-5. In-situ fluid considers fluids in both the wellbore and the annulus. The maximum volume of fluids to be recovered from the well includes wellbore and annulus fluids that may be recovered pending the final P&A plan for the well (e.g. verify existing barriers and reset cement plug, perforate-wash-cement, section milling, cut and pull casing, etc). The final plan for P&A will be confirmed once the well is re-entered and the well barrier status confirmed. The Artisan 1 well is not anticipated to require re-entry to the well's total depth and therefore will not be exposing the reservoir section during the abandonment activities.

The Artisan 1 well has the conductor and surface casing cemented to surface based on historical well records, supported by subsurface work performed to date and the plan to qualify the annulus cement upon re-entry. Beach's view is that there is remote to no possibility of retained hydrocarbons being released during wellhead severance. Once the wellhead is cut, an environmental plug (cement plug) will be installed above the casing stump of the inner casing string(s) within the seabed (as per WOMP).

A formations assessment by an independent expert in the Otway Basin was conducted with the summary of results below:

- Otway Basin geology is well understood by Beach Energy and others due to the number of wells that have been drilled.
- For the Otway Basin, hydrocarbon-bearing interval is in the Thylacine and Flaxman formations. The Belfast formation is the regional caprock for the Otway Basin. Other shallower formations are Clifton Formation, Mepunga Formation, Dilwyn Formation and Paaratte Formations have all been assessed against the well logs and field logs. They are normally pressured, non-hydrocarbon bearing and brine filled zones.

Table 3-5: Summary of Artisan 1

Well Name	Well History	Current Status	In situ Fluids	Well Infrastructure
Artisan 1	Well drilled in 2021. Currently suspended with 7" liner cemented	The well was suspended with multiple cement barriers.	Fluids inside wellbore is weighted brine / seawater. SBM in the 13-3/8" x 9-5/8" annulus.	Subsea wellhead (with corrosion cap), portion of conductor and

	(unperforated) and cement plug.	casing above the seabed.

3.9.2 Suspended Well Inspection

A program of General Visual Inspections of each suspended well using a ROV has been in place since 2014. The Beach Well Integrity Standard mandates that inspections are undertaken every 2 years to confirm that well integrity is maintained.

3.9.3 Activity Overview

Contingent P&A activities of Artisan 1, including designing and installing permanent well barriers, will be completed per industry best practice (OEUK Guidelines) and in accordance with the NOPSEMA accepted WOMP.

Abandonments of the well will be performed through a marine riser and BOP. The P&A sequence for the well will depend on the existing well design and integrity, casing cement quality and well condition upon re-entry.

Fluids will include those within the well, as well as fluids and chemicals specifically selected for the permanent well abandonment program.

The generic planned well abandonment will include the following steps for the well:

- Position the MODU over the well and anchor or connect to pre-laid anchors
- Run BOP and pressure test connector
- Pull wellhead seal assembly
- Cut 9-5/8” x 18-3/4” casing hanger
- Pull BOP
- Perform 36” x 20” cut
- Release MODU from mooring spread and leave location

The final P&A program for Artisan 1 will be included in the WOMP which must be accepted by NOPSEMA prior to commencement of activity.

3.9.4 Clean and Prepare Wellhead

Although unlikely, some wellhead equipment may require scale dissolver or calci-wash for removal of scale on the wellhead using ROV. Typically, this is applied in batches of approximately 320 L applied over 1 hour. Total discharge from seabed where the wellhead is can be up to 10 m^3.

3.9.5 Displace Well with Clean Overbalance fluid

During well abandonment activities, fluids will be circulated in and out of the well to maintain a hydrostatic barrier over the wellbore pressure, and to clean the well in preparation for cementing.

Fluids will include those in-situ in the well and clean overbalanced fluids specifically selected for the well abandonment program. The in-situ fluids discharge will include up to approximately 130–150 m^3 per well of inhibited water (corrosion inhibiter, biocide, and oxygen scavenger) and KCl brine. Due to the wells not being completed and commercially produced, and suspended with barriers in place, no hydrocarbons are expected to be in the in-situ fluids. This is unlikely but should be included as contingency for impact assessment.

3.9.6 Drill Out Cement Plug

The Artisan 1 well is currently suspended with a cement plug, which are generally required to be drilled out to enable the permanent cement barrier to be properly placed adjacent to the regional caprock.

In general, if the permanent cement plugs do not pass the verification test, then drilling out of these cement plugs will be required so the cement plug(s) can be reinstalled. WBDF will be used, and the WBDF and cement cuttings will be processed through the drill fluids and cuttings handling system as described in Section 3.6.8, and discharged overboard. This will generate about 25 m^3 of cement cuttings per plug and use ~250 m^3 of WBDF.

3.9.7 Set and Verify Permanent Cement Barriers

The existing cement plug may be assessed by tagging and/or pressure testing as required. Wireline logs will be run to assess casing condition, annulus cement quality and position only if required.

Wireline activities may include gamma ray and casing collar locator logging, ultrasonic cement bond logging and other tools such as drifts, bridge plugs, cement retaining tool, punch perforators or cutters etc. and will be performed through the marine riser and BOP with appropriate isolation barriers in place.

Cement is used to place permanent cement plugs adjacent to the caprock. Cement slurry discharges to the marine environment may occur from cement unit tests, cleaning of tanks upon completion and if there if a problem during the cementing operation. The cement discharge volume is described in Table 7-13.

Once permanent barriers are installed and verified, the BOP will be recovered.

3.9.8 Removal and Recovery of Infrastructure

Following P&A operations and verification of permanent barriers, the wellhead and portion of production casing, surface casing and conductor will be cut and retrieved at ~100 m BML. A volume of approximately 2 bbl of SBM present between the production casing and the surface casing will be circulated from the well during the seal assembly retrieval and the casing hanger cut process. The approximately 2 bbl of SBM (present in the surface and production casing annulus) is expected to mix with the water based fluid used to re-enter and P&A the well. A ram/annular will be closed to circulate the annulus up the choke line to result in minimum slops volume. SBM or fluid mixed with SBM will be stored for onshore disposal. The BOP and marine riser will be recovered to the MODU and then the 20" surface casing and conductor will be cut below the mud line and recovered with the wellhead to surface. The cutting process produces a small amount of metal shavings (swarf), some of which may remain on the seabed. Subsequently, a shallow surface to seabed cement plug will be set.

Equipment associated with the wellhead cut such as wellhead, cut conductor and casing section(s) will be recovered for onshore disposal.

An ROV seabed clearance survey will be conducted following P&A and removal of associated infrastructure to confirm all infrastructure on the seabed has been removed, returning the area to original condition as much as possible.

In the unlikely event that the wellhead is not able to be cut or retrieved whilst the MODU is on location, it will be left in situ while further decommissioning plans (e.g. using a vessel) are developed to remove the wellhead at a later date. If required, the wellhead will be maintained in accordance with Beach's well integrity system and the Artisan 1 WOMP (CDN/ID19009884).

3.9.9 Contingent Activities

The following activities may be required because of operational or technical issues during P&A.

3.9.9.1 Cut and Pull, Milling and Wellbore Fishing Operations

In an unlikely scenario, if the cement on the outside of the casing does not meet well barrier requirements, casing or liners may need to be removed either by cutting and pulling or milling methods. These operations are done through the marine riser with milling debris returned to the MODU (through a swarf handling system for milling operations) and will only be performed if necessary.

Milling operations involve removing steel casing, annulus cement and formation to expose formation (caprock). The methods used include milling tools that create chips or ribbons of steel (swarf), chips of cement and chips of formation. Milling is typically performed at a controlled rate (1 to 1.5 m/hr), to enable steel swarf to be removed effectively from the milling site.

As the steel swarf within the milled fluids is hard and sharp, the fluids from the well will be passed through specific swarf handling equipment, which generally includes magnets, that separate steel from the fluid before being processed through the solids control equipment on the MODU. The milling fluids, including an additional approximately 2 m^3 of swarf, approximately 3 m^3 of drilled cement and approximately 3.5 m^3 of formation rock, will be discharged overboard per 100 m interval if milling is required. As a result of restricted milling speeds, the rate of swarf and cement will be generated over several days (the rate is expected to be up to approximately 30 m per 18 hours).

The metal shavings gathered from swarf handling equipment as above will be sent ashore for disposal.

Recovered water-based drilling fluid (WBDF) will be circulated as part of the brine system with intermittent discharges during and at the end of the activities.

Casing, liners and other equipment that are removed from the well will be transported to shore for onshore disposal.

3.10 Routine Support Operations

3.10.1 Vessels

Vessel operations include:

- MODU moves between well locations and MODU positioning.
- Deployment and retrieval of mooring and BOP tethering equipment (if required).
- Standby support to monitor and maintain the 500 m MODU PSZ from errant vessels.
- Transfer of goods and equipment between the shore base and MODU.
- Facilitating site and equipment inspection and operation of MODU positioning equipment.

The MODU will be supported by up to 3 support vessels with one vessel on standby within the Operational Area at any given time and the other two vessels transporting cargo between port and the MODU or performing other supporting duties of the MODU.

Vessels enter the 500 m MODU PSZ under instruction from the MODU when transferring cargo to the MODU or supporting specific operations. Support vessels generally have approximately 15 POB at any given time.

Support vessels maintain station-keeping via dynamic positioning (DP) during the drilling activity therefore no anchoring is required.

Based on a review of operational details from Beach Energy's Otway drilling campaign, conducted from February 2021 to July 2022, resupply operations are predicted to occur near-daily for an average duration of 3 hours.

3.10.2 Helicopter

Helicopters are the primary form of transport for personnel to and from the MODU and may also be used during emergency situations, including operational and scientific monitoring in the event of a hydrocarbon spill. Helicopters will be available to service the MODU up to 7 days per week for the duration of the drilling program, normally operating in daylight hours only.

Helicopter operations within the Operational Area are limited to landing and take-off directly to and from the MODU helideck.

Offshore refuelling of the helicopters whilst onboard the MODU is not planned, however, may be undertaken if required.

3.10.3 Remotely Operated Vehicle

An underwater remotely operated vehicle (ROV) is a tethered underwater vehicle deployed from a vessel or MODU. ROVs are unoccupied, highly manoeuvrable and operated by a crew aboard a vessel or MODU.

ROVs are equipped with a video camera and lighting and can monitor the subsea infrastructure and the surrounding environment. ROVs are also used to deploy specialist tooling and equipment. Tooling and equipment may be operated with the use of electrics or hydraulics. Hydraulics on ROVs are a closed system, where hydraulic fluid is circulated to move components and the system is designed not to release hydraulic fluid.

The ROVs will be housed on the deck of a vessel and / or MODU and are unlikely to be temporarily parked on the seabed during the drilling program.

ROVs will undertake the following activities:

- Pre and post-activity site surveys.
- Assist in installation and removal of subsea equipment.
- Equipment deployment, monitoring and retrieval.
- Tool deployment and operation (dredgers, cutters etc.).
- BOP activation under emergency conditions and testing of same.

Discharges from the ROV are expected when interfacing with the subsea production tree (XT) and the drilling BOP (functioning/testing the Emergency BOP Intervention system). This will include different fluid types depending on the activity required; MEG, XT/downhole control fluid (McDermid Oceanic HW443 or similar) and BOP control fluid. A cleaning solution may also be used to clean the XT manual valve / ROV interface buckets. Nominal discharge volumes during completion, well flowback and XT activities are detailed in 3.6.8

Table 3-6: ROV nominal fluid types and discharge volumes

Emission Parameter	UOM	Amount	Discharge Location
XT Connector Lock Function (Oceanic HW443)	L	120	Discharged to sea
XT Connector Test (VX Gasket, Oceanic HW443)	L	30	Discharged to sea
ROV continuity testing and tooling disengagement (Oceanic HW443)	L	20	Discharge to sea
Class 4 XT API Bucket washing/cleaning solution (Oceanic CWLD, Oceanic LTF additives)	L	500	Discharge to sea

3.11 Visual Inspection

A program of visual inspections of wells using ROV will be undertaken to comply with the Beach Well Integrity Standard (WIS) (CDN/ID 7726350) typically every 12 or 24 months to confirm that well integrity is maintained.

4 Stakeholder Consultation

4.1 Summary

Beach has consulted relevant persons in the course of preparing this EP in accordance with applicable regulations, case law, guidelines, and Beach policies and standards as set out in Section 8.

Beach understands that the purpose of consultation is to inform its understanding of the environment, including people and communities, the heritage value of places, and their social and cultural features, which may be affected by the proposed activities in this EP. This ensures Beach can understand and address all the environmental impacts and risks that might arise from the proposed activity. Consultation therefore enables Beach to refine or change measures proposed to reduce impacts and risks to an acceptable level and ALARP.

Consultation, carried out in accordance with the regulations and guidelines, was designed to ensure that relevant persons and organisations were identified and provided sufficient information and a reasonable time period to allow them to make an informed assessment of the potential consequences of the Program activities on them (including relevant impacts and risks). Where objections or claims were raised about adverse impacts and risks of the EP activities, the consultation process enabled an assessment of impacts and risks and consideration of new or changed control measures to be adopted in the EP to reduce impacts and risks to an acceptable level and ALARP.

Beach has provided sufficient information in different formats including: emails; information sheets; its online consultation hub, Engage Beach, which includes information in different formats and with different levels of detail; public notice advertisements; online advertisements; radio advertisements; direct phone calls; letters; and consultations with Beach technical staff at information sessions, webinars and meetings. Relevant persons and organisations were advised of the purpose of consultation, provided multiple opportunities over a reasonable period to ask questions, raise concerns, and discuss control measures. Beach also included advice regarding sensitive information not being published and provided all relevant persons with a copy of the NOPSEMA *Consultation on offshore environment plans brochure*.

Recognising the diversity of different categories of relevant persons and multiple regional locations, a range of engagement methods and locations were used including: emailing information sheets and updates to all identified relevant persons; publishing information on Engage Beach; holding in-person and online meetings with individuals and organisations; and online and in-person community information sessions.

Response levels to communications and consultations were monitored and assessed throughout the consultation period. Beach reviewed non-responses on a case-by-case basis and followed up non-responders, undertaking engagement that was commensurate with the extent to which Beach considered that each relevant person's functions, interests or activities may be affected by the Program activities. Beach has assessed the merits of any concerns raised and identified any additional measures adopted as a result of consultation in Section 4.17.

Consultation in the course of preparing this EP has been completed and Beach believes it has met the regulatory engagement requirements. Consultation in relation to implementing the activities in this EP is set out in Section 4.19. Should concerns or feedback about adverse impacts and risks from the activities in this EP be received after this EP has been accepted, Beach will assess the matters raised, and where a further measure or control may be required, Beach will apply its Management of Change process as detailed in Section 8.3.4.

Beach's consultation period commenced on 16 September 2024 and concluded on 14 February 2025.

4.2 Consultation Context

As an operator of offshore and onshore facilities in the Otway and Bass basins, Beach has consulted with relevant persons and local communities regarding its projects for many years. Beach has been consulting with relevant persons since 2019 for its Otway Offshore Project for the preparation and implementation of several EPs relating to different project phases including seabed assessments, drilling and P&A, completing wells, and its ongoing offshore operations. For further activities being planned in these basins and in the course of preparing this EP, Beach has continued to review its methodology for identifying relevant persons and refined its engagement methods in response to case law and growing community interest.

In addition to consultation undertaken in respect of the Program activities, Beach has provided information to relevant persons on the broader context of the EP activities by explaining that the activities are a part of different phases for Beach's Offshore Gas Victoria (OGV) Project. This includes the previous submission and acceptance by NOPSEMA of a Seabed Survey EP and Drilling and Plug & Abandonment EP, and submission of an Offshore Project Proposal (OPP) for the OGV Project. Beach has undertaken this holistic approach as it gives relevant persons contextual information on how the Program activities fit in the OGV Project. This approach also demonstrates Beach's commitment to consulting transparently, consistent with NOPSEMA consultation guidelines and Beach's Community Engagement Standards.

4.3 Guidelines Considered

The guidelines detailed in Table 4-1 were also considered in planning and delivering the consultation carried out in the course of preparing this EP:

Table 4-1: Consultation guidelines considered

Organisation	Guideline
NOPSEMA	GL2086 – Consultation in the course of preparing an environment plan – 20/5/2024 (NOPSEMA Consultation Guidelines) GL1721 – Environment Plan decision making (Section 12.3 of GL1721) – January 2024 GN1344 - Environment plan content requirements – January 2024 GN1488 - Oil pollution risk management - October 2024 GN1785 – Petroleum activities and Australian Marine Parks – January 2024 GL1887 – Consultation with Commonwealth agencies with responsibilities in the marine area – November 2024 N-04750-PL1347 A662608 – Environment Plan Assessment Policy – 10 January 2024 GN1847 – Responding to public comment on environment plans – January 2024 Brochure – Consultation on offshore petroleum environment plans – Information for the community – May 2023
AFMA	Petroleum industry consultation with the commercial fishing industry
IAP2	Public participation spectrum
DCCEEW	Interim Engaging with First Nations People and Communities on Assessments and Approvals under the Environment Protection and Biodiversity Act 1999

4.4 Regulatory Requirements

Table 4-2 details where information in this EP has been included to demonstrate that Beach has met the consultation requirements in the OPGGS(E)R and NOPSEMA's Guideline GL2086 Consultation in the course of preparing an environment plan prepared to support clarity and transparency on the legal requirements including recent case law:

- *Santos NA Barossa Pty Ltd v Tipakalippa* [2022] FCAFC 193 (appeal decision);
- *Cooper v NOPSEMA (No 2)* [2023] FCA 1158; and
- *Munkara v Santos NA Barossa Pty Ltd* (No 3) [2024] FCA 9.

Table 4-2: OPGGS(E)R, NOPSEMA guidelines and how requirements met

Table note: the sections from the OPGGS(E)R have been updated to align with 2024 OPGGS(E)R.

OPGGS(E)R SECTION *(for consultation)*	NOPSEMA GUIDELINE	HOW REQUIREMENTS WERE MET
34 Criteria for acceptance of environment plan For section 34, the criteria for acceptance of an environment plan are that the plan demonstrates that: (g)(i) the titleholder has carried out the consultations required by section 25; and (g)(ii) the measures (if any) that the titleholder has adopted, or proposes to adopt, because of the consultations are appropriate	Section 25 establishes a duty on titleholders to carry out consultation in the course of preparing an EP. NOPSEMA's role is to assess whether or not the duty has been discharged, read particularly with section 34(g). In order to accept an EP under section 33, NOPSEMA must be reasonably satisfied (as per section 34) that the EP demonstrates the duty (to carry out consultation with relevant persons required by section 25) has been discharged and that the measures (if any) the titleholder has adopted, or proposes to adopt, because of the consultations are appropriate. **General principles for effective consultation** Consultation should be a genuine and meaningful two-way dialogue in which relevant persons are given sufficient information and time to allow them to make an informed assessment of the possible consequences of the activity on their functions, interests, or activities. The consultation process used for different activities may vary depending on a range of factors, certain key principles should be evident in the Environment Plan. **Consulting with groups where interests are held communally** Where interests are held communally, in accordance with tradition, the method of consultation will need reasonably to reflect the characteristics of the interests affected by the titleholder's proposed activity. **First Nations people / groups** First Nations groups, such as land councils and prescribed body corporates, may be relevant persons with a function that may be affected by the activities in the environment plan, but they may also provide advice in relation to who and how other First Nations groups or individuals should be consulted as relevant persons whose interests may be affected by the activities.	Consultations required by Division 3 EP Appendix B and referenced in Section 4.19. EP Section 4.16 shows approach to assessment of objections or claims. EP Section 4.17 shows actual measures adopted as a result of consultation on this EP. EP Sections 4.3 and 4.4 shows the policy, standards and guidelines Beach applies when planning consultation. EP Section 4.5.1 show understanding and respect for consulting representative commercial fishers associations, and commercial fishers. EP Section 4.5.2 shows an informed and culturally sensitive approach to consulting First Nations groups holding formal representative roles in their communities.

OPGGS(E)R SECTION *(for consultation)*	NOPSEMA GUIDELINE	HOW REQUIREMENTS WERE MET
	A connection of traditional owners with Sea Country may constitute an interest for the purposes of section 25(1)(d). Titleholders must demonstrate to NOPSEMA that a reasonable opportunity to be consulted has been afforded to First Nation groups.	
25 Consultation with relevant authorities, persons and organisations, etc (1) In the course of preparing an environment plan (including a revised environment plan referred to in Division 5) a titleholder must consult each of the following (a relevant person): (a) each Commonwealth, State or Northern Territory agency or authority to which the activities to be carried out under the environment plan may be relevant; (b) if the plan related to activities in the offshore area of a State – the Department of the responsible State Minister; (c) if the plan related to activities in the Principal Northern Territory offshore area – the Department of the responsible Northern Territory Minister; (d) a person or organisation whose functions, interests or activities may be affected by the activities to be carried out under the environment plan; (e) any other person or organisation that the titleholder considers relevant.	**Identifying relevant persons** Titleholders are required to identify and consult with each authority, person or organisation who falls within the categories of relevant persons set out in section 25. Titleholders must clearly identify in their EP who is a relevant person and the rationale the titleholder has used to determine who they consider falls within that definition. EPs should set out the processes that have been applied to identifying and determining who are relevant persons, as well as the processes undertaken for consultation. Authorities, persons, and organisations are to be identified on a case-by-case basis. Factors such as the nature of the activity, the environment in which the activity is being undertaken and the possible impacts and risks of the activity should be taken into account when determining whether the activity may be relevant to authorities, or determining who has functions, interests or activities that may be affected. Section 25, like most statutory consultation provisions, imposes an obligation that must be capable of practicable and reasonable discharge by the titleholder. It also involves 'some decisional choice' that the titleholder must make in identifying relevant persons and in how the consultation is undertaken. Processes for the identification of relevant persons must provide for sufficiently broad capture of ascertainable persons and organisations who may have their functions, interests or activities affected or that may be affected by the activity.	**Relevant Persons Identification** EP Section 4.6 sets out a comprehensive methodology supported by research techniques, public notices, advertisements and other methods to identify relevant persons. EP Appendix A (referenced in Section 4.7) shows the categories and names of relevant persons, alongside their functions, interests, and activities.

OPGGS(E)R SECTION *(for consultation)*	NOPSEMA GUIDELINE	HOW REQUIREMENTS WERE MET
	Publication in appropriate media forms may be a reasonable tool to assist in the identification of relevant persons and inform the delivery of more targeted notices to potentially relevant persons. It is recognised that in any community consultation there will inevitably be persons within a group who could not participate for various reasons, however the absence of their participation would not invalidate the process provided reasonable efforts were made to identify the relevant persons and to consult with them. The process should include reference to multiple sources of information, such as publicly available materials, review of databases and registers, published guidance, previous history, as well as advice from authorities and other relevant persons. In some cases, relevant persons have developed guidance detailing their functions, interests, or activities and how and when they wish to be consulted on activities. Titleholders should take this guidance into account in developing consultation processes with relevant persons. Titleholders may also consider how they can create awareness of their activities to encourage potentially relevant persons to make themselves known to the titleholder. **Functions, interests or activities under section 25(1)(d)** The phrase “functions, interests or activities” in section 25(1)(d) should be broadly construed as this approach best promotes the objects of the Regulations, including that offshore petroleum and greenhouse gas activities are carried out in a manner consistent with the principles of ESD. The phrase is a composite one, each part of which has work to do in identifying relevant persons. **Functions:** refers to “a power or duty to do something” **Activities:** to be read broadly and is broader than the definition of ‘activity’ in section 5 of the Environment Regulations and is likely directed to what the relevant person is already doing **Interests:** to be construed as conforming with the accepted concept of “interest” in other areas of public administrative law includes “any interest	

OPGGS(E)R SECTION *(for consultation)*	NOPSEMA GUIDELINE	HOW REQUIREMENTS WERE MET
	possessed by an individual whether or not the interest amounts to a legal right or is a proprietary or financial interest or relates to reputation”	
25 Consultation with relevant authorities, persons and organisations, etc. (2) For the purpose of the consultation, the titleholder must give each relevant person sufficient information to allow the relevant person to make an informed assessment of the possible consequences of the activity on the functions, interests or activities of the relevant person.	**Providing sufficient information under section 25(2)** Information provided must be sufficient to allow an informed assessment of the possible consequences of the activity on the functions, interests or activities of the relevant person. Again, the titleholder has a “decisional choice” to make in how information will be given to allow the “relevant person” to make the assessment contemplated by regulation 25(2). Titleholders should consider the functions, interests or activities of relevant persons and the impacts and risks that affect them when determining information requirements. The level of information necessary is likely to vary for different relevant persons and may depend on the degree to which a relevant person is affected. Different consultation processes may be required for relevant persons and organisations depending on information requirements. What constitutes sufficient information may differ depending on the relevant person(s) and the EP should demonstrate that the process was suited to the type of relevant person. Generic, targeted electronic mailouts or links to a webpage may not be sufficient. Information should be in a form that is readily accessible and appropriate for the relevant person being consulted. Materials provided may include written forms, pictorial or other graphics, verbal briefings or presentations, and the use of other technologies.	**Sufficient information** EP Section 4.8 sets out the approach to preparing different types of information based on the potential impacts on the functions, interest or activities of the relevant persons. Includes a schedule of advertising and public information sessions held.
25 Consultation with relevant authorities, persons and organisations, etc. (3) The titleholder must allow a relevant person a reasonable period for the consultation.	**Providing a reasonable period under section 25(3)** Titleholders must provide a “reasonable period” for the relevant person to make an informed assessment of the possible consequences of the proposed activity on their functions, interests or activities and so they are able to respond with any concerns. The nature, scale and complexity of an activity as well as the extent and severity of potential impacts and risks on a relevant person’s functions,	**Reasonable period** Beach recognises that what constitutes a reasonable period for consultation should be considered on a case-by-case basis, with reference to the nature, scale and complexity of the activity. EP Section 4.9 shows that a reasonable

OPGGS(E)R SECTION *(for consultation)*	NOPSEMA GUIDELINE	HOW REQUIREMENTS WERE MET
	interests or activities may inform what makes a reasonable period for consultation. Relevant persons may have also provided the titleholder with their views of what constitutes reasonable timeframes, their availability and or accessibility issues that should be taken into account. Therefore, what is a reasonable period for consultation should be considered on a case-by-case basis.	period has been provided and consultation has been completed.
25 Consultation with relevant authorities, persons and organisations, etc. (4) The titleholder must tell each relevant person the titleholder consults that: (a) the relevant person may request that particular information the relevant person provides in the consultation not be published; and (b) information subject to such a request is not to be published under this Part.		**Sensitive information** EP Section 4.18 shows that relevant persons have been informed of their rights regarding sensitive information.
24 Other information in environment plan The environment plan must contain the following: (b) a report on all consultations under section 25 of any relevant person by the titleholder, that contains: (i) a summary of each response made by a relevant person; and (ii) an assessment of the merits of any objection or claim about the adverse impact	**Reporting on consultation in the EP under section 24** The consultation process should be documented within the Environment Plan through the titleholder report on consultation and the sensitive information report. NOPSEMA expects the Environment Plan to also provide descriptions of the consultation processes and the rationale used to determine who and how to consult with relevant persons, including the approach to provision of sufficient information and how a reasonable period for the consultation was determined. This will assist to provide a basis for NOPSEMA to form a reasonable satisfaction view that the titleholder has carried out the consultations required by section 25. The consultation process should also assist the titleholder to meet its obligation under section 280 or 460 of the Offshore Petroleum and	**Report on consultations** EP Section 4.13 shows the approach taken to consult to understand and not interfere with others rights. EP Section 4.16 includes approach to assessment of the merits of objections or claims about the adverse impacts of each activity and Beach's response and reference to the report on consultation in Appendix B. The full text of any response by a relevant person was provided to

OPGGS(E)R SECTION *(for consultation)*	NOPSEMA GUIDELINE	HOW REQUIREMENTS WERE MET
of each activity to which the environment plan relates; and (iii) a statement of the titleholder's response, or proposed response, if any, to each objection or claim; and (iv) a copy of the full text of any response by a relevant person;	Greenhouse Gas Storage Act which requires that it must carry out the petroleum or greenhouse gas activity respectively in a manner that does not interfere with navigation, fishing, conservation of resources of the sea and seabed, other offshore electricity infrastructure and petroleum activities, and the enjoyment of native title rights and interests (within the meaning of the Native Title Act 1993) to a greater extent than is necessary for the reasonable exercise of the titleholder's rights and obligations. The report on consultation should include clear and precise identification of claims and objections presented, an assessment of the merit of each objection or claim with sufficient rationale provided to support that assessment, and a demonstration of the suitability of any measures adopted as a result of the consultation.	NOPSEMA on submission of the EP as sensitive information.
22 Implementation strategy for environment plan (15) The implementation strategy must provide for appropriate consultation with: (a) relevant authorities of the Commonwealth, a State or a Territory; and (b) other relevant interested persons or organisations.	Demonstrating in an Environment Plan that ongoing consultation is a part of a titleholder's implementation strategy as required by section 22(15), is separate to demonstrating that requirements for relevant persons consultation outlined in this guideline have been met.	**Ongoing consultation** EP Section 4.19 show the consultation that will continue as part of the implementation strategy for this EP.

4.5 Principles of Effective Consultation

Beach is committed to genuine, transparent, and meaningful consultation that meets regulatory requirements and applies Beach's own policies and standards. These policies are available on Beach's corporate website:

- Community Engagement Policy
- Indigenous Participation Policy
- Human Rights Policy

Beach also undertook consultation in accordance with its internal Community Engagement Standard BSTD 10.2.

This standard incorporates the International Association of Public Participation's (IAP2) Public Participation Spectrum global best practice model.

4.5.1 Consulting Groups with Communal Interests

Beach respects the role of commercial fishing associations in representing their members and consults with them to understand their preferred consultation approach for their executive, board (where applicable) and their members. Where an individual commercial fisher is known to Beach and wishes to receive information from Beach and consult directly, Beach respects such requests. See Section 4.14.

Beach respects communal interests held by First Nations groups and has approached consultation as set out in Section 4.5.2.

4.5.2 Consulting Frist Nations Groups and Peoples

Beach's Indigenous Participation Policy sets out commitments aimed at building positive, long term, trusting relationships with relevant Indigenous communities. In addition, Beach is cognisant of the NOPSEMA Consultation Guidelines and applicable case law detailed in Section 4.3 and Section 4.4 and has applied these requirements in its approach to identifying and consulting with First Nations relevant persons.

As an operator in Victoria, Beach's consultation approach is underpinned by the recognition of the role of Registered Aboriginal Parties (RAPs),and Registered Native Title Body Corporate (RNTBCs), under the relevant state and Commonwealth laws - in Victoria the Aboriginal Heritage Act 2006 (Vic) (AHA 2006 VIC) that recognises a Registered Aboriginal Party (RAP) as the Traditional Owner Corporation appointed under the AHA 2006 VIC to manage and protect Aboriginal cultural heritage over their Country, including coastal and onshore waters. The AHA 2006 VIC recognises RAPs as the primary guardians, keepers and knowledge holders of Aboriginal cultural heritage and the primary source of advice and knowledge on matters relating to Aboriginal places or objects in the appointed RAP region.

Beach has taken care to ensure its consultation with First Nations groups is respectful and culturally appropriate. This included, for example, Beach:

- offering First Nations groups tailored information sessions, both in-person and online (webinars), which promoted a culturally safe space to discuss activities.

- Offered online or in person meetings at a mutually convenient time and location, to discuss Beach's activities,
- reviewing each group's published Country or Sea Country management plans and, where discussed with First Nations groups, referenced those plans to confirm the cultural priorities and values important to those groups.
- reviewing additional research and public documents, including archaeological and anthropological reports, to further develop its understanding of First Nations groups cultural values.
- based on feedback from First Nations groups, preparing information material with a strong visual focus, which included story boards using images and brief EP activity descriptions, also showing the proposed activity timeline, using infographics and maps of Beach's operational areas and EMBAs, and identifying the First Nations communities adjacent to the activity/EMBA.

Beach does not directly approach First Nations individuals for consultation, as this could undermine the role of the recognised representative bodies and corporations and has the potential to cause issues within the community. Beach does however ask First Nations representative bodies to identify individuals and to distribute Beach activity information to those who they consider relevant.

Beach's approach to respectful and effective consultation with RAPs and Registered Native Title Body Corporates identified as relevant persons has also included the following key steps:

11. Provided information on the activities in this EP (and the OGV Project).
    - Provided information on the purpose of consultation.
    - Explained that the identification of cultural values and sensitivities is an important part of preparing EPs as it enables any impacts and risks to be assessed and where applicable for measures to be developed to reduce impacts and risks to an acceptable level and ALARP.
    - Enquired how they wish to consult with Beach and whether they have existing consultation guidelines and protocols if they wanted consultation between Beach and their members and how they would like that to occur.
    - Asked if there is any information they wish to provide on cultural values and sensitivities and any heritage values, and discussed relevant information they have already published where applicable.
    - Enquired if they are aware of any people, who in accordance with Indigenous tradition, may have spiritual and cultural connections to the environment that may be affected (EMBA) by the activity that have not yet been afforded the opportunity to provide information that may inform the management of the activity.

While not all First Nations groups responded with specific requirements for consultation with them, Beach notes the following examples as positive demonstrators of Beach's adaptive approach to consultation, taking into account First Nations responses to Beach's enquiries:

- **Bunurong Land Council Aboriginal Corporation**: Beach visited in person to discuss the activities in plain English and answer their questions, responded to their request to undertake an assessment of cultural values and sensitivities, and offered discussion sessions with their members.
- **Gunditj Mirring Traditional Owners Aboriginal Corporation:** Beach provided opportunities for, and sought to hold, an in-person meeting with GMTOAC and the Gunditjmara people throughout the consultation period. See Appendix D.
- **Eastern Maar Aboriginal Corporation:** Beach consulted in accordance with an agreed process set out in Beach and EMAC's native title agreement; and also met with EMAC in response to webinar requests to consult with newly hired staff members, in addition to past visits on Country to build relationships and understand EMAC Sea Country.
- **Wadawurrung Traditional Owners Corporation**: Beach accommodated WTOC's requests for direct meetings to discuss the Program and their requests to remain updated of Beach activities.

The consultation approach set out above was not to the exclusion of any individual First Nations persons and Beach has undertaken such direct consultations.

4.6 Relevant Persons Identification Methodology

4.6.1 Identification Process

In following the law set out in *Santos NA Barossa Pty Ltd v Tipakalippa* [2022] FCAFC 193 (appeal decision), Beach undertook a further comprehensive review of its methodology for identifying and consulting with relevant persons resulting in Beach's recently accepted Seabed Survey EP and Drilling and Plug & Abandonment Activities EP. Beach is constantly refining its methodology cognisant of NOPSEMA Guidelines, recent case law, and industry best practice applicable to the nature and scale of the activities in this EP.

The relevant person identification methodology utilised for the purposes of this EP follows a process of assessing elements of this EP to identify potentially relevant persons: defined activities; the spatial extent of the Operational Area, Planning Area and impact and risk specific EMBA; environmental values and sensitivities; identification and assessment of risks and impacts. After initial identification, the consultation process was used to verify and refine the initial steps. That process is set out in Figure 4-1.

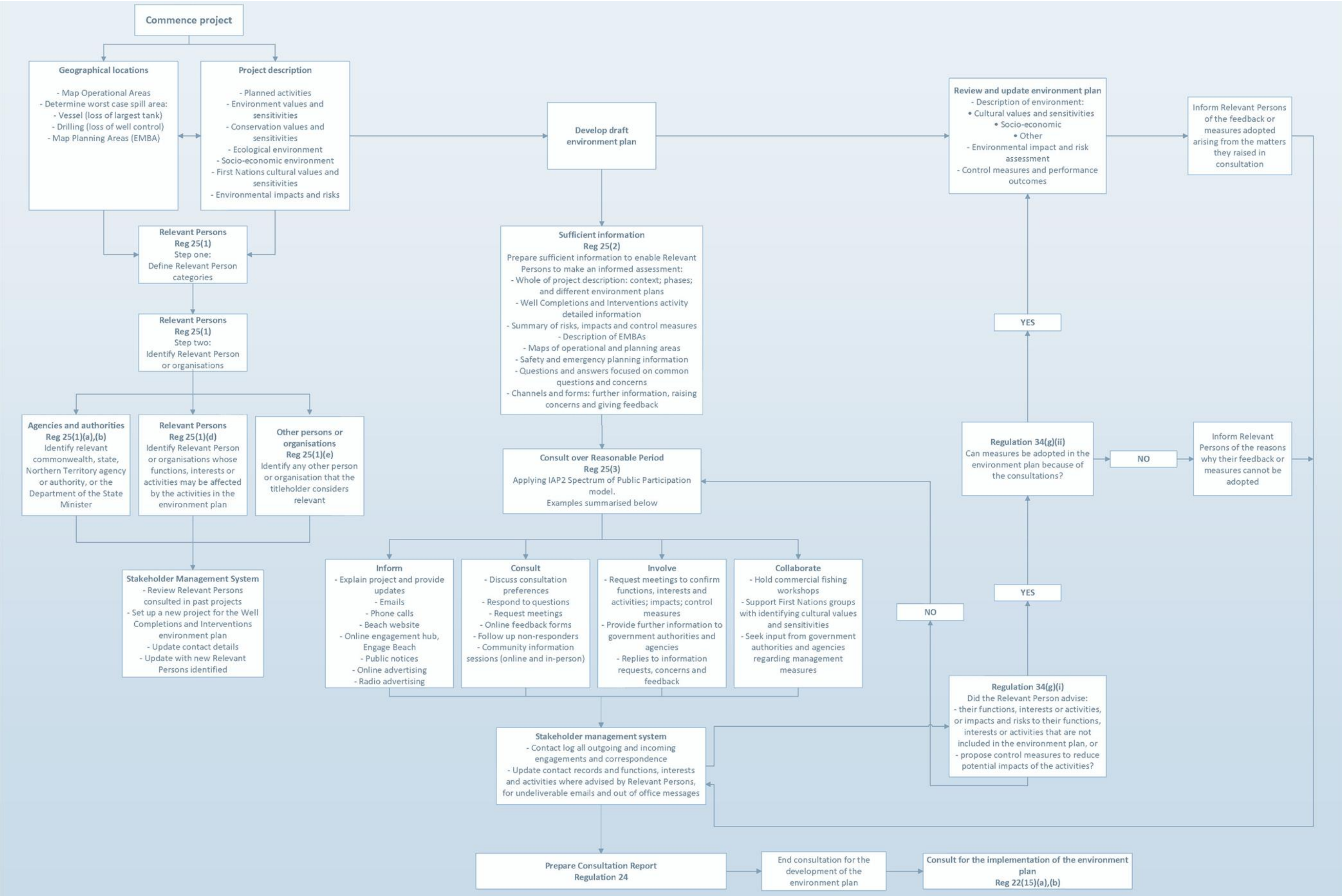


Figure 4-1: Relevant person methodology

4.6.2 Step One: Define Project

The first step in the relevant person identification methodology involved defining the project including:

- Program activities;
- Description of the environment where the Program activities would be undertaken;
- Assessment of impacts and risks to the environment from the Program activities;
- Geographic locations of the Operational and Planning Areas.

4.6.2.1 Activities, Environment description and assessment

The Program activities were described, the receiving environment was defined, and an assessment of impacts and risks undertaken to enable a review of relevant person categories as described further in Section 4.6.1 and set out in Table 4-4. The descriptions of environment, impact and risk assessments, along with control measures adopted, was an iterative process, informed by the consultation process undertaken to meet the requirements of regulation 34.

4.6.2.2 Geographic locations

Establishing the geographic areas of the Program activities enabled the broadest extent of potential impacts, thereby enabling a geographic area of enquiry in the relevant persons identification methodology. Geographic locations were determined including:

- Operational Area: where the Program activities would occur;
- Planning Area: the area that may be potentially exposed to hydrocarbons at the low exposure values for the four hydrocarbon phases described in NOPSEMA Environment Bulletin Oil spill modelling (NOPSEMA 2019). The Planning Area is conservatively based on the low exposure values that do not result in environmental or ecological impacts.

The Planning Area was determined from quantitative spill modelling for a loss of diesel from a vessel collision and a loss of containment (condensate) while Program activities were underway (Section 7.14.5). The spill modelling and impact assessment defines different hydrocarbon exposure values for the four hydrocarbon phases (floating, dissolved, entrained, and accumulated shoreline) that pose different potential ecological and socio-economic risks. Section 7.13.5 details the predicted level of risk.

The defined geographic locations Figure 6-1, and Section 7 Environmental Impact and Risk Assessment, were examined by the Beach Community Relations and Environment OGV Project team members in the first steps in the relevant persons identification methodology. That assessment was also used to plan appropriate consultation methods given the nature and scale of the activity and the potential impacts on the relevant person's functions, interests, or activities.

There may be instances where potential environmental impacts may occur. Despite a geographical overlap, this will not necessarily equate to a consequence of the activity on an organisation or person’s functions, interests or activities. In such instances an organisation or person would not be identified as a relevant person (as defined under OPGGS(E)R Section 25).

Table 4-3 summarises the different geographical areas of enquiry, potential impacts and relevant person category focus for further research to identify relevant organisations or persons.

Table 4-3: Geographic locations and relevant person focus

Area	Summary of Potential Impacts	Relevant Persons Category Focus
Operational Area Area where the activities will take place.	Displacement of other marine users required to avoid the rig, vessels, and wells. Localised disturbance of the marine environment including seabed, marine fauna, and flora. Potential for disturbance to telecommunications infrastructure.	Relevant Commonwealth and State Departments and Authorities. Persons or organisations whose functions, interests or activities may be affected by the displacement or disturbance from the planned activities, such as: • Commercial fishing • Indigenous groups • Marine based industries • Marine tourism • Environmental conservation groups • Education and research organisations.
Planning Area: <u>Shoreline hydrocarbons</u> Worst-case hydrocarbon releases have been modelled to show the broadest extent of potential shoreline contact at low, moderate and high thresholds.	**Low Threshold** Low threshold shoreline contact hydrocarbons may be visible as a stain or film, thereby reducing visual amenity for tourism and potentially having a socio-economic impact. The low threshold of 10 g/m2 equates to approximately 2 teaspoons of hydrocarbon per square metre of shoreline accumulation. NOPSEMA and AMSA guidance indicates that the low threshold shoreline hydrocarbon contact would not initiate a clean-up response. **Moderate and high threshold** Moderate and high threshold shoreline hydrocarbon contact has the potential for environmental impact and would require activating the Beach Oil Pollution Emergency Preparedness plan (OPEP). A shoreline concentration of 100 g/m2 (moderate threshold), or above, is the minimum loading that hydrocarbons can be effectively cleaned up as per the NOPSEMA Oil Spill Modelling Environment Bulletin (April 2019).	Organisations who have responsibilities for emergency response activities, including Commonwealth and State marine pollution agencies. Other organisations who may have a supporting or communication role, such as Local Government Authorities or parks management authorities. Persons or organisations whose functions, interests or activities may be affected by unplanned activities such as: • First Nations groups • Marine based industries • Marine tourism • Land tourism • Recreational associations • Environmental conservation groups.
Planning Area:	**Low threshold**	Organisations who have responsibilities for emergency

Area	Summary of Potential Impacts	Relevant Persons Category Focus
Floating, entrained and dissolved hydrocarbons. Worst-case hydrocarbon releases have been modelled to determine the broadest extent of potential floating, in-water entrained and dissolved hydrocarbons at low, moderate and high.	Floating Low threshold floating hydrocarbons would be visible on the sea surface (described as a rainbow sheen) thereby reducing visual amenity for tourism and potentially having a socio-economic impact. The low threshold floating hydrocarbons is considered appropriate for scientific monitoring to assessment potential impacts. In-water entrained and dissolved Low threshold in-water hydrocarbons (dissolved and entrained) are not considered to have environmental, ecological, or socio-economic impacts and are considered appropriate to establish planning area for scientific monitoring. **Moderate and high threshold** Floating Moderate and high threshold floating hydrocarbons may have environmental effects and at the high threshold would require activating the OPEP for a clean-up response. The moderate and high thresholds would trigger scientific monitoring to determine potential impacts to inform management measures such as closure of areas such as fishing grounds. In-water entrained and dissolved Moderate and high threshold entrained and dissolved hydrocarbons may have environmental effects. The moderate and high thresholds would trigger scientific monitoring to determine potential impacts to inform management measures such as closure of areas such as fishing grounds.	response activities, including Commonwealth and State marine pollution agencies. Other organisations who may have a supporting or communication role, such as Local Government Authorities or parks management authorities. Persons or organisations whose functions, interests or activities may be affected by unplanned activities such as: • Commercial fishing • Indigenous groups • Marine based industries • Marine tourism • Environmental conservation groups • Education and research organisations.

4.6.3 Step Two – Define Relevant Person Categories

The second step in the relevant persons identification methodology involved reviewing the environment values and sensitivities, along with the impacts and risks to determine the broad categories of relevant persons or organisations whose functions, interests and activities may be affected by the Program activities. Relevant persons categories are shown in Table 4-4.

Table 4-4: Identification of Relevant Persons Categories

Environmental Values and Sensitivities	Operational Area	Planning Area: Floating, dissolved, entrained	Planning Area: Shoreline	Relevant Person Categories
Conservation Values and Sensitivities				
World Heritage Properties	N/A	N/A	N/A	N/A
Australian Marine Parks: • Apollo • Zeehan	N/A	✓	N/A	Relevant Government Departments and Agencies
		✓		Indigenous Groups
		✓		Marine Based Industries
		✓		Marine Tourism
		✓		Educational and Research Organisations
		✓		Environmental Conservation Groups
National Heritage Places: • Great Ocean Road and Scenic Environs • Point Nepean Defence Sites and Quarantine Station Area • Quarantine Station and Surrounds (within Point Nepean Site)	N/A	N/A	✓	Relevant Government Departments and Agencies
			✓	Indigenous Groups
			✓	Marine Based Industries
			✓	Marine Tourism
			✓	Educational and Research Organisations

Environmental Values and Sensitivities	**Operational Area**	**Planning Area:** Floating, dissolved, entrained	**Planning Area:** Shoreline	**Relevant Person Categories**
			✓	Environmental Conservation Groups
Commonwealth Heritage Places	N/A	N/A	N/A	N/A
• No wrecks have been recorded within the Operational Area	N/A	N/A	N/A	N/A
Wetlands of International Importance • Glenelg Estuary and Discovery Bay Wetlands	N/A	N/A	✓ ✓ ✓ ✓ ✓	Relevant Government Departments and Agencies Indigenous Groups Land Tourism Educational and Research Organisations Environment Conservation Groups
Nationally Important Wetlands: • Western Port (Victoria)	N/A	N/A	✓ ✓ ✓ ✓ ✓	Relevant Government Departments and Agencies Indigenous Groups Land Tourism Educational and Research Organisations Environment Conservation Groups
Marine Protected Areas: • Victorian – see Section 6.2.8	N/A	✓ ✓ ✓ ✓	Depending on location	Relevant Government Departments and Agencies Indigenous Groups Marine Tourism

Environmental Values and Sensitivities	Operational Area	Planning Area: Floating, dissolved, entrained	Planning Area: Shoreline	Relevant Person Categories
		✓		Educational and Research Organisations Environment Conservation Groups
Terrestrial Protected Areas: • Victorian – see Section 6.2.9 • Tasmanian – see Section 6.2.11	N/A	N/A	✓ ✓ ✓ ✓ ✓	Relevant Government Departments and Agencies Indigenous Groups Land Tourism Educational and Research Organisations Environment Conservation Groups
Key Ecological Features: • Bonney Coast Upwelling • West Tasmania Canyons	N/A	✓ ✓ ✓ ✓ ✓	N/A	Relevant Government Departments and Agencies Commercial Fishing Indigenous Groups Educational and Research Organisations Environmental Conservation Groups

Environmental Values and Sensitivities	Operational Area	Planning Area: Floating, dissolved, entrained	Planning Area: Shoreline	Relevant Person Categories
Ecological Environment				
The ecological and physical environment described in Chapter 6 provides the basis for further assessment of values and sensitivities, along with impact and risk assessments (Chapter 7) from planned and unplanned activities. The ecological and physical environment includes: • Benthic habitats and species assemblages • Carbonate sands and exposed limestone (habitat for various species) • Seagrass (coastline presence) • Algae (coastline presence) • Mangroves (coastline presence) • Plankton • Invertebrates • Fish • Birds • Marine reptiles • Cetaceans • Pinnipeds	✓ ✓ ✓ ✓ ✓	✓ ✓ ✓ ✓ ✓	Various assessments specific to ecological feature.	Relevant Government Departments and Agencies Commercial Fishing Indigenous Groups Educational and Research Organisations Environmental Conservation Groups
Threatened Ecological Communities: • Assemblages of species associated with open-coast	N/A	✓	Specific to location of	Relevant Government Departments and Agencies

Environmental Values and Sensitivities	Operational Area	Planning Area: Floating, dissolved, entrained	Planning Area: Shoreline	Relevant Person Categories
salt-wedge estuaries of western and central Victoria ecological community • Giant Kelp Marine Forests of South East Australia • Subtropical and Temperate Coastal Saltmarsh			ecological community.	Indigenous Groups Educational and Research Organisations Environmental Conservation Groups
Socio-economic				
Otway Victoria Local Government Areas: • Bass Coast • Colac Otway • Corangamite • Glenelg • City of Greater Geelong • Mornington Peninsula • Moyne • South Gippsland • Surf Coast Tasmania Local Government Areas: • King Island	N/A	✓ ✓ ✓ ✓ ✓ ✓ ✓	✓ ✓ ✓ ✓ ✓ ✓ ✓	Relevant Government Departments and Agencies Community Indigenous Groups Land Tourism Marine Tourism Educational and Research Organisations Environment Conservation Groups
Offshore petroleum industry (non-Beach): • ConocoPhillips Australia exploration titles (VIC/P79 and T/49P) • Cooper Energy Casino-Henry pipeline, Casino and Henry	ConocoPhillips Australia exploration title (VIC/P79) Cooper Energy exploration title (VIC/P76) Cooper Energy production licence (VIC/L24)	✓	N/A	Marine Based Industries (offshore oil and gas)

Environmental Values and Sensitivities	**Operational Area**	**Planning Area:** Floating, dissolved, entrained	**Planning Area:** Shoreline	**Relevant Person Categories**
gas fields (production licences VIC/L24, VIC/L30, VIC/L33, VIC/L34; exploration permits VIC/P44, VIC/P76) • Minerva pipeline and gas field (VIC/L22)				
Offshore renewable energy • Southern Ocean Declared Area	N/A	✓	N/A	Marine Based Industries (offshore renewables)
Other infrastructure Existing: • Indigo Central telecommunications cable • Bass Strait-1 and Bass Strait-2 telecommunications cables Planned: • East Coast Cable System • Hawaiki Submarine Cable • Sydney-Melbourne-Adelaide-Perth (SMAP) Cable	N/A	✓	N/A	Marine Based Industries
Defence • Restricted Airspace • Unexploded Ordnance Areas	✓	N/A	N/A	Relevant Government Departments and Agencies
Shipping	✓ ✓	✓ ✓	✓ ✓	Relevant Government Departments and Agencies Marine Based Industries

Environmental Values and Sensitivities	Operational Area	Planning Area: Floating, dissolved, entrained	Planning Area: Shoreline	Relevant Person Categories
Tourism Recreation (beach walking, fishing, snorkelling, diving, surfing close to coastline)	N/A	✓ ✓ ✓ ✓ ✓ ✓	✓ ✓ ✓ ✓ ✓ ✓	Relevant Government Departments and Agencies Community Indigenous Groups Land Tourism Marine Tourism Recreational associations
Commercial fisheries: • Commonwealth • Victoria • Tasmania • SA	✓ **(Commonwealth and Victoria only)**	✓	N/A	Commercial Fishing
Seaweed Industry	N/A	✓ ✓	✓ ✓	Business Indigenous Groups
First Nations				
Sea Country Native Title Indigenous Groups Protected Areas Indigenous Groups Land Use Agreements	✓ (Sea Country only)	✓	✓	Indigenous Groups
Impacts				
Light emissions: may attract light-sensitive species to MODU and vessels	✓	N/A	N/A	Relevant Government Departments and Agencies

Environmental Values and Sensitivities	**Operational Area**	**Planning Area:** Floating, dissolved, entrained	**Planning Area:** Shoreline	**Relevant Person Categories**
	✓ ✓ ✓ ✓			Commercial Fishing Indigenous Groups Educational and Research Organisations Environmental Conservation Groups
Atmospheric emissions: decrease in air quality, greenhouse gas emissions	✓	N/A	N/A	Relevant Government Departments and Agencies Environmental Conservation Groups
Underwater sound: temporary, during vessel and MODU activities, up to 8 km	✓ ✓ ✓ ✓ ✓ ✓	N/A	N/A	Relevant Government Departments and Agencies Commercial Fishing Indigenous Groups Educational and Research Organisations Environmental Conservation Groups
Physical presence: • Pre-laid anchors: 2 km caution zone for anchors • MODU on location: 500 m PSZ and 2 km caution zone for anchors • Permanent wells: 500 m PSZ	✓ ✓ ✓ ✓	N/A	N/A	Relevant Government Departments and Agencies Commercial Fishing Marine Based Industries Marine Tourism

Environmental Values and Sensitivities	**Operational Area**	**Planning Area:** Floating, dissolved, entrained	**Planning Area:** Shoreline	**Relevant Person Categories**
Seabed disturbance: survey samples, wells, anchors, drill cuttings	✓ ✓ ✓ ✓ ✓ ✓	N/A	N/A	Relevant Government Departments and Agencies Commercial Fishing Indigenous Groups Marine Based Industries Marine Tourism Environmental Conservation Groups
Marine discharge MODU and vessels: putrescible waste, sewerage and grey water, cooling and brine water, bilge water and deck drainage. Marine discharge well completions, well intervention and P&A: drill cuttings and fluids, P&A fluids, BOP fluids, well completions fluids, XT control system discharges, cement, bulk dry discharges.	✓ ✓ ✓ ✓	N/A	N/A	Relevant Government Departments and Agencies Commercial Fishing Indigenous Groups Environmental Conservation Groups
Risks				
Introduction and establishment of invasive marine species	✓ ✓ ✓ ✓ ✓	N/A	N/A	Relevant Government Departments and Agencies Commercial Fishing Indigenous Groups Environmental Conservation Groups

Environmental Values and Sensitivities	Operational Area	Planning Area: Floating, dissolved, entrained	Planning Area: Shoreline	Relevant Person Categories
				Educational and Research Organisations
Fauna interaction	✓ ✓ ✓ ✓	N/A	N/A	Relevant Government Departments and Agencies Indigenous Groups Environmental Conservation Groups Educational and Research Organisations
Loss of waste or materials	✓ ✓ ✓ ✓	N/A	N/A	Commonwealth Departments / Agencies Commercial Fishing Indigenous Groups Environmental Conservation Organisations
Loss of containment – diesel and condensate	✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓	✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓	✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓	Relevant Government Departments and Agencies Community Commercial Fishing Indigenous Groups Land Tourism Marine Tourism Educational and Research Organisations Environment Conservation Groups

Environmental Values and Sensitivities	**Operational Area**	**Planning Area:** Floating, dissolved, entrained	**Planning Area:** Shoreline	**Relevant Person Categories**
Spill response activities	✓	✓	✓	Relevant Government Departments and Agencies
	✓	✓	✓	Commercial Fishing
	✓	✓	✓	Land Tourism
	✓	✓	✓	Marine Based Industries
	✓	✓	✓	Marine Tourism
	✓	✓	✓	Environment Conservation Groups

4.6.4 Step Three – Identify Relevant Authorities, Organisations and Persons

Section 4.6.5 below sets out the different methods undertaken to identify responsible agencies, authorities, and relevant persons or organisations as required by the OPGGS(E)R. Methods range from desktop research of a range of publicly available information, public advertising, and consultation with existing relevant persons to identify other relevant persons.

4.6.4.1 Identify Relevant Authorities – Regulations 25(!)(a)-(b)

Relevant authorities, as required in the OPGGS(E)R Section 25(1)(a) were identified as relevant based on their roles and responsibilities in relation to the proposed activities in this EP, the spatial extent of the Planning Area, potential impacts and control measures. Methods to identify relevant authorities included review of:

- GL1887 – Consultation with Commonwealth agencies with responsibilities in the marine area – January 2024.
- AFMA Petroleum industry consultation with the commercial fishing industry.
- NOPSEMA and Director of National Parks Petroleum activities and Australian Marine Parks. A guidance note to support environmental protection and effective consultation – January 2024.
- Beach’s recent consultation records in BeachConnect (Beach’s stakeholder database).
- Desktop research, emails and phone calls to identify any agency or department changes or contacts within the agency or department.
- Department or agency feedback to Beach from time to time.

The Department of the responsible State Minister has also been identified, for both Victoria and Tasmania, as required by OPGGS(E)R Section 25(1)(b).

4.6.4.2 Identify Relevant Persons or Organisations – Regulation 25(1)(d)

Building upon the relevant person category assessments in Table 4-5: Relevant persons research methods, the next steps to identify individual organisations or persons whose functions, interests or activities may be affected by the activities in the EP (OPGGS(E)R Section 25(1)(d)) included reviews of existing database records and additional research as described for:

- Broadly for relevant persons or organisations: Table 4-5: Relevant persons research methods.
- Specifically for First Nations Groups or people: Section 4.6.4.3
- Specifically for Commercial Fishing Associations and Commercial Fishers: Section 4.6.4.4.

Table 4-5: Relevant persons research methods

Activity	Detail
Database review	Beach’s stakeholder database (BeachConnect) contains a significant number of organisations and individuals identified since 2014 for consultation in the development of EPs.

Activity	Detail
	A comprehensive review was undertaken in November 2022 for further consultation on the Thylacine Installation and Commissioning EP. Another review was undertaken during January and February 2023 for the Otway Offshore Operations EP review. In preparing for consultation on the OGV Project, a further review of BeachConnect was undertaken. Specific activities have included: • Creating a relevant person list from the full OGV Project list specific to this EP. • Reviewing master list of organisations and individuals against relevant person categories identified in assessment of totality of environment values, sensitivities, impacts and risks. • Contacting each organisation or individual where engagements showed no or few responses or where data appeared out of date, verified contact details and if they wished to continue consulting with Beach.
Functions, interests or activities	Identification of potential new relevant persons involved preliminary research into their functions, interests and activities from: • Readily ascertainable information on internet search engines, social media channels and organisation websites. • Prior communication with persons and organisations is reviewed to update the records of functions, interests and activities captured against entity records in BeachConnect. • Beach prepares information sheets that explain the purpose of consultation, the meaning of 'relevant person' in accordance with the regulations (among other things) and invites the reader to advise any other people they believe may be a relevant person to contact Beach. • Beach creates ongoing opportunities for relevant persons to participate in consultation such as community information sessions (online and in-person) and Engage Beach, which are advertised through public notices in local, state and national newspapers; radio advertisements; Facebook, Instagram, Meta and other online advertisements. • Through the consultation process, relevant persons functions, interests or activities are updated in BeachConnect when new information is available.
Local knowledge	• Beach has carried out wide ranging consultations for offshore and onshore Otway Basin projects since 2014. Beach owns and operates the Otway Gas Plant and a number of Beach staff live in the local area and have extensive knowledge of the local community, and other relevant persons. • Beach has previously contracted consultants who live in south-west Victoria and have extensive local knowledge of organisations and persons who may be relevant persons, to undertake research into potentially relevant persons based on the categories identified.
Broad based keyword search	• Searched online for potentially relevant persons using key words including boat; swim; dive; sail; yacht; boat charter; SCUBA diving; sea kayaking; fish; marine environment; oceans; marine mammals; cultural heritage; maritime heritage. • Combined above terms with place-based search terms of: Warrnambool; Peterborough; Port Campbell; Apollo Bay; Portland; Mount Gambier; King Island. • Investigated and monitored media articles and online campaigns around offshore activity concerns and using the above searches.

Activity	Detail
	• Investigated social media channels including LinkedIn, Facebook, and Instagram in the above searches.
Warrnambool Moyne Shire, Corangamite Shire, Colac Otway Shire and Glenelg Shire focus	• Beach has engaged with an extensive list of relevant persons in Port Campbell, Peterborough, and Timboon for many years. • Relevant persons in Warrnambool, Port Fairy and Portland have historically focussed on commercial fishers, therefore further research and public advertising was carried out. • For each relevant person newly identified in these areas Beach enquired if they could share project information sheets and recommend any other potentially relevant persons. • Public notices were published in the Cobden Timboon Coast Times, Colac Herald, Portland Observer, The Beacon Newsletter, and Warrnambool Standard. • Radio campaigns on 94.5 3YB, 95.3 Coast, 3CS and Mixx Colac were undertaken. • Information sessions were held in Port Campbell, Warrnambool, and Portland. • Advertisements were posted on Facebook, Instagram and Meta, using geotargeting and key interest terms to reach potentially relevant persons in the region. Online advertisements were also published on local masthead websites, where available.
South Gippsland Shire	• Reviewed existing database contacts. • Identified and contacted relevant Local Government Authorities. • Online search and identification of any commercial fishing and marine tourism businesses in accordance with the Planning Area and assessment criteria identified in our methodology, time to exposure, extent of exposure, volumes ashore and probability of accumulation above threshold. • Advertisements were posted on Facebook, Instagram and Meta, using geotargeting and key interest terms to reach potentially relevant persons in the region. Public notices were run in the South Gippsland Sentinel Times and online banner advertisements were published on its website.
King Island focus	• Engagement approach was developed with King Island Council for the OGV Project. • Types of organisations engaged include: industry and tourism associations; marine based tourism businesses; coast care groups; fishing industry; and seaweed industry. • Public notices were published in the King Island Courier. • Advertisements were posted on Facebook, Instagram and Meta, using geotargeting and key interest terms to reach potentially relevant persons in the region.
Marine parks	• Contacted Parks Victoria to clarify agency and divisional responsibilities and updated Beach's database with information on the separate teams dedicated to marine parks and sanctuaries in the 12 Apostles and Apollo Bay areas. • Contacted Department of Natural Resources and Environment Tasmania (Parks and Wildlife Services). Engaged with the Director of National Parks as per the NOPSEMA and Director of National Parks guidance note. Shape files were provided as part of the required 'sufficient information'. • Reviewed database of parties licensed to carry out activities within marine parks.

Activity	Detail
Conservation groups	• Beach sought direct engagement with regional and national conservation groups and commenced consultations with organisations who responded. • National ENGOs were included where a specific interest or campaign on gas development within Victorian, Tasmanian or Commonwealth waters could be identified.
Tourism groups	• Researched marine tourism operators active between Portland and Apollo Bay, South Gippsland, and King Island. • For locations where potential shoreline oil is limited to the low threshold, the following is considered for relevant persons identification associated with tourism: time to exposure, extent of exposure, volumes ashore and probability of accumulation above threshold. • Shore based tourism focus is where there may be moderate to high shoreline contact in the event of an emergency and adjacent to Beach's Operational Areas.
Local government	• Contacted local government councils adjacent to Operational Areas to review the correct personnel to liaise with for Beach activity updates and environmental questions or concerns.
Other public notices and online advertising	• Public notices were published in the National Indigenous Times, Koori Mail, Hobart Mercury, Geelong Advertiser and Herald Sun for greater reach of potentially relevant persons. Online advertisements were published on news sites and social media platforms where available (see advertising schedule in Table 4-8).

4.6.4.3 Identifying First Nations Groups or Persons

Beach has assets in Victoria that have been in operation for many years. Since becoming the operator of those assets, Beach has been investing time to build genuine, honest and transparent relationships with the First Nations groups on whose Traditional Lands and Waters Beach operates. Beach has consulted with these groups for various purposes including relationship building, agreement making, cultural heritage management plans and community development initiatives. These engagements have been led by Beach's First Nations Engagement Manager, a First Nations person who has completed post graduate studies in Land and Sea Country management and Cultural Heritage.

Beach understands that Sea Country is an important part of First Nations people's traditional estate, and they hold a cultural responsibility to ensure its protection and management. First Nations people's relationship to their Sea Country brings with it a complexity of cultural rights and responsibilities, including the right to access, use and distribute resources, and the responsibility to manage those resources from generation to generation. Beach acknowledges that First Nations groups make various claims to land; that they are owners of their country, they belong to their country, they identify with their country, and they are stewards of their country, including their Sea Country (Smyth 1994).

First Nations groups who reside along the coasts or on islands believe that Sea Country contains the evidence of ancestral creation stories, stories about animals, plants, and people, as well as the creation of landscape features such as islands and reefs. Coastal and Islander communities hold cultural responsibilities to ensure Sea Country is cared for and managed. Contemporary First Nations groups including RAPs and Registered Native Title Body Corporates, also known as Prescribed Body Corporates are playing an increasingly important role in the management of this Sea Country, through formalised roles and programs that work alongside various State and Commonwealth government departments or agencies.

Values and sensitivities regarding Sea Country may include different features such as:

- Historic and contemporary cultural harvesting of marine flora and fauna.
- Cultural landscape features that hold dreamtime and creation stories, such as offshore islands, estuaries, beaches, bays, and marine areas.
- Different marine and avian species that hold deep connections to cultural lore and represent spiritual emblems.

Given these Sea Country values and sensitivities, there is the potential for some First Nations groups and peoples to be considered 'Relevant Persons' in relation to the proposed activities set out in this EP. Beach understands the interconnectedness of Sea Country, along with the importance of genuine, respectful and effective consultation with RAPs and Registered Native Title Body Corporates. Given this knowledge, Beach's method of identifying potential First Nations Peoples that may be Relevant Persons included:

- Assessed the total values and sensitivities of the physical environment that may be affected by the planned and unplanned activities in the EP, including the spatial extent of the activities.
- Carried out desktop research to identify any published Sea Country, Healthy Country research or management plans that may identify any culturally significant landscapes, totem species, marine and avian, that may be considered a cultural value or sensitivity relevant to the activities.
- Beach recognises the importance of Sea Country and researched opportunities to uplift its knowledge of Sea Country and submerged cultural heritage and to connect further and develop relationships with First Nations groups and leading regulatory bodies. In addition to desktop research, Beach's First Nations Engagement Manager attended the following events to build knowledge and relationships:
    - National Sea Country Summit November 2023 in Darwin.
    - Underwater Cultural Heritage Conference 13 – 15 September 2023 in Canberra.
- Understanding and respecting that First Nations Peoples are protective of their cultural sensitivities, and therefore such information may not be published, further research was undertaken to identify First Nations Peoples organisations and persons including:
    - Used the National Native Title database to identify any Native Title claims or determinations in the area adjacent to our activities.
    - Used the Victorian Aboriginal Heritage Council online map to identify any RAPs in Victoria.
    - Researched the Prescribed Bodies Corporate, RAPs, Native Titleholders and claimants. This research focussed on Victoria given the nature and scale of the planned and unplanned activities, including the spatial extent of the planning area in the EP.

  - Consulted with First Nations Peoples Legal Research Service to seek their advice on identifying First Nations Relevant Persons.
  - Consulted with First Peoples State Relations to seek their advice on Beach's relevant person methodology and identify any additional community groups or individual who may be considered relevant.
  - Consulted with local Council authorities on King Island to identify additional First Nations residents who may be considered a relevant person.
  - Visited the local government authority websites (the shire or municipal council) who often include an acknowledgement of the local Traditional Owners.
- Reviewed Commonwealth and State Marine Park Management Plans, or Indigenous Protected Areas (IPAs) that overlap the Planning Area, which may identify Traditional Custodians or representative bodies to contact regarding Sea Country and any cultural values.
- Asked each First Nations group or person consulted if they could identify any other potentially Relevant Persons (organisations or people) who may wish to be consulted, alternatively if they did not want to identify them to Beach, Beach requested they share the project information with them.
- Advertised in the Koori Mail and National Indigenous Times newspapers and their online platforms to invite consultation with any persons who may have a function, interest or activity that may be affected by the activities set out in the EP (see advertising schedule in Section 4.8.3). This additional step was undertaken to provide an opportunity for any relevant persons unknowable to Beach, notwithstanding the relevant person identification steps undertaken.
- Completed a broad-based online keyword search using: Deakin University Library; Google; Google Scholar; LinkedIn; Facebook; TikTok; and Instagram to identify potential additional relevant persons or organisations and cultural values and sensitivities using the following search terms.
  - Sea Country; Saltwater Country; cultural Sea Country; cultural sea values; cultural values; totems; Sea Country Totems; submerged cultural heritage and landscapes; paleo landscapes; songlines; whales; whale songlines; dream time; deep time; dreaming. Undertook combined searches including:
  - Combined above terms with Indigenous terms: First Nations; Aboriginal; Indigenous; Aboriginal newsletters; Aboriginal news.
  - Combined above terms with industry related terms: gas; offshore gas; fossil fuels; offshore energy.
  - Combined above terms with place-based search terms of: South Coast, Victoria; Warrnambool; Peterborough; Port Campbell; Port Fairy; and King Island.

• Investigated and monitored media articles identified in the above searches for further relevant persons.

• Investigated social media platforms including LinkedIn, Facebook, Tik Tok, to search for individuals who may be associated with relevant First Nations groups.

The land and Sea Country adjacent to the Operational Area and most of the Planning Area is the Traditional Lands of the Eastern Maar peoples. The Eastern Maar Aboriginal Corporation (EMAC) manages native title rights for the Eastern Maar Peoples. EMAC is a Recognised Native Title Body Corporate and holds native title rights for the sea and landscape features that hold dreamtime and creation stories, such as offshore islands and different marine and avian species that hold deep connections to lore and represent spiritual emblems. Eastern Maar Aboriginal Corporation is also a Registered Aboriginal Party under the Aboriginal Heritage Act 2006 (Vic) covering the area from Port Fairy to Lorne.

The representative entity for the land and Sea Country north of the Planning Area in the Bass Strait is the Bunurong Land Council Aboriginal Corporation. Bunurong are the Registered Aboriginal Party whom under the Victorian Aboriginal Heritage Act (2006) are recognised as the primary guardians, keepers and knowledge holders of Aboriginal Cultural Heritage and are the primary source of advice and knowledge on matters relating to Aboriginal places or Aboriginal objects within their registered region.

Beach has also identified and undertaken consultation with other First Nations groups who may have an interest in Program activities based on a worst-case scenario of an incident in the Planning Area. They include:

- Wadawurrung Traditional Owners Corporation
- Gunditj Mirring Traditional Owners Aboriginal Corporation

For First Nations organisations that Beach had not consulted with prior to commencing consultation on this EP, the Beach First Nations Engagement Manager made a personal phone call to identify the most appropriate contact, where such information was not obvious on their website.

Beach’s First Nations Engagement Manager has undertaken extensive research and engagement with the Victorian State Government agencies and other First Nations groups to identify potentially relevant persons. Beach’s methodology for identifying First Nations groups has been endorsed by First Peoples State Relations Victoria and Aboriginal Heritage Council Victoria.

4.6.4.4 Identifying Commercial Fishers

4.6.4.4.1 Methodology for identifying relevant commercial fishers

The commercial fishing sector is a key category of relevant persons given the potential overlap of fishing and petroleum activities. The process applied for identifying relevant commercial fishing persons or organisations is set out in Figure 4-2 below:

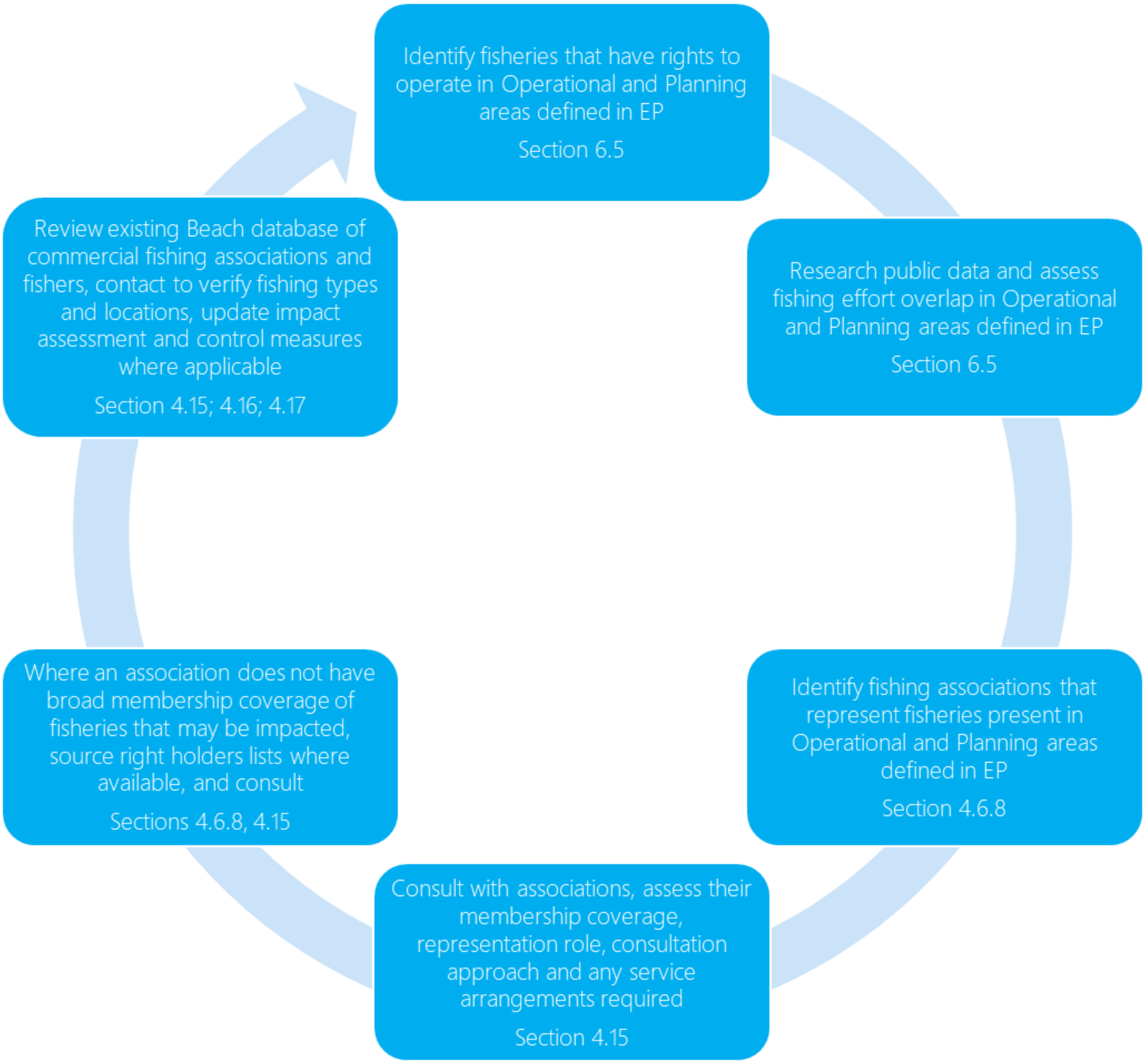


Figure 4-2: Commercial fishery identification process

See also Figure 4-3: Commercial fishery relevant persons identification and consultation methodology.

4.6.4.4.2 Identification of designated Commonwealth managed commercial fishery areas

Beach sourced publicly available information from the Australian Fisheries Management Authority (AFMA) and Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES) Fishery Status Reports 2014 to 2022 to identify designated fisheries that have the right to operate in the Operational and Planning Areas of the activities in this EP.

Data from the Fishery Status Reports 2014 to 2022 was used to prepare a comprehensive assessment at Table 6-32 of Commonwealth fisheries that overlap the footprint of the Operational and Planning Areas identified in this EP.

Data from the Fishery Status Reports was also used to prepare maps showing relative low, medium and high fishing effort overlayed on the footprint of the Operational and Planning Areas identified in this EP (Section 6.5.10).

The available data from the Commonwealth Fishery Status Reports excludes catch from areas where fewer than five boats operated during a given year, and the maximum area fished shows the area fished by all fishers aggregated by 11-degree (111 km x 111 km) grid cells.

4.6.4.4.3 Identification of designated State managed commercial fishery areas

Beach sourced publicly available information and requested catch data from State fishery management authorities, to identify designated State fisheries that have the right to operate in the Operational and Planning Areas of the activities in this EP. The data was used to prepare comprehensive assessments of fisheries that overlap the footprint of the Operational and Planning Areas identified in this EP and prepare maps showing high, medium and low fishing intensity, and where fewer than five boats operated during a given year in any 11-degree grid cell. State fishery management authorities and assessments included:

- South Australia: Department of Primary Industries and Regions (Section 6.5.11)
- Tasmania: Department of Natural Resources and Environment Tasmania, Department of Primary Industries, Water and Environment (Section 6.5.12)
- Victoria: Victorian Fisheries Authority (Section 6.5.13).

4.6.4.4.4 Identification of active fishing in the Operational Areas

Beach understands the publicly available fishery data has limitations including a ‘five boat rule’ that prevents fishing data from being included in reports where there are less than five fishers in a one-degree grid within a reporting year, and the size of the grid scales (111 km x 111 km) for reporting that may not be sufficiently granular to identify fishing activity.

Given the data limitations from publicly available reports, Beach engaged the consulting services of South East Trawl Fishing Industry Association (SETFIA) to provide a report of fishing activity, thereby updating the last report SETFIA provided to Beach in 2021. As SETFIA personnel have extensive knowledge and expertise in the east coast fishing sector, Beach engaged SETFIA to seek and assess fishing for Commonwealth, Victorian and Tasmanian managed fisheries. The SETFIA report has been included in the Appendix K.

Beach did not include South Australian managed fisheries in the scope for the analysis by SETFIA. The SETFIA study area was based on boundaries including the Operational Area and immediate surrounds.

SETFIA undertook a fine scale analysis of data they requested from AFMA for Commonwealth managed fisheries, the Victorian Fisheries Authority for Victorian managed fisheries, and the Department of Natural Resources for Tasmanian managed fisheries.

SETFIA reported the location and frequency of fishing, and the amount and value of the catch of active fisheries in Beach’s proposed Operational Areas. See SETFIA Commercial Fisheries Data Report November 2023 (SETFIA Report) in Appendix K.

The SETFIA Report was a key input for the analysis of potential impacts in Section 7.5.5.4 and a review of relevant commercial fisher persons and organisations.

4.6.4.4.5 Long-term consultation and coexistence with commercial fishers

Beach, as an operator in the Otway and Bass offshore basins managing production assets established approximately 21 years ago, has a long history of consultation and successful coexistence with relevant fishery associations and individual fishers who actively fish in areas that have shown over many years to be primarily adjacent to Beach's offshore operations. Recent examples of successful identification, consultation and coexistence with the commercial fishing sector include the following.

In the Otway offshore basin from October 2019 to May 2023, Beach conducted a Seabed Assessment project, drilled seven wells, connected four wells and twice reviewed its Otway Offshore Operations EP after consultation. Beach identified relevant fishers and associations by:

- Contracting SETFIA for its consulting services to provide an update (to past reports provided to Beach) on actual fishing activity in the Operational Area;
- Requesting fishery data from the Victorian Fisheries Authority and the Department of Natural Resources and Environment Tasmania; and
- Contacting all commercial fishers in the Beach stakeholder database to ensure records were up to date.

Beach consulted with commercial fishers and their associations for the development of several EPs, communicated regularly regarding anchor pre-lays, MODU moves and timings. Beach advised the process of determining the MODU movements and supply vessel routes to avoid fishing equipment.

In 2021, working with the Commonwealth Fishing Association, Bass Strait Scallop Industry Association, and SETFIA, Beach co-designed its Fair Ocean Access procedure that sets out Beach's commitment to consultation, minimising impacts of its activities, the circumstances where a fisher may claim compensation, the evidence required and the claim process. Beach also sought input from the Victorian Fisheries Authority and Seafood Industry Victoria (SIV).

Consultation for the development of this EP has built upon existing relationships by holding meetings with fishing associations and on behalf of their members at which the offshore activities and potential impacts were discussed, along with mitigation measures.

Building on the history of identification of commercial fishers, consultation and coexistence summarised above, for the development of this EP, Beach undertook a comprehensive assessment of fishing activity and verification of commercial fishing relevant persons as described below.

4.6.4.4.6 Review of Fishing Associations

The AFMA website identifies relevant fishing associations, all of whom offer voluntary membership to commercial fishers.

SIV membership coverage includes all Victorian commercial fishery licence holders, other than Abalone fishers who are represented by one or more associations. Victorian Abalone fishing associations include:

- Abalone Council Victoria;
- Abalone Victoria Central Zone;

- Abalone Council Australia.

Seafood Industry Tasmania (SIT) membership coverage includes all Tasmanian commercial fishery licence holders. In addition to the broad membership coverage of SIT, Tasmania also has fishery associations representing all relevant fishery licence holders as follows:

- Tasmanian Rock Lobster Fisherman's Association.
- Scallop Fishermen's Association of Tasmania.

Relevant South Australian fishery associations also have full membership coverage of all relevant licence holders and include:

- South Australian Rock Lobster Advisory Council
- South Eastern Professional Fishermen's Association
- Marine Fishers Association
- Charter Boat Association of South Australia.

Beach has identified and undertaken consultation with all relevant Commonwealth and State commercial fishing associations as described in Section 4.7.

4.6.4.4.7 Review of Individual Fishers

Based on inputs from the SETFIA Report, the environment impact and risk assessment in Section 7.5.5.4 identified five key fisheries. Beach assessed its stakeholder database for identified fishers within those fisheries and determined:

- Bass Strait Central Scallop (Cth) fishery licence holders may be members of one or more of: Bass Strait Scallop Industry Association; Victorian Scallop Fishermen's Association; Scallop Fishermen's Association of Tasmania Inc. Beach has also previously identified and consulted directly with all commercial scallop fishers who operate in Bass Strait for the Prion Seismic Survey project discussed above.
- Commonwealth Trawl and Gillnet Hoot Trap and Shark Gillnet sectors are represented by SETFIA. In addition, Beach has several shark and gillnet individual commercial fishers in its database and has consulted with them regarding this EP.
- Southern Squid Jig Commonwealth Fishery does not have an association however Beach has consulted directly with individual fishers in this sector representing at least three vessels, and potentially more as some commercial fishers operate in more than one sector and change fishing equipment seasonally to focus on commercially viable fishing. Squid jig fishers work together as a group given the nature of their fishing practice and share information between them about Beach's activities.
- Tasmanian Rock Lobster fishery licence holders are all members of: SIT and the Tasmanian Rock Lobster Fishermen's Association.

- Victorian Giant Crab and Victorian Southern Rock Lobster fishery licence holders are all represented by SIV.

Across all the fisheries above, and including other fisheries, Beach has direct contacts (other than fishing associations) with sole trader or fishing companies who may actively fish around the proposed Operational Areas. This is in addition to the associated fishing industry businesses, with whom it consults directly.

Item 8 below also demonstrates further Beach's relationship with commercial fishing peak bodies and industry associations and their direction to petroleum titleholders for communicating and consulting with their members on offshore petroleum activities.

4.6.4.4.8 Entitlement Holders vs Active Fishers

Designated Commonwealth fisheries are vast, often spanning three or more states. State fisheries are also vast, spanning entire coastal perimeters out to three nautical miles off the shore. Persons or organisations with fishing entitlements may be a vessel permit holder, a fishing licence holder, a quota holder, or hold a combination of more than one of those rights, and across multiple fisheries.

Beach understands from its broad consultations with the fishing industry that fishery entitlement holders are being approached for consultation by Petroleum Titleholders, multiple proponents holding windfarm feasibility licences, various government agencies with marine management authorities, and their own fishing management authorities. Many fishery entitlement holders who may hold more than one permit, licence or quota, have been receiving multiple approaches via various industry proponents who have acquired entitlement holder mailing lists and issued correspondence regardless of where the entitlement holder may (or may not) fish.

Beach's methodology is focussed on identifying fishing activity that may be impacted by Beach's activities, and therefore 'on-the-water' commercial fishers either via their associations or directly (as described above) whose functions, interest and activities may be affected.

Stakeholder fatigue is a genuine concern of the commercial fishing industry. Historically, Beach has sought to avoid exacerbating concerns and therefore has not mass-mailed any person or organisation who may hold one or more entitlements in designated fisheries, the vast majority of which would not be impacted by Beach's activities.

However, during the consultation period for this EP, given Beach could not establish that all commercial fishing associations represented all rights holders in their applicable fisheries, Beach sought relevant fishery rights holders contact lists as follows:

A.1 AFMA for relevant Commonwealth fisheries. The list included email addresses for the majority; and

A.2 Fisheries Public Register via Government of South Australia – Department of Primary Industries and Region.

4.6.4.4.9 Ongoing Identification of Active Fishers

Many individual fishers in Beach's operating areas have been included in Beach's stakeholder database for several years. Nevertheless, commercial fishers in any given area may change from time to time as they optimise their business across different seasons, fisheries, and fishing effort. As such, Beach contacts the individual fishers approximately every two years and did so in January 2023 prior to commencing consultation for the OGV Project.

During the consultation period, Beach also attempted to contact each individual fisher in BeachConnect to verify their fishing activities and their contact details.

In addition to the commercial fisher identification methods described above, Beach has undertaken local media advertising to create general awareness. Beach advertised and held community information sessions around active fishing ports including: Warrnambool; Portland; and Port Campbell. Information sessions were also promoted to members by SETFIA and SIV. Local media advertising has not resulted in newly identified commercial fishers.

From time to time, Beach receives direct contact from individual fishers who received Beach’s contact details from other commercial fishers and Beach updates its database to include these fishers accordingly.

Beach requests Notice to Mariners via the Australian Hydrographic Office prior to commencement of Program activities. Such notices also provide an opportunity for fishers to contact Beach if they have not been in contact already.

4.6.5 Identify persons of organisations the titleholder considers relevant – Regulation 25(1)(e)

In the development of this EP, Beach has also consulted with other persons or organisations it considers relevant, in accordance with Section 25(1)(e) of the OPGGS(E)R.

The methodology applied by Beach in identifying other persons or organisations is based on ensuring continuity of Beach’s long standing proactive consultation undertaken with community members, local businesses, and some government agencies around Beach’s operating assets. As a local operator, Beach considers it good engagement practice to consult with people and organisations that will not be relevant persons under Sections 25(1)(a) (b) and (d) but may still have an interest in Beach’s activities.

Beach regularly reviews its stakeholder database, which contains historical engagement information used to identify persons or organisations that may have an interest in future Beach projects. Unless organisations or individuals advise Beach that they no longer wish to receive communications, Beach has continued to consult with such stakeholders.

4.7 Relevant Persons Identified

Relevant persons and other persons identified and consulted in relation to developing this EP are set out in Appendix A as follows:

- Relevant Authorities, reg 25(1)(a),(b),(c)
- Relevant Persons, reg 25(1)(d)
- Other Persons, reg 25(1)(e)

4.8 Sufficient Information

4.8.1 Types of Information

Beach has prepared and delivered sufficient information cognisant of regulatory requirements, guidelines, and standards. Information must be sufficient to allow the relevant person to make an informed assessment of the possible consequences of the activity on their functions, interests or activities. The depth of information required, the way it is prepared (e.g. short copy, long copy, questions and answers, diagrams, and maps), and the way it is delivered, has been adapted to different relevant persons needs and the degree to which they may be affected.

Key types and delivery, purpose and key content and the relevant person focus for the provision of sufficient information are set out in Table 4-6 in chronological order. Copies of information are provided in Appendix C.

Table 4-6: Provision of sufficient information

Information Type	Purpose	Key Content	Relevant Person Focus	Date
Email	Introduce the OGV Project, its context and an overview of a range of its activities, including this EP. Outline that consultation will be required for development of different EPs. Commence review of relevant persons.	OGV Project overview. Consultation overview. OGV information sheet, which includes: Phases and timings Maps Regulations Consultation purpose Consultation information Sensitive information advice	All in BeachConnect database assigned by Beach to OGV Project as potentially relevant persons.	29 May 2023 to 6 June 2023
Email	Commence consultation on the Well Completions, Well Interventions and Plugging and Abandonment Activities EP. Introduce context and overview of a range of activities in the OGV Project, including this EP.	EP information sheet. Outline of the purpose of consultation as defined by the regulations (link to regulations). Definition of a Relevant Person as per regulations. Overview of sufficient information and reasonable period as regulation requirements. Advise information on EP available on Engage Beach, including information sheets, summary of impacts and risk assessment and activity area maps. Link to NOPSEMA's consultation and public comment webpage, which includes NOPSEMA's *Consultation*	All in BeachConnect database assigned by Beach to OGV Project as potentially relevant persons.	16 September 2024

Information Type	Purpose	Key Content	Relevant Person Focus	Date
		on offshore petroleum environment plans brochure. Link to Engage Beach.		
Engage Beach	A Well Completions, Well Interventions and Plugging and Abandonment Activities EP project information page including: EP scope, timings, locations. A separate EP open consultation page. A prominent link to Engage Beach was included on the home page of Beach's corporate website.	Long and short form content. Q&A on common concerns. Maps. Diagrams. Downloadable summary table of risks, impacts, controls for Program activities. Downloadable information sheet. Purpose of consultation. Information sessions and webinar details. Questions and feedback form. Invitation to identify functions, interests or activities and join mailing list. Button link to NOPSEMA's Consultation on offshore petroleum environment plans brochure.	Key focus is for relevant persons whose functions, interests or activities may be affected by the activity in the EP, providing detailed information in different formats. Secondary focus is new potentially relevant persons who can request further information and register for ongoing consultation.	16 September 2024
Fair Ocean Access information sheet	Simple explanation of Beach's commercial fishing compensation protocol.	Summary of protocol. How to find out more information.	Potentially impacted commercial fishers.	Was available to commercial fishers upon request
Public notices Information sessions Webinar	Provide overview of Beach. Advise consultation and invite consultation, to unknown potentially relevant persons. Advise community information sessions and webinar series.	Overview of the EP Advise consultation dates. EMBA information. Project maps. Information sessions and webinar details. QR code for more information.	Unknown potentially relevant persons in regional locations adjacent Operational Areas.	24 September to 13 October 2024 (*see advertising schedule below*)
Public notice advertisements Webinars	Provide overview of Beach. Advise consultation and invite consultation, to unknown potentially relevant persons. Advise webinar series.	Overview of the EP. Advise consultation dates. EMBA information. Project maps. Webinar details. QR code for more information	Unknown potentially relevant persons in regional locations adjacent Planning Area.	24 September to 13 October 2024 31 October to 1 November 2024

Information Type	Purpose	Key Content	Relevant Person Focus	Date
				(*see advertising schedule below*)
Online banner advertisements (*National Indigenous Times and Koori Mail*)	Invite consultation. Advise revised dates for information sessions and webinars.	Call to action to click the banner advertisement to view the schedule of Sea Country consultation.	First Nations relevant persons.	4 to 20 October 2024
Radio advertisements	Encourage unknown relevant persons who may be impacted to consult with Beach.	Invite consultation. Purpose of consultation. Call to action to visit Engage Beach to consult.	Unknown potentially relevant persons in regional locations adjacent activity areas.	7 to 20 October 2024 11 to 24 November 2024 20 January to 2 February 2025 (*see advertising schedule below*)
Email	Advise of additional consultation opportunities. Reminder that further information can be found on Engage Beach.	Advise of additional consultation opportunities. Reminder of the purpose of consultation. Community information session details (for those in the Operating Area). Online webinar details. Link to Engage Beach.	All in BeachConnect database assigned by Beach to OGV Project as potentially relevant persons.	9 October 2024
Facebook, Instagram and Meta advertisements	Invite consultation. Encourage unknown relevant persons who may be impacted to consult with Beach.	Invite consultation. Purpose of consultation. Call to action to visit Engage Beach to consult.	Unknown potentially relevant persons in regional locations adjacent activity and/or planning areas.	14 to 21 October 2024 28 October to 24 November 2024 20 January to 13 February 2025 (*see advertising schedule below*)

Information Type	Purpose	Key Content	Relevant Person Focus	Date
Community information sessions	Provide additional opportunity to consult with Beach technical staff and ask questions or raise concerns. Locations are focussed on community towns adjacent the activity areas.	Open community information sessions and dedicated First Nations information sessions were held. Attended by Beach technical staff from Environment, Well Completions, First Nations and Community teams. Information sheets provided. Posters of operation and planning area maps, subsea and MODU photos and completion program displayed. First Nations country map on display. Printed NOPSEMA *Consultation on offshore petroleum environment plans* brochures available.	Key focus is for relevant persons whose functions, interests or activities may be affected by the activity in the EP. Relevant persons in BeachConnect were advised of the sessions via email and sessions were advertised publicly.	22 to 24 October 2024 (*see summary of information sessions dates, locations and outcomes below*)
Letter	Introduce Beach. Introduce the OGV Project and this EP, and invite consultation. Provide sufficient information.	Explain EP under consultation. Provide information sheet with maps for Operational and Planning Areas. Advise purpose of consultation, explain relevant persons, invite consultation. Provide contact details and link to Engage Beach. Given a lesser time period for consultation was offered to newly identified South Australian commercial fishers with rights that overlap the Planning Area, Beach provided detailed information on the assessment within the EP of SA fisheries that overlap the Planning Area, and specific advice that there is no overlap of the Operational Areas with SA fisheries. Beach included maps to support the written advice.	Commercial fishers – South Australia.	21 October 2024

Information Type	Purpose	Key Content	Relevant Person Focus	Date
Email Letter (for 3 licence holders who did not have an email address)	Introduce Beach. Introduce the OGV Project and this EP. Invite consultation. Provide sufficient information.	Explain EP under consultation. Provide information sheet with maps for Operational Area and Planning area. Advise purpose of consultation, explain relevant persons, invite consultation. Provide contact details and link to Engage Beach. Given a lesser time period for consultation was offered to newly identified Commonwealth commercial fishers with rights that overlap the Operational area and / or Planning Area, Beach provided detailed information on the assessment within the EP of Commonwealth fisheries that overlap the Operational and Planning Areas. To support the written advice, Beach provided specific fishery maps that showed instance of high, medium, low and <5 fishers, with overlap of the Operational and Planning Areas. Over 28 different letters were prepared for the newly identified fishers, ensuring each of their fishery licences was included in the information sent. Beach encouraged the fishery rights holder to consult with Beach if they had a concern or feedback.	Commercial fishers – Commonwealth fishery licence holders from fisheries that overlapped the EP Operational or Planning Areas.	25 October 2024 (email) 30 October 2024 (letter)
Online advertisements	Invite consultation. Encourage unknown relevant persons who may be impacted to consult with Beach.	Consultation is underway. Call to action to visit Engage Beach to consult.	Unknown potentially relevant persons in regional locations adjacent activity and/or Planning Area.	28 October to 10 November 2024 20 January to 14 February 2025

Information Type	Purpose	Key Content	Relevant Person Focus	Date
				(*see advertising schedule below*)
Email	Remind recipients of upcoming webinars and how to register.	Reminder to participate in Well Completions, Well Interventions and Plugging and Abandonment Activities EP webinar hosted by Beach technical staff. Webinar details. Registration details. Link to Engage Beach	All in BeachConnect database assigned by Beach to OGV Project as potentially relevant persons.	29 October 2024
Email	Advise system error re email sent on 16/09/2024 that missed some organisations. As per 16/09/2024 email: Update on OGV Project. Reminder that consultation period underway. Re-send sufficient information.	Advise of system error when sending initial consultation email. Provide an overview of the Well Completions, Well Interventions and Plugging and Abandonment Activities EP. EP information sheet attached. Advise of consultation dates. Advise purpose of consultation. Definition of a Relevant Person as per regulations. Overview of sufficient information and reasonable period as regulation requirements. Advise EP information is available on online consultation hub (Engage Beach), including information sheets, summary of impacts and risk assessment and activity area maps. Initial email attached.	Relevant persons who were missed in the 16/09/2024 bulk email due to a system error. Note: *178 individuals from 76 organisations did not receive the email advising consultation on 16/09/2024. All organisations were successfully sent subsequent emails sent on 9/10/2024 and 29/10/2024.*	4 November 2024
Online webinars	Provide additional opportunity for consultation and to engage with Beach technical staff about the Program activities.	Webinar 1 Dedicated culturally sensitive First Nations webinar. Webinar 2 Open community information webinar. Webinar 3 Open community information webinar.	Key focus is for relevant persons whose functions, interests or activities may be affected by the activity in the EP, and who may not have attended public information sessions but want	12 and 13 November 2024

Information Type	Purpose	Key Content	Relevant Person Focus	Date
		Webinar 4 Dedicated culturally sensitive First Nations webinar. Attended by Beach technical staff from environment, drilling and completions, First Nations and community teams.	more information or to ask questions.	
e-newsletter advertisement (*twice weekly – National Indigenous Times*)	Invite consultation. Encourage unknown relevant persons who may be impacted to consult with Beach.	Consultation is underway. Call to action to visit Engage Beach to consult.	First Nations unknown potentially relevant persons.	12 November to 8 December 2024 31 January to 14 February 2025 (*see advertising schedule below*)
Email	Reminder of consultation dates.	Reminder that consultation is underway. Reminder to visit Engage Beach or contact via phone or email to consult. Reminder that consultation closes 14 February 2025. Link to Engage Beach.	All in BeachConnect database assigned by Beach to OGV Project as potentially relevant persons.	25 November 2024
Email	Reminder of consultation dates.	Reminder that consultation is underway. Reminder to visit Engage Beach or contact via phone or email to consult. Reminder that consultation closes 14 February 2025. Link to Engage Beach.	All in BeachConnect database assigned by Beach to OGV Project as potentially relevant persons.	10 December 2024
Email	Reminder of consultation dates. Advise of additional consultation opportunities	Advise of additional consultation opportunities (online community information sessions – webinars). Online community information session – webinar details. Reminder that further information can be found on Engage Beach. Link to Engage Beach.	All in BeachConnect database assigned by Beach to OGV Project as potentially relevant persons.	15 January 2024

Information Type	Purpose	Key Content	Relevant Person Focus	Date
Public notices Webinars	Provide overview of Beach. Advise and invite consultation and invite consultation. Advise webinar series.	Overview of Beach. Overview of the Well Completions, Well Interventions and Plugging and Abandonment Activities EP. Advise consultation dates. EMBA information. Project map. Webinar details. QR code for more information.	Unknown potentially relevant persons in regional locations adjacent Planning Area.	21 to 29 January 2025 (*see advertising schedule below*)
Online webinars	Provide additional opportunity for consultation and to engage with Beach technical staff about the Program activities.	Webinar 1 Dedicated culturally sensitive First Nations webinar. Webinar 2 Dedicated culturally sensitive First Nations webinar. Webinar 3 Open community information webinar. Webinar 4 Open community information webinar. Attended by Beach technical staff from environment, drilling and completions, First Nations and community teams.	Key focus is for relevant persons whose functions, interests or activities may be affected by the activity in the EP, and who may not have attended in-person information sessions but want more information or to ask questions.	5 to 7 February 2025
Email	Advise consultation closing soon.	Reminder of consultation dates. Advise next steps. Link to Engage Beach.	All in BeachConnect database assigned by Beach to OGV Project as potentially relevant persons.	10 February 2025
Email	Advise consultation has closed. Next steps.	Consultation has closed. Advise EP will be sent to NOPSEMA for assessment. Link to Engage Beach	All in BeachConnect database assigned by Beach to OGV Project as potentially relevant persons.	17 February 2025

4.8.2 Information Sessions & Webinars

Beach advertised and held six in-person regional community information sessions during consultation, with flexible timing to facilitate different work and family needs. The purpose of the sessions was to provide an opportunity for consultation directly with Beach technical staff members about the OGV Project and specifically about the Program activities. Face-to-face consultation gives an opportunity for people with concerns to be listened to, for two-way dialogue and genuine collaboration on control measures where applicable, and a consultation method for those less comfortable with exchanging emails or phone contact. The regional community information sessions were held in areas selected for their proximity to the areas closest to Beach's proposed activities.

Beach also advertised and held eight online information sessions (webinars) during consultation, which received a stronger attendance than the in-person information sessions, with 24 attendees from 20 organisations and the community.

Following each information session and webinar, Beach assessed the number and types of attendees, the type of questions and concerns raised, and assessed the engagement approach. Beach's Community Team also held weekly consultation progress meetings to review consultation progress with different relevant person categories and individual organisations, and review the questions being asked and the required information from the relevant Beach subject matter expert to enable the Community Team to prepare a considered response. In addition, there was a weekly OGV Project Team meeting at which the Community Team reviewed the progress of engagement. These assessment processes enabled Beach to regularly review the sufficient information being provided, the consultation channels being used.

Table 4-7 details the schedule of information sessions (both in-person and online) locations, dates, attendees, and consultation summary.

Table 4-7: Summary of information sessions (in-person and online)

Location	Date	Attendees	Concerns, objections, responses where applicable
Community information session (in person) Portland (*Dedicated First Nations session*)	22 Oct 2024 11am to 4pm	Nil attendees	N/A
Community information session (in person) Portland (*Dedicated First Nations session*) 2 attendees	22 Oct 2024 6pm to 8pm	Two community members (did not want to provide their details)	Beach provided an overview of Program activities. No concerns raised.
Community information session (in person) Portland (*Dedicated First Nations session*)	23 Oct 2024	Nil attendees	N/A
Community information session (in person) Warrnambool	23 Oct 2024	Nil attendees	N/A
Community information session (in person)	24 Oct 2024	Two community members (added to BeachConnect)	Beach provided an overview of Program activities. No concerns raised.

Location	Date	Attendees	Concerns, objections, responses where applicable
Warrnambool (*Dedicated First Nations session*) 2 attendees			
Community information session (in person) Port Campbell 1 attendee	24 Oct 2024	Corangamite Shire Council – Councillor	Beach provided an overview of the project. Interested in oil spill response.
Community information session (online) (*Dedicated First Nations*) 1 attendee	12 Nov 2024	Eastern Maar Aboriginal Corporation	Beach provided an overview of Program activities. Emergency response planning notifications.
Community information session (online) 5 attendees	12 Nov 2024	South Gippsland Shire Council Southerly Ten Scallop Fisherman's Association of Tasmania Incorporated Wilderness Society One community member	Beach provided an overview of Program activities. Consultation with commercial fishers and local fisheries. Compensation due to displacement while activities are underway. Activity timing. Activity locations.
Community information session (online) 10 attendees	13 Nov 2024	Environmental Protection Authority – Tasmania Two Friends of the Earth – Melbourne chapter members Fisheries Research and Development Corporation Department of Transport and Planning (Victoria) Office of the Member for Western Victoria (Greens Party) Parliament of Victoria (Electorate office for the South-West coast) Seafood Industry Tasmania District Council of Grant One community member	Beach provided an overview of Program activities. Removal of infrastructure from the seabed. Confirmation that Beach plans to remove all infrastructure from the seabed. Consultation with local fisheries. Clarity that these are not seismic activities. Title areas within operational areas. Contingency funds removal of infrastructure.
Community information	13 Nov 2024	Nil attendees	N/A

Location	Date	Attendees	Concerns, objections, responses where applicable
session (online) (*Dedicated First Nations session*) 0 attendees			
Community information session (online) (*Dedicated First Nations*) 0 attendees	5 Feb 2025	Nil attendees	5 Feb 2025
Community information session (online) (*Dedicated First Nations*) 1 attendee	6 Feb 2025	Charter Boat Association of South Australia	Beach provided an overview of Program activities. Clarity there is no overlap with operational area in South Australian waters. Clarity minimal overlap with planning area in South Australian waters. Confirmed no crude oil in this activity. Explanation of how infrastructure was connected and disconnected.
Community information session (online) 6 attendees	7 Feb 2025	Game Fishing Association of Australia Office of the Member for South-West Coast Moyne Shire Council State Member for Western Victoria region Heritage Victoria Colac Otway Shire Council	Beach provided an overview of Program activities. Queried whether the project had all required permits. Explanation of exclusion zones related to the activity.

4.8.3 Advertising Schedule

Throughout consultation, Beach released two versions of public notices and aired three radio commercials. Prior to the consultation period, Beach conducted additional research to identify where the public typically accesses news. It found a large percentage of the public sourced their news online, with a growing trend for reading news on social media. The Australian Communications and Media Authority released a report in February 2024 outlining that there was an increase in Australians using social media as their main source of news. Considering this, Beach adopted a hybrid strategy throughout the consultation period, including online advertising to the media mix across news sites and Facebook, Instagram and Meta platforms to achieve greater reach and accessibility. Online advertising allowed for targeted campaigns that reached specific demographics with precision and real-time analytics to track performance and adjust strategies.

When Beach launched its first Facebook, Instagram and Meta campaign on 14 October 2024, it saw a spike in click throughs to Engage Beach. Throughout the first campaign, the advertisement reached 45,487 with 365,252 impressions on Facebook, Instagram and Meta platforms and Engage Beach received 32 unique visitors and 52 views to the Program activities pages.

Beach continually looked for ways to optimise the campaign by reviewing the geotargeting locations within the planning area and key terms for the advertisements, and monitoring click throughs to Engage Beach while campaigns were live to ensure maximum reach and engagement.

The purpose, content and relevant person focus for advertising is explained in Section 4.8.1. The locations, publisher and dates are shown in Table 4-8. Copies of advertisements are provided are in 778.

Table 4-8: Public notice and online advertisements

Local Government Area	Date	Media	Key Purpose
National reach to First Nations audiences	24 September 2024	National Indigenous Times	Identify unknown potentially relevant persons and advertise community information sessions and webinars.
Corangamite Shire, VIC	4 October 2024	The Beacon Newsletter	Identify unknown potentially relevant persons and advertise community information sessions and webinars.
National reach to First Nations audiences	4 to 20 October 2024	National Indigenous Times website	Advise of revised schedule of consultation.
South West VIC	7 to 20 October 2024	3CS; Mixx Colac; 3YB; Coast FM	Consultation is underway. Identify unknown potentially relevant persons and promote Engage Beach.
South Gippsland Shire, VIC	8 October 2024	South Gippsland Sentinel Times	Identify unknown potentially relevant persons and advertise webinars.
Corangamite Shire, VIC	9 October 2024	Cobden Timboon Coast Times	Identify unknown potentially relevant persons and advertise community information sessions and webinars.
National reach to First Nations audiences	9 October 2024	Koori Mail	Identify unknown potentially relevant persons and advertise community information sessions and webinars.
King Island, TAS	10 October 2024	King Island Courier	Identify unknown potentially relevant persons and advertise webinars.
Colac Otway Shire, VIC	11 October 2024	Colac Herald	Identify unknown potentially relevant persons and advertise community information sessions and webinars.
Glenelg Shire, VIC	11 October 2024	Portland Observer	Identify unknown potentially relevant persons and advertise community information sessions and webinars.
Corangamite, Moyne, Warrnambool, VIC	12 October 2024	Warrnambool Standard	Identify unknown potentially relevant persons and advertise community information sessions and webinars.
City of Greater Geelong	12 October 2024	Geelong Advertiser	Identify unknown potentially relevant persons and advertise webinars.
Hobart, statewide	12 October 2024	Hobart Mercury	Identify unknown potentially relevant persons and advertise webinars.
Melbourne, statewide	12 October 2024	Herald Sun	Identify unknown potentially relevant persons and advertise webinars.
Geotargeting locations within the EMBA	14 to 21 October 2024	Facebook, Instagram, Meta	Identify unknown potentially relevant persons and promote Engage Beach.
National reach to First Nations audiences	28 October to 10 November 2024	Koori Mail website	Invite consultation. Identify unknown potentially relevant persons and promote Engage Beach.
National reach to First Nations audiences	28 October to 10	National Indigenous Times website	Invite consultation.

Local Government Area	Date	Media	Key Purpose
	November 2024		Identify unknown potentially relevant persons and promote Engage Beach.
Geotargeting locations within the EMBA	28 October to 10 November 2024	South Gippsland Sentinel Times website	Invite consultation. Identify unknown potentially relevant persons and promote Engage Beach.
Geotargeting locations within the EMBA	28 October to 10 November 2024	Cobden Timboon Coast Times website	Invite consultation. Identify unknown potentially relevant persons and promote Engage Beach.
Geotargeting locations within the EMBA	28 October to 10 November 2024	NewsCorp websites (includes Herald Sun, Hobart Mercury and Geelong Advertiser)	Invite consultation. Identify unknown potentially relevant persons and promote Engage Beach.
Geotargeting locations within the EMBA	28 October to 24 November 2024	Facebook, Instagram, Meta	Identify unknown potentially relevant persons and promote Engage Beach.
Geotargeting locations within the EMBA	30 October to 12 November 2024	Warrnambool Standard website	Invite consultation. Identify unknown potentially relevant persons and promote Engage Beach.
King Island, TAS	31 October 2024	King Island Courier	Identify unknown potentially relevant persons and advertise webinars.
Colac Otway Shire, VIC	1 November 2024	Colac Herald	Identify unknown potentially relevant persons and advertise webinars.
Glenelg Shire, VIC	1 November 2024	Portland Observer	Identify unknown potentially relevant persons and advertise webinars.
Corangamite Shire, VIC	1 November 2024	The Beacon Newsletter	Identify unknown potentially relevant persons and advertise webinars.
South West VIC	11 to 24 November 2024	3CS; Mixx Colac; 3YB; Coast FM	Consultation is underway. Identify unknown potentially relevant persons and promote Engage Beach.
National reach to First Nations audiences	12 November to 8 December 2024	National Indigenous Times e-newsletter (twice weekly)	Invite consultation. Identify unknown potentially relevant persons and promote Engage Beach.
Geotargeting locations within the EMBA	20 January to 2 February 2025	Cobden Timboon Coast Times website	Invite consultation. Identify unknown potentially relevant persons and promote Engage Beach.
Geotargeting locations within the EMBA	20 January to 3 February 2025	Koori Mail website	Invite consultation. Identify unknown potentially relevant persons and promote Engage Beach.
South west, VIC	20 January to 2 February 2025	3CS; Mixx Colac; 3YB; Coast FM	Consultation is underway. Identify unknown potentially relevant persons and promote Engage Beach.
Geotargeting locations within the EMBA	20 January to 13 February 2025	Facebook; Instagram; Meta	Invite consultation. Identify unknown potentially relevant persons and promote Engage Beach.
Geotargeting locations within the EMBA	20 January to 3 February 2025	South Gippsland Sentinel Times website	Invite consultation. Identify unknown potentially relevant persons and promote Engage Beach.
South Gippsland Shire, VIC	21 January 2025	South Gippsland Sentinel Times	Identify unknown potentially relevant persons and advertise webinars.

Local Government Area	Date	Media	Key Purpose
Geotargeting locations within the EMBA	22 January to 5 February 2025	Warrnambool Standard website	Invite consultation. Identify unknown potentially relevant persons and promote Engage Beach.
Geotargeting locations within the EMBA	22 January to 5 February 2025	NewsCorp websites (Herald Sun and Geelong Advertiser)	Invite consultation. Identify unknown potentially relevant persons and promote Engage Beach.
Corangamite Shire, VIC	22 January 2025	Cobden Timboon Coast Times	Identify unknown potentially relevant persons and advertise webinars.
King Island, TAS	23 January 2025	King Island Courier	Identify unknown potentially relevant persons and advertise webinars.
Corangamite, Moyne, Warrnambool, VIC	24 January 2025	Warrnambool Standard	Identify unknown potentially relevant persons and advertise webinars.
Colac Otway Shire, VIC	24 January 2025	Colac Herald	Identify unknown potentially relevant persons and advertise webinars.
National reach to First Nations audiences	28 January 2025	National Indigenous Times	National reach to First Nations audiences
National reach to First Nations audiences	29 January 2025	Koori Mail	National reach to First Nations audiences
National reach to First Nations audiences	31 January to 14 February 2025	National Indigenous Times e-newsletter	National reach to First Nations audiences
National reach to First Nations audiences	31 January to 14 February 2025	National Indigenous Times website	National reach to First Nations audiences
Glenelg Shire, VIC	24 January 2025	Portland Observer	Identify unknown potentially relevant persons and advertise webinars.

4.9 Reasonable Period

An email announcing the OGV Project was sent between 29 May and 6 June 2023 to all contacts in the BeachConnect database that were assigned to the OGV Project as potentially relevant persons. This email included a project overview of activities, including Well Completions; timings; locations; a link to Beach's company website for further information and to invite requests for further information and consultation.

Beach commenced consultation for the purpose of developing the Well Completions, Well Interventions and Plugging and Abandonment Activities EP by issuing an email to all identified relevant persons on 16 September 2024. This email included the announcement of the beginning of consultation for this EP; an information sheet that provided the activity scope, timings and locations; and further consultation details including definitions of relevant persons, sufficient information and reasonable period under the OPGGS(E)R; and Beach contact details including a link to Engage Beach where the persons could find more activity information, a timeline of in-person and online information session opportunities and the option to consult or request consultation via the online feedback form. As noted in Table 4-9 above, a bulk email system error occurring on 16 September 2024 meant that a total of 178 individuals from 76 organisations did not receive this initial consultation email. These organisations and individuals received subsequent correspondence, including emails sent on 9 October 2024 and 29 October 2024. On 4 November 2024, Beach emailed these individuals and organisations to advise of the system error and provide the information in the 16 September 2024 email summarised above.

The consultation period was open for five months from 16 September 2024 to 14 February 2025. Further information and different consultation opportunities were provided up to the conclusion of the formal consultation period on 14 February 2025. As set out further in Appendix D, additional consultation efforts were made with specific relevant persons, in response to correspondence with those relevant persons, up to Wednesday, 16 April 2025.

During consultation for this EP, relevant persons were advised that the purpose of consultation was to ensure potential impacts and risks have been identified and appropriate measures adopted because of the consultations. Relevant persons were encouraged to contact Beach if they required further information or wished to discuss how the Program activities may affect their functions, interests, and activities.

Beach understands that what constitutes a reasonable period for consultation should be considered on a case-by-case basis, with reference to the nature, scale, and complexity of the activity.

Beach considers that it has provided reasonable time for consultation and that consultation in the course of preparing this EP has been completed.

4.10 Reasonable Period: First Nations Relevant Persons

4.10.1 Comparison with benchmark periods for consultation with First Nations peoples and communities under other legislative instruments

In determining whether a reasonable period for consultation has been achieved with First Nations peoples and communities, Beach has considered the requirements for consultation with First Nations groups and communities under other legislative instruments and policies.

Beach has observed that there is a general reluctance from authorities to prescribe specific periods of time for consultation. This is understandable. It accords with the notion that what constitutes a reasonable period of consultation will vary on a case-by-case basis with the nature of the consultation required having regard to the scale and complexity of the proposed activity, the regulatory purpose of consultation, and the circumstances of the persons required to be consulted with.

Beach notes that the Court in *Tipakalippa* reasoned that the consultation process must be capable of being discharged within a reasonable time, where, at paragraph 136, the Court said that "… *it must be taken to be the regulatory intention that the consultation requirement cannot be one that is incapable of being complied with within a reasonable time*".

The Court went on to say that the obligation to consult must be capable of practicable and reasonable discharge by the titleholder. This has been repeated in NOPSEMA's consultation guidelines for s 25.

Beach has considered the benchmark materials and its general determination of whether a 'reasonable period' for consultation has been afforded to relevant persons through this lens.

Taking into consideration these comparative materials, and Beach's experience and understanding of First Nations groups and communities, Beach has taken a conservative approach to determining whether a reasonable period of time for consultation has been afforded to relevant persons pursuant to regulation 25(3). In particular:

- As described in Section 4.9 above, Beach commenced consultation in respect of this EP on 16 September 2024. This has involved an iterative release of project information and materials to relevant persons, including further project information as it became available.

Beach has provided an overall period for consultation with most relevant persons across a period of approximately 5 months, with an additional period of consultation until 16 April 2025 offered to specific First Nations relevant persons.

While the degree of information provided was iterative and developed over time, this consultation period has allowed Beach to engage in meaningful, two-way discussions with relevant persons without compromising the ability of those relevant persons to meaningfully consider Beach's project information and engagements, and to make an informed assessment of the possible consequences of Beach's activities on their functions, interest or activities.

With regard to the benchmark consultation periods discussed below, Beach considers the period of consultation it undertook demonstrates that Beach has provided a reasonable period for relevant persons to consult in accordance with regulation 25(3). However, Beach notes that there is no directly comparable consultation framework to regulation 25 of the OPGGS(E)R and what is a reasonable period for consultation under regulation 25(3) needs to be determined on a case-by-case basis.

- *The Native Title Act 1993* (Cth) contains various requirements for proponents and government authorities to undertake consultation with native title parties for periods ranging from two to eight months.
- Past versions of the *Mineral Resources Act* 1989 (Qld) provided for a two-month consultation period for entry into a native title area for low impact prospecting.
- Minimum public comment periods required under other legislation include:
  - *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations* 2023 (Cth), regulation 30(1) provides for a 30-day public comment period on seismic or exploratory drilling environment plans that have been submitted and published on NOPSEMA's website.
  - *Heritage Act 2004* (ACT), section 37(1) provides for a four week public comment period in relation to the registration of a place or object. This period may be extended by the Australian Capital Territory Heritage Council under section 37(2).
  - *Environment Protection and Biodiversity Conservation Act 1999* (Cth), provides for a range of public comment periods including at least 28 days in relation to the publication of draft terms of reference and draft impact assessment reports for strategic assessments (sections 146(1B)(b) and (2)(b), and a period of not less than 20 business days in relation to draft public environment reports (section 98(3)).
  - *Aboriginal Heritage Act 1988* (SA), sections 24(1), 24(4) and 24(6) provide for not less than eight weeks' notice to make representations to the Minister regarding a proposed direction prohibiting or restricting activities, or access to a site surrounding an Aboriginal site, object or remains. The Minister may however give a direction without this notice if satisfied that urgent action is necessary.
- Consultation guidelines published from the (now repealed) *Aboriginal Cultural Heritage Act 2021* (WA), prescribe approximately 12 weeks consultation (unless otherwise agreed) depending on the degree of engagement from relevant First Nations groups.

These benchmarks indicate a range of consultation periods under current and former legislation. Noting the difference in legislative purpose for these consultation periods, the consultation period afforded by Beach to relevant persons in relation to this EP represents a reasonable period properly suited to the legislative intent of the OPGGS Act and the OPGGS(E)R.

4.10.2 Review of consultation policies for consultation with First Nations peoples and communities

Beach has also ensured it has had regard to relevant policy statements in relation to its method of consultation with First Nations peoples and communities and how Beach can best respect those First Nations peoples and communities with regard to time.

In order to assist with ensuring its consultation is appropriate and adapted to First Nations relevant persons, Beach has incorporated the following policy guidance into its consultation methodology:

- “Proponents should be aware that cultural obligations, such as protocols governing death and grieving, may require First Nations peoples and communities to engage in ceremony for days, weeks or in some cases months, during which First Nation peoples or communities may not be available for other business. First Nations peoples and communities may also be unavailable on calendar dates that are significant, such as, during NAIDOC Week and National Sorry Day. Proponents should respect these protocols, and build flexibility into engagement strategies, as far and as early as possible in the engagement process”.
- “Good practice consultation with Aboriginal people, including through their representatives and organisations where applicable, includes … (5) Respecting Aboriginal traditions, cultural protocols and obligations, including taking reasonable steps to make contact and allowing sufficient time for genuine consultation to occur. This may include using multiple contact methods (e.g. phone and email) and providing a reasonable time for responses”.
- “Engagement takes many different forms, and it is important that the level of your engagement appropriately matches what you are doing. Give it time – leave space for people to get to know you and to build trust; leave time for unexpected occurrences (e.g. sorry business); be sensitive to the different timelines of the communities you are working with”.
- “Additional time may be needed to deal with external cultural influences, such as ceremony or conflicts between family groups. Attempting to force the pace may result in expedited outcomes that do not stand the test of time”.

Generally, by applying the guidance above, Beach considers its consultation methodology has led to successful engagement and relationship building with many First Nations relevant persons.

4.11 Non-responsive Relevant Persons

Beach undertook the following approach for non-responsive relevant persons during the consultation period that commenced on 16 September 2024 and concluded on 14 February 2025.

Beach attempted consultation with all identified relevant persons and other relevant persons identified by Beach under regulation 25(1)(e) at different stages as outlined in Section 4.7. Throughout the consultation Beach provided relevant persons with sufficient information and multiple opportunities to consult, aimed at helping relevant persons to understand the project activities and potential impacts, to ask questions, raise concerns and provide feedback. Different communication options were advised throughout the consultation period including encouragement to email or phone Beach, to request meetings, to attend information sessions in-person or online, and to visit Engage Beach, where persons were provided phone and email contact details as well as encouraged to complete a simple enquiry form for questions and feedback.

In cases where relevant persons were non-responsive, Beach followed up to verify their contact details, confirm receipt of emails and enquire whether they still wished to be consulted. Beach did not set a specific number of emails as a measure of having met the regulatory requirements for consultation for relevant persons, including non-responsive relevant persons. Rather, Beach undertook a qualitative case-by-case approach to consultation, with the number of attempts to establish contact and the consultation method, being commensurate with the extent to which Beach considered that each relevant person's functions, interests or activities may be affected by the activity.

Additionally, Beach sought to meet the regulatory consultation requirements while being mindful of feedback from some relevant persons about ‘stakeholder fatigue’. The qualitative case-by-case approach was aligned with the IAP2 Spectrum of Public Participation model, as detailed in Section 4.12.

Before completion of the consultation period, Beach emailed all relevant persons again to alert them of the consultation closing date and reminded them of all available avenues to consult.

As described in the processes outlined in Section 4.12 and above, Beach has established a methodology to provide sufficient information over a reasonable period, using different consultation methods. Where there were relevant persons whose functions, interests and activities may be impacted by the activities set out in this EP, such as First Nations groups and Commercial Fishers, Beach ensured it used best endeavours to make personal contact. For First Nations groups, Beach called each newly identified group in the first instance to ascertain the correct contact name/s. This phone call also facilitated an introduction to the Beach First Nations Engagement Manager who provided an overview of the project and the purpose of consultation. Beach then sent a follow up email in line with the methodology above. For Commercial Fishers who actively fish in the Operational Areas, Beach consulted with relevant associations and where requested directly with commercial fishers.

4.12 Consultation Methods

Beach understands the regulatory requirements for consultation and that genuine consultation involves a two-way dialogue. Beach also understands that consultation is voluntary for relevant persons, and some have cited 'stakeholder fatigue' from Petroleum Titleholders and from other organisations and government departments seeking consultation on other offshore matters. Therefore, Beach's approach to consultation starts with a focus on building long-term relationships with key relevant persons groups by demonstrating understanding of their needs, timelines, the types of information they need and their preferred consultation pathways.

Beach recognises that consultation methods should be adapted based on the nature and scale of the activity, and the potential impacts on the relevant person's functions, interests, or activities, and that any specific requirements communicated by relevant persons should be taken into account and accommodated where practicable. Therefore, consultation methods should be appropriate for different types of relevant persons, that not all persons or organisations will require the same type of consultation, and that some relevant persons may not be willing to participate in consultation, see Section 4.11.

Table 4-9 shows how Beach has adapted and applied the different levels of the IAP2 Spectrum of Public Participation model based on the nature and scale of the activity, the potential impacts on the relevant persons functions, interests, or activities, and where relevant persons elect to participate in two-way dialogue with Beach. Beach does not apply the IAP2 model on the basis that only the 'consult' participation element within the model meets the OPGGS(E)R requirements. All participation levels within the IAP2 model constitute "consultation" in accordance with the OPGGS(E)R, with the exception of the fifth level of participation being 'empower' (not shown below), which is not applicable in the context of safely performing offshore petroleum activities in accordance with OPGGS(E)R.

To inform relevant persons about the Well Completions, Well Interventions and Plugging and Abandonment Activities EP and the opportunity to consult, Beach used a variety of communication methods, beginning with an email on 16 September 2024 to relevant persons providing detailed information about the EP's activities and an invitation to community information sessions (in-person and online) as set out in Table 4-6 and Table 4-7.

In the early consultation phases Beach also attempted to contact key relevant persons or organisations by telephone to request meetings to discuss their functions, interests or activities. Beach also followed up key non-responders by email and phone.

Beach's online consultation hub, Engage Beach, provided information in a variety of formats with long and short descriptions of activities, project and consultation timelines, diagrams, maps, detailed information on key topics, and contact details and forms to ask questions and provide feedback. Information sessions and webinars were also promoted on Engage Beach.

Beach saw increased activity on its Engage Beach project and consultation pages at key points throughout the consultation period including the first day of the first Facebook, Instagram and Meta campaign, throughout its news site advertising campaigns and around bulk email distribution dates. During the consultation period, the Program activities pages had a total of 335 unique visitors, 624 page views and 526 visits.

Beach used an optimised mixed media advertising effort to inform the public about the Well Completions, Well Interventions and Plugging and Abandonment Activities EP under development, invite enquiries from potentially relevant persons, and ensure as greater reach as possible. This included public notices in regional, state and national newspapers, digital advertising on news sites, social media, National Indigenous Times e-newsletters, and radio advertising as set out in Table 4-8.

The digital advertising used geotargeting locations within the Planning and Operational areas and key demographic interests from Facebook's list of terms, such as commercial fishing; marine; recreational fishing (fishing); cultural heritage; and environmentalism to inform the reach. The call to action was to click through to visit Engage Beach where there were opportunities to learn more and consult via a feedback form. Beach email and phone contact details were also available on Engage Beach.

Beach has consulted with some Commercial Fishing Groups and First Nations Groups employing the 'involve' and 'collaborate' practices in the IAP2 model, with success, and as demonstrated in the Consultation Report at Appendix B, and corresponding records in the Sensitive Information Report.

Table 4-9: IAP2 Spectrum of public participation – Applied for consultation on this EP

	Inform	Consult	Involve	Collaborate
Relevant person focus	• Relevant persons identified from Beach methodology and desktop research. • Self-identified relevant persons from public notices, digital and radio advertisements and meetings.	• Those seeking further information or who raise concerns. • Fishing associations. • First Nations groups. • Relevant government departments and agencies.	• Potentially impacted commercial fishers and marine users. • Relevant government departments and agencies.	• Impacted commercial fishers • Industry proponents who may be conducting activities in similar locations and times. • Support as applicable for First Nation groups to identify cultural values and sensitivities. • Seek input from relevant marine park management authorities and other government agencies regarding risks and management measures.
Consultation methods	• Beach online engagement hub, Engage Beach. • Information sheets. • Phone calls. • Email to Beach database. • Regional public notices introducing the project and inviting self-identification as relevant person. • Targeted public notices for drop-in information session. • Advertising.	• Direct response to questions & concerns (email/phone/meetings) • Email and phone to discuss consultation preferences. • Phone follow up to potentially impacted RPs who haven't replied. • Email follow up to other no-replies. • Engage Beach to encourage questions and consultation. • Request meetings with regional community groups. • Hold community information sessions, in-person and online (webinars).	• Follow up non-responses to verify contact details, receipt of Beach emails, if they wish to be consulted. • Request meeting to confirm functions, interests and activities, and potential impacts to fishers. • Request meetings with First Nations Groups to identify consultation preferences, cultural values & sensitivities, and any other relevant persons. • Provide further information to requests from marine park management authorities and other government agencies regarding activities, locations, risks and impacts.	• Facilitate meetings with commercial fishing associations to advise and seek feedback on consultation approach, impact assessments, mitigation measures, research references and compensation approach where applicable. • Support First Nations Groups as requested, to identify cultural values and sensitivities.

	• Replies to government agencies such responses such as AHO and Defence agencies.

4.13 Consultation to Minimise Impacts on Relevant Person's Rights

In accordance with sections 280 and 460 of the OPGGS Act, petroleum activities must not interfere with navigation, fishing, conservation of resources of the sea and seabed, other offshore electricity infrastructure and petroleum activities, and the enjoyment of native title rights and interests (within the meaning of the Native Title Act 1993) to a greater extent than is necessary for the reasonable exercise of the titleholder's rights and obligations.

Beach has consulted with other petroleum industry operators in the vicinity of its proposed Program activities and no concerns were raised.

With regard to native title rights, Beach has detailed how it has undertaken an extensive assessment of First Nations relevant persons (Section 4.6.4.3) and its approach to consulting with First Nations groups (Section 4.5.2) to ascertain whether the Program activities would impact their functions, interest and activities, and where applicable, their native title rights. No concerns were raised about the Program activities.

4.14 Commercial Fishing Industry Consultation

Beach has developed long-term respectful relationships with the commercial fishing industry operating in the Otway and Bass Basins (see Section 4.6.4.4). Beach understands the consultation fatigue cited by the commercial fishing sector due to growing requests from petroleum titleholders seeking to meet requirements of the OPGGS(E)R, and more recently the offshore wind sector. Therefore, Beach applies an adaptive consultation approach (described in Section 4.12) commensurate with the potential impacts and risks to commercial fishers, as summarised below:

<table>
<tr><th rowspan="2"></th><th rowspan="2">Fishery Effort</th><th colspan="2">Potential Impacts or Risks</th><th colspan="3">Relevant Persons Identification for Fisheries with Operational Area and Planning Area Overlap</th><th>Consultation Methods (IAP2)</th></tr>
<tr><th>Operational Area</th><th>Planning Area</th><th>1. Identify Associations</th><th>2. Assess Association's Representation</th><th>3. Fishery rights holders</th><th>Commensurate with nature and scale of activities and potential impacts and risks</th></tr>
<tr><td>Tier One</td><td>Area has been fished by more than 5 fishers:
High, medium or low fishing intensity data publicly available, or upon request to fishery authortiy / agency.</td><td>Potential for displacment of fishing activity due to physical presence of drilling rig.
Potential impacts would depend on EP activity timings and fishing areas that commercial fishers prioritise to maximise fishing outcomes (reference,</td><td>LOWC or MDO spill.
Floating, entrained and disssolved hydrocarbons (low, moderate, high thresholds)</td><td rowspan="3">Identify Fishery Associations representing fishery</td><td rowspan="3">A) Assess membership coverage within relevant fishery.

B) Inquire if association's role includes members' permission to represent members in OPGGS(E) matters.

C) Inquire if association wishes to consult with their members re Beach EP activities, or have prior permission to represent members.

D) Inquire if association wants to agree commercial arrangements for supporting Beach's consultation.</td><td rowspan="3">A) Where fishery associations do not have 100% membership in a fishery, access fishery rights holders lists where available and consult directly with rights holders.

B) Use public advertising for awareness of EP activity areas that may enable commercial fishers to self identify.</td><td>Inform and follow up via email or phone (if number is available).
Consult if relevant person advises potential impact.
Involve and collaborate on control measures where impacts identified.</td></tr>
<tr><td>Tier Two</td><td>Area has been fished by less than 5 fishers:
Publicly available fishing effort data shows some fishing in grid blocks, but records of 'fishing intensity' due to less than 5 fishers having reported fishing effort.</td><td>Potential for impacts assoicated with displacement are unlikely due to sporadic nature of fishing effort in recorded grid blocks.</td><td>LOWC or MDO spill.
Floating, entrained and disssolved hydrocarbons (low, moderate, high thresholds)</td><td>Inform.
Follow up via email or phone (if details available).
Consult if relevant person advises potential impact.</td></tr>
<tr><td>Tier Three</td><td>Fishing rights only:
Publicly available data shows no reported fishing intensity or effort.
Fishery rights may be held (licence, quota, permits, etc).</td><td colspan="2">Designated fisheries may overlap the Operational and Planning areas. However, as there has been no fishing history reported in publicly available data, impacts to fishing activity are unlikely.</td><td>Inform.
Consult if requested.</td></tr>
</table>

Figure 4-3: Commercial fishery relevant persons identification and consultation methodology

4.14.1 Commercial Fishing Association Consultation

Beach has consulted with key commercial fishing associations for many years. Beach respects their role in representing their member's interests, to minimise the potential impact to their members from the Program activities and to minimise the potential for 'stakeholder fatigue' on fishers from Beach's and other energy sector consultation efforts.

Beach has advised commercial fishing associations that it will consult with them and seek their support to engage their members to inform them of Beach's proposed projects and seek feedback on questions or concerns. Beach has also advised it will enter into commercial arrangements for that purpose as it has done with some associations for many years. However, Beach has also advised such associations that it does have a significant number of individual fishers within its stakeholder database that have been consulted directly by Beach for many years and unless such fishers advise Beach otherwise, that direct consultation will continue.

Where membership of an organisation is voluntary, Beach has asked commercial fishing associations about their membership coverage of active commercial fishers in their sector. The key associations that Beach has consulted with for many years (and for this EP) have previously advised Beach that their membership covers the vast majority of active fishers in their sector and their members wish for them to act on their behalf in consultations with the petroleum industry. Beach appreciates that it cannot insist upon evidence to this effect given the commercial confidential nature of such information, in addition to compliance with privacy legislation and associations' policies.

SIV represent all Victorian licenced commercial fishers other than the abalone sector, which has three separate associations. For several years, Beach has contracted SIV to share Beach's project information with their members and enquire if they have any questions or concerns about the activities based on their fishing operations. Beach has formalised a service agreement with SIV regarding consultation and SIV has engaged its members regarding the activities in this EP including sharing project information and invitations to Beach information sessions for the fishing sector.

Beach has also consulted with abalone associations representing Victorian abalone fishers, including: Abalone Council Victoria; Abalone Victoria Central Zone; and Abalone Council Australia.

SETFIA have been contracted by Beach many times over the last several years to prepare fishery activity reports for Beach's preparation of EPs, and to request their support in contacting their members to share information on proposed projects for the development of EPs, and before, during and after activities commenced. The Small Pelagic Fisheries Association (SPFA), and the Southern Shark Industry Alliance (SSIA) are both managed by the same SETFIA Executive Officer who has shared Beach's project information for this EP and reminded members of the Beach information sessions for the fishing sector.

After initial consultations with key industry associations at the beginning of consultation for the OGV Project, and in an effort to help reduce 'stakeholder fatigue' Beach held a hybrid peak body group meeting to facilitate efficient, productive, and transparent consultation across the different fisheries.

For the meeting of the peak body groups, Beach invited:

- SIV

- SETFIA; SSIA; SPFA
- Commonwealth Fishing Association (CFA)
- Seafood Industry Australia (SIA)
- Seafood Industry Tasmania (SIT) (formerly TSIC)
- Tuna Australia (TA)

The meeting was attended by: SIV; SIA; and TA. Further meetings will be held on an as-needs basis (as per direction from the groups). General matters discussed included fisheries impacts research, optimal consultation approach given growing stakeholder fatigue, Beach's Fair Ocean Access Procedure, the concept of an industry-wide compensation approach, and petroleum exclusion zones, but no specific concerns were raised regarding Program activities due to the minimal disturbance impacts over a short time frame and relatively small area.

Other groups intending to participate include SETFIA/SSIA/SPFA, VFA, and SIT. The CFA advised they were unable to participate in consultation due to limited resources and requested that Beach direct its enquires to the associations that represent the directly affected fisheries/fishers.

Notwithstanding the very limited fishing effort in the Beach Operational and Planning Areas, Beach has consulted with TA, entered into their service agreement and received their fishery assessment report that has not identified any concerns.

Beach has consulted with SIT, the Tasmanian Rock Lobster Fisheries Association – both of which represent all Tasmanian licence fishers – and licenced rock lobster fishers respectively. Beach also consulted with the Tasmanian Scallop Fishermen's Industry Association who represent both Tasmanian State licenced scallop fishers and Bass Strait Central Zone scallop fishers, and the Bass Strait Scallop Association who represents Bass Strait Central Zone scallop fishers. Beach ran public notice advertising in Tasmania and King Island.

Beach has consulted with relevant South Australian fishery associations including: South Australian Rock Lobster Advisory Council; South Eastern Professional Fishermen's Association; Marine Fishers Association; and Charter Boat Association of South Australia.

4.14.2 Individual Commercial Fisher Consultation

Beach consulted with its direct contacts (other than fishing associations) of sole traders or fishing companies who may actively fish around the proposed Operational Area. This is in addition to the associated fishing industry businesses, with whom it also consults directly.

During the consultation period, given Beach could not establish that all commercial fishing associations represented all rights holders in their applicable fisheries, Beach sought relevant fishery rights holders' contact lists as follows:

A.3 AFMA for relevant Commonwealth fisheries. The list of 344 unique additional entities included email addresses for the majority; and

A.4 Fisheries Public Register via Government of South Australia – Department of Primary Industries and Region. A list of 804 unique additional entities (organisations or individuals) was identified and postal addresses were available.

Given the newly identified commercial fishing rights holders were identified during the consultation period, Beach undertook the following additional actions to ensure provision of sufficient information and a reasonable period to consult:

- Each rights holder was provided with information sheets, including a description of the EP activities, area maps, indicative timings, environment description regulatory framework;
- A summary of the method of assessing fishery areas in relation to the EP Operational and Planning Areas, including an extract of each applicable map (relevant to their fishery rights held) that showed fishery effort overlayed on Beach's Operational and Planning Areas;
- A description of the purpose of consultation, relevant person explanation, how to seek further information and consult with Beach, that their information can be requested to remain private.

All fishers were contacted via phone (where phone number was available) and sent an email containing detailed information of Beach's assessment of fishery effort (applicable to their fishery where known) in relation to Beach's Operational and Planning Areas. Fishers were invited to review the information (including links to maps) and advise Beach if they wished to provide Beach information on their fishery areas or had any objections or concerns.

4.14.3 Summary of Commercial Fishing Industry Consultation

The following key steps set out the approach Beach has taken for consultation during the development of this EP with the Commercial Fishing sector, including associations and individual fishers.

- Provide information sheet and link to Engage Beach (online consultation hub) to all identified relevant persons and organisations.
- Request direct meetings with associations to provide opportunity for detailed discussion, response to questions, concerns and further information requests.
- Seek information to confirm actual fishing effort and seek support from associations (including costing proposals where applicable) for engagement with their members, either directly or via the association as applicable.
- Provide additional information where requested.
- Send follow up emails to all commercial fishing associations and individual fishers, throughout the consultation period.
- Send tailored information regarding Beach's assessment of fishery effort in relation to the Operational Area and Planning Area in the EP.

4.15 Assessment of Merit of Objections or Claims

The merits of objections or claims raised during consultation were assessed via evidence such as applicable publicly available credible information, scientific data or peer reviewed scientific literature, published fishery reports from State or Commonwealth authorities. Where the objection or claim was substantiated, where applicable, it was assessed as per the Beach impact and risk assessment process and controls applied where appropriate to manage impacts and risks to an acceptable level and ALARP.

Relevant persons were provided with feedback as to the assessment of merits of the objection or claim made, where applicable, how it was assessed and if any controls were put in place to manage the impact or risk to an acceptable level and ALARP.

If an objection or claim is raised after acceptance of this EP and the matter necessitates a revision of the EP this will be managed in accordance with Beach Management of Change processes (Section 8.3.4) and the relevant person will be advised of the process.

4.16 Measures Adopted as a Result of Consultation

Objection or Claim Raised, or Other Relevant Matter Raised	Beach's Assessment of Merit for Program Activities	Measures Adopted
Director of National Parks (DNP) confirmed no overlap with Australian Marine Parks therefore no authorisation required. DNP provided guidance on preparing EPs to align with marine park management objectives, outlined notification requirements for activity changes or emergency responses, and highlighted the inclusion of operational areas in the EP to assess risks and apply mitigations.	Beach acknowledges DNP engagement as a relevant matter but that no objection or claim was raised.	No additional controls or measures required.
Seafood Industry Tasmania (SIT) raised that octopus fishing may be impacted by the activity.	Beach acknowledges the relevant matter raised about the potential impacts to octopus fishing raised by SIT. Beach has successfully managed communications with all fishers during previous activities to minimise potential impacts and will utilise similar measures in mitigation in place for this activity.	CM03: Consultation for Implementation of EP. Relevant details in relation to pre-laid anchor buoys, MODU and vessels will be provided to the AHS and AMSA and to relevant stakeholders to ensure the presence of the MODU and vessels are known.
A relevant person (Mactaggart Marine) raised concerns about the potential loss of fishing gear due to MODU and supply vessel routes.	Beach acknowledges the relevant matter raised about the risk of lost fishing gear. Beach has successfully managed this risk by setting and communicating vessel routes in its last drilling campaign and will put this measure in place for these activities.	Updated CM03: Consultation for Implementation of EP to address potential impacts, with existing control measure modified to include communication of supply vessel navigation corridors. Relevant details in relation to pre-laid anchor buoys, MODU and vessels will be provided to the AHS and AMSA and to relevant stakeholders to ensure the presence of the MODU and vessels are known.
Marine Fishers Association Inc. advised they have no concerns provided that Beach had a compensation policy in the event of a release of hydrocarbons that affected South Australian marine scalefish.	Beach confirmed that it has a compensation procedure that applies to commercial fishers such as Marine Fishers Association Inc. in the event of a direct impact from its offshore activities.	CM04: Beach Fair Ocean Access Procedure.
Gunditj Mirring Traditional Owners Aboriginal Corporation		
GMTOAC does not view the interactions that have taken place to date between GMTOAC members and Beach Energy to constitute consultation in relation to the Well Completions, Well Interventions and Plugging and Abandonment Activities EP.	Beach rejects this assertion and considers that Beach's interactions with GMTOAC and Gunditjmara people to date to constitute sufficient and appropriate consultation in relation to the Well Completions, Well Interventions and Plugging and Abandonment Activities EP.	No additional measures or controls are necessary to be adopted.

Objection or Claim Raised, or Other Relevant Matter Raised	Beach's Assessment of Merit for Program Activities	Measures Adopted
(Note: this is 'other information' and is not an objection or claim to be assessed under Reg 24(b)(ii), as it does not concern an adverse impact of an activity to which the EP relates)	Consultation under regulation 25 has been demonstrated by: • A reasonable consultation period of 5 months, in which Beach afforded GMTOAC and Gunditjmara people a reasonable opportunity to consult. • Beach's extension of the consultation period for GMTAOC and Gunditjmara people, including for the purpose of accommodating an in-person meeting in March 2025 and to provide an opportunity for GMTOAC and Gunditjmara people until 16 April 2025 to raise any further comments, feedback or concerns in respect of information provided. • Beach's provision of sufficient project information to GMTOAC and Gunditjmara people, throughout the consultation period. • Beach incorporating GMTOAC's and Gunditjmara people's values and sensitivities, and appropriate control measures, in relation to the Whale, the Deen Maar and the Eel.	
Consultation for the purposes of GMTOAC's membership requires more than emails between Beach Energy and GMTOAC staff members or officers who do not have authority to participate in consultation on behalf of the group on highly consequential matters. All offshore petroleum activities are potentially highly consequential to GMTOAC's interest and those of its members. (Note: this is 'other information' and is not an objection or claim to be assessed under Reg 24(b)(ii), as it does not concern an adverse impact of an activity to which the EP relates)	Beach consulted with GMTOAC in its capacity as the representative body for the Gunditjmara native title group, and with Gunditjmara people through GMTOAC. However, during the course of consultation, Beach repeatedly invited GMTOAC to share the information Beach provided to it, including Beach's invitation to consult, to GMTOAC and the Gunditjmara people. Numerous invitations have been extended by Beach to both GMTOAC and Gunditjmara people to attend online or in person sessions (both general and targeted to First Nations interests) in order to engage directly with Beach. This is in addition to repeated	No additional measures or controls are necessary to be adopted.

Objection or Claim Raised, or Other Relevant Matter Raised	Beach's Assessment of Merit for Program Activities	Measures Adopted
	offers to meet specifically with GMTOAC and / or Gunditjmara people. On that basis, Beach rejects the assertion that consultation with GMTOAC was insufficient and limited to emails between Beach and GMTOAC staff members and officers.	
GMTOAC's members need to take appropriate, independent technical legal advice on the impact of proposed petroleum activities on Gunditjmara Sea Country, individually and cumulatively. Preliminary independent technical advice has only been received on 12 November 2024, and requires time to be reviewed and considered. (Note: this is 'other information' and is not an objection or claim to be assessed under Reg 24(b)(ii), as it does not concern an adverse impact of an activity to which the EP relates)	Beach has sought to provide GMTOAC with all available resources to accommodate any request for information or explanation necessary to further inform GMTOAC and its members about Beach's activities, including in relation to the cumulative impact analysis. While GMTOAC is entitled to seek independent advice, Beach is unable to wait indefinitely for GMTOAC to do so. In November 2024, EJA indicated that GMTOAC has obtained independent technical advice, but did not specify what this advice is in relation to. Beach provided further information to GMTOAC on 4 April 2025. In any event, whether or not GMTOAC has obtained the technical advice identified is not determinative of whether consultation has been carried out as required by reg 25.	No additional measures or controls are necessary to be adopted.
The provision by EJA of the Consultation & Negotiation Plan marks the start of meaningful consultation. (Note: this is 'other information' and is not an objection or claim to be assessed under Reg 24(b)(ii), as it does not concern an adverse impact of an activity to which the EP relates)	For the reasons expressed in Appendix D, Beach does not consider that this claim has merit. Beach has consulted with both GMTOAC and its members in line with its obligations under s 25 of the OPGGS(E)R.	No additional measures or controls are necessary to be adopted.
Registered Native Title Bodies such as GMTOAC are under-resourced and dealing with competing demands, including demands from multiple proponents to consult. This context needs to be considered and accommodated within Beach's consultation with GMTOAC.	Beach acknowledges these assertions. Beach is aware of the resourcing constraints faced by Registered Native Title Bodies and of the consultation fatigue facing both proponents and relevant persons in respect of consultation in the Otway Basin. These factors have been considered by Beach in its	No additional measures or controls are necessary to be adopted.

Objection or Claim Raised, or Other Relevant Matter Raised	Beach's Assessment of Merit for Program Activities	Measures Adopted
(Note: this is 'other information' and is not an objection or claim to be assessed under Reg 24(b)(ii), as it does not concern an adverse impact of an activity to which the EP relates)	assessment of what constitutes a reasonable period for consultation pursuant to s 25(3), together with other circumstances relevant to this assessment (as outlined above in sections 4.10 and 4.14.3). On balance, having regard to all circumstances, Beach is comfortable that in allowing a period of up to five months for formal consultation and an additional period of time until 16 April 2025 for consultation with GMTAOC and Gunditjmara people, Beach has afforded a reasonable period for consultation.	
There cannot be consultation with GMTOAC without consultation with the full group of Gunditjmara people for whom GMTOAC holds its native title on trust. (Note: this is 'other information' and is not an objection or claim to be assessed under Reg 24(b)(ii), as it does not concern an adverse impact of an activity to which the EP relates)	Beach does not agree with this assertion. Beach has decisional choice in how to consult in relation to communal cultural interests. While GMTOAC's views are relevant to determining the approach that Beach takes to consultation, they are not determinative. Notwithstanding this, Beach considers that it is entirely appropriate to consult with Gunditjmara people through GMTOAC and this is in accordance with GMTOAC and Gunditjmara people's expressed preference. Beach has repeatedly offered to GMTOAC to meet with Gunditjmara people and has held numerous online and in person meetings and sessions (including dedicated First Nations consultation sessions) which have been widely and publicly advertised and available to allow direct engagement between Beach and Gunditjmara people.	No additional measures or controls are necessary to be adopted.

4.17 Sensitive Information

Within information sheets and online content, Beach has included the following information:

"Relevant persons may request that the information they provide not be published, and it will be identified as sensitive information and not published in the Environment Plans."

4.18 Report on Consultations

The report on consultations provides details of the information sent to relevant persons, response received including concerns raised about impacts and risk to their functions, interests, and activities from the activities in the EP, assessments of the concerns raised, and responses to those concerns.

Where an objection or claim was raised by a relevant person, they were provided feedback as to whether the objection or claim was substantiated, how it was assessed and if any additional controls were required to manage the impact or risk to an acceptable level and ALARP. Where an objection or claim was substantiated via evidence such as publicly available credible information and/or scientific or fishing data, this was assessed as per the impact and risk assessment process detailed in Section 2 and controls applied where appropriate to ensure impacts and risks are managed to an acceptable level and ALARP.

The report on consultation can be found in Appendix B.

Copies of the full text of any response by a relevant person have been provided to NOPSEMA as a Sensitive Information under Section 26(8) of the OPGGS(E)R.

4.19 Consultation for Implementation of EP

Consultation in the course of preparation of the EP has been completed in accordance with the OPGGS(E)R. Beach engages in ongoing consultation and communications during the implementation of this EP and Relevant Interested Persons can provide feedback to Beach on any new relevant matters that may emerge. Beach will assess any new matters and where appropriate, Beach will apply its Management of Change Standard (Section 8.3.4).

Beach will continue to consult with relevant interested persons to meet Section 22(15) of the OPGGS(E)R. This includes providing updates and notices for the OGV Project phases and other future activities, including the Program activities, to keep relevant persons informed as information becomes available. This will be done via one-on-one communications, emails, and provision of information on the Beach website. Records of ongoing consultations will be maintained in Beach's database BeachConnect.

Table 4-10 details the ongoing consultation requirements for implementation of the activity.

Table 4-10: Consultation requirements for implementation of the activity

Relevant person	Consultation	Timing
All relevant persons	Activity updates including acceptance of EP and start and completion of activities.	As required
Relevant First Nations groups	Consultation regarding implementation of an oil spill emergency response in the unlikely event of a hydrocarbon spill	As required
Relevant Commercial Fishing Associations	Consultation regarding well locations, the ongoing communication of Beach activities to their members, and applying Control Measure 04: Beach Fair Ocean Access Procedure.	After determination of well locations
Relevant persons identified as marine users and relevant government departments and agencies	Notifications of activity commencement, including: type of activity, including pre-lay of anchors and buoys, towing of the MODU to first and subsequent locations, supply vessel contact details and proposed routes. • location of activity, coordinates, and map. • timing of activity: expected start and finish date and duration. • sequencing of locations if applicable. • vessel details including call sign and contact. • any safety exclusion zones required. • Beach contact details. Note: coordinates to be provided as degrees and decimal minutes referenced to the WGS 84 datum.	2 weeks prior to activity commencing
AHO	Vessel contractor to issue notification of activity for publication of notices to mariners (NOTMAR), including: • type of activity. • geographical coordinates of activity. • any exclusion zones required. • period that NOTMAR will cover (start and finish date). • vessel details including name, Maritime Mobile Service Identity (MMSI)), satellite communications details (including INMARSAT-C and satellite telephone), contact details and call signs. • Beach and vessel Contractor contact details. Update AHS of progress, changes to the intended operations including if activity start or finish date changes.	4 weeks prior to activity commencing

Relevant person	Consultation	Timing
AMSA - JRCC	Vessel Contractor to issue notification of activity for promulgation of radio navigation warnings, including: • type of activity. • geographical coordinates of activity. • any exclusion zones required. • period that warning will cover (start and finish date). • vessel details including name, call-sign and Maritime Mobile Service Identity (MMSI)), satellite communications details (including INMARSAT-C and satellite telephone numbers), contact details and calls signs. • any other information that may contribute to safety at sea. • Beach and vessel Contractor contact person. Update AMSA JRCC of progress, changes to the intended operations including if activity start or finish date changes.	48 – 24 hrs prior to activity commencing
NOPSEMA and Director of National Parks	Regulatory notification of start of activity.	10 days prior to activity commencing
Relevant Persons who have requested vessel location information.	SMS or email messaging undertaken where requested by Relevant Person.	During activity
NOPSEMA and Director of National Parks	Regulatory notification of cessation of activity.	Within 10 days of activity completion

4.19.1 Specific Commercial Fishing Sector Consultation for EP Implementation

- Should any commercial fisher advise in the future that they may be potentially impacted by the Program activities the following steps would be followed:
  - For fishers who have contacted their associations, Beach would consult with the association to gather information about the fisher's fishing patterns and locations and to establish contact for consultation throughout the activity.
  - For fishers who have contacted Beach directly, engage with them and gather information about their fishing patterns and locations and to establish contact for consultation throughout the activity.
  - Where fishers provide Beach with sensitive fishing data, advise the information will be managed confidentially in accordance with Beach's Privacy Policy, and provide a copy of the policy where requested.
- Beach has previously and will continue to offer SMS messaging to commercial fishers and their associations to provide updates before, during and after the activity.
- To facilitate minimising of impacts to each other's activities, Beach will provide regular updates on the locations and timings of pre-laying of anchors and mooring chains; MODU towing routes and locations, and supply vessels routes.
- Beach has a stated position that fishers should not suffer an economic loss as a direct result of Beach activities. Beach's Fair Ocean Access Procedure for Compensation Claims from Commercial Fishers is explained in clear and simple language in the Fair Ocean Access

Information Sheet in Appendix D. It summarises Beach's procedures for minimising and mitigating potential impacts to commercial fishing and procedures for compensation claims from commercial fishers. Beach will ensure that the evidence required is not burdensome on the fisher while ensuring genuine claims are processed.

5 Environmental Requirements

This section describes the requirements that apply to the activity, and includes relevant laws, codes, other approvals and conditions, standards, agreements, treaties, conventions, or practices (in whole or part) that apply to the jurisdiction that the activity takes place in.

The proposed activity is located in Commonwealth waters. Commonwealth legislation including relevant international conventions and other requirements relevant to the Program activities are summarised in Table 5-1.

On the basis that a worst-case credible spill has the potential to intersect Victorian, Tasmanian and South Australian waters, the relevant requirements are described in Table 5-2, Table 5-3 and Table 5-4, respectively.

Recovery plans, threat abatement plans and species conservation advice applicable to species are detailed in the description of threatened and migratory species (Section 6.4.9).

5.1 EPBC Act Primary Approval

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is the key legislation regulating projects that may have an impact on MNES. The Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW) is the Regulator of the EPBC Act.

In February 2014, NOPSEMA became the sole designated assessor of petroleum and GHG activities in Commonwealth waters in accordance with the Minister for the Environment's endorsement of NOPSEMA's environmental authorisation process under Part 10, section 146 of the EPBC Act. Under the streamlined arrangements, impacts on the Commonwealth marine area by petroleum and GHG activities are assessed solely through NOPSEMA.

NOPSEMA as the regulator for the OPGGS(E)R that requires that:

6 (1). Before commencing an offshore project, a person must submit an offshore project proposal for the project to NOPSEMA.

6 (2) However, subregulation (1) does not apply if the Environment Minister:

(a) has made a decision under section 75 of the EPBC Act that an action that is equivalent to or includes the project is not a controlled action; or

(b) has made a component decision under section 77A of the EPBC Act that a particular provision of Part 3 of that Act is not a controlling provision for an action that is equivalent to or includes the project, because the Minister believes the action will be taken in a particular manner; or

(c) has approved, under Part 9 of the EPBC Act, the taking of an action that is equivalent to or includes the project.

Thylacine West 1 and Thylacine North 1 and part of the existing Otway Development of the Thylacine and Geographe fields which is an approved project under Part 9 of the EPBC Act ((EPBC No 2002/621). The accepted EP for Otway Offshore Operations EP (CDN/ID17275058) includes the operation and maintenance of Thylacine West 1 and Thylacine North 1, however, does not include well intervention activities. This EP is prepared to account for the well intervention activity for Thylacine West 1 and Thylacine North 1.

On 9 April 2025, NOPSEMA accepted the OPP for Otway Offshore Gas Victoria Project. The OPP provided the project level assessment of potential impacts and risks from the Offshore Gas Victoria Project which is the primary project approval for the well completions (and contingent P&A) activity presented in this EP.

5.2 Commonwealth Requirements

Table 5-1: Commonwealth environmental requirements relevant to the Program activities

Requirements	Scope	Related International Conventions	Administering Authority
Aboriginal and Torres Strait Islander Heritage Protection Act 1984	The *Aboriginal and Torres Strait Islander Heritage Protection Act 1984* enables the Australian Government to protect important Indigenous areas and objects under immediate threat, if it appears that state or territory laws have not provided effective protection. Areas or objects protected under this Act are included in the National Heritage List and Commonwealth Heritage List. **Application to activity:** Areas or objects protected under this Act may be present within the Operational and Planning Areas as detailed in Section 6.6.	-	Department of Climate Change, Energy, the Environment and Water (DCCEEW)
Australian Ballast Water Management Requirements (CoA 2020b)	The Australian Ballast Water Management Requirements set out the obligations on vessel operators with regards to the management of ballast water and ballast tank sediment when operating within Australian seas. **Application to activity:** Provides requirements on how vessel and MODU operators should manage ballast water when operating within Australian seas to comply with the Biosecurity Act. Section 7.10 details how the requirements applicable to the activity will be met.	International Convention for the Control and Management of Ships' Ballast Water and Sediments (adopted in principle in 2004 and in force on 8 September 2017)	Department of Agriculture, Fisheries and Forestry (DAFF)
Australia Biofouling Management Requirements (DAFF 2023a)	The Australian biofouling management requirements set out vessel operator obligations for the management of biofouling when operating vessels under biosecurity control within Australian territorial seas. **Application to activity:** Provides requirements on how vessel and MODU operators should manage biofouling when operating within Australian seas to comply with the Biosecurity Act. Section 7.10 details how the requirements applicable to the activity will be met.	International Convention for the Control and Management of Ships' Ballast Water and Sediments (adopted in principle in 2004 and in force on 8 September 2017)	DAFF
Air Navigation Act 1920 Air Navigation (Aircraft Engine	This Act and associated regulations relate to the management of air navigation. **Application to activity:** Applies to helicopter operations during Program activities.	Chicago Convention 1947	Department of Infrastructure, Transport, Regional

Requirements	Scope	Related International Conventions	Administering Authority
Emissions) Regulations 1995 Air Navigation (Aircraft Noise) Regulations 2018	The requirements under this Act are related to safety, and therefore not relevant to the environmental management of Program activities		Development, Communications and the Arts
Australian Maritime Safety Authority Act 1990	This Act facilitates international cooperation and mutual assistance in preparing and responding to a major oil spill incident and encourages countries to develop and maintain an adequate capability to deal with oil pollution emergencies. Requirements are effected through Australian Maritime Safety Authority (AMSA) who administers the National Plan for Maritime Environmental Emergencies (NatPlan). **Application to activity:** AMSA is the designated Control Agency for oil spills from vessels in Commonwealth waters. These arrangements are detailed in the OPEP.	International Convention on Oil Pollution Preparedness, Response and Cooperation 1990 Protocol on Preparedness, Response and Co-operation to Pollution Incidents by Hazardous and Noxious Substances, 2000 International Convention Relating to Intervention on the High Seas in Cases of Oil Pollution Casualties 1969 Articles 198 and 221 of the United Nations Convention on the Law of the Sea 1982.	Australian Maritime Safety Authority (AMSA)
Biosecurity Act 2015 Biosecurity Regulations 2016	This Act is the primary legislation for the management of the risk of diseases and pests that may cause harm to human, animal or plant health, the environment and the economy. The objects of this Act are to provide for: (a) managing biosecurity risks; human disease; risks related to ballast water; biosecurity emergencies and human biosecurity emergencies; (b) to give effect to Australia's international rights and obligations, including under the International Health Regulations, the Sanitary and Phytosanitary Agreement and the Biodiversity Convention. **Application to activity:** The Biosecurity Act and regulations apply to 'Australian territory' which is the airspace over and the coastal seas out to 12 m from the coastline.	International Convention for the Control and Management of Ships' Ballast Water and Sediments (adopted in principle in 2004 and in force on 8 September 2017)	DAFF

Requirements	Scope	Related International Conventions	Administering Authority
	For the activity the Act and regulations regulates vessels and MODUs entering Australian territory regarding ballast water and hull fouling. Section 7.10 details how the requirements applicable to the activity will be met.		
Climate Change Act 2022 Climate Change (Consequential Amendments) Act 2022	The Act sets out Australia's greenhouse gas emissions reduction targets. It outlines Australia's greenhouse gas emissions reduction targets of a 43% reduction from 2005 levels by 2030 and net zero by 2050; requires the minister to prepare and table an annual climate change statement; requires the Climate Change Authority to give the minister advice in relation to the annual statement and future greenhouse gas emissions reduction targets; and provides for periodic reviews of the operation of the Act. The Act operates as 'umbrella' legislation to implement Australia's net-zero commitments and codifies Australia's net 2030 and 2050 GHG emissions reductions targets under the Paris Agreement. **Application to activity:** GHG requirements are detailed in Section 7.3.	The Act itself does not impose obligations directly on companies, but its passage into law sets the scene for sector-based reforms to implement the 2030 target and emissions budget, which will impact businesses. The Safeguard Mechanism reforms, which will apply principally to the industrial and resources sectors, is one such measure.	DCCEEW
Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)	This Act applies to actions that have, will have or are likely to have a significant impact on matters of national environmental or cultural significance. The Act protects MNES and provides for a Commonwealth environmental assessment and approval process for actions. There are eight MNES, these being: World heritage properties Ramsar wetlands Listed threatened species and communities Listed Migratory species under international agreements Nuclear actions Commonwealth marine environment Great Barrier Reef Marine Park Water trigger for coal seam gas and coal mining developments. **Application to activity:** Petroleum activities are excluded from within the boundaries of a World Heritage Area (Sub regulation 10A(f)). The activity is not within a World Heritage Area.	1992 Convention on Biological Diversity and 1992 Agenda 21 Convention on International Trade in Endangered Species of Wild Fauna and Flora 1973 Agreement between the Government and Australia and the Government of Japan for the Protection of Migratory Birds and Birds in Danger of Extinction and their Environment 1974 Agreement between the Government and Australia and the Government of the People's Republic of China for the Protection of Migratory Birds and their Environment 1986 Agreement between the Government of Australia and the Government of the	DCCEEW

Requirements	Scope	Related International Conventions	Administering Authority
	The EP must describe matters protected under Part 3 of the EPBC Act and assess any impacts and risks to these. Section 6 describes matters protected under Part 3 of the EPBC Act. The EP must assess any actual or potential impacts or risks to MNES from the activity. Section 7 provides an assessment of the impacts and risks from the activity to matters protected under Part 3 of the EPBC Act.	Republic of Korea on The Protection of Migratory Birds 2006 Convention on Wetlands of International Importance especially as Waterfowl Habitat 1971 (Ramsar) International Convention for the Regulation of Whaling 1946 Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention) 1979	
Environment Protection and Biodiversity Conservation Regulations 2000	Part 8 of the regulations provide distances and actions to be taken when interacting with cetaceans. **Application to activity:** The interaction requirements are applicable to the activity in the event that a cetacean is sighted. Section 7.11 details how the requirements applicable to the activity will be met.	-	DCCEEW
Environmental Protection (Sea Dumping) Act 1981 Environment Protection (Sea Dumping) Regulations 1983	The Sea Dumping Act and associated regulations regulate the loading and dumping of waste at sea and the creation of artificial reefs in Australian waters. Australian waters stretch from the low-water mark of the Australian shoreline out to 200 nm. **Application to activity:** For P&A activities, removal of well infrastructure is planned and does not trigger requirements under the *Environmental Protection (Sea Dumping) Act 1981*.	Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter 1972 (the London Convention)	DCCEEW
Fisheries Management Act 1991	This Act and associated regulations protect Australia's fishery resources and establish responsibilities in ecologically sustainable development. **Application to activity:** The Program overlaps several Commonwealth-managed fisheries, described in Section 6.5.10. Impacts and risks to Commonwealth-managed fisheries are assessed in Section 7.4.8.2	United Nations Convention on the Law of the Sea (UNCLOS) (1982) United Nations Fish Stocks Agreements (UNFSA) (1995) Code of Conduct for Responsible Fisheries (1995)	AFMA DAFF

Requirements	Scope	Related International Conventions	Administering Authority
Hazardous Waste (Regulation of Exports and Imports) Act 1989	The main purpose of the *Hazardous Waste (Regulation of Exports and Imports) Act 1989 (*'the Act') is to regulate the export, import and transit of hazardous waste to ensure that hazardous waste is dealt with appropriately so that human beings and the environment, both within and outside Australia, are protected from the harmful effects of the waste **Application to activity:** To ensure that hazardous waste as prescribed in the Act (i.e. – exhibiting one or more of the following characteristics: ignitability, corrosivity, reactivity, toxicity, mutagenic, teratogenic, infectious, irritant, carcinogenic, bioaccumulate/bio magnify, flammable or explosive), are documented, segregated from other waste streams and stored in suitable containers ahead of transport and disposal at a suitably licensed onshore facility.	The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal	DCCEEW
Marine Pest Plan 2018–2023: National Strategic Plan for Marine Pest Biosecurity	Australia's national strategic plan for marine pest biosecurity. It outlines a coordinated approach to building Australia's capabilities to manage the threat of marine pests over the next five years. It represents agreed priorities and actions of governments, marine industries, and other stakeholders to achieve a common purpose: to manage the risks posed by marine pests and minimise their potential harm to marine industries, communities and the environment. **Application to activity:** Applying the recommendations within this document and implementing effective biofouling controls can reduce the risk of the introduction of an introduced marine species Section 7.10 details how the requirements applicable to the activity will be met.	-	DAFF
Minamata Convention on Mercury	Australia ratified the Minamata Convention on 7 December 2021. The Minamata Convention on Mercury is an international treaty that seeks to protect human health and the environment from anthropogenic (caused by humans) emissions and releases of mercury and mercury compounds. The Convention covers all aspects of the life cycle of mercury, controlling and reducing mercury across a range of products, processes and industries. This includes controls on: Mercury mining. Manufacture and trade of mercury and products containing mercury. Disposal of mercury waste.	Minamata Convention on Mercury	DCCEEW

Requirements	Scope	Related International Conventions	Administering Authority
	Emissions of mercury from industrial facilities. Countries that have ratified the Convention are bound by international law to put these controls in place. **Application to activity:** Mercury may be present in drill fluid additives such as barite. Section 7.8 details how the requirements applicable to the activity will be met.		
National Biofouling Management Guidelines for the Petroleum Production and Exploration Industry (MPSC 2018)	The guidance document provides recommendations for the management of biofouling risks by the petroleum industry. **Application to activity:** Applying the recommendations within this document and implementing effective biofouling controls can reduce the risk of the introduction of an introduced marine species. Section 7.10 details how the requirements applicable to the activity will be met.	Certain sections of International Convention for The Prevention of Pollution from Ships (MARPOL) International Convention for the Safety of Life at Sea 1974 Convention on the International Regulations for Preventing Collisions at Sea (COLREG) 1972	DAFF
National Light Pollution Guidelines for Wildlife (DCCEEW 2023)	The Guidelines outline the process to be followed where there is the potential for artificial lighting to affect wildlife. **Application to activity:** Applying the recommendations within this document and implementing effective controls can reduce the impact of light to sensitive receptors. Section 7.2 details how the requirements applicable to the activity will be met.	-	DCCEEW
National Strategy for Reducing Vessel Strike on Cetaceans and other Marine Megafauna (DoEE 2017)	The overarching goal of the strategy is to provide guidance on understanding and reducing the risk of vessel collisions and the impacts they may have on marine megafauna. **Application to activity:** Applying the recommendations within this document and implementing effective controls can reduce the risk of the vessel collisions with megafauna. Section 7.11 details how the requirements applicable to the activity will be met.	-	DCCEEW
Native Title Act 1993 *Native Title Legislation*	The main objects of this Act are: (a) to provide for the recognition and protection of native title; and	-	Attorney-General's Department

Requirements	Scope	Related International Conventions	Administering Authority
Amendment Act 2021	(b) to establish ways in which future dealings affecting native title may proceed and to set standards for those dealings; and (c) to establish a mechanism for determining claims to native title; and (d) to provide for, or permit, the validation of past acts, and intermediate period acts, invalidated because of the existence of native title. **Application to activity:** Native Title or Indigenous Land Use Agreements may be present within the Operational and Planning Areas as detailed in Section 6.6.		
Navigation Act 2012	This Act regulates ship-related activities and invokes certain requirements of the International Convention for the Prevention of Pollution from Ships (MARPOL 73/78) relating to equipment and construction of ships. Several Marine Orders (MO) are enacted under this Act relating to offshore petroleum activities, including: MO 21: Safety and emergency arrangements. MO 30: Prevention of collisions. MO 31: SOLAS and non-SOLAS certification. **Application to activity:** The relevant vessels (according to class) will adhere to the relevant MO with regard to navigation and preventing collisions in Commonwealth waters. Section 7 details how the requirements applicable to the activity will be met.	Certain sections of MARPOL International Convention for the Safety of Life at Sea 1974 (SOLAS) Convention on the International Regulations for Preventing Collisions at Sea 1972 (COLREG)	AMSA
National Greenhouse and Energy Reporting Act 2007 (NGER Act)	The Act provides for the reporting and dissemination of information related to greenhouse gas emissions (GHG), greenhouse gas projects, energy production and energy consumption, and for other purposes. **Application to activity:** GHG emissions and energy use from vessels and MODU will be reported in accordance with the requirements of the NGER Act. Applicable requirements are specified as controls to relevant impacts and risks.	-	Clean Energy Regulator
Offshore Petroleum and Greenhouse Gas	The Act addresses all licensing, health, safety, environmental and royalty issues for offshore petroleum exploration and development operations extending beyond the three-nautical mile limit.		

Requirements	Scope	Related International Conventions	Administering Authority
Storage Act 2006 (OPGGS Act) Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2023 (OPGGS(E)R)	Part 4 of the OPGGS(E)R specifies that an EP must be prepared for any petroleum activity and that activities are undertaken in an ecologically sustainable manner and in accordance with an accepted EP. **Application to activity:** The OPGGS Act provides the regulatory framework for all offshore petroleum exploration and production activities in Commonwealth waters, to ensure that these activities are carried out: Consistent with the principles of ecologically sustainable development as set out in section 3A of the EPBC Act. So that environmental impacts and risks of the activity are reduced to ALARP. So that environmental impacts and risks of the activity are of an acceptable level. Demonstration that the activity will be undertaken in line with the principles of ecologically sustainable development, and that impacts and risks resulting from these activities are ALARP and acceptable is provided in Section 7.		
Offshore Petroleum and Greenhouse Gas Storage Act 2006 (OPGGS Act) – Maintenance and Decommission	The OPGGS Act sets out the requirements for maintenance and removal of all property. Under subsection 572(2) of the OPGGS Act, a titleholder must maintain in good condition and repair all structure, property and equipment within a title area. Under subsection 572(3) of the OPGGS Act, a titleholder must remove from the title area all structures that are, and all equipment and other property that is neither used nor to be used in connection with the operations. Under subsection 270(3) of the OPGGS Act, before title surrender, all property brought into the surrender area must be removed to the satisfaction of NOPSEMA, or arrangements that are satisfactory to NOPSEMA must be made relating to the property. **Application to Activity:** The EP covers (contingent) P&A of Artisan 1 in VIC/L35. This EP provides an assessment against section 572 for removal of property and section 270 of the OPPGS Act to in the event of surrender of title. Further information is provided in Section 8.5.5		
Offshore Petroleum and Greenhouse Gas Storage Act 2006	Petroleum licences granted and administered under the OPGSS Act provide rights to the titleholder to carry out petroleum activities with the licence area. **Application to Activity:** The EP may include petroleum activities in areas outside the boundaries of Beach's petroleum permits/titles and within either vacant areas and/or areas within petroleum permits held by other titleholders. Beach will obtain the		

Requirements	Scope	Related International Conventions	Administering Authority
(OPGGS Act) - Licensing	relevant authority approvals prior to commencing the activity. In accordance with section 268 and Part 2.8 of the Offshore Petroleum and Greenhouse Gas Storage Act 2006 (the Act) and the Offshore Petroleum: Special Prospecting Authority, Access Authority & Scientific Investigation Consents Guideline.		
Ozone Protection and Synthetic Greenhouse Gas Management Act 1989 Ozone Protection and Synthetic Greenhouse Gas Management Regulations 1995	This Act and associated regulations provide for measures to protect ozone in the atmosphere by controlling and ultimately reducing the manufacture, import and export of ozone depleting substances (ODS) and synthetic greenhouse gases, and replacing them with suitable alternatives. **Application to activity:** The Act will only apply to Beach if it manufactures, imports or exports ODS. Activities undertaken as a part of this program will adhere to the requirements of this Act including restrictions on import and use of ODS (in refrigeration and air conditioning equipment) through control measures in procurement. Applicable requirements are specified as controls to relevant impacts and risks.		
Protection of the Sea (Prevention of Pollution from Ships) Act 1983 Protection of the Sea (Prevention of Pollution from Ships) (Orders) Regulations 1994	This Act and associated regulations regulate Australian regulated vessels with respect to ship-related operational activities and invokes certain requirements of the MARPOL Convention relating to discharge of noxious liquid substances, sewage, garbage, air pollution etc. **Application to activity:** All ships involved in petroleum activities in Australian waters are required to abide to the requirements under this Act. Several MOs are enacted under this Act relating to offshore petroleum activities, including: MO 91: Marine Pollution Prevention – Oil. MO 93: Marine Pollution Prevention – Noxious Liquid Substances. MO 94: Marine Pollution Prevention – Packaged Harmful Substances. MO 95: Marine Pollution Prevention – Garbage. MO 96: Marine Pollution Prevention – Sewage. MO 97: Marine Pollution Prevention – Air Pollution. Section 7 details how the requirements applicable to the activity will be met.		

Requirements	Scope	Related International Conventions	Administering Authority
Protection of the Sea (Harmful Antifouling Systems) Act 2006	Under this Act, it is an offence for a person to engage in negligent conduct that results in a harmful anti-fouling compound being applied to or present on a ship. The Act also provides that Australian ships must hold 'anti-fouling certificates', provided they meet certain criteria. **Application to activity:** All ships involved in offshore petroleum activities in Australian waters are required to abide to the requirements under this Act. The MO 98: Marine Pollution Prevention – Anti-fouling Systems is enacted under this Act. Section 7.9 details how the requirements applicable to the activity will be met.		
Threat Abatement Plan for the impacts of Marine Debris on Vertebrate Wildlife of Australia's Coasts and Ocean (CoA 2018)	The plans focus on strategic approaches to reduce the impacts of marine debris on vertebrate marine life. **Application to activity:** Section 7.12 details how the requirements applicable to the activity will be met.		
Underwater Cultural Heritage Act 2018	Protects the heritage values of shipwrecks, sunken aircraft, and relics (older than 75 years) and other types of underwater cultural heritage including Australia's Aboriginal and Torres Strait Islander Underwater Cultural Heritage in Australian Territorial waters from the low water mark to the outer edge of the continental shelf (excluding the State's internal waterways). The Act allows for protection through the designation of protection zones. Activities / conduct prohibited within each zone will be specified. **Application to activity:** In the event of removal, damage or interference to shipwrecks, sunken aircraft or relics declared to be historic under the legislation, activity is proposed with declared protection zones, or there is the discovery of shipwrecks or relics. Section 6.2.5 provides information on known shipwrecks or sunken aircraft in the Operational and Planning Areas.		

Requirements	Scope	Related International Conventions	Administering Authority
	Section 6.6 provides information on First Nations cultural heritage.		
Underwater Cultural Heritage Guidance for Offshore Developments (DoEE 2019)	Provides guidance on how the Underwater Heritage Act must be considered when applying for any State, Territory or Commonwealth planning approval for actions or developments in all coastal and offshore waters. **Application to activity:** Impacts to underwater cultural heritage from the activity have been identified as seabed disturbance and from an oil spill and associated oil spill response activities. The guidance document has been used to inform those sections.		

5.3 Victorian Requirements

Table 5-2: Victorian environment requirements relevant to potential impacts and risks to State waters and lands

Requirements	Scope	Application to Activity	Administering Authority
Aboriginal Heritage Act 2006 Aboriginal Heritage Regulations 2018	The Act acts primarily to provide for the protection of Aboriginal cultural heritage in Victoria. It does this through: Establishing the Victorian Aboriginal Heritage Council. Council provides a state-wide voice for Aboriginal people and advises the Minister for Aboriginal Affairs on cultural heritage management. Establishing Registered Aboriginal Parties. This allows Aboriginal groups with connections to country to be involved in cultural heritage decision making. Establishing the Victorian Aboriginal Heritage Register. The register records details about Aboriginal places, objects, and knowledge. Cultural Heritage Management Plans (CHMPs) and Cultural Heritage Permit processes, to manage activities that may impact Aboriginal cultural heritage. Providing sanctions and penalties to prevent harm to Aboriginal cultural heritage. Powers for Authorised Officers and Aboriginal Heritage Officers, and increased fees and charges for breaches of the Act. The Regulations give effect to the Act. The Regulations prescribe standards, set out the circumstances in which a CHMP should be prepared and set fees and charges.	There is the potential for aboriginal heritage and Registered Aboriginal Parties within the Operational and Planning Areas. Section 6.6 identifies aboriginal heritage sites and Registered Aboriginal Parties within the Operational and Planning Areas.	First Peoples State Relations
Environment Protection Act 2017 and Environmental Protection Regulations 2021	This is the key Victorian legislation which controls discharges and emissions (air, water) to the environment within Victoria (including state and territorial waters). It gives the Environment Protection Authority (EPA) powers to licence premises discharges to the marine environment, control marine discharges and to undertake prosecutions. Provides for the maintenance and, where necessary, restoration of appropriate environmental quality. The State Environment Protection Policy (Waters of Victoria) designates:	Oil pollution management in Victorian State waters. Discharge of domestic ballast water from emergency response vessels into Victorian State waters must comply with these requirements.	Environmental Protection Authority Victoria

Requirements	Scope	Application to Activity	Administering Authority
	spill response responsibilities by Victorian Authorities to be undertaken in the event of spills (DoTP) with EPA enforcement consistent with the Environment Protection Act 1970 and the Pollution of Waters by Oil & Noxious Substances Act 1986. requires vessels not to discharge to surface waters sewage, oil, garbage, sediment, litter or other wastes which pose an environmental risk to surface water beneficial uses. To protect Victorian State waters from marine pests introduced via domestic ballast water, ballast water management arrangements applying to all ships in State and territorial waters must be observed as per the Environment Protection (Ships' Ballast Water) Regulations 2006, Waste Management Policy (Ships' Ballast Water) and the Protocol for Environmental Management. High risk domestic ballast water (ballast water which leachates from an Australian port or within the territorial sea of Australia (to 12 nm)), regardless of the source, must not be discharged into Victorian State waters. Ship masters must undertake a ballast water risk assessment on a voyage by voyage basis to assess risk level, provide accurate and comprehensive information to the EPA on the status and risk of ballast water contained on their ships (i.e. domestic/international), and to manage domestic ballast water discharges with EPA written approval.	Vessel discharges during spill response are managed as detailed in Section 7.7 Onshore waste disposal (refer Section 7.9 on solid waste management)	
Emergency Management Act 2013	Provides for the establishment of governance arrangements for emergency management in Victoria, including the Office of the Emergency Management Commissioner and an Inspector-General for Emergency Management. Provides for integrated and comprehensive prevention, response, and recovery planning, involving preparedness, operational co-ordination and community participation, in relation to all hazards. These arrangements are outlined in the Emergency Management Manual Victoria.	Emergency response structure for managing emergency incidents within Victorian State waters. Emergency management structure will be triggered in the event of a spill impacting or potentially impacting State waters. See OPEP.	Department of Justice and Community Safety (Emergency Management Commissioner, Emergency Management Victoria)
Fisheries Act 1995 (and Regulations 2019)	Provides legislative framework for the regulation, management and conservation of Victorian fisheries including aquatic habitats.	Victorian commercial and recreational fishing occur within the Operational and Planning Areas as described in Section 6.5.11. Impacts and risks to commercial and	Victorian Fishing Authority (VFA)

Requirements	Scope	Application to Activity	Administering Authority
		recreational fishing are assessed in Section 7.5.	
Flora and Fauna Guarantee Act (FFG Act) 1988 (and Regulations 2020)	The purpose of this Act is to protect rare and threatened species; and enable and promote the conservation of Victoria's native flora and fauna and to provide for a choice of procedures that can be used for the conservation, management or control of flora and fauna and the management of potentially threatening processes. Where a species has been listed as threatened an Action statement is prepared setting out the actions that have or need to be taken to conserve and manage the species and community.	Triggered if an incident results in the injury or death of a FFG Act listed species (e.g. collision with a whale). See incident reporting requirements in Section 8.3.1.	Victoria Department of Energy, Environment and Climate Action (DEECA)
Heritage Act 2017	The purpose of the Heritage Act is to provide for the protection and conservation of historic places, objects, shipwrecks and archaeological sites in state areas and waters (complementary legislation to Commonwealth legislation). Part 4 (Underwater cultural heritage) of the Act is focused on historic shipwrecks, which are defined as the remains of all ships that have been situated in Victorian State waters for 75 years or more. The Act addresses, among other things, the registration of wrecks, establishment of protected zones, and the prohibition of certain activities in relation to historic shipwrecks.	Section 6.2.5 identifies maritime heritage in Commonwealth and State waters. Act may be triggered in the event of impacts to a known or previously un-located shipwreck whilst undertaking emergency response activities. Incident reporting requirements in Section 8.3.1 details reporting to Commonwealth in first instance.	Heritage Victoria Department of Transport and Planning
Marine Safety Act 2010 (and Regulations 2023)	Act provides for safe marine operations in Victoria, including imposing safety duties on owners, managers and designers of vessels, marine infrastructure, and marine safety equipment; marine safety workers, masters and passengers on vessels; regulation and management of vessel use and navigation in Victorian State waters; and enforcement provisions of Police Officers and the Victorian Director of Transport Safety. This Act reflects the requirements of international conventions - Convention on the International Regulations for Preventing Collisions at Sea and International Convention for the Safety of Life at Sea. The Act also defines marine incidents and the reporting of such incidents to the Victorian Director of Transport Safety.	Applies to vessel masters, owners, crew operating vessels in Victorian State waters whilst undertaking emergency response activities. Vessel safe operations during the activity and/or spill response are managed as detailed in Section 7.	Safe Transport Victoria

Requirements	Scope	Application to Activity	Administering Authority
National Parks Act 1975	Establishes a framework for the protection and management of national parks in Victoria. It provides for the conservation of natural and cultural resources, the provision of recreational opportunities, and the management of park use.	Triggered in the event of a spill impacting or potentially impacting marine or coastal park. Reporting requirements in the event of a spill impacting or potentially impacting State waters are detailed in the OPEP.	DEECA
Pollution of Waters by Oil and Noxious Substances Act 1986 (POWBONS) (and Regulations 2022)	The purpose of the Pollution of Waters by Oils and Noxious Substances Act 1986 (POWBONS) is to protect the sea and other waters from pollution by oil and noxious substances. This Act also implements the MARPOL Convention (the International Convention for the Prevention of Pollution from Ships 1973) in Victorian State waters. Requires mandatory reporting of marine pollution incidents. Act restricts within Victorian State waters the discharge of treated oily bilge water according to vessel classification (> 400 tonnes); discharge of cargo substances or mixtures; prohibition of garbage disposal and packaged harmful substances; restrictions on the discharge of sewage; regulator reporting requirements for incidents; ship construction certificates and survey requirements.	Triggered in the event of a spill impacting or potentially impacting State waters. Reporting requirements in the event of a spill impacting or potentially impacting State waters are detailed in the OPEP.	Jointly administered by DEECA and EPA
Traditional Owner Settlement Act 2010	The purposes of this Act are to advance reconciliation and promote good relations between the State and traditional owners and to recognise traditional owner groups based on their traditional and cultural associations to certain land in Victoria.	There is the potential for aboriginal heritage and Registered Aboriginal Parties within the Operational and Planning Areas. Section 6.6 identifies aboriginal heritage sites and Registered Aboriginal Parties within the Operational and Planning Areas.	Department of Justice and Community Safety
Wildlife Act 1975 (& Regulations 2024)	The purpose of this Act is to promote the protection and conservation of wildlife. Prevents wildlife from becoming extinct and prohibits and regulates persons authorised to engage in activities relating to wildlife (including incidents).	Applies where vessels are within State waters responding to a spill event. Prescribed minimum proximity distances to whales, dolphins and	DEECA

Requirements	Scope	Application to Activity	Administering Authority
	The Wildlife (Marine Mammal) Regulations 2024 prescribe minimum distances to whales and seals/seal colonies, restrictions on feeding/touching and restriction of noise within a caution zone of a marine mammal (dolphins (150 m), whales (300 m) and seals (50 m).	seals will be maintained if vessel undertaking spill response in Victorian waters. Triggered if an incident results in the injury or death of whales, dolphins, or seals. See incident reporting requirements in Section 8.3.1.	

5.4 Tasmanian Requirements

Table 5-3: Tasmanian environment requirements relevant to potential impacts to State waters and lands

Requirements	Scope	Application to Activity	Administering Authority
Aboriginal Heritage Act 1975	The Act is the primary legislation for the protection of Aboriginal cultural heritage in Tasmania.	There is the potential for aboriginal heritage and Registered Aboriginal Parties within the Planning Area. Section 6.6 identifies aboriginal heritage sites any Registered Aboriginal Parties within the Planning Area.	Department of Premier and Cabinet
Aboriginal Land Act 1995	An Act to promote reconciliation with the Tasmanian Aboriginal community by granting to Aboriginal people certain parcels of land of historic or cultural significance.	There is the potential for aboriginal heritage and Registered Aboriginal Parties within the Planning Area. Section 6.6 identifies aboriginal heritage sites and Registered Aboriginal Parties within the Planning Area.	Department of Premier and Cabinet
Emergency Management Act 2006	Provides for the protection of life, property and the environment in the event of an emergency, to establish emergency management arrangements, to provide for certain rescue and retrieval operation. Establishes that the EPA is the designated jurisdictional authority for maritime environmental emergencies in Tasmania, specifically oil pollution and noxious substance pollution events.	The Director, EPA is the Tasmanian Marine Pollution Controller and has powers relating to pollution events under Marine-related Incidents (MARPOL Implementation) Act 2020. See OPEP.	Department of Police, Fire and Emergency Management
Environmental Management and Pollution Control Act 1994 (EMPCA) & Regulations	EMPCA is the primary environment protection and pollution control legislation in Tasmania. It is a performance-based style of legislation, with the fundamental basis being the prevention, reduction and remediation of environmental harm. The clear focus of the Act is on preventing environmental harm from pollution and waste.	Defines the EPA's jurisdiction during a spill event.	Environmental Protection Authority (EPA) Tasmania

	Relevant regulations under the EMPCA include: Environmental Management and Pollution Control (General) Regulations 2017 Environmental Management and Pollution Control (Waste Management) Regulations 2010 The EPA Division Compliance Policy provides the Director of the EPA powers of compliance.	Prescribes the fee structure to waste events and environmental protection notices. Regulates the management and control of controlled wastes. See OPEP	
Historic Cultural Heritage Act 1995	The act was developed to ensure the historic places that are of importance to the whole of Tasmania are recognised, protected, and managed effectively as part of the Resource Management and Planning System.	Section 6.2.5 identifies Martine heritage in Commonwealth and State waters. Act may be triggered in the event of impacts to a known or previously un-located historical items such as shipwrecks whilst undertaking emergency response activities. Incident reporting requirements in Section 8.3.1 details reporting to Commonwealth in first instance.	
Living Marine Resources Management Act 1995	An Act to promote the sustainable management of living marine resources, to provide for management plans relating to fish resources, to protect marine habitats.	Tasmanian commercial fishing occurs within the Operational and Planning Areas as described in Section 6.5.12. Impacts and risks to commercial and recreational fishing are assessed in Section 7.5.	NRE (Tasmania) Wild Fisheries Management Branch – Fishing Tasmania
Marine-related Incidents (MARPOL Implementation) Act 2020	Pollution of the sea in Tasmanian State waters may be regulated by general pollution laws such as the EMPCA (see above), but the Marine-related Incidents (MARPOL Implementation) Act 2020 deals specifically with discharges of oil and other pollutants from ships. It gives effect in Tasmania to the MARPOL international convention on marine pollution.	Gives effect to MARPOL in Tasmanian waters. Vessel discharges during the activity and/or spill response are managed as detailed in Section 7.7.	EPA Tasmania
National Parks and Reserves Management Act 2002	The act provides for the management of parks and reserves based on management objectives of each class of reserve, declaration, and management of Marine Protected Areas (marine reserves).	Marine and terrestrial protected areas were identified within the	Tasmania Parks and Wildlife Service

		Planning Area (Section 6.2.10 and 6.2.11).	
Nature Conservation Act 2002	An Act to make provision with respect to the conservation and protection of the fauna, flora and geological diversity of the State, to provide for the declaration of national parks and other reserved land and for related purposes.	Marine and terrestrial protected areas were identified within the Planning Area (Section 6.2.10 and 6.2.11).	Tasmania Parks and Wildlife Service
Threatened Species Protection Act 1995	Provide for the protection and management of threatened native flora and fauna and to enable and promote the conservation of native flora and fauna.	Identification of species that are also protected under Tasmanian legislation.	NRE (Tasmania)

5.5 South Australian Requirements

Table 5-4: South Australian environment requirements relevant to potential impacts to State waters and lands

Requirements	Scope	Application to Activity	Administering Authority
Fisheries Management Act 2007 (& Regulations)	The Act provides for the conservation and management of the aquatic resources of the State, the management of fisheries and aquatic reserves, the regulation of fishing and the processing of aquatic resources and the control of exotic aquatic organisms and disease in aquatic resources, and for other purposes.	South Australian commercial fishing overlaps the Planning Area as described in Section 6.5.13. Impacts and risks to fishing are assessed in Section 7.5.	Department of Primary Industries and Regions (South Australia)

6 Description of the Environment

The physical, biological, and socio-economic environment that may be affected by the Program is described in this section, together with the details of the particular relevant values and sensitivities of that environment.

The existing environment that may be affected by the Program is defined as the area where a change to ambient environmental conditions may potentially occur as a result of planned activities or unplanned events. It is noted that a change does not always imply that an adverse impact will occur; for example, a change may be required over a particular exposure value or over a consistent period of time for an adverse impact to occur.

Table 6-1 and Figure 6-1 detail the areas associated with the Program that are used to describe the environmental that may be affected. In addition to those zones, aspect-specific EMBAs are defined in the environmental impact evaluation sections (Section 7), including light EMBAs and noise EMBAs. Where relevant, these EMBAs are shown spatially within this chapter.

Table 6-1: Description of the areas used to define the existing environment

Zones	Description
Operational Area	The Operational Area is within Commonwealth waters and is where all infrastructure and activities associated with the Program will be undertaken as detailed in Section 3.1 The EPBC Protected Matters Search Tool (PMST) Report for the Operational Area is provided in Appendix F.
Planning Area	The Planning Area is within Commonwealth, Victorian, Tasmanian and South Australian waters and reaches Victorian and Tasmanian (King Island) shorelines (Figure 6-1). The Planning Area is based on a combination of the MDO (Diesel) Planning Area and Condensate Planning Area based on the spill modelling to the low thresholds as detailed in Section 7.13 for two separate release locations for conservatism. The PMST Report for the Planning Area is in Appendix H.

6.1 Regional Context

The Operational Area and Planning Area are within the South-east Marine Region, with the Operational Area within the Western Bass Strait Shelf Transition and West Tasmania Transition Provincial bioregions (Figure 6-1). The bioregions are based on the Integrated Marine and Coastal Regionalisation of Australia (IMCRA v4.0) which is a spatial framework for classifying Australia's marine environment into bioregions that make sense ecologically and are at a scale useful for regional planning (CoA 2005)

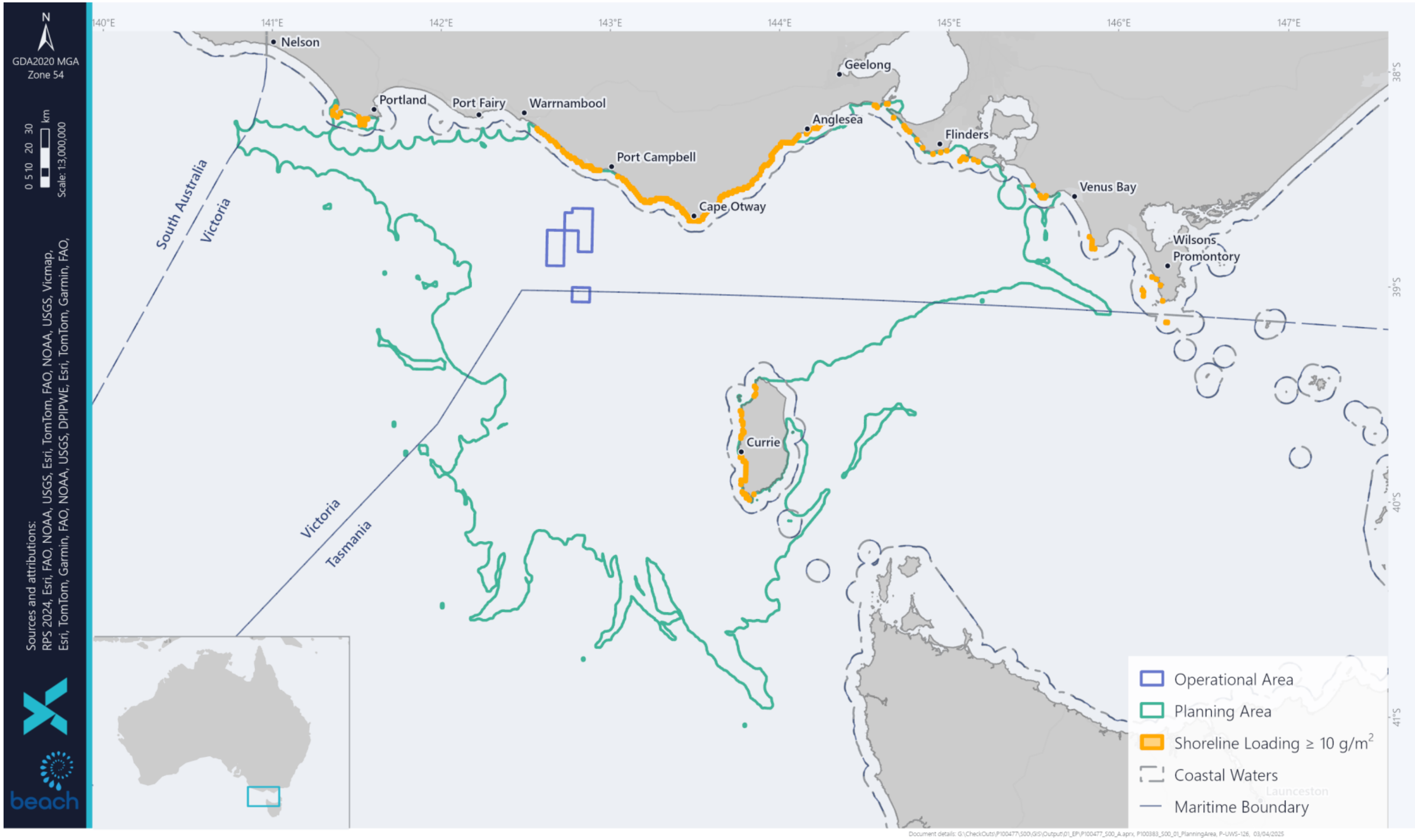


Figure 6-1: Program activities Operational Area and Planning Area.

6.2 Conservation Values and Sensitivities

The following section details the conservation values and sensitivities identified within the Operational Area and Planning Area identified from PMST Reports (Appendix F, Appendix H), reputable, peer-reviewed literature and relevant person consultation.

6.2.1 World Heritage Properties

No World Heritage Properties were identified within the Operational or Planning Area (Appendix F, Appendix H).

6.2.2 Australian Marine Parks

No Australian Marine Parks were identified within the Operational Area (Figure 6-2).

Australian Marine Parks identified within the Planning Area (Appendix H) are presented in Table 6-2 and Figure 6-2. Australian Marine Parks identified in the PMST Reports due to the size of the grids used in the PMST but not actually intersecting the Planning Area are listed in the table with 'X'. Australian Marine Parks which intersect the Planning Area are discussed in the subsections below.

Table 6-2: Australian Marine Parks identified within the Operational Area and Planning Area

Australian Marine Park	Zone & IUCN Categories	Operational Area	Planning Area
Apollo	Multiple Use (IUCN VI)	-	✓
Franklin	Multiple Use (IUCN VI)	-	X
Zeehan	Multiple Use (IUCN VI)	-	✓
	Special Purpose Zone (IUCN VI)	-	✓

The majority of AMPs within the Planning Area are classified as International Union for Conservation of Nature (IUCN) VI – Multiple Use Zone, in which a wide range of sustainable activities are allowed if they do not significantly impact on benthic (seafloor) habitats or have an unacceptable impact on the values of the area. Allowable activities include commercial fishing, general use, recreational fishing, defence, and emergency response. Some forms of commercial fishing, excluding demersal trawl, Danish seine, gill netting (below 183 m) and scallop dredging, are allowed, provided that the operator has approval from the Director of National Parks and abides by the conditions of that approval.

A section of Zeehan AMP within the Planning Area is classified as IUCN VI - Special Purpose Zone, which allows for limited mining and low-level extraction of natural resources. Permitted activities are similar to Multiple Use Zones; however, commercial fishing is not permitted.

The South-east Marine Parks are managed under the South-east Marine Parks Management Plan (DNP 2025).

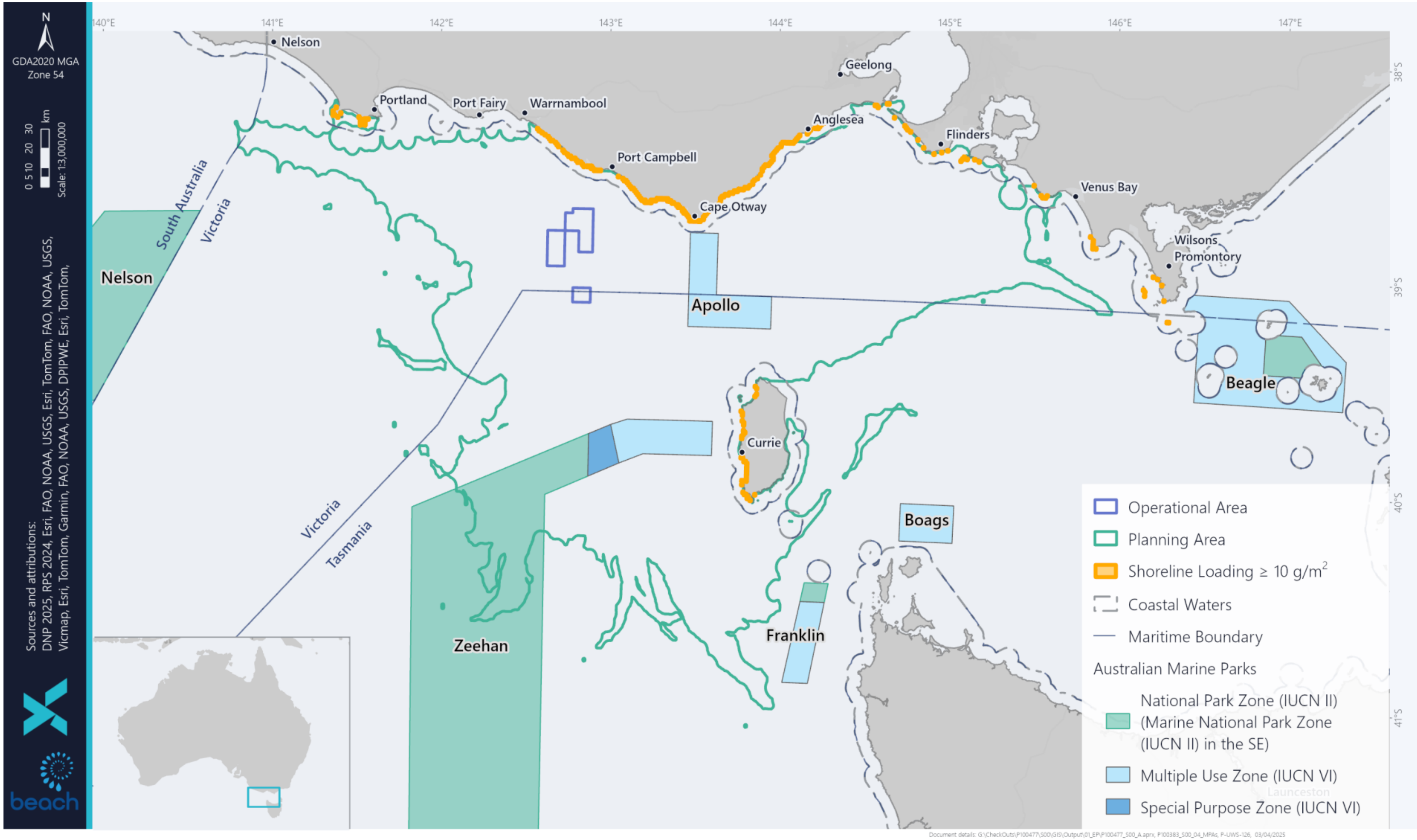


Figure 6-2: Australian Marine Parks within the Planning Area.

6.2.2.1 Apollo AMP

The Apollo AMP is located off Apollo Bay on Victoria's west coast in waters 80 m to 120 m deep on the continental shelf. The reserve covers 1,184 km^2 of Commonwealth ocean territory (DNP 2025). The AMP encompasses the continental shelf ecosystem of the major biological zone that extends from South Australia to the west of Tasmania. The area includes the Otway Depression, an undersea valley that joins the Bass Basin to the open ocean. Apollo AMP is a relatively shallow reserve with big waves and strong tidal flows; the rough seas provide habitats for fur seals and school sharks (DNP 2025).

The major conservation values of the Apollo AMP (DNP 2025) are:

- ecosystems, habitats, and communities associated with the Western Bass Strait Shelf Transition and the Bass Strait Shelf Province and associated with the seafloor features: deep/hole/valley and shelf.
- important migration area for blue, fin, sei and humpback whales.
- important foraging area for black-browed and shy albatross, Australasian gannet, short-tailed shearwater and crested tern.
- cultural and heritage site - wreck of the MV City of Rayville.

6.2.2.2 Zeehan AMP

The Zeehan AMP covers an area of 19,897 km^2 to the west and south-west of King Island in Commonwealth waters surrounding north-western Tasmania (DNP 2013). It covers a broad depth range from the shallow continental shelf depth of 50 m to the abyssal plain which is over 3,000 m deep. The AMP spans the continental shelf, continental slope and deeper water ecosystems of the major biological zone that extends from South Australia to the west of Tasmania. Four submarine canyons incise the continental slope, extending from the shelf edge to the abyssal plains. A rich community made up of large sponges and other permanently attached or fixed invertebrates is present on the continental shelf, including giant crab (*Pseudocarcinus gigas*). Concentrations of larval blue wahoo (*Seriolella brama*) and ocean perch (*Helicolenus* spp.) demonstrate the role of the area as a nursery ground.

Rocky limestone banks provide important seabed habitats for a variety of commercial fish and crustacean species including the giant crab. The area is also a foraging area for a variety of seabirds such as fairy prion, shy albatross, silver gull, and short-tailed shearwater (DNP 2025).

The major conservation values for the Zeehan AMP (DNP 2025) are:

- examples of ecosystems, habitats and communities associated with the Tasmania Province, the West Tasmania Transition and the Western Bass Strait Shelf Transition and associated with the seafloor features: abyssal plain/deep ocean floor, canyon, deep/hole/valley, knoll/abyssal hill, shelf, and slope.
- important migration area for blue and humpback whales.
- important foraging habitat for black-browed, wandering and shy albatrosses, and great-winged and cape petrels.

6.2.3 National Heritage Places

No National Heritage Places were identified within the Operational Area (Figure 6-3; Appendix F).

National Heritage Places identified within the Planning Area (Appendix H) are presented in Table 6-3 and Figure 6-3. National Heritage Places which overlap the Planning Area are described in the subsections below.

Table 6-3: National Heritage Places identified within the Operational Area and Planning Area

National Heritage Places	Class	Status	Costal Component	Operational Area	Planning Area
Great Ocean Road and Scenic Environs	Historic	Listed place	✓	-	✓
Point Nepean Defence Sites and Quarantine Station Area	Historic	Listed place	✓	-	✓
Quarantine Station and surrounds (within Point Nepean Site)	Historic	Within listed place	✓	-	✓

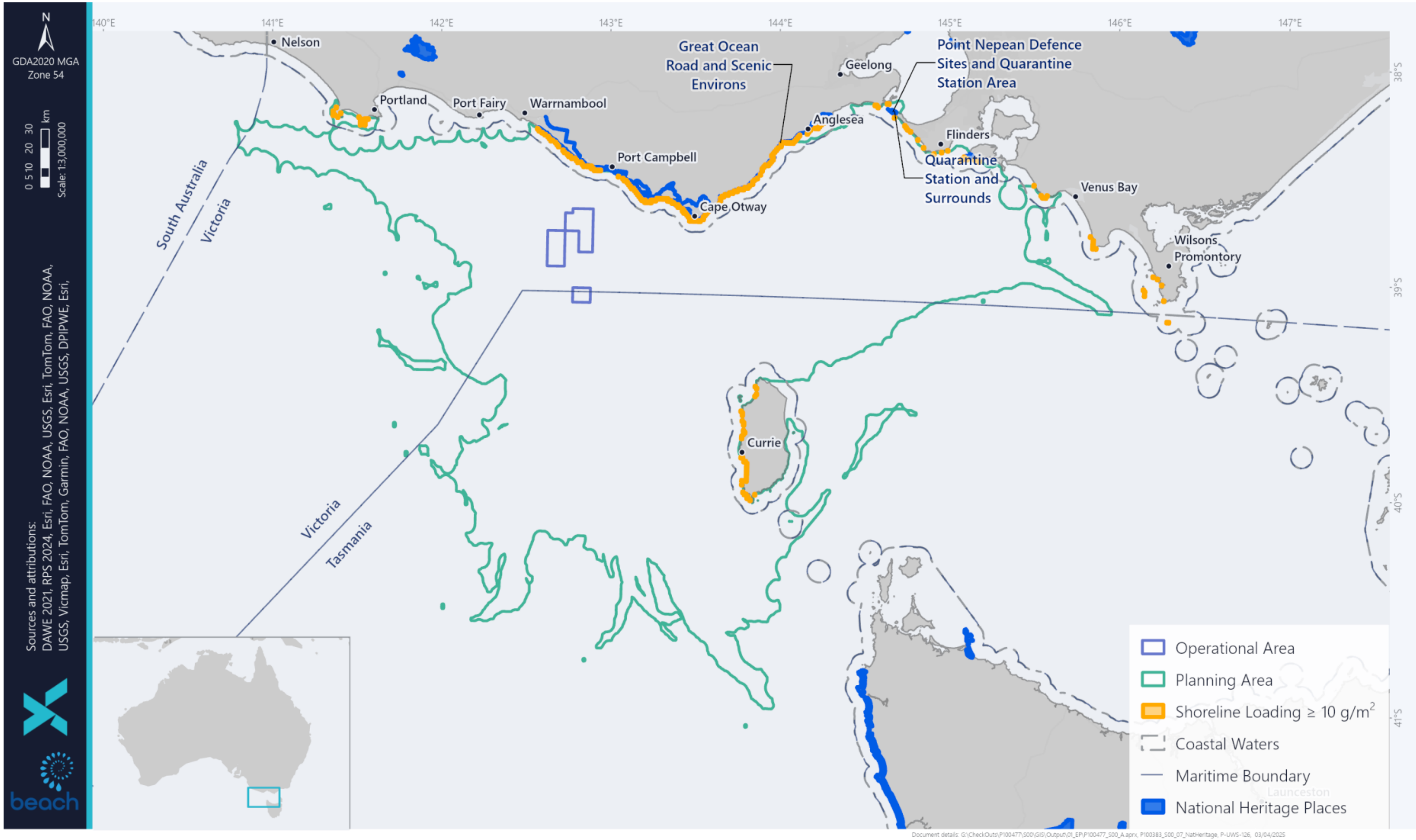


Figure 6-3: National Heritage Places within the Planning Area.

6.2.3.1 Great Ocean Road and Scenic Enviros

The Australian Heritage Council found the Great Ocean Road and its scenic environs road from Torquay to Allansford, a journey of 242 km, as a place of outstanding national heritage significance. Constructed by workers, including more than 3,000 returned servicemen, as a memorial to First World War servicemen, the Great Ocean Road is a significant reminder of the participation of Australian servicemen in the First World War, the Australian community's appreciation of their service, and the support provided for the welfare of servicemen and women upon returning to Australia.

The scenic environs include all views from the Great Ocean Road and Great Ocean Walk, including the Twelve Apostles, the Bay of Islands and Bay of Martyrs. The coastline from Lorne to Kennett River is among the world's most dramatic cliff and ocean scenery able to be viewed from a vehicle.

Along the length of the Great Ocean Road, the pullover points, and lookouts beside or nearby the road provide travellers with spectacular views of the coastline, hinterland, and Bass Strait seascape, framed only by cliffs, lighthouses and unencumbered by intrusive built structures. The place is also listed for its; outstanding rocky coastline, dinosaur fossil sites, geomorphological monitoring sites, its association with the pioneering landscape architect Edna Walling, and for the significance of Bells Beach to surfing.

6.2.3.2 Point Nepean Defence Sites and Quarantine Station Area including Quarantine Station and Surrounds

Point Nepean comprises approximately 520 ha at the western end of the Mornington Peninsula, along the southern coast of Port Phillip Bay. The coastline at Point Nepean is rocky with cliffs as well as Pleistocene and Holocene dunes. Ninety species of birds have been recorded at the site.

Point Nepean demonstrates the primary importance of coastal defence as well as Victorian and national quarantine processes. It contains the oldest surviving quarantine accommodation buildings in Australia which was established in 1852 after the discovery of gold which saw 100,000 migrants arriving to the region by sea.

The values of Point Nepean are managed under the Point Nepean National Park and Point Nepean Quarantine Station Management Plan 2009 (Parks Victoria and Point Nepean Community Trust 2009).

6.2.4 Commonwealth Heritage Places

No Commonwealth Heritage Places were identified within the Operational Area (Appendix F). One Commonwealth Heritage Place with a costal component, Swan Island and Naval Waters, was identified in the Planning Area (Appendix H) however this is due to the size of the grids used in the PMST and does not actually overlap the Planning Area.

6.2.5 Maritime Archaeological Heritage

Shipwrecks over 75 years old are protected within Commonwealth waters under the Underwater *Cultural Heritage Act 2018 (Cth*), in Victorian State waters under the *Heritage Act 1995* (Vic) and in Tasmanian waters under the *Historic Cultural Heritage Act 1995* (Tas). Some historic shipwrecks lie within protected zones of up to 800 m radius, typically when the shipwreck is considered fragile or at particular risk of interference. The primary purpose of the *Heritage Act 1995* (Vic) is to provide for the protection and conservation of the cultural heritage of the State and is administered by Heritage Victoria. In Tasmania, the Historic Heritage Section of the Parks and Wildlife Service is the government authority responsible for the management of the State's historic shipwrecks and other maritime heritage sites.

Within the Planning Area there is a 130 km stretch of coastline known as the ‘Shipwreck Coast’ because of the large number of shipwrecks present, with most wrecked during the late nineteenth century. The strong waves, rocky reefs and cliffs of the region contributed to the loss of these ships. More than 180 shipwrecks are believed to lie along the Shipwreck Coast (Parks Victoria 2015b) and well-known wrecks include Loch Ard (1878), Thistle (1837), Children (1839), John Scott (1858) and Schomberg (1855).

The wrecks represent significant archaeological, educational, and recreational (i.e. diving) opportunities for locals, students and tourists (Flagstaff Hill 2015). There are 188 documented historic wrecks in the Planning Area, one of which (S.S. Alert) has a protection zone (Figure 6-4). Only one historic shipwreck is located within 10 km of the Operational Area. The S.S. Selje, a Norwegian cargo ship, wrecked in 1929 is located 8.9 km east of the north-eastern tip of the Operational Area (Figure 6-4).

Beach commissioned a seabed site assessment for the Otway Basin Environmental Survey (Ramboll 2020). As part of the seabed site assessment a sub-bottom profiler was used to identify any buried objects. The penetration of the sub-bottom profiler was limited to a maximum of approximately 100 cm, with the average thickness of the sand patches being approximately 20-30 cm precluding burial of a shipwrecks.

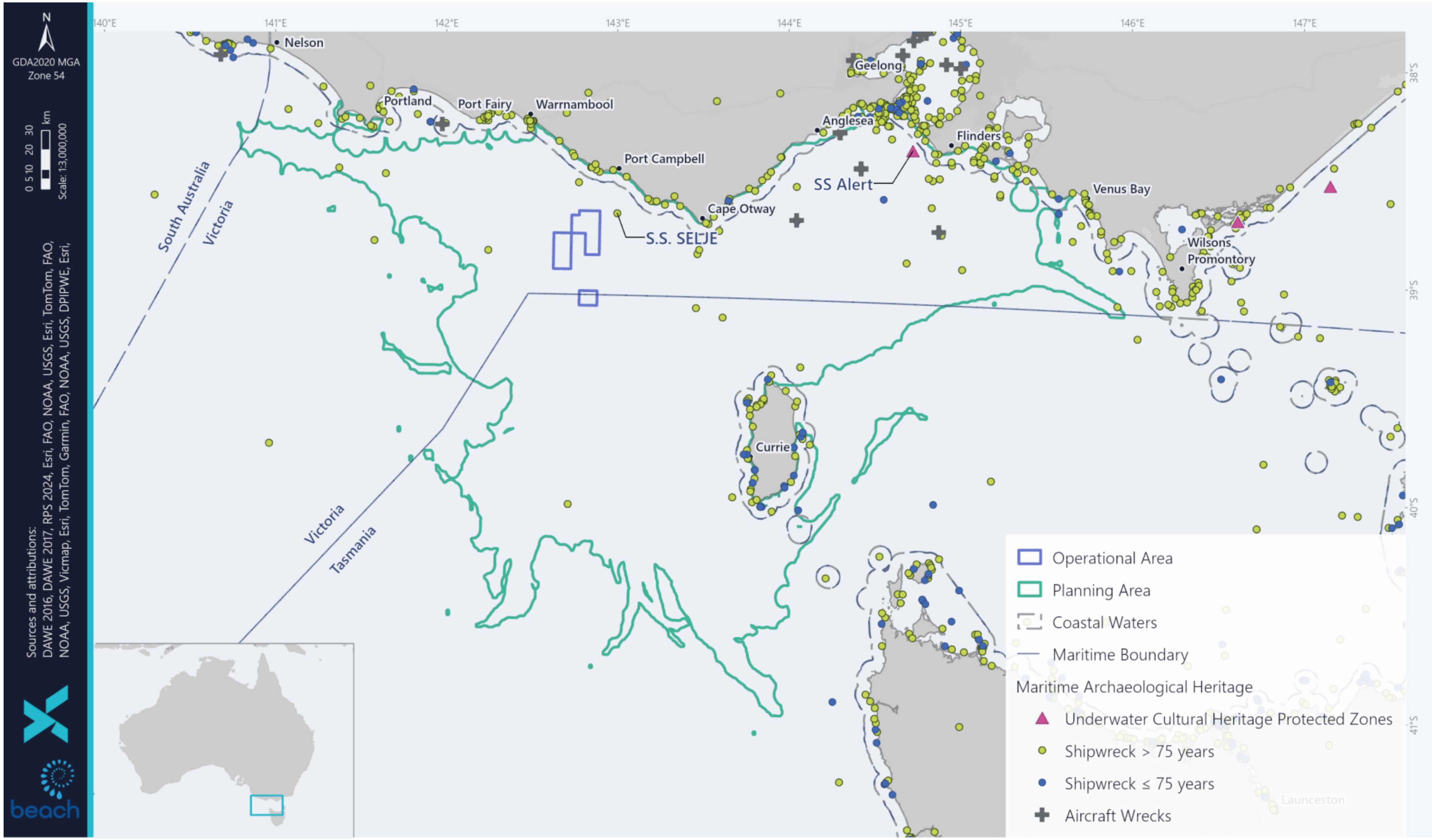


Figure 6-4: Maritime Archaeological Heritage within the Planning Area.

6.2.6 Wetlands of International Importance

No Wetlands of International Importance were identified in the Operational Area (Appendix F).

Wetlands of International Importance (Ramsar-listed wetlands) identified within the Planning Area (Appendix H) are presented in Table 6-4 and Figure 6-5. Wetlands identified in the PMST Report due to the size of the grids used in the PMST but not actually intersecting the Planning Area are listed in the table with 'X'. Wetlands of International Importance which intersect the Planning Area and have a coastal component which may be exposed to hydrocarbons from a spill event are described in the subsections below.

As defined in the OPGGS(E)R, particular relevant values and sensitivities include: the ecological character of a declared Ramsar wetland within the meaning of that Act. The ecological character and values of the overlapping Ramsar sites are described below and are from the Australian Wetlands Database (DCCEEW 2025a).

Table 6-4: Wetlands of International Importance within the Planning Area

Wetland of International Importance	Coastal Component	Operational Area	Planning Area
Glenelg Estuary and Discovery Bay Wetlands	✓	-	X
Lavinia	✓	-	✓
Port Phillip Bay (Western Shoreline) and Bellarine Peninsula	✓	-	X
Western Port	✓	-	X

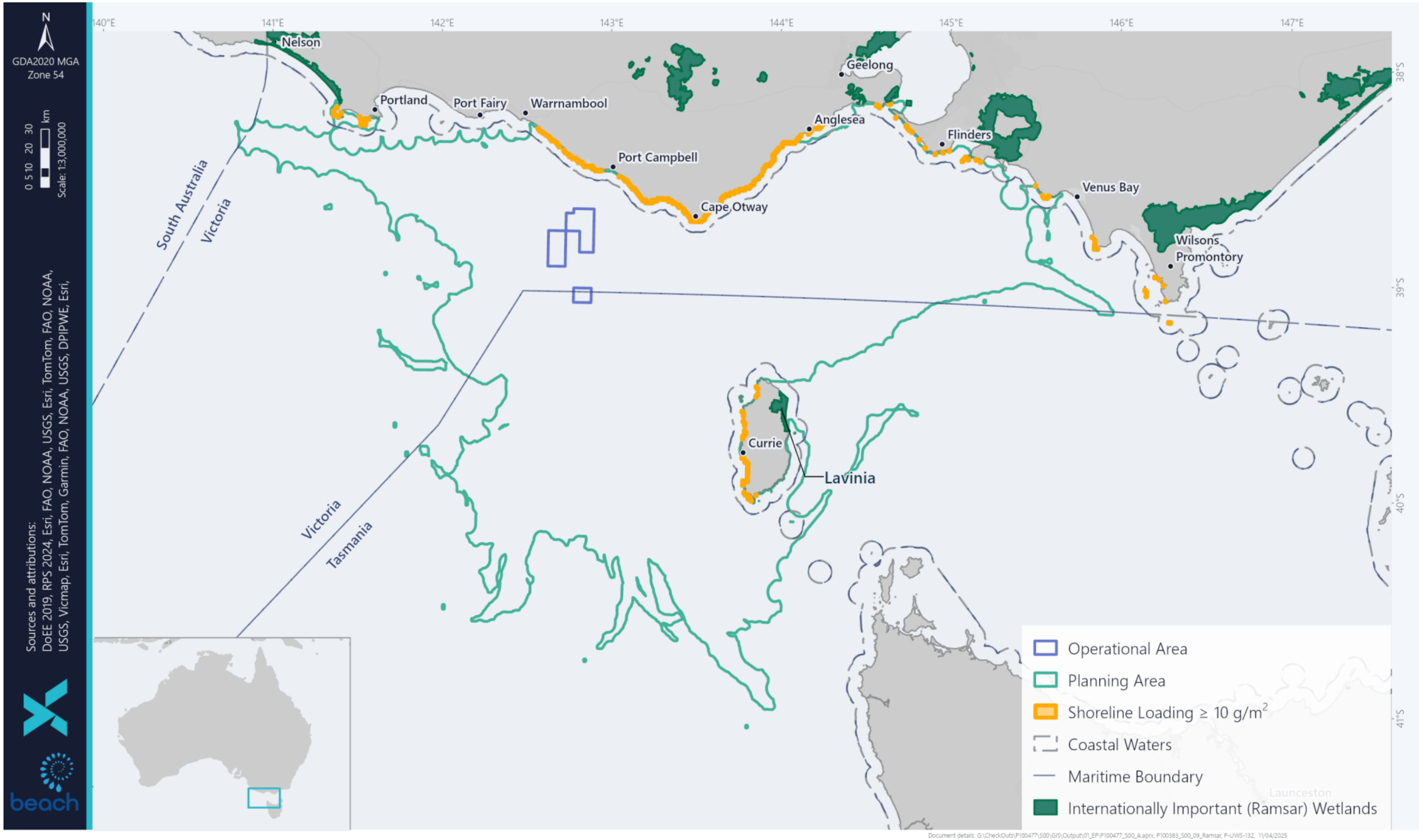


Figure 6-5: Ramsar wetland sites within the Planning Area.

6.2.6.1 Lavinia

The Lavinia Ramsar site is located on the north-east coast of King Island, Tasmania. The boundary of the site forms the Lavinia State Reserve, with major wetlands in the reserve including the Sea Elephant River estuary area, Lake Martha Lavinia, Penny's Lagoon, and the Nook Swamps. It is subject to the Lavinia Nature Reserve Management Plan (2000) (in draft).

The shifting sands of the Sea Elephant River's mouth have caused a large back-up of brackish water in the Ramsar site, creating the saltmarsh which extends up to 5 km inland. The present landscape is the result of several distinct periods of dune formation. The extensive Nook Swamps, which run roughly parallel to the coast, occupy a flat depression between the newer parallel dunes to the east of the site and the older dunes further inland. Water flows into the wetlands from the catchment through surface channels and groundwater and leaves mainly from the bar at the mouth of the Sea Elephant River and seepage through the young dune systems emerging as beach springs.

The Lavinia State Reserve is one of the few largely unaltered areas of the island and contains much of the remaining native vegetation on King Island. The vegetation communities include Succulent Saline Herbland, Coastal Grass and Herbfield, Coastal Scrub and King Island Eucalyptus globulus Woodland. The freshwater areas of the Nook Swamps are dominated by swamp forest. Nook Swamps and the surrounding wetlands contain extensive peatlands.

The site is an important refuge for a collection of regional and nationally threatened species, including the nationally endangered, orange-bellied parrot. This parrot is heavily dependent upon the samphire plant, which occurs in the saltmarsh, for food during migration. They also roost at night in the trees and scrub surrounding the Sea Elephant River estuary.

Several species of birds which use the reserve are rarely observed on the Tasmanian mainland, including the Dusky Moorhen, Nankeen Kestrel, Rufous Night Heron and the Golden-headed Cisticola.

The site is currently used for conservation and recreation, including boating, fishing, camping and off-road driving. There are artefacts of Indigenous Australian occupation on King Island that date back to the last ice age when the island was connected to Tasmania and mainland Australia via the Bassian Plain.

There are ten critical components and processes identified in the Ramsar site: wetland vegetation communities, regional and national rare plant species, regionally rare bird species, Kind Island scrubtit, orange-bellied parrot, water and sea birds, migratory birds, striped marsh frog and the green and gold frog. Elements essential to the site are the marine west coast climate, mild temperatures along with wind direction and speed. Sandy deposits dominant the site, inland sand sheets cover majority of the western area of the site (PWS 2000). Between these sand sheets and the eastern coast there is an important geoconservation feature, several sand dunes. The dunes impede drainage from inland causing extensive swamps, lakes and river reflections. Terrestrial vegetation communities are important in providing the overall structure by buffering and supporting habitat (PWS 2000). Wetland vegetation in the Ramsar site include swamp forest and forested peatlands are rare and vulnerable in the region. Along with other types the vegetation, the wetland provides support and provides habitat for rare flora and fauna highlighting the significance of the wetlands. Six wetland associated species have been recorded within the site. Rare bird and frog species are dependent on the wetland habitat along with ten migratory birds and other water and sea birds. Benefits provided by the Lavinia Ramsar site include aquaculture (oyster farming), tourism, education, and scientific value.

There has been considerable damage caused to the saltmarsh community by vehicle disturbance in the Sea Elephant Estuary and the coastal strip (PWS 2000). Vegetation clearance in parts of the catchment upstream as contributed to altered water balance due to less evapotranspiration of rainfall and build-up of the groundwater. There are threats to flora and fauna by invasive weeds and fungus. Although aquaculture plays a role in the Lavinia benefits risk from inputs of nutrients from feeding and occasional opening of the barred estuary for tidal flushing although with farm vehicles disturbance can impact the site.

6.2.7 Nationally Important Wetlands

No Nationally Important Wetlands were identified in the Operational Area (Appendix F).

Nationally Important Wetlands identified within the Planning Area (Appendix H) are presented in Table 6-5 and Figure 6-6. Wetlands identified in the PMST Report due to the size of the grids used in the PMST but not actually intersecting the Planning Area are listed in the Table with ‘X’. Nationally Important Wetlands which intersect the Planning Area and have a coastal component which may be exposed to hydrocarbons from a spill event are discussed in the subsections below. Information provided on these wetlands is from the DCCEEW Directory of Important Wetlands in Australia.

Table 6-5: Nationally Important Wetlands identified within the Planning Area

Nationally Important Wetland	State	Coastal Component	Operational Area	Planning Area
Aire River	VIC	-	-	X
Bungaree Lagoon	TAS	-	-	X
Lake Connewarre State Wildlife Reserve	VIC	✓	-	X
Lake Flannigan	TAS	-	-	X
Lavinia Nature Reserve	TAS	✓	-	X
Lower Aire River Wetlands	VIC	✓	-	X
Mud Islands	VIC	✓	-	X
Pearshape Lagoons (1-4)	TAS	-	-	X
Princetown Wetlands	VIC	✓	-	X
Swan Bay & Swan Island	VIC	✓	-	X
Western Port	VIC	✓	-	✓

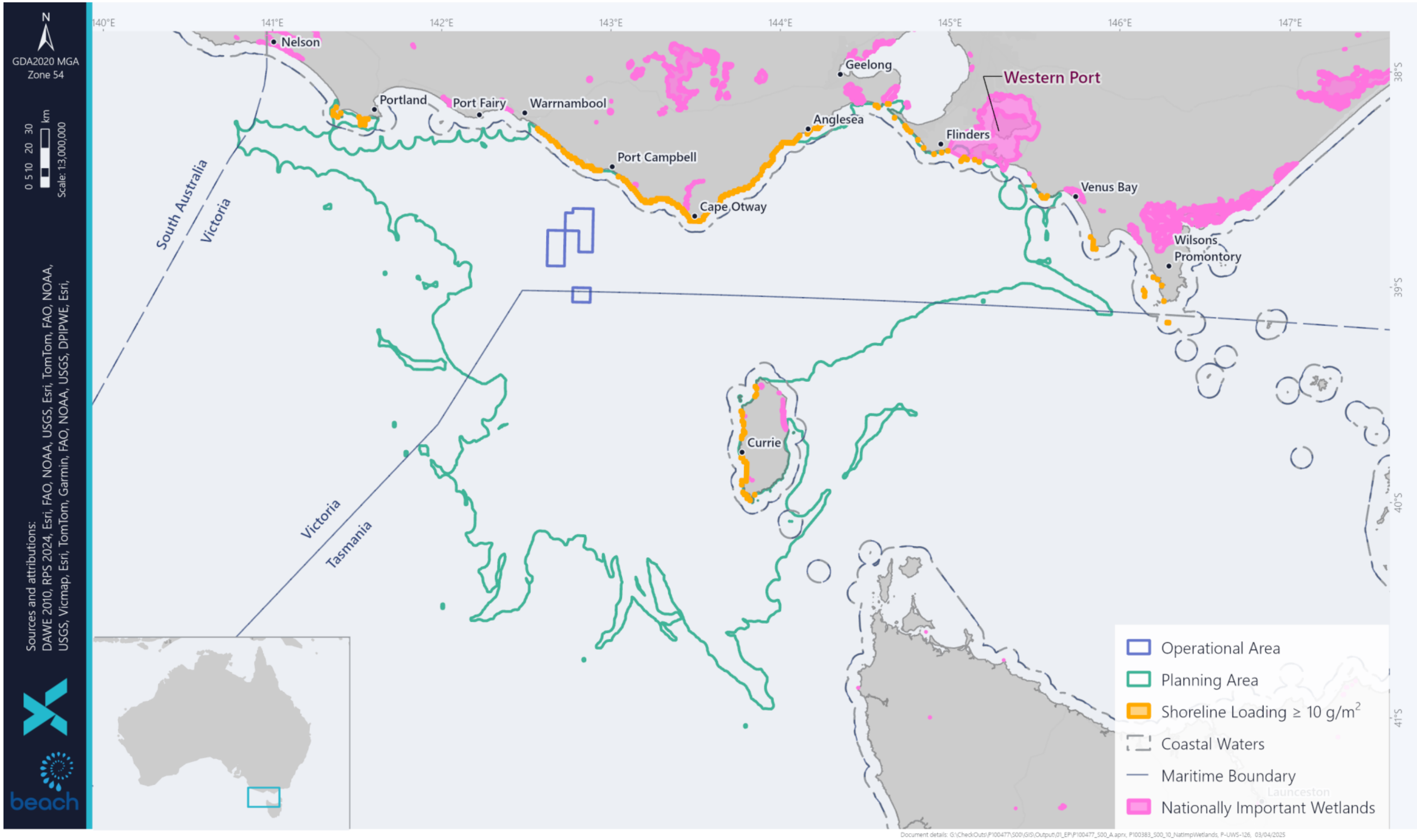


Figure 6-6: Nationally Important Wetlands within the Planning Area.

6.2.7.1 Western Port

Western Port is a large bay with extensive intertidal flats, mangroves, saltmarsh, seagrass beds, several small islands and two large islands.

Western Port is a high value wetland for its ecological, recreational, tourist, scientific, educational, cultural, and scenic features. It is a very good example of a saltmarsh-mangrove-seagrass wetland system.

Western Port is of high value for its avifauna and flora. The bays seagrass flats are nursery grounds for King George Whiting and other species of fish and many birds depend on these areas. Many sites in Western Port are of special significance as breeding, roosting, or feeding sites for waterbirds, including migratory waders.

6.2.8 Victorian Protected Areas – Marine

Victoria has a representative system of marine protected areas consisting of 13 Marine National Parks and 11 Marine Sanctuaries established under the *National Parks Act 1975 (Vic)*.

No Victorian marine protected areas were identified within the Operational Area (Appendix F).

Victorian marine protected areas identified in the Planning Area (Appendix H) are presented in Table 6-6 and Figure 6-7. Some Victorian marine protected areas are identified in the PMST Report due to the size of the grids used in the PMST but do not actually intersect the Planning Area. These are denoted in the table below with ‘X’. Victorian marine protected areas which intersect the Planning Area are described in the subsections below.

Table 6-6: Victorian Marine Protected Areas within the Planning Area

Protected Area Name	Reserve Type	Operational Area	Planning Area
Barwon Bluff	Marine Sanctuary	-	✓
Bunurong	Marine National Park	-	✓
Bunurong Marine Park	National Parks Act Schedule 4 park or reserve	-	✓
Discovery Bay	Marine National Park	-	✓
Eagle Rock	Marine Sanctuary	-	X
Marengo Reefs	Marine Sanctuary	-	✓
Mushroom Reef	Marine Sanctuary	-	✓
Point Addis	Marine National Park	-	✓
Port Phillip Heads	Marine National Park	-	✓
The Arches	Marine Sanctuary	-	✓
Twelve Apostles	Marine National Park	-	✓
Wilsons Promontory	Marine National Park	-	✓
Wilsons Promontory Marine Park	National Parks Act Schedule 4 park or reserve	-	✓

Wilsons Promontory Marine Reserve	National Parks Act Schedule 4 park or reserve	-	X

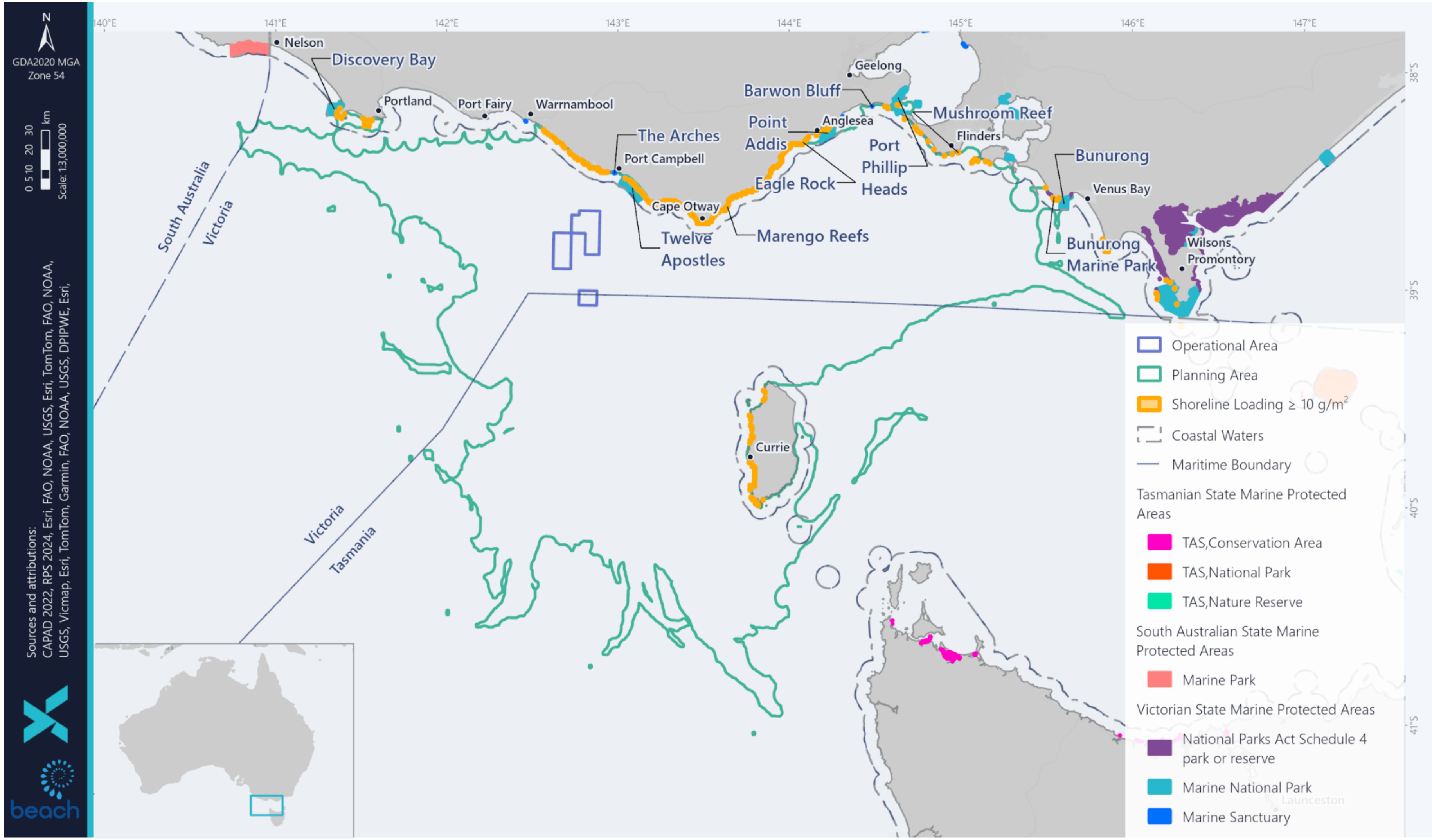


Figure 6-7: State Marine Protected Areas within Planning Area.

6.2.8.1 Barwon Bluff Marine Sanctuary

Barwon Bluff Marine Sanctuary is managed through the Barwon Bluff Marine Sanctuary Management Plan (Parks Victoria 2007a). The marine sanctuary protects 17 ha of reef and marine environment near the mouth of the Barwon River. The management plan identifies the key values of the sanctuary as:

- Intertidal reef platforms with a high diversity of invertebrate fauna and flora.
- Subtidal reefs that support diverse and abundant flora, including kelps, other brown algae, and green and red algae.
- Calcarenite and basalt reefs extending from The Bluff that are of regional geological significance.
- Intertidal habitats that support resident and migratory shorebirds, including threatened species.
- Subtidal habitats that support sedentary fish and are also used by migratory fish and marine mammals.
- Marine habitats and species that are of scientific interest and valuable for marine education.
- An important landmark and area for gathering fish and shellfish for the Wathaurong people.
- A strong historic and ongoing connection with marine education.
- Remnants from the Earl of Charlemont, a heritage-listed shipwreck.

6.2.8.2 Bunurong Marine National Park

The Bunurong Marine National Park is classified as IUCN II (National Parks) and the Bunurong Marine Park as IUCN IV (Habitat/species management area).

The Bunurong Marine National Park and Bunurong Marine Park are managed through the Bunurong Marine National Park Management Plan (Parks Victoria 2006a). The Plan identifies the key values of the Parks as:

- Extensive intertidal rock platforms and subtidal rocky reefs with a geology and form that is uncommon along the Victorian coast.
- Abundant and diverse marine flora and fauna including over 22 species of marine flora and fauna recorded, or presumed to be, at their eastern or western distributional limits (Plummer et al. 2003).
- Highest diversity of intertidal and shallow subtidal invertebrate fauna recorded in Victoria on sandstone (ECC 2000).
- High proportion of the common invertebrates occurring along the Victorian coast.
- High diversity of vegetation communities, many of which are considered rare, depleted or endangered within the region (WGCMA 2003; Carr 2003).
- Important coastal habitat for several threatened species.

- Spectacular coastal scenery, featuring rugged sandstone cliffs, rocky headlands, intertidal rock platforms and sandy cove.
- Eagles Nest, a prominent rock stack, recognised as a site of national geological and geomorphological significance (Buckley 1993).
- One of the richest Mesozoic fossil areas in Victoria.
- Landscape and seascape of cultural significance to Indigenous people.
- Numerous places and objects of significance to Indigenous people.
- European history rich in diversity, including sites associated with shipping, coal mining, holidaying and living on the coast.
- Two historical shipwrecks listed on the Victorian Heritage Register (Heritage Victoria 2004).
- Opportunities for cultural values investigation in an area protected from human disturbance.
- Extensive subtidal reefs with magnificent underwater seascapes, offering numerous opportunities for diving and snorkelling.
- Highly accessible intertidal rock platforms offering opportunities for rock-pooling, marine education, and interpretation.
- Spectacular coastal drive, with numerous lookouts and panoramic views of the coast and surrounding waters.
- Coastline offering opportunities for swimming, surfing, boating, fishing, and rock-pooling in a natural setting.

6.2.8.3 Discovery Bay Marine National Park

Discovery Bay Marine National Park protects 2,770 ha within the Southern Ocean and experiences some of the highest wave energy environments in Victoria. It is managed under the Ngootyoong Gunditj Ngootyoong Mara South West Management Plan (Parks Victoria 2015a). It is part of Koonang Mirring (Sea Country) with the coast of Discovery Bay filled with Aboriginal artefacts that are evidence of earlier ages of plenty and integral to the cultural heritage of the Gunditjmara people.

The Bonney Coast, which extends from Robe in South Australia to Discovery Bay, is a productive area because of a nutrient rich cold water upwelling, known as the Bonney Upwelling, which provides a nutrient-rich environment for fish, whales, seals, penguins, and invertebrates (Parks Victoria 2015a).

Conservation Action Planning for marine protected areas across Victoria identified two key focal ecosystems in the park (Parks Victoria 2015a):

- Subtidal Reefs with six key natural assets – Brown macroalgae dominated beds, large mobile fish including sharks and rays, motile macroinvertebrates, Giant Kelp Forest communities, sessile invertebrate dominated communities such as thick growths of sponges, ascidians, bryozoans and gorgonians, and mixed red algae sessile invertebrate dominated communities.

- Water Column with key assets including planktonic and other species, baleen whales and seabirds.

6.2.8.4 Marengo Reefs Marine Sanctuary

The Marengo Reefs Marine Sanctuary (12 ha) is in Victorian State waters near Marengo and Apollo Bay, which are on the Great Ocean Road, approximately 220 km south-west of Melbourne. The sanctuary protects two small reefs and a wide variety of microhabitats. Protected conditions on the leeward side of the reefs are unusual on this high wave energy coastline and allow for dense growths of bull kelps and other seaweed. There is an abundance of soft corals, sponges, and other marine invertebrates, and over 56 species of fish have been recorded in and around the sanctuary. Seals rest on the outer island of the reef and there are two shipwrecks (the Grange and Woolamai) in the sanctuary (Parks Victoria 2007b).

The Marengo Reefs Marine Sanctuary Management Plan (Parks Victoria 2007b) identifies the environmental, cultural, and social values as:

- Subtidal soft sediments, subtidal rocky reefs, and intertidal reefs.
- High diversity of algal, invertebrate and fish species.
- Australian Fur-seal haul out area.
- Evidence of a long history of Indigenous use, including many Indigenous places and objects nearby.
- Wrecks of coastal and international trade vessels in the vicinity of the sanctuary.
- Spectacular underwater scenery for snorkelling and scuba diving.
- Intertidal areas for exploring rock pools.
- Opportunities for a range of aquatic recreational activities including seal watching.

6.2.8.5 Mushroom Reef Marine Sanctuary

Mushroom Reef Marine Sanctuary covers 80 ha along the southern Mornington Peninsula and protects a system of ancient basalt platforms and reefs. The sanctuary is adjacent to Mornington Peninsula National Park, extending from the high-water mark to approximately 1 km offshore. The Mushroom Reef Marine Sanctuary Management Plan (Parks Victoria 2007c) identifies the following important natural values:

- Among the most diverse intertidal and rocky reef communities in Victoria.
- Numerous subtidal pools and boulders in the intertidal area that provide a high complexity of intertidal basalt substrates and a rich variety of microhabitats.
- Subtidal reefs that support diverse and abundant flora including kelps, other brown algae, and green and red algae.
- Sandy bottom habitats that support large beds of *Amphibolis* seagrass and patches of green algae.

- Diverse habitats that support sedentary and migratory fish species.
- A range of reef habitats that support invertebrates including gorgonian fans, seastars, anemones, ascidians, barnacles and soft corals.
- A distinctive basalt causeway that provides habitat for numerous crab, seastar and gastropod species.
- Intertidal habitat that support resident and migratory shorebird species including threatened species.

The Burinyung-Bulluk, one of the six clans that made up the Boonwurrung people, inhabited the coastal area from Point Nepean to Hastings, which incorporates the sanctuary area. The reefs and waters of this coast provided excellent sites for gathering shellfish and hunting fish and seals and were among the most important sources of food for Boonwurrung people (Parks Victoria 2007c).

6.2.8.6 Point Addis Marine National Park

Point Addis Marine National Park lies east of Anglesea and covers 4,600 ha. This park protects representative samples of subtidal soft sediments, subtidal rocky reef, rhodolith beds and intertidal rocky reef habitats. The park also provides habitat for a range of invertebrates, fish, algae, birds and wildlife. The world-famous surfing destination of Bells Beach is within Point Addis Marine National Park.

It is managed under the Management Plan for Point Addis Marine National Park, Point Danger Marine Sanctuary and Eagle Rock Marine Sanctuary (Parks Victoria 2005a) and is classified as IUCN II. The plan identifies the following environmental, cultural, and social values for the parks and sanctuaries:

- Sandy beaches, subtidal soft sediments, subtidal rocky reefs, rhodolith beds and intertidal reefs.
- High diversity of algal, invertebrate and fish species.
- High diversity of sea slugs (opisthobranchs) and other invertebrate communities within Point Danger Marine Sanctuary.
- Evidence of a long history of Indigenous use, including many Indigenous places and objects adjacent to the park and sanctuaries near dunes, headlands, estuaries, and creeks.
- Surf breaks, including those at Bells Beach, which are culturally important to many people associated with surfing.
- Coastal seascapes of significance for many who live in the area or visit.
- Recreational and tourism values.
- Spectacular underwater scenery for snorkelling and scuba diving.
- Intertidal areas for exploring rock pools.
- Opportunities for a range of recreational activities.

- Spectacular seascape complementing well-known visitor experiences on the Great Ocean Road.

6.2.8.7 Port Phillip Heads Marine National Park

Port Phillip Heads Marine National Park protects 3,850 ha across six sections including Swan Bay, Mud Islands, Point Lonsdale, Point Nepean, Popes Eye and Portsea Hole. The Port Phillip Heads Marine National Park is managed under the Port Phillip Heads Marine National Park Management Plan (Parks Victoria 2006b). The plan identifies the key values of the park as:

- Incised entrance to Bay (the Rip) and the 'Heads' at Point Nepean and Point Lonsdale.
- Spectacular dive sites such as the Lonsdale and Nepean Walls and popular recreational dive locations.
- Intertidal rock platforms at Cheviot Beach and Point Lonsdale the coastal landscape of Point Nepean in Point Nepean National Park.
- Bottlenose dolphin populations sites listed under the Ramsar Convention for their importance for migratory wading birds (Swan Bay, Mud Islands).
- Distinctive bird-dominated island ecosystem of Mud Islands.
- Sheltered environments such as the seagrass meadows of Swan Bay.

Indigenous tradition indicates that the Mornington Peninsula side of the park, including Mud Islands is part of Country of the Boonwurrung and that the Bellarine Peninsula side of the park is part of Country of the Wathaurong (Parks Victoria 2006b).

6.2.8.8 The Arches Marine Sanctuary

The Arches Marine Sanctuary protects 45 ha of ocean directly south of Port Campbell. It is managed in conjunction with the Twelve Apostles Marine Park under the Management Plan for Twelve Apostles Marine National Park and The Arches Marine Sanctuary (Parks Victoria 2006c).

It has a spectacular dive site of limestone formations, rocky arches, and canyons. The sanctuary is also ecologically significant, supporting habitats such as kelp forests and a diverse range of sessile invertebrates on the arches and canyons. These habitats support schools of reef fish, seals, and a range of invertebrates such as lobster, abalone, and sea urchins.

It is also important to indigenous culture based on spiritual connection to Sea Country.

6.2.8.9 Twelve Apostles Marine National Park

The Twelve Apostles Marine National Park (75 km^2) is located 7 km east of Port Campbell and covers 16 km of coastline from east of Broken Head to Pebble Point and extends offshore to 5.5 km (Plummer et al. 2003).

The area is representative of the Otway Bioregion and is characterised by a submarine network of towering canyons, caves, arches, and walls with a large variety of seaweed and sponge gardens plus resident schools of reef fish. The park contains areas of calcarenite reef supporting the highest diversity of intertidal and sub-tidal invertebrates found on that rock type in Victoria (DSE 2012).

The park includes large sandy sub-tidal areas consisting of predominantly fine sand with some medium to coarse sand and shell fragment (Plummer et al. 2003). Benthic sampling undertaken within the park in soft sediment habitats at 10 m, 20 m and 40 m water depths identified 31, 29 and 32 species respectively based upon a sample area of 0.1m2. These species were predominantly polychaetes, crustaceans, and nematodes with the mean number of individuals decreasing with water depth (Heisler and Parry 2007). No visible macroalgae species were present within these soft sediment areas (Plummer et al. 2003; Holmes et al. 2007). These sandy expanses support high abundances of smaller animals such as worms, small molluscs, and crustaceans; larger animals are less common.

The Twelve Apostles Marine Park is managed in conjunction with the Arches Marine Sanctuary under the Management Plan for Twelve Apostles Marine National Park and The Arches Marine Sanctuary (Parks Victoria 2006c) and is classified as IUCN II. The Plan describes the key environmental, cultural, and social values as:

- Unique limestone rock formations, including the Twelve Apostles.
- Range of marine habitats representative of the Otway marine bioregion.
- Indigenous culture based on spiritual connection to Sea Country and a history of marine resource use.
- Wreck of the Loch Ard (shipwreck).
- Underwater limestone formations of arches and canyons.
- Diverse range of encrusting invertebrates.
- Spectacular dive site.

6.2.8.10 Wilsons Promontory Marine National Park

The Wilsons Promontory Marine National Park protects 15,500 ha and is located approximately 220 km southeast of Melbourne on Victoria’s southernmost tip (Parks Victoria 2006d). Adjacent to Wilsons Promontory Marine National Park are the marine park (overlapped by the Planning Area) and marine reserve (not overlapped by the Planning Area).

Wilsons Promontory Marine National Park is located in the Flinders marine bioregion, as identified by the Interim Marine and Coastal Regionalisation for Australia (IMCRA). The Flinders marine bioregion extends across Bass Strait and is characterised by cool wet winters and warm summers, predominately granite and unconsolidated clastic sediments with rocky headlands and promontories interspersed by long sandy beaches, highly variable wave exposure, and high fish and plant species richness (Parks Victoria 2006a).

The Wilsons Promontory Marine National Park is managed under the Wilsons Promontory Marine National Park Management Plan (Parks Victoria 2006d). The plan identifies the key values of the park as:

- Biological communities with distinct biogeographic patterns, including shallow subtidal reefs, deep subtidal reefs, intertidal rocky shores, sandy beaches, seagrass and subtidal soft substrates.

- Important habitat for several threatened shorebird species, including species listed under international migratory bird agreements.
- Important breeding sites for a significant colony of Australian fur seals
- Indigenous cultural lore and interest maintained by the Gunai / Kurnai and Boonwurrung people. Also is part of a past land link to Tasmania occupied and used by Indigenous people.
- Magnificent underwater seascapes for diving and snorkelling.

6.2.9 Victorian Protected Areas – Terrestrial

No Victorian terrestrial protected areas were identified within the Operational Area (Appendix F).

Victorian terrestrial protected areas identified in the Planning Area (Appendix H) are presented in Table 6-7 and Figure 6-8. Some Victorian terrestrial protected areas were identified in the PMST Report due to the size of the grids used in the PMST but do not actually intersect the Planning Area. These are denoted in Table 6-7 with 'X'. Victorian terrestrial protected areas which intersect the Planning Area and have a coastal component which may be exposed to hydrocarbons from a spill event are discussed in the subsections below where information is available.

Table 6-7: Victorian Terrestrial Protected Areas within the Planning Area

Protected Area Name	Reserve Type	Coastal Component	Operational Area	Planning Area
Aire River	Heritage River	✓	-	✓
Aire River W.R.	Natural Features Reserve	✓	-	X
Aireys Inlet B.R.	Natural Features Reserve	-	-	X
Anglesea B.R	Natural Features Reserve	-	-	X
Anser Island	Reference Area	-	-	X
Barham Paradise S.R.	Natural Features Reserve	-	-	X
Bay of Islands Coastal Park	Conservation Park	✓	-	✓
Breamlea F.F.R.	Nature Conservation Reserve	✓	-	X
Cape Liptrap	Coastal Park	✓	-	✓
Cape Nelson	State Park	✓	-	✓
Cape Patterson N.C.R	Natural Features Reserve	-	-	X
Discovery Bay Coastal Park	Conservation Park	✓	-	✓
Edna Bowman N.C.R	Natural Features Reserve	-	-	X
Great Otway	National Park	✓	-	✓
Johanna Falls S.R	Natural Features Reserve	-	-	X
Lake Connewarre W.R	Natural Features Reserve	✓	-	✓
Lake Gillear W.R	Natural Features Reserve	-	-	X
Latrobe B.R.	Natural Features Reserve	-	-	X
Lily Pond B.R.	Natural Features Reserve	✓	-	✓

Marengo N.C.R.	Nature Conservation Reserve	-	-	✓
Mornington Peninsula	National Park	✓	-	✓
Painkalac Creek	Reference Area	-	-	X
Phillip Island Nature Park	Other	✓	-	✓
Point Nepean	National Park	✓	-	X
Port Campbell	National Park	✓	-	✓
Portland B.R.	Natural Features Reserve	-	-	X
Princetown W.R	Natural Features Reserve	-	-	X
Southern Wilsons Promontory	Remote and Natural Area - Schedule 6, National Parks Act	✓	-	✓
Stony Creek (Otways)	Reference Area	✓	-	X
Unnamed P0176	Private Nature Reserve	-	-	X
Wild Dog B.R.	Natural Features Reserve	-	-	X
Wild Dog Creek SS.R.	Natural Features Reserve	-	-	X
Wilsons Promontory	National Park	✓	-	✓
Wilsons Promontory Islands	Remote and Natural Area	✓	-	✓
Wonthaggi Heathlands N.C.R.	Natural Features Reserve	-	-	X

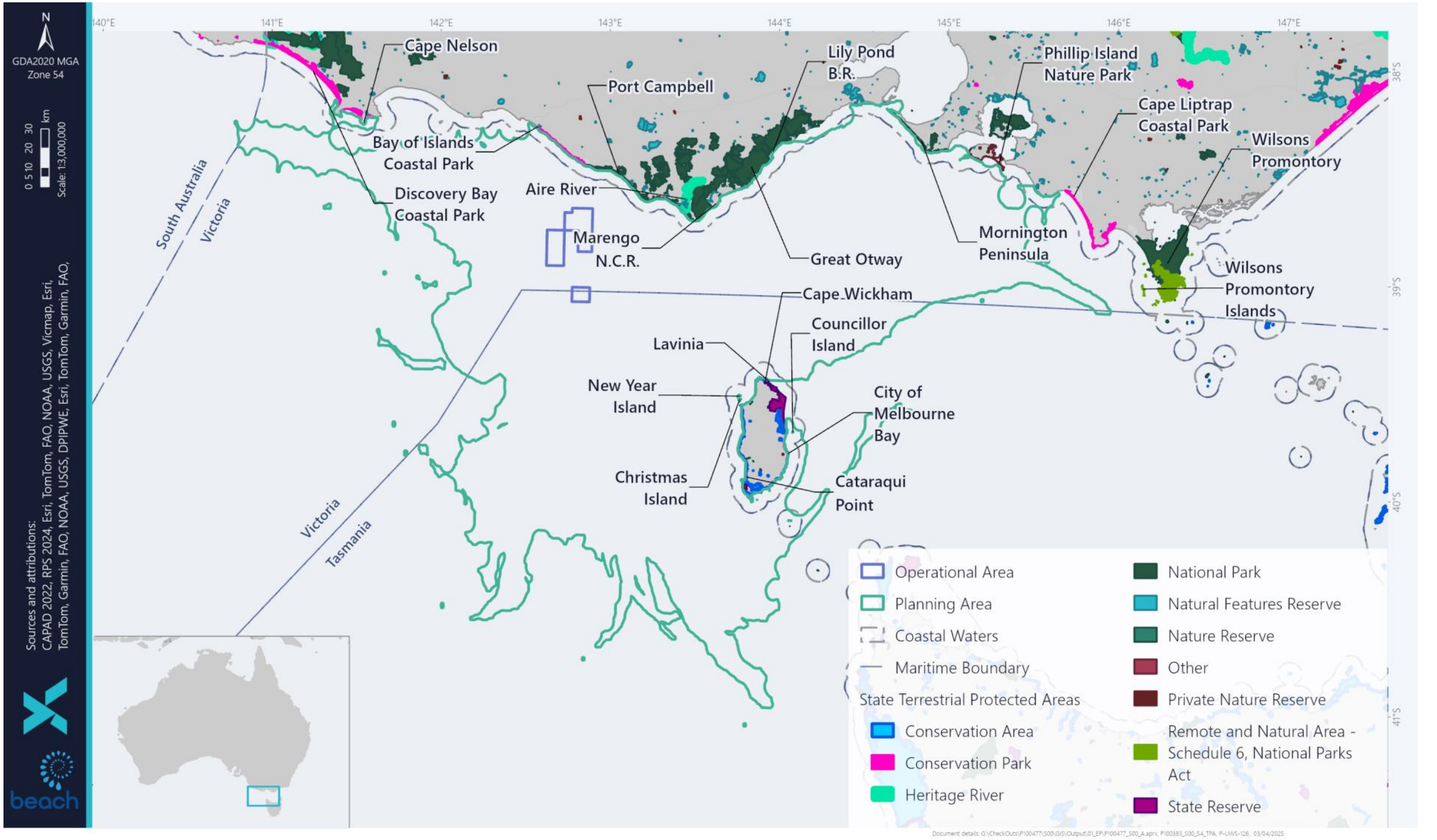


Figure 6-8: State Terrestrial Protected Areas with the Planning Area

6.2.9.1 Aire River Heritage River

The Aire River is a perennial river of the Corangamite catchment, located in the Otway region. The river generally flows west by south then south through the Great Otway National Park, joined by three minor tributaries, before reaching its mouth and emptying into Bass Strait west of Cape Otway. It is a popular fishing and camping area.

6.2.9.2 Bay of Islands Conservation Park

This coastal park has outstanding ocean views and geological features and covers an extensive area of the coastline (approximately 32 km in length and 950 ha), stretching east from Warrnambool to Peterborough. Sheer cliffs and rock stacks dominate the bays, and the heathlands contain wildflowers. Beaches are accessible at some points (Parks Victoria 1998a).

This park protects the terrestrial environment above the low water mark of this coastline. This Coastal Park is protected under the Port Campbell National Park and Bay of Islands Coastal Park Management Plan (Parks Victoria 1998a).

6.2.9.3 Cape Nelson State Park

Cape Nelson State Park comprises 210 ha and is located near Portland, 377 km south-west of Melbourne. The park is a popular destination for hikers as it is positioned along the Great South West Walk as well as several other popular day walks. The park is managed under the Ngootyoong Gunditj Ngootyoong Mara South West Management Plan (DELWP 2015). Cape Nelson contains rocky platforms which provide habitat for the Australian fur-seal and New Zealand fur-seal.

6.2.9.4 Discovery Bay Coastal Park

Discovery Bay Coastal Park comprises 10,460 ha and extends along the coast of Discovery Bay from Cape Nelson north-westwards for 50 km to the border with South Australia. The park is managed under the Ngootyoong Gunditj Ngootyoong Mara South West Management Plan (DELWP 2015). The Cape Bridgewater fur seal colony is located within the park.

6.2.9.5 Great Otway National Park

The Great Otway National Park (103,185 ha) is located near Cape Otway and stretches from the low water mark inland on an intermittent basis from Princetown to Apollo Bay (approximately 100 km).

Landscapes within the park are characterised by tall forests and hilly terrain extending to the sea with cliffs, steep and rocky coasts, coastal terraces, landslips, dunes and bluffs, beaches, and river mouths. There is a concentration of archaeological sites along the coast, coastal rivers, and reefs. The park contains many sites of international and national geological and geomorphological significance including Dinosaur Cove (internationally significant dinosaur fossil site), Lion Headland and Moonlight Head to Milanesia Beach (internationally significant coastal geology and fossils).

The park provides habitats for the conservation of the rufous bristlebird, hooded plover, white-bellied sea eagle, fairy tern, caspian tern and Lewin's rail and native fish such as the Australian grayling.

The park contains significant Aboriginal cultural sites adjacent to rivers, streams and the coastline including over 100 registered archaeological sites, particularly shell middens along the coast, as well as non-physical aspects such as massacre sites, song lines, family links and stories. The park also contains four sites listed on the Victorian Heritage Register including the Cape Otway Light Station and several shipwreck features along the coast (i.e. anchors) (Parks Victoria and DSE 2009).

This park protects the terrestrial environment above the low water mark of this coastline. The Park is protected under the Great Otway National Park and Otway Forest Park Management Plan (Parks Victoria and DSE 2009) and relevant values are:

- a large area of essentially unmodified coastline, linking the land to marine ecosystems and marine national parks.
- a diverse range of lifestyle and recreation opportunities for communities adjacent to the parks – for local permanent residents and holiday homeowners Regionally, nationally, and internationally.
- significant tourist attractions, close to access routes and accommodation, such as spectacular coastal scenery along the Great Ocean Road, access to beautiful beaches, clifftop lookouts, picnic areas, historic sites, waterfalls and walking tracks such as the Great Ocean Walk.
- the basis for continued growth of nature-based tourism associated with the parks and the region, providing economic opportunities for accommodation providers, food and services providers, and recreation, tourism, and education operators.

6.2.9.6 Lake Connewarre Wilderness Reserve

Lake Connewarre Wilderness Reserve is within the Port Phillip Bay (Western Shoreline) and Bellarine Peninsula Ramsar site.

6.2.9.7 Mornington Peninsula National Park

Mornington Peninsula National Park protects 2,686 ha of land along the coast approximately 70 km south of Melbourne, often described as 'Melbourne's Playground' due to its popularity for recreation. Mornington Peninsula National Park is the most visited park in Victoria.

The park is managed under the Mornington Peninsula National Park and Arthurs Seat State Park Management Plan (Parks Victoria 1998b) which identifies the following natural values:

- largest and most significant remaining areas of native vegetation on the Mornington Peninsula.
- numerous sites and features of geomorphic significance, particularly along the coast (cliffed calcarenite coast, sandy forelands and basalt shore platforms).
- only representation in the Victorian conservation reserve system of four particular land systems formed within the Southern Victorian Coastal Plains and the Southern Victorian Uplands.
- many significant native plants and vegetation communities.
- highly scenic landscape values along the ocean coast and at Port Phillip heads and prominent feature of Arthurs Seat.
- many significant fauna species, including populations of the nationally significant Hooded Plover, over 30 species of State significance and many species of regional significance.

- high quality marine and intertidal habitats, with some pristine areas within Point Nepean.

6.2.9.8 Phillip Island Nature Park

Phillip Island is east of Melbourne and forms a natural breakwater for the shallow waters of Western Port. Phillip Island is a BIA for the little penguin, with breeding and foraging sites present. There is no management plan for Phillip Island Nature Park.

6.2.9.9 Point Nepean National Park

Point Nepean National Park protects 560 ha of land at the tip of Mornington Peninsula, surrounded by Port Phillip Heads Marine National Park (see Section 6.2.8.7). The park is of great cultural significance as a sacred place to Traditional Owners for over 35,000 years, a landmark and natural resource to European settlers, as well as a line of defence for Victoria and Australia (Parks Victoria 2017). Restricted access has allowed the park to maintain the largest and most intact area of remnant coastal vegetation on the Port Phillip coast and Victoria's largest remnant area of coastal alkaline scrub. Intertidal rock platforms support a diverse marine ecosystem while dune habitats provide roosting and feeding opportunities for resident and migratory seabirds.

6.2.9.10 Port Campbell National Park

Port Campbell National Park is slightly west of Twelve Apostles Marine National Park and 10 km east of Warrnambool. The park is 1,750 ha that presents an extraordinary collection of wave-sculptured rock formations. Port Campbell National Park is home to various fauna such as the little penguin, short-tailed shearwater and various whale species (Parks Victoria 2019).

6.2.10 Tasmanian Protected Areas – Marine

No Tasmanian marine protected areas were identified within the Operational or Planning Area (Appendix F; Appendix H).

6.2.11 Tasmanian Protected Areas – Terrestrial

No Tasmanian terrestrial protected areas were identified within the Operational Area (Appendix F).

Tasmanian terrestrial protected areas identified in the Planning Area (Appendix H) are presented in Table 6-8 and Figure 6-8. Areas identified in the PMST Report due to the size of the grids used in the PMST but not actually intersecting the Planning Area are listed in the table with 'X'. Tasmanian terrestrial protected areas which intersect the Planning Area and have a coastal component which may be exposed to hydrocarbons from a spill event are described in the subsections below, where information is available.

Table 6-8: Tasmanian Terrestrial Protected Areas Identified within the Planning Area

Protected Area Name	Reserve Type	Coastal Component	Operational Area	Planning Area
Badger Box Creek	Nature Reserve	-	-	X
Cape Wickham	Conservation Area	✓	-	✓
Cataraqui Point	Conservation Area	✓	-	✓
Christmas Island	Nature Reserve	✓	-	✓

City of Melbourne Bay	Conservation Area	✓	-	✓
Colliers Forest Reserve	Conservation Covenant	-	-	X
Colliers Swamp	Conservation Area	-	-	X
Councillor Island	Nature Reserve	✓	-	✓
Counsel Hill	Conservation Area	-	-	X
Currie Lightkeepers Residence	Historic Site	-	-	X
Disappointment Bay	State Reserve	✓	-	X
Eldorado	Conservation Area	-	-	X
Lavinia	State Reserve	✓	-	✓
Muddy Lagoon	Nature Reserve	-	-	X
New Year Island	Game Reserve	✓	-	✓
Porky Beach	Conservation Area	✓	-	✓
Red Hut Point	Conservation Area	✓	-	✓
Red Hut Road #1	Conservation Covenant	-	-	X
Red Hut Road #2	Conservation Covenant	-	-	X
Reid Rocks	Nature Reserve	✓	-	✓
Rodondo Island	Nature Reserve	✓	-	✓
Sea Elephant	Conservation Area	✓	-	✓
Sea Elephant River	Conservation Covenant	-	-	X
Seal Rocks	Conservation Area	-	-	X
Port Campbell	State Reserve	✓	-	X
South Rd Nugara	Conservation Covenant	-	-	X
Stokes Point	Conservation Area	✓	-	✓

6.2.11.1 Cape Wickham Conservation Area

The Cape Wickham Conservation Area on the northern tip of King Island and contains Cape Wickham lighthouse and the gravesites of the crew of Loch Leven, a ship that was wrecked nearby. It is designated as IUCN Category V which is a protected landscape/seascape. There is no management plan for the Cape Wickham Conservation Area.

6.2.11.2 Cataraqui Point Conservation Area

Cataraqui Point Conservation Area is located on the west coast of King Island covering an area of 3.05 km^2 and extending from the coast to 100-200 m inland. The conservation area is designated as IUCN Category V and there is no management plan in place.

6.2.11.3 Christmas Island Nature Reserve

Christmas Island Nature Reserve covers 84.24 ha surrounding the granite island to the north-west of King Island. The reserve is part of the King Island Important Bird Area recognised by BirdLife Australia (Birdlife International 2025) and provides important habitat for the orange-bellied parrot during its migration as well as significant numbers of short-tailed shearwater, black-faced cormorant, fairy tern, hooded plover and pacific gull.

6.2.11.4 City of Melbourne Bay Conservation Area

City of Melbourne Bay Conservation Area covers 201.03 ha on King Island. The conservation area is designated as IUCN Category V and there is no management plan in place.

6.2.11.5 Colliers Swamp Conservation Area

Colliers Swamp Conservation Area covers 1,089.8 ha on King Island. The conservation area is designated as IUCN Category VI and there is no management plan in place.

6.2.11.6 Councillor Island Nature Reserve

Councillor Island Nature Reserve covers 17.58 ha of the granite island within the New Year Group. The reserve is part of the King Island Important Bird Area recognised by BirdLife Australia (Birdlife International 2025) and provides important habitat for the orange-bellied parrot during its migration as well as significant numbers of short-tailed shearwater, black-faced cormorant, fairy tern, hooded plover and pacific gull. The conservation area is designated as IUCN Category Ia and there is no management plan in place.

6.2.11.7 Lavinia State Reserve

Lavinia State Reserve covers 7,860.4 ha on King Island at the Lavinia Ramsar Site. See Section 6.2.6.1.

6.2.11.8 New Year Island Game Reserve

New Year Island Game Reserve covers 118.22 ha to the north-west of King Island. The reserve is part of the King Island Important Bird Area recognised by BirdLife Australia (Birdlife International 2025) and provides important habitat for the orange-bellied parrot during its migration as well as significant numbers of short-tailed shearwater, black-faced cormorant, fairy tern, hooded plover and pacific gull.

6.2.11.9 Porky Beach Conservation Area

Porky Beach Conservation Area is located on the west coast of King Island covering an area of 4.55 km^2 and extending from the coast to 100-200 m inland. The conservation area is designated as IUCN Category V and there is no management plan in place.

6.2.11.10 Red Hut Point Conservation Area

Red Hut Point Conservation Area covers an area of 159.84 ha on King Island. The conservation area is designated as IUCN Category V and there is no management plan in place.

6.2.11.11 Reid Rocks Nature Reserve

Reid Rocks Nature Reserve covers 6.62 ha in the New Year Island Group. It is the only breeding site in Tasmania for Australian fur-seals (PWS 2000).

6.2.11.12 Sea Elephant Conservation Area

Sea Elephant Conservation Area covers 722.06 ha on King Island, approximately 25 km north-east of Currie. The conservation area is designated as IUCN Category VI and there is no management plan in place.

6.2.11.13 Seal Rocks State Reserve

Seal Rocks State Reserve is a 5.84 km^2 area on the south-western coast of King Island. The state reserve is an IUCN category III and there is no management plan in place. Images produced by google maps and google earth, show the coastal sections of the reserve consist primarily of large rocks and rocky cliffs.

6.2.11.14 Stokes Point Conservation Area

Stokes Conservation Area is a 2.44 km^2 area on the south-western coast of King Island. The state reserve is an IUCN category V and there is no management plan in place.

6.2.12 Key Ecological Features

Key Ecological Features (KEFs) are elements of the marine environment, based on current scientific understanding, and are considered to be of regional importance for either the region's biodiversity or ecosystem function and integrity of a Commonwealth Marine Area.

No KEFs were identified within the Operational Area. Areas identified in the PMST Report (Appendix F) due to the size of the grids used in the PMST but not actually intersecting the Operational Area are listed in the table with ‘X’.

KEFs identified in the Planning Area (Appendix H) are presented in Table 6-9 and Figure 6-9 and described in the subsections below.

Table 6-9: Key Ecological Features within the Planning Area

Key Ecological Feature	Operational Area	Planning Area
Bonney Coast Upwelling	-	✓
West Tasmanian Canyons	X	✓

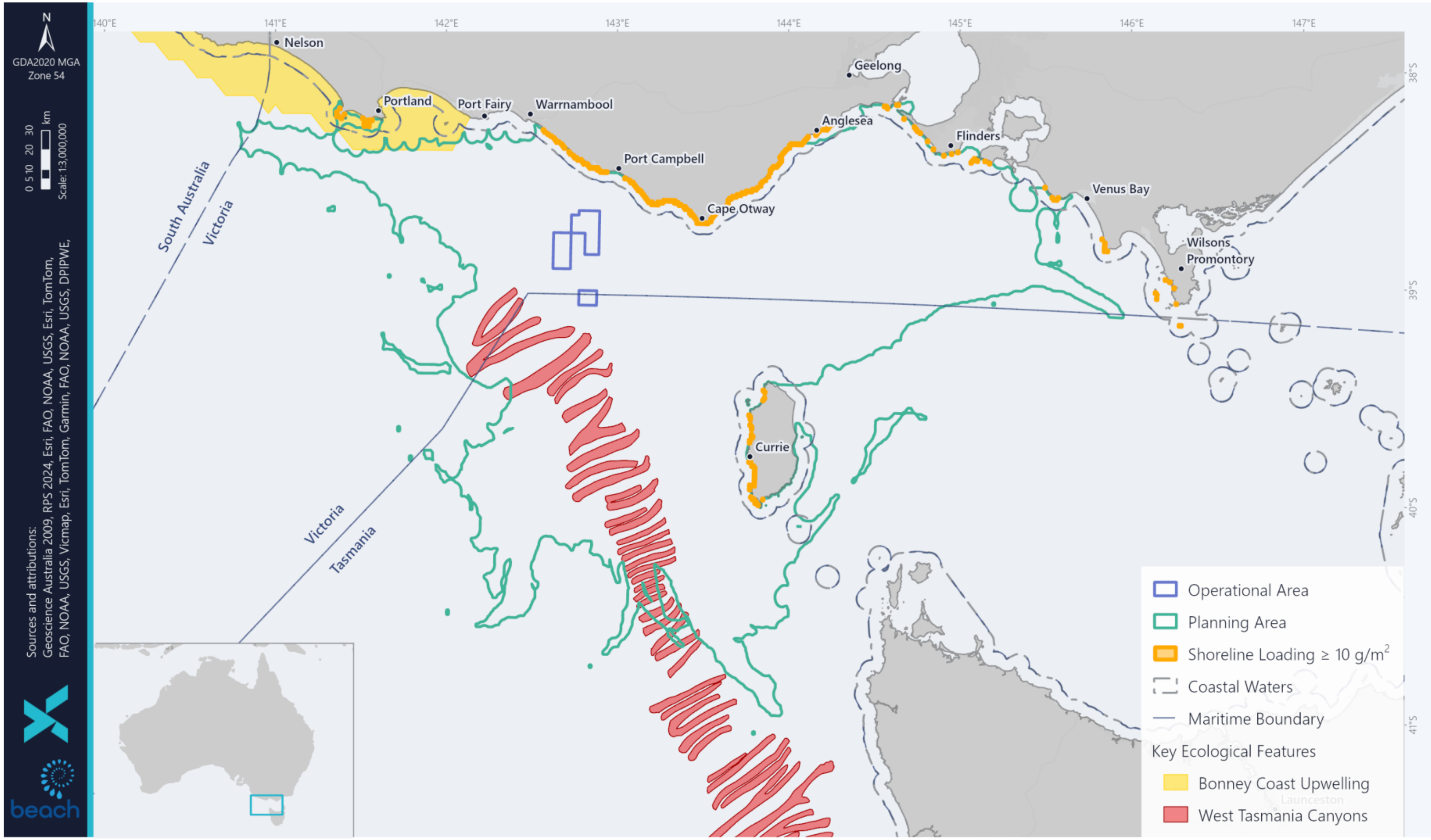


Figure 6-9: Key Ecological Features within the Planning Area.

6.2.12.1 Bonney Coast Upwelling

The Bonney Coast upwelling is a predictable, seasonal upwelling bringing cold nutrient rich water to the sea surface and supporting regionally high productivity and high species diversity in an area where such sites are relatively rare and mostly of smaller scale (CoA 2015). The Bonney Coast upwelling is defined as a key ecological feature as it is an area of enhanced pelagic productivity and has high aggregations of marine life (DCCEEW 2025b). In addition to whales, many endangered and listed species frequent the area, possibly also relying on the abundance of krill that provide a food source to many seabirds and fish. The high productivity of the Bonney coast upwelling is also capitalised on by other higher predator species such as little penguins and Australian Fur-seals feeding on baitfish (CoA 2015).

The Bonney Coast Upwelling KEF lies on the continental shelf situated approximately 120 km northwest of Cape Jaffa, South Australia to Portland, Victoria (Figure 6-9). The location of the Bonney Coast Upwelling KEF was originally derived through a review of enhanced chlorophyll occurrence for summer seasonal data between the years of 1998 and 2010 (Research Data Australia 2013).

6.2.12.2 West Tasmanian Canyons

The West Tasmanian Canyons are located on the relatively narrow and steep continental slope west of Tasmania. This location has the greatest density of canyons within Australian waters where 72 submarine canyons have incised a 500 km-long section of slope (Heap and Harris 2008). The canyons in the Zeehan AMP are relatively small on a regional basis, each less than 2.5 km wide and with an average area of 34 km^2 shallower than 1,500 m (Williams et al. 2009). The Zeehan canyons are typically gently sloping and mud-filled with less exposed rocky bottoms compared with other canyons in the south-east marine region (e.g. Big Horseshoe Canyon).

Submarine canyons modify local circulation patterns by interrupting, accelerating, or redirecting current flows that are generally parallel with depth contours. Their size, complexity and configuration of features determine the degree to which the currents are modified and therefore their influences on local nutrients, prey, dispersal of eggs, larvae and juveniles and benthic diversity with subsequent effects which extend up the food chain.

Eight submarine canyons surveyed in Tasmania, Australia, by Williams et al. (2009) displayed depth-related patterns with regard to benthic fauna, in which the percentage occurrence of faunal coverage visible in underwater video peaked at 200-300 m water depth, with averages of over 40% faunal coverage. Coverage was reduced to less than 10% below 40 m depth. Species present consisted of low-relief bryozoan thicket and diverse sponge communities containing rare but small species in 150 to 300 m water depth.

Sponges are concentrated near the canyon heads, with the greatest diversity between 200 m and 350 m depth. Sponges are associated with abundance of fishes and the canyons support a diversity of sponges comparable to that of seamounts. Based upon this enhanced productivity, the West Tasmanian canyon system includes fish nurseries (blue wahoo and ocean perch), foraging seabirds (albatross and petrels), white shark and foraging blue and humpback whales (TSSC 2022).

6.3 Physical Environment

6.3.1 Climate

The climate in the Otway Basin is typical of a cool temperate region with cold, wet winters and warm dry summers. It is located on the northern edge of the westerly wind belt known as the Roaring Forties. In winter, when the subtropical ridge moves northwards over the Australian continent, cold fronts generally create sustained west to south-westerly winds and frequent rainfall in the region (McInnes and Hubbert 2003). In summer, frontal systems are often shallower and occur between two ridges of high pressure, bringing more variable winds and rainfall.

6.3.2 Oceanography

6.3.2.1 Winds

The Otway Basin is a high-energy environment exposed to frequent storms and significant wave heights. Winds in the area generally exceed 13 knots (23.4 km/h) for more than 50% of the time contributing to the moderate to high wave-energy environment. Strongest winds are associated with eastward-moving low pressure and frontal systems that cross the site every 4 to 6 days in winter. Directions are predominantly south-westerly veering north-westerly. September is the windiest month, with average wind speeds of 29 km/h.

6.3.2.2 Waves

The Otway Basin has a predominantly south-westerly aspect and is highly exposed to swell from the Southern Ocean. Wave heights generally range from 1.5 m to 2 m. Waves up to 10 m can occur during winter storm events.

6.3.2.3 Tides

Tides are semi-diurnal with a diurnal inequality (Jones and Padman 1983). The maximum tidal range in western Bass Strait is 1.2 m. Currents are directed along a north-east/south-west axis, with maximum speeds of 0.3 m/s (Fandry 1983).

6.3.2.4 Ocean Currents

The South-east Marine Region is oceanographically complex, with subtropical influences from the north and subpolar influences from the south. The Leeuwin Current transports warm, subtropical water southward along the Western Australian coast and then eastward into the Great Australian Bight where it mixes with the cool waters from the Zeehan Current running along the west coast of Tasmania. These currents are stronger in winter than in summer (Figure 6-10).

The eastern parts of the Region are strongly influenced by the East Australian Current (EAC) that flows southward adjacent to the east coast of New South Wales, Victoria, and Tasmania, carrying warm equatorial waters. The EAC is up to 500m deep and 100 km wide and is strongest in summer when it can flow at up to 5 knots. In winter it flows at 2–3 knots as the oceanographic and climatic drivers in the Coral Sea diminish.

The EAC tends to form ocean eddies that rotate around warm, central cores that can be up to 200 km across and may persist for months. The eddies can cross the continental shelf, and when mixing with shelf break waters, create upwellings that form isolated areas of enhanced productivity 200–300 km in diameter. Eddies form more frequently off the south coast of New South Wales than other areas but are also common along the east coast of Tasmania. The EAC affects sea surface temperatures on the eastern Tasmanian shelf, which can vary substantially among years depending on the relative influence of subtropical waters.

During winter, the South Australian current moves dense, salty warmer water eastward from the Great Australian Bight into the western margin of the Bass Straight. In winter and spring, waters within the straight are well mixed with no obvious stratification, while during summer the central regions of the straight become stratified.

6.3.2.5 Sea Temperature

Surface seawater temperatures in the Otway Basin typically range from 14°C in winter to 21°C in summer. However, upwelling of cooler nutrient-rich water occur along the seafloor during mid to late summer. This upwelling is an extension of the regional Bonney coast upwelling system, which affects southern Australia because of south-east winds forcing surface water offshore thus triggering a compensatory subduction along the bottom. If the wind is strong enough the water sometimes shoals against the coast. The water originates from a subsurface water flow called the Flinders current and has the characteristics of reheated Antarctic Intermediate Water (Levings and Gill 2011).

During winter and spring onshore winds cycling from the southwest to northwest mound the surface layer against the land and cause a south-easterly flow along the coast that fills the shelf from the shore outwards to a depth of 500 m deep. Shelf water temperatures at these times range from between 18°C to 14°C with seafloor temperatures warmer in winter than in summer.

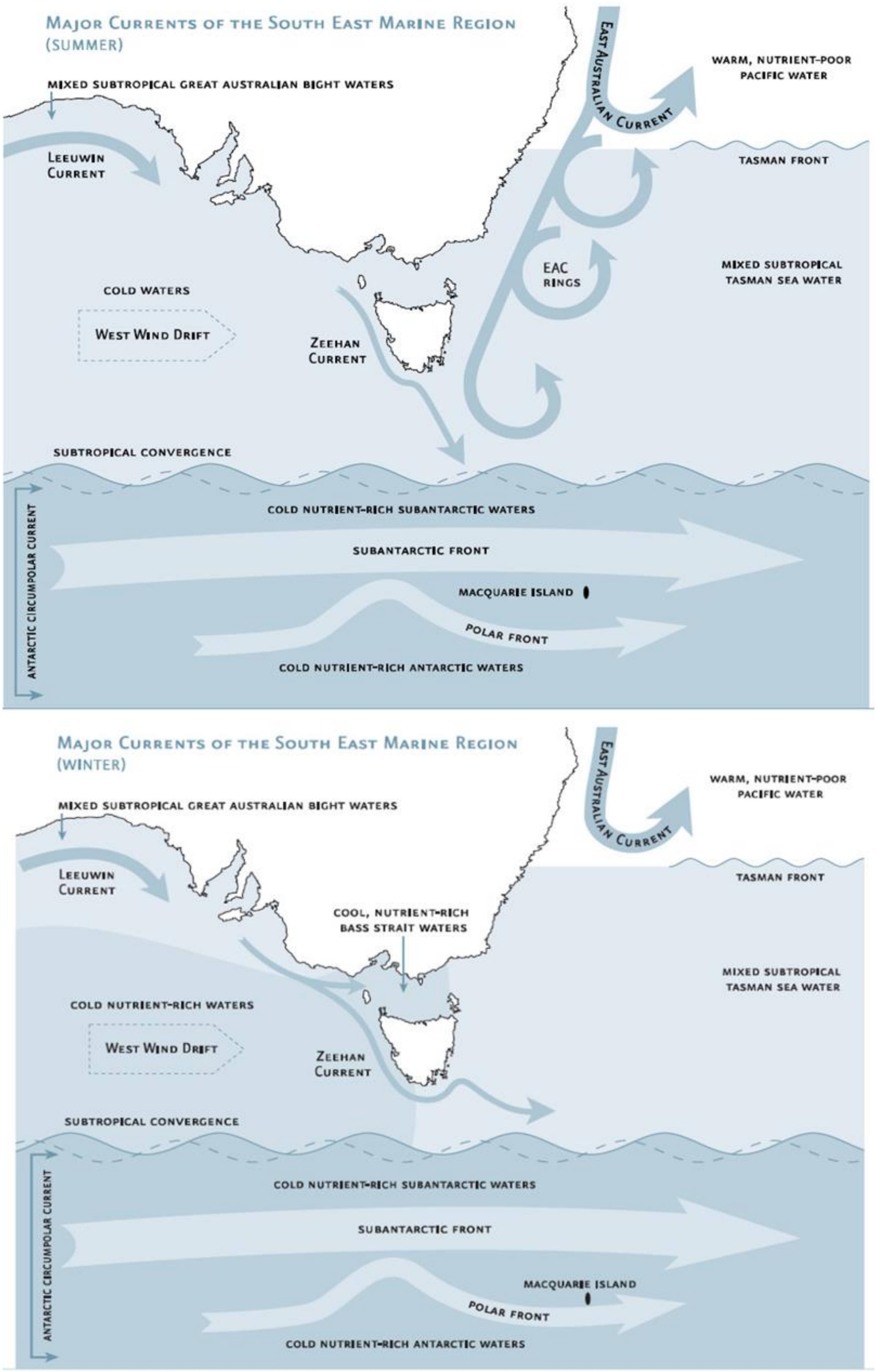


Figure 6-10: Ocean currents in south-eastern Australian waters during summer (top) and winter (bottom) (Source: CoA 2015)

6.3.3 Geomorphology

The south-eastern section of Australia's continental margin comprises the Otway Shelf and the Bonney Coast, Bass Strait, and the western shelf of Tasmania. The 400 km long Otway Shelf lies between 37° and 43.5°S and 139.5°E (Cape Jaffa) and 143.5°E (Cape Otway). The narrowest point is off Portland, where the shelf is less than 20 km wide. It broadens progressively westward, to 60 km off Robe, SA, and eastward to 80 km off Warrnambool. The Otway shelf is comprised of Miocene limestone below a thin veneer of younger sediments.

Boreen et al. (1993) examined 259 sediment samples collected over the Otway Basin and the Sorell Basin of the west Tasmanian margin. Based on assessment of the sampled sediments the authors concluded the Otway continental margin is a swell-dominated, open, cool-water, carbonate platform. A conceptual model was developed which divided the Otway continental margin into five depth-related zones – shallow shelf, middle shelf, deep shelf, shelf edge and upper slope (Figure 6-11).

In the shallow shelf are exhumed limestone substrates that host dense encrusting mollusc, sponge, bryozoan, and red algae assemblages. The middle shelf is a zone of swell-wave shoaling and production of mega-rippled bryozoan sands. The deep shelf is described as having accumulations of intensely bioturbated, fine, bioclastic sands. At the shelf edge and top of slope, nutrient-rich upwelling currents support extensive, aphotic bryozoan/sponge/coral communities. The upper slope sediments are a bioturbated mixture of periplatform bioclastic debris and pelleted foraminiferal/nano-fossil mud. The lower slope is described as crosscut by gullies with low accumulation rates, and finally, at the base of the slope the sediments consist of shelf-derived, coarse-grain turbidites and pelagic ooze.

The Operational Area is primarily located within the shallow and middle shelf zones.

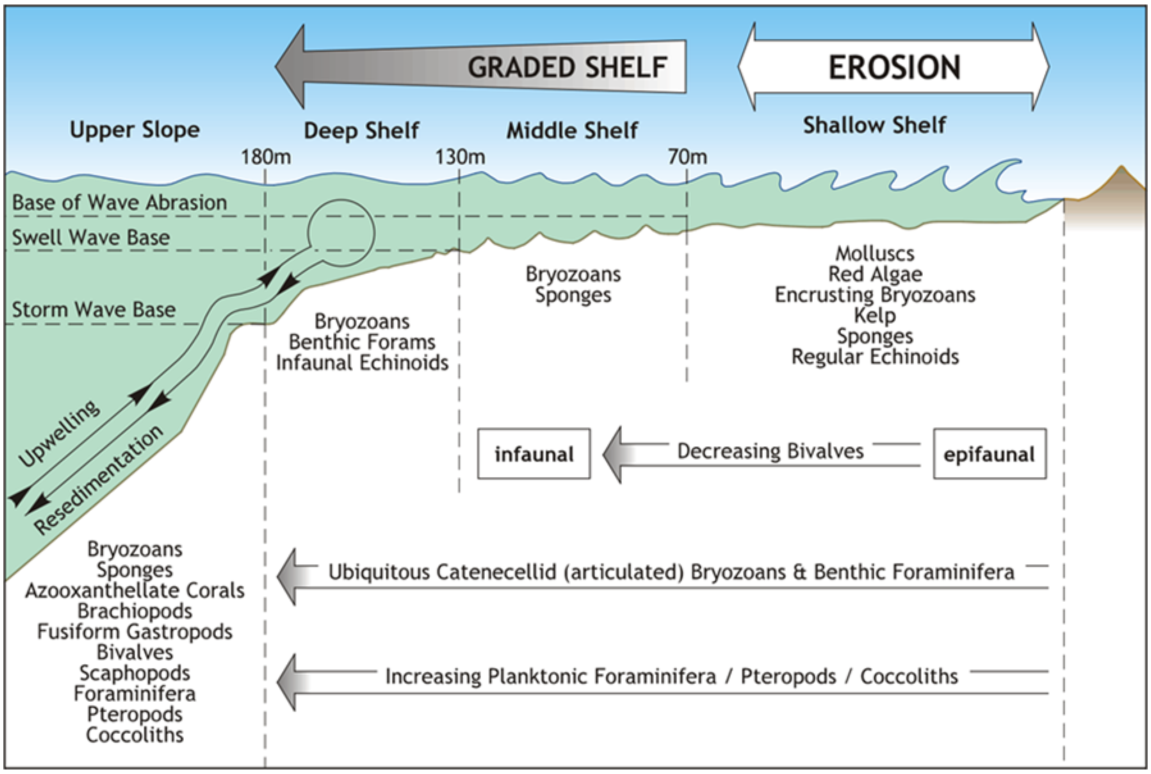


Figure 6-11: Model of geomorphology of the Otway shelf (Boreen et al. 1993)

Previous surveys of the shallow shelf and middle shelf zones where existing Beach infrastructure is located are provided in detail in Section 6.4.1. A video survey of the seabed at selected sites along proposed offshore pipeline routes for the Otway Gas Development (BBG 2003) found that the substrate in water depths between 82 and 66 m were predominantly low-profile limestone with an incomplete sand veneer that supported a low to medium density, sponge dominated filter feeding community. Fish and other motile organisms were uncommon.

In shallower depths between 63 and 30 m, the video surveys showed a rippled, sand or sand/pebble substrate with minor sponge dominated benthic communities. The epibenthic organisms were generally attached to outcropping or sub-outcropping limestone pavements. Only in waters shallower than approximately 20 m, was an area of significant, high-profile reef and associated high density macroalgae dominated epibenthos encountered.

6.3.4 Sediment Quality

Sediments were sampled during the Otway Basin Environmental Survey (Ramboll 2020). Sediment samples were collected at two of the gas fields, Artisan and Thylacine. The Artisan field would be representative of the sediments closer to shore, while the Thylacine field which is further offshore would be representative of the sediments in the deeper waters of the Operational Area.

The sediment within all samples was predominantly sand with a range of 95-97% as a proportion of each sample. There was very little silt and a maximum of 4.7% for the clay fraction. There were no discernible trends based on the location of sample collection.

The oxidation reduction potential (ORP) of sediments within the samples was measured and the anoxic layer with low ORP was not detected in any of the sediments analysed and the range of measurements indicated that these sediments maintain a well oxygenated, unmodified environment.

There was a notable degree of variability in the nutrient samples collected in the Thylacine field, however the small number of samples means that a trend or pattern was not discernible. Nitrate-nitrite was not detected in any samples. Total organic content and detectable nitrogen concentrations were slightly higher in the Artisan samples compared to the Thylacine samples. Generally, the concentrations of nutrients in the marine sediments were to be expected for this environment and type of sediment.

Of the inorganic compounds tested, Cd, Cu, Pb, Hg, Ni and Sn were below the limit of reporting in all sediment samples. The concentration of Cr in sediments was low, and well below the default guideline values which indicate the concentrations below which there is a low risk of unacceptable effects occurring within the recommended sediment quality guidelines set out in the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (2018). The concentration of Cr was slightly higher in the samples from Artisan than those from Thylacine. Zn was detected in two of the six samples (one sample from each field) and was well below the default guideline values set out within the Sediment Quality Guidelines.

BTEXs, PAHs, PCBs and TRHs were either below the LOR or at levels of no concern.

In summary, sediments had a high ORP and low or undetectable levels of toxicants indicating an unmodified seabed environment. It is expected that sediment quality within the Operational Area and Planning Area will be typical of the offshore marine environment of the Otway Basin.

6.3.5 Water Quality

Water quality was sampled during the Otway Basin Environmental Survey (Ramboll 2020). Water samples were collected at two of the gas fields, Artisan and Thylacine. The Artisan field would be representative of the water quality closer to shore, while the Thylacine field which is further offshore would be representative of the water quality in the deeper waters of the Operational Area.

In situ measurements were taken for dissolved oxygen (DO), pH and ORP and DO and pH were assessed against the default trigger values for physical and chemical stressors for south-east Australia for slightly disturbed ecosystems set out in the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG 2018). Trigger values are used to assess risk of adverse effects due to nutrients, biodegradable organic matter, and pH in various ecosystem types.

DO was between the lower and upper limits of 90 and 110% saturation for marine waters in all samples. Likewise, pH was between the lower and upper limits of 8.0 and 8.4 for all samples. The range of ORP measurements indicated a well oxygenated, ecologically healthy environment.

Laboratory analyses for a suite of analytes were undertaken and has been compared to the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (2018) default guideline values for physical and chemical stressors for nutrient analytes and the trigger values for toxicants at alternative levels of protection for all other analytes.

The concentration of ammonia, nitrite and reactive phosphorus was at or below the level of reporting (LOR) for all samples. Only one sample contained a concentration of nitrate-nitrite, NO3, Total Kjeldahl Nitrogen and Total Nitrogen above the LOR. This same sample site (Thylacine_1_3) slightly exceeded ANZG (2018) default guideline values for Total Nitrogen. Concentrations of Total Phosphorus were recorded in all samples, but all measurements were below ANZG (2018) default guideline values. Total Suspended Solids was typically within the range expected for unmodified marine waters.

The concentrations of Cd, Cr, Co, Pb, Hg, and Ni were at or below LOR in all samples. The concentration of Cu was below, at or very close to the LOR for all samples. The concentration of all contaminants (Cd, Cr, Co, Pb, Hg, Zn, Ni and Cu) against the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (2018) were all below the default guideline values in all samples. This is consistent with a slightly disturbed marine system which is described in (ANZG 2018) as an ecosystem in which biodiversity may have been affected to small degree by human activity.

BTEXs and PAHs were below the detection limit in all water samples. Very low traces of Total Recoverable Hydrocarbon (TRHs) were detected in a Thylacine water sample but were at levels of no concern. TRHs were below detection limits in all other samples. The level of chlorophyll a in filtered samples was below the detection level.

In summary, the water quality at the Thylacine and Artisan survey areas indicated an undisturbed mid-depth environment.

It is expected that water quality within the Operational Area and Planning Area will be typical of the offshore marine environment of the Otway Basin, which is characterised by high water quality with low background concentrations of trace metals and organic chemicals.

6.3.6 Ambient Light

Ambient light is defined as the light that is already present within an environment. Ambient light is predominantly from solar/lunar luminescence. There are minor anthropogenic sources from townships and nearby shipping lanes within the vicinity of the light EMBAs (Figure 6-12) Within the Otway Basin artificial light emissions can be expected from both permanent (e.g. onshore/ offshore developments) and temporary (e.g. vessel) activities. Lighting from the existing Thylacine-A Wellhead Platform is required for navigational and safety purposes and complies with Sections 2.1 and 2.2 of the Recommendation O-139 on The Marking of Man-Made Offshore Structures (IALA, Ed 2, 2013). Moderate levels of commercial vessel traffic are expected within the Planning Area (Section 6.5.6) and light EMBAs with navigation and working lighting complying with Australian Maritime Safety Authority (AMSA) Marine Orders Part 30 (Prevention of Collisions). Closer to shore, particularly in coastal communities, natural light is considered to be a community value. Major population centres and areas associated with popular tourist attractions and their potential presence within the light EMBAs are detailed in Table 6-10. Artificial light may attract light sensitive species such as shorebirds, seabirds, and turtles (Section 6.3).

Table 6-10: Population centres and other anthropogenic light sources within the light EMBAs

Anthropogenic Light Source	Light EMBA	Flaring EMBA
Port Fairy (Population: 3,742)	-	-
Warrnambool (Population: 31,308)	-	✓
Peterborough (Population: 322)	✓	✓
Port Campbell (Population: 440)	✓	✓
Princetown (Population: 236)	-	✓
Thylacine-A Platform	✓	✓
Shipping	✓	✓

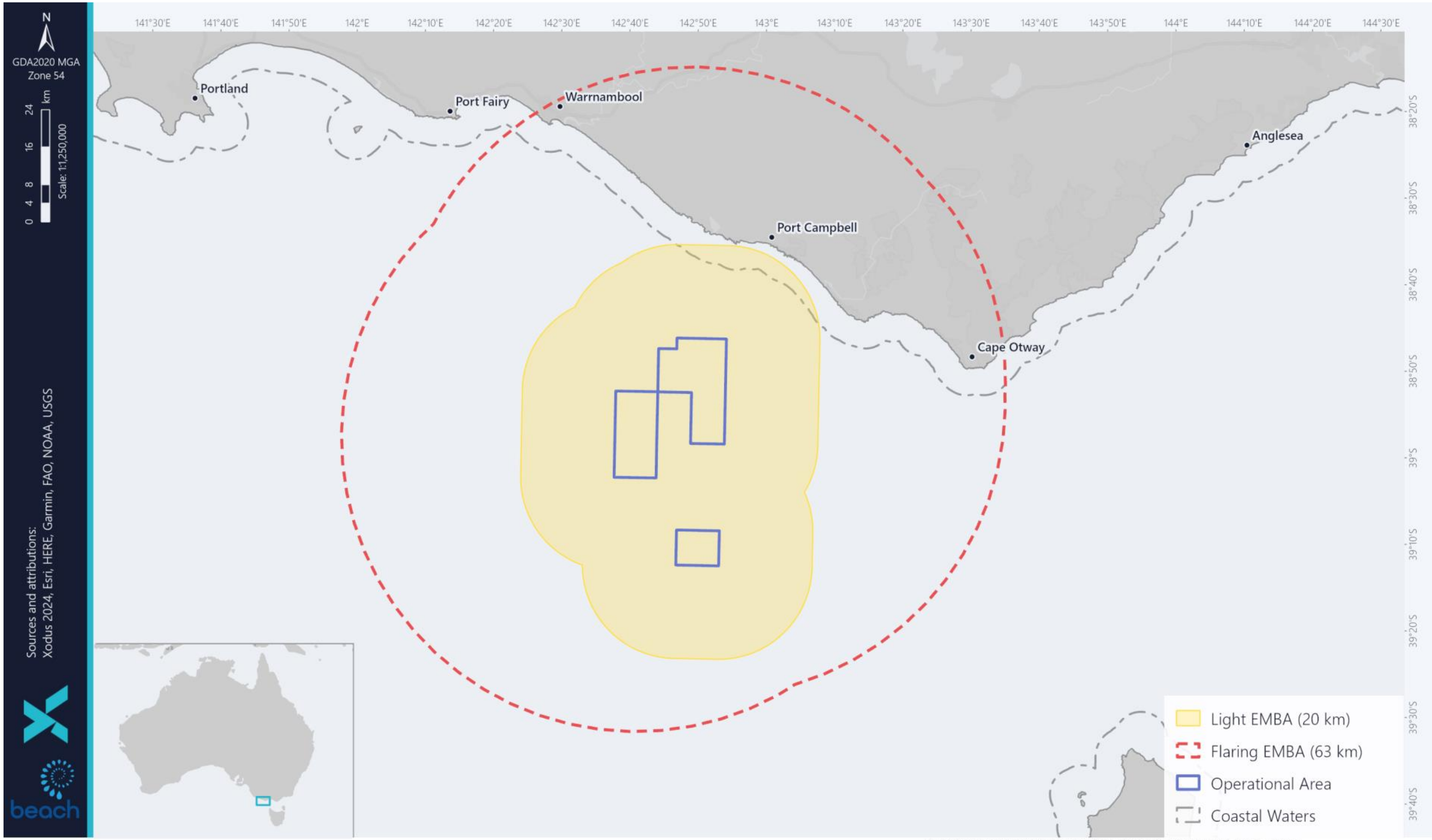


Figure 6-12: Light and flaring EMBAs

6.3.7 Ambient Sound

McCauley and Duncan (2001) undertook a desktop review of natural and man-made sea sound sources likely to be encountered in the Otway Basin. They concluded that natural sea sound sources are dominated by wind noise, but also include rain noise, biological noise and the sporadic noise of earthquakes. Man-made underwater sound sources in the region comprise shipping and small vessel traffic, petroleum production and exploration drilling activities and sporadic petroleum seismic surveys.

Between 2009 and 2016 the Integrated Marine Observing System (IMOS) recorded underwater sound south of Portland, Victoria (38°32.5' S, 115°0.1'E). Prominent sound sources identified in recordings include blue and fin whales at frequencies below 100 Hz, ship noise at 20 to 200Hz and fish at 1 to 2 kHz (Erbe et al. 2016). In the broader region, primary contributors to background sound levels were wind, rain and currents-and waves associated sound at low frequencies under 2kHz (Przeslawski et al. 2016). Biological sound sources including dolphin vocalisations were also recorded (Przeslawski et al. 2016).

During April-May 2001 two underwater noise loggers were placed (5.1 km and 2.9 km south-west of an exploration petroleum drilling vessel at the Thylacine site) to measure underwater noise before, during and after drilling activity. A further logger was placed in the shipping lane approximately 60 km due south of Port Fairy to measure ambient noise produced by physical, manmade and biological sources between late November 2001 and early March 2002 (Woodside 2003). Baseline broadband underwater noise for the period was in the order of 93 to 97 dB re 1 µPa with shipping raising the averaged noise level above 105 dB re 1 µPa for 6% of the deployment time.

An acoustic monitoring program was also undertaken during exploratory drilling of the Casino-3 well. A sound logger located 28.03 km from the drill site did not detect drilling noise and recorded ambient noise that ranged between 90 and 110 dB re 1 µPa (McCauley 2004). Passive acoustic monitoring commissioned by Origin from April 2012 to January 2013, 5 km offshore from the coastline east of Warrnambool, identified that ambient underwater noise in coastal areas is generally higher than further offshore, with a mean of 110 dB re 1 µPa and maximum of 161 dB re 1 µPa (Duncan et al. 2013).

More recently JASCO Applied Sciences (Australia) (JASCO) completed a monitoring study for Beach in relation to exploration drilling activities at the Artisan 1 well with the aim of completing an acoustic characterisation of the drilling and associated vessel activity within the Otway Basin. McPherson et al. (2021) details the monitoring program and results. Four recorders were deployed in February and retrieved in early April 2021 with Stations 1 through 4 deployed at distances of 0.336, 1.13, 5.11, and 25 km from the Ocean Onyx MODU.

The results for Station 4, the furthest from the MODU, were a median broadband ambient noise of 104.5 dB re 1 µPa, a mean of 118.3 dB re 1 µPa, a minimum of 86.6 dB re 1 µPa, and a maximum of 153.6 dB re 1 µPa. This is both quieter and louder than those for Casino 3. The mean levels at Station 4 are 8.3 dB higher than those recorded 5 km offshore of Warrnambool, while the maximum recorded at Station 4 is lower by 7.4 dB. For Station 4 contributors to the soundscape were weather, shipping, and marine mammals. Local variations in ambient noise and received levels can depend upon water depth and the proximity to contributors. In this case, the shipping lanes and the frequency and proximity of vessel passes are strong drivers of the ambient noise at Station 4. The quieter levels reported at Thylacine in Lattice Energy (2017) are likely due to the placement of the monitoring station at a distance from the shipping lanes, which limited their contributions to the data set and thus resulted in a lower reported range of received sound levels.

6.3.8 Bonney Coast Upwelling

The Bonney coast upwelling is mainly driven by the frequent south-easterly winds during the austral summer (Lewis 1981, Middleton and Bye 2007, Nieblas et al. 2009, Schahinger 1987). The frequent south-easterly winds are the result of southern migration of the subtropical ridge (Nieblas et al. 2009, Schahinger 1987). The upwelling occurs via Ean dynamics, where the ocean surface experiences a steady wind stress which results in a net transport of water at right angles to the left of the wind direction which brings cold, nutrient rich water to the sea surface.

Huang and Wang (2019) developed an image processing technique to map upwelling areas along the south-eastern coast of Australia. This study used monthly Moderate Resolution Imaging Spectroradiometer (MODIS) sea surface temperature (SST) composites between July 2002 and December 2016, which were generated from daily SST images with a spatial resolution of approximately 1 km. As upwelling in winter is unlikely to occur images during this period were not analysed. Upwelling reaching the surface often displays a colder SST signature than the adjacent area (e.g., Dabuleviciene et al. 2018, Gill et al. 2011, Kampf et al. 2004, McClatchie et al. 2006, Oke and Griffin 2011, Oke and Middleton 2001, Roughan and Middleton 2004, Willis and Hobday 2007). This negative SST anomaly is the foundation of upwelling mapping using SST data (Huang and Wang 2019).

The spatial patterns of the mapped Bonney coast upwelling have been shown to follow a clear temporal pattern. When the upwelling season starts during late spring and early summer (November and December), the influence of the Bonney coast upwelling was found to be often restricted to the coast. During the mid-summer and early autumn (January to March) when the upwelling is the strongest, the upwelling influence often extended to the shelf break before retreating in April (Huang and Wang 2019).

Gill et al (2011) states that the Bonney coast upwelling generally starts in the eastern part of the Great Australian Bight and spreads eastwards to the Otway Basin. At the height of the Bonney coast upwelling during February and March, the upwelling's area of influence often exceeds 12,000 km^2, its SST anomaly often exceeds 1°C, and its chlorophyll-a concentrations are often >1.5 times of its adjacent areas (Huang and Wang 2019).

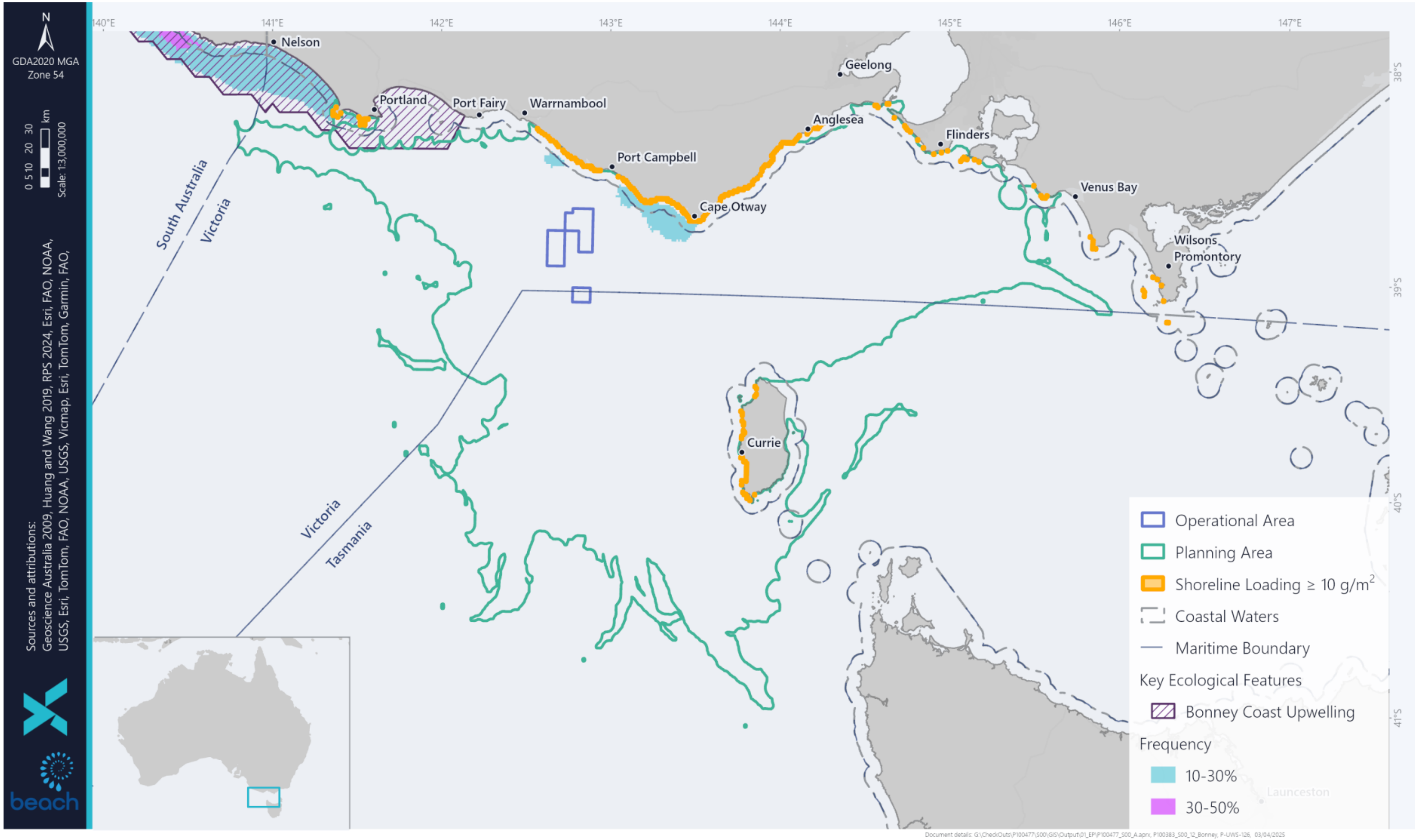


Figure 6-13: Bonney Coast Upwelling Frequency within the Planning Area.

6.3.8.1 Variability

While the general characteristics of the Bonney coast upwelling are broadly understood virtually nothing is known of the longer-term variability of the phenomenon. Alongshore wind is the predominant mechanism in the upwelling, which is, therefore, directly impacted by any changes to the strength or frequency of these winds. However, not all favourable upwelling winds lead to an upwelling event. Huang and Wang (2019) state that each year for the period of 14 years (Sept 2002 to May 2016) of their study there was large variability in the distribution of the upwelling influence areas, month to month, season to season and year to year.

The El Niño – Southern Oscillation (ENSO) has been identified by some authors as a potential driver of upwelling strength along the south Australian coast. The ENSO is the dominant global mode of inter-annual climate variability, is a major contributor to Australia's climate and influences Australia's marine waters to varying degrees around the coast. The two phases of ENSO, El Niño and La Niña, produce distinct and different changes to the climate.

Middleton et al. (2007) examined meteorological and oceanographic data and output from a global ocean model. The authors concluded that El Niño events lead to enhanced upwelling along Australia's southern shelves. However, it has been found that relationships between ENSO events and upwelling and production indices off southern Australia are weak due to the high interannual and inter-seasonal variability in these indices.

Huang and Wang (2019) results indicate that the ENSO events are likely to have a low-to-moderate impact on the upwelling intensity although the El Nino events tend to strengthen upwelling intensity along the south-east coast of Australia with La Nina events tending to weaken upwelling intensity. Previous studies (Middleton and Bye 2007; Middleton et al. 2007) indicated that the El Nino events would raise the thermocline (along the Australian margin) which effectively forms a colder and nutrient-rich pool at shallower depths. This is likely to enhance upwelling intensity, with higher SST and chlorophyll-a anomalies and a larger area of influence.

6.3.8.2 Ecological Importance

The primary ecological importance of the Bonney coast upwelling is as a feeding area for the blue whale (*Balaenoptera musculus*). The upwelled nutrient-rich re-heated Antarctic intermediate water promotes blooms of coastal krill, *Nyctiphanes australis*, which in turn attracts blue whales to the region to feed.

The Bonney coast upwelling is one of only two identified seasonal feeding areas for blue whales in Australian coastal waters and is one of 12 known blue whale feeding aggregation areas globally. Sightings of the sei whale in the upwelling indicate this is potentially an important feeding ground for the species (Gill et al. 2015). There have also been sightings of the fin whale, which indicate this could potentially be an important feeding ground (Morrice et al. 2004).

The high productivity of the Bonney coast upwelling also leads to other attributes such as algal diversity and its productivity as a fishery. This productivity is also capitalised on by other higher predator species such as little penguins and fur-seals feeding on baitfish. Robinson et al. (2008) postulated that upwelling waters may bring fish prey of Australian Fur-seals to surface waters, which are then flushed into Bass Strait within foraging range of seals.

6.3.8.3 Linkages between Climate, Upwelling Strength, and Blue Whale Abundance

The complex interaction between climatic conditions, upwelling strength and seasonal blue whale distribution and abundance within the Bonney coast upwelling is currently poorly understood other than at a general level. Factors to be resolved to enable a more detailed understanding include observations that not all strong upwelling-favourable winds necessarily lead to strong upwelling events (Griffin et al. 1997) and that increased upwelling does not necessarily equate to increased productivity as conditions may be less optimal for plankton growth. Huang and Wang (2019) found a generally weak and unclear correlation between chlorophyll-a and SST. This weak correlation may be due to chlorophyll-a concentrations (a remote measure of plankton population) are also influenced by other complex oceanographic and biological mechanisms such as grazing, seasonality and transportation.

Further an increase in plankton biomass does not necessarily coincide with the presence of the Blue Whales. Review of pygmy blue whale aerial observation data from Gill et al. (2011) from the 2001-02 to 2006-07 seasons, and additional surveys in the Otway Basin commissioned by Origin during February 2011 and November -December 2012 did not find a significant positive correlation between El Niño conditions and pygmy blue whale abundance. Such a positive correlation could be expected if El Niño conditions caused stronger upwelling, stronger upwelling led to increased planktonic productivity and blue whales were more likely to be present when productivity is higher.

Two of the six seasons subject to aerial surveys in the eastern section of the Otway Basin (Gill et al. 2011) were determined by the Bureau of Meteorology to demonstrate weak to moderate El Nino conditions. The remainder of the years were assessed to be neutral. The two El Nino seasons (2002-03 and 2006-07) corresponded with the lowest observation frequencies (sightings/1,000 km) for pygmy blue whales of all the yearly surveys.

Aerial surveys commissioned by Origin undertaken during February 2011 and November-December 2012 were undertaken during La Nina events classified by the Bureau of Meteorology as very strong and strong respectively. Although observation frequencies are not available, the absolute numbers of pygmy Blue Whales observed was substantially higher than during the 2001-01 to 2006-07 surveys. Also, of note is that pygmy blue whales observed during February 2011 were congregated along the seaward edge of a plume of terrestrial runoff, potentially suggesting use of this plume as a feeding resource, which has no relationship to upwelling.

As such, the interactions between climate and ecology for this upwelling system are complex and no definitive linkages between climatic events, upwelling strength and blue whale abundance have yet been described.

6.3.8.4 Operational Setting

Mapping of the Bonney coast upwelling frequency by Huang and Wang (2019) identified that the occurrence of an upwelling event between 2002 and 2016 (measured by remote sensing of a combination of SST anomaly and chlorophyll-a) within the Operational Area was unlikely with an upwelling frequency for this area of <10%. The closest areas of increased frequency of upwelling events to the Operational Area (10-30% occasional/semi-seasonal) were small, isolated areas situated in coastal areas to the north and north-east (Figure 6-13). Areas of further increased frequencies of Bonney coast upwellings (30-50% seasonal) were found over 67 km to the west of the Operational Area.

6.4 Ecological Environment

6.4.1 Benthic Habitats and Communities

As discussed in Section 6.3.3, a number of studies (Boreen et al. 1993, BBG 2003, CEE Consultants Pty Ltd 2003 and Ramboll 2020) have been undertaken within or adjacent to the Operational Area within the shallow and middle shelf zones. These studies have identified the seabed is similar across these areas, consisting of carbonate rich coarse to medium sands with areas of exposed limestone substrate. This type of seabed is highly mobile making it difficult for filter feeders and soft body invertebrates to survive and establish in significant populations. Epifauna is dominated by low density, patchy assemblages of branching bryozoans, gorgonian cnidarians and sponges. A summary of these studies is provided below.

The existing studies focus on the shallow and middle shelf zones up to approximately 130 m water depth (refer to Section 6.3.3).

6.4.1.1 Existing Studies

In 2002, 2003 and 2004, Fugro undertook a number of bathymetric surveys of the two proposed pipeline rights of way: one constructed for the Thylacine Geographe pipeline and one extending from the completed Geographe A well to Flaxman's Hill.

A review of the available geotechnical data was carried out in March 2011 for the Geographe location (Advanced Geomechanics 2011). Overall, the seabed in the Otway area surveyed slopes to the south at a gentle average gradient of less than 1 degree. However, the local topography is predominantly irregular in nature, varying from gently undulating and locally smooth in areas of increased sediment deposition, to areas of outcropping cemented calcrete features that are from smooth to jagged relief. These areas are covered in marine growth. ROV video survey confirmed the presence of a shallow hard underlying substrate at a depth of 50 mm below the sediment in areas of marine growth (JP Kenny 2012).

The Flaxman's Hill alignment traverses the Thistle drilling area and the Thylacine Geographe pipeline runs parallel and northeast of this area. During 2003, bathymetric data was collected, and the right of way was assessed and recorded using an underwater video camera (CEE Consultants Pty Ltd 2003). The Flaxman's Hill pipeline route travels approximately 68 km from the Geographe gas field to the shoreline. Visual assessment of the sea floor was undertaken from a water depth of 99 m to 16 m terminating at Flaxman's Hill.

A summary of the seabed morphology and benthic assemblages is provided in Table 6-11 to Table 6-15.

Table 6-11: Otway margin geomorphology (Boreen et al. 1993)

Zone	Depth (m)	Width (m/km)	Gradient	Features
Shallow Shelf	30 - 70	4 – 28	1.5 – 10	Drops rapidly from strandline to depths of 30 m, characterised by rugged but subdued topography
Middle Shelf	70 - 130	7 – 65	1 - 8.5	Generally smooth topography with occasional rock out crops

Table 6-12: Thylacine to Geographe seabed morphology and benthic assemblages (CEE Consultants Pty Ltd 2003)

Depth (m)	Seabed morphology	Benthic assemblage
92	High profile reef stone with deep sand gutters.	Diverse, high density sessile: sponge, coral dominated crinoids common and mobile species
88	Low profile with areas of high profile limestone ridges; incomplete sand veneer.	Diverse, high density sessile: sponge, dominated and mobile species

Table 6-13: Geographe to Flaxman's Hill seabed morphology and benthic assemblages (CEE Consultants Pty Ltd 2003)

Depth (m)	Seabed morphology	Benthic assemblage
82	Low profile with areas of high profile limestone ridges; incomplete sand veneer	Medium density sessile: sponge, dominated low density mobile species. (small shark)
82	Equal % of exposed low profile limestone and sand. Two reef outcrops. Low profile with areas of high profile limestone ridges; incomplete sand veneer.	Medium density, sessile: sponge, dominated
78	Low profile with areas of high profile limestone ridges; incomplete sand veneer	Medium density, sessile: sponge, dominated Motile: sea urchins dominated
76		Medium density, sessile: sponge, dominated
76		Low - Medium density, sessile: sponge, dominated
70		Diverse, med density sessile, sponge dominated
68		Medium density, sessile: sponge, dominated
65		Diverse, med density sessile, sponge dominated
60		Medium density, sessile: sponge, dominated

Table 6-14: Geographe to Rifle Range seabed morphology and benthic assemblages (CEE Consultants Pty Ltd 2003)

Depth (m)	Seabed morphology	Benthic assemblage
82	Low profile with areas of high profile limestone ridges; incomplete sand veneer	Very low density sessile; large sponge.
79		Diverse, low – high density sessile
75	Low profile with areas of high profile limestone ridges; incomplete sand veneer	Medium density, sessile: sponge, dominated. Motile: sea urchins dominated
74		Medium density, sessile: sponge, dominated
70		Low - Medium density, sessile: sponge, dominated

Depth (m)	Seabed morphology	Benthic assemblage
67		Diverse, med density sessile, sponge dominated
66	Low profile limestone with sand gutters	Medium density, sessile: sponge, dominated
66	Low profile with areas of high profile limestone ridges; incomplete sand veneer	Diverse, med density sessile, sponge dominated
70	(Pock marks) Data not documented.	Medium density, sessile: sponge, dominated
63	Corse gravel to fine sand	High density sessile: micro algae dominated

Table 6-15: Nearshore seabed morphology and benthic assemblages (CEE Consultants Pty Ltd 2003)

Depth (m)	Seabed morphology	Benthic assemblage
53	Sand	None observed
45		Only sea pens noted
16-30	Very high profile l/stone reef to sand	High density, sessile: sponge, macroalgae (Bull Kelp common)

A video survey of the seabed at selected sites along proposed offshore pipeline routes for the Otway Gas Development was undertaken by BBG during 2003 (Figure 6-14). BBG (2003) found that the substrate in water depths between 82 and 66 m were predominantly low- profile limestone with an incomplete sand veneer that supported a low to medium density, sponge dominated filter feeding community. Fish and other motile organisms were uncommon.

In shallower depths of between 63 and 30 m, the video surveys showed a rippled, sand or sand/pebble substrate with minor sponge dominated benthic communities. The epibenthic organisms were generally attached to outcropping or sub-outcropping limestone pavements. Only in waters shallower than approximately 20 m, was an area of significant, high profile reef and associated high density macroalgae dominated epibenthos encountered. Details of the seabed and benthic epifaunal assemblage are provided in Table 6-16.

Table 6-16: Nearshore seabed morphology and benthic assemblages (CEE Consultants Pty Ltd 2003)

Site No.	Depth (m)	Seabed type	Benthic Assemblage
3097	99	Bare rippled sand; minor limestone outcrops	Low density sessile; small sponge dominated
3118	99	Low profile limestone reef with sand veneer. isolated areas of raised l/stone	Low density sessile; sponge dominated
3084	99	Low profile limestone reef with incomplete sand veneer	Low density sessile; sponge dominated
3072	99	Low profile limestone reef with incomplete sand veneer	Low density sessile; sponge dominated

Site No.	Depth (m)	Seabed type	Benthic Assemblage
3054	98	Mix of low and high profile l/stone; shallow and deep sand	Low density sessile on low l/stone; high density sessile on high l/stone plus fish; sponge dominated
3185	95	Low profile limestone reef with incomplete sand veneer	Low density sessile; sponge dominated
3196	94	Low profile limestone reef with incomplete sand veneer	Low density sessile; sponge dominated
3232	92	High profile reef stone with deep sand gutters.	Diverse, high density sessile: sponge, coral dominated crinoids common and mobile species
3267	88	Low profile with areas of high profile limestone ridges; incomplete sand veneer.	Diverse, high density sessile: sponge, dominated and mobile species
2801	82	Low profile with areas of high profile limestone ridges; incomplete sand veneer	Very low density sessile; large sponge.
2720	79		Diverse, low – high density sessile
2590	75	Low profile with areas of high profile limestone ridges; incomplete sand veneer	Medium density, sessile: sponge, dominated. Motile: sea urchins dominated
2490	74		Medium density, sessile: sponge, dominated
2339	70		Low - Medium density, sessile: sponge, dominated
2291	67		Diverse, med density sessile, sponge dominated
2191	66	Low profile limestone with sand gutters	Medium density, sessile: sponge, dominated
2181	66	Low profile with areas of high profile limestone ridges; incomplete sand veneer	Diverse, med density sessile, sponge dominated
1191	63	Coarse gravel to find sand	High density sessile: micro algae dominated
1668	53	Sand	None observed

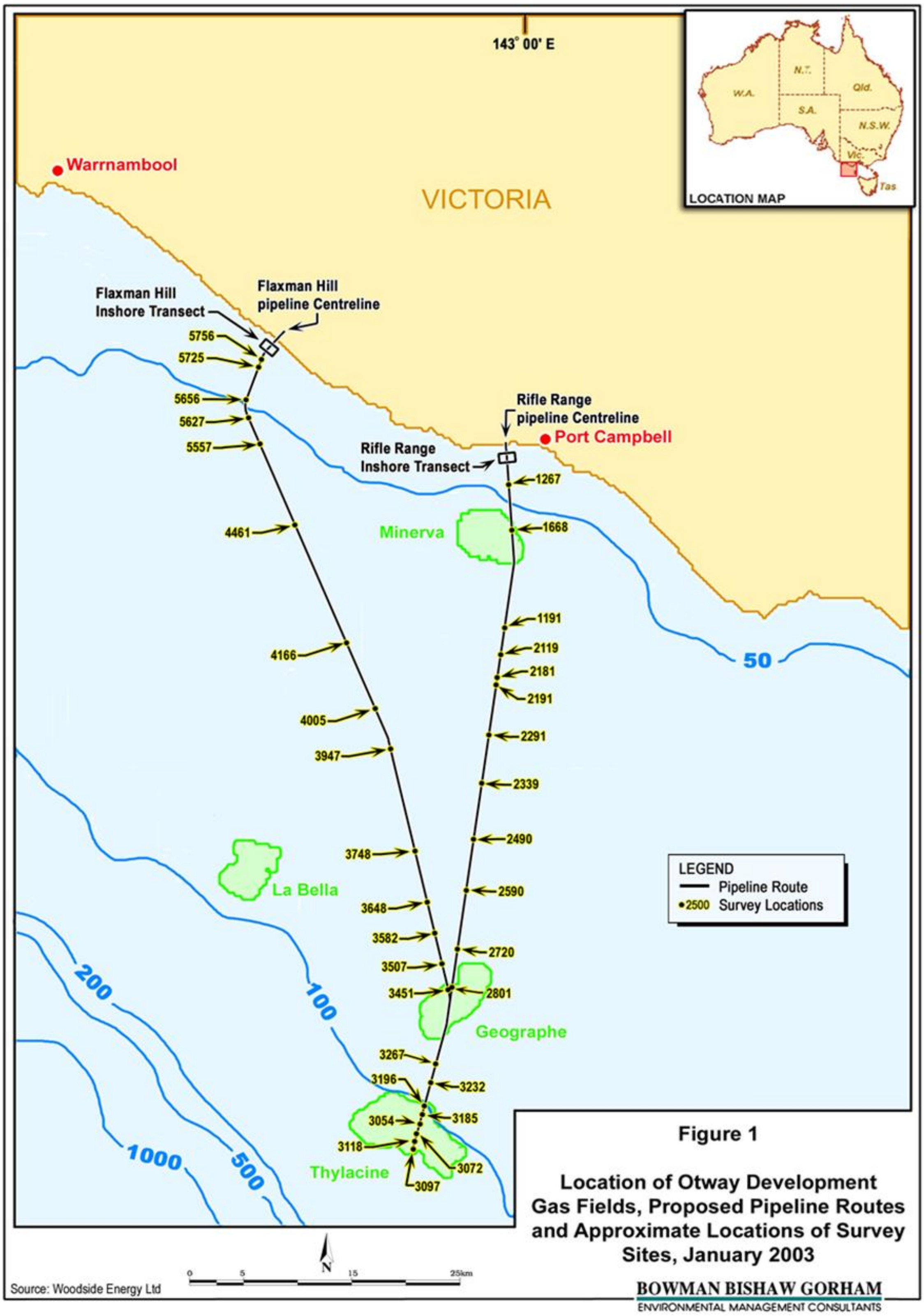


Figure 6-14: Seabed sites assessed by video survey during 2003 (BBG 2003)

Beach commissioned a seabed site assessment of the preferred infrastructure routes for the Otway Gas Development which was undertaken during the Otway Basin Environmental Survey from November 2019 to January 2020 and ranged in water depths from 70 to 104 m (Ramboll 2020). Figure 6-15 details the survey area and sample locations.

The objective of the seabed site assessment was to determine suitable locations for anchoring and MODU placement for drilling operations and the installation of infrastructure to connect new production wells to the existing infrastructure. Several different investigation techniques were used to examine and describe the seabed and benthic habitats, as well as identify possible hazards from manmade, natural, and geological features including benthic habitats

The survey comprised of multibeam bathymetry, side scan sonar, magnetometer, and sub-bottom profiling, cone penetration tests and seabed samples. In addition, sediment samples for infauna were collected and the composition and percent coverage of epifauna was assessed from photographs of the seafloor taken with a drop camera. Drop camera images at various locations are shown in Figure 6-16 to Figure 6-23 and survey results are summarised in Table 6-17.

Sediment samples for infauna were collected at two of the gas fields, Artisan and Thylacine. It was considered that the Artisan field would be representative of the infauna closer to shore (such as along the pipeline route), while the Thylacine field which is further offshore would represent the Geographe field.

The benthic infauna identified and counted from samples collected at the Thylacine and Artisan sites were relatively depauperate in both abundance and diversity. A total of 22 morpho-species were identified, from a total of 45 organisms collected from the grab samples, most of which were polychaete worms or crustaceans. These results are reflective of the sedimentary environment at the Thylacine and Artisan fields. All sites were dominated by sand, which typically have a lower abundance and diversity of infauna given that this abrasive type of substrate tends to be more easily subjected to laminar flows that move the sediment more dynamically than muddy substrates. The consequence of this is a physical environment that is not favourable for filter feeding and burrowing infauna species to inhabit. The types of species that were present in the samples were all those which can be expected to tolerate this somewhat dynamic environment. There were no discernible spatial trends in the distribution of sediment particle size. Likewise, there were no clear trends in the abundance, diversity, or composition of benthic infauna.

The composition and percent coverage of epifauna was assessed from photographs of the seafloor taken with a drop camera system. Percent cover ranged from 0 to 80% of the sample photograph for all samples but on average the percent cover was typically no more than 37%. The seabed at Hot Tap X had the greatest average coverage of epibiota (Figure 6-21) while the lowest coverage of epibiota was recorded along the route between Artisan and Hot Tap Y (Figure 6-16). Of the gas field sites, Artisan and Hercules had a slightly greater coverage of epifauna, while the routes between gas fields and Hot Tap Y have the least coverage of epifauna. Of the individual epibenthic organisms, Gastropoda sp. 2 (a cone shell) and crionids (featherstars) were the most abundant.

Further analysis of epifauna from grab samples at Artisan showed that much of the epifauna is comprised of branching bryozoans, feather-like gorgonian cnidarians and sponges. This complex of encrusting/branching fauna provides refuge for macrofauna such as amphipods, isopods, polychaete worms and molluscs.

Based on the assessment of epifauna using seabed photographs, the general impression of the seafloor is of an unmodified marine environment that supports a patchy complex of branching epibiota (i.e., bryozoans, gorgonian cnidarians, and sponges). This complex was highly patchy, covering 0.25 m^2 on average but could be found in patches of at least 0.4 m^2. A microscopic examination of a qualitative sample of this epibiota indicated that this complex of fauna provide microhabitat for a range of macrofauna such as amphipods, isopods, polychaete worms and molluscs. Such epifaunal habitats are known to provide refuge and other resources for benthic species (Jones et al. 2006). By comparison, there was a low abundance and diversity of infauna living within the sediment which reflects the coarse nature of the substrate. This type of substrate is highly mobile making it difficult for filter feeders and soft bodies invertebrates to survive and establish significant populations.

Ramboll (2020) summarise that the epibiota on the seabed in the vicinity of the Thylacine and Artisan gas fields is representative of what is expected at depths around 70-100 m. The infauna was of relatively low abundance and diversity as expected for coarse sand substrates. No benthic species or ecological communities listed as threatened under the Environmental Protection and Biodiversity Conservation Act 1999 (the EPBC Act) were identified.

The findings from Ramboll (2020) align with findings from the Otway Gas Development studies (CEE Consultants Pty Ltd 2003; BBG 2003) and Boreen et al. (1993) concerning the subsea features and biological communities likely to dominate the middle shelf zones of the Operational Area. In summary the seabed of the Operational Area can be characterised as a carbonate mid shelf and deeper sections (60 – 70 m) of the shallow shelf with surficial sediments of carbonate rich coarse to medium sands with areas of exposed limestone substrate. The epifauna is dominated by low density, sessile sponge assemblages.

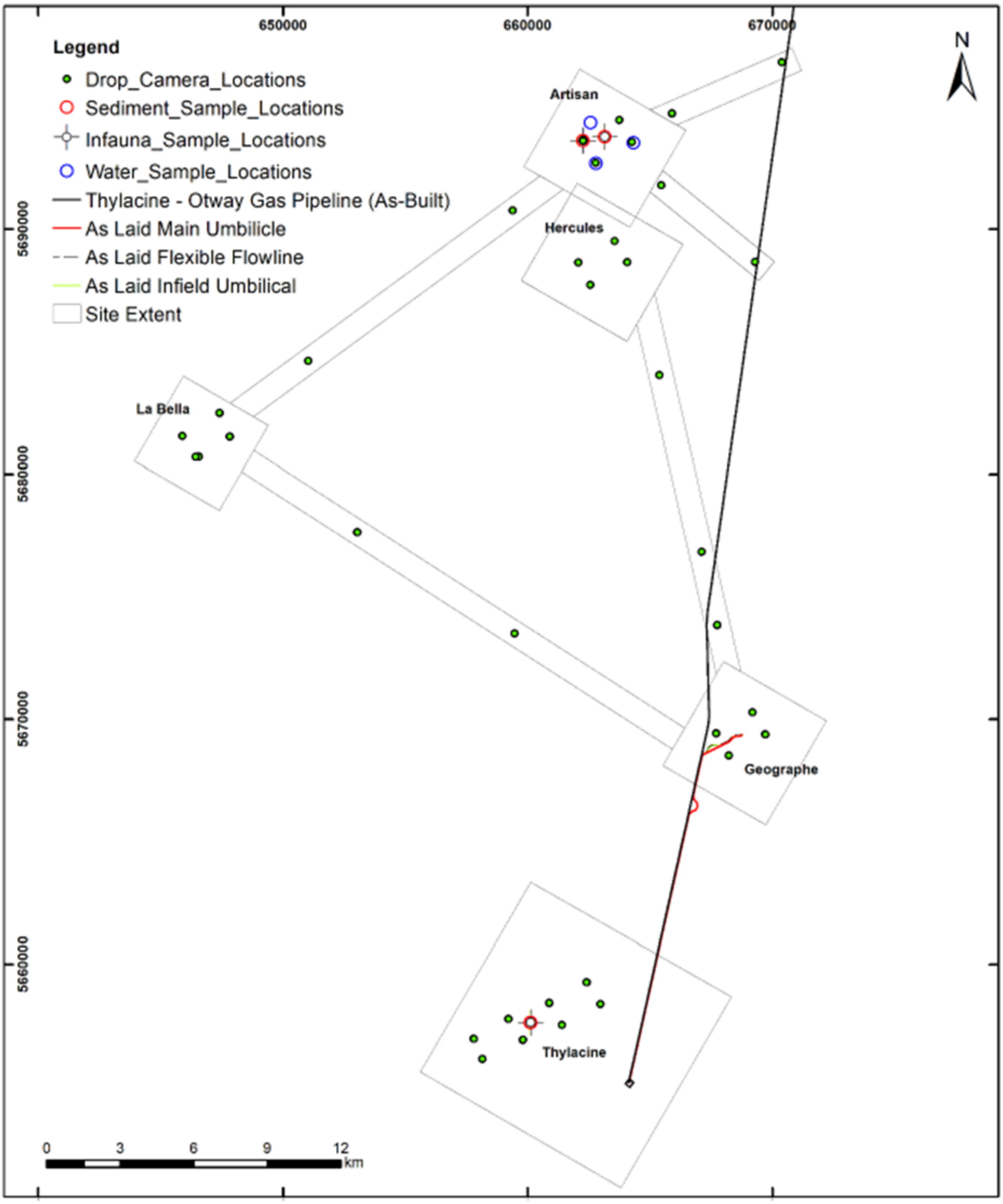


Figure 6-15: Seabed sites assessed during the Otway Gas Development Phase 4 seabed survey (Fugro, 2019; Ramboll, 2020)

Table 6-17: Results of the Otway Gas Development Phase 4 seabed survey (Fugro, 2019; Ramboll, 2020)

Survey Location	Results
Artisan (Figure 6-16)	Very little bathymetric variation across the survey area with water depths ranging from 68 to 74m. Seabed topography dominated by exposed rock on the seabed. Small patches of very thin transgressive coarse sand are present across the survey area. Megaripples were seen in some areas, with a wavelength of 1.5 to 2m and a height of 0.3 to 0.5m. Survey area characterised by low to moderate reflectivity characteristic of rock outcrop. A series of elevated mounds were noted in the north-west of the Artisan survey area 0.5 -1.0m above ambient seabed. Seabed showed a scattered sessile biota on a sandy seafloor.
Thylacine (Figure 6-17)	Seabed depths vary ranging from 92 to 115m, with an overall southwestern slope. Seabed topography compromises of rocky outcrops of the regionally dipping Port Campbell limestones. Sands are coarse (siliceous) calcareous medium sand. A local relief of up to 3m is identified on the rocky scarp surfaces, which are separated by shallow depressions often with a transgressive sandy infill. Percentage epifauna cover from the eight drop camera sites ranged from zero to 65% with an average percentage cover of 14%. Predominantly hard seabed with coarse sand substrates that supports a patchy complex of branching epibiota (i.e., bryozoans, gorgonian cnidarians and sponges). Epibiota on the seabed in the vicinity of the Thylacine gas fields is representative of what is expected at depths around 70 – 100m. Infauna was of relatively low abundance and diversity as expected for coarse sand substrates.
Geographe (Figure 6-18)	Very little bathymetric variation across the survey area with water depths ranging from 80 to 91m. Rocky outcrops of the Port Campbell Limestone show some variable relief up to 2m. Sand is clean washed and well sorted and comprising predominantly of angular broken shells and bryozoans. Percentage cover from the four drop camera sites ranged from zero to 55% with an average percentage cover of 13%. Predominantly hard seabed with coarse sand substrates that supports a patchy complex of branching epibiota (i.e., bryozoans, gorgonian cnidarians, and sponges).

Survey Location	Results
La Bella (Figure 6-19)	Water depth varies from 89 to 104m, with an overall southwestern slope. Seabed characterised by rocky outcrops interspersed with low-lying areas of shallow uncemented sediment. Seabed topography is typical of an eroded platform, with inferred calcarenite lithology. Side scan sonar results also provide flat seabed and megarippled sands and rock outcrop features. At rock exposures, seabed photographs appear to show biogenic growth.
Hercules (Figure 6-20)	Very little bathymetric variation across the survey area with water depths ranging from 71 to 77m. Seabed characterised by rocky outcrops interspersed with low-lying areas of shallow uncemented sediment. Port Campbell limestone cap rock is covered in places by mobile sediments of 1m thickness. Hercules site is a southern extension of the Artisan site, and therefore the seabed features bear strong similarities to those seen at Artisan site. Seabed features are typical of an eroded platform, including parallel asymmetric ridges with intermittent depressions.
OGPP and Umbilical Routes (Figure 6-21, Figure 6-22, Figure 6-23)	Seabed terrain is largely comprised of outcropping calcarenites, incised with erosional features and interspersed with (relatively) low-lying areas where shallow uncemented sands occur. Sands are generally less than 1m thick. Side scan sonar results also provide flat seabed and megarippled sands and rock outcrop features. At rock exposures, seabed photographs appear to show biogenic growth.

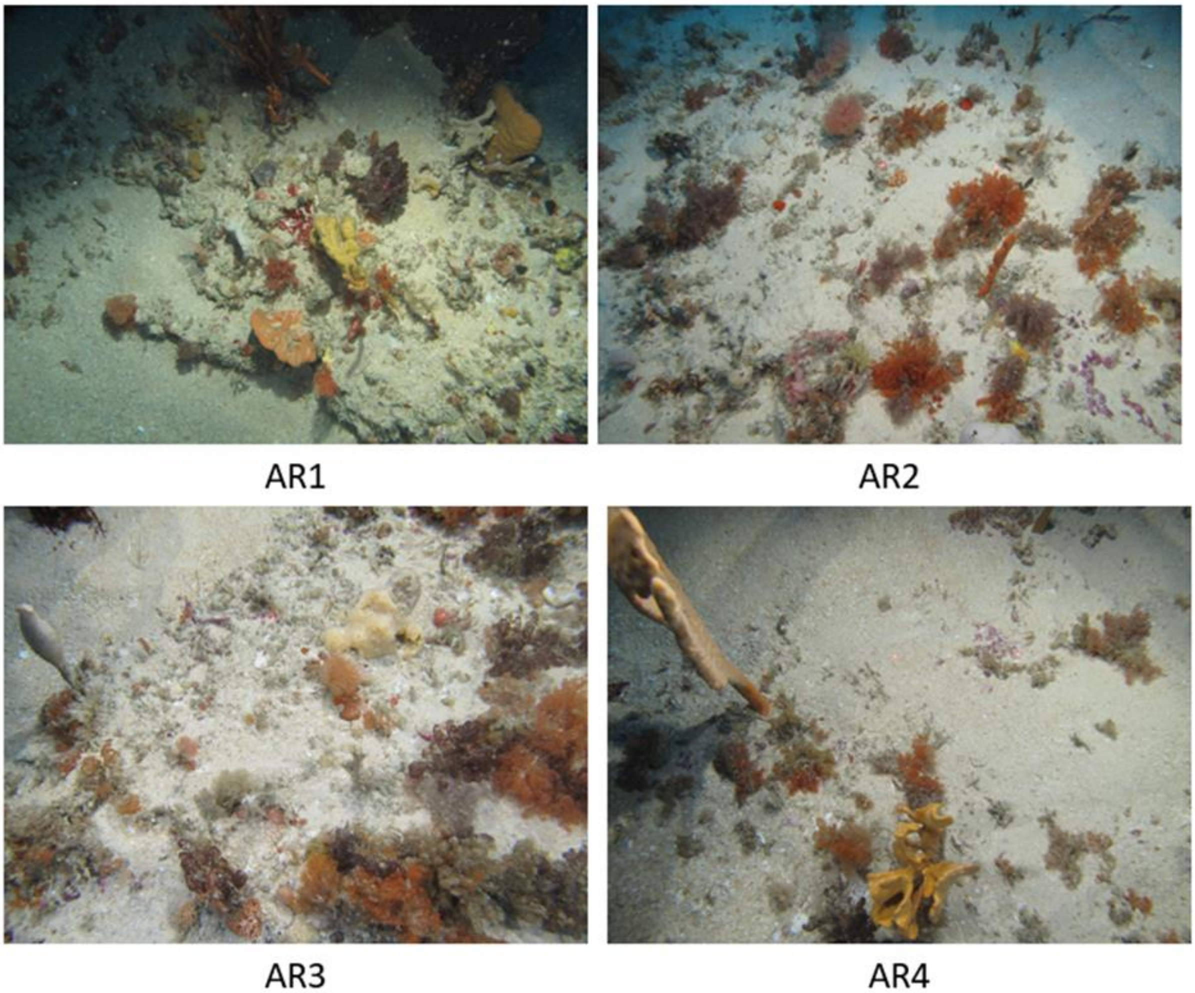


Figure 6-16: Drop camera images at Artisan

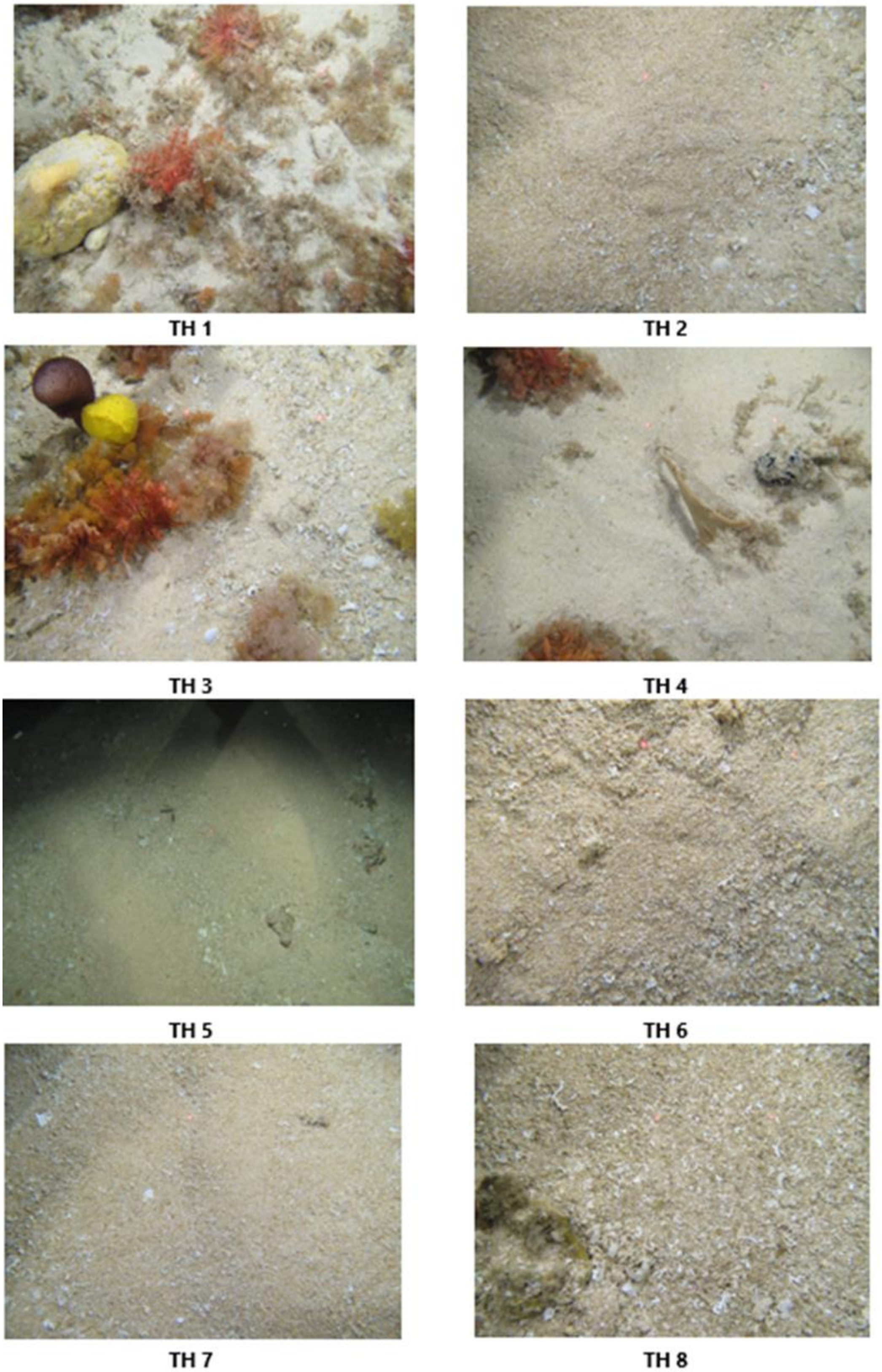


Figure 6-17: Drop camera images at Thylacine

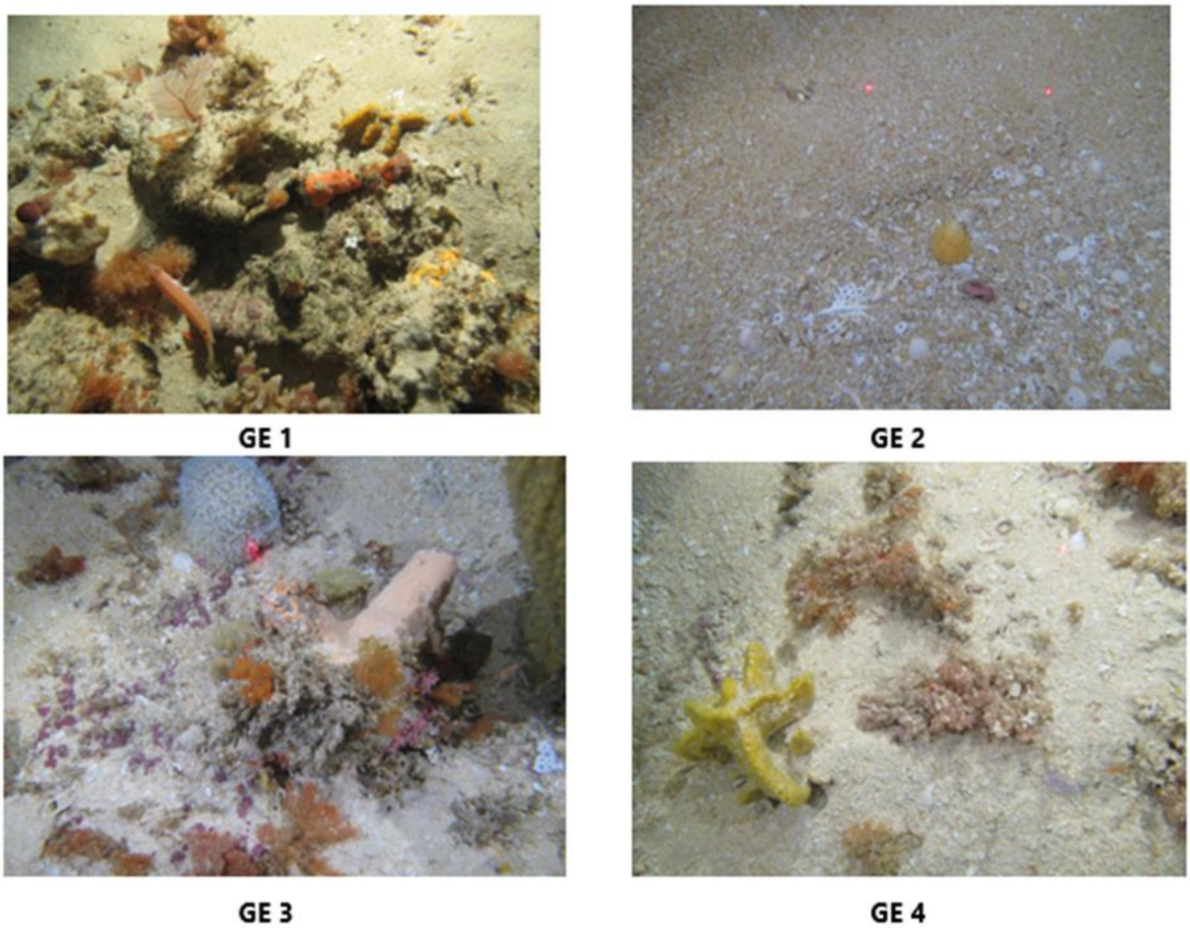


Figure 6-18: Drop camera images at Geographe

La Bella, LB1

La Bella, LB2

La Bella, LB3

La Bella, LB4

Figure 6-19: Drop camera images at La Bella

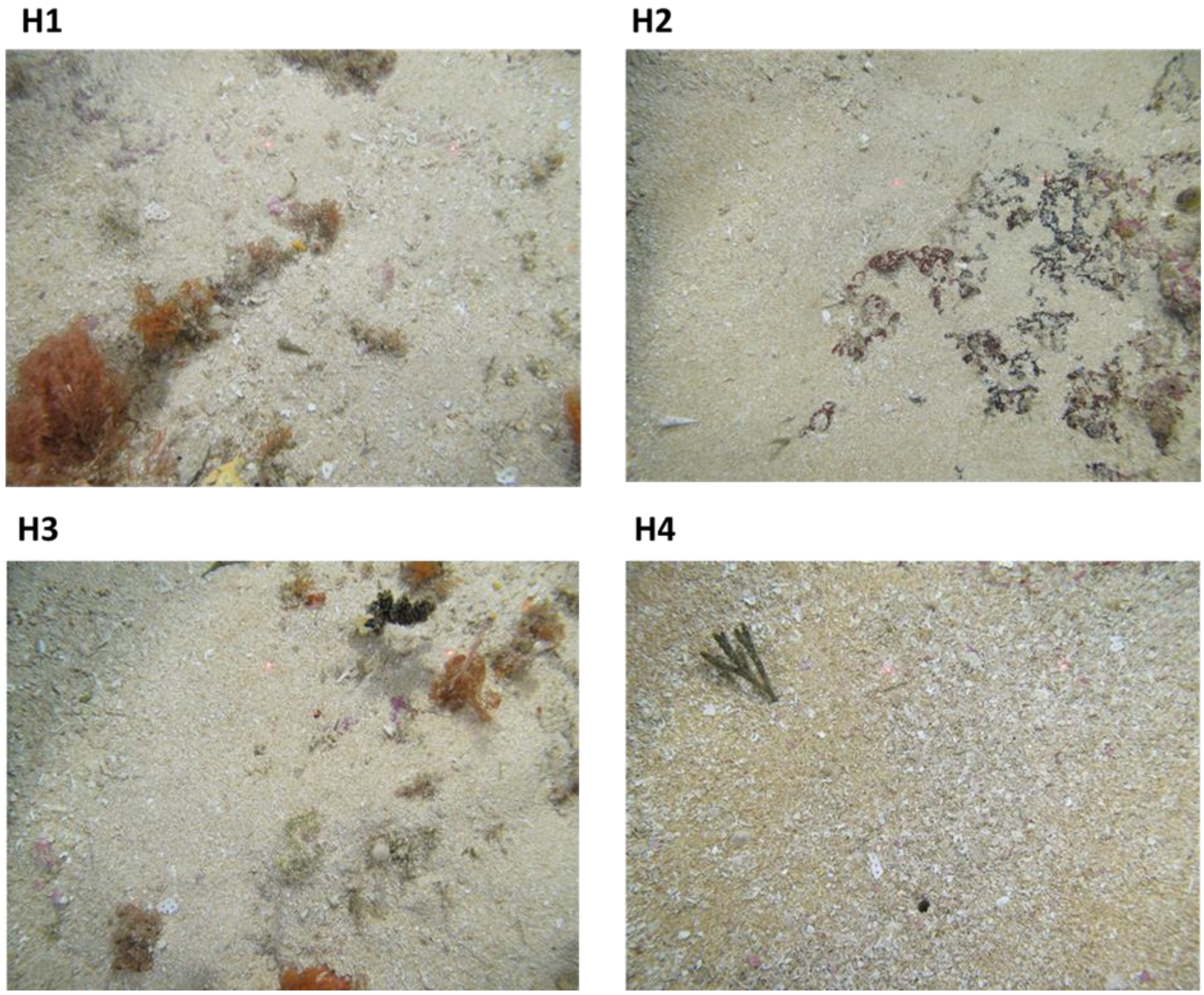


Figure 6-20: Drop camera images at Hercules

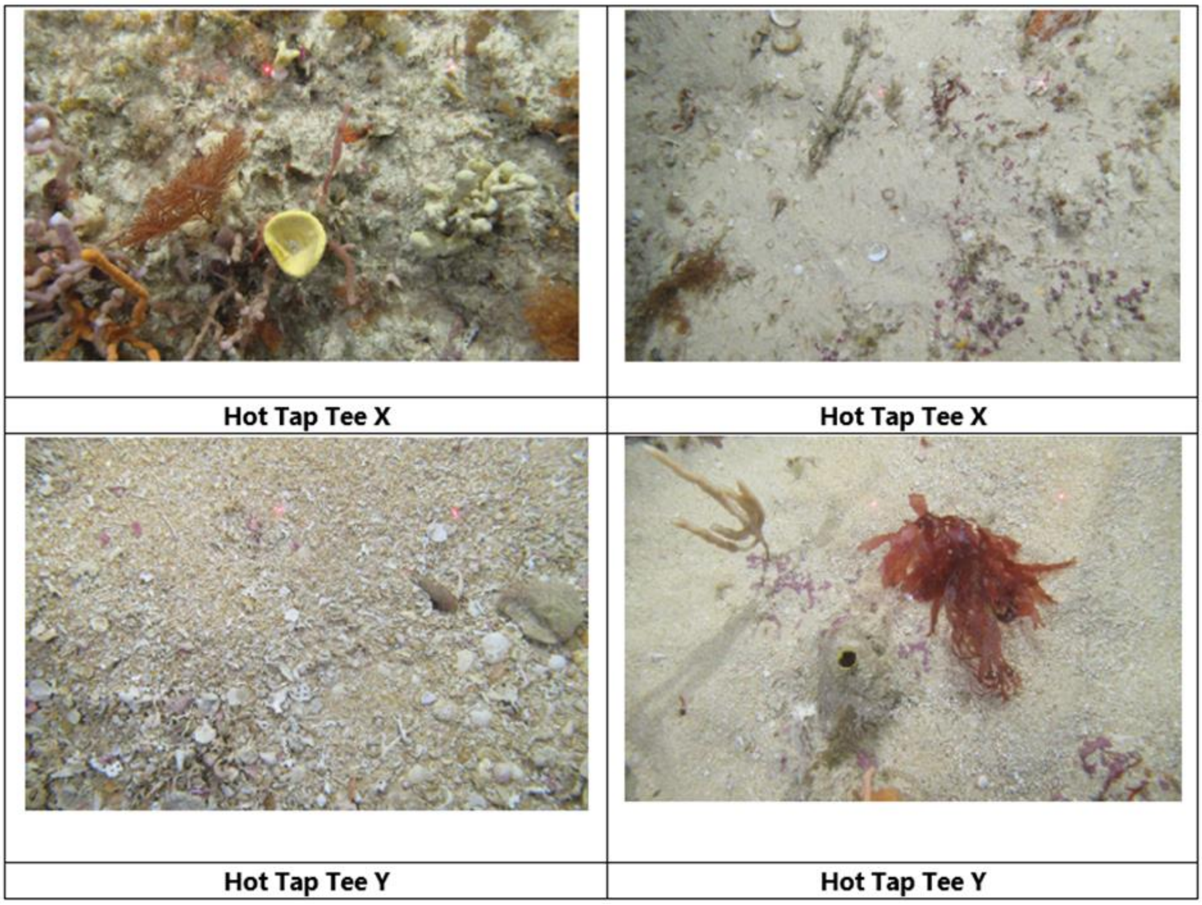


Figure 6-21: Drop camera images at Hot Tap Tee locations

Artisan to Geographe Route

Artisan to Geographe Route

Artisan to La Bella Route

Artisan to La Bella Route

La Bella to Geographe Route

La Bella to Geographe Route

Figure 6-22: Drop camera images along flowline and umbilical routes

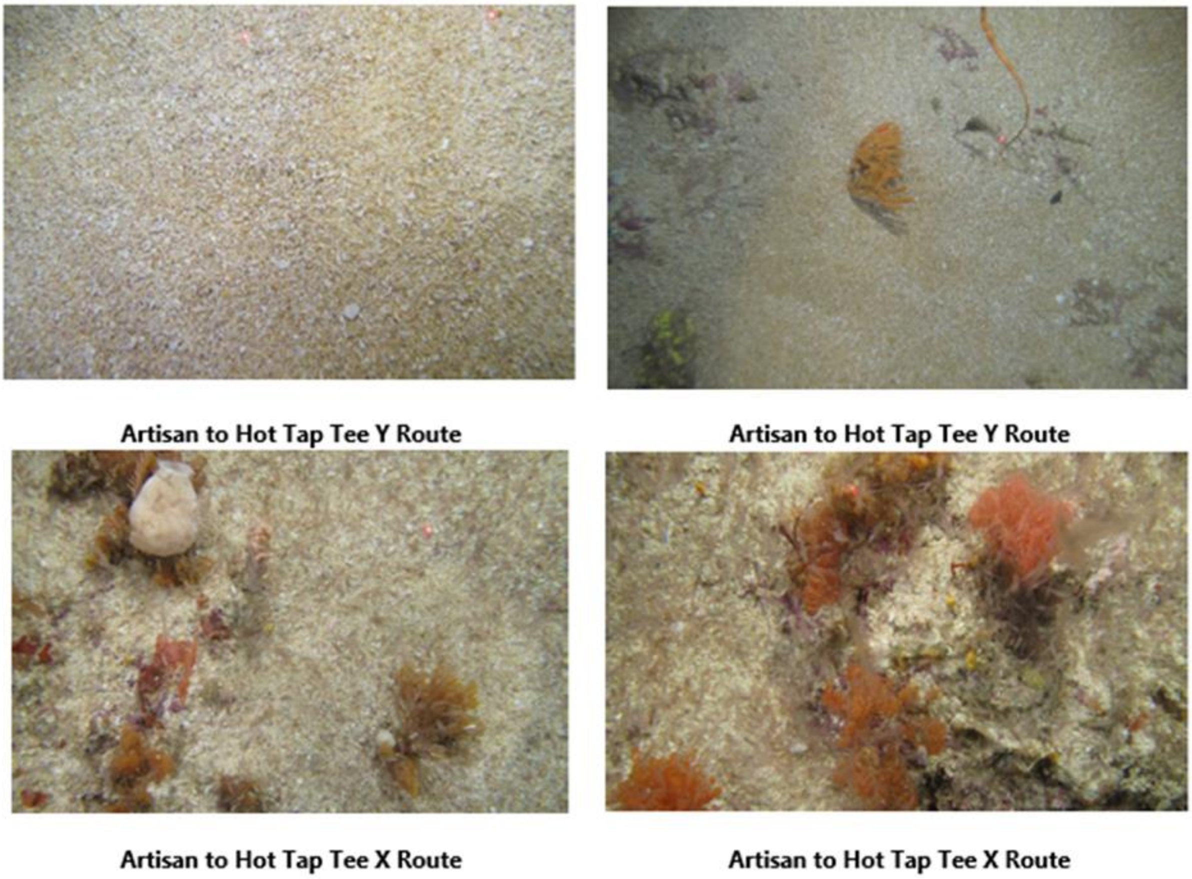


Figure 6-23: Drop camera images along flowline routes

6.4.2 Seagrass

Seagrasses are marine flowering plants, with around 30 species found in Australian waters (Huisman 2000). While seagrass meadows are present throughout southern and eastern Australia, the proportion of seagrass habitat within the south-eastern sector is not high compared to the rest of Australia (in particular with parts of South Australia and Western Australia) (Kirkham 1997).

Seagrass generally grows in soft sediments within intertidal and shallow subtidal waters where there is sufficient light and are common in sheltered coastal areas such as bays, lees of islands and fringing coastal reefs (McClatchie et al. 2006, McLeay et al. 2003). Seagrass meadows are important in stabilising seabed sediments, and providing nursery grounds for fish and crustaceans, and a protective habitat for the juvenile fish and invertebrates species (Huisman 2000, Kirkham 1997).

Known seagrass meadows within the Planning Area are present along the Victorian coastline (Figure 6-24). No seagrass meadows were identified within the Operational Area.

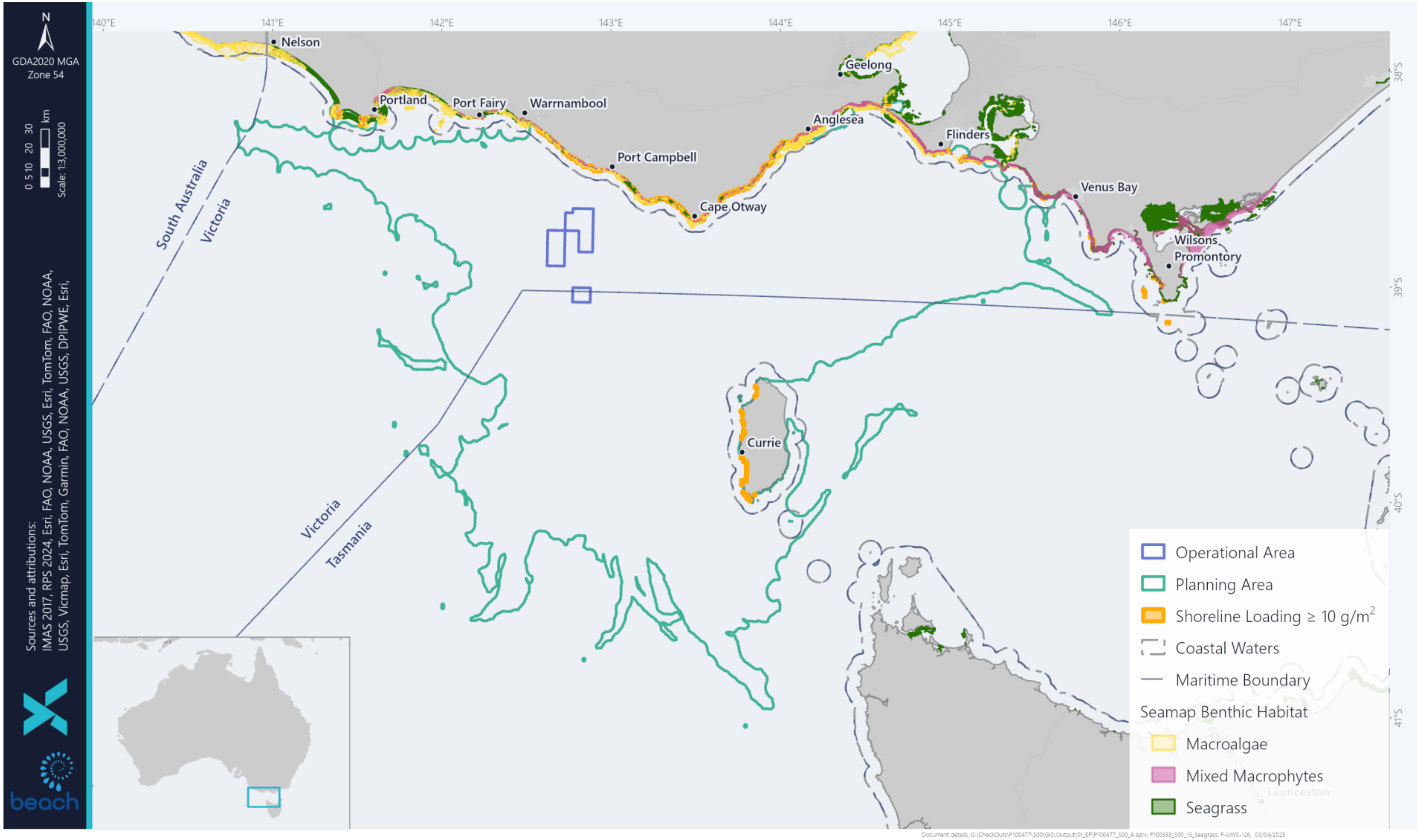


Figure 6-24: Presence of seagrass, macroalgae and mixed macrophyte habitat within the Planning Area.

6.4.3 Algae

Benthic microalgae are present in areas where sunlight reaches the sediment surface. Benthic microalgae are important in assisting with the exchange of nutrients across the sediment-water interface; and in sediment stabilisation due to the secretion of extracellular polymetric substances (Ansell et al. 1999). Benthic microalgae can also provide a food source to grazers such as gastropods and amphipods (Ansell et al. 1999).

Macroalgae communities occur throughout the Australian coast and are generally found on intertidal and shallow subtidal rocky substrates. Macroalgal systems are an important source of food and shelter for many ocean species; including in their unattached drift or wrack forms (McClatchie et al. 2006). Macroalgae are divided into three groups: *Phaeophyceae* (Brown Algae), Rhodophyta (Red Algae), and *Chlorophyta* (Green Algae). Brown Algae are typically the most visually dominant and form canopy layers (McClatchie et al. 2006). The presence and growth of macroalgae are affected by the principal physical factors of temperature, nutrients, water motion, light, salinity, substratum, sedimentation, and pollution (Sanderson 1997). Macroalgae assemblages vary, but *Ecklonia radiata* and *Sargassum* sp. are typically common in deeper areas.

Within the Planning Area, macroalgae are present along the Victorian coastline (Figure 6-25). No macroalgae have been mapped within Operational Area.

Kelp are a special group of large brown algae that attach themselves to solid structures to form forests. They extend their leaf-like fronds into the waters above them reaching towards the sunlight. These larger algae in turn create a habitat for smaller algae, invertebrates, and fish (VFA 2021). On Victoria's coast kelp forests grow on most rocky reefs in waters to a depth of around 30 m, although most are found in shallower waters (VFA 2021a).

Bull kelp or southern bull kelp (*Durvillaea potatorum*) is a fast-growing brown macroalgae (seaweed) with large dark brown and leathery strap-like blades. It consists of a body, called the thallus, with a stipe connecting the blades to the holdfast (a structure adhering the bull kelp to the seafloor.

Offshore Victoria and Tasmania there are two main species of *Durvillaea*, these are *D. potatorum* and *D. amatheiae*. The approximate distribution of the species is shown in Figure 6-25.

Durvillaea spp. are a significant habitat. The holdfast can be inhabited by a diverse array of epifauna and infauna invertebrates. These burrow into the holdfast creating holes that can be used by a wide variety of animals. In addition, *Durvillaea* spp. grow in large groups or forests that can become important nursery areas and sanctuary areas for fish, crustaceans, and other fauna.

Thurstan et al. (2018) gathered historical data on the use of bull kelp by First Nations. Bull kelp has a long history of use by First Nations people in Australia, New Zealand, and Chile. In Australia this reportedly dates back 65,000 years (Thurstan et al. 2018). First Nations people in Tasmania used dried bull kelp to transport water and food. The species name came from this use: *potatorum* means ‘to drink’ in Latin (Govt of SA 2025).

Thurstan et al. (2018) details a number of First Nations historical references for bull kelp including:

- Cultural activities and cultural history –mythology and sacred songs.
- Ceremonial activities –being burned or being used during smoking ceremonies.

- Medicinal use –bandages and medicinal poultice.
- Clothing – cloaks and shoes.
- Diet – raw, jelly, dried and roasted (preserving for several months).
- Fishing – ropes and fishing nets / traps, traps for short-finned eels, also used to assist during diving for crayfish.
- Shelter – waterproofing, wind proofing and carpeting.

Bulk kelp is also collected by the seaweed industry as described in Section 6.5.14.

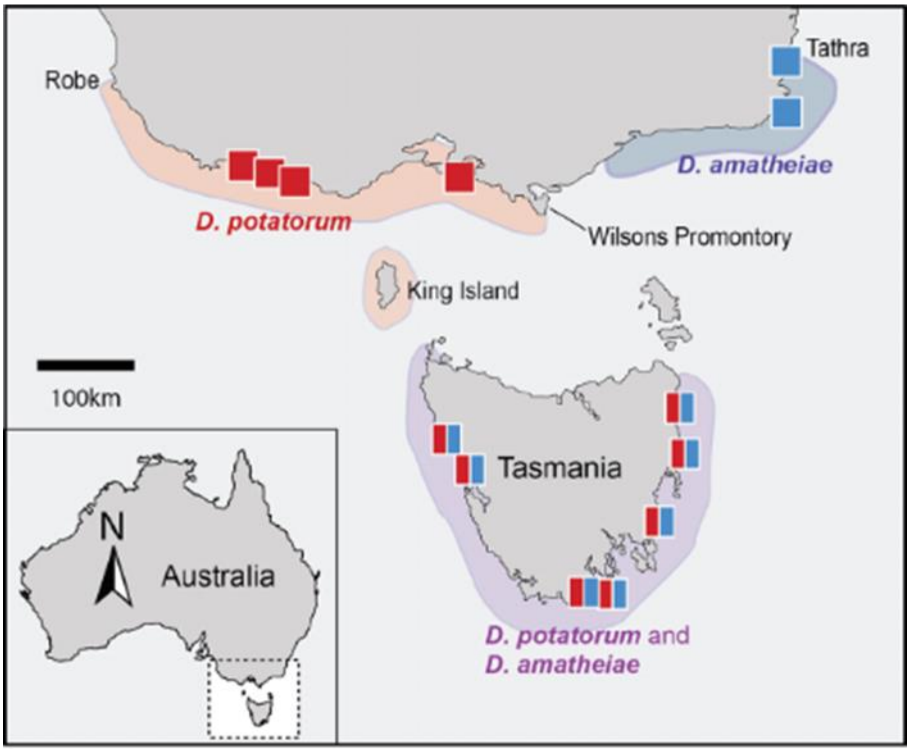


Figure 6-25: Distribution of Bull Kelp off Victoria and Tasmania (Velasquez et al. 2019)

6.4.4 Mangrove

Mangroves grow in intertidal mud and sand, with specially adapted aerial roots (pneumatophores) that provide for gas exchange during low tide (McClatchie et al. 2006). Mangrove forests are important in helping stabilise coastal sediments, providing a nursery ground for many species of fish and crustacean, and providing shelter or nesting areas for seabirds (McClatchie et al. 2006).

The mangroves in Victoria are the most southerly extent of mangroves found in the world and are located mostly along sheltered sections of the coast within inlets or bays (MESA 2015). There is only one species of mangrove found in Victoria, the white or grey mangrove (*Avicennia marina*), which is known to occur at Western Port and Corner Inlet. Small patches of mangroves have been mapped within the Planning Area at the Erskine River (Figure 6-26).

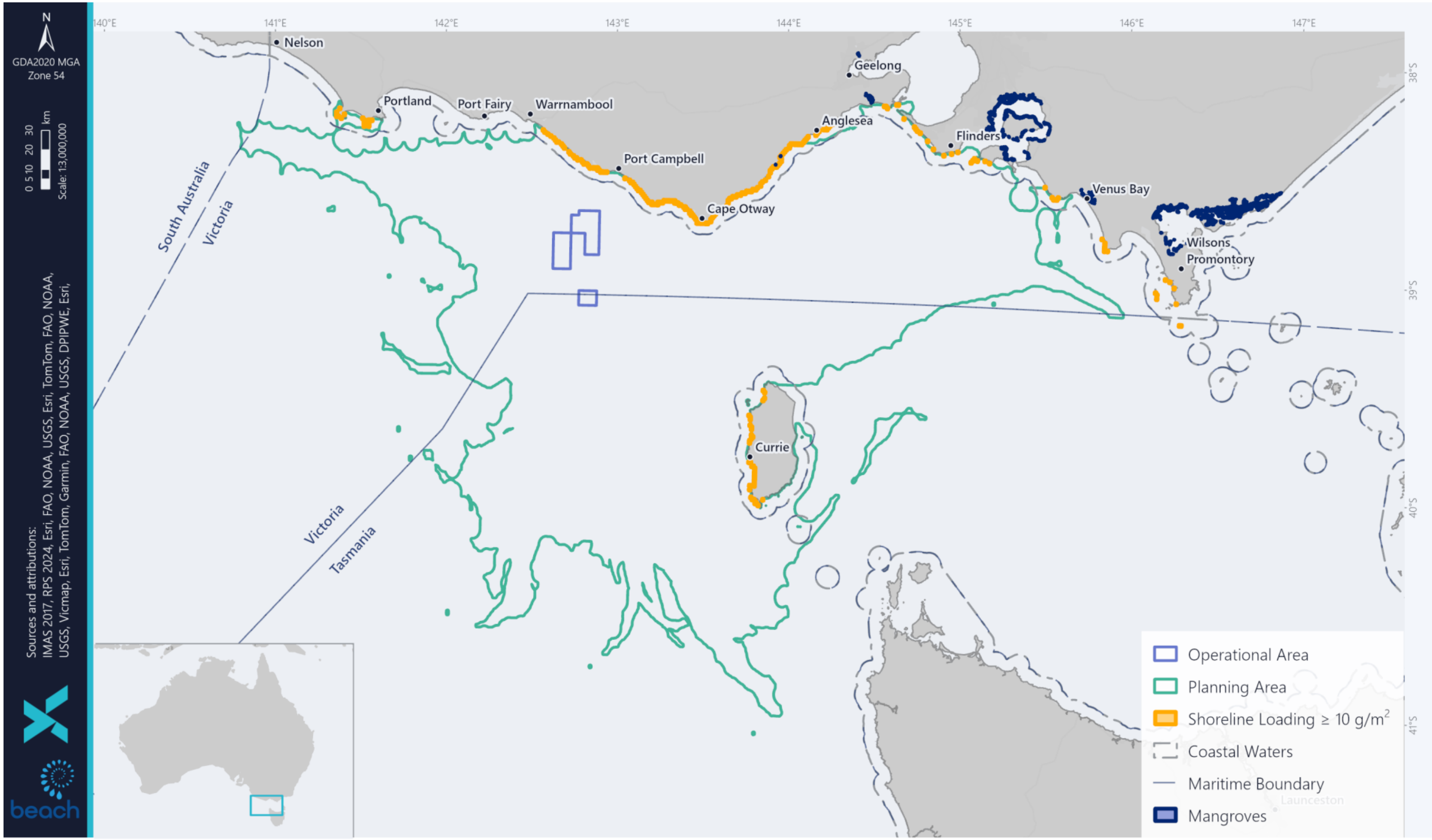


Figure 6-26: Presence of mangrove habitat within the Planning Area.

6.4.5 Saltmarsh

Saltmarshes are terrestrial halophytic (salt-adapted) ecosystems that mostly occur in the upper-intertidal zone and are widespread along the coast. Saltmarshes are typically dominated by dense stands of halophytic plants such as herbs, grasses, and low shrubs. In contrast to mangroves, the diversity of saltmarsh plant species increases with increasing latitude. The vegetation in these environments is essential to the stability of the saltmarsh, as they trap and bind sediments. The sediments are generally sandy silts and clays and can often have high organic material content. Saltmarshes provide a habitat for a wide range of both marine and terrestrial fauna, including infauna and epifaunal invertebrates, fish, and birds.

Saltmarsh is found along many parts of the Victorian coast, although is most extensive in western Port Phillip Bay, northern Western Port, within the Corner Inlet-Nooramunga complex, and behind the sand dunes of Ninety Mile Beach in Gippsland (Boon et al. 2011). Within the Planning Area, saltmarsh habitat has been mapped along the Victorian coastline including Kennett River (Figure 6-27).

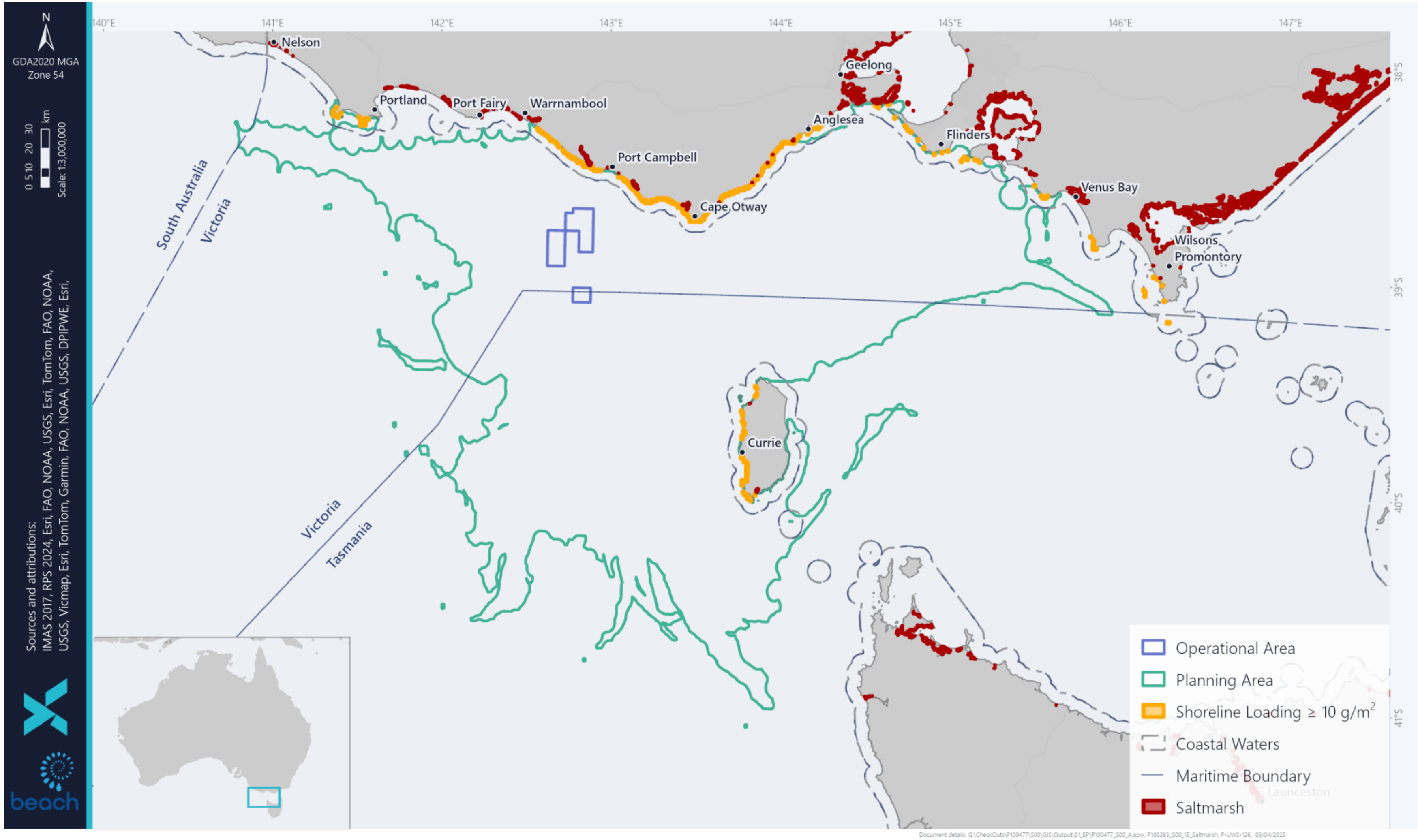


Figure 6-27: Presence of saltmarsh habitat within the Planning Area.

6.4.6 Plankton

Plankton are small animals and plants that float or drift on the surface or within the water column. Some forms have limited swimming ability but are still dispersed mainly by water currents. Plankton are a very important part of the ecosystem for several reasons:

- Primary production of the phytoplankton is considerable.
- Much of the plankton consists of eggs and juvenile stages of organisms which are not planktonic as adults. It is thus an important contributor to the maintenance of population and diversity in other habitats.
- Plankton is an important food resource for many larger organisms, including fish.

Plankton are abundant and widely distributed in the South East Marine Region. In the Otway Basin, they have patchy distributions linked to localised and seasonal productivity that produces sporadic bursts in populations (CoA 2015). Distribution in the Operational Area is expected to be highly variable both spatially and temporally and are likely to comprise characteristics of tropical, Southern Australian, central Bass Strait and Tasman Sea distributions.

Plankton are not protected under the EPBC Act.

6.4.7 Invertebrates

There is a very large number of marine invertebrates in deep waters around Australia. Knowledge of the species in different habitats is extremely patchy; the number of deep-water benthic fauna is large but almost unknown. Throughout the region, a variety of seabed habitats support a range of animal communities such as sparse sponges to extensive ‘thickets” of lace corals and sponges, polychaete worms and filter feeders (DNP 2013).

Characteristics of large species of crustacea, such as lobster, prawn and crab, which are significant commercial species in southern Australia, are well known. Mollusc species, such as oysters, scallops and abalone are also commercially fished, and their biology and abundance are well known. Major fisheries for the blacklip and to a lesser extent, greenlip abalone and scallops have been founded. The cooler waters of southern Australia also support the Maori Octopus commercial fishery, which is one of the largest octopuses in Australia (with arm spans longer than 3 m and weighing more than 10 kg). Other molluscs are abundant in southern Australia and Tasmania such as the sea-slug with more than 500 species. Volutes and cowries represent a relic fauna in southern Australia, with several species being very rare and can be highly sought after by collectors.

Echinoderms, such as sea stars, sea urchins and sea cucumbers are also an important fauna species of the southern Australian and Tasmanian waters, with several species at risk of extinction (DPIPWE 2016).

Studies by the Museum of Victoria found that invertebrate diversity was high in southern Australian waters although the distribution of species was patchy, with little evidence of any distinct biogeographic regions (Wilson and Poore 1987). Results of sampling in shallower inshore sediments reported high diversity and patchy distribution (Parry et al. 1990). In these areas, crustaceans, polychaetes, and molluscs were dominant.

6.4.7.1 Commercially Important Invertebrate Species

6.4.7.1.1 Abalone

Blacklip abalone (*Haliotis rubra rubra*) and greenlip abalone (*Haliotis laevigata*) are commercially important reef-dwelling species widely distributed across tropical and temperate coastal areas. Abalone are single shelled with a fleshy body and muscular foot which they use to attach to hard substrate, typically in water depths of 5-10 m however they can be found in depths up to 40 m (DPI 2024). A distinguishing feature of this genus is their rows of small holes or 'pores' along the edge of their shells where the organism will expel water that has passed through its gills (DPIRD 2016). Females produce and release millions of eggs each year into the water column, where they are fertilised by sperm released by males. Fertilised eggs hatch into larvae and after about a week the larvae develop into small juveniles which settle onto rocks (DPIRD 2016). After settlement, juvenile abalone hide under rocks during the day only emerging in the night to feed. Once abalone reach sexual maturity (approximately 5-8 years old) most animals no longer engage in this behaviour and become sedentary, rarely moving more than a few hundred metres from their natal site (DNRET 2022a). Evidence confirms that the greenlip abalone comprises numerous independent biological stocks at a spatially broad scale, even larger than the biological stock structure of the blacklip abalone (Stobart et al. 2023).

Stock status records show the blacklip abalone to be sustainable in 1 of 4 NSW stocks, 2 of 3 South Australian stocks and in all 4 Tasmanian stocks. Of the remaining stocks, 4 are determined to be depleting (VIC and NSW) and while the last is depleted in NSW. Stock status records show the greenlip abalone to be sustainable in 2 of 3 South Australian stocks and in the Tasmanian stock, while undefined in 3 other stocks (VIC, SA). Figure 6-28 and Figure 6-29 show the distribution of reported commercial catch of both species in south-eastern Australia (Mundy et al. 2023; Stobart et al. 2023) which indicates that they are likely to be present in the Planning Area. Although neither abalone species have EPBC status or an associated recovery or management plans, there are a range of anthropogenic threats that have the potential to affect them including:

- Commercial and recreational fishing, and
- Climate change (i.e. ocean acidification).

During consultation it was identified that Victorian stocks are at risk of a herpes-like virus that is believed to reappear when abalone are under stress.

Figure 6-28: Distribution of reported commercial catch of blacklip abalone (Mundy et al. 2023)

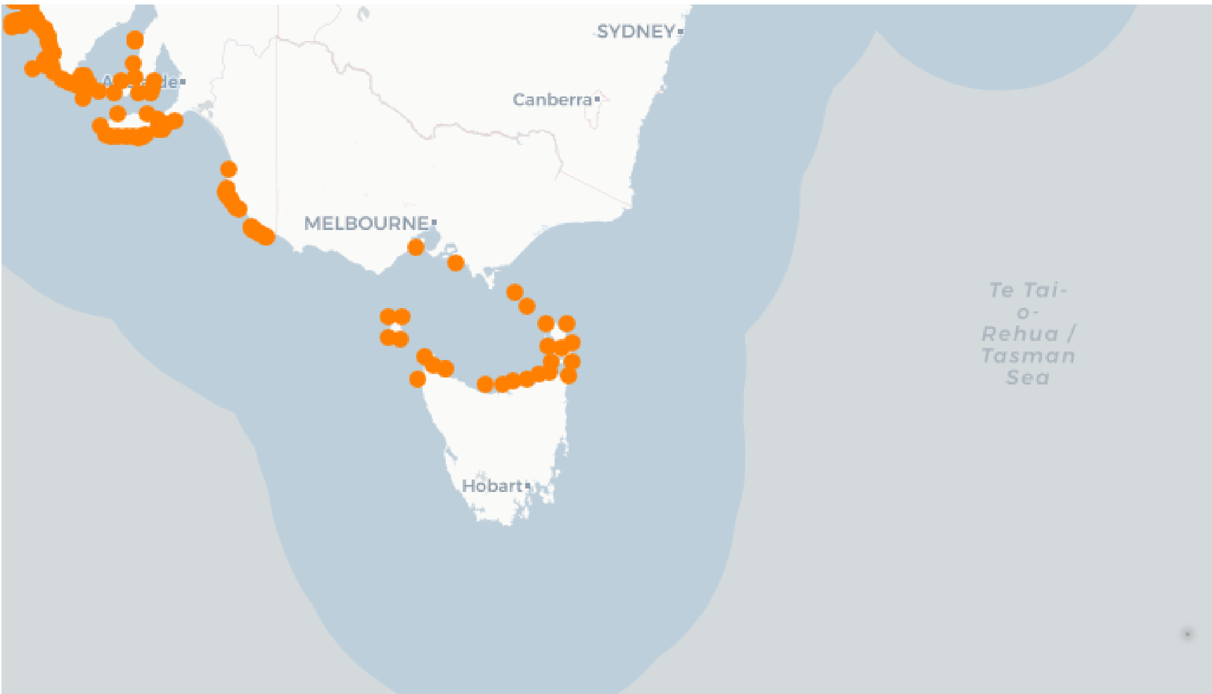


Figure 6-29: Distribution of reported commercial catch of greenlip abalone (Stobart et al. 2023)

6.4.7.1.2 Commercial Scallop

Commercial scallops (*Pecten fumatus*) are a commercially important species that can be distinguished from other scallops by their equal-sized circular shaped shells. This species is distributed throughout southern Australia, from mid NSW to mid-WA including Tasmania in depths between 1-120 m. Scallops are typically sedentary benthic organisms that aggregate into beds and can be found buried in soft sediment (mud and sand). Spawning is known to only occur after a two-year development period and is thought to be triggered by an increase in temperature. Commercial scallops can release up to one million eggs into the water column during spawning.

There are four commercial scallop stocks in Australia: Bass Strait Central Zone Scallop Fishery, Port Phillip Bay Dive Scallop Fishery, Tasmanian Scallop Fishery and Victoria's Ocean Scallop Fishery. Stock status records show the species to be sustainable through the Commonwealth and Port Phillip Bay jurisdictions, recovering in Tasmanian jurisdiction stocks, and depleted in the Victorian Fisheries jurisdictions (Bromhead and Semmens 2023). However, since being closed in 2015 due to low stock the Tasmanian Scallop Fishery was approved to reopen in September of 2021 and has continued on with the 2022 season. Figure 6-30 shows the distribution of reported commercial catch of commercial scallop in south-eastern Australia (Bromhead and Semmens 2023) which indicates it is likely to be present in the Planning Area. Although, the commercial scallop does not have EPBC status or an associated recovery or management plan, there are a range of anthropogenic threats that have the potential to affect commercial scallops including:

- Commercial and recreational fishing, and
- Climate change (i.e. ocean acidification).

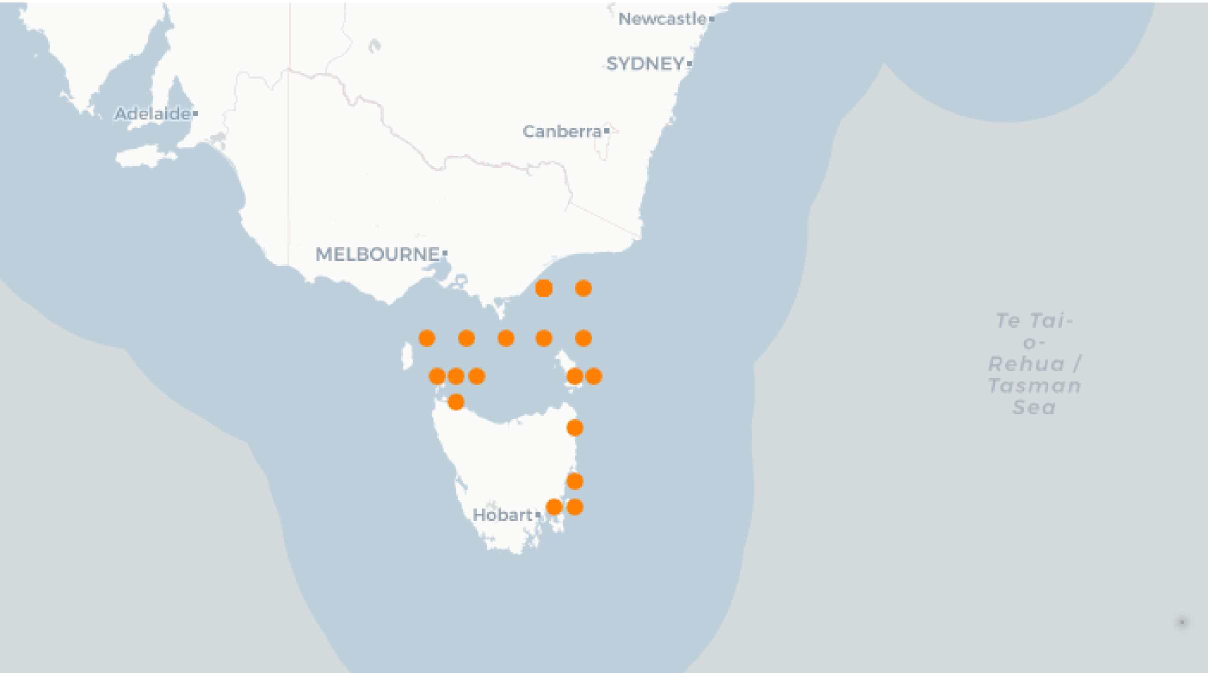


Figure 6-30: Distribution of reported commercial catch of commercial scallops (Bromhead and Semmens 2023)

6.4.7.1.3 Giant Crab

The giant crab (*Pseudocarcinus gigas*) is a commercially important species in the region that is endemic to the waters of southern Australia (DoE 2014a) (Figure 6-31). This species resides on muddy or rocky bottoms in waters of the Southern Ocean at depths from 18 to 600 m depth (Gardner and Welsford 2003, Poore 2004, Heeren and Mitchell 1997). Most commonly this species is found in the shelf break habitat associated with bryozoan substrates between 140 m and 270 m (Poor 2004, Leon et al. 2017). The habitat of early juveniles has yet to be established, however there is some evidence that smaller individuals occur in deeper water (Williams et al 2009; Leon unpublished data). Additionally, bryozoan communities are rich in prey items suitable for juvenile crabs, suggesting that this particular habitat is likely to be important for the settlement and growth of giant crab (Levings 2001). Williams et al. (2009) notes that giant crabs observed during surveys along the continental slope were using ledges and sponges for shelter. Given its habitat preferences and mapped fishing activity (edge of the continental slope), giant crabs are known to be present in the shelf slope of the Planning Area and may be present in the Operational Area.

Giant carb feeds on carrion and slow-moving benthic species including gastropods, crustaceans and starfish. They breed in June and July, and the females carry up to two million eggs for approximately four months. As hatching approaches (October to November), females are thought to migrate to the shelf-break (Currie and Ward 2009). Upon hatching, the larval duration is around 50 days with larvae release occurring at the edge of the continental shelf (FRDC 2017). There is a strong capacity for larval dispersal over large spatial scales prior to settlement (PIRSA 2002). Recruitment is not distributed evenly, with some areas having higher juvenile abundance than others, which is not a function of habitat but larval drift and ocean current movements (FRDC 2018). Oceanographic modelling has demonstrated the species is of a single biological stock with larval dispersal occurring along the edge of the continental shelf and drifting with plankton for a 50-day period.

Female moulting peaks strongly in winter (June and July). Males moult in summer (November and December). Intermoult period estimates varied from 3 to 4 years for juvenile males and females, with rapid lengthening in time between moulting events to approximately 7 years for females and 4.5 years for males. Gardner (1998) reports that females appear to mate while soft-shelled with stored sperm remaining viable for at least 4 years; broods are produced annually although females occasionally skip a reproductive season, which may be associated with moulting, and several broods may be produced between moults although fecundity declines with successive broods.

The species key biological features (e.g., long-lived, slow growing) have the potential to leave the population vulnerable to decline (FRDC 2018). While there is little scientific data on the population, stock status records show the species to be sustainable in WA, but depleting in SA and depleted in Victoria (Hartmann et al. 2023a). The Tasmanian stock status is classified as undefined (Hartmann et al. 2023a). The giant crab does not have EPBC status or an associated recovery or management plan. There are a range of anthropogenic threats that affect giant crabs including:

- Commercial and recreational fishing, and
- Ecosystem effects as a result of habitat modification and climate change.

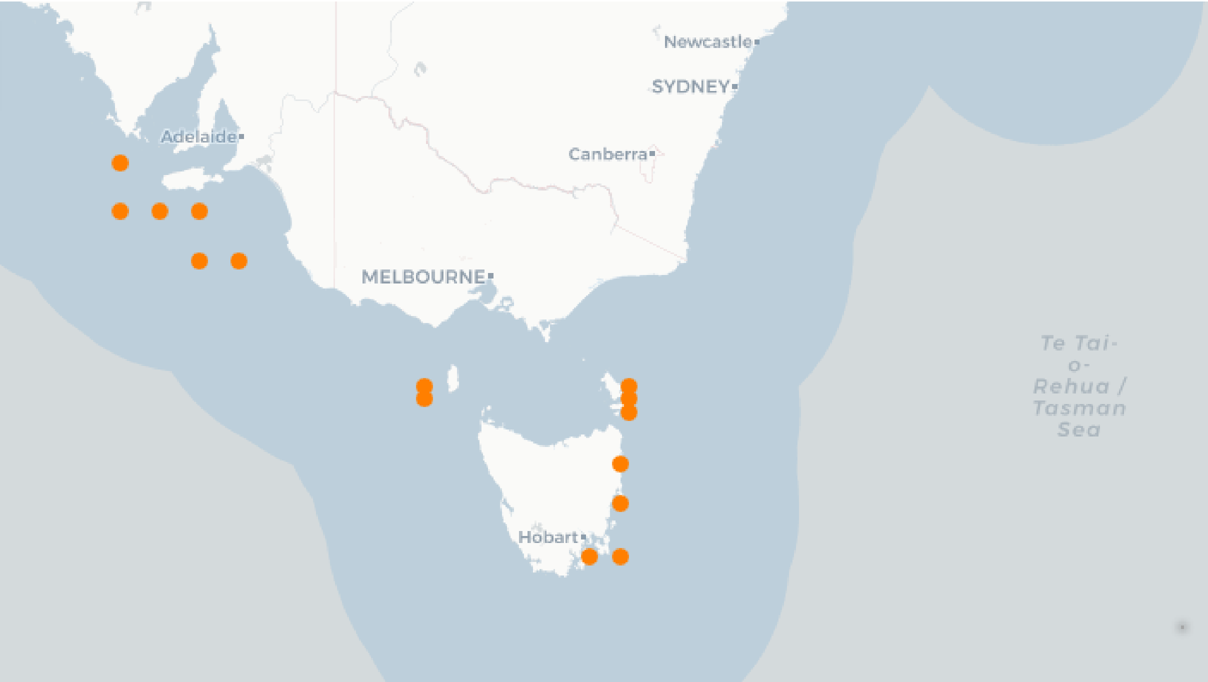


Figure 6-31: Distribution of reported commercial catch of giant crab (Hartmann et al. 2023a)

6.4.7.1.4 Octopus

The pale octopus (*Octopus pallidus*) is a commercially important species found across the Great Australian Bight around Tasmania and towards southern NSW. They can be found inhabiting sand and mud substrates, often in association with sponge gardens or beds of large solitary sea squirts in depths up to 600 m (Atlas of Australia 2022a). This species hides during the day and feeds at night primarily on bivalves, which are pulled apart or drilled. The pale octopus lays large eggs that are attached to hard substrates and foraging begins immediately after hatching. Evidence suggests that there are a number of subpopulations within the Bass Strait due to limited species dispersal and isolation due to distance (Hartmann et al. 2023b).

Stock status records show the species to be depleting in the Tasmanian jurisdiction, undefined in the Victorian and SA jurisdictions and negligible in NSW due to historically low catch rates. Figure 6-32 shows the distribution of reported commercial catch of pale octopus in south-eastern Australia (Hartmann et al. 2023b) which indicates it is likely that they will be present within the Operational Area and Planning Area. Although, the pale octopus does not have EPBC status or an associated recovery or management plan, there are a range of anthropogenic threats that have the potential to affect them. Key threats identified include:

- Commercial and recreational fishing, and
- Climate change.

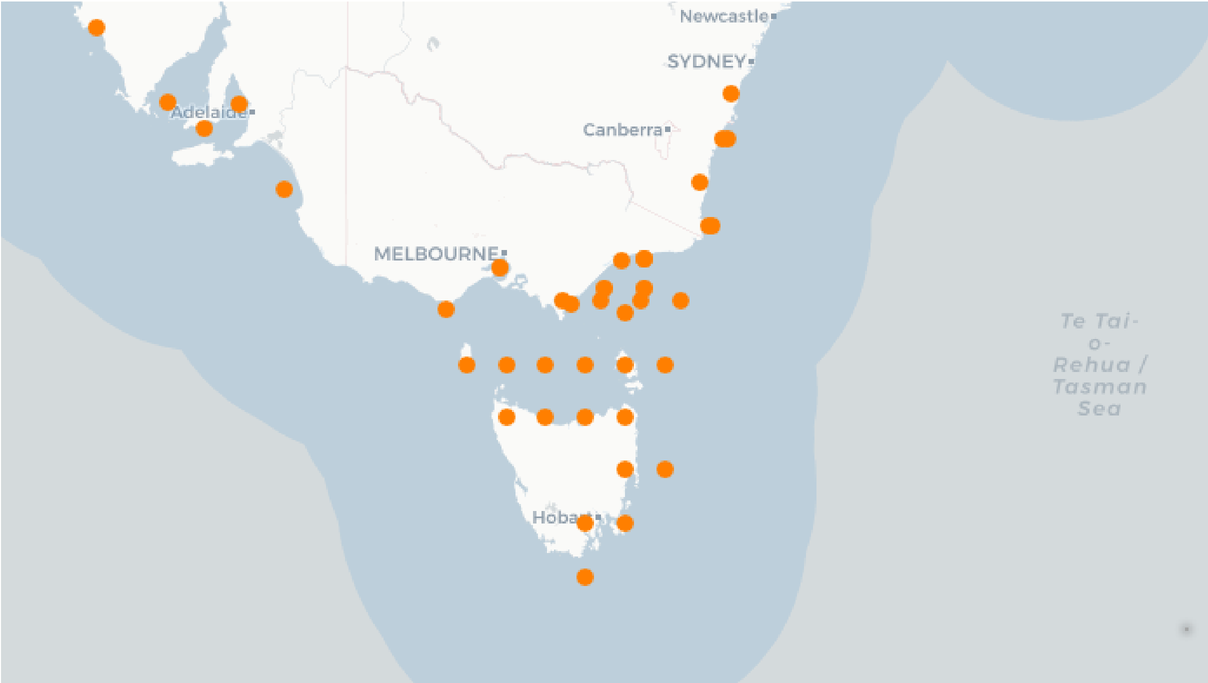


Figure 6-32: Distribution of reported commercial catch of pale octopus (Hartmann et al. 2023b)

6.4.7.1.5 Pipi

Pipi (*Donax deltoides*) are a commercially important species found on sandy beaches between southern QLD and the Murray River in SA and have been a culturally important species to First Nations people for thousands of years. Life expectancy for this species is between 4-5 years and like most bivalves this species filter feeds by extracting microscopic matter from the water column (Ferguson et al. 2023). Typically, pipi reach sexual maturity towards the end of their first year and are then able to spawn year-round. East Australian and South Australian currents act as key drivers of gene flow on the east and south coasts of Australia which has resulted in high genetic variation between populations on either side of Bass Strait (Ferguson et al. 2023).

Stock status records show the species to be sustainable through the NSW and SA jurisdiction while the Victorian jurisdiction is undefined. Figure 6-33 shows the distribution of reported commercial catch of pipi in south-eastern Australia (Ferguson et al. 2023) which indicates it is likely that they will be present in the Planning Area. Although, pipi does not have EPBC status or an associated recovery or management plan, there are a range of anthropogenic threats that have the potential to affect them. Key threats identified include:

- Commercial and recreational fishing, and
- Climate change.

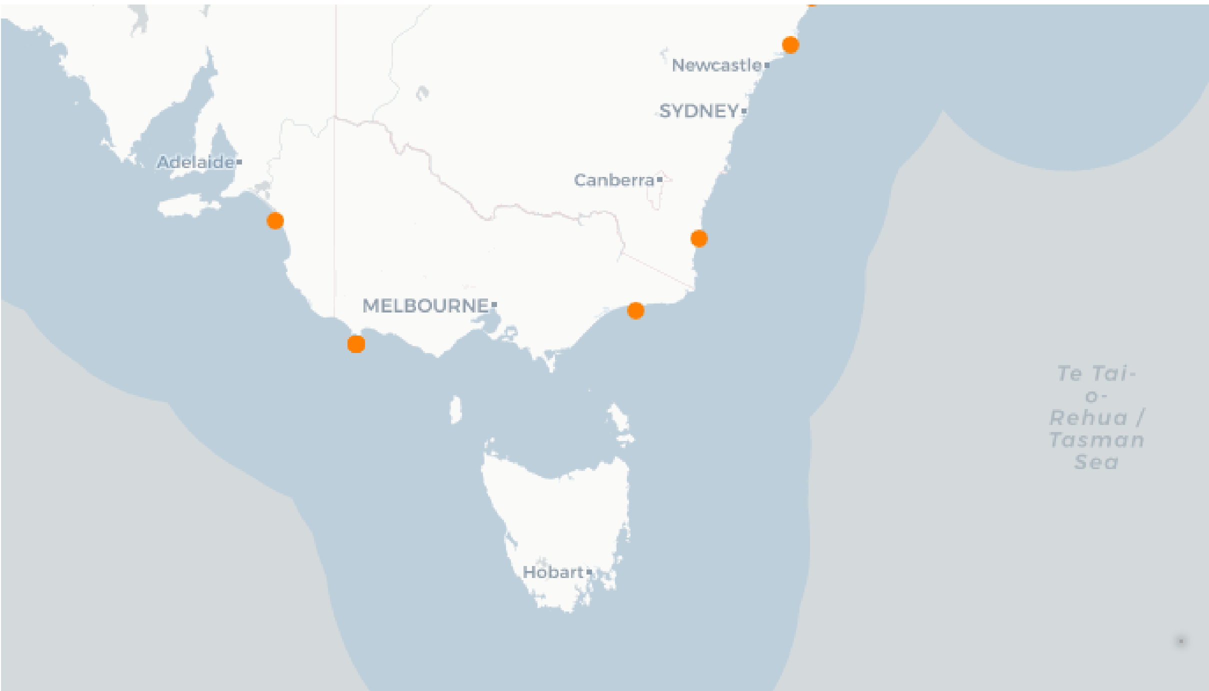


Figure 6-33: Distribution of reported commercial catch of pipi (Ferguson et al. 2023)

6.4.7.1.6 Southern Rock Lobster

The southern rock lobster (SRL) (*Jasus edwardsii*) is a commercially important species that is found on coastal reefs from the south-west coast of WA to the south coast of NSW, including Tasmania and the New Zealand coastline (Figure 6-34). SRL are found in depths up to 150 m (DPI 2009). In Victoria, the abundance of SRL decreases from west to east reflecting a decreasing area of suitable rocky reef habitat (DPI 2009).

Most adult SRL remain within the same region (moving less than 1 km), though some tagged SRL have moved more than 80 km between inshore and offshore reefs (SRL 2021). More broadly in the region, SRL habitat occurs as patchy, discontinuous low-profile reef running parallel to the coast. Bathymetry mapping, including recent shelf mapping of the Zeehan Multiple Use Zone funded by Parks Australia found the existence of multiple marine canyons in the area as well as areas of deep reef extending across the shelf from the shelf-break. The outer shelf region is limestone reef pavement that becomes significantly more fractured with notable long step-features which were rarely undercut limiting habitat available for crevice-dwelling species such as the SRL (Barrett et al. 2023). Preliminary research in the area has found that while multibeam sonar mapping has identified areas of suitable reef, 300 camera drops identified no lobsters which is likely due to the absence of suitable crevice-like habitat (Barrett et al. 2023). Therefore, the Zeehan Multiple Use Zone is likely low-quality habitat (Barrett et al. 2023) for the SRL at ecologically or commercially important levels. In any case, it is assumed that where rocky reef is located within the Planning Area, SRL are likely to be present.

Adult SRL are carnivorous and feed mostly at night on a variety of bottom dwelling invertebrates such as molluscs, crustaceans and echinoderms. The main predators of SRL are octopus, sharks and reef fish such as wrasse and ling (SRL 2021).

The life cycle of the SRL is complex. After mating between April and July (SRL 2021), fertilised eggs (up to 1,000,000 per female) are carried under the tail of the female for approximately 4-6 months before being released, typically between September and November. Larval release occurs across the southern continental shelf, which is a high-current area, facilitating dispersal. Oceanographic modelling has also indicated that SRL dispersal occurs over large spatial scales, indicating that there is a single biological stock (Bruce et al. 2007). Genetic analyses also indicate that it is a single stock (Ovenden et al. 1992). This suggests that SRL in the Otway Bioregion is present as a connected stock with recruitment into the permit area from upstream subpopulations.

Once released, SRL larvae, or phyllosoma, undergo 11 developmental stages over a period of 12 and 24 months (Hartmann et al. 2013; SRL 2021) while being carried by ocean currents up to 200 km offshore far beyond the continental shelf. At the end of this developmental phase, phyllosoma larvae moult and metamorphose into a puerulus larvae (a transparent miniature version of the adult), still living in the water column but not feeding (SRL 2021). Successful metamorphosis from the final-stage phyllosoma to puerulus stage occurs far offshore sometimes even beyond the continental shelf (SRL 2021). The puerulus swim inshore at night to settle onto reef habitat in depths from 50 m to the intertidal zone (Booth et al. 1991) where they moult into pigmented juvenile lobsters (SRL 2021). Bruce et al. 2007 reported data for state-maintained puerulus collector sites, which indicates that most puerulus settlement in NW Tasmania occurs June through August, tapering off in September.

SRL grow by moulting or shedding their exoskeleton. Juvenile lobsters moult approximately 5 times per year, declining to once a year for mature adults. Research on temporal moulting patterns in adult SRL in Tasmanian waters including King Island (Gardner and Mills 2013), which tracked over 4,000 tagged individuals, found females mainly moult between February and May while males moult mainly in August and September with the greater majority moulting in August. The Tasmanian Seafood Industry Council (TSIC) advised that moulting for adult males occurs in September and October. Males grow faster and larger than females, reaching 160 mm in carapace length after ten years. Females generally reach 120 mm in the same period. Growth rates also vary spatially, with growth faster in the east than in the west (DPI 2009). It can take between 3 and 10 years for SRL to reach commercial fishing size (SRL 2021).

Although rock lobsters have no formal protection under Australian law, Hayes et al. (2021) identified SRL as a key natural value for the South-East marine park network. The key natural values were identified by subject matter experts using a set of criteria developed from the criteria used to identify equivalent or similar concepts in other national and international contexts. Each key natural value is allocated to an ecosystem within the common language and thereby mapped.

The SRL does not have an EPBC status or associated recovery or management plan. While there is little scientific data on the population, stock status records indicate that the southern Australian stock is sustainable (Linnane et al. 2023). However, the stock status is only marginally above the limit reference point for egg production. The populations of SRL in the north-west of Tasmania are characterised by larger individuals and faster growth than much of the rest of the state. The Tasmanian stock assessment area that incorporates King Island and part of the AMP has the second lowest biomass in Tasmania, as well as the lowest egg production in the state (Hartmann 2022).

Surveys of commercial fishers operating in and around the ZMP, as well as analysing commercial rock lobster catch data in the region, identified that most of the fishing reported occurred in waters closer to King Island than the marine park offshore (UTAS 2023). Surveys also identified that the aggregate catches recorded in fishery reporting blocks overlapping the ZMP were low relative to other areas, implying an overall low population density within the park. A review of catch data showed that catch in tonnes appears to have remained steady since 2008 for both the Tasmanian and Victorian fishing blocks.

Pressures on SRL populations include fishing, climate change, with respect to declining individual performance with warming, potential future competition with conspecific lobsters, and future interactions with the range-extending destructive sea urchin (UTAS 2023).

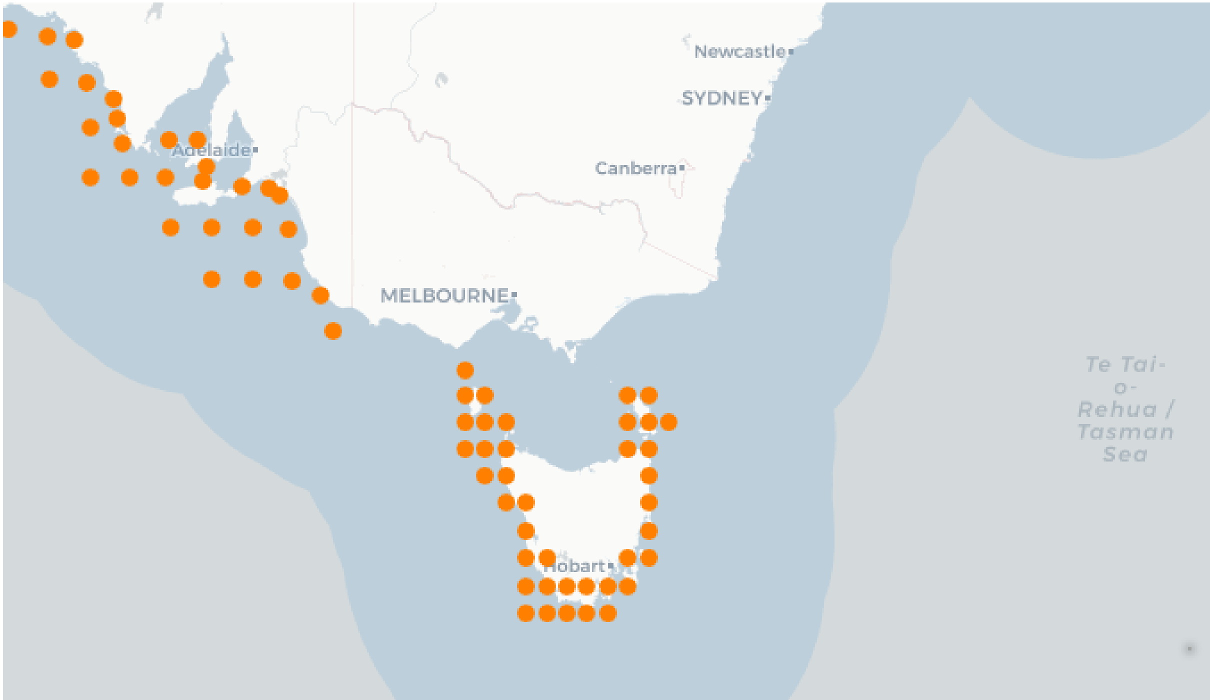


Figure 6-34: Distribution of reported commercial catch of southern rock lobster (Linnane et al. 2023)

6.4.7.1.7 Squid

Gould's squid (*Nototodarus gouldi*) are a commercially important species typically found at depths from 50 – 200 m off the subtropical and temperate coasts of Australia (Atlas of Living Australia 2022b). Gould's squid feed on crustaceans, fish and cephalopods at night and in turn are prey for birds, large fish, sharks and marine mammals (O'Sullivan and Cullen 1983). Gould's squid are short lived (less than one year), spawn multiple times during their life cycle, and display highly variable growth rates, size and age at maturity (Jackson and McGrath-Steer 2003).

Noriega et al (2023) highlights characteristics of the Gould's squid's lifecycle which lend itself to rapid increases in biomass during favourable environmental conditions, making it less susceptible to becoming overfished than longer-lived species. The species is commercially harvested and the population size in Bass Strait varies from year to year. This is primarily due to its short life cycle, the 'boom and bust' nature of its population dynamics and life history characteristics. Figure 6-35 shows the distribution of reported commercial catch of Gould's squid in south-eastern Australia (Noriega et al. 2023) which indicates it is likely that Gould's squid will be present in the Planning Area.

There is no formal stock assessment available for the population, however stock status records show the species in south-eastern Australia to be of a sustainable level (Noriega et al. 2023). However, there are a range of anthropogenic threats that affect the population including:

- Commercial and recreational fishing, and
- Ecosystem effects as a result of habitat modification and climate change.

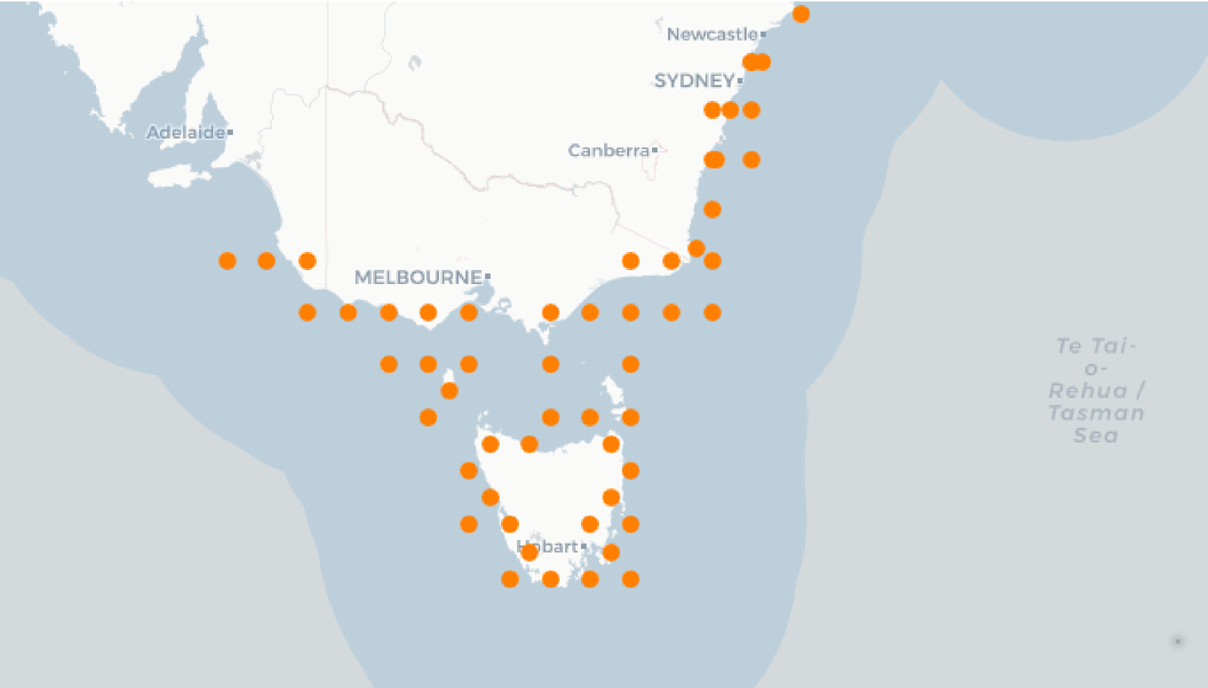


Figure 6-35: Distribution of reported commercial catch of Gould's squid (Noriega et al. 2023)

6.4.8 Threatened Ecological Communities

Threatened Ecological Communities (TECs) provide wildlife corridors or refugia for many plant and animal species, and listing a TEC provides a form of landscape or systems-level conservation (including threatened species).

No TECs were identified within the Operational Area. TECs identified in the PMST Report (Appendix H) as occurring in the Planning Area are presented in Figure 6-36 and Table 6-18.

TECs identified in the PMST Report due to the size of the grids used in the PMST but not actually intersecting the Planning Area are listed in the Table with 'X'. TECs which intersect a Planning Area and have a coastal component which may be exposed to hydrocarbons from a spill event are discussed in the subsections below.

Table 6-18: Threatened Ecological Communities within the Planning Area

Threatened Ecological Community	Threatened Category	Coastal Component	Operational Area	Planning Area
Assemblages of species associated with open-coast salt-wedge estuaries of western and central Victoria ecological community	Endangered	✓	-	✓
Giant Kelp Marine Forests of South East Australia	Endangered	✓	-	✓

Grassy Eucalypt Woodland of the Victorian Volcanic Plain	Critically Endangered	-	-	X
Karst springs and associated alkaline fens of the Naracoorte Coastal Plain Bioregion	Endangered	-	-	X
King Island Scrub Complex	Endangered	-	-	X
Natural Damp Grassland of the Victorian Coastal Plains	Critically Endangered	-	-	X
Natural Temperate Grassland of the Victorian Volcanic Plain	Critically Endangered	-	-	X
Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains	Critically Endangered	-	-	X
Subtropical and Temperate Coastal Saltmarsh	Vulnerable	✓	-	✓
Tasmanian Forests and Woodlands dominated by black gum or Brookers gum (*Eucalyptus ovata / E. brookeriana*)	Critically Endangered	-	-	X
Tasmanian white gum (*Eucalyptus viminalis*) wet forest	Critically Endangered	-	-	X
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Critically Endangered	-	-	X

6.4.8.1 Assemblages of Species associated with Open-coast Salt-wedge Estuaries of Western and Central Victoria Ecological Community

This TEC is the assemblage of native plants, animals and micro-organisms associated with the dynamic salt-wedge estuary systems that occur within the temperate climate, microtidal regime (<2 m), high wave energy coastline of western and central Victoria. The TEC currently encompasses 25 estuaries in the region defined by the border between South Australia and Victoria and the most southerly point of Wilsons Promontory (TSSC 2018).

Salt-wedge estuaries are usually highly stratified, with saline bottom waters forming a 'salt-wedge' below the inflowing freshwater layer of riverine waters. The dynamic nature of salt-wedge estuaries has important implications for their inherent physical and chemical parameters, and ultimately for their biological structure and ecological functioning. Some assemblages of biota are dependent on the dynamics of these salt-wedge estuaries for their existence, refuge, increased productivity, and reproductive success. The TEC is characterised by a core component of obligate estuarine taxa, with associated components of coastal, estuarine, brackish, and freshwater taxa that may reside in the estuary for periods of time and/or utilise the estuary for specific purposes such as reproduction, feeding, refuge, migration (TSSC 2018).

6.4.8.2 Giant Kelp Marine Forests of South East Australia

Giant kelp (*Macrocystis pyrifera*) is a large brown algae that grows on rocky reefs in cold temperate waters off south east Australia. The kelp grows up from the sea floor 8 m below the sea surface and deeper, vertically toward the water surface. It is the foundation species of this TEC in shallow coastal marine ecological communities. The kelp species itself is not protected, rather, it is communities of closed or semi-closed Giant Kelp canopy at or below the sea surface that are protected (DSEWPaC 2012a).

Giant Kelp is the largest and fastest growing marine plant. Their presence on a rocky reef adds vertical structure to the marine environment that creates significant habitat for marine fauna, increasing local marine biodiversity. Species known to shelter within the kelp forests include weedy sea dragons (*Phyllopteryx taeniolatus*), six-spined leather jacket (*Mesuchenia freycineti*), brittle stars (ophiuroids), sea urchins, sponges, blacklip abalone (*Tosia* spp.) and southern rock lobsters (*Jasus edwardsii*). The large biomass and productivity of the Giant Kelp plants also provides a range of ecosystem services to the coastal environment.

Giant Kelp requires clear, shallow water no deeper than approximately 35 m deep (Edyvane 2003; Shepherd and Edgar 2012; cited in TSSC 2012). They are photo-autotrophic organisms that depend on photosynthetic capacity to supply the necessary organic materials and energy for growth. O'Hara (in Andrew 1999) reported that giant Giant Kelp communities in Tasmanian coastal waters occur at depths of 5-25 m.

Figure 6-36 shows that the largest extent of Giant Kelp marine forests are along the SA coastline with patches around the Victorian coastline.

James et al (2013) undertook extensive surveys of macroalgal communities along the Otway Shelf from Warrnambool to Portland in south-west Victoria. Sites were adjacent to shore or on offshore rocky reefs covering a depth range of 0 to 36 meters water depth. These surveys did not locate Giant Kelp at any site but identified that other brown algae species (*Durvillaea, Ecklonia, Phyllospora, Cystophora, and Sargassum*) are prolific to around 20 m water depth. Brown algae tend to be replaced by red algae in deeper waters.

Surveys of the Arches Marine Sanctuary (Edmunds et al. 2010) and Twelve Apostles Marine National Park (Holmes et al. 2007 cited in Barton et al. 2012) have not located giant Giant Kelp. The species has been recorded in Discovery Bay National Park forming part of a mixed brown algae community (Ball and Blake 2007) (not part of the TEC), on basalt rocky reefs. An assemblage dominated by the species has been recorded from Merri Marine Sanctuary occupying a very small area (0.2ha) of rocky reef (Barton et al. 2012).

6.4.8.3 Subtropical and Temperate Coastal Saltmarsh

This TEC occurs in a relatively narrow strip along the Australian coast, within the boundary along 23°37' latitude along the east coast and south from Shark Bay on the west coast (DSEWPaC 2013a). The TEC is found in coastal areas which have an intermittent or regular tidal influence. Figure 6-36 shows that from Corner Inlet to Marlo there is a substantial amount of subtropical and temperate coastal saltmarsh along the Victorian coastline.

The TEC community consists mainly of salt-tolerant vegetation including grasses, herbs, sedges, rushes, and shrubs. Succulent herbs, shrubs and grasses generally dominate, and vegetation is generally less than 0.5 m in height (Adam 1990). In Australia, the vascular saltmarsh flora may include many species, but is dominated by relatively few families, with a high level of endism at the species level.

The TEC is inhabited by a wide range of infaunal and epifaunal invertebrates and low and high tide visitors such as fish, birds, and prawns (Adam 1990). It is often important nursery habitat for fish and prawn species. Insects are also abundance and an important food source for other fauna. The dominant marine residents are benthic invertebrates, including molluscs and crabs (Ross et al. 2009).

The TEC provides extensive ecosystem services such as the filtering of surface water, coastal productivity and the provision of food and nutrients for a wide range of adjacent marine and estuarine communities and stabilising the coastline and providing a buffer from waves and storms. Most importantly, saltmarshes are one of the most efficient ecosystems globally in sequestering carbon, due to the biogeochemical conditions in the tidal wetlands being conducive to long-term carbon retention. A concern with the loss of saltmarsh habitat is that it could release the huge pool of stored carbon to the atmosphere.

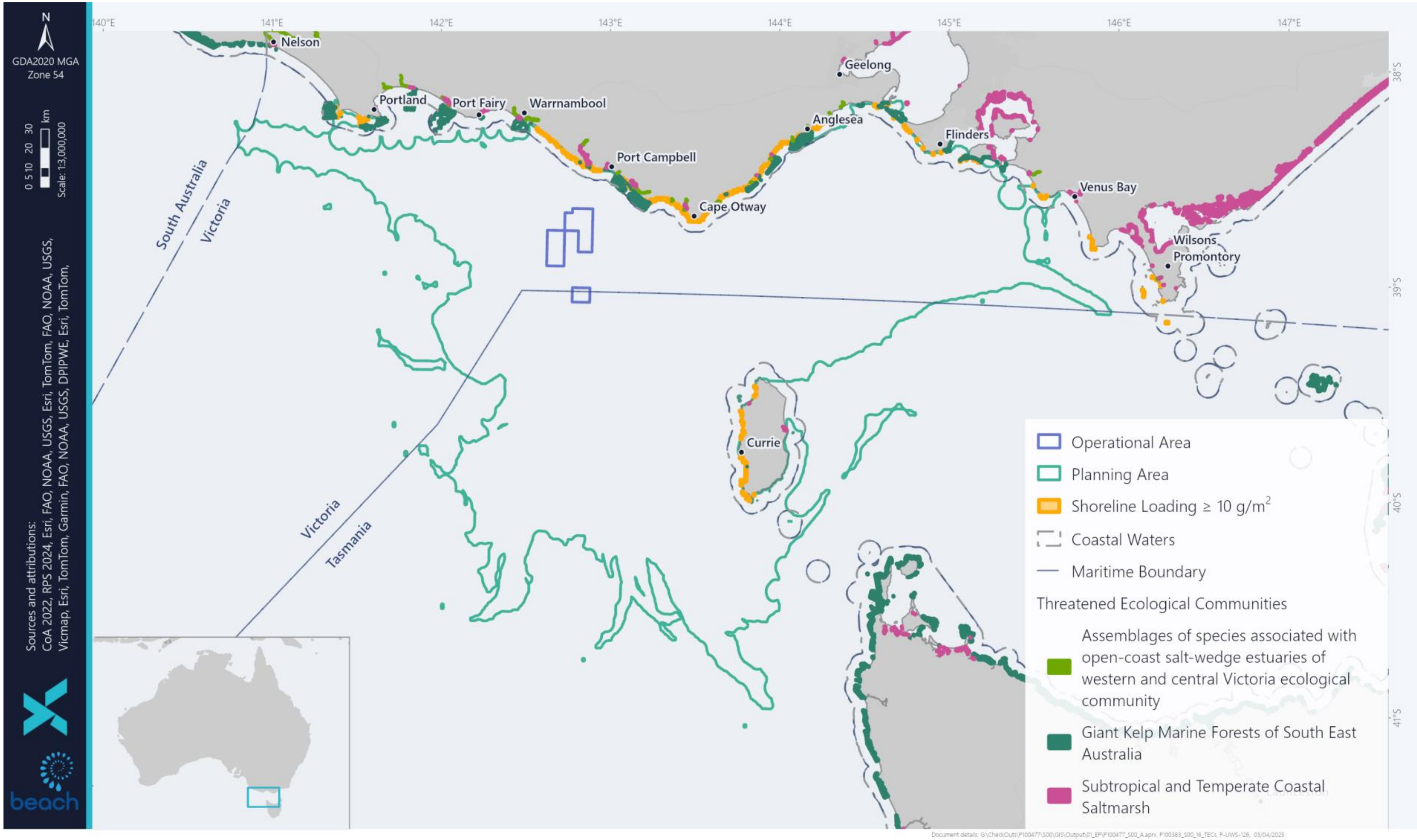


Figure 6-36: Threatened Ecological Communities within the Planning Area.

6.4.9 Threatened and Migratory Species

PMST Reports (Appendix F, Appendix H) were generated for the Operational Area and Planning Area and were used in combination with reputable peer-reviewed literature to identify the listed Threatened and Migratory species that may be present.

6.4.9.1 Marine Fauna of conservation Significance

Under Part 13 of the EPBC Act, species can be listed as one, or a combination, of the following protection designations:

- Threatened (further divided into categories; extinct, extinct in the wild, critically endangered, endangered, vulnerable, conservation-dependent)
- Migratory
- Whale or other cetaceans
- Marine.

Details of listed fauna and their likely presence in the Operational Area or Planning Area are provided in the following sections.

For the purpose of the EP, species listed as threatened or migratory under the EPBC Act and are known or likely to occur in the Operational or Planning Area and/or have an intercepting BIA with the Operational or Planning Area are discussed in more detail. Known and likely occurrence was determined from the PMST report and reputable peer-reviewed literature or through designation of important habitat (e.g. BIA).

6.4.9.2 Biologically Important Areas and Habitat Critical to the Survival of the Species

DoE (2014b) detail that 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. Their designation is based on expert scientific knowledge about species' distribution, abundance, and behaviour. The presence of the observed behaviour is assumed to indicate that the habitat required for the behaviour is also present.

CoA (2013) details that habitat critical to the survival of a species or ecological community' refers to areas that are necessary:

- for activities such as foraging, breeding, roosting, or dispersal.
- for the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators)
- to maintain genetic diversity and long-term evolutionary development, or
- for the reintroduction of populations or recovery of the species or ecological community.

Such habitat may be but is not limited to: habitat identified in a recovery plan for the species or ecological community as habitat critical for that species or ecological community; and/or habitat listed on the Register of Critical Habitat maintained by the minister under the EPBC Act.

BIAs and habitat critical to the survival of a species within the Operational Area and Planning Area are detailed in Table 6-19 with further details in the relevant species sections. Seasonality of important behaviours within BIAs is summarised in Table 6-20. No habitat critical to the survival of species was identified within the Operational Area.

Table 6-19: Proximity of BIAs and Habitat Critical to the Survival of a Species to the Operational Area and Planning Area

Receptor	Operational Area	Planning Area	Type of BIA	Habitat Critical to the Survival of a species
Birds				
Antipodean Albatross	Overlap	Overlap	Foraging	-
Australasian Gannet	59 km	Overlap	Foraging	-
	93 km	Overlap	Aggregation	-
Black-browed Albatross	Overlap	Overlap	Foraging	-
Black-faced Cormorant	92 km	Overlap	Breeding	-
	82 km	Overlap	Foraging	-
Buller's Albatross	Overlap	Overlap	Foraging	-
Campbell Albatross	Overlap	Overlap	Foraging	-
Common Diving-petrel	Overlap	Overlap	Foraging	-
	78 km	Overlap	Breeding	-
Indian Yellow-nosed Albatross	Overlap	Overlap	Foraging	-
Little Penguin	84 km	Overlap	Foraging	-
	92 km	Overlap	Breeding	-
Short-tailed Shearwater	Overlap	Overlap	Foraging	-
	91 km	Overlap	Breeding	-
Shy Albatross	Overlap	Overlap	Foraging likely	-
Wandering Albatross	Overlap	Overlap	Foraging	-
White-faced Storm Petrel	58 km	Overlap	Foraging	-
Fish				
White Shark	Overlap	Overlap	Distribution	-
	48 km	Overlap	Foraging	-
Cetaceans				
Pygmy Blue Whale	5 km	Overlap	Foraging	-

	Overlap	Overlap	Foraging (annual high use area)	-
	54 km	Overlap	Known Foraging Area	-
Southern Right Whale	Overlap	Overlap	Migration	-
	18 km	Overlap	Reproduction	-

Table 6-20: Seasonality of biologically important behaviours relevant to the Program. (P = possible, L = likely)

Species	Biologically Important Behaviour	J	F	M	A	M	J	J	A	S	O	N	D
Birds													
Antipodean Albatross	Foraging	P	P	P	P	P	P	P	P	P	P	P	P
Australasian Gannet	Foraging	L	L	L	L	L	P	P	P	P	L	L	L
	Aggregation	L	L	L	L	L	P	P	P	P	L	L	L
Black-browed Albatross	Foraging						L	L	L				
Black-faced Cormorant	Breeding						P	L	P	P			
	Foraging	L	L	L	L	L	L	L	L	L	L	L	L
Buller's Albatross	Foraging	P	P	P	P	P	P	P	P	P	P	P	P
Campbell Albatross	Foraging					P	P	P					
Common Diving-petrel	Foraging	L	P	P	P	P	P	L	L	L	L	L	L
	Breeding	L						L	L	L	L	L	L
Indian Yellow-nosed Albatross	Foraging						P	P	P				
Little Penguin	Foraging	L	L	P	P	P	P	P	P	L	L	L	L
	Breeding	L	L							L	L	L	L
Short-tailed Shearwater	Foraging	L	L	L	L	L				P	L	L	L
	Breeding	L	L	L	L	L					L	L	L
Shy Albatross	Foraging likely	P	P	P	P	P	P	P	P	P	P	P	P
Wandering Albatross	Foraging	P	P	P	P	P	P	P	P	P	P	P	P
Wedge-tailed Shearwater	Breeding	L	L	L	L	L			L	L	L	L	L
White-faced Storm Petrel	Foraging	P	P	P						P	P	P	P
	Breeding	P	P	P						P	P	P	P
Fish													
White Shark	Distribution	L	L	L	L	L	L	L	L	L	L	L	L
	Foraging	L	L	L	L	L	L	L	L	L	L	L	L
Whales													

Species	Biologically Important Behaviour	J	F	M	A	M	J	J	A	S	O	N	D
Pygmy Blue Whale	Foraging (annual high use)	P	L	L	P	P	P					P	P
Southern Right Whale	Migration				P	P	P	L	L	P	P		
	Reproduction					P	P	P	P	P			

6.4.9.3 Fish

Fish species present in the Operational Area or Planning Area are either pelagic (living in the water column), or demersal (benthic). Fish species inhabiting the region are largely cool temperate species, common within the South-east Marine Region. Table 6-21 details the listed fish species identified in the PMST Reports (Appendix F, Appendix H) as occurring in the Operational and/or Planning Area.

Two fish species identified in the PMST Reports are freshwater species, Dwarf Galaxias and Yarra Pygmy Perch as they will be outside of the areas potentially affected by the Program they are not discussed further.

Threatened or migratory species that are likely or known to occur or have an intercepting BIA with the Operational or Planning Area are discussed in more detail.

Five species of fish are listed as Conservation Dependent which do not receive special protection, as they are not considered MNES under the EPBC Act. These species are targeted by commercial fisheries as detailed in sub-section 6.4.9.3.7.

Information on eels is also provided as Beach's consultation with the Eastern Maar Aboriginal Corporation for the previous Otway Project activities identified that they have interests regarding eels, and they are possibly present within the Planning Area during migration and spawning seasons.

Table 6-21: Listed fish species or species habitat identified in the Operational Area and/or Planning Area

Common Name	Scientific Name	Threatened Category	Migratory Status	Migratory Category	Marine Status	BIAs	Presence in Planning Area	Presence in Operational Area
Fish								
Australian Grayling	*Prototroctes maraena*	Vulnerable					Species or species habitat known to occur within area	Species or species habitat may occur within area
		National Recovery Plan for the *Prototroctes maraena* (Australian Grayling) (Backhouse et al. 2008). No threats relevant to the Program identified.						
Blue Warehou	*Seriolella brama*	Conservation Dependent					Species or species habitat known to occur within area	Species or species habitat known to occur within area
Eastern Dwarf Galaxias, Dwarf Galaxias	Galaxiella pusilla	Endangered					Species or species habitat likely occur within area	_
Eastern Gemfish	*Rexea solandri (eastern Australian population)*	Conservation Dependent					Species or species habitat likely to occur within area	_
Orange Roughy, Deep-sea Perch, Red Roughy	*Hoplostethus atlanticus*	Conservation Dependent					Species or species habitat likely to occur within area	Species or species habitat likely to occur within area
Yarra Pygmy Perch	*Nannoperca obscura*	Endangered					Species or species habitat known to occur within area	_
Sharks								
Grey Nurse Shark	*Carcharias taurus*		Migratory	Migratory Marine Species			Species or species habitat may occur within area	Species or species habitat may occur within area
		Recover Plan for the Grey Nurse Shark (*Carcharias taurus)* (DoE 2014c). No threats relevant to the Program identified.						

Common Name	Scientific Name	Threatened Category	Migratory Status	Migratory Category	Marine Status	BIAs	Presence in Planning Area	Presence in Operational Area
Little Gulper Shark	*Centrophorus uyato*	Conservation Dependent					Species or species habitat likely to occur within area	Species or species habitat likely to occur within area
Porbeagle, Mackerel Shark	*Lamna nasus*		Migratory	Migratory Marine Species			Species or species habitat likely to occur within area	Species or species habitat likely to occur within area
School Shark, Eastern School Shark, Snapper Shark, Tope, Soupfin Shark	*Galeorhinus galeus*	Conservation Dependent					Species or species habitat likely to occur within area	Species or species habitat may occur within area
Shortfin Mako, Mako Shark	*Isurus oxyrinchus*		Migratory	Migratory Marine Species			Species or species habitat likely to occur within area	Species or species habitat likely to occur within area
White Shark, Great White Shark	*Carcharodon carcharias*	Vulnerable	Migratory	Migratory Marine Species		Foraging, distribution	Foraging, feeding or related behaviour known to occur within area	Migration route known to occur within area
		Recovery Plan for the *Carcharodon carcharias* (White Shark) (DSEWPaC 2013b). No relevant threats identified.						
Syngnathids								
Australian Smooth Pipefish, Smooth Pipefish	*Lissocampus caudalis*				Listed		Species or species habitat may occur within area	Species or species habitat may occur within area
Big-belly Seahorse, Eastern Potbelly Seahorse, New Zealand Potbelly Seahorse	*Hippocampus abdominalis*				Listed		Species or species habitat may occur within area	Species or species habitat may occur within area
Brushtail Pipefish	*Leptoichthys fistularius*				Listed		Species or species habitat may occur within area	Species or species habitat may occur within area

Common Name	Scientific Name	Threatened Category	Migratory Status	Migratory Category	Marine Status	BIAs	Presence in Planning Area	Presence in Operational Area
Bullneck Seahorse	*Hippocampus minotaur*				Listed		Species or species habitat may occur within area	_
Common Seadragon, Weedy Seadragon	*Phyllopteryx taeniolatus*				Listed		Species or species habitat may occur within area	Species or species habitat may occur within area
Crested Pipefish, Briggs' Crested Pipefish, Briggs' Pipefish	*Histiogamphelus briggsii*				Listed		Species or species habitat may occur within area	Species or species habitat may occur within area
Deepbody Pipefish, Deep-bodied Pipefish	*Kaupus costatus*				Listed		Species or species habitat may occur within area	Species or species habitat may occur within area
Hairy Pipefish	*Urocampus carinirostris*				Listed		Species or species habitat may occur within area	Species or species habitat may occur within area
Halfbanded Pipefish	*Mitotichthys semistriatus*				Listed		Species or species habitat may occur within area	Species or species habitat may occur within area
Javelin Pipefish	*Lissocampus runa*				Listed		Species or species habitat may occur within area	Species or species habitat may occur within area
Knifesnout Pipefish, Knife-snouted Pipefish	*Hypselognathus rostratus*				Listed		Species or species habitat may occur within area	Species or species habitat may occur within area
Leafy Seadragon	*Phycodurus eques*				Listed		Species or species habitat may occur within area	Species or species habitat may occur within area
Longsnout Pipefish, Australian Long-snout Pipefish, Long-snouted Pipefish	*Vanacampus poecilolaemus*				Listed		Species or species habitat may occur within area	Species or species habitat may occur within area

Common Name	Scientific Name	Threatened Category	Migratory Status	Migratory Category	Marine Status	BIAs	Presence in Planning Area	Presence in Operational Area
Mollison's Pipefish	*Mitotichthys mollisoni*				Listed		Species or species habitat may occur within area	_
Mother-of-pearl Pipefish	*Vanacampus margaritifer*				Listed		Species or species habitat may occur within area	Species or species habitat may occur within area
Port Phillip Pipefish	*Vanacampus phillipi*				Listed		Species or species habitat may occur within area	Species or species habitat may occur within area
Pugnose Pipefish, Pug-nosed Pipefish	*Pugnaso curtirostris*				Listed		Species or species habitat may occur within area	Species or species habitat may occur within area
Red Pipefish	*Notiocampus ruber*				Listed		Species or species habitat may occur within area	Species or species habitat may occur within area
Rhino Pipefish, Macleay's Crested Pipefish, Ring-back Pipefish	*Histiogamphelus cristatus*				Listed		Species or species habitat may occur within area	Species or species habitat may occur within area
Ringback Pipefish, Ring-backed Pipefish	*Stipecampus cristatus*				Listed		Species or species habitat may occur within area	Species or species habitat may occur within area
Robust Pipehorse, Robust Spiny Pipehorse	*Solegnathus robustus*				Listed		Species or species habitat may occur within area	Species or species habitat may occur within area
Sawtooth Pipefish	*Maroubra perserrata*				Listed		Species or species habitat may occur within area	Species or species habitat may occur within area
Short-head Seahorse, Short-snouted Seahorse	*Hippocampus breviceps*				Listed		Species or species habitat may occur within area	Species or species habitat may occur within area

Common Name	Scientific Name	Threatened Category	Migratory Status	Migratory Category	Marine Status	BIAs	Presence in Planning Area	Presence in Operational Area
Spiny Pipehorse, Australian Spiny Pipehorse	*Solegnathus spinosissimus*				Listed		Species or species habitat may occur within area	Species or species habitat may occur within area
Spotted Pipefish, Gulf Pipefish, Peacock Pipefish	*Stigmatopora argus*				Listed		Species or species habitat may occur within area	Species or species habitat may occur within area
Trawl Pipefish, Bass Strait Pipefish	*Kimblaeus bassensis*				Listed		Species or species habitat may occur within area	_
Tucker's Pipefish	*Mitotichthys tuckeri*				Listed		Species or species habitat may occur within area	Species or species habitat may occur within area
Upside-down Pipefish, Eastern Upside-down Pipefish, Eastern Upside-down Pipefish	*Heraldia nocturna*				Listed		Species or species habitat may occur within area	Species or species habitat may occur within area
Widebody Pipefish, Wide-bodied Pipefish, Black Pipefish	*Stigmatopora nigra*				Listed		Species or species habitat may occur within area	Species or species habitat may occur within area

6.4.9.3.1 Australian Grayling

The Australian grayling (*Prototroctes maraena*) is a dark brown to olive-green fish attaining 19 cm in length. The species typically inhabits the coastal streams of New South Wales, Victoria, and Tasmania, migrating between streams and the ocean. Spawning occurs in freshwater, with timing dependant on many variables including latitude and temperature regimes (Backhouse et al. 2008). Most of its life is spent in fresh water, with parts of the larval or juvenile stages spent in coastal marine waters (Backhouse et al. 2008), though its precise marine habitat requirements remain unknown (Backhouse et al. 2008). They are a short-lived species, usually dying after their second year soon after spawning (a small proportion may reach four or five years) (DSE 2008).

Australian Grayling has been recorded from the Gellibrand River (DSE 2008) making it likely that it occurs in coastal waters. As marine waters are not part of the species' spawning grounds, the Planning Area is not likely to represent critical habitat for the species.

6.4.9.3.2 Eels

6.4.9.3.2.1 Ecology and Biology

The shortfin eel (*Anguilla australis australis*) and the longfin eel (*A. reinhardtii*) both occur naturally within Victoria and are the target species of the Victorian Eel Fishery. The eels have differing but overlapping distributions east and south of the Great Dividing Range in estuarine and freshwater catchments (VFA 2022b) (Figure 6-37).

The shortfin eel is widespread across the southern parts of Victoria and occurring occasionally in northern streams draining into the Murray River, while the longfin eel is found within south-east parts of Victoria only (VFA 2022a). Both species spend the majority of their life cycle in fresh water or estuaries before travelling to the ocean to spawn once before dying (VFA 2022a). Shortfin eels are listed as 'near threatened' on the IUCN red list, with barriers to riverine movement and freshwater habitat loss being key threats. Additionally, changes in ocean currents, primary production, and thermal regimes may also affect eel migration, spawning success, and recruitment (Koster et al. 2021). The longfin eel is listed as 'least concern' by the IUCN. Neither species are listed as threatened under the EPBC Act.

Both species of eel are primarily carnivorous, however, they will both opportunistically eat plant material (VFA 2022a; 2022c). The shortfin eel is known to eat various types of fish, worms, insects, small crustaceans, molluscs, and water plants and can grow up to 1.1 m long and weigh up to 6.8 kg (VFA 2022a). The longfin eel consumes primarily fish and insects. The longfin eel is larger in size compared to the shortfin eel, reported to grow up to 2 m and weigh up to 16 kg, however, they are usually much smaller and often reach 1 m in length (VFA 2022c). Both species are believed to follow a seasonal feeding pattern, with the most intense feeding window being at night during summer and spring (VFA 2022a; 2022c). Both species sexes are determined by influences such as salinity, temperature, diet, and population density (more females as the population density decreases) (VFA 2017).

6.4.9.3.2.2 Migration and Spawning

Both species of eel have a remarkable lifecycle that is not entirely understood, remaining a natural phenomenon. They spend most of their life cycle in freshwater or estuaries before undergoing a mass migration into the ocean, travelling in excess of 3,000 km to spawn once (VFA 2022b). Spawning location is believed to be in the Coral Sea near New Caledonia although no precise spawning location for either species has been identified (VFA 2022a). Both species migrate to the ocean once matured;

male shortfin eels generally mature at 8 to 12 years of age, whilst females mature at 10 to 20 years and long-finned eels can take double this time to mature. Migration occurs during late summer to autumn, and after a period of insatiable feeding and significant growth, the eels undergo a series of physical changes to prepare for their migration (VFA 2022a).

Once the eels are prepared for spawning, they move out of their freshwater environments into the ocean in total darkness and swim north against the current to reach the Coral Sea. By the time they arrive, they have used up all their energy resources then they spawn and die, and their young commence the cycle over again. Their life begins at unknown spawning sites at a depth of 200 m as larvae. The pelagic larvae are then carried southwards by the ocean currents that parallel the east coast of Australia such as the EAC and swing east past Tasmania and then north to New Zealand. Along the way, they feed on microscopic organisms and develop into transparent, leaf-shaped larvae and eventually metamorphose into 'glass eels' which are eel-shaped, but extremely small and still transparent. At this stage, they move closer to land and commence migrating towards estuaries. Most glass shortfin eels migrate in the winter and spring, while glass longfin eels migrate during summer and autumn (VFA 2022a), although glass eels of both species may continue to arrive anytime throughout the year (VFA 2017).

Koster et al. (2021) tracked the shortfin eel spawning migration for the first time in Australia. Sixteen eels were collected and tagged from the Hopkins and Fitzroy River estuaries as they migrated from the river mouths outwards to the Southern Ocean over a sandbar in 2019. They were then released at either Warrnambool Harbour, Hopkins's mouth beach or Killarney beach. Twelve of the 16 tags returned data. The results showed that the shortfin eels exhibit diel vertical migration, meaning they travel in the top layers of water during the night and travel further down in the water column during the day (Koster et al. 2021). Of the small number of eels that made the entire journey to the spawning location, their last movements were recorded in the Coral Sea. Many of the eels (about 30%) migrations were cut short due to predation, suspected by sharks, tuna, or other marine mammals. The conclusion of the study talks about the need for further research to determine the eel's exact spawning locations and timing and how the information can be used to support conservation management, particularly when looking at anthropogenic impacts on the species. Koster et al. (2021) listed construction and operation of energy developments as having potential to interact with eel migration.

6.4.9.3.2.3 Victorian Eel Fishery

Both the longfin and shortfin eel are the target species for the Victorian Eel Fishery. The first commercial catches of eel were recorded in 1914, and up until 1950 eel was primarily fished for bait. Export of frozen shortfin eel to Europe began in the 1960s (VFA 2022a). Eel are harvested in Victorian coastal river basins south of the Great Dividing Range using fyke nets, with a maximum of 18 licences allowed in Victoria. Certain waterways are closed to fishing to allow for eels to escape and spawn (VFA 2022a). Shortfin eels are the most abundant and the most keenly targeted eel species in Victoria, productivity from the fishery is highly susceptible to short and long term and seasonal environmental variations, particularly drought (VFA 2017).

The eel fishery comprises both a wild catch sector and a culture (stock enhanced) sector. The culture sector has developed strategies for growth consistent with the species life cycle by translocating juvenile eels from other parts of Victoria into lakes and impoundments (culture waters) in western inland Victoria where they continue to grow (VFA 2017). Fishing for glass eels has been of limited success due to the highly variable abundance in Victoria. Most of Victoria's eel catch is taken by commercial fishers and is comprised of adult eels during different stages of their migration.

6.4.9.3.2.4 First Nations Connection to Eels

Eels were, and continue to be, an important resource for certain First Nations communities. Their use for communal gatherings and for barter and trade was extensive in pre-colonial times. Today, eel remains a popular food for community events (VFA 2017). Shortfin eels in particular hold a cultural significance to First Nations people. For example, the Gunditjmara People of south-western Victoria built and used sophisticated aquaculture systems throughout the Budj Bim cultural landscape to exploit eel migrations at least 7,000 years ago. These systems and their eel catches have since provided a lasting and sustainable economic and social base for the Gunditjmara society (Koster et al. 2021). The Budj Bim cultural landscape is outside of the Planning Area.

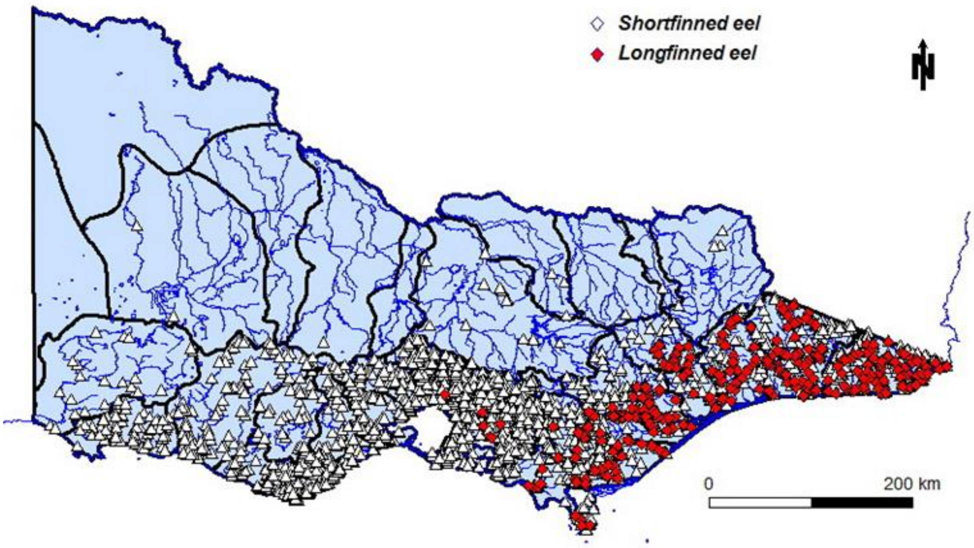


Figure 6-37: Distribution of longfinned and shortfinned eels in Victoria (VFA 2017)

6.4.9.3.3 Porbeagle Shark

The porbeagle shark (*Lamna nasus*) is widely distributed in the southern waters of Australia including Victorian and Tasmanian waters. The species preys on bony fishes and cephalopods and is an opportunistic hunter that regularly moves up and down in the water column, catching prey in mid-water as well as at the seafloor. It is most commonly found over food-rich banks on the outer continental shelf, but does make occasional forays close to shore or into the open ocean, down to depths of approximately 1,300 m. It also conducts long-distance seasonal migrations, generally shifting between shallower and deeper water (Pade et al. 2009). The porbeagle shark is likely to be present in the Operational Area and Planning Area in low numbers.

6.4.9.3.4 Shortfin Mako Shark

The shortfin mako shark (*Isurus oxyrinchus*) is a pelagic species with a circum-global oceanic distribution in tropical and temperate seas (Mollet et al. 2000). It is widespread in Australian waters, commonly found in water with temperatures greater than 16°C. Populations of the shortfin mako shark are considered to have undergone a substantial decline globally. These sharks are a common by-catch species of commercial fisheries (Mollet et al. 2000).

The use of dorsal satellite tags on 10 juvenile shortfin mako sharks captured in the Great Australian Bight between 2008 and 2011 investigated habitat and migration patterns. It revealed the Great

Australian Bight and south east of Kangaroo Island near the norther extent of the Bonney Upwelling Region, to be areas of highest fidelity and indicating critical habitats for juvenile shortfin mako Ssarks (Rogers 2011). The tagged sharks also showed migration to south west Western Australia, Victoria, Bass Strait and south-west of Tasmania. Stomachs of shortfin mako shark were also analysed from specimens collected by game fishing competitors in Port MacDonnell, South Australia and Portland, Victoria from 2008 and 2010 which found they specialise in larger prey including pelagic teleosts and cephalopods (Rogers 2011). Due to their widespread distribution in Australian waters, shortfin mako sharks are likely to be present in the Operational Area and Planning Area in low numbers.

6.4.9.3.5 Syngnathids

Syngnathids identified in the EPBC PMST Reports (Appendix F, Appendix H) as potentially occurring in the Operational and Planning Areas include seahorses and their relatives (sea dragon, pipehorse and pipefish). The majority of these species are associated with seagrass meadows, macroalgal seabed habitats, rocky reefs and sponge gardens located in shallow, inshore waters (e.g. protected coastal bays, harbours, and jetties) less than 50 m deep (Fishes of Australia 2015). They are sometimes recorded in deeper offshore waters, where they depend on the protection of sponges and rafts of floating seaweed such as Sargassum.

Of the 29 species of Syngnathids identified in the EPBC PMST Report, only the big-belly seahorse (*Hippocampus abdominalis*) has a documented species profile and threats profile, indicating how little published information exists in general regarding Syngnathids.

The PMST report species profile and threats profiles indicate that the Syngnathids species identified in the Operational Area and Planning Area are widely distributed throughout southern, south-eastern and south-western Australian waters. It is unlikely that these species will be present within the Operational Area as water depths are greater than 50 m, however they may be present within the Planning Area.

6.4.9.3.6 White Shark

The white shark (*Carcharodon carcharias*) is widely distributed and located throughout temperate and sub-tropical waters with their known range in Australian waters from the Northwest Cape, Western Australia, through southern waters to the central coast of Queensland (Last and Stevens 2009; DoE 2025). Studies of white sharks indicate that they are largely transient, with several discrete populations (Pardini et al. 2000; Gubili et al. 2012). In the Australasian region, white sharks differ genetically from other populations and data suggest there is an eastern and a western population in southern Australia, divided by the Bass Strait (Blower et al. 2012). A recent long-term electronic tagging study of juvenile white sharks off eastern Australia, indicated complex movement patterns over thousands of kilometres, including annual fidelity to spatially restricted nursery areas, directed seasonal coastal movements, intermittent areas of temporary nearshore residency and offshore movement into the Tasman Sea (Bruce et al. 2019). This study also supported the two-population model for the species in Australian waters with restricted east to west movements through Bass Strait. Bruce et al. (2019) observed seasonal movements of juvenile white sharks being in the northern region during winter and spring (June through November) and southern region during summer and autumn (December through May).

Observations of adult sharks are more frequent around fur seal and sea lion colonies, including Wilsons Promontory and the Skerries. Juveniles are known to congregate in certain key areas including the Ninety Mile Beach area (including Corner Inlet and Lakes Entrance) in eastern Victoria and the Portland area of western Victoria).

The distribution BIA for the white shark intersects the Operational Area. The foraging BIA is 48 km, and the breeding BIA is 295 km from the Operational Area (Figure 6-38). The known distribution is on the coastal shelf/upper slope waters out to 1000 m and the broader area where they are likely to occur extends from Barrow Island in WA to Yeppoon in NSW. They are more likely to be found between the 60 to 120 m depth contours than in the deeper waters. There is a known nursery area at Corner Inlet, and they are known to forage in waters off pinniped colonies throughout the SEMR. It is likely that White Sharks will be present in the Operational Area and Planning Area.

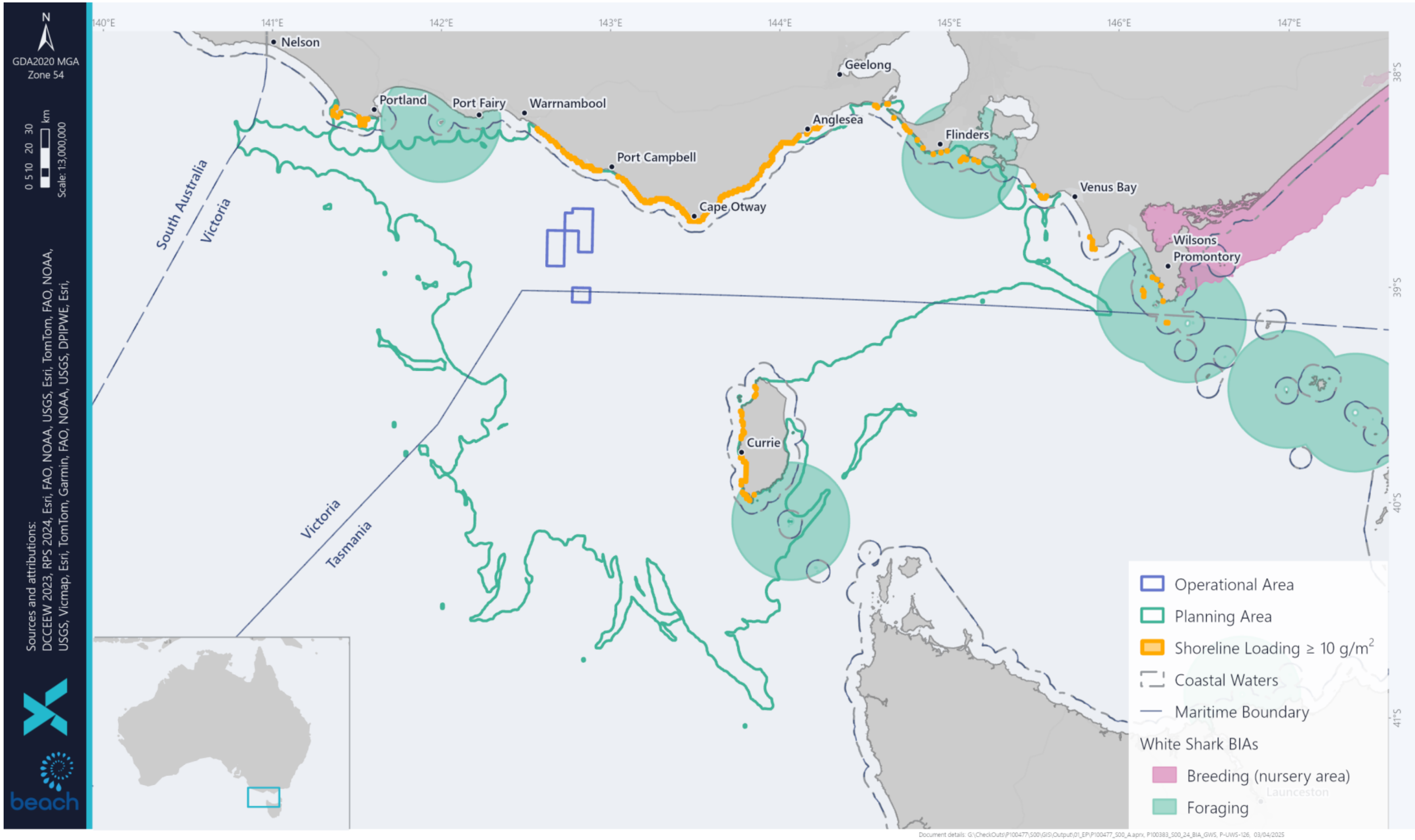


Figure 6-38: BIAs for the white shark within the Planning Area.

6.4.9.3.7 Commercially Important Fish Species

6.4.9.3.7.1 Blue Warehou

The blue warehou (*Seriolella brama*) is a bentho-pelagic species that inhabits continental slope waters at depth from 50-300 m (AFMA 2024a). The blue warehou is a targeted species within the Southern and Eastern Scalefish and Shark Fishery (SESSF) Commonwealth Trawl and Scalefish Hook sectors. There are two separate stocks of the blue warehou (east and west). The eastern stock extends offshore from southern New South Wales to southern Tasmania and the western stock extends offshore from western Tasmania northward to western Victoria (Bessell-Browne et al. 2021). Both the western and eastern stock of the blue warehou is classified as overfished and was actively avoided in 2022-23 (Butler et al. 2023).

6.4.9.3.7.2 Eastern Gemfish

The eastern gemfish (*Rexea solandri*) is a bottom-dwelling species that inhabits temperate waters of Australian and New Zealand and typically found in large schools at water depths of 100-800 m (AFMA 2024b). The species typically preys on bentho-pelagic fish such as grenadier, as well as squid and crustaceans (AFMA 2024b). Female eastern gemfish reach reproductive maturity at 4-6 years and males at 3-5 years, with spawning occurring in northern and central New South Wales during winter (AFMA 2024b). The species is incidentally caught in the SESSF Commonwealth Trawl sector and the Gillnet Hook and trap sector. The eastern Gemfish has been classified as overfished since 1992 and a rebuilding strategy established the eastern gemfish as an incidental catch-only species, which was implemented in 2008 (Butler et al. 2023)

6.4.9.3.7.3 Gummy Shark

Gummy sharks (*Mustelus antarcticus*) are a demersal species that inhabits the continental shelf at depths of 80-350 m (AFMA 2024c). The species typically remains on or near the surface feeding on cephalopods, crustaceans and occasionally fish. Newborn and juvenile sharks aggregate across southern Australia, with adults more widely distributed. Gummy sharks reach reproductive maturity at 4-5 years of age, with males maturing at a smaller size. The females are ovoviviparous producing litters of about 14-57 pups during the summer months after an 11–12-month gestation period (AFMA 2024c).

The gummy shark is a key targeted species within the SESSF Gillnet Hook and Trap sector, and incidentally caught in the Commonwealth Trawl Sector (Butler et al. 2024). The species is mainly caught in southern Australia, extending from Bunbury in Western Australia to Jervis Bay in New South Wales (White and Last 2008). As of 2024, the gummy shark is classified as not overfished (Butler et al. 2024).

6.4.9.3.7.4 Orange Roughy

Orange roughy (*Hoplostethus atlanticus*) is listed as Conservation Dependent under the EPBC Act. The orange roughy is a deep-water species that inhabits waters over steep continental slopes and ocean ridges at water depths between 700-1400 m (AFMA 2024d). The species usually aggregate 5-10 m above the seabed, with some extending over 50 m from the seafloor, and are associated with submerged hills or pinnacles (AFMA 2024d). At these depths, orange roughy prey on benthopelagic and meso-pelagic fish such as viperfish, lanternfish, whiptails, squid, crustaceans, amphipods and mysids (AFMA 2024d). The orange roughy reach reproductive maturity at 27-32 years of age, with spawning aggregations occurring between mid-July and late August.

The orange roughy is targeted within the SESSF south-East Trawl Sector and incidentally caught within the Great Australian Bight Trawl (Butler et al. 2023). The species has been historically targeted in aggregations around seamounts, mainly at depths from 600 m to about 1,300 m (Butler et al. 2023). However, no commercial catch of orange roughy was landed in 2022-23 (Butler et al. 2023). The species is considered overfished and no documented evidence of recovery (Butler et al. 2023).

6.4.9.3.7.5 School Shark

The school shark (*Galeorhinus galeus*) is a temperate demersal species found on the continental shelf and slop at depths of 550 m (AFMA 2024e). The species undertakes long migrations of up to 1,400 km along the southern coast of Australia, which may be associated with mating and pupping grounds (AFMA 2024e). The school shark reaches reproductive maturity at 8-15 years of age, with the females producing litters of 15-42 pups every 2-3 years (AFMA 2024e). Birth occurs in early summer after 12 months gestation period. The pups and juveniles tend to aggregate in shallower waters during the spring and summer.

School sharks were historically the primary target species within the SESSF shark gillnet and shark hook sector. Assessments for the school shark indicate that the stock has been overfished since approximately 1990 (Butler et al. 2024). Although overfished, the school shark remains the second most economically important stock in the fishery (Butler et al. 2024).

6.4.9.3.7.6 Southern Bluefin Tuna

The southern bluefin tuna (*Thunnus maccoyii*) is a highly migratory, pelagic species and is distributed throughout the Atlantic, Pacific and Indian Oceans. The species inhabits water depths of 500 m, feeding on fish, cephalopods, crustaceans and salps (AFMA 2024f). In Australia, the southern bluefin tuna and mainly found in the Great Australian Bight and typically caught between December to April (AFMA 2024f). The species reaches reproductive maturity at 11-12 years of age, with spawning occurring in tropical waters during spring and summer (AFMA 2024f). Only one spawning ground has been identified and is located in the north-eastern Indian Ocean, south of Java (AFMA 2024f). The juveniles are generally associated with coastal and continental shelf waters.

The southern bluefin tuna is a key targeted species within the Southern Bluefin Tuna Fishery and Eastern Tuna and Billfish Fishery. The species is not considered to be overfished (Butler et al. 2024).

6.4.9.4 Seabirds and Shorebirds

A diverse array of seabirds and shorebirds birds utilise the Otway region and potentially forage within or fly over the Operational and Planning Area. Figure 6-39 through Figure 6-42 show the seabird BIAs that overlap the Operational and Planning Area. No shorebird BIAs were identified within the Operational and Planning Area.

Table 6-22 details the listed bird species identified to potentially occur in the Operational and Planning Area PMST Reports (Appendix F, Appendix H).

Threatened or migratory species that are likely or known to occur or have an intercepting BIA with the Operational or Planning Area are discussed in more detail.

No habitats critical to the survival of a bird species were identified in the Operational Area or Planning Area.

Table 6-22: Listed seabird and shorebird species identified in the Operational and/or Planning Area

Common Name	Scientific Name	Threatened Category	Migratory Status	Migratory Category	Marine Status	BIAs	Present in Planning Area	Present in Operational Area
Albatrosses and Petrels								
Antipodean Albatross	*Diomedea antipodensis*	Vulnerable	Migratory	Migratory Marine Birds	Listed	Foraging	Foraging, feeding or related behaviour likely to occur within area	Foraging, feeding or related behaviour likely to occur within area
Black-browed Albatross	*Thalassarche melanophris*	Vulnerable	Migratory	Migratory Marine Birds	Listed	Foraging	Foraging, feeding or related behaviour likely to occur within area	Foraging, feeding or related behaviour likely to occur within area
Blue Petrel	*Halobaena caerulea*	Vulnerable			Listed		Species or species habitat may occur within area	Species or species habitat may occur within area
		Approved Conservation Advice for the *Halobaena caerulea* (Blue Petrel) (TSSC 2015a). No relevant threats identified.						
Buller's Albatross, Pacific Albatross	*Thalassarche bulleri*	Vulnerable	Migratory	Migratory Marine Birds	Listed	Foraging	Foraging, feeding or related behaviour likely to occur within area	Foraging, feeding or related behaviour likely to occur within area
Campbell Albatross, Campbell Black-browed Albatross	*Thalassarche impavida*	Vulnerable	Migratory	Migratory Marine Birds	Listed	Foraging	Foraging, feeding or related behaviour likely to occur within area	Foraging, feeding or related behaviour likely to occur within area
Common Diving-petrel	*Pelecanoides urinatrix*				Listed	Breeding, Foraging	Breeding known to occur within area	_
Gibson's Albatross	*Diomedea antipodensis gibsoni*	Vulnerable			Listed (as *Diomedea gibsoni*)		Foraging, feeding or related behaviour likely to occur within area	_
		Endangered					Species or species habitat may occur within area	Species or species habitat may occur within area

Common Name	Scientific Name	Threatened Category	Migratory Status	Migratory Category	Marine Status	BIAs	Present in Planning Area	Present in Operational Area
Gould's Petrel, Australian Gould's Petrel	*Pterodroma leucoptera leucoptera*	National Recovery Plan for *Pterodroma leucoptera leucoptera* (Gould's Petrel) (DEC NSW 2006). No relevant threats identified.						
Grey-headed Albatross	*Thalassarche chrysostoma*	Endangered	Migratory	Migratory Marine Birds	Listed		Species or species habitat may occur within area	Species or species habitat may occur within area
Indian Yellow-nosed Albatross	*Thalassarche carteri*	Vulnerable	Migratory	Migratory Marine Birds	Listed	Foraging	Species or species habitat likely to occur within area	Species or species habitat likely to occur within area
Northern Buller's Albatross, Pacific Albatross	*Thalassarche bulleri platei*	Vulnerable			Listed (as *Thalassarche* sp. nov.)		Foraging, feeding or related behaviour likely to occur within area	Foraging, feeding or related behaviour likely to occur within area
Northern Giant Petrel	*Macronectes halli*	Vulnerable	Migratory	Migratory Marine Birds	Listed		Foraging, feeding or related behaviour likely to occur within area	Foraging, feeding or related behaviour likely to occur within area
Northern Royal Albatross	*Diomedea sanfordi*	Endangered	Migratory	Migratory Marine Birds	Listed		Foraging, feeding or related behaviour likely to occur within area	Foraging, feeding or related behaviour likely to occur within area
Salvin's Albatross	*Thalassarche salvini*	Vulnerable	Migratory	Migratory Marine Birds	Listed		Foraging, feeding or related behaviour likely to occur within area	Foraging, feeding or related behaviour likely to occur within area
Shy Albatross	*Thalassarche cauta*	Endangered	Migratory	Migratory Marine Birds	Listed	Foraging likely	Foraging, feeding or related behaviour likely to occur within area	Foraging, feeding or related behaviour likely to occur within area
Soft-plumaged Petrel	*Pterodroma mollis*	Vulnerable			Listed		Species or species habitat may occur within area	Species or species habitat may occur within area
		Approved Conservation Advice for *Pterodroma mollis* (Soft-plumaged Petrel) (TSSC 2015b). No relevant threats identified.						

Common Name	Scientific Name	Threatened Category	Migratory Status	Migratory Category	Marine Status	BIAs	Present in Planning Area	Present in Operational Area
Sooty Albatross	*Phoebetria fusca*	Vulnerable	Migratory	Migratory Marine Birds	Listed		Species or species habitat likely to occur within area	Species or species habitat likely to occur within area
Southern Giant-Petrel, Southern Giant Petrel	*Macronectes giganteus*	Endangered	Migratory	Migratory Marine Birds	Listed		Foraging, feeding or related behaviour likely to occur within area	Species or species habitat may occur within area
Southern Royal Albatross	*Diomedea epomophora*	Vulnerable	Migratory	Migratory Marine Birds	Listed		Foraging, feeding or related behaviour likely to occur within area	Foraging, feeding or related behaviour likely to occur within area
Wandering Albatross	*Diomedea exulans*	Vulnerable	Migratory	Migratory Marine Birds	Listed	Foraging	Foraging, feeding or related behaviour likely to occur within area	Foraging, feeding or related behaviour likely to occur within area
White-bellied Storm-Petrel (Tasman Sea), White-bellied Storm-Petrel (Australasian)	*Fregetta grallaria grallaria*	Vulnerable					Species or species habitat likely to occur within area	_
White-capped Albatross	*Thalassarche steadi*	Vulnerable	Migratory	Migratory Marine Birds	Listed		Foraging, feeding or related behaviour known to occur within area	Foraging, feeding or related behaviour known to occur within area
White-faced Storm-Petrel	*Pelagodroma marina*				Listed	Breeding, Foraging	Breeding known to occur within area	_
Terns and Shearwaters								
Australian Fairy Tern	*Sternula nereis nereis*	Vulnerable					Species or species habitat known to occur within area	Foraging, feeding or related behaviour likely to occur within area

Common Name	Scientific Name	Threatened Category	Migratory Status	Migratory Category	Marine Status	BIAs	Present in Planning Area	Present in Operational Area
		Approved Conservation Advice for *Sternula nereis nereis* (Australian fairy Tern) (DSEWPaC 2011a). Threats identified relevant to the Program: Marine pollution - Evaluate risk of oil spill impact to nest locations and, if required, appropriate mitigation measures are implemented. National Recovery Plan for the Australian Fairy Tern (*Sternula nereis nereis*) (CoA 2020). Threats identified relevant to the Program: Habitat degradation Climate variability Pollution No actions specific to the Program were identified.						
Caspian Tern	*Hydroprogne caspia*		Migratory	Migratory Marine Birds	Listed (as *Sterna caspia*)		Breeding known to occur within area	_
Fairy Tern	*Sternula nereis*				Listed (as *Sterna nereis*)		Breeding known to occur within area	_
Flesh-footed Shearwater, Fleshy-footed Shearwater	*Ardenna carneipes*		Migratory	Migratory Marine Birds	Listed (as *Puffinus carneipes*)		Foraging, feeding or related behaviour likely to occur within area	Foraging, feeding or related behaviour likely to occur within area
Greater Crested Tern	*Thalasseus bergii*		Migratory	Migratory Wetlands Species	Listed (as *Sterna bergii*)		Breeding known to occur within area	_
Little Tern	*Sternula albifrons*	Vulnerable	Migratory	Migratory Marine Birds	Listed (as *Sterna albifrons*)		Breeding known to occur within area	_
		Approved Conservation Advice for *Sternula albifrons* (Little Tern) (DCCEEW 2025c). Threats identified relevant to the Program: Climate change No actions specific to the Program were identified.						

Common Name	Scientific Name	Threatened Category	Migratory Status	Migratory Category	Marine Status	BIAs	Present in Planning Area	Present in Operational Area
Short-tailed Shearwater	*Ardenna tenuirostris*		Migratory	Migratory Marine Birds	Listed (as *Puffinus tenuirostris*)	Breeding, Foraging	Breeding known to occur within area	-
Sooty Shearwater	*Ardenna grisea*	Vulnerable	Migratory	Migratory Marine Birds	Listed (as *Puffinus griseus*)		Species or species habitat may occur within area	Species or species habitat may occur within area
		Conservation Advice for *Ardenna grisea* (sooty shearwater) (DCCEEW 2023a). No relevant threats identified.						
Sooty Tern	*Onychoprion fuscatus*				Listed (as *Sterna fuscata*)		Breeding known to occur within area	_
White-fronted Tern	*Sterna striata*				Listed		Foraging, feeding or related behaviour likely to occur within area	Migration route may occur within area
Other								
Australasian Bittern	*Botaurus poiciloptilus*	Endangered					Species or species habitat known to occur within area	_
		Approved Conservation Advice for *Botaurus poiciloptilus* (Australasian Bittern) (TSSC 2019). National Recovery Plan for the Australasian Bittern (CoA 2022a). No relevant threats identified.						
Australasian Gannet	*Morus serrator*				Listed	Aggregation, Foraging	Breeding known to occur within area	_
Australian Painted Snipe	*Rostratula australis*	Endangered			Listed - overfly marine area (as *Rostratula benghalensis* (sensu lato))		Species or species habitat known to occur within area	_

Common Name	Scientific Name	Threatened Category	Migratory Status	Migratory Category	Marine Status	BIAs	Present in Planning Area	Present in Operational Area
		Approved Conservation Advice for *Rostratula australis* (Australian Painted Snipe) (DSEWPaC 2013c). No relevant threats identified. National Recovery Plan for the Australian Painted Snipe (CoA 2022b). Threats identified relevant to the Program: Deterioration of water quality, human disturbance.						
Bar-tailed Godwit	*Limosa lapponica*		Migratory	Migratory Wetlands Species	Listed		Species or species habitat known to occur within area	_
Black Currawong (King Island)	*Strepera fuliginosa colei*	Vulnerable					Breeding likely to occur within area	_
Black-eared Cuckoo	*Chalcites osculans*				Listed - overfly marine area (as *Chrysococcyx osculans*)		Species or species habitat known to occur within area	_
Black-faced Cormorant	*Phalacrocorax fuscescens*				Listed	Breeding, Foraging	Breeding known to occur within area	_
Black-faced Monarch	*Monarcha melanopsis*		Migratory	Migratory Terrestrial Species	Listed - overfly marine area		Species or species habitat known to occur within area	_
Black-tailed Godwit	*Limosa limosa*	Endangered	Migratory	Migratory Wetlands Species	Listed - overfly marine area		Roosting known to occur within area	_
		Conservation Advice for *Limosa limosa* (Black-tailed Godwit) (DCCEEW 2024a) Threats relevant to the Program: Chronic and acute pollution						
Blue-winged Parrot	*Neophema chrysostoma*	Vulnerable			Listed - overfly marine area		Species or species habitat known to occur within area	_

Common Name	Scientific Name	Threatened Category	Migratory Status	Migratory Category	Marine Status	BIAs	Present in Planning Area	Present in Operational Area
		Conservation Advice for *Neophema chrysostoma* (Blue-winged Parrot) (DCCEEW 2024b). No relevant threats identified.						
Broad-billed Sandpiper	*Limicola falcinellus*		Migratory	Migratory Wetlands Species	Listed - overfly marine area		Roosting known to occur within area	-
Brown Skua	*Stercorarius antarcticus*				Listed (as *Catharacta skua*)		Species or species habitat may occur within area	Species or species habitat may occur within area
Brown Treecreeper (south-eastern)	*Climacteris picumnus victoriae*	Vulnerable					Species or species habitat may occur within area	_
Cape Gannet	*Morus capensis*				Listed		Breeding known to occur within area	_
Cattle Egret	*Bubulcus ibis*				Listed - overfly marine area (as *Ardea ibis*)		Species or species habitat may occur within area	_
Common Greenshank, Greenshank	*Tringa nebularia*	Endangered	Migratory	Migratory Wetlands Species	Listed - overfly marine area		Species or species habitat known to occur within area	_
Common Noddy	*Anous stolidus*		Migratory	Migratory Marine Birds	Listed		Species or species habitat likely to occur within area	_
Common Sandpiper	*Actitis hypoleucos*		Migratory	Migratory Wetlands Species	Listed		Species or species habitat known to occur within area	Species or species habitat may occur within area
Curlew Sandpiper	*Calidris ferruginea*	Critically Endangered	Migratory	Migratory Wetlands Species	Listed - overfly marine area		Species or species habitat known to occur within area	Species or species habitat may occur within area

Common Name	Scientific Name	Threatened Category	Migratory Status	Migratory Category	Marine Status	BIAs	Present in Planning Area	Present in Operational Area
		Conservation Advice for *Calidris ferruginea* (Curlew Sandpiper) (DoE 2015a). Threats identified relevant to the Program: Habitat degradation/ loss (oil pollution)						
Diamond Firetail	*Stagonopleura guttata*	Vulnerable					Species or species habitat known to occur within area	_
		Conservation Advice for *Stagonopleura guttata* (diamond firetail) (DCCEEW 2023b). No relevant threats identified.						
Double-banded Plover	*Charadrius bicinctus*		Migratory	Migratory Wetlands Species	Listed - overfly marine area		Roosting known to occur within area	_
Eastern Curlew, Far Eastern Curlew	*Numenius madagascariensis*	Critically Endangered	Migratory	Migratory Wetlands Species	Listed		Species or species habitat known to occur within area	Species or species habitat may occur within area
		Conservation Advice for *Numenius madagascariensis* (Far Eastern Curlew) (DCCEEW 2023c). Threats identified relevant to the Program: Habitat degradation/ loss (oil pollution)						
Eastern Hooded Plover, Eastern Hooded Plover	*Thinornis cucullatus cucullatus*	Vulnerable			Listed - overfly marine area (as *Thinornis rubricollis rubricollis*)		Species or species habitat known to occur within area	_
Fairy Prion	*Pachyptila turtur*				Listed		Species or species habitat known to occur within area	Species or species habitat may occur within area
Fairy Prion (southern)	*Pachyptila turtur subantarctica*	Vulnerable					Species or species habitat known to occur within area	Species or species habitat may occur within area
		Approved Conservation Advice for *Pachyptila subantarctica* (Fairy Prion (southern)) (TSSC 2015c). No relevant threats identified.						

Common Name	Scientific Name	Threatened Category	Migratory Status	Migratory Category	Marine Status	BIAs	Present in Planning Area	Present in Operational Area
Fork-tailed Swift	*Apus pacificus*		Migratory	Migratory Marine Birds	Listed - overfly marine area		Species or species habitat likely to occur within area	_
Gang-gang Cockatoo	*Callocephalon fimbriatum*	Endangered					Species or species habitat known to occur within area	_
Great Knot	*Calidris tenuirostris*	Vulnerable	Migratory	Migratory Wetlands Species	Listed - overfly marine area		Roosting known to occur within area	_
		Conservation Advice for *Calidris tenuirostris* (great knot) (DCCEEW 2024c). Threats identified relevant to the Program: Chronic and acute pollution						
Greater Sand Plover, Large Sand Plover	*Charadrius leschenaultii*	Vulnerable	Migratory	Migratory Wetlands Species	Listed		Species or species habitat known to occur within area	_
		Conservation Advice for *Charadrius leschenaultia* (Greater sand Plover) (TSSC 2016a). Threats identified relevant to the Program: Habitat degradation/ loss (oil pollution)						
Green Rosella (King Island)	*Platycercus caledonicus brownii*	Vulnerable					Species or species habitat known to occur within area	_
Grey Falcon	*Falco hypoleucos*	Vulnerable					Species or species habitat likely to occur within area	_
Grey Plover	*Pluvialis squatarola*	Vulnerable	Migratory	Migratory Wetlands Species	Listed - overfly marine area		Roosting known to occur within area	_
		Conservation Advice for *Pluvialis squatarola* (grey plover) (DCCEEW 2024d). Threats identified relevant to the Program: Chronic and acute pollution						

Common Name	Scientific Name	Threatened Category	Migratory Status	Migratory Category	Marine Status	BIAs	Present in Planning Area	Present in Operational Area
Grey-tailed Tattler	*Tringa brevipes*		Migratory	Migratory Wetlands Species	Listed (as *Heteroscelus brevipes*)		Roosting known to occur within area	_
Hooded Plover, Hooded Dotterel	*Thinornis cucullatus*				Listed - overfly marine area (as *Thinornis rubricollis*)		Species or species habitat known to occur within area	_
Kelp Gull	*Larus dominicanus*				Listed		Breeding known to occur within area	_
King Island Brown Thornbill, Brown Thornbill (King Island)	*Acanthiza pusilla magnirostris*	Endangered					Species or species habitat known to occur within area	_
King Island Scrubtit, Scrubtit (King Island)	*Acanthornis magna greeniana*	Critically Endangered					Species or species habitat known to occur within area	_
Latham's Snipe, Japanese Snipe	*Gallinago hardwickii*	Vulnerable	Migratory	Migratory Wetlands Species	Listed - overfly marine area		Species or species habitat known to occur within area	_
		Conservation Advice for *Gallinago hardwickii* (Latham's snipe) (DCCEEW 2024e). No relevant threats identified.						
Lesser Sand Plover, Mongolian Plover	*Charadrius mongolus*	Endangered	Migratory	Migratory Wetlands Species	Listed		Roosting known to occur within area	_
Little Curlew, Little Whimbrel	*Numenius minutus*		Migratory	Migratory Wetlands Species	Listed - overfly marine area		Roosting likely to occur within area	_

Common Name	Scientific Name	Threatened Category	Migratory Status	Migratory Category	Marine Status	BIAs	Present in Planning Area	Present in Operational Area
Little Penguin	*Eudyptula minor*				Listed	Breeding, Foraging	Breeding known to occur within area	_
Magpie Goose	*Anseranas semipalmata*				Listed - overfly marine area		Species or species habitat may occur within area	_
Marsh Sandpiper, Little Greenshank	*Tringa stagnatilis*		Migratory	Migratory Wetlands Species	Listed - overfly marine area		Roosting known to occur within area	_
Nunivak Bar-tailed Godwit, Western Alaskan Bar-tailed Godwit	*Limosa lapponica baueri*	Endangered					Species or species habitat known to occur within area	_
		Conservation Advice for *Limosa lapponica baueri* (Alaskan Bar-tailed Godwit (western Alaskan)) (DCCEEW 2024o). Threats identified relevant to the Program: Habitat degradation/ loss.						
Orange-bellied Parrot	*Neophema chrysogaster*	Critically Endangered			Listed - overfly marine area		Migration route known to occur within area	_
		National Recovery Plan for the *Neophema chrysogaster* (Orange-bellied Parrot) (DELWP 2016). Threats identified relevant to the Program: Illuminated boats and structures: evaluate risk of lighting on vessels and offshore structures.						
Osprey	*Pandion haliaetus*		Migratory	Migratory Wetlands Species	Listed		Species or species habitat known to occur within area	_
Pacific Golden Plover	*Pluvialis fulva*		Migratory	Migratory Wetlands Species	Listed		Roosting known to occur within area	_

Common Name	Scientific Name	Threatened Category	Migratory Status	Migratory Category	Marine Status	BIAs	Present in Planning Area	Present in Operational Area
Pacific Gull	*Larus pacificus*				Listed		Breeding known to occur within area	_
Painted Honeyeater	*Grantiella picta*	Vulnerable					Species or species habitat known to occur within area	_
Pectoral Sandpiper	*Calidris melanotos*		Migratory	Migratory Wetlands Species	Listed - overfly marine area		Species or species habitat known to occur within area	Species or species habitat may occur within area
Pied Stilt, Black-winged Stilt	*Himantopus himantopus*				Listed - overfly marine area		Roosting known to occur within area	_
Pilotbird	*Pycnoptilus floccosus*	Vulnerable					Species or species habitat likely to occur within area	_
Pin-tailed Snipe	*Gallinago stenura*		Migratory	Migratory Wetlands Species	Listed - overfly marine area		Roosting likely to occur within area	_
Plains-wanderer	*Pedionomus torquatus*	Critically Endangered					Species or species habitat may occur within area	_
Rainbow Bee-eater	*Merops ornatus*				Listed - overfly marine area		Species or species habitat may occur within area	_
Red Knot, Knot	*Calidris canutus*	Vulnerable	Migratory	Migratory Wetlands Species	Listed - overfly marine area		Species or species habitat known to occur within area	Species or species habitat may occur within area
		Conservation Advice for *Calidris canutus* (Red Knot) (DCCEEW 2024f). Threats identified relevant to the Program: Marine pollution - Evaluate risk of oil spill impact to nest locations and, if required, appropriate mitigation measures are implemented.						

Common Name	Scientific Name	Threatened Category	Migratory Status	Migratory Category	Marine Status	BIAs	Present in Planning Area	Present in Operational Area
Red-capped Plover	*Charadrius ruficapillus*				Listed - overfly marine area		Roosting known to occur within area	_
Red-necked Avocet	*Recurvirostra novaehollandiae*				Listed - overfly marine area		Roosting known to occur within area	_
Red-necked Phalarope	*Phalaropus lobatus*		Migratory	Migratory Wetlands Species	Listed		Roosting known to occur within area	_
Red-necked Stint	*Calidris ruficollis*		Migratory	Migratory Wetlands Species	Listed - overfly marine area		Roosting known to occur within area	_
Regent Honeyeater	*Anthochaera phrygia*	Critically Endangered					Foraging, feeding or related behaviour likely to occur within area	_
Ruddy Turnstone	*Arenaria interpres*	Vulnerable	Migratory	Migratory Wetlands Species	Listed		Roosting known to occur within area	_
		Conservation Advice for *Arenaria interpres* (ruddy turnstone) (DCCEEW 2024g). Threats identified relevant to the Program: Chronic and acute pollution						
Rufous Fantail	*Rhipidura rufifrons*				Listed - overfly marine area		Species or species habitat known to occur within area	_
Sanderling	*Calidris alba*		Migratory	Migratory Wetlands Species	Listed		Roosting known to occur within area	_
Satin Flycatcher	*Myiagra cyanoleuca*				Listed - overfly marine area		Breeding known to occur within area	_

Common Name	Scientific Name	Threatened Category	Migratory Status	Migratory Category	Marine Status	BIAs	Present in Planning Area	Present in Operational Area
Sharp-tailed Sandpiper	*Calidris acuminata*	Vulnerable	Migratory	Migratory Wetlands Species	Listed		Roosting known to occur within area	Species or species habitat may occur within area
		Conservation Advice for *Calidris acuminata* (sharp-tailed sandpiper) (DCCEEW 2024h). Threats identified relevant to the Program: Chronic and acute pollution						
Silver Gull	*Chroicocephalus novaehollandiae*				Listed (as Larus novaehollandiae)		Breeding known to occur within area	_
South-eastern Hooded Robin, Hooded Robin (south-eastern)	*Melanodryas cucullata cucullata*	Endangered					Species or species habitat may occur within area	_
South-eastern Red-tailed Black-Cockatoo	*Calyptorhynchus banksii graptogyne*	Endangered					Species or species habitat likely to occur within area	_
Southern Whiteface	*Aphelocephala leucopsis*	Vulnerable					Species or species habitat may occur within area	_
		Conservation Advice for *Aphelocephala leucopsis* (southern whiteface) (DCCEEW 2023d). No relevant threats identified.						
Swift Parrot	*Lathamus discolor*	Critically Endangered			Listed - overfly marine area		Species or species habitat known to occur within area	_
		Conservation advice *Lathamus discolor* Swift Parrot (TSSC 2015d) National Recovery Plan for the Swift Parrot *Lathamus discolour* (DCCEEW 2024i). No relevant threats identified.						

Common Name	Scientific Name	Threatened Category	Migratory Status	Migratory Category	Marine Status	BIAs	Present in Planning Area	Present in Operational Area
Swinhoe's Snipe	*Gallinago megala*		Migratory	Migratory Wetlands Species	Listed - overfly marine area		Roosting likely to occur within area	_
Tasmanian Azure Kingfisher	*Ceyx azureus diemenensis*	Endangered					Species or species habitat known to occur within area	_
Tasmanian Wedge-tailed Eagle, Wedge-tailed Eagle (Tasmanian)	*Aquila audax fleayi*	Endangered					Species or species habitat may occur within area	_
Terek Sandpiper	*Xenus cinereus*	Vulnerable	Migratory	Migratory Wetlands Species	Listed - overfly marine area		Roosting known to occur within area	_
		Conservation Advice for *Xenus cinereus* (terek sandpiper) (DCCEEW 2024j). Threats relevant to the Program: Chronic and acute pollution						
Whimbrel	*Numenius phaeopus*		Migratory	Migratory Wetlands Species	Listed		Roosting known to occur within area	_
White-bellied Sea-Eagle	*Haliaeetus leucogaster*				Listed		Breeding known to occur within area	-
White-throated Needletail	*Hirundapus caudacutus*	Vulnerable	Migratory	Migratory Terrestrial Species	Listed - overfly marine area		Species or species habitat known to occur within area	_
Yellow Wagtail	*Motacilla flava*		Migratory	Migratory Terrestrial Species	Listed - overfly marine area		Species or species habitat may occur within area	_

6.4.9.4.1 Albatross and Petrels

Albatross and giant-petrels are among the most dispersive and oceanic of all birds, spending more than 95% of their time foraging at sea in search of prey and usually only returning to land (remote islands) to breed (CoA 2022). Only seven species of albatross and the southern and northern giant petrel are known to breed within Australia, which are protected under The National Recovery Plan for Albatross and Petrels (CoA 2022). Breeding within Australian territory occurs on the isolated islands of Antarctica (Giganteus Island, Hawker Island and Frazier islands) and the Southern Ocean (Heard Island, McDonald Island, Macquarie Island, Bishop and Clerk Islands), as well as islands off the south coast of Tasmania and Albatross Island off the north-west coast of Tasmania in Bass Strait (CoA 2022). There are no islands with colonies of threatened marine seabirds within the Operational Area. Albatross Island, defined as habitat critical to the survival of the shy albatross (*Thallassarche cauta*), supportsing a breeding population of approximately 5,000 pairs shy albatross (*Thallassarche cauta*), and is 195 km south-east of the Operational Area outside of the Planning Area. No habitats critical to the survival of threatened albatross or petrel species occur within the Operational Area or Planning Area, this includes known nesting or migrating sites.

A critical life phase for birds is termed "fledging". Fledging occurs when juvenile birds begin taking their first flights. Unlike albatross species which forage most actively during daylight and are less active at night because their ability to see and capture prey from the air is reduced (Phalan et al. 2007), many petrels are known to be nocturnal at their breeding places, increasing the species susceptibility to light emissions, particularly during fledging (Chevillion et al. 2022). Survival rates during the first few weeks as a fledging are the lowest as there is no parental care and young petrels will need to learn how to fly, forage, and maintain plumage alone (Menkhorst 2010). Fledging typically occurs within the first two hours after sunset during the fledging period (Chevillion et al. 2022). Therefore this biologically sensitive period can be impacted by light at night and result in groundings or fallout events, sometimes leading to mortality (Atchoi et al. 2024). Impacts to fledglings from light emissions are assessed in Section 6.4.9.4.

Albatross and Giant Petrel species exhibit a broad range of diets and foraging behaviours; hence their at-sea distributions are diverse. Combined with their ability to cover vast oceanic distances, all waters within Australian jurisdiction can be considered foraging habitat, however the most critical foraging habitat is those waters south of 25° where most species spend most of their foraging time (CoA 2022). Therefore, albatross and petrel species are likely to fly through and forage sporadically within the Operational Area and Planning Area year-round.

The antipodean albatross, black-browed albatross, campbell albatross, wandering albatross, buller's albatross, Indian yellow-nosed albatross and shy albatross have BIAs for foraging that overlap the Operational Area and Planning Area (Figure 6-39; Figure 6-40; Figure 6-41).

Both the common diving-petrel and the white-faced storm petrel are not listed as threatened species under the EPBC Act, and have large populations within Australia, accounting for 5% and 25% respectively of the global population (CoA 2015). The common diving-petrel breeds on islands off south-east Australia and Tasmania; there are 30 sites with significant breeding colonies (defined as more than 1,000 breeding pairs) known in Tasmania, and 12 sites in Victoria (including Seal Island, Wilson's Promontory and Lady Julia Percy Island) (DCCEEW 2023). Common diving-petrels are thought to be fairly sedentary, remaining more or less in the area of their breeding colony year-round, however, there are instances where individuals have been recorded venturing into the open ocean to forage outside of the breeding season and may migrate to more tropical climates (Brooke 2004).

Within the Bass Strait the common diving-petrels has shown high foraging efforts compared to other populations (with foraging trips averaging 71 ± 3 km). This is believed to potentially be due to the sparse distribution of prey such as krill (Formant et al. 2021). There are 15 sites with significant breeding colonies for the white-faced storm petrel in Tasmania and 3 sites within Victoria (CoA 2015). The Operational Area and Planning Area overlap a foraging BIA for the common diving-petrel which is expected to be utilised year-round by the species (Figure 6-40). While the closest breeding BIA for the Common Diving-petrel is located 78 km from the Operational Area, within the Planning Area (Table 6-19).

Southern royal albatross forage from 36° to 63°. They range over the waters off southern Australia at all times of the year but especially from July to October (CoA 2022). The northern royal albatross is regularly recorded throughout the year around Tasmania and South Australia at the continental shelf edge and feeds frequently in these waters. Despite breeding colonies in New Zealand, the White Capped and the Chatham Albatross are common off the coast of south-east Australia throughout the year (CoA 2022). During the non-breeding season, the Salvin's albatross occur over continental shelves around continents with a small number of non-breeding adults flying regularly across the Tasman Sea to south-east Australian waters (CoA 2022). Sooty albatrosses although rare are likely regular migrants to Australian waters mostly in the autumn to winter months and have been observed foraging in southern Australia (Thiele 1977; Pizzey and Knight 1999). The Pacific albatross (equivalent to the northern buller's albatross) is a non-breeding visitor to Australian waters mostly limited to the Tasman Sea and Pacific Ocean, occurring over inshore, offshore, and pelagic waters and off the east-coast of Tasmania (CoA 2022). Gibson's albatross has breeding colonies in New Zealand but has been known to forage in the Tasman Sea and South Pacific Ocean with individuals occurring offshore from Coffs Harbour in the north to Wilson's Promontory in the south (CoA 2022; Marchant and Higgins 1990). Therefore, it is likely that these species along with the Tasmanian shy albatross will be present throughout the year and forage within the Operational Area and Planning Area.

The white-bellied storm petrel breed on small offshore islets and rocks in Lord Howe Island and has been recorded over near-shore waters off Tasmania (Baker et al. 2002). The great-winged petrel breeds in the Southern Hemisphere between 30° and 50° south, outside of the breeding season they are widely dispersed.

6.4.9.4.2 Terns and Shearwaters

Four species of shearwater (flesh-footed shearwater (*Ardenna carneipes*), short-tailed shearwater (*Ardenna tenuirostris*), sooty shearwater (*Ardenna grisea*), wedge-tailed shearwater (*Ardenna pacifica*)) may occur within the Planning Area. All of the shearwater species listed are managed under the Wildlife Conservation Plan for Seabirds (CoA 2020a). There are a range of anthropogenic threats that affect the shearwater family which may vary based on species, stocks and life history stage.

Like petrels, shearwaters are also considered to be primarily nocturnal at their breeding places making them susceptible to light emissions when they commute from breeding colonies to forage out at sea (Chevillion et al. 2022). Therefore, like petrels, the fledging phase, a biologically sensitive period, can be impacted by light at night and result in groundings or fallout events, sometimes leading to mortality (Atchoi et al. 2024). The fledging season may vary between species; however it is known to occur over a short period of time with the first flight typically occurring within the first two hours after sunset (Chevillion et al. 2022). The wedge-tailed shearwater, for example, has a very synchronized breeding regime with all fledglings leaving nests within a very short period of time (less than one lunar cycle) (Chevillion et al. 2022). While the fledging period of the short-tailed shearwater is believed to occur between the third week of April and the first week of May each year (Skira 1991; Rodriguez et al. 2014; Price 2022). The short-tailed shearwater fledglings in particular, appear to have an increased sensitivity to artificial light although fewer than 1% of fledglings produced annually are thought to be affected by mortality (CoA 2020a). Impacts to fledglings from light emissions are assessed in Section 7.2.5.1.3.

Flesh-footed shearwater may forage in the Operational Area and Planning Area. The species is a trans-equatorial migrant widely distributed across the south-western Pacific during breeding season (early September to early May) and is a common visitor to the waters of the continental shelf/slope and occasionally inshore waters (DoE 2025). The species breeds in burrows on sloping ground in coastal forest, scrubland, or grassland. Thirty-nine of the 41 islands on which the species breeds lie off the coast of southern Western Australia, with the remaining two islands being Smith Island (SA) and Lord Howe Island (DoE 2025), all of which are located outside of the Operational Area and Planning Area. The flesh-footed shearwater feeds on small fish, cephalopod molluscs (squid, cuttlefish, nautilus and argonauts), crustaceans (barnacles and shrimp), other soft-bodied invertebrates (such as Velella) and offal (DoE 2025). The species forages almost entirely at sea and very rarely on land. It obtains most of its food by surface plunging or pursuit plunging. It also regularly forages by settling on the surface of the ocean and snatching prey from the surface ('surface seizing'), momentarily submerging onto prey beneath the surface ('surface diving') or diving and pursuing prey beneath the surface by swimming ('pursuit diving'). Birds have also been observed flying low over the ocean and pattering the water with their feet while picking food items from the surface (termed 'pattering') (DoE 2025). This species is likely to visit and forage within the Operational and Planning Areas outside of the breeding season.

The short-tailed shearwater has a foraging BIA (September to May) within the Operational Area and breeding BIAs that overlap the Planning Area (Figure 6-39). The short-tailed shearwater migrates to the Northern hemisphere for the austral winter and is generally only present in Australian waters from September to May. The short-tailed shearwater is migratory, and breeding is restricted to southern Australia being most abundant in Victoria and Tasmania (Skira et al. 1996). Huge numbers arrive along the south and south-east coast of Australia from wintering grounds in the North Pacific and are observed in large numbers foraging the surrounding coastal and offshore waters (Marchant and Higgins 1990). They are common in the South-east Marine Region and largely found on numerous islands off Victoria and Tasmania during the breeding season (Baker and Hamilton 2013, Skira et al. 1996). Though not designated as BIAs, breeding has been recorded at additional locations such as Middle Island and Griffiths Island which are located over 50 km from the Operational Area within the Planning Area (Baker and Hamilton 2013). During breeding the short-tailed shearwater conducts a bimodal feeding strategy, alternating short foraging trips to local waters with long foraging trips (up to 17 days) to the Polar Frontal Zone (Berlincourt and Arnould. 2015). Short trips allow greater chick provisioning at the sacrifice of body condition, which is then recovered in richer subantarctic waters. Diet includes fish (particularly myctophids), crustaceans and squid (Weimerskirch and Cherel 1998). Short-tailed shearwaters have been identified as a conservation value in the temperate east and south-west marine areas. and Therefore, considering the presence of breeding islands within proximity of the Program the short-tailed shearwater is are likely to be present in the Operational Area and Planning Area between September and May each year.

The sooty shearwater is migratory and breeds in summer around southern Australia in New South Wales and Tasmania and may occur within the Operational Area. The Australian breeding population is estimated to be 6,500 pairs (DCCEEW 2023a). In Australian territory, the sooty shearwater breeds on offshore islands off New South Wales and Tasmania. Breeding populations within Tasmania are known on Tasman Island, Hippolyte Rock, Maatsuyker Island and Courts Island, all of which occur outside of the Operational Area and Planning Area. The species forages mainly in subtropical (open ocean), sub-Antarctic and Antarctic waters. No BIAs have been identified to overlap with the Operational Area or Planning Area. It has been recorded in areas with sea surface temperature of 8.7-22°C (Reid et al. 2002). The species takes most food by pursuit-plunging and other methods and feeding concentrations are often observed over thermal fronts at edges of upwellings at boundaries of cool and warm water-masses. Although this species may occur and forage opportunistically within the Operational and Planning Areas the absence of defined BIAs and the distance to breeding colonies reduce the chance of interaction.

The wedge-tailed shearwater has a breeding BIA 18 km north of the Operational Area (Figure 6-39). A review of the DCCEEW Species Profile and Threats Database (SPRAT), Atlas of Living Australia and South-east Marine Region Profile did not provide any information on the Victorian Muttonbird Island wedge-tailed shearwater colony. The DCCEEW SPRAT profile does not show any locations for the wedge-tailed shearwater in Victoria and Beaver (2022) details Montague Island in NSW was the southernmost known colony, however, in 2017 breeding individuals of wedge-tail shearwaters were discovered a couple of hundred kilometres further south on Gabo Island Lighthouse Reserve, Victoria near the NSW border. Movement patterns of the wedge-tailed shearwater are poorly known but populations at the northern and southern extremities of the known range are migratory, departing nests in early April to early May and spending the non-breeding season in the tropics (DoE 2025). The species have been recorded to predominantly forage during the day and form large aggregations referred to as “rafts” just offshore from their breeding colony just on dusk and enter and leave the colony at night to avoid predators (Warham 1996). Although this species may occur and forage opportunistically within the Operational and Planning Areas during the breeding season (November to April) the absence of defined BIAs and the distance to known breeding colonies reduce the chance of interaction.

The Australian fairy tern occurs along the coastline of Victoria, South Australia, Western Australia and Tasmania. Breeding habitat for the caspian, little tern and Australian fairy tern vary from terrestrial wetlands, rocky islets or banks, low islands, beaches, cays and spits. Nests are present in the open sparse vegetation such as tussocks and other sand binding plants to sometimes near bushes and driftwood. Their diet also consists primarily of fish along with aquatic invertebrates, insects, and eggs and the young of other birds (Higgins and Davis 1996; Taylor and Roe 2004; Van de Kam et al. 2004).

The caspian tern is the largest tern in Australia, they inhabit both coastal and inland regions and breeding occurs widespread throughout Australia. In Victoria breeding sites are mostly along coastal regions with three significant regular breeding colonies at Corner Inlet, Mud Island and Mallacoota (Minton and Deleyev 2001). Breeding occurs between September to December are resident and occur throughout the year at breeding sites (Minton and Deleyev 2001).

The little tern species is also widespread in Australia with three major sub populations, the northern population that breeds from Broome to Northern Territory. The eastern subpopulation breeds on the eastern and south-eastern coast extending as far as western Victoria and the south-eastern parts of South Australia, to the northern and eastern coast of Tasmania. The third population migrate from breeding grounds in Asia to spend the spring and summer in Australia. The little tern has a naturally high rate of breeding failure due to the ground nets being exposed to adverse weather conditions, and native predators.

The sooty tern has a much larger foraging range, encompassing open shelf waters, shelf edge and deep water (DSEWPaC 2012b). Main breeding colonies occur off Australia's west and east coast. Like the crested tern where distribution is widespread in Australia, but breeding occurs off islands in large colonies off Queensland and NSW (Higgins and Davis 1996). Foraging diet consists of pelagic fish, cephalopods, crustaceans and insects. Sooty terns were observed amongst mixed flocks of seabirds (such as albatross and shearwaters) during a previous Beach drilling campaign in the region in April 2021.

6.4.9.4.3 Osprey and White-bellied Sea Eagle

No BIAs were identified for osprey or white-bellied sea eagles within the Operational Area or Planning Area.

The white-bellied sea eagle (*Haliaeetus leucogaster*) is a large raptor generally seen singly or in pairs, distributed along the coastline of mainland Australia and Tasmania (Threatened Species Section 2023). Breeding records are patchily distributed mainly along the coastline especially the eastern coast extending from Victoria and Tasmania to Queensland. There are recorded breeding sites as far inland as the Murray, Murrumbidgee and Lachlan River in norther Victoria (Marchant and Higgins 1993). There is no quantitative data available on area of occupancy, but it is believed that there could be a decline due to increased development of coastal areas. Estimations of 500 or more pairs in Australia account for 10-20% of the global population (Marchant and Higgins 1993). Recorded decline in numbers have been recorded across Australia, with a decline in Victoria's Gippsland Lakes, Phillip Island and the Sunraysia district (Bilney and Emison 1983; Quinn 1969). White-bellied sea eagles feed on a variety of fish, birds, reptiles, mammals and crustaceans. They hunt from a perch and while in flight (circling slowly). Described as a breeding resident throughout much of its range in Australia, breeding is generally sedentary, and the home range can be up to 100 km^2 (Marchant and Higgins 1993). White-bellied sea eagles are sensitive to disturbance particularly in the early stages of nesting, human activity may cause nests and young to be abandoned (Debus et al. 2014).

The osprey (*Pandion haliaetus*) is a medium sized raptor extending around the northern coast of Australia from Albany, Western Australia to Lake Macquarie in NSW with an isolated breeding population on the coast of South Australia. Listed as migratory under the EPBC Act they are resident around breeding territories. They are found along coastal habitats and terrestrial wetlands and require open fresh or saltwater for foraging (Marchant and Higgins 1993). Osprey feed mainly on fish, occasionally molluscs, crustaceans, mammals, birds, reptiles, and insects. Generally, they search or prey by soaring, circling, and quartering above water and dive directly into the water at their target prey (Clancy 2005). This species is likely to be an uncommon visitor to the Operational Area and Planning Area.

6.4.9.4.4 Orange-bellied Parrot

The orange-bellied parrot (*Neophema chrysogaster*) (listed as critically endangered under the EPBC Act) breeds in south-west Tasmania during summer (November to March), migrates north across Bass Strait in autumn and spends winters (April to October) on the coast of south-east mainland Australia (DELWP 2016). The migration route includes the west coast of Tasmania and King Island (Figure 6-42). Birds depart the mainland for Tasmania from September to November (Green 1969). The southward migration is rapid (Stephenson 1991), so there are few migration records. The northward migration across western Bass Strait is more prolonged (Higgins and Davies 1996); but typically occurs late-February to early-April (Australian Museum 2020). Migration activities are known to occur within the

Planning Area based on PMST Report and reputable peer-review literature (Appendix H). The orange-bellied parrot is protected under the National Recovery Plan for the Orange-bellied Parrot (DELWP 2016). The parrot's breeding habitat is restricted to south-west Tasmania, where breeding occurs from November to mid-January mainly within 30 km of the coast.

The species forage on the ground or in low vegetation (Loyn et al. 1986). During winter, on mainland Australia, orange-bellied parrots are found mostly within 3 km of the coast. In Victoria, they mostly occur in sheltered coastal habitats, such as bays, lagoons and estuaries. They are also found in low samphire herbland dominated by beaded glasswort (*Sarcocornia quinqueflora*), sea heath (*Frankenia pauciflora*) or sea-blite (*Suaeda australis*), and in taller shrubland dominated by shrubby glasswort (*Sclerostegia arbuscula*). There are also non-breeding orange-bellied parrots on mainland Australia, between Goolwa in Australia and Corner Inlet in Victoria. The west coast of King Island and coastal Victoria has been identified as resting and feeding areas, however, parrots rarely land or forage out at sea.

The orange bellied parrot may overfly the Operational Area on its migrations to and from breeding grounds between March and April and October and November each year, however no presence was recorded by the PMST (Appendix F). The Planning Area overlaps the known migration route in the Bass Strait as well as habitat on the coast of King Island (Figure 6-42).

6.4.9.4.5 Little Penguin

The little penguin is recognised as a conservation value in the South-east Marine Region (CoA 2015). It is the smallest species of penguin in the world and are permanent residents on a number of inshore and offshore islands. The Australian population is large but not thought to exceed one million birds (CoA 2015). Despite the colony of little penguins at Manly, Sydney Harbour, being protected as an endangered population, the Australian population is considered stable (Birdlife Australia 2025). Bass Strait has the largest proportion (approximately 60%) of the known breeding colonies in Australia. Individuals exhibit strong site fidelity, returning to the same breeding colony each year to breed in the winter and spring months (Gillanders et al. 2013). Breeding typically occurs from September to February. The diet of a little penguin includes small school fish, squid and krill. Prey is typically caught with rapid jabs of the beak and swallowed whole. Little penguins are also an important component of the Australian and New Zealand fur-seals' diet (Parliament of South Australia 2011). The species is known to exhibit a wide foraging range, with individuals able to spend weeks away at sea foraging (McCutcheon et al. 2011). The closest foraging BIA to the Operational Area is surrounding Christmas Island located off of nearby King Island, approximately 83 km from the Operational Area (see Figure 6-40).

The closest breeding BIA to the Operational Area correlates with the foraging BIA at Christmas Island, approximately 93 km from the Operational Area (see Figure 6-40). However, additional breeding sites which are not designated BIAs have been recorded at Middle Island, the Twelve Apostles and Port Campbell (Norman et al. 2017). Therefore, considering the occurrence of a number of breeding sites within the region it is considered that the little penguin is likely to transit and forage within the Operational and Planning Areas.

6.4.9.4.6 Other Shorebirds

A number of species listed in Table 6-22 use coastal shoreline habitats such as the Australian gannet, fairy prion, red knot, pectoral sandpiper, fork-tailed swift, sharp-tailed sandpiper, curlew sandpiper, eastern curlew, little curlew, yellow wagtail, and species of plover. These species are commonly found on coastal shores including beaches and rocky shores and either feed at low tide on worms, crustaceans, molluscs or fish species. These species are unlikely to be present in the Operational Area due to the distance offshore but are likely to be present in the Planning Area.

Many sandpipers including the broad-billed, common, marsh and terek are widespread through Australia's coastline inhabiting saltwater and freshwater ecosystems. They migrate from the Northern Hemisphere in non-breeding months, favouring estuaries, saltmarshes, intertidal mudflats, swamps, and lagoons and foraging on worms, molluscs, crustaceans, insects, seeds and occasionally rootlets and other vegetation (Marchant and Higgins 1993; Higgins and Davies 1996).

The Australian painted snipe is a stocky wading bird most commonly in eastern Australian wetlands. Feeding on vegetation, insects, worms, molluscs, crustaceans, and other invertebrates. Latham's, swinhoe's and pin-tailed snipe is a non-breeding visitor to Australia occurring at the edges of wetlands, shallow swamps, ponds, and lakes (Marchant and Higgins 1993). The grey-tailed tattler migrates from the Northern hemisphere and inhabit rocky coasts with reefs and platforms, offshore islands, and intertidal mudflats. Foraging on polychaete worms, molluscs and crustaceans and roosting on branches of mangroves and rocks and boulders close to water. The bar-tailed godwit and black-tailed godwit are large waders, migrating from the Northern hemisphere in the noon-breeding months to coastal habitat in Australia. The large waders are commonly found in sheltered bays, estuaries, intertidal mudflats, and occasionally on rocky coasts (Higgins and Davies 1996).

Hooded and eastern hooded plovers are small beach nesting birds. They predominantly occur on wide beaches and are easily disturbed by human activity. The lesser sand and greater sand plover are migratory and inhabits intertidal sand and mudflats, forage on invertebrates and breed in areas characterised by high elevation. Breeding occurs outside Australia, but roosting occurs near foraging areas on beaches, banks, spits and banks (Pegler 1983). The Pacific golden and grey plover are widespread in coastal regions foraging on sandy beaches, spits, rocky points, exposed reef and occasional low saltmarsh and mangroves. Roosting usually occurs near foraging areas while breeding occurs in dry tundra areas away from the coast (Bransbury 1985; Pegler 1983; Marchant and Higgins 1993). The double-banded plover is found in both coastal and inland areas with greatest numbers in Tasmania and Victoria. It breeds only in New Zealand and migrates to Australia.

Other waders including common noddy, ruddy turnstone, sanderling, red-necked stint, whimbrel, common greenshank, pied stilt, white-throated needletail, red-necked phalarope, ruff, red-necked avocet, rufous fantail and black-faced cormorant are common along Australia's coastline. Many are migratory travelling from the Northern Hemisphere in non-breeding months. Most inhabit intertidal mudflats, rocky islets, sand beaches, mangroves, rocky coastline, and coral reefs. Roosting occurs in similar habitats and species are found feeding on fish, crustaceans, aquatic insects, as well as plants and seeds (Higgins and Davies 1996). These species are unlikely to be present in the Operational Area due to the distance offshore. The plains wanderer is a unique bird that lives predominantly in grasslands in Victoria, South Australia, New South Wales, and Queensland. The swift parrot is a small parrot breeding in colonies in Tasmania. The entire population migrates to the mainland during winter. The great knot is listed as vulnerable and migratory, arriving in large numbers in Australia occurring in sheltered coastal habitats with large intertidal mudflats. Typically, they roost in large open areas at the water's edge to in shallow water close to foraging grounds (Higgins and Davies 1996). These species are critically endangered and may occur within the Planning Area.

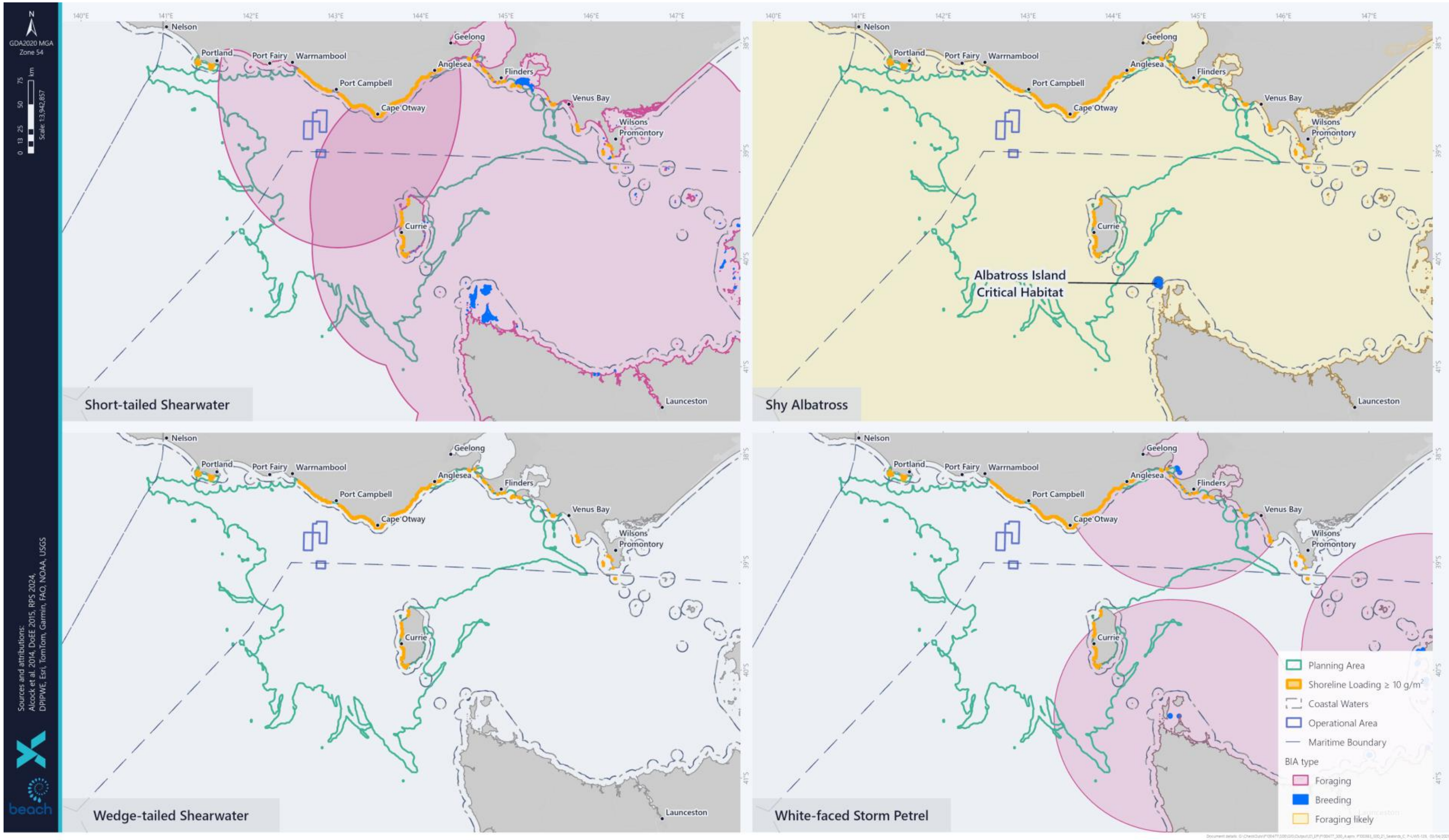


Figure 6-39: BIAs for the short-tailed shearwater, shy albatross, wedge-tailed shearwater and white-faced storm petrel within the Operational and Planning Areas.

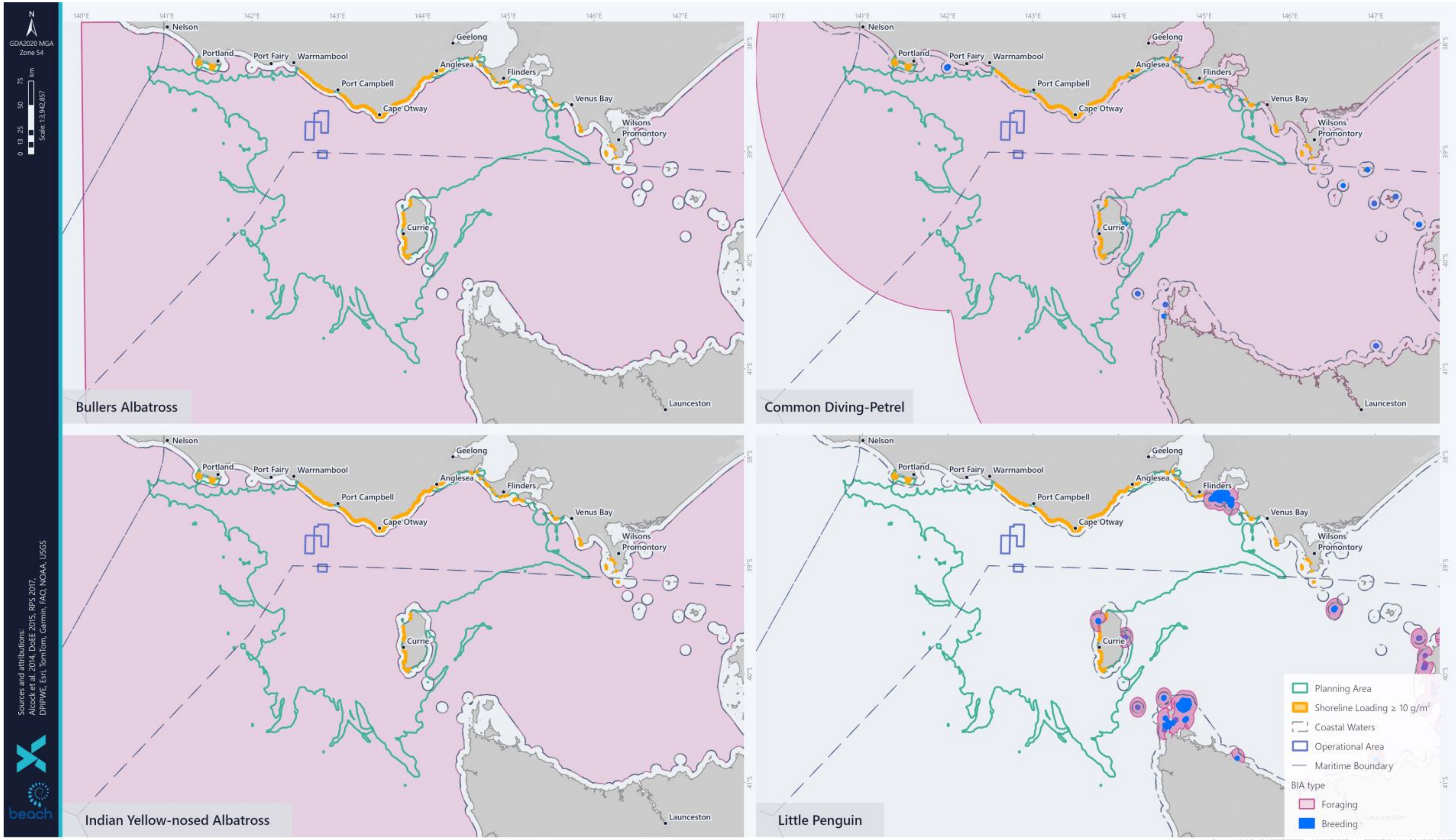


Figure 6-40: BIAs for the Bullers albatross, common diving-petrel, Indian yellow-nosed albatross and little penguin within the Operational and Planning Areas.

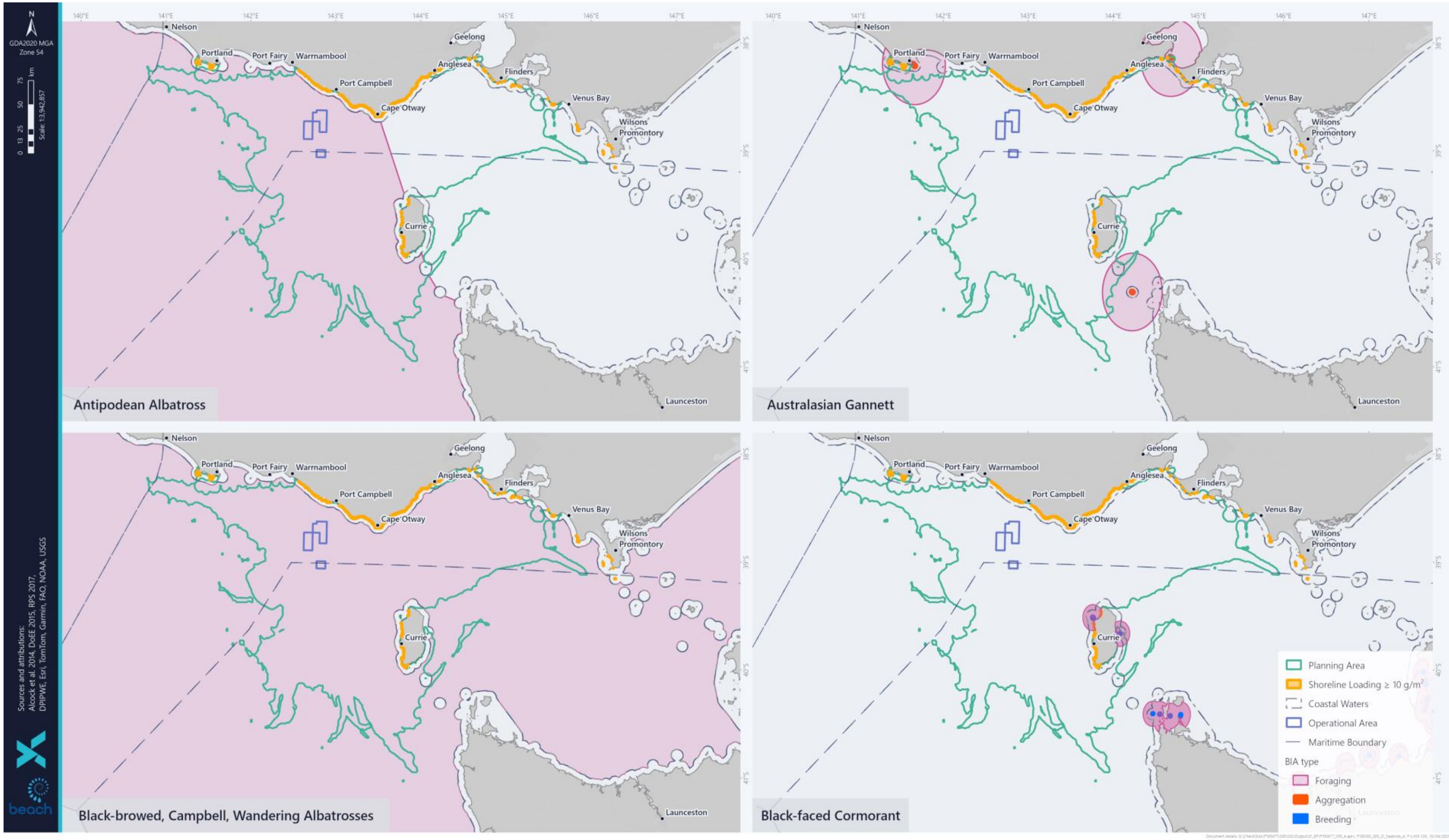


Figure 6-41: BIAs for antipodean albatross, Australasian gannet, black-browed, Campbell, wandering albatrosses and blacl-faced cormorant in the Operational and Planning Areas.

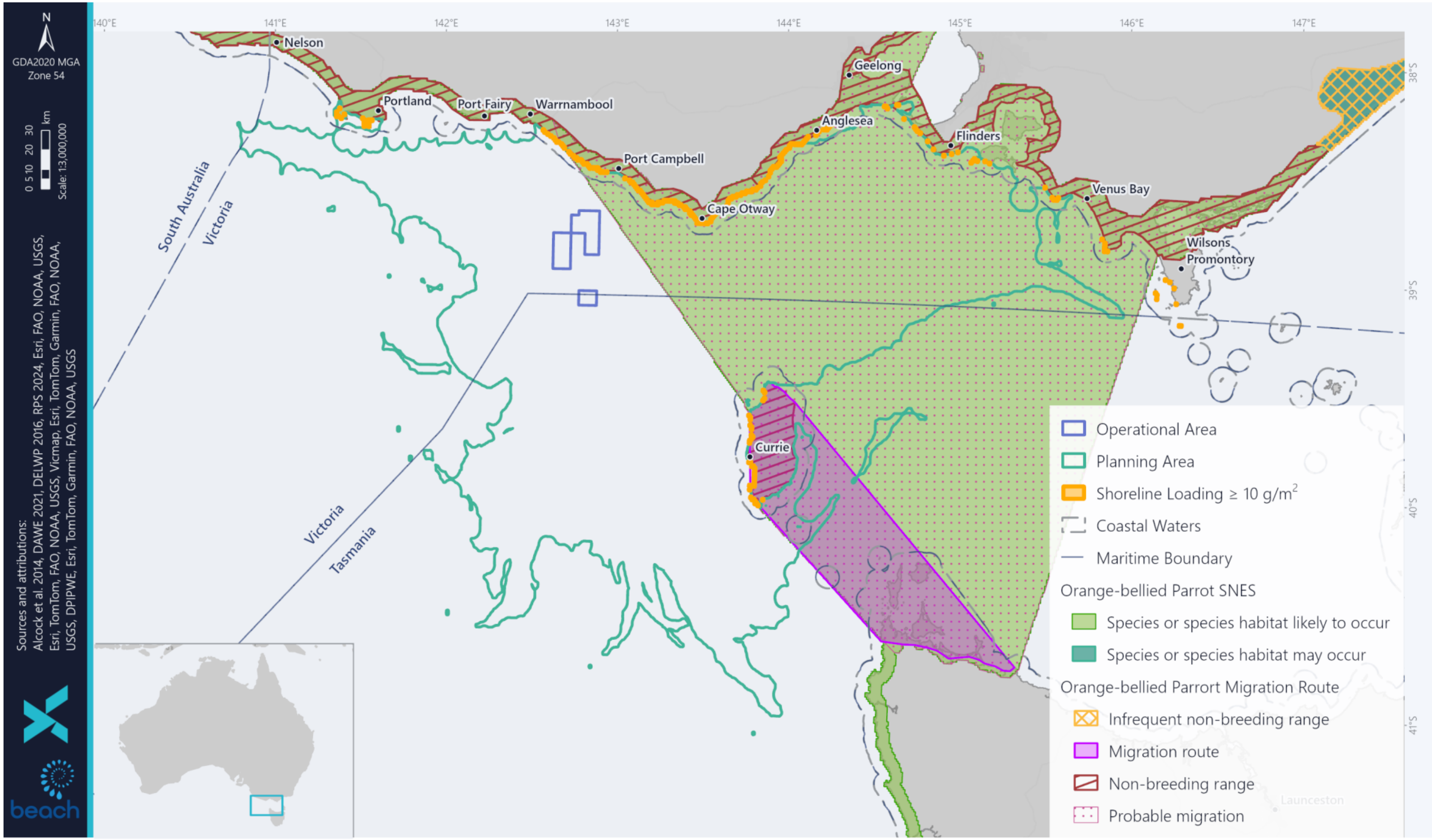


Figure 6-42: Distribution of the orange-bellied parrot within the Operational and Planning Areas.

6.4.9.5 Marine Reptiles

The PMST reports identified three marine turtle species with potential to occur in the Operational Area and/or Planning Area (Table 6-23). All three species of marine turtles are protected by the Recovery Plan for Marine Turtles in Australia (CoA 2017). Foraging, feeding or related behaviours are known to occur within the Planning Area for two of the identified marine turtle species. No BIAs or habitat critical to the survival of marine turtles overlap the Operational Area or Planning Area.

6.4.9.5.1 Green Turtle

Green turtles (*Chelonia mydas*) nest, forage and migrate across tropical northern Australia. They usually occur between the 20°C isotherms, although individuals can stray into temperate waters as vagrant visitors. Green turtles spend their first 5 to 10 years drifting on ocean currents. During this pelagic (ocean-going) phase, they are often found in association with drift lines and floating rafts of Sargassum. Green turtles are predominantly found in Australian waters off the Northern Territory, Queensland, and Western Australian coastlines, with limited numbers in New South Wales, Victoria, and South Australia. There are no known nesting or foraging grounds for green turtles offshore Victoria; they occur only rarely in these waters (DoE 2025) therefore it is expected they would only be occasional visitors in the Operational Area and Planning Area.

6.4.9.5.2 Leatherback Turtle

The leatherback turtle (*Dermochelys coriacea*) is a pelagic feeder found in tropical, sub-tropical and temperate waters throughout the world. Unlike other marine turtles, the leatherback turtle utilises cold water foraging areas, with the species most commonly reported foraging in coastal waters between southern Queensland and central NSW, southeast Australia (Tasmania, Victoria, and eastern SA), and southern WA (CoA 2017). This species is an occasional visitor to the Otway shelf and has been sighted on a number of occasions during aerial surveys undertaken by the Blue Whale Study Group (Gill 2020), particularly to the southwest of Cape Otway. It is mostly a pelagic species, and away from its feeding grounds is rarely found inshore (CoA 2017). Adults feed mainly on soft-bodied organisms such as jellyfish, which occur in concentrations at the surface in areas of convergence and upwelling (Bone 1998; Cogger 1992).

No major nesting has been recorded in Australia, with isolated nesting recorded in Queensland and the Northern Territory. The leatherback turtle is expected to be only an occasional visitor in the Operational Area and Planning Area.

6.4.9.5.3 Loggerhead Turtle

The loggerhead turtle (*Caretta caretta*) is globally distributed in tropical, sub-tropical and temperate waters. The loggerhead is a carnivorous turtle, feeding primarily on benthic invertebrates in habitat ranging from nearshore to 55 m depth (Plotkin et al. 1993).

The main Australian breeding areas for loggerhead turtles are generally confined to southern Queensland and Western Australia (Cogger et al. 1993). Loggerhead turtles will migrate over distances in excess of 1,000 km but show a strong fidelity to their feeding and breeding areas (Limpus 2008). Loggerhead turtles forage in all coastal states and the Northern Territory, but are uncommon in South Australia, Victoria, and Tasmania (CoA 2017). Due to water depths, it is unlikely loggerhead turtles would be present in the Operational Area but may be occasional visitors to the Planning Area.

Table 6-23: Listed turtle species or species habitat identified in the Operational Area and/or Planning Area

Common Name	Scientific Name	Threatened Category	Migratory Status	Migratory Category	Marine Status	BIAs	Present in Planning Area	Present in Operational Area
Green Turtle	*Chelonia mydas*	Vulnerable	Migratory	Migratory Marine Species	Listed	-	Species or species habitat may occur within area	Species or species habitat may occur within area
Leatherback Turtle, Leathery Turtle	*Dermochelys coriacea*	Endangered	Migratory	Migratory Marine Species	Listed	-	Foraging, feeding or related behaviour known to occur within area	Species or species habitat likely to occur within area
		Approved Conservation Advice for *Dermochelys coriacea* (leatherback turtle) (DEWHA 2008). Threats identified relevant to the Program are as per the recovery plan.						
Loggerhead Turtle	*Caretta caretta*	Endangered	Migratory	Migratory Marine Species	Listed	-	Foraging, feeding or related behaviour known to occur within area	Species or species habitat likely to occur within area

6.4.9.6 Marine Mammals – Pinnipeds

The PMST Report and reputable peer-reviewed literature identified three pinniped species with potential to occur in the Planning Area (Table 6-24). Two of these were also identified within the Operational Area. The Operational and Planning Areas do not overlap any BIAs for pinnipeds. Breeding and haul-out sites for Australian fur seals and New Zealand fur seals are displayed in Figure 6-43.

Table 6-24: Listed pinniped species or species habitat identified in the Operational Area and/or Planning Area

Common Name	Scientific Name	Threatened Category	Migratory Status	Migratory Category	Marine Status	BIAs	Presence in Planning Area	Presence in Operational Area
Australian Fur-seal, Australo-African Fur-seal	*Arctocephalus pusillus*				Listed		Breeding known to occur within area	Species or species habitat may occur within area
Australian Sea-lion, Australian Sea Lion	*Neophoca cinerea*	Endangered			Listed		Species or species habitat may occur within area	_
		Conservation advice *Neophoca cinerea* Australian sea lion (TSSC 2020). Threats relevant to the Program are: Habitat degradation and pollution – Oil spills Require all vessels to have oil spill mitigation measures in place, and implement jurisdictional oil spill response strategies as required Human disturbance – Noise Monitor and mitigate impacts (including cumulative impacts) of human interactions on Australian sea lion colonies Recovery Plan for the Australian sea-lion (*Neophoca cinerea*) (DSEWPaC, 2013d). Threats relevant to the Program are: Habitat degradation - No explicit relevant management actions Vessel strike - Collect data on direct killings and confirmed vessel strikes Pollution (oil spills, toxins) - implement jurisdictional oil spill response strategies as required Climate change - No explicit relevant management actions						
Long-nosed Fur-seal, New Zealand Fur-seal	*Arctocephalus forsteri*				Listed		Species or species habitat may occur within area	Species or species habitat may occur within area

a

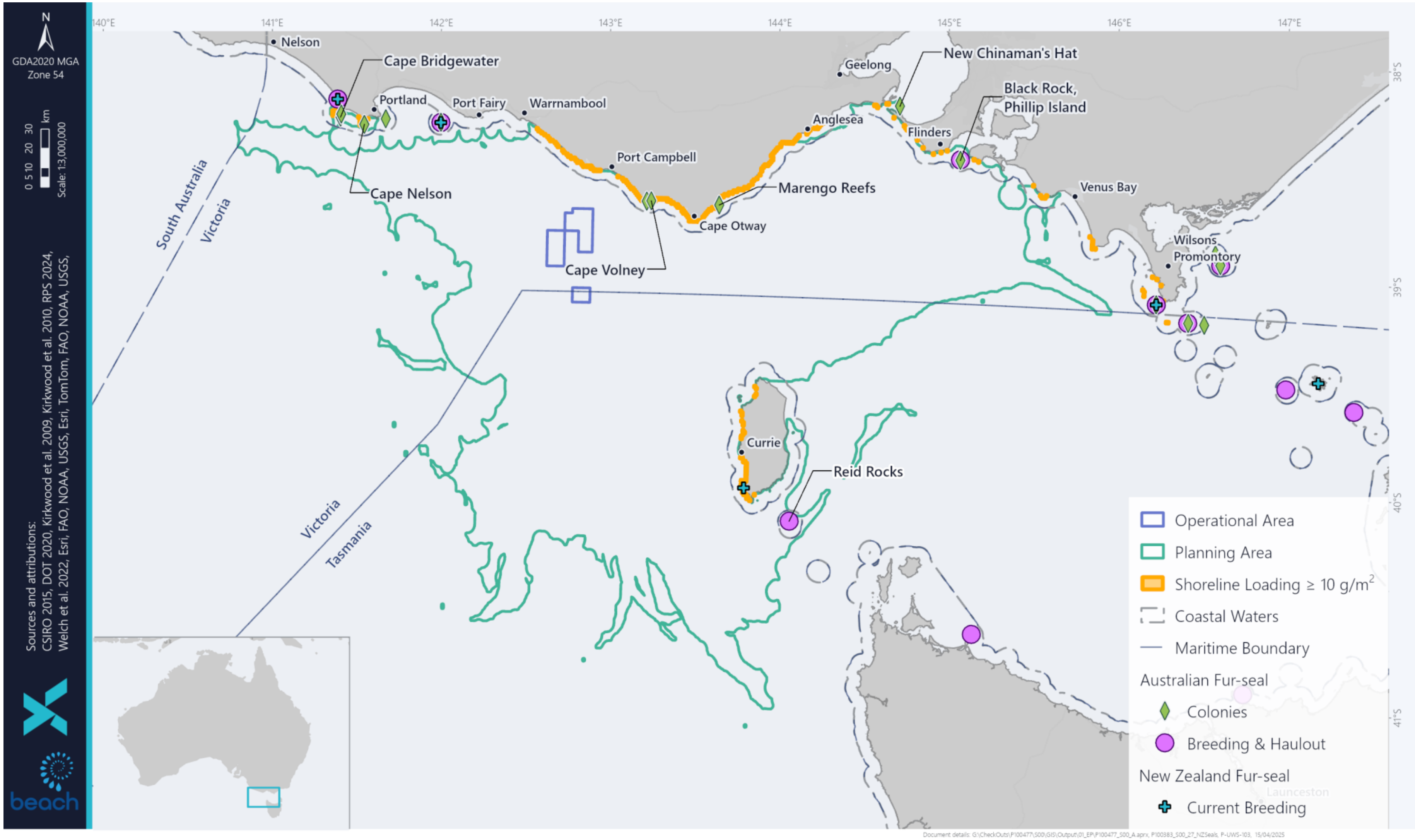


Figure 6-43: Australian and New Zealand fur-seal colonies within the Operational and Planning Areas

6.4.9.6.1 Australian Fur-seal

Australian fur-seals (*A. pusillus*) breed on islands of the Bass Strait but range throughout waters off the coasts of South Australia, Tasmania, Victoria, and NSW. Numbers of this species are believed to be increasing as the population recovers from historic hunting (Hofmeyr et al. 2008). The species is endemic to south-eastern Australian waters.

Australian fur-seals are present in the region all year, with breeding taking place during November and December. In Victorian State waters they breed on offshore islands, including Lady Julia Percy Island, Seal Rocks in Westernport Bay, Kanowna, and Rag Islands off the coast of Wilson’s Promontory and The Skerries off Wingan Inlet in Gippsland. Within the Planning Area, there are breeding colonies at Cape Bridgewater, Cape Volney, Judgement Rocks, Kanowna Island, Lady Julia Percy Island, Rag Island, Reid Rocks, Seal Rocks and West Moncoeur Island (Figure 6-43). There are important breeding sites on Lady Julia Percy Island and Seal Rocks, with 25% of the population occurring at each of these islands. Their preferred breeding habitat is a rocky island with boulder or pebble beaches and gradually sloping rocky ledges.

Haul-out sites with occasional pup births are located at Cape Bridgewater, at Moonlight Head, on various small islands off Wilsons Promontory and Marengo Reef near Apollo Bay. Within the Planning Area, haul-out sites include Maatsuyker Island and Walker Island (Figure 6-43).

Research being undertaken at Lady Julia Percy Island indicates that adult females feed extensively in the waters between Portland and Cape Otway, out to the 200 m bathymetric contour. Seal numbers on the island reach a maximum during the breeding season in late October to late December. By early December, large numbers of lactating females are leaving for short feeding trips at sea and in late December there is an exodus of adult males. Thereafter, lactating females continue to alternate between feeding trips at sea and periods ashore to suckle their pups. Even after pups begin to venture to sea, the island remains a focus, and at any time during the year groups may be seen ashore resting (Robinson et al. 2008; Hume et al. 2004; Arnould and Kirkwood 2007).

During the summer months, Australian fur-seals travel between northern Bass Strait islands and southern Tasmania waters following the Tasmanian east coast, however, lactating female fur-seals and some territorial males are restricted to foraging ranges within Bass Strait waters. Lactating female Australian fur-seals forage primarily within the shallow continental shelf of Bass Strait and Otway on the benthos at depths of between 60 to 80 m and generally within 100 to 200 km of the breeding colony for up to five days at a time.

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, even up to 9 days (Kirkwood et al. 2009; Hume et al. 2004).

Within the Planning Area, a breeding colony is located at Cape Bridgewater and haul out sites identified at Marengo Reefs and New Chinaman’s Hat. Additional colonies were identified at Reid Rocks and Seal Rocks (Figure 6-43). As there are colonies, breeding and haul out sites within the Planning Area it is expected that Australian fur-seals would be present in the Planning Area. During Beach’s Otway drilling campaign in 2021, 394 Australian fur-seal detections were made, spread across the year.

6.4.9.6.2 Australian Sea Lion

The Australian sea lion is the only endemic, and least abundant, pinniped that breeds in Australia (DoE 2025). All current breeding populations are outside of the Planning Area and are located from the Abrolhos Islands (Western Australia) to the Pages Islands (South Australia). The Australian sea lion uses a variety of shoreline types but prefer the more sheltered side of islands and typically avoid rocky exposed coasts (Shaughnessy 1999). The nearest BIA is for male foraging off the South Australian coast, 100 km to the west of the Planning Area and over 260 km north west of the Operational Area.

The Australian sea lion is a specialised benthic forager, i.e. it feeds primarily on the sea floor (DSEWPaC 2013d). The Australian sea lion feeds on the continental shelf, most commonly in depths of 20–100 m, with adult males foraging further and into deeper waters (DSEWPaC 2013d). They typically feed on a range of prey including fish, cephalopods (squid, cuttlefish and octopus), sharks, rays, rock lobster and penguins (DSEWPaC 2013d) They typically forage up to 60 km from their colony but can travel up to 190 km when over shelf waters (Shaughnessy 1999).

6.4.9.6.3 New Zealand Fur-seal

New Zealand fur-seal (*Arctocephalus forsteri*) are found in the coastal waters and offshore islands of South Australia, Western Australia, Victoria, NSW and New Zealand. Population studies for New Zealand fur-seal in Australia carried out in 1990 estimated an increasing population of about 35,000. The species breeds in southern Australia at the Pages Islands and Kangaroo Island, which produces about 75% of the total pups in Australia. Small populations are established in Victorian coastal waters including at Cape Bridgewater near Portland, Lady Julia Percy Island near Port Fairy, Kanowna Island (near Wilsons Promontory) and The Skerries in eastern Victoria.

Figure 6-43 shows the breeding distribution of New Zealand fur-seal colonies (Kirkwood et al. 2009). These colonies are typically found in rocky habitat with jumbled boulders. Colonies are typically occupied year-round, with greater activity during breeding seasons. Pups are born from mid-November to January, with most pups born in December (Goldsworthy 2008). No known breeding sites or colonies for the New Zealand fur-seal were identified within the Planning Area (Figure 6-43).

6.4.9.7 Marine Mammals – Cetaceans

The PMST Reports and reputable peer-reviewed literature identified several cetaceans with potential to occur in the Operational and Planning Areas (Table 6-25). Threatened or migratory species that are likely or known to occur or have a BIA that overlaps the Operational and/or Planning Area are discussed in more detail in the following sections.

The Otway Basin is considered an important migratory path for humpback, blue, southern right, and to some extent the fin and sei whales. The whales use the Otway region to migrate to and from the north-eastern Australian coast and the sub-Antarctic. Of environmental importance in the Otway Basin is the Bonney coast upwelling, the eastward flow of cool nutrient rich water across the continental shelf of the southern coast of Australia that promotes blooms of krill and attracts baleen whales during the summer months.

Table 6-25: Listed cetacean species or species habitat identified in the Operational Area and/or Planning Area

Common Name	Scientific Name	Threatened Category	Migratory Status	Migratory Category	Marine Status	BIAs	Presence in Planning Area	Presence in Operational Area
Andrew's Beaked Whale	*Mesoplodon bowdoini*						Species or species habitat may occur within area	Species or species habitat may occur within area
Antarctic Minke Whale, Dark-shoulder Minke Whale	*Balaenoptera bonaerensis*		Migratory	Migratory Marine Species			Species or species habitat likely to occur within area	Species or species habitat likely to occur within area
Arnoux's Beaked Whale	*Berardius arnuxii*						Species or species habitat may occur within area	Species or species habitat may occur within area
Blainville's Beaked Whale, Dense-beaked Whale	*Mesoplodon densirostris*						Species or species habitat may occur within area	Species or species habitat may occur within area
Blue Whale	*Balaenoptera musculus*	Endangered	Migratory	Migratory Marine Species		Foraging, Distribution,	Foraging, feeding or related behaviour known to occur within area	Foraging, feeding or related behaviour known to occur within area
	Conservation Management Plan for the Blue Whale (CoA 2015a). The long-term recovery plan objective for Blue Whales is to minimise anthropogenic threats to allow for their conservation status to improve. Threats relevant to the Program are: Noise interference -Evaluate risk of noise impacts and, if required, appropriate mitigation measures are implemented Vessel disturbance - Evaluate risk of vessel strikes and, if required, appropriate mitigation measures are implemented.							
Bottlenose Dolphin	*Tursiops truncatus* s. str.						Species or species habitat may occur within area	Species or species habitat may occur within area
Common Dolphin, Short-beaked Common Dolphin	*Delphinus delphis*						Species or species habitat may occur within area	Species or species habitat may occur within area

Cuvier's Beaked Whale, Goose-beaked Whale	*Ziphius cavirostris*				Species or species habitat may occur within area	Species or species habitat may occur within area
Dusky Dolphin	*Lagenorhynchus obscurus*		Migratory	Migratory Marine Species	Species or species habitat likely to occur within area	Species or species habitat likely to occur within area
Dwarf Sperm Whale	*Kogia sima*				Species or species habitat may occur within area	Species or species habitat may occur within area
False Killer Whale	*Pseudorca crassidens*				Species or species habitat likely occur within area	Species or species habitat likely to occur within area
Fin Whale	*Balaenoptera physalus*	Vulnerable	Migratory	Migratory Marine Species	Foraging, feeding or related behaviour known to occur within area	Foraging, feeding or related behaviour likely to occur within area
		Approved Conservation Advice for *Balaenoptera physalus* (Fin Whale) (TSSC 2015e). Threats relevant to the Program are: Noise interference - Evaluate risk of noise impacts to cetaceans and, if required, appropriate mitigation measures are implemented. Vessel disturbance - Evaluate risk of vessel strikes and, if required, appropriate mitigation measures are implemented.				
Gray's Beaked Whale, Scamperdown Whale	*Mesoplodon grayi*				Species or species habitat may occur within area	_
Hector's Beaked Whale	*Mesoplodon hectori*				Species or species habitat may occur within area	Species or species habitat may occur within area
Humpback Whale	*Megaptera novaeangliae*		Migratory	Migratory Marine Species	Species or species habitat known to occur within area	Species or species habitat likely to occur within area
		Approved Listing Advice for *Megaptera novaeangliae* (Humpback Whale) (TSSC 2022). Listing advice details that the humpback is no longer listed as vulnerable and has been removed from the threatened species list. It will remain a matter of national environmental significance under the EPBC Act as a listed Migratory Species. Threats identified relevant to the Program:				

		Marine debris Noise interference Pollution Vessel disturbance and strike No explicit relevant management actions.				
Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin	*Tursiops aduncus*				Species or species habitat likely to_ occur within area	
Killer Whale, Orca	*Orcinus orca*		Migratory	Migratory Marine Species	Species or species habitat likely to occur within area	Species or species habitat likely to occur within area
Long-finned Pilot Whale	*Globicephala melas*				Species or species habitat may occur within area	Species or species habitat may occur within area
Minke Whale	*Balaenoptera acutorostrata*				Species or species habitat may occur within area	Species or species habitat may occur within area
Pygmy Right Whale	*Caperea marginata*		Migratory	Migratory Marine Species	Foraging, feeding or related behaviour likely to occur within area	Foraging, feeding or related behaviour may occur within area
Pygmy Sperm Whale	*Kogia breviceps*				Species or species habitat may occur within area	Species or species habitat may occur within area
Risso's Dolphin, Grampus	*Grampus griseus*				Species or species habitat may occur within area	Species or species habitat may occur within area
Sei Whale	*Balaenoptera borealis*	Vulnerable	Migratory	Migratory Marine Species	Foraging, feeding or related behaviour known to occur within area	Foraging, feeding or related behaviour likely to occur within area

		Approved Conservation Advice for *Balaenoptera borealis* (Sei Whale) (TSSC 2015f). Threats identified relevant to the Program: Noise interference -Evaluate risk of noise impacts to cetaceans and, if required, appropriate mitigation measures are implemented. Vessel disturbance -Evaluate risk of vessel strikes and, if required, appropriate mitigation measures are implemented.					
Shepherd's Beaked Whale, Tasman Beaked Whale	*Tasmacetus shepherdi*					Species or species habitat may occur within area	_
Short-finned Pilot Whale	*Globicephala macrorhynchus*					Species or species habitat may occur within area	Species or species habitat may occur within area
Southern Bottlenose Whale	*Hyperoodon planifrons*					Species or species habitat may occur within area	_
Southern Right Whale	*Eubalaena australis*	Endangered	Migratory (as *Balaena glacialis australis*)	Migratory Marine Species	Migration Reproduction	Breeding known to occur within area	Species or species habitat known to occur within area
		National Recovery Plan for the Southern Right Whale *Eubalaena australis* (DCCEEW 2024k). Threats identified relevant to the Program: Habitat degradation from coastal and offshore development Anthropogenic underwater noise Vessel collision Actions identified relevant to the Program: Address habitat degradation impacts from coastal and offshore marine infrastructure developments Assess, manage and mitigate impacts from anthropogenic noise Manage, minimise and mitigate the threat of vessel strike					
Southern Right Whale Dolphin	*Lissodelphis peronii*					Species or species habitat may occur within area	Species or species habitat may occur within area

Sperm Whale	*Physeter macrocephalus*	Migratory	Migratory Marine Species	Species or species habitat may occur within area	Species or species habitat may occur within area
Strap-toothed Beaked Whale, Strap-toothed Whale, Layard's Beaked Whale	*Mesoplodon layardii*			Species or species habitat may occur within area	Species or species habitat may occur within area
True's Beaked Whale	*Mesoplodon mirus*			Species or species habitat may occur within area	Species or species habitat may occur within area

6.4.9.7.1 Cultural significance

First Nation's people around Australia have long had a strong connection to whales, which has significance as totemic ancestors to some groups. The arrival of whales along Australia's coastline marked the arrival of the "elders of the sea", which follows a songline or ancient memory code, that traces the journeys of ancestral spirits as they created the land, animals, and lore.

Indigenous Australians have a long tradition of utilising beached (or stranded) whales as a food source and whale stranding's were occasions for feasting (Clarke 2001). For example, Ngarrindjeri had gathered to harvest the bodies of stranded whales well before Kringkari (pink-skinned men) arrived in their lands. Runners were sent inland telling others of the arrival of Kondoli, which was a time for ceremony and trade (Paterson and Wilson 2019).

6.4.9.7.2 Otway whale surveys

Gill et al. (2015) summarised cetacean sightings from 123 systematic aerial surveys undertaken over western Bass Strait and the eastern Great Australian Bight between 2002 and 2013. This paper does not include sighting data for blue whales, which has previously been reported in Gill et al. (2011).

These surveys recorded 133 sightings of 15 identified cetacean species consisting of seven mysticetes (baleen) whale species, eight odontocete (toothed) species and 384 sightings of dolphins (Table 6-26 and Table 6-27). Survey effort was biased toward coverage of upwelling seasons, corresponding with pygmy blue whales' seasonal occurrence (November to April; 103 of 123 surveys), and relatively little survey effort occurred during 2008–2011. Cetacean species sighted within the region are described in the following sections.

Gill et al. (2015) encountered southern right and humpback whales most often from May to September, despite low survey effort in those months. Southern right whales were not recorded between October and May. Fin, sei, and pilot whales were sighted only from November to May (upwelling season), although this may be an artefact of their relative scarcity overall and low survey effort at other times of year. Dolphins were sighted most consistently across years. The authors caution that few conclusions about temporal occurrence can be drawn because of unequal effort distribution across seasons and the rarity of most species.

Species of cetacean sighted in the period 31 October to 19 December 2010 during the Speculant 3D Transitions Zone Seismic Survey (3DTZSS) undertaken by Origin Energy, recorded species of common dolphin (*Delphinus* spp.), bottlenose dolphin (*Tursiops* spp.), unidentified small cetaceans and fur-seals.

Origin conducted a survey for cetaceans focused on Origin operations and permits in the Otway basin from June 2012 through to March of 2013. Table 6-28 lists the species present in the area Origin surveyed.

As part of Beach's Otway drilling campaign, marine fauna observations occurred through most of 2021 (2 February to 31 December 2021) from the MODU and support vessels at the Artisan 1, Geographe 4, Geographe 5 and Thylacine North 1 drilling locations. Table 6-29 provides this cetacean sighting data. For whales, the highest number of detections was for blue whales (198), while for dolphins, it was the common dolphin (519).

Table 6-26: Cetacean species recorded during aerial surveys 2002–2013 in Southern Australia

SRW = Southern Right Whales; ROR = rorquals; ODO = other odontocetes; DOL = dolphins

Taxon	Common name	Species group*	Sightings	Individual	Mean group size (+/- SD)
Baleen whales					
Eubalaena australis	Southern Right Whale	SRW	12	52	4.2 +/- 4.2
Caperea marginata	Pygmy Right Whale		1	100	100
Balaenoptera physalus	Fin and like Fin Whale	ROR	7	8	1.1 +/- 0.4
B. borealis	Sei and like Sei Whale	ROR	12	14	1.3 +/- 0.5
B. acutorostrata	Dwarf Minke Whale	ROR	1	1	1
B. bonaerensis	like Antarctic Minke Whale	ROR	1	1	1
Megaptera novaeangliae	Humpback Whale	ROR	10	18	1.8 +/- 1.0
Toothed whales					
Physeter macrocephalus	Sperm Whale	ODO	34	66	1.9 +/- 2.2
Mesoplodon spp.	Unidentified beaked whales	ODO	1	20	20
Orcinus orca	Killer whale	ODO	6	21	3.5 +/- 2.8
Globicephala melas	Long-finned Pilot Whale	ODO	40	1853	46.3 +/- 46.7
Grampus griseus	Risso's Dolphin	ODO	1	40	40
Lissodelphis peronii	Southern Right Whale dolphin	ODO	1	120	120
Tursiops spp.	Bottlenose Dolphin	DOL	4	363	90.8 +/- 140.1
	Dolphins	DOL	384	22169	58 +/- 129.6
Unidentified large whales			3	3	1
Unidentified small whales			2	2	1

Table 6-27: Temporal occurrence across months of cetaceans sighted during aerial surveys from November 2002 to March 2013 in Southern Australia

*Species sighted 2 or fewer times.

Species	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Southern Right Whale	0	0	0	0	0	0	0	0	0.8	3.1	6.8	8.8
Pygmy Right Whale*	0	0	0	0	0	0	0	0	19.8	0	0	0
Fin Whale	0	0.10	0.14	0.07	0.08	0	0	0	0	0	0	0
Sei Whale	0	0.25	0.07	0.04	0.08	0.19	0	0.21	0	0	0	0
Minke Whale*	0	0	0.02	0	0	0	0.12	0	0	0	0	0
Humpback Whale	0	0.05	0.07	0	0	0	0	0.11	0.99	1.0	0	0.35
Sperm Whale	1.7	1.2	0.23	0.53	0.08	0.13	0.75	0.85	0	0	0	0
Unidentified beaked whale*	0	0	0.47	0	0	0	0	0	0	0	0	0
Killer Whale	0	0	0.19	0	0	5.0	0	6.0	0	0.68	0	0
Pilot Whale	0	59.6	7.0	19.3	4.0	39.5	0	26.3	0	0	0	0
Southern Right Whale dolphin*	0	59.6	0	0	0	0	0	0	0	0	0	0
Risso's Dolphin*	0	0	0	0	1.7	0	0	0	0	0	0	0
Bottlenose Dolphin	0	1.5	7.7	0	0	0	0	0	0	0	0	1.1
Dolphins	545.1	120.3	105.0	151.8	105.6	233.4	26.9	257.6	155.8	2.7	0	0

Table 6-28: Observed cetaceans in the Otway Basin

*September values averaged over two surveys on 1 and 11 September 2012. Totals include individuals from both September surveys

Species	Jun	Jul	Aug	Sep *	Oct	Nov	Dec	Jan	Feb	Mar	Total
Blue Whale	0	0	0	0	0	23	70	17	8	2	120
Southern Right Whale	2	0	12	13	0	0	0	0	0	0	39*
Humpback Whale	3	2	0	1	0	1	0	0	0	0	7
Sperm Whale	2	0	0	0	4	0	0	3	1	0	10
Pilot Whale	0	0	0	0	0	70	0	0	55	0	125
Dolphins	13	298	0	33	54	620	80	672	1526	21	3317
Southern Right Whale	0	0	0	0	0	120	0	0	0	0	120

Table 6-29: Marine fauna observations at Project locations during the Otway Drilling Project in 2021

Species	Feb	Mar	Apr	May	Jun	July	Aug	Sep*	Oct	Nov	Dec	Total
Whales												
Blue	0	101	66	16	2	0	0	1	0	7	5	198
SRW	0	0	0	0	1	1	1	0	0	0	0	3
Humpback	0	0	7	9	25	4	2	11	14	18	5	95
Minke	0	0	0	3	0	0	0	0	0	0	0	3
Pilot	0	0	0	0	1	0	0	0	0	0	0	1
No ID	0	0	0	3	0	0	0	0	1	2	1	7
Dolphins												
Common	40	103	44	28	16	37	8	21	37	85	100	519
Bottlenose	12	4	1	2	1	3	2	4	3	1	7	40
No ID	32	27	30	10	15	11	11	5	2	2	5	150

6.4.9.7.3 Antarctic Minke Whale

The Antarctic minke whale (*Balaenoptera bonaerensis*) has been found in all Australian states except the Northern Territory and occupies cold temperate to Antarctic offshore and pelagic habitats between 21°S and 65°S (Bannister et al. 1996). In summer the species is found in pelagic waters from 55°S to the Antarctic ice edge. During winter the species retreat to breeding grounds between 10-30°S, occupying oceanic waters exceeding 600 m depth and beyond the continental shelf break (DoE 2025). They have been observed as far north as 21°S along the east coast of Australia and are presumed to follow the same migration pattern on Australia's west coast (Bannister et al. 1996). Mating occurs from June through December, with a peak in August and September and calving occurs during late May and early June in warmer waters north of the Antarctic Convergence (DoE 2025). The species primarily feeds in the Antarctic on Antarctic krill during summer and does not appear to feed much while in the breeding grounds of lower latitudes (DoE 2025).

The Antarctic minke whale has been observed within the region, however, there are no BIAs in the Operational Area or Planning Area.

6.4.9.7.4 Blue Whale

The pygmy blue whale has a foraging (annual high use area) BIA within the Operational Area and Planning Area (Figure 6-44).

Data, as detailed in this section, suggests that blue whales are most likely to first appear during December/January and reach peak number during February/March. The likelihood and extent of the interaction is dependent on broad scale environmental factors affecting the abundance and distribution of blue whale feeding resources.

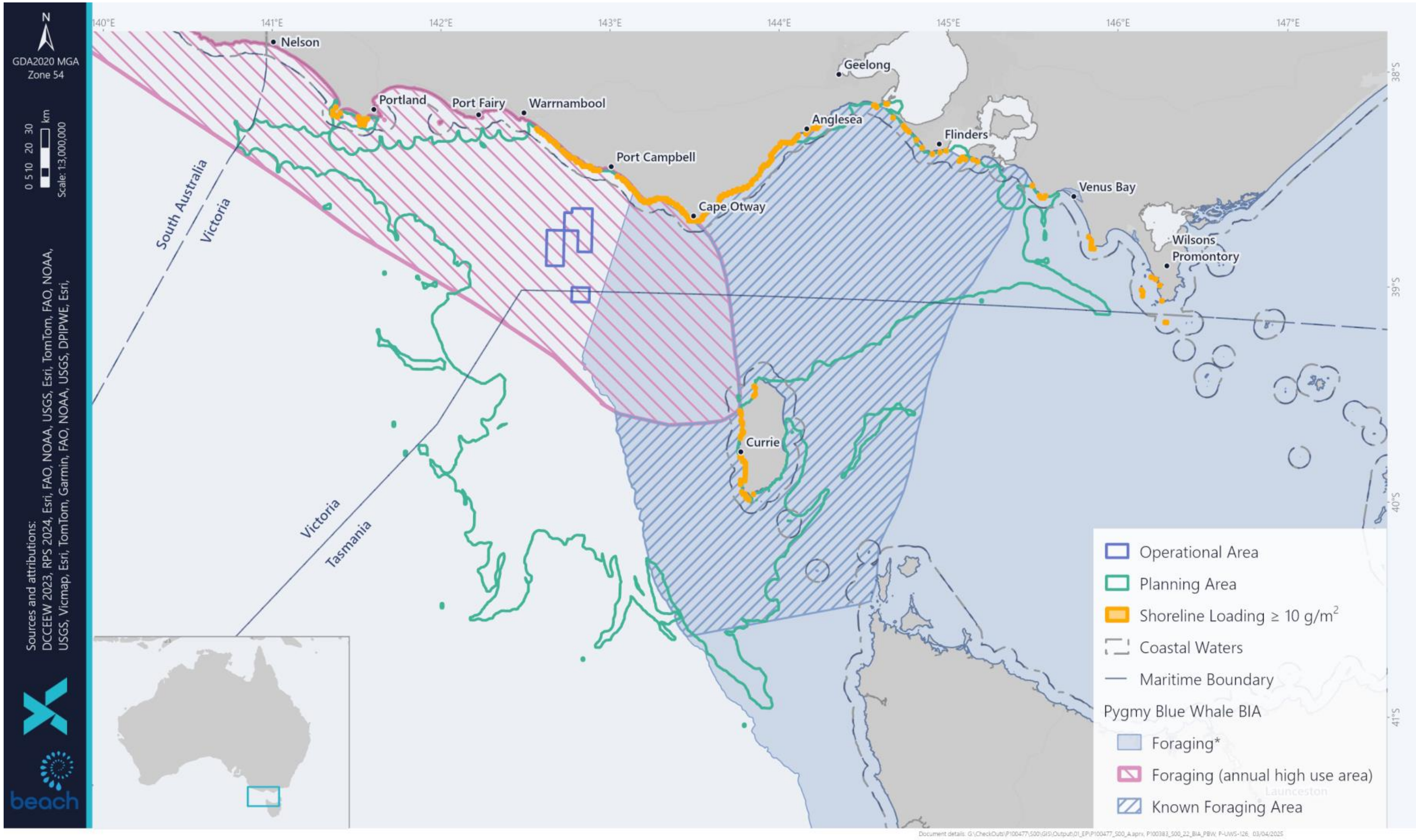


Figure 6-44: Pygmy blue whale BIAs within the Operational and Planning Areas.

6.4.9.7.4.1 Status

The blue whale (*Balaenoptera musculus*) is listed as an endangered species under the *EPBC Act (1999)* and the IUCN Red List. There are two subspecies of blue whales that use Australian waters (including Australian Antarctic waters), the pygmy blue whale (*B. m. brevicauda*) and the Antarctic blue whale (*B. m. intermedia*). Reference to blue whales unless otherwise specified is generally synonymous to both species. The Conservation Management Plan for the Blue Whale (CoA 2015a) identifies threats and establishes actions for assisting the recovery of blue whale populations using Australian waters (CoA 2015a).

6.4.9.7.4.2 Population

The Antarctic blue whale was extremely abundant until the early 20th century when they were hunted to near extinction. Approximately 341,830 blue whale takes were recorded by commercial whaling in the Antarctic and sub-Antarctic in the 20th century, of which 12,618 were identified as pygmy blue whales (Branch et al. 2004). The current global population of blue whales is uncertain but is plausibly in the range of 10,000 to 25,000, corresponding to about 3-11% of the 1911 estimated population size (Reilly et al. 2018). The Antarctic blue whale subspecies remains severely depleted from historic whaling and its numbers are recovering slowly. The Antarctic blue whale population is growing at an estimated rate of 7.3% per year, but it was hunted to such a low level that it remains at a tiny fraction of pre-whaling numbers (Branch et al. 2004). Recent studies suggest an updated rate of increase in population growth of 12.6 %, consistent with growth rates in waters off the south of Australia (McCauley et al. 2018). The updated abundance estimate uses acoustic chorus squared pressure levels to estimate growth rate off Portland (McCauley et al. 2018). This growth rate considers the number of whales calling assuming the range distribution of whales, source levels, sound propagation and calling behaviour were all similar between years.

Genetic analysis has shown that pygmy blue whales which feed off the Perth Canyon and the Bonney Upwelling constitute the same population (Attard et al. 2010, in CoA 2015a). Photo identification and genomic studies suggest population exchange between the two feeding grounds of the Bonney coast upwelling and the Perth Canyon (Attard et al. 2018). A pygmy blue whale was tagged in 2014 north of the Perth Canyon and travelled a total distance of 506.3 km in 7.6 days, indicating the vast distances that the large marine mammals can travel in a short amount of time (Owen et al. 2016). While migrating the whale made dives at depths just below the surface which likely reduces energy expenditure but also increases the risk of ship strike greatly for longer periods than previously thought.

Global pygmy blue whale abundance estimates range from 2,000 to 5,000 individuals (Reilly et al. 2008). Abundance estimates based on photo-identification mark-recapture from 1999/2000 to 2004/2005 for blue whales in the Perth Canyon were between 532 and 1,754 individuals, which generally agree with acoustic abundance estimates of 662 to 1,559 calling blue whales migrating south in 2004 past Exmouth in Western Australia and a 1992/1993 season cruise which estimated 671 (95% interval 289–1,557) individuals offshore of southern Western Australia (35–45^0 South, 115–125^0 East) (CoA 2015b).

6.4.9.7.4.3 Distribution

The blue whale is a cosmopolitan species, found in all oceans except the Arctic, but absent from some regional seas such as the Mediterranean, Okhotsk and Bering seas. Little is known about mating behaviour or breeding grounds. The pygmy blue whale is mostly found north of 55°S, while Antarctic blue whales are mainly sighted south of 60°S in Antarctic waters. The presence of Antarctic blue whales in the area is considered rare (Gavrilov 2012), however acoustic detection of Antarctic blue whales indicates that they occur along the entire southern coastline of Australia (McCauley et al. 2018).

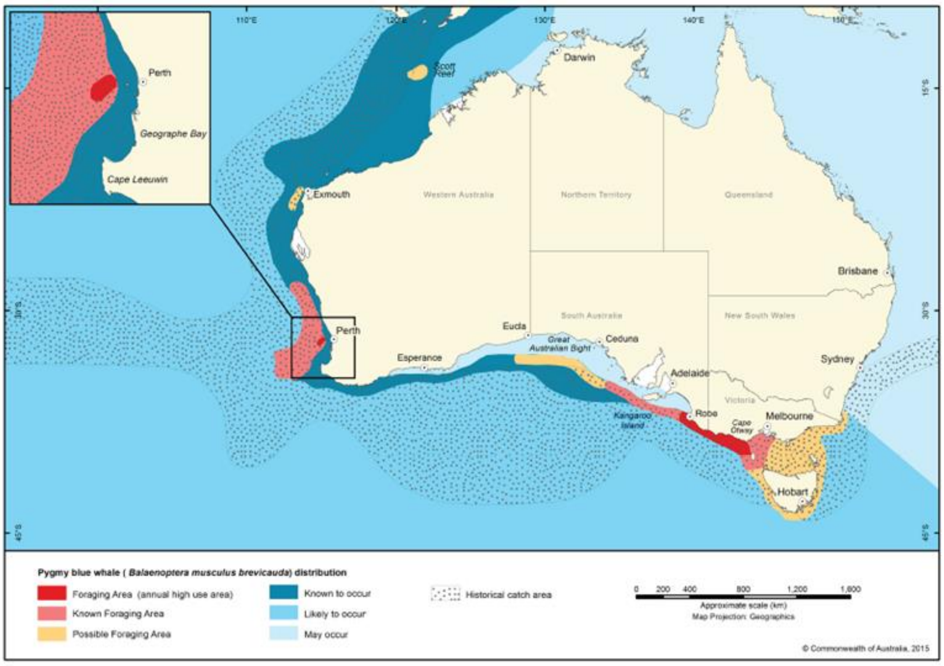
Pygmy blue whales are most abundant in the southern Indian Ocean on the Madagascar plateau, and off South Australia and Western Australia, where they form part of a more or less continuous distribution from Tasmania to Indonesia.

Blue whales are rapid long-distance travellers, and pygmy blue whales spend the winter breeding in Indonesian waters, returning to cool temperate waters around November each year, interchanging between these waters and remoter waters of the Southern Ocean during the upwelling 'season' (Gill 2020). Pygmy blue whales have three migratory stages around Australia; the "southbound migration stage" is predominantly between October to December (sometimes into January) where whales travel from Indonesian waters down to the WA coast. The "southern Australian stage" between January and June is where whales spread across the southern Australian waters. The "northbound migration stage" is where whales travel back up to Indonesia between April and August. The "southern stage" involves animals searching for feeding sites, feeding and then marking their way north towards June (McCauley et al. 2018).

The distribution of blue whales in the Australian region is shown in Figure 6-. There are two known seasonal feeding aggregations areas in Australia, the Bonney Coast Upwelling KEF and adjacent waters off South Australia and Victoria and the Perth Canyon KEF and adjacent waters in Western Australia. The Operational Area is located within a blue whale BIA – Foraging Area (annual high use area).

McCauley et al. (2018) suggests that acoustic detection of pygmy blue whales indicate they predominantly occur west of Bass Strait. Acoustic detections of pygmy blue whales off Portland Victoria correlated with upwelling indicators in the Bonney coast upwelling in late summer to autumn (February to April) (McCauley et al. 2018). The two pygmy blue whale call types and the Antarctic blue whale call have been detected in central Bass Strait. On one occasion all three types were detected between April and June with more commonly two calls present over this period during other years.

The Otway Shelf is squarely within the productive, and to a certain extent predictable, Great Southern Australian Upwelling System. It has been shown to be an important, consistently used blue whale foraging area over many years (Gill et al. 2011).



Foraging Area (Annual high use area)	Blue whales are regularly observed feeding on a seasonal basis
Known Foraging Area	Known foraging occurs in these areas but is highly variable both between and within seasons
Possible Foraging Area	Evidence for feeding is based on limited direct observations or through indirect evidence, such as occurrence of krill in close proximity of whales, or satellite tagged whales showing circling tracks. Blue whales travel through on a seasonal basis, possibly as part of their migratory route

Known to occur	Blue whales are known to occur based on direct observations, satellite tagged whales or based on acoustic detections
Likely to occur	Blue whales are likely to occur based on occasional observations in the area and nearby areas
May occur	Evidence for the presence of blue whales through strandings or rare observations
Historical catch area	Blue whales were caught during the whaling period based on whaling data

Figure 6-45: Pygmy blue whale distribution Areas around Australia (CoA 2015a)

6.4.9.7.4.4 Foraging Ecology

Krill are the key to understanding the ecology and behaviour of blue whales. Krill is sensitive to temperature and migrates vertically and horizontally to maintain optimal positioning with respect to nutrients, often being found along thermal fronts and thermoclines. Krill abundance in a given season may be linked to oceanographic conditions of the previous year. Unlike most krill species, *Nyctiphanes australis* frequently swarm at or near the surface, making it easily available to foraging blue whales. However, it is often found at depth, when blue whales must dive to search for and consume it. Foraging is energetically expensive for these giant mammals, which must regularly find sufficient food to balance their enormous energy requirements (Gill 2020). Blue whales typically feed during daylight hours when krill is visible to them (Gill 2020).

Between the months of November and April, south-east winds drive upwelling of nutrient-rich water drawn from the continental slope, onto the continental shelf. An upwelling regime known as the Great Southern Australian Upwelling System extends along the shelf from the eastern Great Australian Bight to western Tasmania. Prominent surface upwelling commonly occurs west of Portland where the shelf is narrow (the Bonney Upwelling); whereas on the broader shelf between Portland and King Island, upwelling is usually subsurface, with cooler upwelled water beneath a warmer surface layer (Gill 2020).

Important foraging grounds for blue whales include the Great Australian Bight, South Australia and off Portland, Victoria where blue whales visit between December and June to forage on the inshore shelf break (Figure 6-). The time and location of the appearance of Blue Whales in the east generally coincides with the upwelling of cold water in summer and autumn along this coast (the Bonney

Upwelling (see Section 6.3.8) and the associated aggregations of krill that they feed on (Gill and Morrice 2003). The Bonney Upwelling generally starts in the eastern part of the Great Australian Bight in November or December and spreads eastwards to the Otway Basin around February as southward migration of the subtropical high-pressure cell creates upwelling favourable winds. Sighting data indicates that blue whales are seasonally distributed (Gill et al. 2011; McCauley et al. 2018).

Diving behaviour of blue whales associated with feeding at depth was observed by Gill and Morris (2003) in the Otway region, who note that blue whales dived steeply, submerging for 1 to 4 minutes, then returned to the surface. Tagging of a pygmy blue whale at the Perth Canyon identified 1,677 dives over the tag duration (7.6 days) (Owen et al. 2016). The duration of dives was:

- Feeding - mean of 7.6 minutes, maximum of 17.5 minutes;
- Migratory – mean of 5.2 minutes, maximum of 26.7 minutes; and
- Exploratory – mean of 8.6 minutes, maximum of 22.05 minutes.
- Tagging of 13 Pygmy Blue Whales (five of which had tags that monitored dive depth and duration) in the Bonney Upwelling identified (Möller et al. 2015):
- Whales predominantly carried out area-restricted search (presumably foraging) with generally shallow and short dives. However, dives were generally deeper at night compared to during the day.
- Whales performed mostly square shaped dives that were shallow in depth and short in duration.
- Dives recorded to a maximum of 492 m (mean = 59.5 m ± 94.3), and for a maximum duration of 112 minutes (mean = 6.1 minutes ± 5.2).

The seasonal distribution and abundance of blue whales is variable across years and influenced by climate variables. The time and location of the appearance of blue whales in the Otway region generally coincides with the upwelling of cold water between November and April along the Bonney coast and the associated aggregations of krill that they feed on (Gill and Morrice 2003). The Bonney Upwelling generally starts in the eastern part of the Great Australian Bight in November or December and spreads eastwards to the Otway Basin around February as southward migration of the subtropical high-pressure cell creates upwelling favourable winds. Sighting data indicates that blue whales are seasonally distributed (Gill et al. 2011; McCauley et al. 2018).

Foraging of pygmy blue whales is known to occur in Bass Strait and the west coast of Tasmania where they have been recorded diving at depth presumably feeding (DoE 2025). Blue whales are known as ‘constant foragers’; their ecology in feeding grounds consists of constantly searching for patchily distributed krill resources, preferably those that reward the effort involved in consuming them (Torres et al. 2020). They are physically well-adapted for rapid movement between widely separated foraging areas (Woodward et al. 2006), but when they enter areas where krill may occur, they carry out zigzagging ‘area-restricted searches’ (ARS) patterns until either they find prey, or exhaust local possibilities, and move on to another possible foraging ground based on past experience (Abrahms et al. 2019). Based on this it is assumed that once blue whales have finished feeding, they will move from the feeding area to commence searching for another area.

6.4.9.7.4.5 The Otway Region

Aerial Surveys (2001-02 to 2006-07)

Seasonal (November to April) aerial surveys between Cape Jaffa and Cape Otway (eastern distribution) over six seasons found that the general pattern of seasonal movement of Blue Whales is from west to east, with whales foraging between the Great Australian Bight and Cape Nelson in November and spreading further east into the Otway Shelf between Portland and Cape Otway around December. Whales were typically widely distributed throughout Otway shelf waters from January through to April (Gill et al. 2011) (Figure 6- and Figure 6-).

The sighting and effort data presented in Figure 6- and Figure 6- was used to calculate an 'encounter rate' (NB: key in upper right corner of the November, January and April figures). Dots represent blue whale sightings while squares are aerial survey effort (10 km by 10 km squares) represented as minutes flown per grid square. The data was pooled for all seasons. Thick solid lines represent 50% and 95% probability contours for blue whale distribution from density kernel analysis. Dashed lines are central and eastern boundaries (Gill et al. 2011). During 2002-11, blue whales were twice more likely to be found west of Portland than to its east (Gill et al. 2011).

The Operational Area is on the outer edge of the eastern distribution.

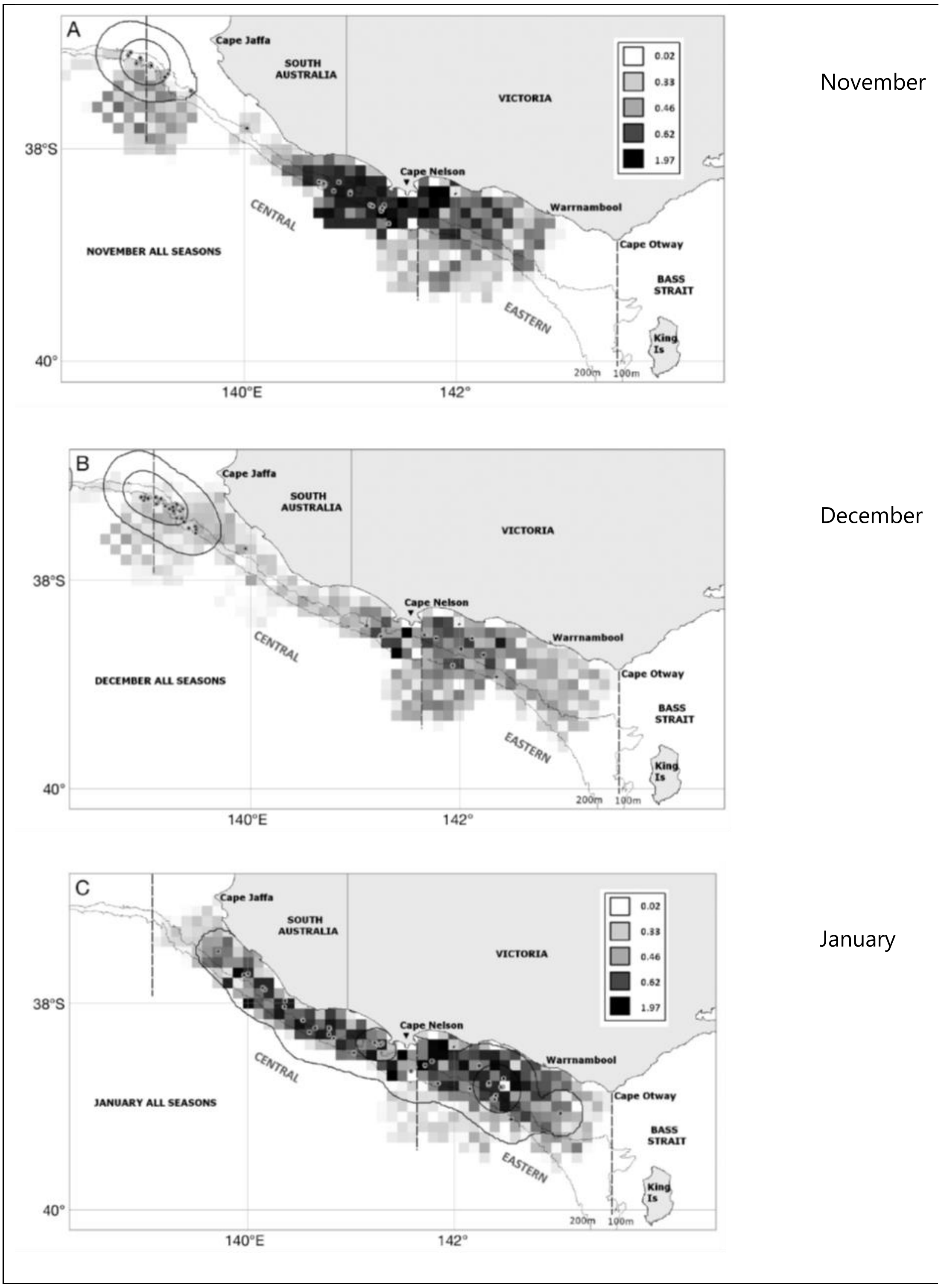


Figure 6-46: Blue whale sightings in the Otway Basin (Nov, Dec, Jan) (Gill et al. 2011)

Note: Dots represent blue whale sightings while squares are aerial survey effort (10 km by 10 km squares) represented as minutes flown per grid square (key, upper right corner of the November and January figures).

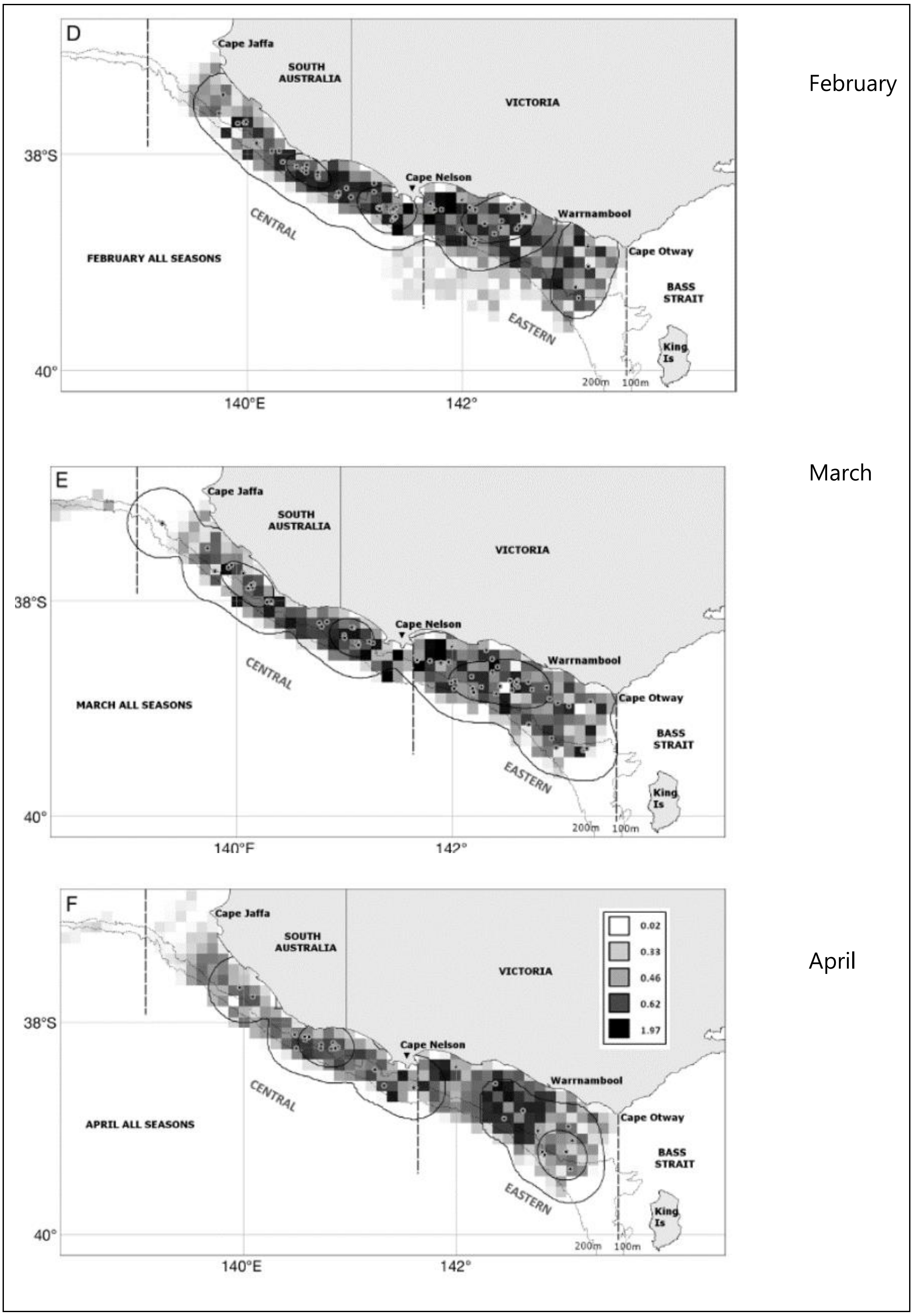


Figure 6-47: Blue whale sightings in the Otway Basin (Feb, Mar, Apr) (Gill et al. 2011)

Note: Dots represent blue whale sightings while squares are aerial survey effort (10 km by 10 km squares) represented as minutes flown per grid square (key, upper right corner of the April figure).

Monthly blue whale encounter rates between 2001 and 2007 in the central and eastern study area (Cape Nelson to Cape Otway) are shown in Figure 6-. The encounter rates increased from 1.6 whales per 1,000 km in December, to 9.8 whales per 1,000 km in February, decreased slightly to 8.8 whales per 1,000 km in March, then declined sharply to a single sighting for May (0.4 whales per 1,000 km) (Gill et al. 2011). A mean blue whale group size of 1.3±0.6 was observed per sighting with cow-calf pairs observed in 2.5% of the sightings. Gill et al. (2011) also identified that 80% of blue whale sightings are encountered in water depths between 50 and 150 m; 93% of sightings occurred in water depths <200 m and 10% of sightings occurred within 5 km of the 200 m isobath in the eastern and central zones (Gill et al. 2011).

Gill et al. (2011) found that across the eastern zone (Cape Nelson to Cape Otway), there were no blue whale sightings in November (2001-2007) despite significant effort (Figure 6-).

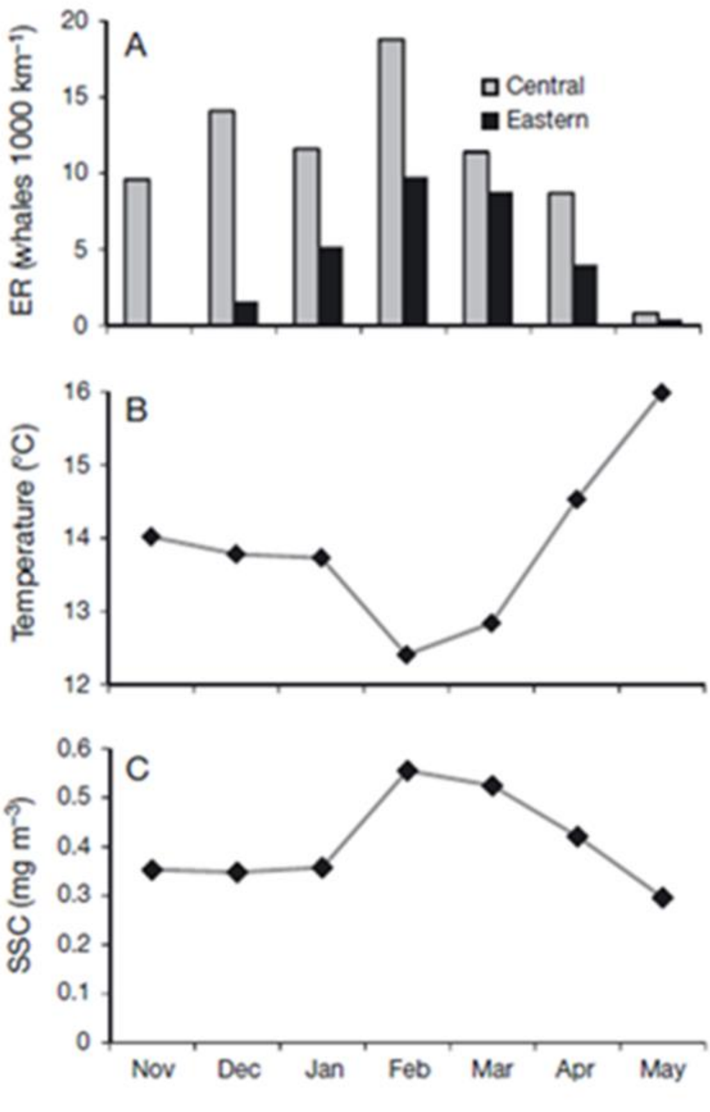


Figure 6-48: Blue whale encounter rates in the central and eastern study (Cape Nelson to Cape Otway) area by month (Gill et al. 2011)

- Blue whales are typically widely distributed throughout central and eastern areas shelf waters from January through to April.
- Blue whale numbers are significantly lower in November, December and January in the eastern area compared to the central area.
- No blue whales were sighted in the eastern area (Cape Nelson to Cape Otway) during November for any season despite significant effort.
- Encounter rates in central and eastern zones peaked in February, coinciding with peak upwelling intensity and primary productivity.

Origin Energy Surveys (2010-2014)

There were no confirmed sightings of blue whales during Origin's Speculant 3D Transition Zone marine seismic survey in November and December 2010, the Astrolabe 3D seismic survey undertaken in early November 2013 (RPS 2014) or during the Enterprise 3D seismic survey undertaken in late October and early November 2014 (RPS 2014).

From February to October 2011 Origin located an array of marine loggers east of the Thylacine platform to document nearby ambient marine noise, detect cetaceans and measure acoustics associated with the Origin 3D Bellerive Marine Seismic Survey. Pygmy and Antarctic blue whales were acoustically detected in the monitored area (east of the Thylacine-A wellhead platform). Pygmy blue whales were observed from early February to early June being abundant from March to mid-May. Rare calls from Antarctic blue whales were observed in June.

Aerial surveys were commissioned by Origin and undertaken during 2011 and 2012 by the blue whale Study (Gill 2020). During five aerial surveys between 8 and 25 February 2011, 56 blue whales were sighted. Most of the sightings were at inshore areas between Moonlight Head to Port Fairy with whales apparently aggregating along and offshore of the boundary between the runoff plume from major flooding prevalent at the time and adjacent seawater. Figure 6- shows sightings from 14 February 2011 (Gill 2020).

The 2012 aerial surveys found that blue whales were common in the eastern upwelling zone during November and December 2012 (Figure 6-). In November, an estimated 21 individual blue whales were sighted, with most sightings near the 100 m isobath or deeper. December 2012 surveys identified 70 blue whales foraging along the edge of the continental shelf west of King Island. This was the largest recorded aggregation of blue whales during any aerial surveys of the Bonney coast upwelling since 1999 (Gill 2020).

The large numbers of whales found in this area during November and December indicated high productivity, although the krill was too deep to be seen from the air. Subsequent surveys in the same area for Origin Energy in early 2013 resulted in 17 blue whales sighted in January, eight in February, and two (a cow and calf) in March 2013, despite the extremely warm surface conditions. The high productivity of this area seen in November to December 2012 evidently tailed off during the next few months (Gill 2020).

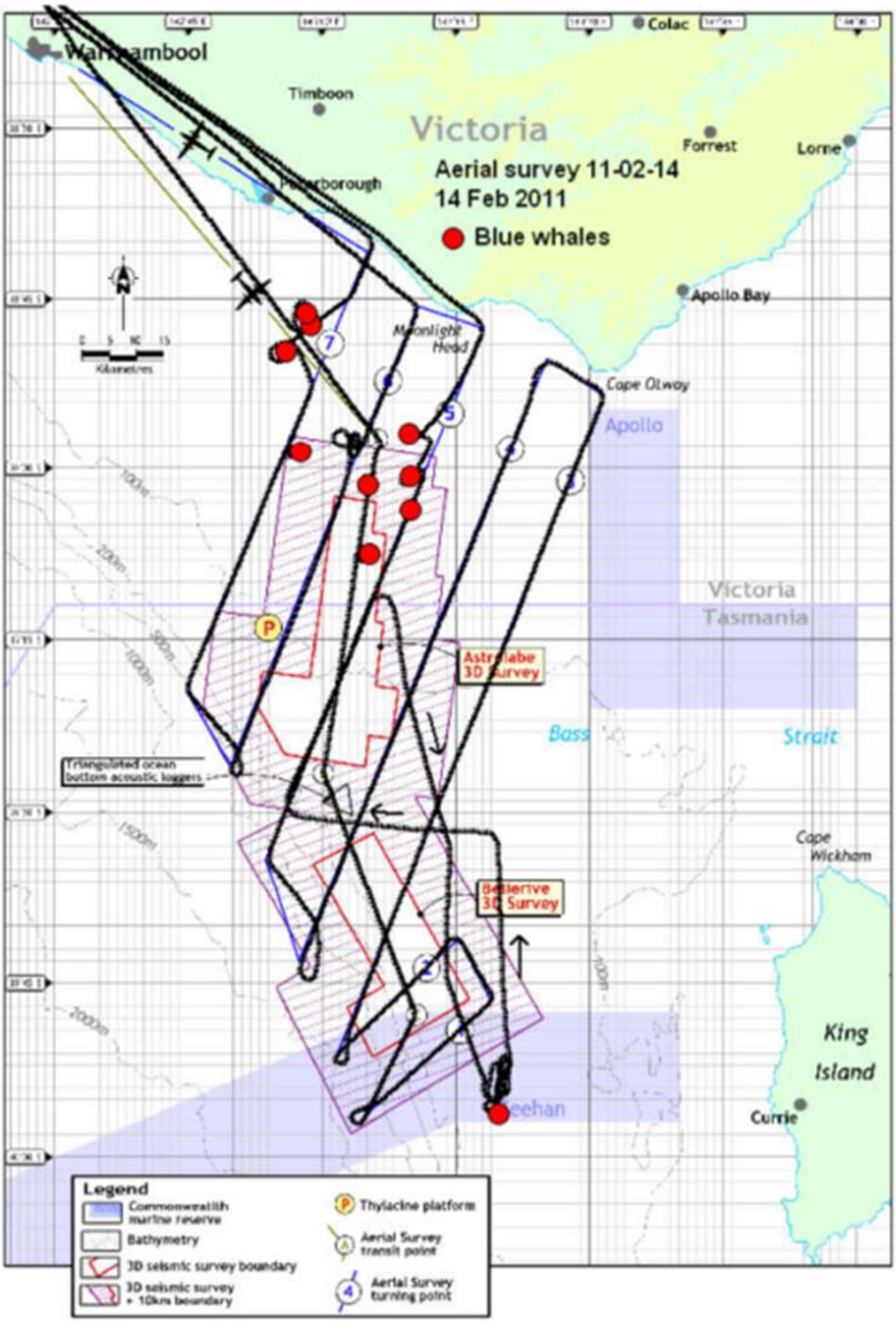


Figure 6-49: Blue whale sightings during an aerial survey for Origin Energy in February 2011 (Gill 2020)

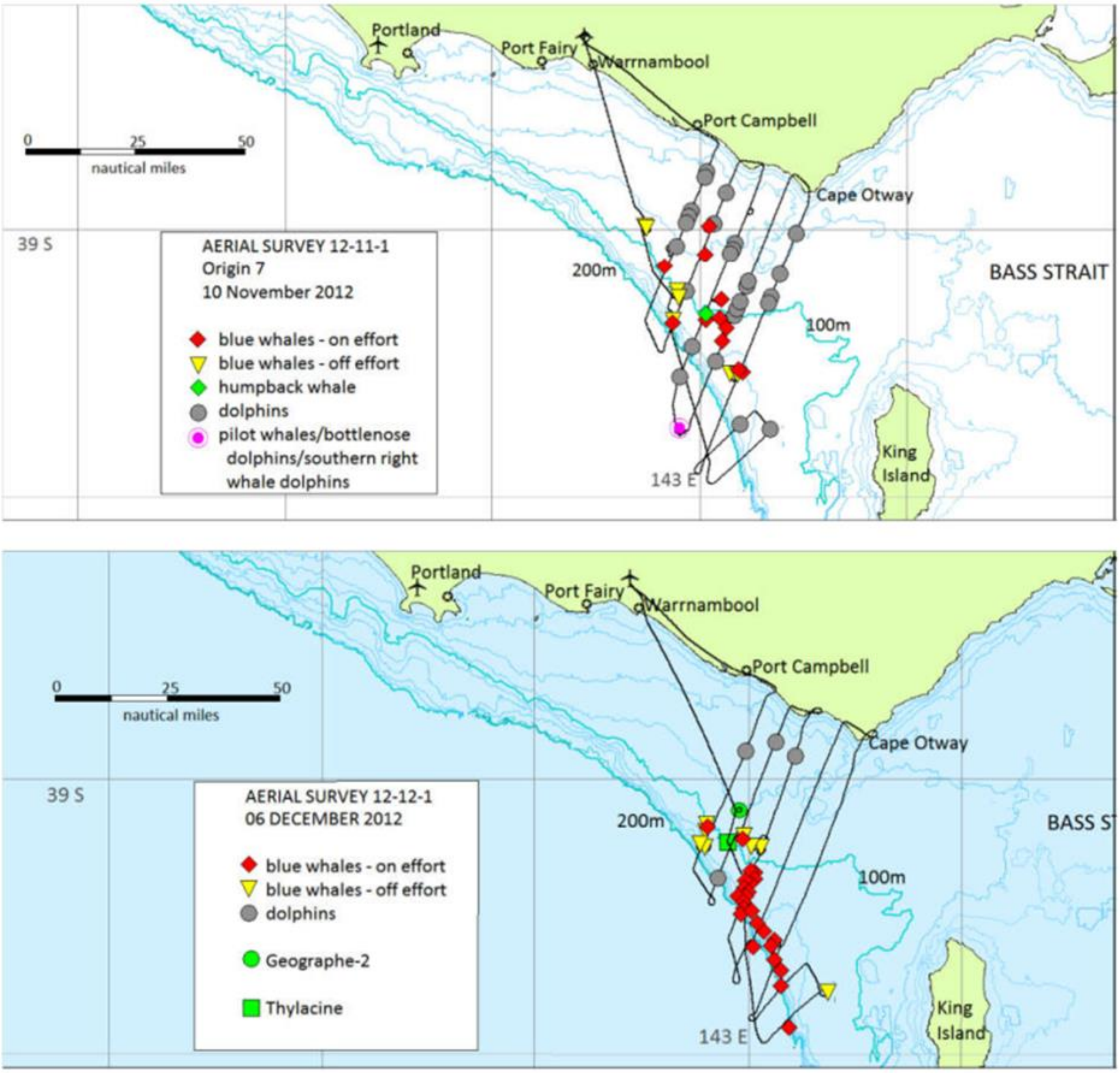


Figure 6-50: Blue whale sightings during an aerial survey for Origin Energy in November and December 2012 (Gill 2020)

<u>Tagging Study (2015-2016)</u>

Möller et al. (2020) analysed data from 13 pygmy blue whales tagged in the Bonney Upwelling region in January 2015 with tags transmitting up to March 2016 (Figure 6-). In summary:

- The whales' movements in the Great Southern Australian Coastal Upwelling System (GSACUS) ranged mostly from eastern South Australia, over the continental shelf south of Kangaroo Island, to between mainland Australia and Tasmania), with a few whales performing some movements to the continental slope and the deep-sea.
- In the GSACUS, most tagged whales remained over the continental shelf, utilising this region from at least January to July. This was the area of highest occupancy by the whales, with one whale returning to the Bonney Upwelling in January the year after and remaining there for at least three

months. This timing coincides with the upwelling season, which generally occurs from November to March each year.

- A low probability of area restricted search (ARS) behaviour (i.e. high probability of transiting behaviour) was mainly observed between April and June, and then between November and December, suggesting that the pygmy blue whales were mainly migrating during those times.
- Seascape correlates of ARS behaviour for these whales suggested the importance of sea surface temperature, sea surface height anomaly, wind speed and chlorophyll a concentration as proxies of upwelling productivity and presence of krill patches.

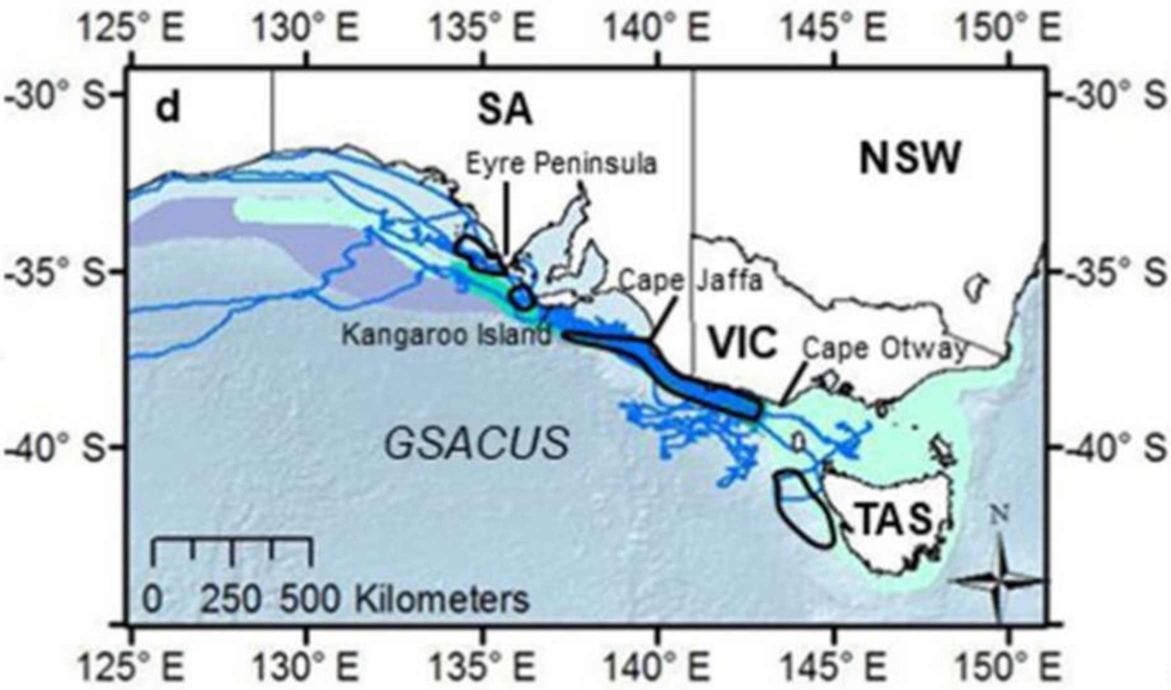


Figure 6-51: Tracks of 13 pygmy blue whales in the GSACUS (Möller et al. 2020)

<u>Passive Acoustic Recorders (2009-2017)</u>

Between 2009 and 2016 the Integrated Marine Observing System (IMOS) recorded underwater sound south of Portland. McCauley et al. (2018) analysed the data from to look at Blue Whale presence, distribution, and population parameters.

Antarctic blue whale calls were received via deep sound channel propagation south of Portland and the maximum chorus levels occurred from late February to late June with yearly increases in chorus levels (McCauley et al. 2018).

In 2009 and 2011, pygmy blue whales arrived in November or December whereas in other years, calls were not detected until January or February (Figure 6-). There was substantial variation in presence within a season, with some whales remaining in the Portland detection area until mid-June each year with no consistent trend other than a peak in presence somewhere over February to June.

McCauley et al. (2018) noted it is difficult to predict numbers within a season but when correlated across seasons, the strength and persistence of the Bonney Coast Upwelling, given by time integrated water temperature, significantly correlates with time integrated number of individual whales calling from the same site (Figure 6-). The upwelling index explains 83% of the variability in blue whale calling presence across seasons when using seasonal whale counts (not corrected for population growth). When a growth rate of 4.3% is applied a correlation of 90% of the variance in seasonal occurrence is predicted by the upwelling index. McCauley et al. (2018) also noted that the number of pygmy blue whales calling in Portland could be expected in increase yearly with whale population growth.

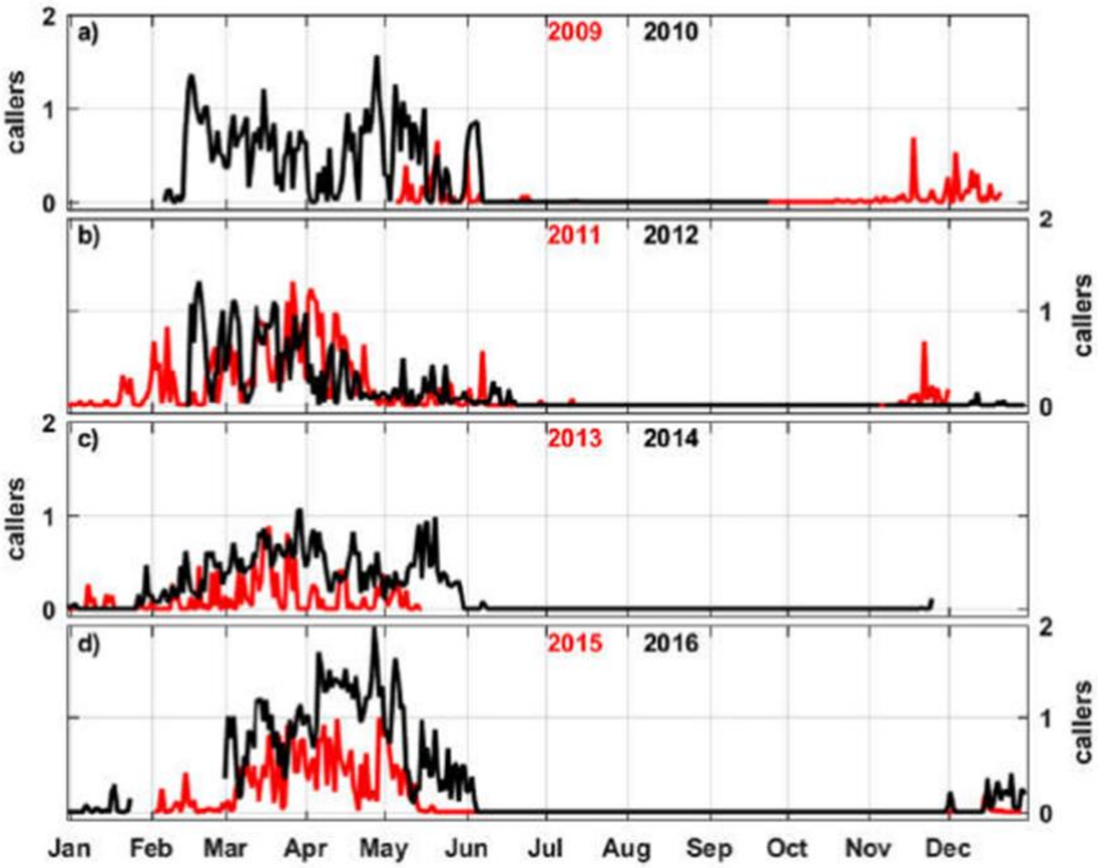


Figure 6-52: Mean number of individual pygmy blue whales calling (McCauley et al. 2018)

<u>Beach Surveys (2019-2022)</u>

During the Beach Otway Development Seabed Survey there were 4 sightings of blue whales within 3.5 km of the Thylacine Platform in November 2019 and one sighting in January 2020 about 1 km from the Artisan well location. The whales were identified as swimming.

JASCO completed a monitoring study for Beach in relation to exploration drilling activities at the Artisan 1 well from the 1 February to 6 April 2021 (McPherson et al. 2021). Songs of pygmy blue whales were detected sporadically through February and the first half of March. By the end of March, the signals were present in almost every hour of recording. This pattern of occurrence was reflected across all recording stations. The data were too sparse to confirm anything about animal movements.

Beach commenced its Otway drilling program in February 2021, including:

- Exploration drilling at the Artisan 1 location (2 February 2021 – 27 March 2021)
- Development drilling, well abandonment, subsea installation, and commissioning activities in the Geographe field (27 March 2021 – 13 November 2021)
- Development drilling of the Thylacine North 1 well (16 November 2021 – 11 January 2022)
- Development drilling of the Thylacine West wells (23 January 2022 – 30 April 2022)

Drilling was undertaken by a mobile offshore drilling unit (MODU), the Ocean Onyx. The blue whale study (Gill 2020) was engaged to undertaken aerial surveys from February to May 2021 to identify blue whale and krill surface swarms within and outside of the defined project area. A preliminary data summary provided to Beach detailed:

- Nine aerial surveys were undertaken from 25 February to 21 May 2021
- There were 34 blue whale sightings consisting of 43 individuals
- The highest number of blue whale sightings was on 7 April 2021, with 19 blue whales sighted
- The first blue whale was sighted 25 February 2021and the final blue whale was sighted 7 April 2021
- Blue whales and krill surface swarms were distributed throughout the area surveyed

Throughout the drilling campaign, Marine Fauna Observers (MFOs) were employed (January 2021 to April 2022) to ensure activities complied with Beach's Whale Management Standard Operating Procedure (WMSOP) (Document No.: S4000AF726092). The data collected includes the numbers of blue whales observed at varying distances from the MODU, based on the WMSOP management zones, during different MODU activities, along with information on whether the whale was observed to be approaching the MODU or moving away from it. They also collect additional data whilst in transit, or at distances outside of the zones specified in the WMSOP. Observations are based on distances of:

- 0 – 500 m
- 501 – 1,500 m
- 1,501 – 2,000 m
- 2,001 – 3,000 m
- 3,000 m

The total number of blue whales sighted by the aerial surveys and by MFOs was 324 individuals (Figure 6-), with a peak of 102 whales in March 2021 (note that the period February – May 2021 includes aerial survey data). Over this period, whales were observed in most months apart from July, August, and October.

Figure 6- shows all whale sightings by MFOs between 2 February 2021 and 31 March 2022 across all well location. Figure 6- shows blue whale sightings within the Thylacine field between 16 November 2021 and 31 March 2022. Note that many observations were made whilst in transit.

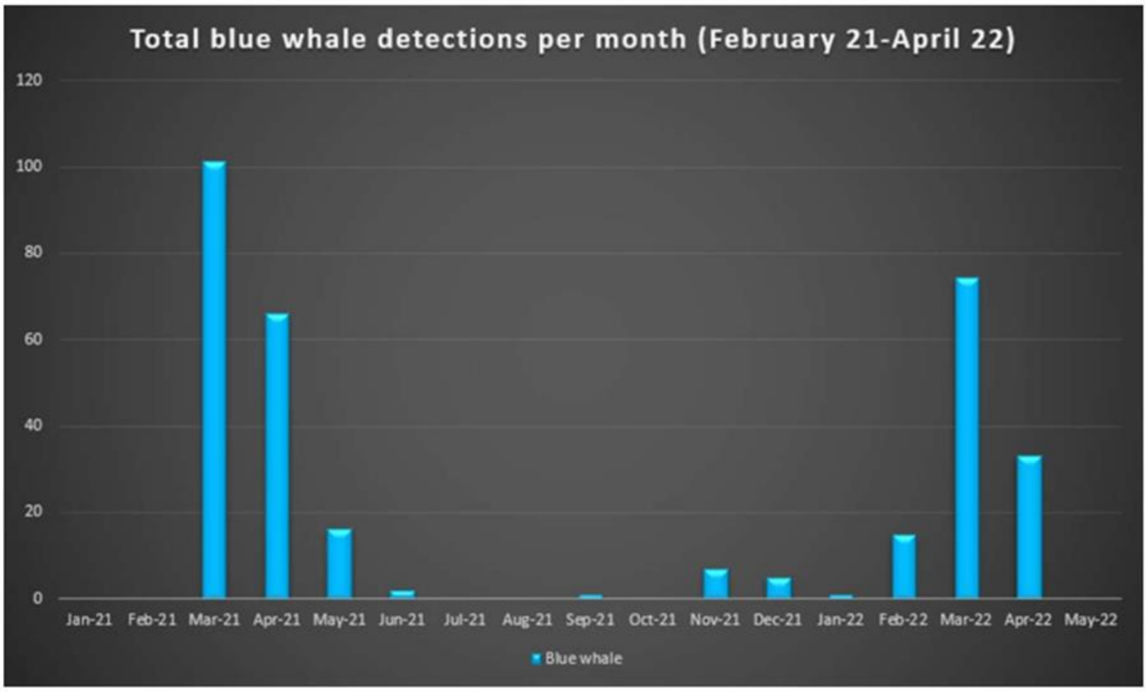


Figure 6-53: Blue whale observations during the Otway Offshore Drilling Campaign

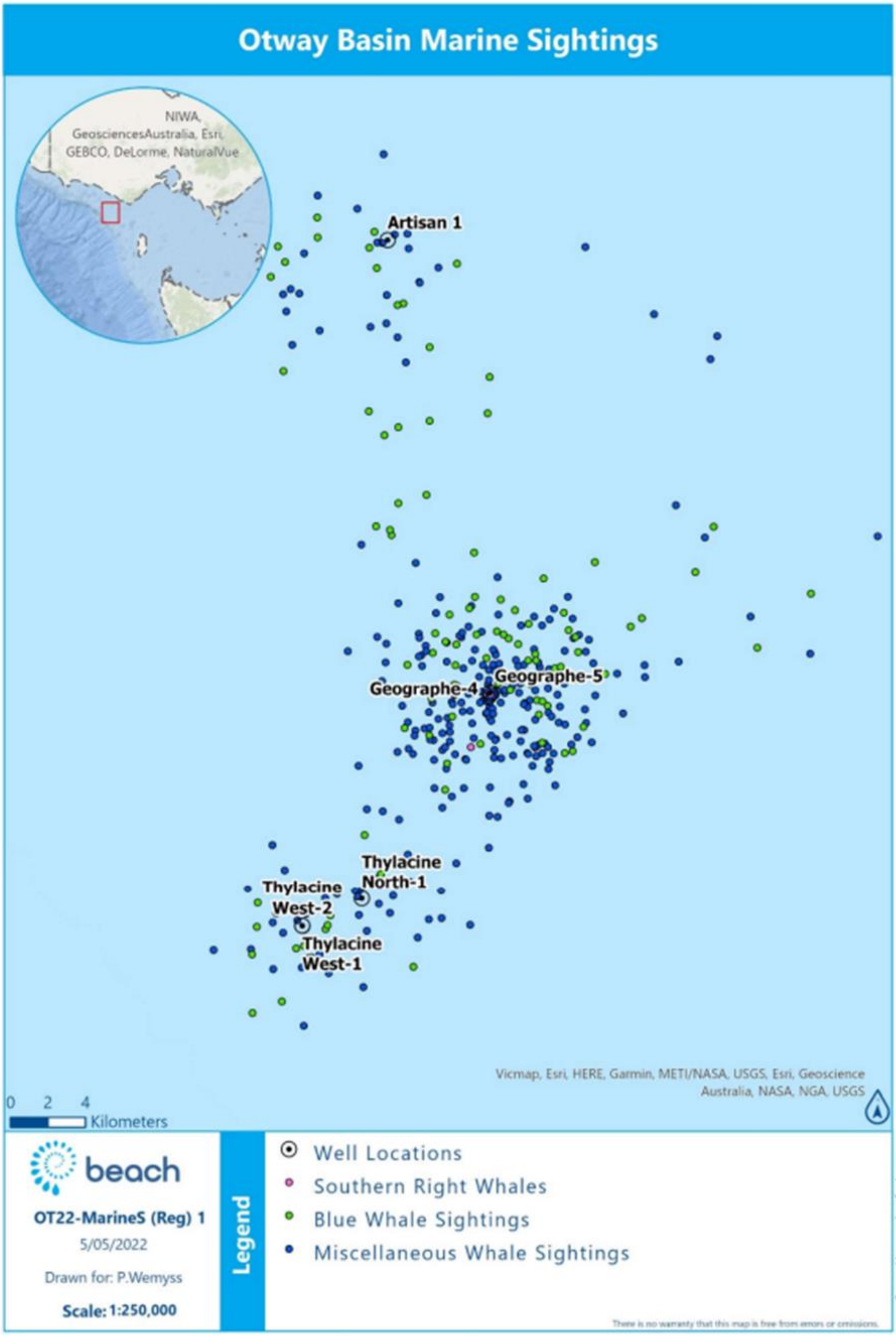


Figure 6-54: Whale sightings between 2 February 21 – 31 March 22.

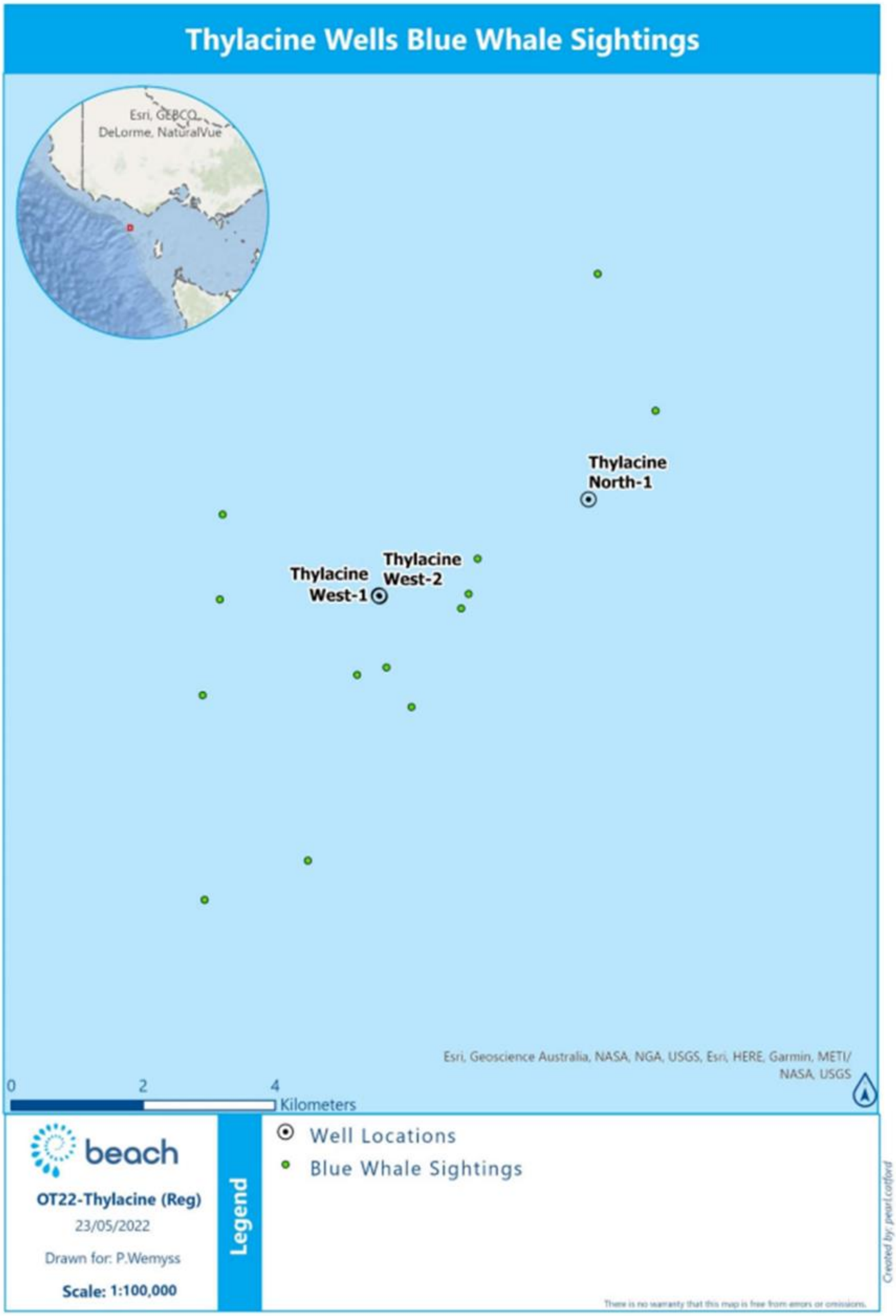


Figure 6-55: Blue whale sightings in the Thylacine field TN-1 (16 Nov 21 – 11 Jan 22); TW (23 Jan 22 – 31 Mar 22)

The Lead MFO provided summary data collected under the WMSOP for the period between 2 February 2021 and 31 March 2022. This was reviewed and a brief analysis undertaken.

During this period, 127 blue whales were observed within 3 km of the MODU (Table 6-30). Thirty-two whales were first detected within 1,500 m of the MODU. Sixty-two were first detected at 1,501 to 3,000 m. Thirty-three were first observed to be further than 3 km from the MODU before moving towards it. The total number of blue whales observed to move towards the MODU (following first detection) was 70 (55%); 57 were observed to move away from the MODU (45%).

Of the 94 whales first detected within 3,000 m of the MODU, 32 were observed within 1,500 m and 62 observed between 1,501 and 3,000 m. The number of blue whales/km^2 observed was 2.7x higher in the 0-1,500 m zone (7.8 whales/km^2) than in the 1,501 to 3,000 m zone (2.9 whales/km^2) (Table 6-30).

It would be expected that the number of blue whales/km^2 would be the same in all zones if underwater noise was not displacing blue whales from the area. Alternatively, if whales are being displaced then it would be expected that the number of blue whales/km^2 would increase with increasing distance from the MODU. The apparent increased density of whales within 1,500 m of the MODU in Table 6-30 can be explained by the fact that it is harder to detect whales at greater distances (i.e., the probability of detection is inversely related to distance). To correct for this a detection function is needed. The data collection methods employed by the MFOs were not designed to enable detection functions to be generated so surrogate detection functions were applied.

Table 6-30: Blue whale observations within 3,000 m of the MODU (2 February 2021 and 31 March 2022)

MODU activity	First detection – distance (m) from MODU					Total	Moving towards MODU	Moving away from MODU
	0-500	501-1,500	1,501-2,000	2,001-3,000	>3,000			
Drilling	-	7	3	8	7	**25**	13	12
Resupply	2	3	6	5	9	**25**	16	9
Drilling and Resupply	-	3	3	4	4	**14**	10	4
In Transit	-		1	5	2	**8**	4	4
At Standby	4	13	13	14	11	**55**	27	28
TOTAL	**6**	**26**	**26**	**36**	**33**	**127**	**70**	**57**
Observation area (km^2)	0.76	6.31	5.50	15.70				
Observed whales/km^2	7.1	4.1	4.7	2.3				
	0-1,500		**1,501-3,000**					
TOTAL	32		62					
Area (km^2)	7.07		21.21					
Blue whales/km^2	7.8		2.9					

Williams et al. (2016) collected 3,262 vessel-based observations from 2008 to 2015 of humpback whales in and near Glacier Bay National Park, Alaska, which is a site of a regionally important feeding aggregation of humpback whales. They analysed this data (85% truncated at 4,565 m) to generate detection functions to understand the probability of whale detection and how it varies with distance under different environmental and biological characteristics. Figure 6- shows the detection function for all data; Figure 6- shows the detection functions under different visibility conditions; Figure 6- shows the detection functions for different group sizes. Shaded areas show 95% confidence intervals. Arrows identify detection probability at 1,000 m reference distance.

Detection probability of surfacing whales decreased markedly with increasing distance from the ship. They found visibility and group size to be the most important variables influencing detection. The worst visibility conditions reduced detection probability to near 0 at 1000 m. Compared to detecting a single whale, a group of 2 or 3 whales almost doubled detection probability at 1000 m. Surface active behaviour increased detection compared to spouting while showing no flukes. In south-eastern Alaska, single whales that spouted during excellent visibility conditions were most commonly encountered and had a detection probability of 0.569 at 1000 m (Williams et al. 2016).

The Lead MFO for the Otway drilling program advised that they were only able to detect whales further than 3 km on 25% of occasions. The detection function from Williams et al. (2016) which best matches the MFOs advice was the curve showing '4+ group size' in Figure 6-. Detection probabilities for this case, along with those for 'excellent visibility' conditions (Figure 6-) and 'all' data (Figure 6-) were extracted to provide probabilities in 500 m increments (Table 6-31). To allow these probabilities to be applied to the management zones shown in Table 6-30, the average probability for each management zone was calculated and expected numbers and densities calculated for the three scenarios (Table 6-32).

The total expected number of blue whales is 158.6 for the '4+ group size' scenario, 437.9 for the 'excellent visibility' scenario and 530.7 for the 'all data' scenario. The total observed blue whales was 127.

The expected densities for each management zone for the three scenarios are shown in Figure 6-. The data shows that for the '4+ group size' there is no significant difference in expected blue whale densities between any of the four management zones, with highest expected densities in the 0–500 m zone. The 'excellent visibility' and 'all data' scenarios show significant expected differences between the 0 to 1,500 m and 1,501 to 3, 000 m management zones, however no significant differences between the 0–500 and 501 –1,500 m zones.

All the scenarios presented show similar expected densities for the 0 to 1,500 m zone. All three scenarios show that there is no increase in expected densities between the 0–500 and 501–1,500 m zones which implies that blue whales are not being displaced within 1,500 m. The '4+ group size' scenario (which most closely matches the Lead MFOs advice) implies that there is no displacement of blue whales within 3,000 m.

The '4+ group size' scenario has a mean expected density of 6.21 blue whales/km^2 across all zones, which (if correct) should apply to the wider area beyond observations. If whales are being displaced beyond 1,500 m as implied by the 'excellent visibility' and 'all data' scenarios, then the minimum mean expected densities for the wider area should be calculated using the observations between 1,501 and 3,000 m. These expected minimum mean densities are 18.70 blue whales/km^2 and 22.91 blue whales/km^2 for the 'excellent visibility' and 'all data' scenarios, respectively.

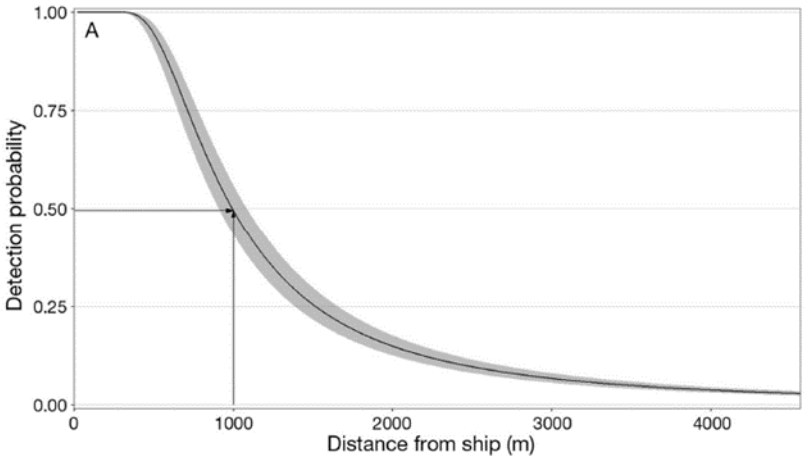


Figure 6-56: Detection probability as it varies with distance between ships and whales in and near Glacier Bay National Park from 2008 to 2015 (Williams et al. 2016)

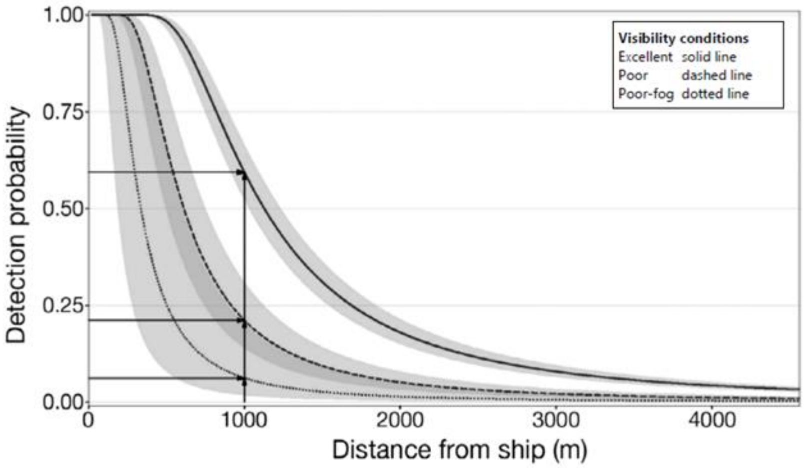


Figure 6-57: Detection probability of humpback whales under different visibility conditions (Williams et al. 2016)

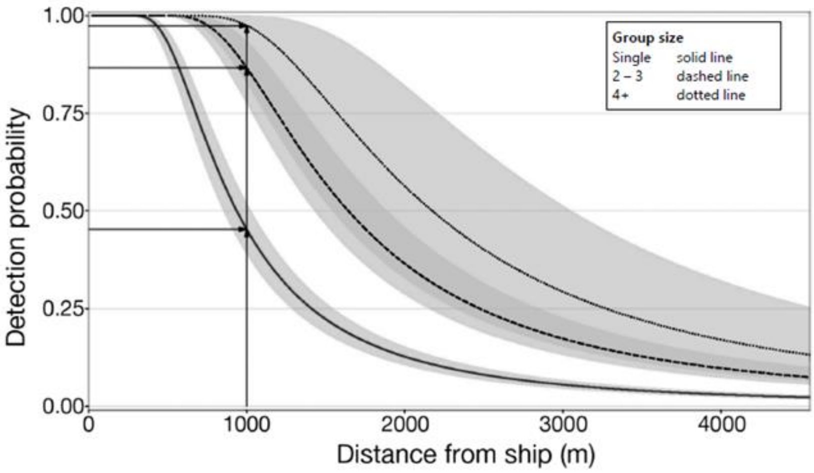


Figure 6-58: Probability of detecting whale groups of different sizes of humpback whales (Williams et al. 2016)

Table 6-31: Detection probabilities derived from Williams et al. (2016)

	Derived detection probabilities		
Distance	4+ group size	Excellent visibility	All data
0	1	1	1
500	1	0.98	0.94
1,000	0.97	0.59	0.5
1,500	0.78	0.31	0.25
2,000	0.57	0.18	0.15
2,500	0.4	0.12	0.09
3,000	0.29	0.08	0.07

Table 6-32: Estimated blue whale abundance and density based on MFO data from 2 Feb. 2021 and 31 Mar. 2022. Note that the reference to Table 5-22 is Table 6-30 in this OPP.

	First detection – distance (m) from MODU			
	0-500	501-1,500	1,501-2,000	2,001-3,000
Area (km^2) (a)	0.76	6.31	5.50	15.70
From Table 5-22				
Observed numbers (b)	6	26	26	36
Blue whales/km^2	7.1	4.1	4.7	2.3
Mean detection probability (c)				
4+ group size	1.00	0.92	0.68	0.42
Excellent visibility	0.99	0.63	0.25	0.13
All data	0.97	0.56	0.20	0.10
Expected numbers (b ÷ c)				
4+ group size	6.0	28.4	38.5	85.7
Excellent visibility	6.1	41.5	106.1	284.2
All data	6.2	46.2	130.0	348.4
Expected density (whales/km^2) (b ÷ c ÷ a)				
4+ group size	7.89	4.50	7.00	5.46
Excellent visibility	7.97	6.58	19.29	18.10
All data	8.14	7.31	23.64	22.19

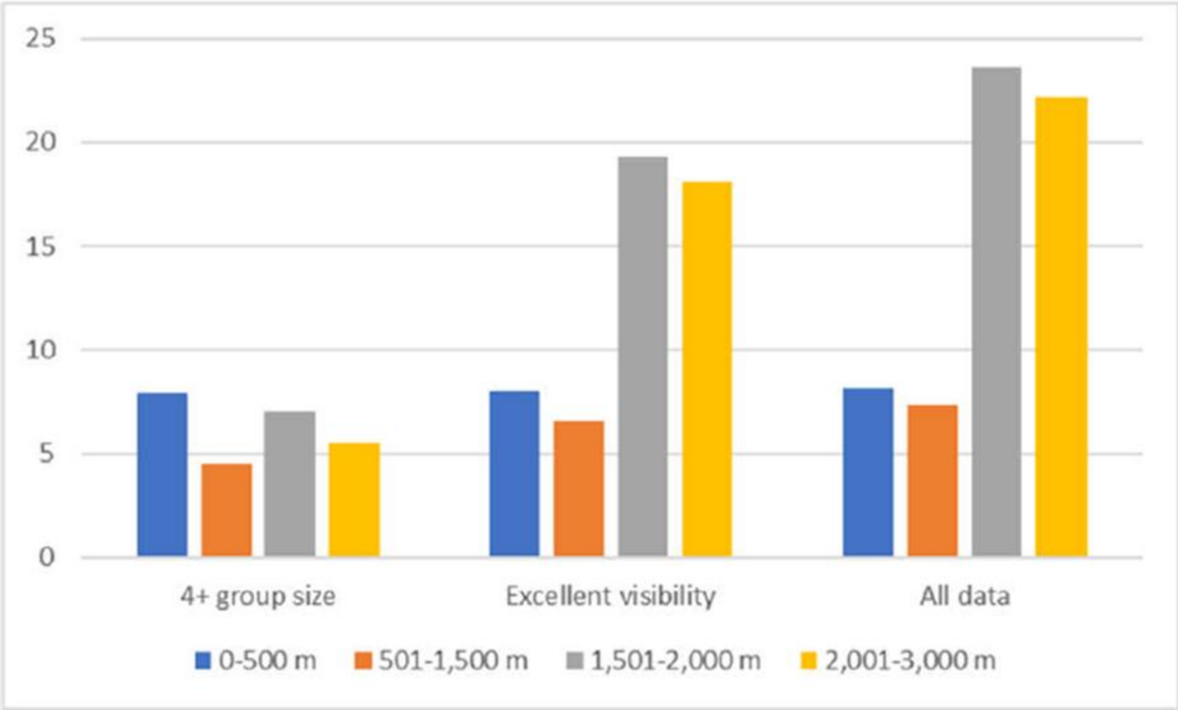


Figure 6-59: Expected density (blue whales/km^2) for each management zone

6.4.9.7.5 Fin Whale

Fin whales are listed as Vulnerable and Migratory under the EPBC Act considered a cosmopolitan species and occur from polar to tropical waters and are rarely in inshore waters. They show well defined migratory movements between polar, temperate, and tropical waters. Migratory movements are essentially north–south with little longitudinal dispersion. Fin whales regularly enter polar waters. Unlike blue whales and minke whales, fin whales are rarely seen close to ice, although recent sightings have occurred near the ice edge of Antarctica.

There are stranding records of this species from most Australian states, but they are considered rare in Australian waters (Bannister et al. 1996). The fin whale has been infrequently recorded between November and February during aerial surveys in the region (Gill et al. 2015). Fin whales have been sighted inshore in the proximity of the Bonney Upwelling, Victoria, along the continental shelf in summer and autumn months (Gill 2002). Fin whales in the Bonney Upwelling are sometimes seen in the vicinity of blue whales and sei whales.

Fin whales were sighted, and feeding was observed between November-May (upwelling season) during aerial surveys conducted between 2002 and 2013 in South Australia (Gill et al. 2015). This is one of the first documented records these whales feeding in Australian waters, suggesting that the region may be used for opportunistic baleen whale feeding (Gill et al. 2015). Fin whales have also been acoustically detected south of Portland, Victoria (Erbe et al. 2016). Aulich et al. (2019) recorded infrequent presence of fin whales in Portland between 2009 to 2016. This suggests that the area may not be a define migratory route however, calls recorded in July may be from whales migrating northward towards the east coast of NSW. Calls detected in late August and September may be indication of the presence of whales on their migration route back to Antarctica waters.

The sighting of a cow and calf in the Bonney Upwelling in April 2000 and the stranding of two fin whale calves in South Australia suggest that this area may be important to the species' reproduction, perhaps as a provisioning area for cows with calves (Morrice et al. 2004). However, there are no defined mating or calving areas in Australia waters.

6.4.9.7.6 Humpback Whale

Humpback whales (*Megaptera novaeangliae*) are listed as Vulnerable and Migratory under the EPBC Act and are present around the Australian coast in winter and spring. Humpbacks undertake an annual migration between the summer feeding grounds in Antarctica to their winter breeding and calving grounds in northern tropical waters (DoE 2025). Along the southeast coast of Australia, the northern migration starts in April and May while the southern migration peaks around November and December (DoE 2025). A discrete population of humpback whales have been observed to migrate along the west coast of Tasmania and through Bass Strait, and these animals may pass through the Operational Area and Planning Area. The exact timing of the migration period varies between years in accordance with variations in water temperature, extent of sea ice, abundance of prey, and location of feeding grounds (DoE 2025). Feeding occurs where there is a high krill density, and during the migration this primarily occurs in Southern Ocean waters south of 55°S (DoE 2025).

Humpback whales satellite-tagged off Australia's east coast were tracked during three austral summers in 2008/2009, 2009/2010 and 2010/2011 (Andrews-Goff et al. 2018). Of the 30 tagged humpbacks, 21 migrated south along the coastline across into Bass Strait during October. In November the whales then migrated along the east coast (12 whales) and west coast (1 whale) of Tasmania to Antarctic feeding grounds. The state space model used shows both search and transit behaviour revealing new temperate feeding grounds in Bass Strait, the east coast of Tasmania and in the eastern Tasman Sea.

There is no known feeding, resting or calving grounds for Humpback Whales in the Operational Area or Planning Area, although feeding may occur opportunistically where sufficient krill density is present DoE 2025). The nearest BIA which is important habitat for migrating humpback whales is Twofold Bay, a resting area off the NSW coast (DCCEEW 2024).

During Origin's Enterprise 3D seismic survey undertaken during early November 2014, 16 humpback whales were sighted (RPS 2014).

The recovery of humpback whale populations following whaling has been rapid. The Australian east coast humpback whale population, which was hunted to near-extinction in the 1950s and early 1960s, had increased to 7,090±660 (95% CI) whales by 2004 with an annual rate of increase of 10.6±0.5% (95% CI) between 1987–2004 (Noad et al. 2011). The available estimates for the global population total more than 60,000 animals, and global population is categorised on the IUCN Red List as Least Concern.

6.4.9.7.7 Killer Whale

Killer whales (*Orcinus orca*) are listed as Migratory under the EPBC Act and thought to be the most cosmopolitan of all cetaceans and appear to be more common in cold, deep waters; however, they have often been observed along the continental slope and shelf particularly near seal colonies (Bannister et al. 1996). The killer whale is widely distributed from polar to equatorial regions and has been recorded in all Australian waters with concentrations around Tasmania. The only recognised key locality in Australia is Macquarie Island and Heard Island in the Southern Ocean (Bannister et al. 1996).

The habitat of killer whales includes oceanic, pelagic and neritic (relatively shallow waters over the continental shelf) regions, in both warm and cold waters (DoE 2025).

Killer whales are top-level carnivores. Their diet varies seasonally and regionally. The specific diet of Australian killer whales is not known, but there are reports of attacks on dolphins, young humpback whales, blue whales, sperm whales, dugongs and Australian sea-lions (Bannister et al. 1996). In Victoria, sightings peak in June/July, where they have been observed feeding on sharks, sunfish, and Australian fur-seals (Morrice et al. 2004; Mustoe 2008).

The breeding season is variable, and the species moves seasonally to areas of food supply (Bannister et al. 1996; Morrice et al. 2004). Killer whales are frequently present in Victorian waters with sightings recorded along most of Victoria's coastline. Mustoe (2008) describes between 2002 and 2008 web-based casual sightings had an average of 13 killer whales sighted per year in Victoria and NSW, more than half in Victorian waters. This combined with the Atlas of Victorian Wildlife indicates a peak in killer whale sightings in June to July and September to November (Mustoe 2008).

The killer whale has been observed within the region however there are no BIAs in the Operational Area and Planning Area.

6.4.9.7.8 Pygmy Right Whale

The pygmy right whale (*Caperea marginata*) is a little-studied baleen whale species that is found in temperate and sub-Antarctic waters in oceanic and inshore locations and listed as migratory under the EPBC Act. The species, which has never been hunted commercially, is thought to have a circumpolar distribution in the Southern Hemisphere between about 30°S and 55°S. Distribution appears limited by the surface water temperature as they are almost always found in waters with temperatures ranging from 5° to 20°C (Baker 1985) and staying north of the Antarctic Convergence. There are few confirmed sightings of pygmy right whales at sea (Reilly et al. 2008). The largest reported group was sighted (100+) just south-west of Portland in June 2007 (Gill et al. 2008).

Species distribution in Australia is found close to coastal upwellings and further offshore it appears that the Subtropical Convergence may be important for regulating distribution (Bannister et al. 1996). Key locations include south-east Tasmania, and Kangaroo Island and southern Eyre Peninsula in South Austalia close to upwelling habitats rich in marine life and zooplankton upon which it feeds (Bannister et al. 1996).

The pygmy right whale has been observed in surveys in the region, however, Origin did not observe it during the 2010 Speculant MSS and 2014 Enterprise MSS. There are no BIAs identified in the Operational Area or Planning Area.

6.4.9.7.9 Sei Whale

Sei whales (*Balaenoptera borealis*) are listed as Vulnerable and Migratory under the EPBC Act, and are considered a cosmopolitan species, ranging from polar to tropical waters, but tend to be found more offshore than other species of large whales. They show well defined migratory movements between polar, temperate, and tropical waters. Migratory movements are essentially north-south with little longitudinal dispersion. Sei whales do not penetrate the polar waters as far as the blue, fin, humpback and minke whales (Horwood 1987), although they have been observed very close to the Antarctic continent.

Sei whales move between Australian waters and Antarctic feeding areas; sub-Antarctic feeding areas (e.g. Subtropical Front); and tropical and subtropical breeding areas. The proportion of the global population in Australian waters is unknown as there are no estimates for sei whales in Australian waters.

Sei whales feed intensively between the Antarctic and subtropical convergences and mature animals may also feed in higher latitudes. Sei whales feed on planktonic crustaceans, in particular copepods and amphipods. Below the Antarctic convergence Sei Whales feed exclusively upon Antarctic krill (*Euphausia superba*).

In the Australian region, sei whales occur within Australian Antarctic Territory waters and Commonwealth waters, and have been infrequently recorded off Tasmania, NSW, Queensland, the Great Australian Bight, Northern Territory and Western Australia (Parker 1978; Bannister et al. 1996; Chatto and Warneke 2000; Bannister 2008).

Sightings of sei whales within Australian waters includes areas such as the Bonney Coast Upwelling off South Australia (Miller et al. 2012), where opportunistic feeding has been observed between November and May (Gill et al. 2015).

6.4.9.7.10 Southern Right Whale

The southern right whale (*Eubalaena australis*) is listed as Endangered under the EPBC Act in Australia and as Endangered on the Victorian Threatened Species Advisory List.

The National Recovery Plan for the Southern Right Whale (DCCEEW 2024k) contains Biologically Important Areas, as displayed in Figure 6-60 (DCCEEW 2024).

The Operational Area overlaps the southern right whale migration BIA and the Planning Area overlap the southern right whale reproduction and migration BIAs (Figure 6-60).

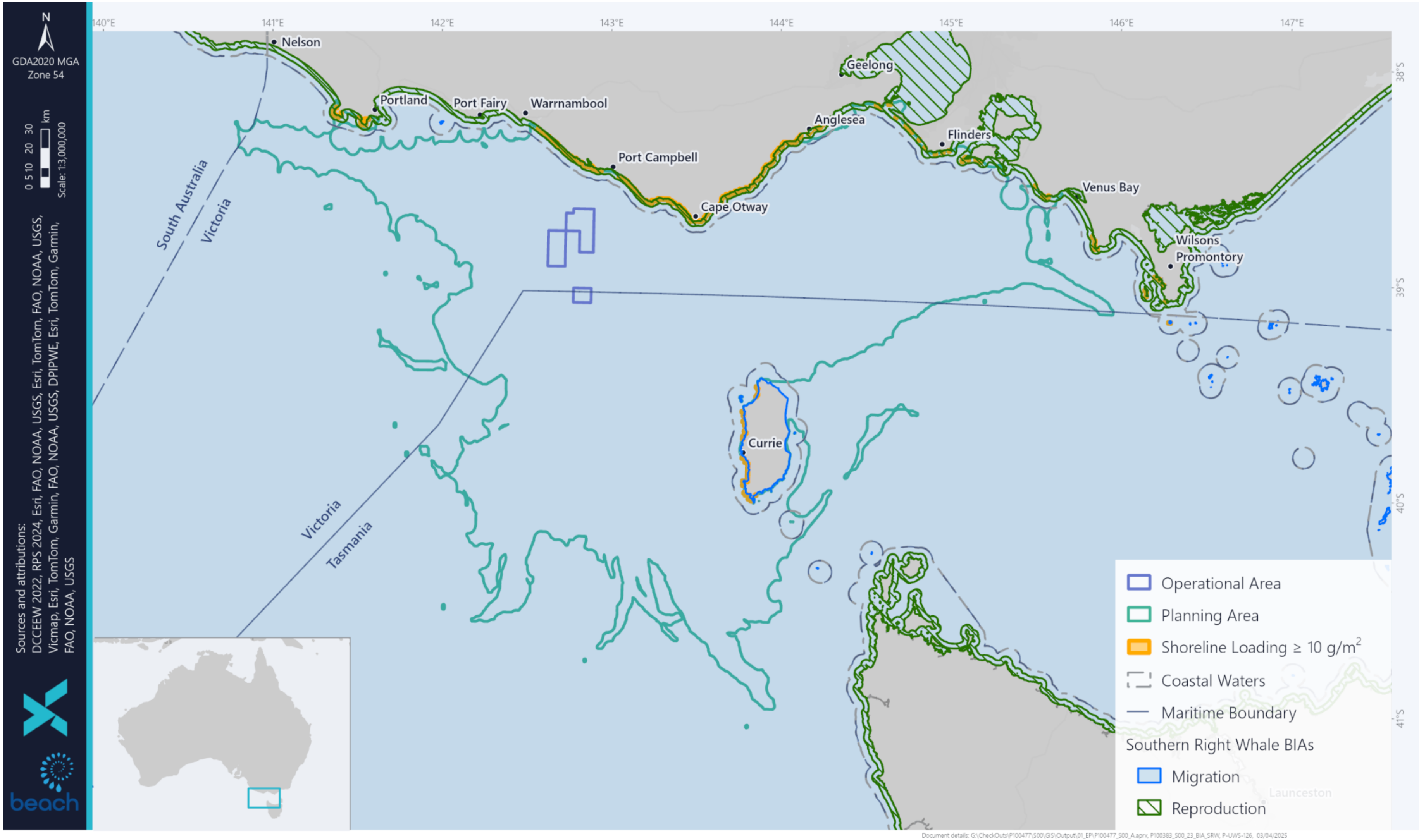


Figure 6-60: Southern right whale BIAs within the Operational and Planning Areas.

6.4.9.7.10.1 Population

Southern right whales were depleted to less than 300 individuals globally due to commercial whaling in the 19th and 20th centuries (Tormosov et al. 1998). They were protected from whaling in 1935 however, due to illegal whaling in the 1970s and because southern right whales have a slow rate of increase compared to other marine mammals, their numbers remain low (IWC 2013). Global abundance estimates are 13,000 for the species, across key wintering grounds in South Africa, Argentina, Australia, and New Zealand.

The Australian population of southern right whales is divided into two sub-populations due to genetic diversity (Carroll et al. 2011; Baker et al. 1999) and different rates of increase (DCCEEW 2024k; DSEWPaC 2012). The western sub-population occurs predominantly between Cape Leeuwin, Western Australia (WA) and Ceduna, South Australia (SA) This sub-population comprises most of the Australian population and is estimated at 3,200 individuals increasing at an annual rate of approximately 6% p.a. (Smith et al. 2019). The eastern sub-population can be found along the south-eastern coast, including the region from Tasmania to Sydney, with key aggregation areas in Portland and Warrnambool in Victoria. The eastern sub-population is estimated at less than 300 individuals and is showing no signs of increase (Bannister 2017). A rate of around 7% p.a. is considered the maximum biological rate of increase for southern right whales (IWC 2013). Connectivity between the two populations is unknown however, some limited movement between the two areas has been recorded (Burnell 2001, Charlton 2017, Pirzl et al. 2009).

6.4.9.7.10.2 Distribution

Southern right whales are distributed in the Southern Hemisphere with a circumpolar distribution between latitudes of 16°S and at least 65°S. They migrate from southern feeding grounds in sub-Antarctic waters to Australia in between May and November to calve, mate and rest (Bannister et al. 1996; DCCEEW 2024k). They are distributed across thirteen primary aggregation areas along the southern coast of Australia (Figure 6-) (DCCEEW 2024k; DSEWPaC 2012). In Australian coastal waters, they occur along the southern coastline of the mainland and Tasmania and generally extend as far north as Sydney on the east coast and Perth on the west coast (DCCEEW 2024k; DSEWPaC 2012). There are occasional sightings further north, with the extremities of their range recorded at Hervey Bay and Exmouth (DCCEEW 2024k; DSEWPaC 2012).

The largest established calving areas in Australia include Head of Bight in SA, and Doubtful Island Bay and Israelite Bay in WA. Smaller but established aggregation areas regularly occupied by southern right whales include Yokinup Bay in WA, Fowlers Bay in SA and the Warrnambool and Portland in Victoria. Emerging aggregation areas include Flinders Bay, Hassell Beach, Cheyne/Wray Bays, and Twilight Cove in WA, and sporadically occupied areas include Encounter Bay in SA (DCCEEW 2024k; DSEWPaC 2012). Southern right whales generally occupy shallow sheltered bays within 2 km of shore and within water depths of less than 20 m (Charlton et al. 2019). A number of additional areas for southern right whales are emerging that might be of importance, particularly to the south-eastern population. In these areas, small but growing numbers of non-calving whales regularly aggregate for short periods of time. These areas include coastal waters off Peterborough, Port Campbell, Port Fairy, and Portland in Victoria (DCCEEW 2024k; DSEWPaC 2012) (Figure 6-60).

There is variation in annual abundance on the coast of Australia due to the 3-year calving cycles (Charlton 2017). Female and calf pairs generally stay within the calving ground for 2–3 months (Burnell 2001). Peak periods for mating in Australian coastal waters are from mid-July through August

(DCCEEW 2024k; DSEWPaC 2012). Pregnant females generally arrive during late May/early June and calving/nursery grounds are generally occupied until October (occasionally as early as April and as late as December) (Charlton et al. 2019). A study conducted by Stamation et al. (2020) shows that despite an increase in breeding females sighted in south-eastern Australian between 1985 and 2017, there is no evidence of an increase in annual numbers of mother-calf pairs.

As a highly mobile migratory species, southern right whales travel thousands of kilometres between habitats used for essential life functions. Movements along the Australian coast are reasonably well understood, but little is known of migration travel, non-coastal movements and offshore habitat use. Exactly where southern right whales approach and leave the Australian coast from, and to, offshore areas remain unknown (DCCEEW 2024k; DSEWPaC 2012). The Victorian and Tasmania coastal waters are known to include migrating habitat and southern right whales are known to arrive at the south eastern Australian coastline and travel west to established aggregation areas in South Australia such as the Head of the Great Australian Bight (Watson et al. 2021). There is one established calving ground for female and calf pairs in south-eastern Australian at Logans Beach, Warrnambool, Victoria (Watson et al. 2021). A predominance of westward movements amongst long-range photo-identification re-sightings may indicate a seasonal westward movement in coastal habitat (Burnell 2001). Direct approaches and departures to the coast have also been recorded through satellite telemetry studies (Mackay et al. 2015).

Aerial surveys of western Bass Strait and eastern Great Australian Bight undertaken by Gill et al. (2015) detected southern right whales between May and September. A survey in early November 2010 did not observe any whales in the Warrnambool area and it was assumed that cows and calves had already left the calving and aggregation areas (M. Watson pers. comm. 2010). No southern right whales were encountered during Origin’s Enterprise 3D seismic survey undertaken during November 2014 (RPS 2014), or during spotter flights of the coastline undertaken prior to the survey in late October 2014. Aerial surveys between Ceduna, SA and Sydney NSW (and included Tasmania) were undertaken in August of 2013 and 2014 and recorded a total of 34 southern right whale individuals (17 breeding females) in 2013 and 39 (11 breeding females) in 2014, respectively (Watson et al. 2015).

Marine mammal observer data from January 2021 to April 2022 for the drilling program in the Otway Development Area identified three southern right whales consisting of a single individual in June and August., and two in July (Figure 6-).

The National Recovery Plan for the Southern Right Whale (DCCEEW 2024k) reports that known and potential threats that may have individual or population level impacts to southern right whales include entanglement in fishing gear, habitat degradation from coastal and offshore developments, anthropogenic underwater noise, vessel interactions and disturbance, whaling, prey depletion and pollution as well as cumulative impacts from these threats.

6.4.9.7.10.3 Cultural significance

The National Recovery Plan for the Southern Right Whale (DCCEEW 2024k) provides information on the cultural significance of southern right whales to Indigenous Australians. The plan details:

At the Great Australian Bight in South Australia, the Mirning People are whale people, and the white whale Jeedara is their totem and part of the Dreaming, which tells how the Mirning and southern right whales are connected (Burgoyne 2000). Mirning Country is the sacred place of the Mirning People, and the Yinyila Nation of Mirning clans forms a huge yerrambai, or rainbow arch, spanning the length of the coastal area of the Great Australian Bight from Point Culver in Western Australia to near Streaky Bay in South Australia (Burgoyne 2000). The Far West Coast Aboriginal Corporation (FWCAC) manages the Far West Coast Land, which belongs to the Far West Coast Aboriginal Peoples. FWCAC represents six distinct cultural groups of Aboriginal people: Mirning Peoples, the descendants of Edward Roberts, Wirangu Peoples, Yalata Peoples, Kokatha Peoples and Maralinga Tjaratja (Oak Valley) Peoples.

In Victoria, Koontapool (southern right whales) occur along the coastlines of south-west Victoria in Gunditjmara Sea Country to feed and birth. These Koontapool Woorrkngan Yakeen (Whale Birthing Dreaming Sites), are in coastal bay areas from Port Campbell to Portland, including Warrnambool. These places on Gunditjmara Country are known resting and feeding sites for mothers and calves and are directly related to Gunditjmara Neeyn (midwives), explaining why Gunditjmara is a Matrilineal Nation.

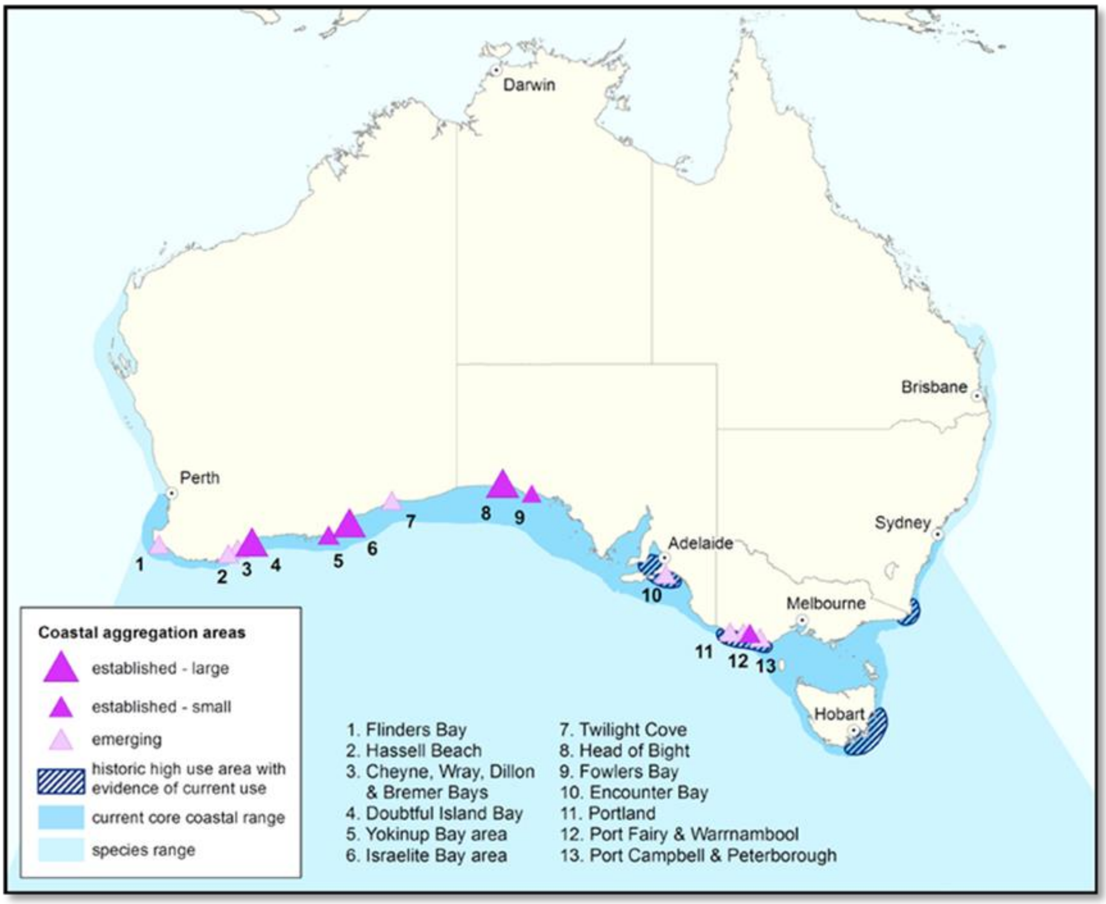


Figure 6-61: Aggregation areas for southern right whales (DSEWPaC 2012)

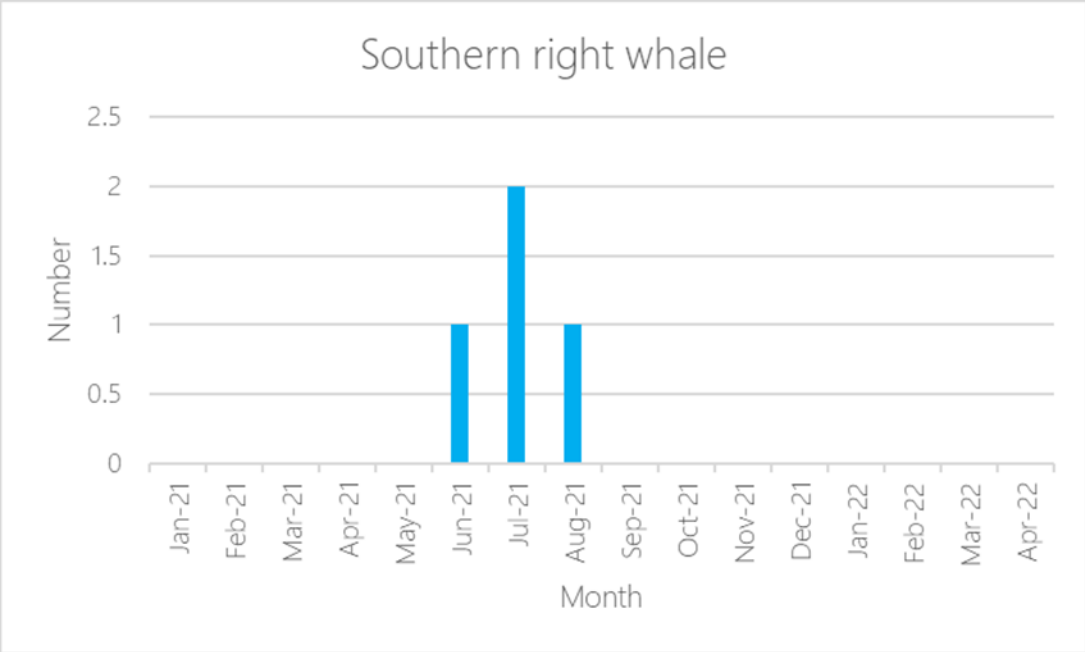


Figure 6-62: Southern right whale sightings for the Otway Drilling Campaign

6.4.9.7.11 Sperm Whale

The sperm whale (*Physeter macrocephalus*) is listed as migratory under the EPBC Act and has a worldwide distribution, having been recorded in all Australian states. Sperm whales tend to inhabit offshore areas with a water depth of 600 m or greater and are uncommon in waters less than 300 m deep (DoE 2025). Key locations for the species include the area between Cape Leeuwin to Esperance (WA); southwest of Kangaroo Island (SA), deep waters of the Tasmanian west and south coasts, areas off southern NSW (e.g., Wollongong) and Stradbroke Island (Qld) (DoE 2025). Concentrations of sperm whales are generally found where seabed rise steeply from a great depth (i.e., submarine canyons at the edge of the continental shelf) associated with concentrations of food such as cephalopods (DoE 2025).

Females and young males are restricted to warmer waters (i.e., north of 45°S) and are likely to be resident in tropical and sub-tropical waters year-round (DoE 2025). Adult males are found in colder waters and to the edge of the Antarctic pack ice. In southern Western Australian waters sperm whales move westward during the year. In oceanic waters, there is a more generalised movement of sperm whales' southwards in summer and northwards in winter (DoE 2025).

Sperm whales are prolonged and deep divers often diving for over 60 minutes (Bannister et al. 1996) however studies have observed sperm whales do rest at, or just below, surface for extended periods (>1 hr) (Gannier et al. 2002). In addition, female and juvenile sperm whales in temperate waters have been observed to spend several hours a day at surface resting or socialising (Hastie et al. 2003).

The sperm whale has been observed in the region, however the closest recognised BIA for foraging is further west near Kangaroo Island in South Australia (DCCEEW 2024). Therefore, it is likely they would be uncommon visitors in the Operational Area and Planning Area.

6.4.9.7.12 Dusky Dolphin

The dusky dolphin (*Lagenorhynchus obscurus*) is listed as migratory under the EPBC Act and is rarely sighted in Australian waters, with most records across southern Australia from Western Australia to Tasmania with a handful of confirmed sightings near Kangaroo Island and off Tasmania (DoE 2025). Only 13 reports of the dusky dolphin have been made in Australia since 1828, and key locations are yet to be identified (Bannister et al. 1996). Therefore, it is likely that they would be uncommon visitors in the Operational Area and Planning Area. The species is primarily found from approximately 55°S to 26°S, though sometimes further north associated with cold currents. They are considered to be primarily an inshore species but can also be oceanic when cold currents are present (DoE 2025). No dusky dolphins were detected during Beach's Otway drilling campaign.

6.5 Socio-economic Values

6.5.1 Coastal Settlements

There are no coastal settlements or Local Government Areas (LGAs) within the Operational Area. The nearest settlement to the Operational Area is Port Campbell. The Planning Area and potential shoreline contact are within the following LGAs (Figure 6-):

- Bass Coast Shire
- Colac Otway Shire
- Corangamite Shire
- Flinders Council
- Glenelg Shire
- Greater Geelong City
- King Island Council
- Mornington Peninsula Shire
- Moyne Shire
- Queenscliffe Borough
- South Gippsland Shire
- Surf Coast Shire

The larger Victorian coastal settlements within the Planning Area are described below based on ABS (2021) census data:

- Anglesea has a population of 3,208 people and a median age of 54. Of those in the labour force, 54.9% work full-time and 39.9% work part-time. Professionals and managers are the most popular occupations, comprising 48.5% of the workforce.
- Apollo Bay has a population of 1,790 people and a median age of 52. Of those in the labour force, 40.05% work full-time and 44.2% work part-time. Labourers and managers are the highest occupation making up 33.9% of the workforce. Accommodation and supermarket and grocery stores are the biggest industries, making up 21.1% of employment.
- Portland has a population of 9,712 people and a median age of 45. Of those in the labour force, 50.3% work full-time and 35% work part-time. Professionals, managers and clerical workers are the most popular occupations, comprising 50.1% of the workforce. Aluminium smelting is the biggest industry, making up 8.1% of employment.
- Warrnambool, which is adjacent to the Planning Area,has a population of 35,406 and a median age of 42. Of those in the labour force, 53.3% work full-time and 36.6% work part-time. Hospitals

employ 6.6% of the workforce followed by cheese and other dairy product manufacturing, aged care residential services, other social assistance services and supermarket and grocery stores. Professionals, technicians and trade workers and labourers comprise 47.7% of occupations.

The largest Tasmanian coastal settlement within the Planning Area is described below based on ABS (2021) census data:

- Currie (King Island) has a population of 659 and a median age of 49. Of those in the labour force, 63.0% work fulltime and 33.3% work part-time. Dairy and beef cattle farming comprise 34.6% of occupations.

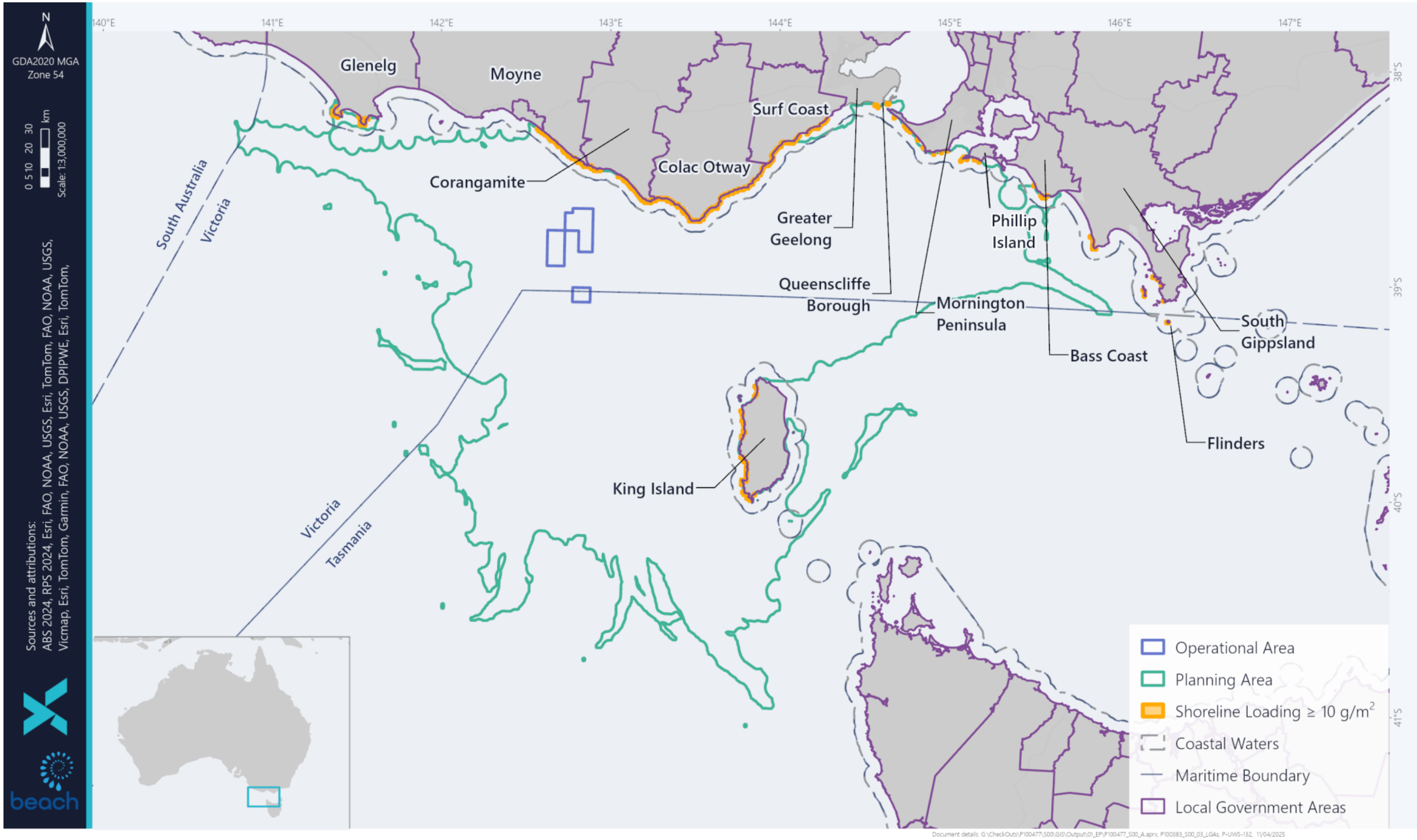


Figure 6-63: Local Government Areas within the Planning Area.

6.5.2 Offshore Petroleum Industry

Petroleum exploration has been undertaken within the Otway Basin since the early 1960s. Gas reserves of approximately 2 trillion cubic feet (tcf) have been discovered in the offshore Otway Basin since 1995, with production from five gas fields using 700 km of offshore and onshore pipeline. Up to 2015, the DEDJTR reports that 23 PJ of liquid hydrocarbons (primarily condensate) has been produced from its onshore and offshore basins, with 65 PJ remaining, while 85 PJ of gas has been produced (Victoria and South Australia), with 1,292 PJ remaining.

There is no non-Beach oil and gas infrastructure within the Operational Area. The Cooper Energy Casino gas field and Casino-Henry pipeline and the Minerva gas field and pipeline are within the Planning Area to the north of the Operational Area.

6.5.3 Offshore Renewable Energy Industry

In 2021 Australia introduced the Offshore Electricity Infrastructure Bill 2021 (Cth) (OEI Act) and in August 2022 the Federal Government announced 6 proposed areas in Australian Commonwealth waters for offshore renewable energy Projects. The Southern Ocean Region declared offshore wind area is situated off Warrnambool and Port Fairy in western Victoria and was declared by the Australian Government on 6 March 2024, which overlaps the Planning Area (Figure 6-64). The Operational Area does not overlap any declared or proposed offshore wind areas. The Southern Ocean declared area is 24.6 km north-west of the Operational Area.

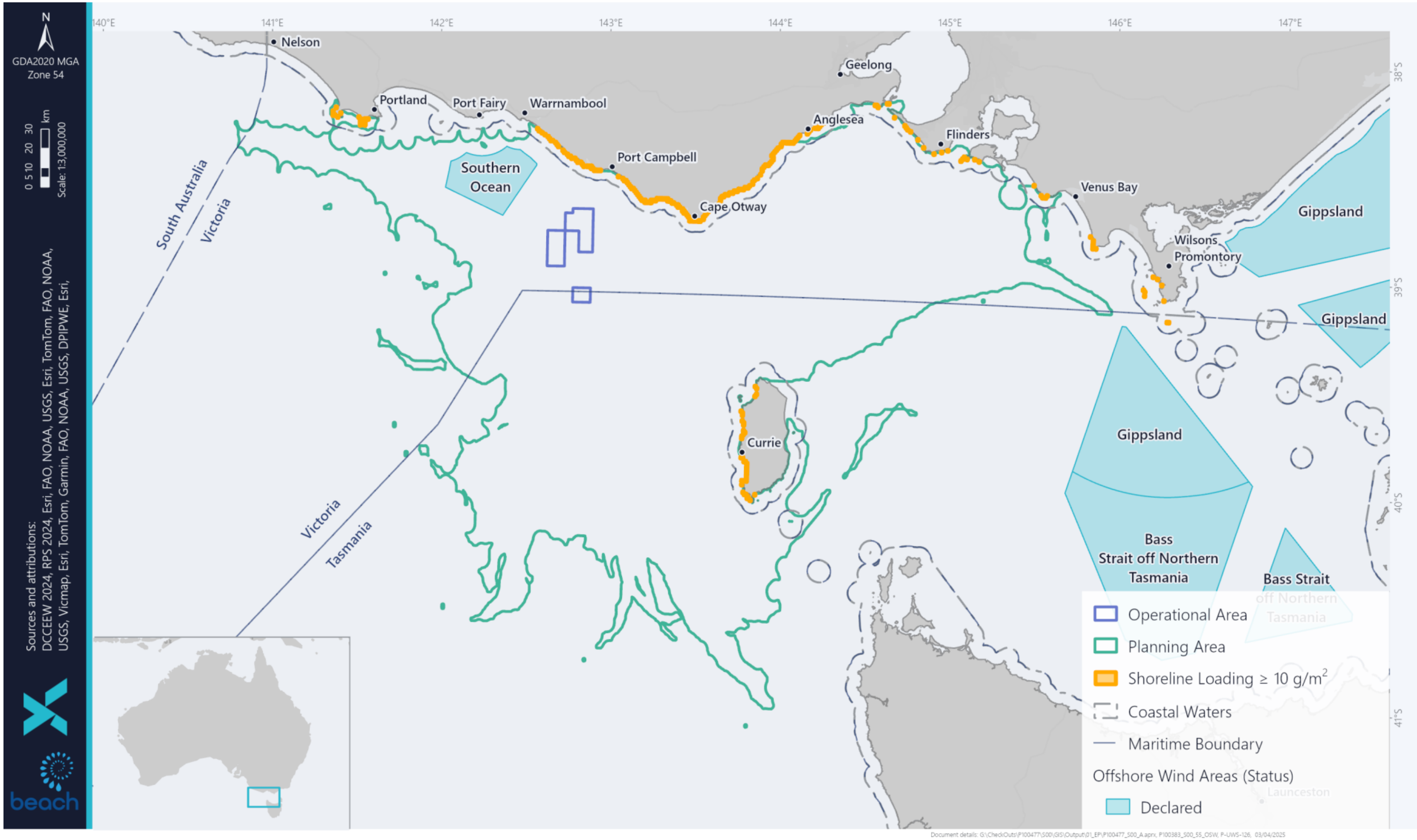


Figure 6-64: Offshore wind proposed and declared areas within the Planning Area.

6.5.4 Other Infrastructure

The Victorian Desalination Plant is located at Wonthaggi, 5 km north of the Planning Area. Operation of the plant commenced in December 2012. The seawater intake and outlet structures are connected to the onshore plant via a 1.2 km and 1.5 km underground tunnel, respectively. The two intake structures are 8 m high, 13 m in diameter, situated 50 m apart and located in a water depth of 20 m. They draw in water at very low speeds (the suction effect is not strong enough to draw fish in).

The Indigo Central telecommunications cable, which connects Perth and Sydney through southern Australia, intersects the Planning Area north of King Island. There are two Telstra telecommunications cables located in central Bass Strait; Bass Strait-1, and Bass Strait-2, which intersect the east of the Planning Area (Figure 6-).

Three new cables are planned to be installed in the next 5 years that may be within the Planning Area:

- East Coast Cable System between Melbourne, Sydney and Brisbane is being developed by Vocus.
- Hawaiki Nui – Hawaiki Submarine Cable between Melbourne and Sydney.
- Marinus Link undersea electricity and data cable that will connect Tasmania and Victoria. Construction is likely to commence in early 2025. Based on current spatial data, the cable will be 3.5 km east of the Planning Area (Figure 6-)

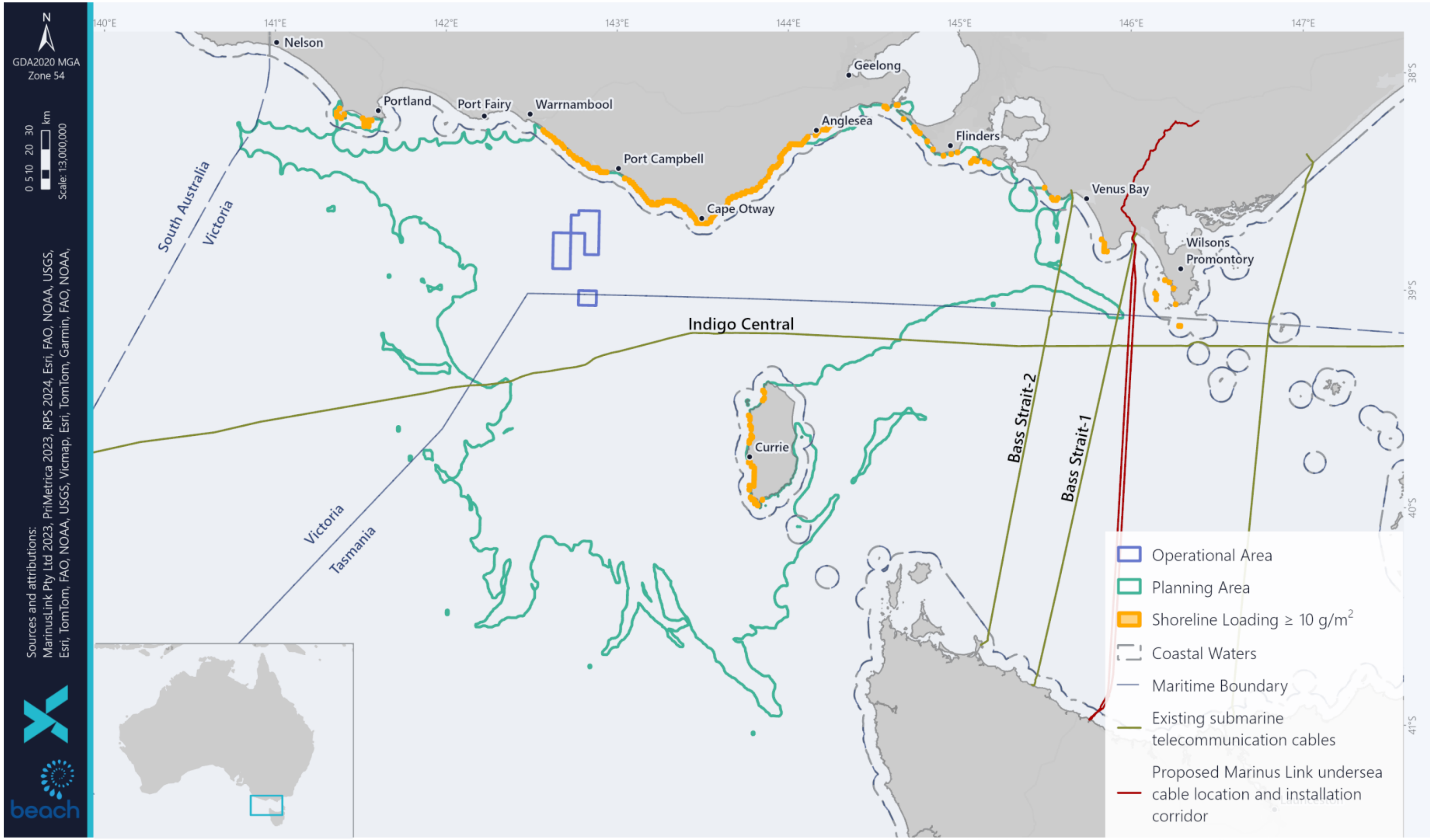


Figure 6-65: Submarine cables within the Planning Area.

6.5.5 Defence Activities

Ongoing consultation with Department of Defence has identified that the Operational Area is located within restricted airspace, but no other defence areas were identified. The Department of Defence also advised that unexploded ordnance (UXO) may be present on and in the sea floor.

UXO is a by-product of past training activities undertaken by the Australian Defence Force or foreign defence forces.

The interactive Department of Defence database (DoD 2025a) indicates that a portion of the Operational Area is located within a UXO Zone 1052 King Island (Figure 6-), which is within the 'slight potential' category', meaning there is confirmed history of military activities that may have resulted in numerous residual hazardous munitions, components, or constituents, but where confirmed UXO affected areas cannot be defined (DoD 2025b). The site was used during 1954 as an Air-to-Air Firing Range (DoD 2025b).

Beach undertook site surveys ahead of the previous Otway Drilling Campaign in 2021 with no UXO identified. Beach will undertake site surveys ahead of any seabed disturbing activities to confirm the location of UXO within the Operational Area.

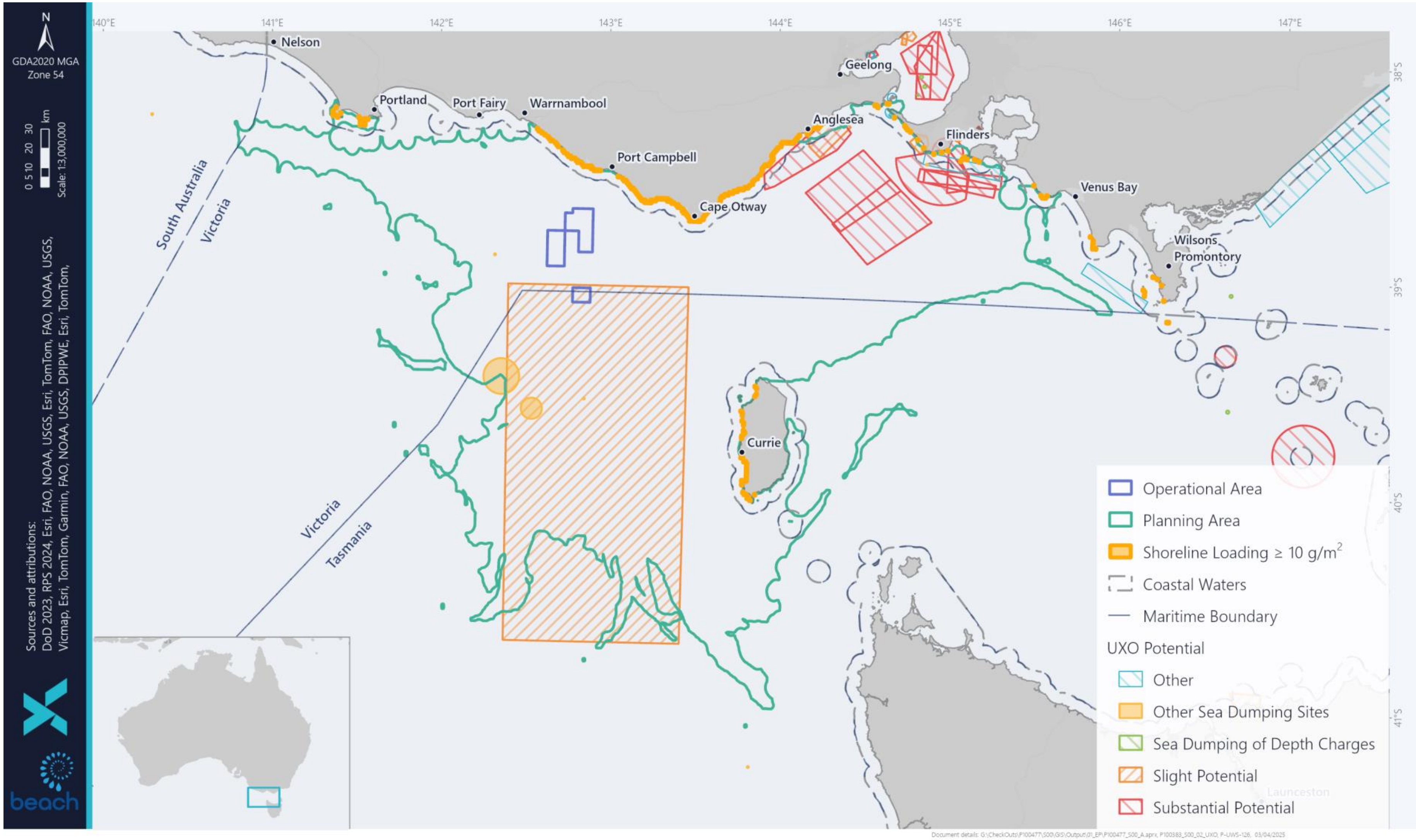


Figure 6-66: UXO within the Operational and Planning Areas.

6.5.6 Shipping

The south-east marine region is one of the busiest shipping regions in Australia and Bass Strait is one of Australia's busiest shipping routes (Figure 6-). Commercial vessels use the route when transiting between ports on the east, south and west coasts of Australia, and there are regular passenger and cargo services between mainland Australia and Tasmania. Automated Identification System (AIS) data from the Australian Maritime Safety Authority (AMSA 2024) provides a summary of vessels overlapping the Operational Area for the period January to December 2022 (Table 6-33).

Ports Australia (2022) provide statistics for port operations throughout Australia's main commercial ports. Based on the latest information (2021) the majority of commercial shipping traffic transiting to and from Victorian ports were container (3,682), general cargo (2,663), bulk liquid carriers (2,019), dry bulk (1,715), car carrier (1,342), bulk gas (220), other cargo (47) and livestock (9).

Table 6-33: Summary of shipping traffic within the Operational Area (AMSA 2022)

Vessel Type	**Shipping Activity within the Operational Area**	
	Number of Vessels[1]	**Average Speed (kts)**
Cargo Ship	1,112	10.3
Tanker	246	10.6
Passenger	18	7.2
Other	359	2.5
Tug	186	1.4
Fishing	15	6.2
Sailing	22	3.5
Total	1,958	7.9
Average per day	5.4	6.2

1. Calculated as individual vessels within the Operational Area each day

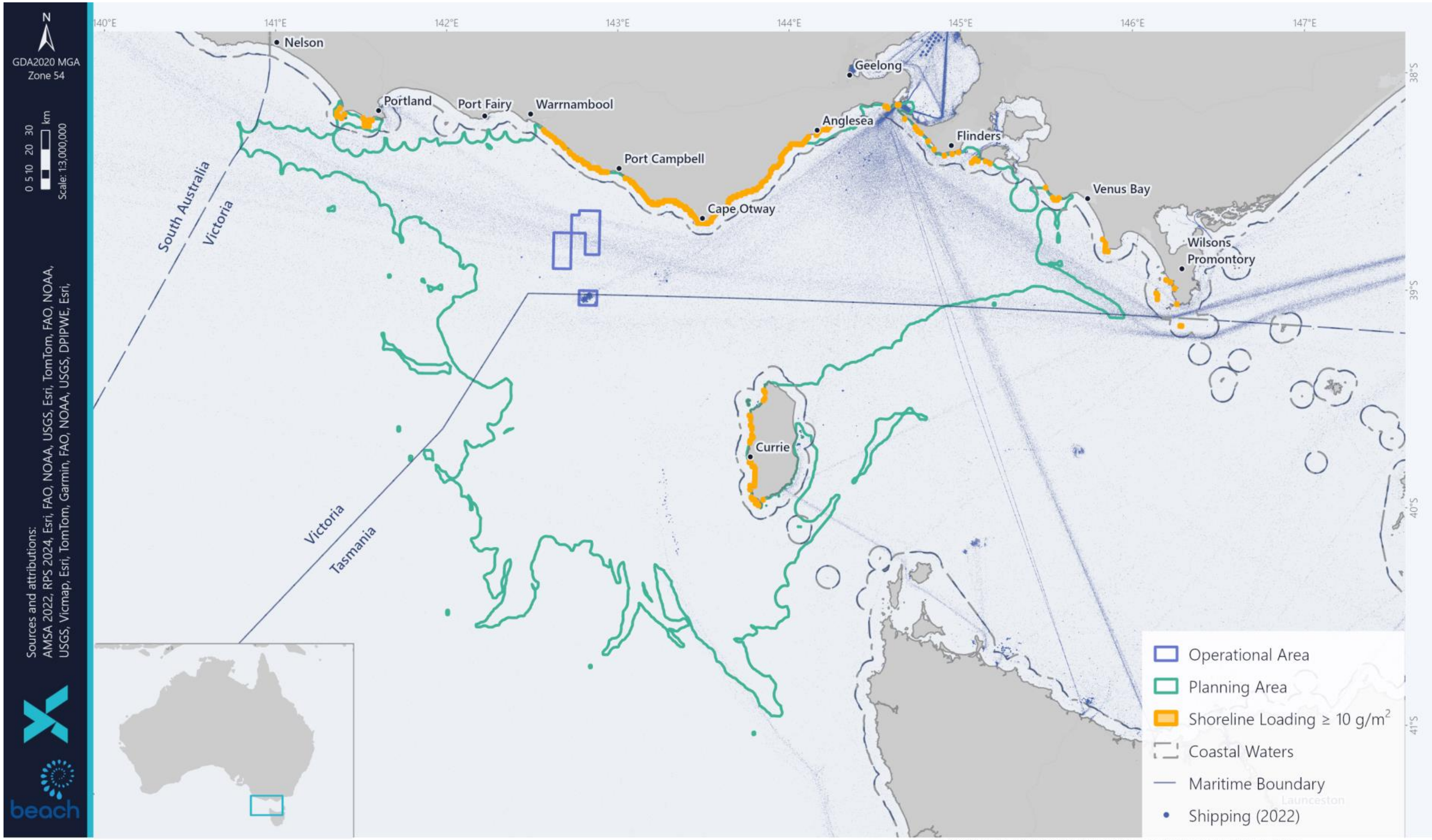


Figure 6-67: Vessel traffic within the Operational and Planning Areas

6.5.7 Tourism

Consultation has identified that the key areas of tourism in the region include land-based sightseeing from the Great Ocean Road and lookouts along that road, helicopter sightseeing, private and chartered vessels touring into the Twelve Apostles Marine Park, diving and fishing. Land-based tourism in the region peaks over holiday periods and in 2011, Tourism Victoria reported a total of approximately 8 million visitors to the Great Ocean Road region.

Local vessels accessing the area generally launch from Boat Bay in the Bay of Islands or from Port Campbell. Given the available boat launching facilities in the area (Peterborough and Port Campbell), and the prevailing sea-state of the area, vessel-based tourism is limited.

6.5.8 Recreational Diving

Recreational diving occurs along the Victorian coastline. Popular diving sites near Peterborough include a number of shipwrecks such as the Newfield, which lies in 6 m of water and the Schomberg in 8 m of water. Peterborough provides a number of good shore dives at Wild Dog Cove, Massacre Bay, Crofts Bay and the Bay of Islands. In addition, there is the wreck of the Falls of Halladale (4 to 11 m of water) which can be accessed from shore or via boat. King Island is also known for several wreck sites and the Waterwitch Reef. A number of operators in the region offer dive charters in the waters of King Island.

Consultation with local vessel charterers and providers of SCUBA tank fills has confirmed that diving activity is generally concentrated around The Arches Marine Sanctuary and the wreck sites of the Loch Ard and sometimes at the Newfield and Schomberg shipwrecks. Diving activity peaks during the Rock Lobster season with the bulk of recreational boats accessing the area launching from Boat Bay at the Bay of Islands or Port Campbell.

6.5.9 Recreational Fishing

Recreational fishing is popular in Victoria and is largely centred within Port Phillip Bay and Western Port, although beach and boat-based fishing occurs along much of the Victorian coastline.

Recreational fishing also occurs in Tasmania in coastal and offshore waters, primarily within 3 nm of the shore.

Recreational fisheries that may occur within the Planning Area are:

- Rock lobster
- Finfish (multiple species are targeted, including sharks)
- Abalone
- Scallops
- Squid
- Pipi

Of these, active recreational fishing for rock lobster, abalone, finfish, and sharks is likely to occur within the Planning Area. Recreational scallop and squid fishing primarily occurs within Port Phillip Bay and Western Port and as such fishing for these species is possible within the Planning Area. Pipi harvesting occurs in Venus Bay, adjacent to the Planning Area, but due to high levels of toxins in pipis at that location the public is currently advised that they are unsafe for human consumption.

There is the potential for low levels of recreational fishing to occur within the areas of the Operational Area which are nearest to shore.

Due to the distance offshore (approximately 20 km) and the lack of emergent features, recreational fishing and tourism in the Operational Area is unlikely.

6.5.10 Commonwealth Managed Fisheries

Commonwealth fisheries are managed by the Australian Fisheries Management Authority (AFMA) under the *Fisheries Management Act 1991* (Cth). AFMA jurisdiction covers the area of ocean from 3 nm from the coast out to the 200 nm limit (the Australian Fishing Zone (AFZ)). Commonwealth commercial fisheries with jurisdictions to fish within the Planning Area are:

- Bass Strait Central Zone Scallop Fishery (BSCZSF)
- Eastern Tuna and Billfish Fishery (ETBF)
- Skipjack Tuna Fishery
- Small Pelagic Fishery (SPF)
- Southern Bluefin Tuna Fishery (SBTF)
- Southern and Eastern Scalefish and Shark Fishery (SESSF)
- Southern Squid Jig Fishery (SSJF)
- Western Tuna and Billfish Fishery (WBTF).

Table 6-34 details fisheries with catch and effort occurring within the Operational Area and Planning Area using data obtained from Fisheries Status Reports published by the Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES) (Butler et al. 2024; ABARES 2024). The Skipjack Fishery is not currently active and management arrangements for the fishery are under review.

Information relating to the target species, fishing locations, landed catch, value and other relevant aspects of each fishery are taken from current and previous Commonwealth Fishery Status Reports (Butler et al. 2024; Butler et al. 2023; Patterson et al. 2022), unless indicated, is summarised in Table 6-34.

Figures of fishing intensity for 2016 – 2023 are provided where there is an overlap with fishing intensity and the Operational Area and/or Planning Area. Relative fishing intensity shows areas where 5 or more fishing vessels operated with the relative effort expended or the catch displayed. Reporting grids show the total area where fishing occurred at a resolution of one degree (approximately 111 x 111 km). Intensity data may not be displayed where less than or equal to 5 vessels operated (policy requirement to protect commercial confidentiality of data). As this data is confidential, due to the limited number of vessels, fishing activity may have occurred anywhere within the reporting grid and not intersect with the Operational Area.

Beach also commissioned the South East Trawl Fishing Industry Association (SETFIA) to provide a report on trawl and gillnet fishing activity in Otway Gas Development Phase 4 Project Area (October 2019). The report concluded the following:

- Trawl fishing in the SESSF CTS board trawl sub-sector does not occur in the Otway Gas Development Phase 4 Project Area proposed footprint. It does occur to the south-east of the Project Area. The grounds around the Otway Gas Development Phase 4 Project Area appear too rough for trawl fishing in its current form. For unknown reasons gillnet fishing in the SESSF GHaT gillnet sub-sector does not seem to occur within the Otway Gas Development Phase 4 Project Area. However, there is some activity from this sub-sector nearby to the east. Gillnet fishing cannot occur deeper than 183 m (100 fathoms).

There is no SESSF CTS Danish seine sub-sector fishing in the Otway Gas Development Phase 4 Project Area.

Table 6-34: Commonwealth-managed fisheries within the Operational Area and Planning Area

Fishery	Target species	Description	Fishing Effort in Operational Area	Fishing Effort in Planning Area
Bass Strait Central Zone Scallop Fishery (BSCZSF)	Scallop (*Pecten fumatus*)	The Bass Strait Central Zone Scallop Fishery operates in the Bass Strait between Victorian and Tasmanian and starts at 20 nm from their respective coastlines. In 2023, fishing was permitted throughout the management area, except in 4 scallop beds that were closed to fishing under the harvest strategy. Fishing in 2023 was primarily concentrated in the western Bass Strait. Additional information for the 2023 season includes: Active boats – 9 (using towed dredges) (2022 season – 10) Fishing season – 8 July to 31 December. Major landing ports – Apollo Bay and Queenscliff. Actual catch – 2,063 tonnes (2022 season – 495 tonnes; 2021 season – 2,344 tonnes). Total fishery value – A$1.4 million (2022 season – A$1.3 million; 2021 season – A$4.4 million). Sensitivities – Target species can be prone to die-off events (e.g. in 2010 and 2011) and disease (paralytic shellfish toxin in 2014). Target species is not listed under the EPBC Act. Existing pressures – Target species within the Bass Strait (between Victoria and Tasmania) are classified as not overfished and not subject to overfishing. Activity trends – Fishing intensity data between 2016 and 2023 (ABARES 2024) shows no significant shift in the location of either low, medium or high intensity fishing activity within the Bass Strait Central Zone Scallop Fishery. No fishing intensity data or reporting grids between 2016 and 2023 overlaps the Operational Area (Figure 6-). The Planning Area overlaps areas of low to high relative fishing intensity which is concentrated to the east of King Island (Figure 6-).	No	Yes
Eastern Tuna Billfish Fishery	Albacore Tuna (*Thunnus alulunga*) Bigeye Tuna (*T. obesus*)	The Eastern Tuna Billfish Fishery is a longline and minor-line fishery that operates in water depths >200 m from Cape York to Victoria. Fishing effort is typically concentrated along the NSW coast and southern Queensland coast. No Victorian ports are used. Fishing in 2023 was primarily concentrated off the east coast of	Yes	Yes

	Yellowfin Tuna (*T. albacares*) Broadbill Swordfish (*Xiphias gladius*) Striped Marlin (*Tetrapturus audux*)	Australia from Queensland to New South Wales. Additional information for the 2023 season includes: Active boats – 34 longline, 12 minor line (2022 season – 36 longline, 6 minor line) Fishing season – 1 January – 31 December Major landing ports – Bermagui, Cairns, Coffs Harbour, Mooloolaba, Southport, Ulladulla Actual catch — 4,040 tonnes (2022 season – 4,032 tonnes) Total fishery value — A$40.1 million (2022 season – A$34.7 million). Existing pressures – Striped Marlin overfished. Activity trends – Fishing intensity data between 2016 and 2023 (ABARES 2024) shows no significant shift in the location of either medium or high intensity fishing within the Eastern Tuna and Billfish Fishery. A small increase in low intensity fishing was noted near Flinders outside of the Operational Area. No fishing intensity data between 2016 and 2023 overlaps the Operational Area. The Planning Area overlaps an area of low relative intensity near Flinders (Figure 6-). The Operational Area and Planning Area overlap reporting grids which contain confidential data due to less than 5 vessels operating (Figure 6-).		
Skipjack Tuna Fishery	Skipjack Tuna (*Katsuwonus pelamis*)	The Skipjack Tuna Fishery is not currently active and the management arrangements for this fishery are under review. There has been no catch effort in this fishery since the 2008 -2009 season.	No	No
Small Pelagic Fishery	Australian Sardine (*Sardinops sagax*) Blue Mackerel (*Scomber australasicus*) Jack Mackerel (*Trachurus declivis*) Redbait (*Emmelichthys nitidus*)	The Small Pelagic Fishery extends from the southern Queensland to southern Western Australia. Fishers use midwater trawls and purse seine nets. Fishing in 2023 was primarily concentrated along the southern coast of New South Wales into Gippsland and the eastern coast of South Australia. Activity trends – Fishing intensity data between 2016 and 2023 is not available. However there is no significant shift in the location of reporting grids showing fishing activity (containing confidential data due to less than 5 vessels operating) within the Small Pelagic Fishery (Western sub-area). There has been no fishing effort reported in the Operational Area or Planning Area between 2016 and 2023.	No	No

Southern and Eastern Scalefish and Shark Fishery (SESSF): Commonwealth Trawl Sector (CTS) Danish-seine	Blue-eye trevalla (*Hyperoglyphe antarctica*) Blue grenadier (*Macruronus novaezelandiae*) Blue warehou (*Seriolella brama*) Deepwater sharks (up to 18 spp.) Eastern school whiting (*Sillago flindersi*) Flathead (*Neoplatycephalus richardsoni*) Orange roughy (*Hoplostethus atlanticus)* Pink ling (*Genypterus blacodes*)	The Commonwealth Trawl Sector (CTS) is part of the SESSF and extends from Barrenjoey Point in northern New South Wales to Kangaroo Island in South Australia. Management of the CTS is separated into demersal otter-board trawl and Danish-seine fishing methods. Danish-seine fishing in 2023 was generally concentrated along the 200 m bathymetric contour from the east coast of Tasmania to the Gippsland coast. Additional information for the 2023 season includes: Active boats – 18 (2022 season – 18) Fishing season – 1 May – 30 April Major landing ports – Eden, Hobart, Lakes Entrance, Portland, Sydney, Ulladulla Actual catch — 10,854 tonnes (combined with otter-board trawl) (2022 season – 11,257 tonnes) Total fishery value — A$65.9 million (2022 - entire CTS including otter-board trawl and scalefish hook). 2023 financials not published. Existing pressures – Some species overfished or subject to overfishing. Activity trends – Fishing intensity data between 2016 and 2023 (ABARES 2024) shows no significant shift in the location of fishing intensity within the Danish-seine sector of the Commonwealth Trawl Sector (CTS) Fishery. No fishing intensity has been identified within the Operational Area during 2016-2023. The Operational Area overlaps reporting grids which contain confidential data due to less than 5 vessels operating. The Planning Area overlaps low to medium fishing intensity near Phillip Island (Figure 6-).	Yes	Yes
Southern and Eastern Scalefish and Shark Fishery (SESSF): Commonwealth Trawl Sector (CTS) Otter-board trawl	Blue-eye trevalla (*Hyperoglyphe antarctica*) Blue grenadier (*Macruronus novaezelandiae*) Blue warehou (*Seriolella brama*) Deepwater sharks (up to 18 spp.)	The Commonwealth Trawl Sector (CTS) is part of the SESSF and extends from Barrenjoey Point in northern New South Wales to Kangaroo Island in South Australia. Management of the CTS is separated into demersal otter-board trawl and Danish-seine fishing methods. Otter-board trawl fishing in 2023 was generally concentrated along the 200 m bathymetric contour from Adelaide to Ulladulla. Additional information for the 2023 season includes: Active boats – 24 (2022 season – 31) Fishing season – 1 May – 30 April Major landing ports – Eden, Hobart, Lakes Entrance, Portland, Sydney, Ulladulla	Yes	Yes

	Eastern school whiting (*Sillago flindersi*) Flathead (*Neoplatycephalus richardsoni*) Orange roughy (*Hoplostethus atlanticus)* Pink ling (*Genypterus blacodes*)	Actual catch — 10,854 tonnes (combined with Danish-seine) (2022 season – 11,257 tonnes) Total fishery value — A$65.9 million (2022 - entire CTS including Danish-seine and scalefish hook). 2023 financials not published. Existing pressures – Some species overfished or subject to overfishing. Activity trends – Fishing intensity data between 2016 and 2023 (ABARES 2024) shows no significant shift in the location of fishing intensity within the otter-board trawl sector of the Commonwealth Trawl Sector (CTS) Fishery. The Operational Area and Planning Area overlap a band of relative fishing intensity from 2016-2023 which follows the 200 m bathymetry contour (Figure 6-). Only low relative intensity overlaps the Operational Area.		
Southern and Eastern Scalefish and Shark Fishery (SESSF): Gillnet, Hook and Trap Sector (GHTS) Scalefish Hook Sector (SHS)	Blue-eye trevalla (*Hyperoglyphe antarctica*) Blue grenadier (*Macruronus novaezelandiae*) Blue warehou (*Seriolella brama*) Deepwater sharks (up to 18 spp.) Eastern school whiting (*Sillago flindersi*) Flathead (*Neoplatycephalus richardsoni*) Orange roughy (*Hoplostethus atlanticus)* Pink ling (*Genypterus blacodes*)	The Scalefish Hook Sector (SHS) is primarily in the southeast of Australia with most fishing intensity occurring off the coast of Tasmania. The SHS is managed under the Gillnet, Hook and Trap Sector (GHTS) of the SESSF. The broader SESSF stretches south from Fraser Island in southern Queensland, around Tasmania, to Cape Leeuwin in southern Western Australia. The SHS shares target species with the CTS. Scalefish hook fishing in 2023 was generally concentrated along the 200 m bathymetric contour. Additional information for the 2023 season includes: Active boats – 13 (2022 season – 12) Fishing season – 1 May – 30 April Major landing ports – Eden, Hobart, Lakes Entrance, Portland, Sydney, Ulladulla Actual catch — 719 tonnes (2022 season – 715 tonnes) Total fishery value — A$65.9 million (2022 - entire CTS including otter-board trawl and Danish-seine). 2023 financials not published. Existing pressures – Some species overfished or subject to overfishing. Activity trends – Fishing intensity data between 2016 and 2023 shows no significant shift in the location of reporting grids within the SHS Fishery. Relative fishing intensity data is not published for the SHS fishery and spatial data for the 2023 fishing season is not yet available but is mapped in the fishery status report (ABARES 2024).	Yes	Yes

		The Operational Area and Planning Area overlap reporting grids for the SHS which contain confidential data due to less than 5 vessels operating (Figure 6-).		
Southern and Eastern Scalefish and Shark Fishery (SESSF): Gillnet, Hook and Trap Sector (GHTS) Shark Gillnet and Shark Hook Sectors (SGSHS) Shark Gillnet subsector	Elephantfish (*Callorhinchus milii*) Gummy Shark (*Mustelus antarcticus*) Sawsharks (*Pristiophorus cirratus, P. nudipinnis*) School Shark (*Galeaorhinus galeus*)	The Shark Gillnet and Shark Hook Sectors (SGSHS) are part of the Gillnet, Hook and Trap Sector (GHTS) of the Southern and Eastern Scalefish and Shark Fishery (SESSF). Most fishing in the SGSHS using nets occurs in the Bass Strait while most fishing using hooks occurs off South Australia. Shark gillnet fishing in 2023 was concentrated in the waters between Victoria and Tasmania, with the highest intensity occurring off the Gippsland coast and Flinders Island. Additional information for the 2023 season includes: Active boats – 31 (2022 season – 30) Fishing season – 1 May – 30 April Major landing ports – Adelaide, Devonport, Hobart, Lakes Entrance, Port Lincoln, Port Welshpool, Robe, San Remo Actual catch – 1,700 tonnes (combined with Shark Hook sector) (2022 season – 1,661 tonnes) Total fishery value – A$21.6 million (2022 – including Shark Hook sector). 2023 financials not published. Existing pressures – Elephantfish has no reliable indicators of fishing mortality or biomass; Schoolshark overfished Activity trends – Fishing intensity data between 2016 and 2023 (ABARES 2024) shows a slight shift to the east of the Operational Area in the location of low, medium and high intensity fishing within the Shark Gillnet Fishery. There has been fishing intensity in the Operational Area and Planning Area from 2016-2023 (Figure 6-). The Operational Area overlaps an area of low to medium relative fishing intensity. Areas of low to high fishing intensity occur within the Planning Area throughout the Bass Strait and along the Victorian coast.	Yes	Yes
Southern and Eastern Scalefish and Shark Fishery (SESSF): Gillnet, Hook and Trap Sector (GHTS)	Elephantfish (*Callorhinchus milii*) Gummy Shark (*Mustelus antarcticus*)	The Shark Gillnet and Shark Hook Sectors (SGSHS) are part of the Gillnet, Hook and Trap Sector (GHTS) of the Southern and Eastern Scalefish and Shark Fishery (SESSF). Most fishing in the SGSHS using nets occurs in the Bass Strait while most fishing using hooks occurs off South Australia. Shark hook fishing in 2023 was concentrated along the coast of South Australia, Victoria and Tasmania, with the highest intensity occurring off Cape Jaffa in South Australia. Additional information for the 2023 season includes:	Yes	Yes

Shark Gillnet and Shark Hook Sectors (SGSHS) Shark Hook subsector	Sawsharks (*Pristiophorus cirratus, P. nudipinnis*) School Shark (*Galeaorhinus galeus*)	Active boats – 68 (2022 season – 57) Fishing season – 1 May – 30 April Major landing ports – Adelaide, Devonport, Hobart, Lakes Entrance, Port Lincoln, Port Welshpool, Robe, San Remo Actual catch – 1,700 tonnes (combined with Shark Gillnet sector) (2021 season – 1,661 tonnes) Total fishery value – A$21.6 million (2022 – including Shark Gillnet sector). 2023 financials not published. Existing pressures – Elephantfish has no reliable indicators of fishing mortality or biomass; School shark overfished Activity trends – Fishing intensity data between 2016 and 2023 (ABARES 2024) shows an increase in activity in South Australian water for 2019 and 2020, decreasing thereafter but with no significant shift in the location of the fishing intensity within the Shark Hook subsector. A small increase in relative intensity also occurred in 2023 near Hunter Island and Three Hummock Island in the north east of Tasmania outside of the Planning Area. The Operational Area and Planning Area overlap reporting grids which contain confidential data due to less than 5 vessels operating (Figure 6-). The Planning Area is adjacent to areas of low relative intensity near the South Australian maritime border and King Island.		
Southern Bluefin Tuna Fishery	Southern Bluefin Tuna (*Thunnus maccoyii*)	The Southern Bluefin Tuna Fishery covers the entire sea area around Australia, out to 200 nm from the coast. The majority of catch since 1992 has been taken in the Great Australian Bight via purse seine. Longline fishing effort is more common along the east coast. Fishing effort in 2022 was concentrated off the coasts of South Australia and southern New South Wales. Data is not yet published for the 2023 season. Additional information for the 2022 season includes: Active vessels – 24 longline, 6 purse seine (2021 – 22 longline, 8 purse seine) Fishing season – 1 December to 30 November Major landing ports – Port Lincoln Actual catch – 6,034 tonnes (2021 – 5,972 tonnes) Total fishery value – A$32.6 million (2021 – A$35.5 million) Existing pressures – Not overfished or subject to overfishing.	Yes	Yes

		Activity trends – Fishing intensity data between 2016 and 2023 (ABARES 2024) shows no significant shift in the location of either low, medium or high intensity fishing within the Southern Bluefin Tuna Fishery. The Operational Area and Planning Area overlap reporting grids which contain confidential data due to less than 5 vessels operating (Figure 6-).		
Southern Squid Jig Fishery	Gould's Squid (Arrow Squid) (*Nototodarus gouldi*)	The Southern Squid Jig Fishery is a single species fishery that operates year-round. Portland and Queenscliff are the major Victorian landing ports. Jigging typically occurs midwater at depths between 50 and 100 m at night using large lights that illuminate the waters around a boat. Fishing effort for the Southern Squid Jig Fishery in 2023 was concentrated off Victoria and north-eastern Tasmanian coasts, with the highest intensity occurring near Portland and off the east coast of Tasmania. Fishing effort for the CTS squid catch in 2023 followed the 200 m bathymetry contour from New South Wales to the east coast of Tasmania and between Cape Otway and Robe. Additional information for the 2023 season includes: Active vessels – 6 (2021 – 8) Fishing season – 1 January – 31 December Major landing ports – Apollo Bay, Lakes Entrance, Portland, Queenscliff, Triabunna Actual catch – 394 tonnes (2021 – 982 tonnes) Total fishery value – A$1.86 million (2021 – A$3.30 million) Existing pressures – Not overfished or subject to overfishing. Activity trends – Fishing effort in 2023 increased to 4,509 jig-hours from 8 vessels from 1,320 jig-hours from 6 vessels in 2022. Fishing mortality: Not subject to overfishing. Biomass: Not overfished. The Operational Area overlaps an area of low relative fishing intensity as well as reporting grids which contain confidential data due to less than 5 vessels operating. The Planning Area overlaps areas of low to high intensity north of King Island and off the coast of Warrnambool (Figure 6-).	Yes	Yes
Western Tuna and Billfish Fishery	Albacore (*Thunnus alalunga*) Bigeye Tuna (*T. obesus*)	The Western Tuna and Billfish Fishery primarily uses pelagic longline gear with low levels of minor-line fishing. The management area extends west from the eastern border of South Australia to Cape York, including Cocos Keeling Islands and Christmas Island.	No	Yes

	Striped Marlin (*Kajikia audax*) Swordfish (*Xiphias gladius*) Yellowfin Tuna (*Thunnus albacares*)	Fishing effort in 2023 was mostly concentrated in south-west Western Australia. Additional information for the 2023 season includes: Active vessels – 2 longline, 1 minor line (2022 – 2 longline, 3 minor line) Fishing season – 1 July – 30 June Major landing ports – Fremantle, Geraldton Actual catch – 208 tonnes (2022 – 146 tonnes) Total fishery value – confidential Existing pressures – Striped marlin overfished; Bigeye Tuna and Yellowfin Tuna subject to overfishing. Activity trends – Fishing intensity data between 2016 and 2023 is not available. However, there is no significant shift in the location of reporting grids showing fishing activity (containing confidential data due to <5 vessels operating) within the Western Tuna and Billfish Fishery. The Planning Area overlaps a reporting grid which contains confidential data due to less than 5 vessels operating (Figure 6-). There has been no fishing effort identified in the Operational Area.

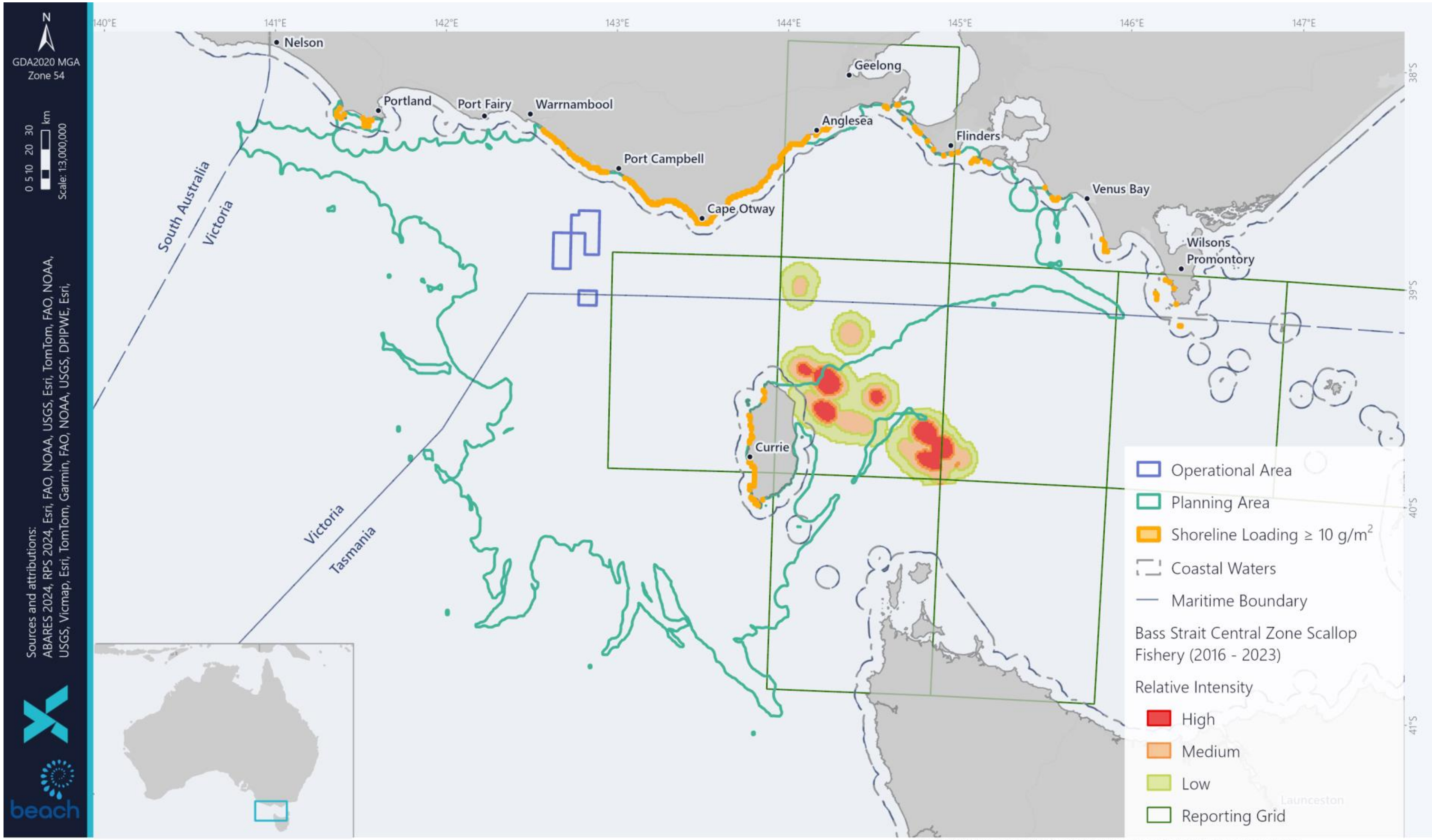


Figure 6-68: Commonwealth Bass Strait Central Zone Scallop Fishery relative fishing intensity (shell weight kg/km^2) and reporting grid

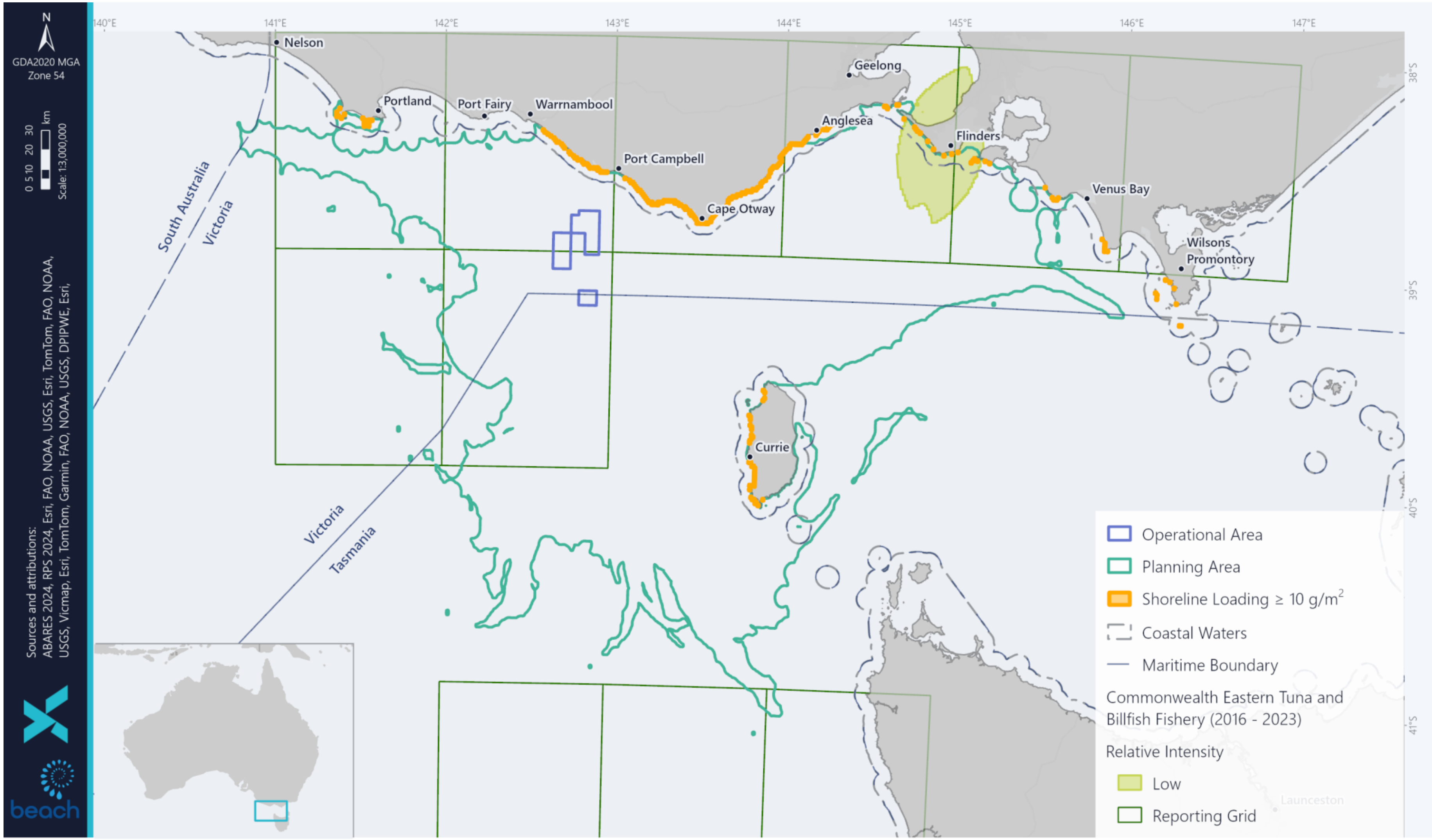


Figure 6-69: Commonwealth Eastern Tuna and Billfish Fishery relative fishing intensity (number of hooks/ km^2) and reporting grid

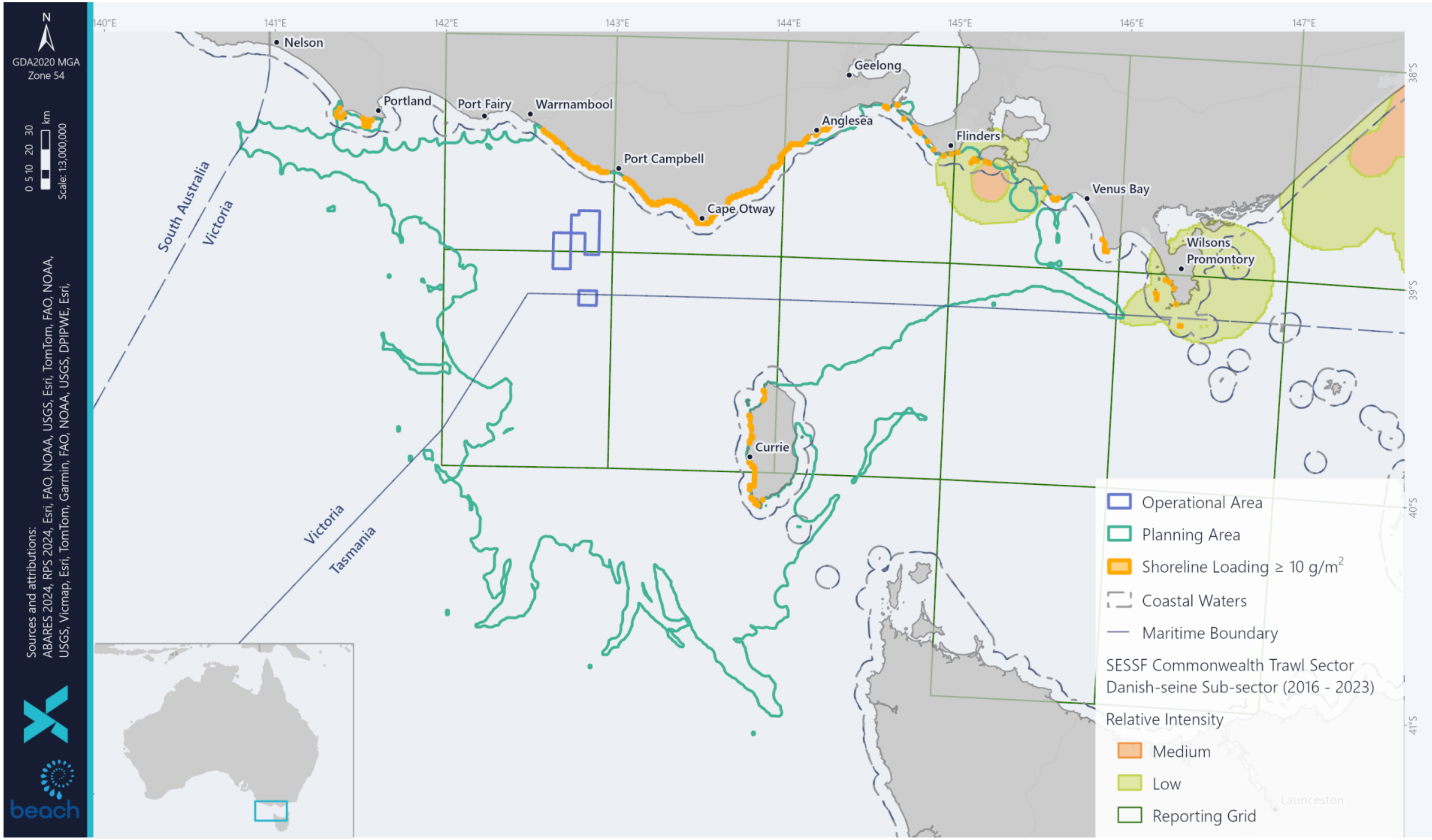


Figure 6-70: Southern and Eastern Scalefish and Shark Fishery (Commonwealth Trawl Sector) Danish-seine Fishery relative fishing intensity (shots/ km^2) and reporting grid

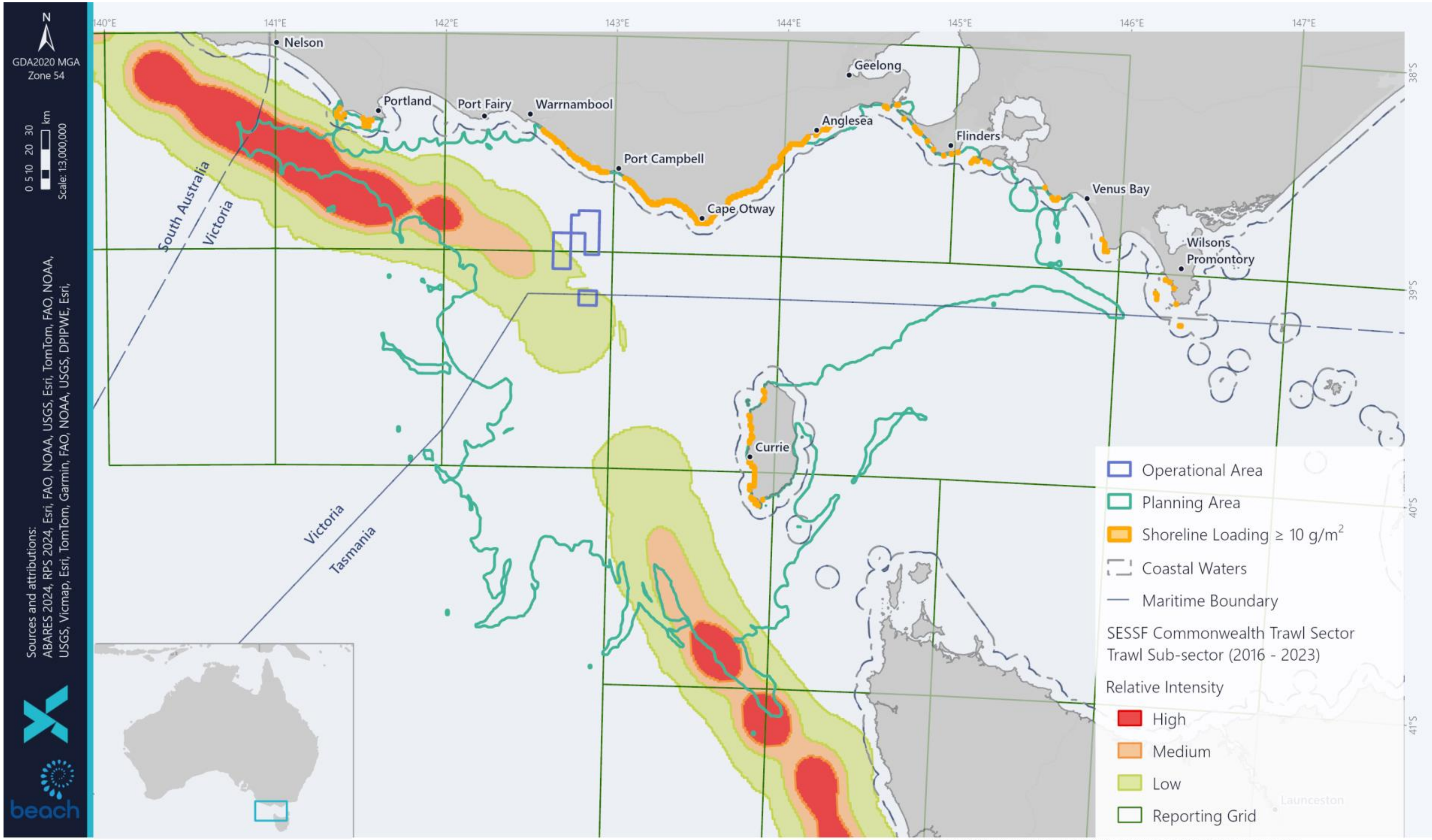


Figure 6-71: Southern and Eastern Scalefish and Shark Fishery (Commonwealth Trawl Sector) Otter Board Trawl Fishery relative fishing intensity (hours fished/ km²) and reporting grid

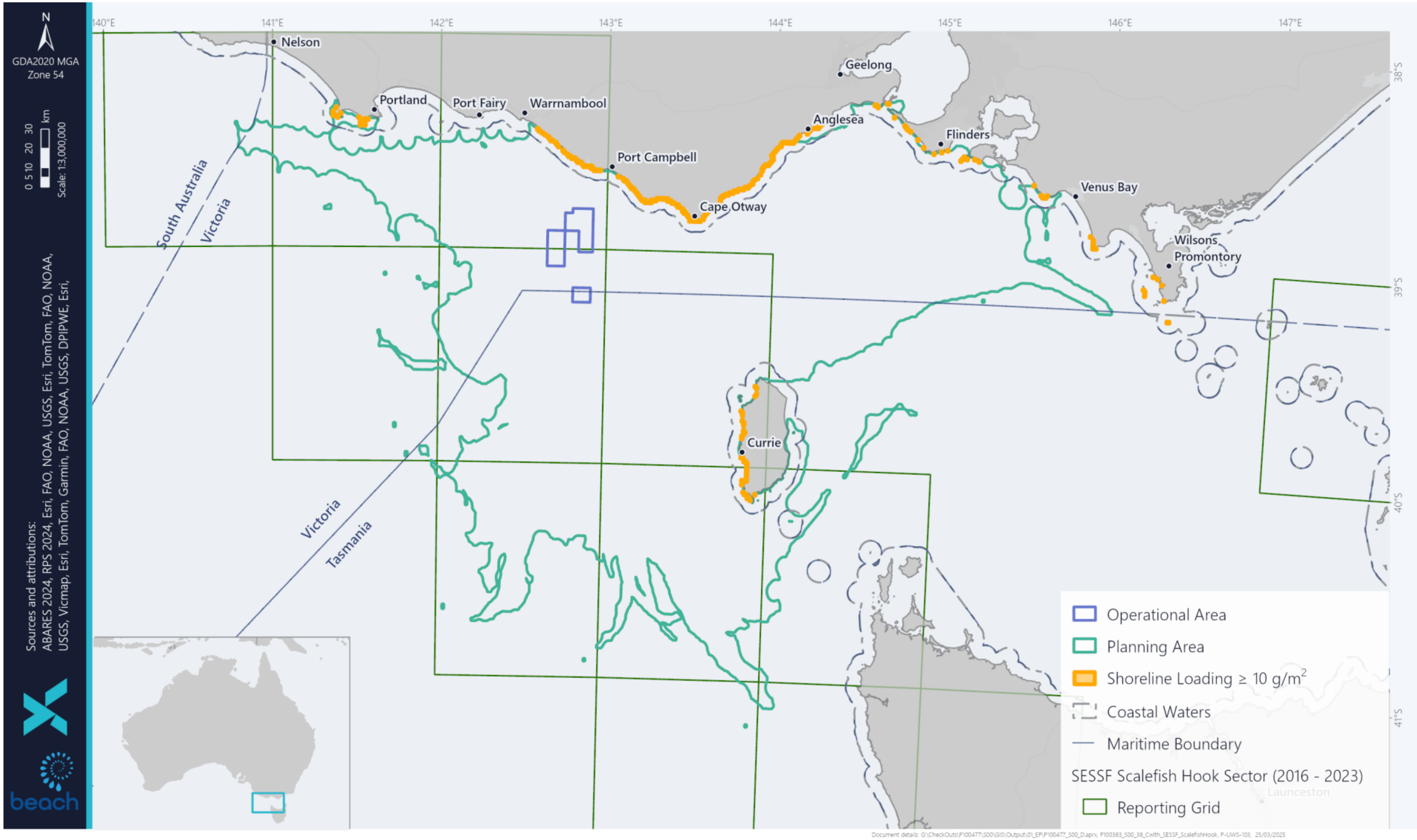


Figure 6-72: Southern and Eastern Scalefish and Shark Fishery (Scalefish Hook Sector) Fishery relative fishing intensity (number of hooks/km^2) and reporting grid

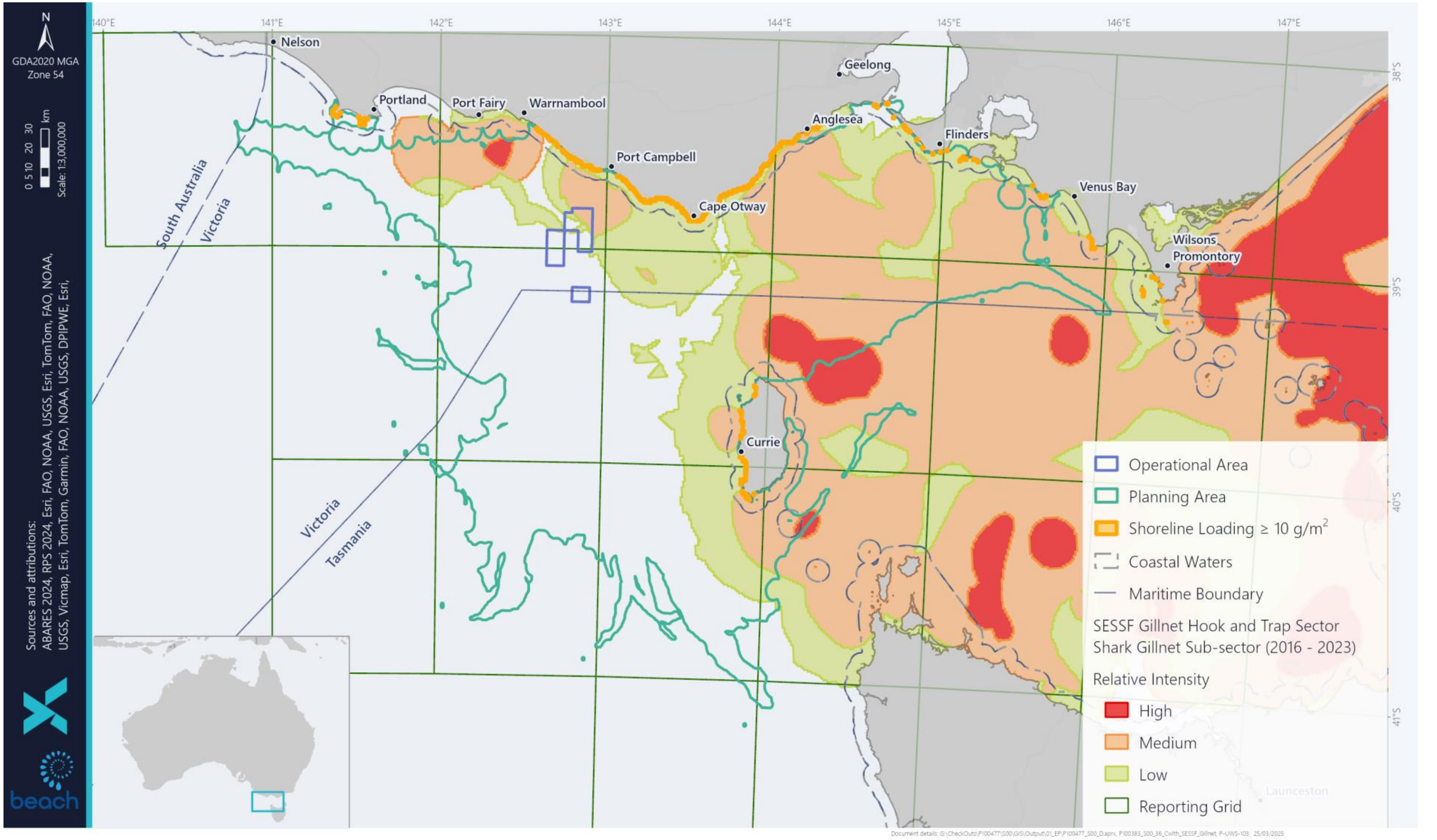


Figure 6-73: Southern and Eastern Scalefish and Shark Fishery (Gillnet Hook and Trap Sector) Shark Gillnet Sub-sector Fishery relative fishing intensity (net length, m/ km^2) and reporting grid

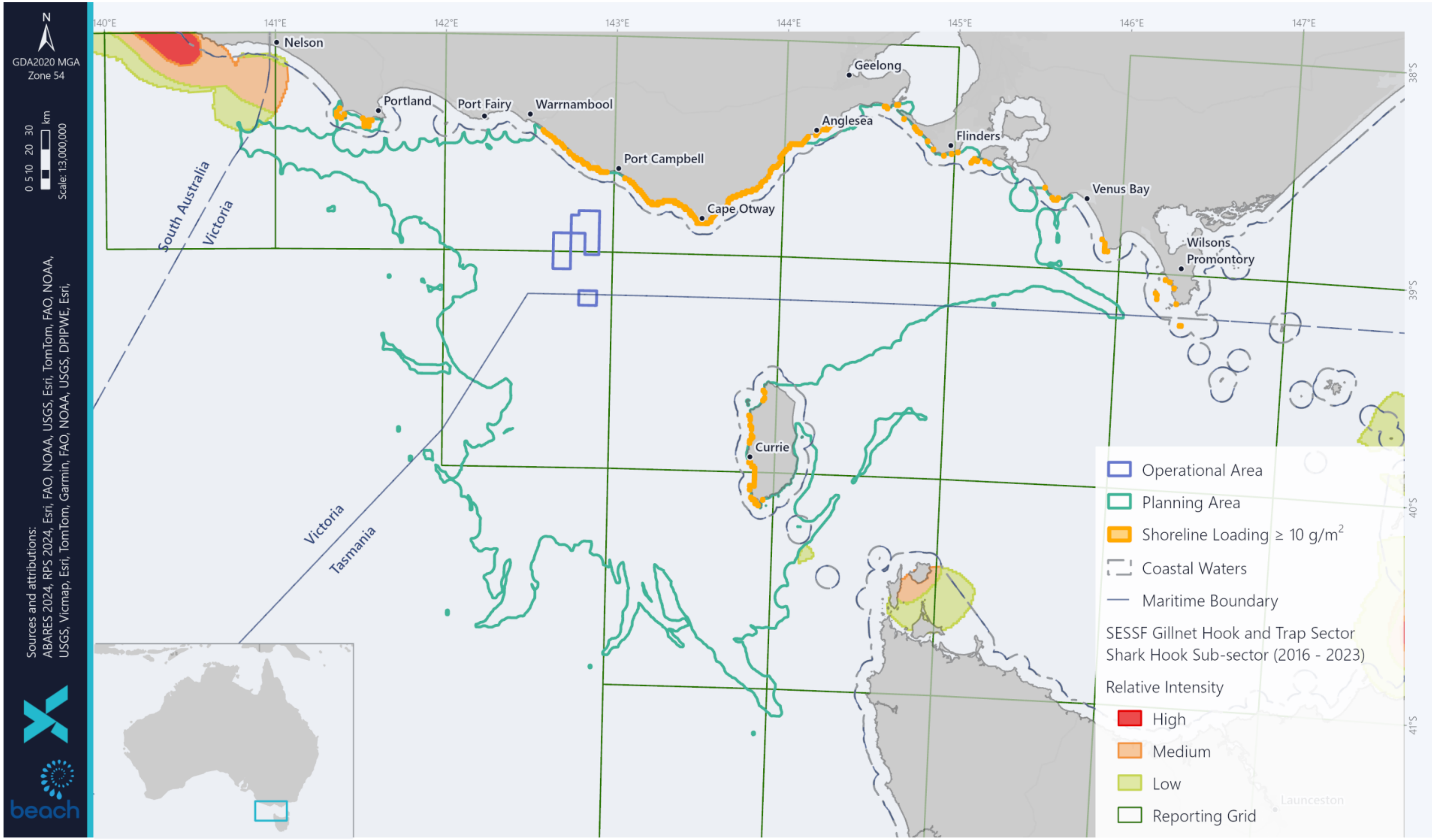


Figure 6-74: Southern and Eastern Scalefish and Shark Fishery (Gillnet Hook and Trap Sector) Shark Hook Fishery relative fishing intensity (number of hooks/ km²) and reporting grid

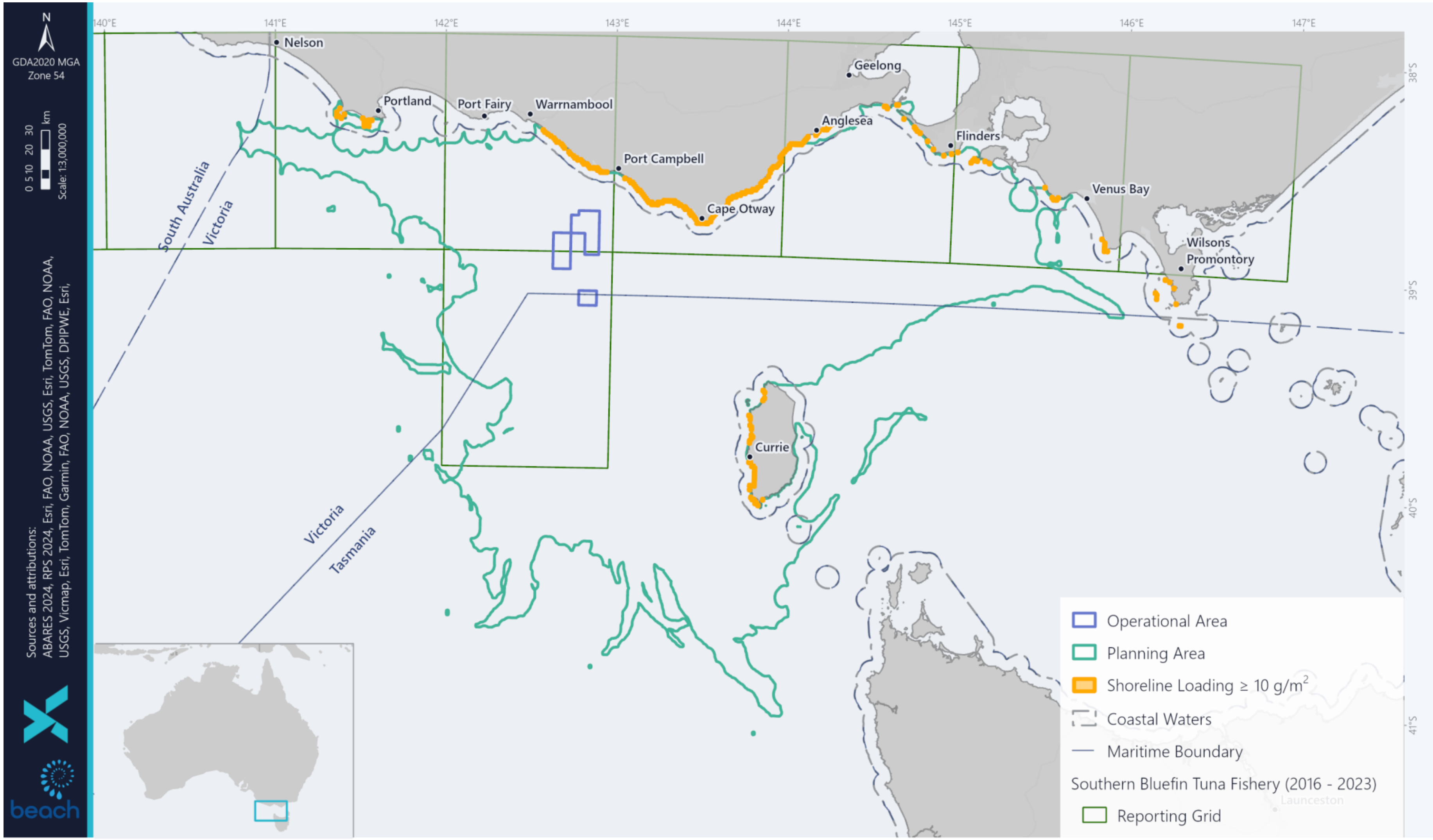


Figure 6-75: Commonwealth Southern Blue Fin Tuna Fishery relative fishing intensity for purse seine (ops/ km^2) and longline fishing (kg retained/k km^2) and reporting grid

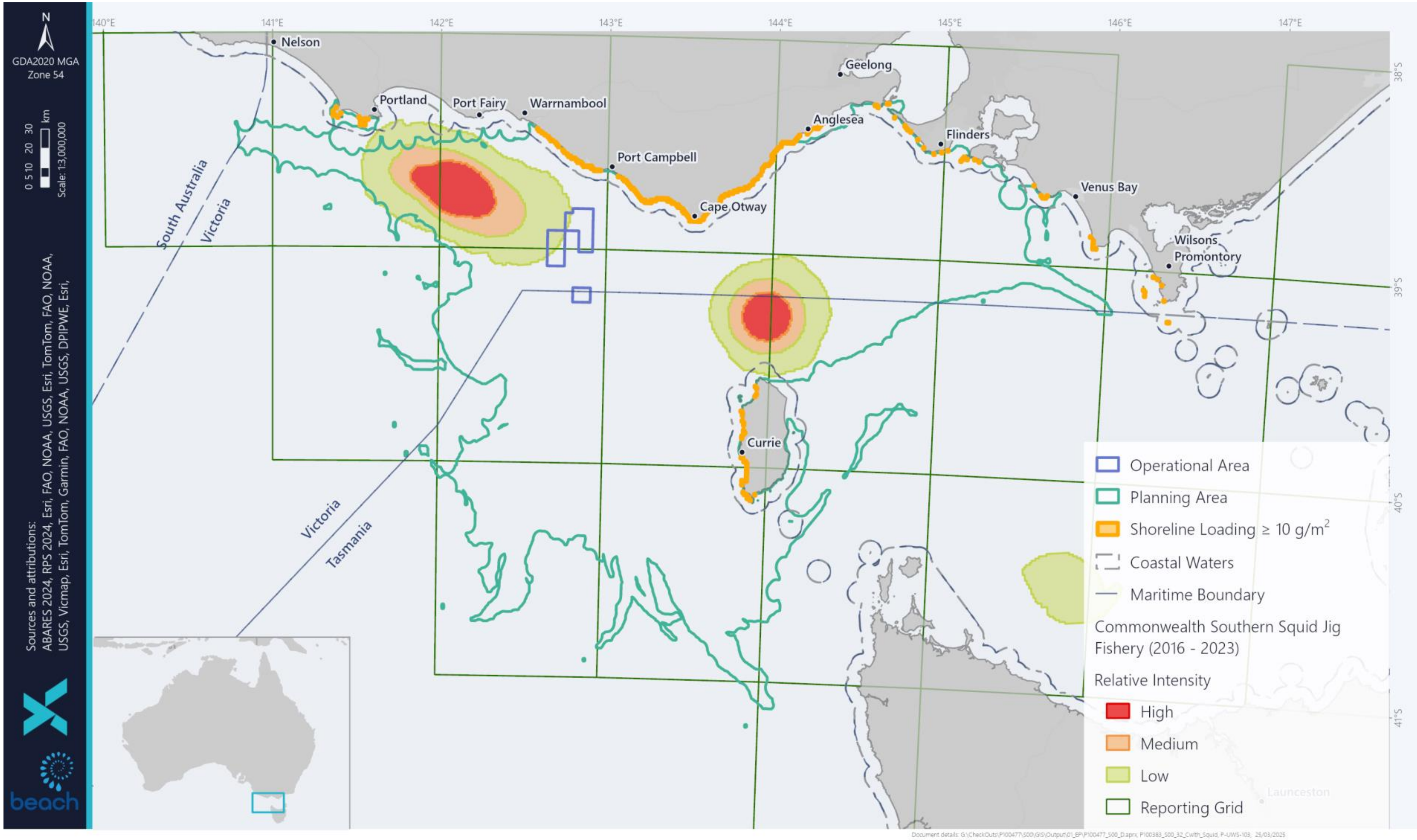


Figure 6-76: Commonwealth Southern Squid Jig Fishery relative fishing intensity (hours fished/ km^2) and reporting grid

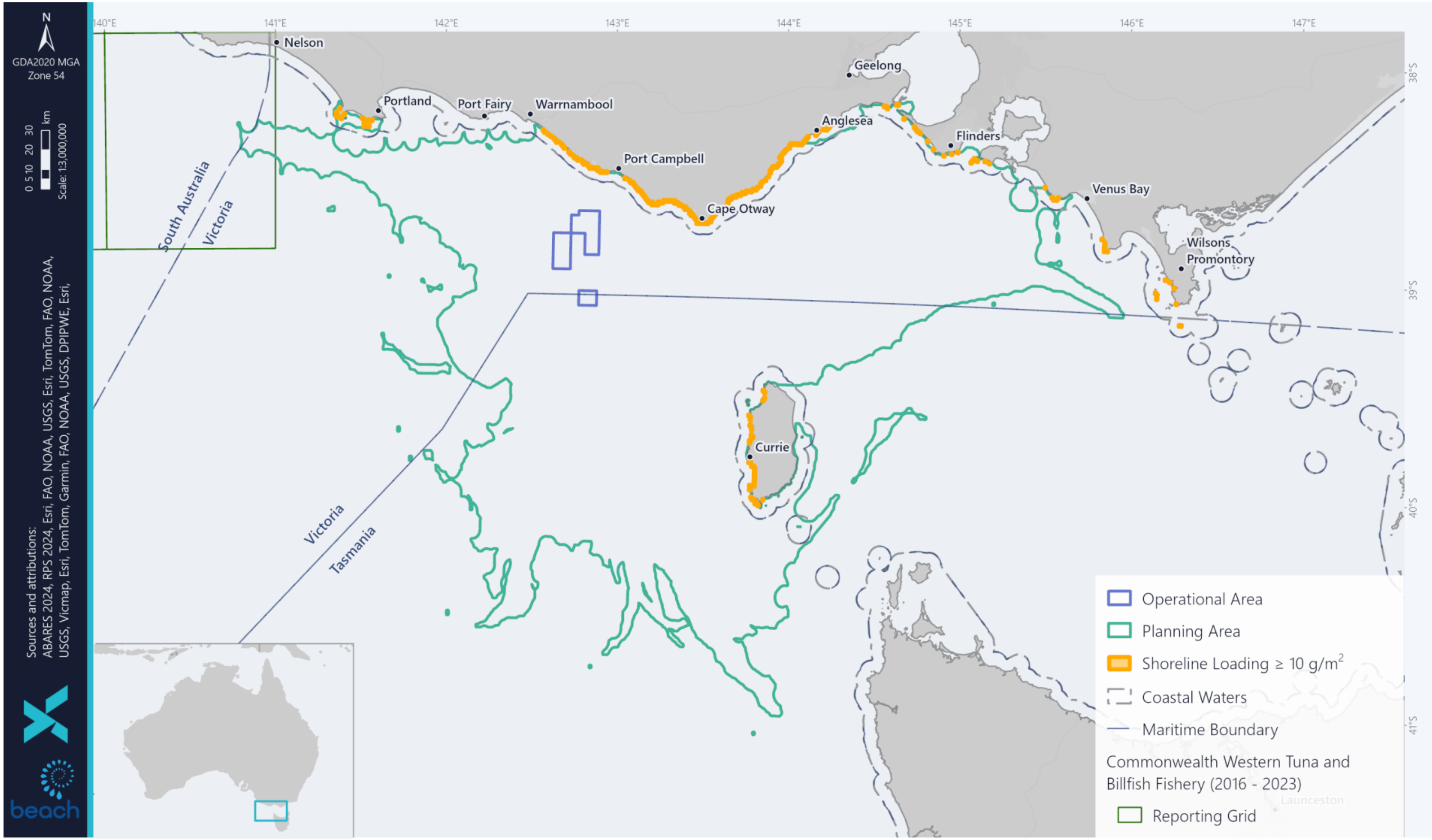


Figure 6-77: Commonwealth Western Tuna and Billfish Fishery reporting grid

6.5.11 Victorian Managed Fisheries

There are eight Victorian state-managed commercial fisheries that overlap the Planning Area:

- Abalone Fishery
- Giant Crab Fishery
- Multispecies Ocean Fisheries (Inshore Trawl and Ocean General)
- Octopus Fishery
- Pipi Fishery
- Rock Lobster Fishery
- Scallop (Ocean) Fishery
- Wrasse (Ocean) Fishery.

Of these, two Victorian state-managed commercial fisheries were identified to be active within the Operational Area in recent years:

- Giant Crab Fishery
- Rock Lobster Fishery

Information relating to the target species, fishing locations, landed catch, value and other relevant aspects of each fishery is provided in Table 6-35. Maps are also provided displaying the number of vessels reported in a VFA grid between 2013–2023 in relation to the Operational and/or Planning Area. Fishing effort data is confidential if a grid has less than 5 active vessels. No data on the Abalone Fishery locations was available from VFA due to the confidential nature of the data.

Data sources are from the Victorian Fisheries Authority Commercial Fish Production Information Bulletin July 2020 to June 2021 (VFA 2021) and VFA website (VFA 2024) unless indicated.

Table 6-35: Victorian-managed fisheries within the Operational Area and Planning Area

Fishery	Target species	Description	Fishing Effort in Operational Area	Fishing Effort in Planning Area
Abalone Fishery (central, eastern and western zones)	Blacklip Abalone Greenlip Abalone	The Victorian Abalone Fishery is a highly valuable fishery (A$16.8 million in 2020-21) that operates along most of the Victorian shoreline, generally to 30 m depth. Abalone are harvested by divers. Total allowable commercial catch (TACC) limits of Blacklip Abalone for the western zone are considerably less than the central and eastern zone (for 2019-20 season, 73.2 tonnes compared with 262.5 and 345.5 tonnes, respectively). There are 14 licences in the western zone, 23 in the eastern zone and 34 in the central zone. The water depths where abalone are fished are close to shore and therefore abalone fishing is likely to occur within the Planning Area. No abalone fishing is expected within the Operational Area due to minimum water depth being 64 m.	No	Yes
Giant Crab Fishery	Giant Crab	The Giant Crab Fishery is a small fishery operating in western Victoria and closely linked with the Rock Lobster Fishery. Most vessels are used primarily for Rock Lobster fishing with Giant Crab taken as by-product. Fishing effort is concentrated on the continental shelf edge (~200 m). Giant Crabs inhabit the continental slope at approximately 200 m depth and are most abundant along the narrow band of the shelf edge. Closed seasons operate for male (15 Sept to 15 Nov) and female (1 June to 15 Nov) Giant Crabs. Total landed catch in 2015-16 was 10 tonnes. Data for 2020/21 is confidential due to less than 5 vessels reporting fishing effort. The Operational Area is within the western management zone of the fishery (Figure 6-). Figure 6- shows overlap of Giant Crab management areas and fishing effort from 2013-2023 with the Operational Area and Planning Area (VFA 2024). The Operational Area and Planning Area overlap reporting grids with up to 15 active vessels.	Yes	Yes
Multispecies Ocean Fisheries – Inshore Trawl and Ocean General	Australian Salmon Eastern King Prawn Gummy Shark Lobster/Balmain Bug School Shark	The Multispecies Ocean Inshore Trawl fishery operates along the entire Victorian coastline, excluding marine reserves, bays and inlets. Most operators are based at Lakes Entrance. The Inshore Trawl fishery uses otter-board trawls with no more than a maximum head- line length of 33 m, or single mesh nets. The Wrasse, Inshore Trawl, Southern Rock Lobster and Giant Crab Fisheries are able to catch Gummy Shark and School Sharks as part of their fishery.	No	Yes

	School Prawn Shovelnose Snapper Minor bycatch of School Whiting and Flathead	The Multispecies Ocean Ocean General fishery uses lines, nets and haul seine to catch snapper. Over 90% of the catch is from Port Phillip Bay, and around 5% from coastal waters. In 2020-21, 45 tonnes were landed but values could not be provided as there is insufficient data to report because there are less than five licence holders (policy requirement to protect commercial confidentiality of data). Figure 6- shows the Planning Area overlaps areas with up to 78 active vessels for the Multispecies Ocean Fisheries. No fishing effort was identified within the Operational Area. Catch effort data is considered confidential if there are less than 5 vessels active.		
Octopus Fishery	Pale Octopus Maori Octopus Gloomy Octopus	The Octopus Fishery (Eastern Zone) is a new fishery harvesting mainly Pale Octopus (*Octopus pallidus*) in East Gippsland. The fishery may also catch Maori Octopus (*Macroctopus maorum*) and Gloomy Octopus (*Octopus tetricus*). Octopus are caught using purpose-built unbaited traps. The fishery commenced on 1st August 2020. Three fishery locations have been established for this new fishery; Eastern, Central and Western octopus zones. The Eastern zone is where the majority of commercial octopus takes place with the Central and Western zones are less established but are being managed by VFA through exploratory, temporary permits. Figure 6- shows the Planning Area overlaps reporting grids with up to 14 active vessels between 2013-2023. No fishing effort was identified within the Operational Area. Catch effort data is considered confidential if there are less than 5 vessels active.	No	Yes
Pipi Fishery	Pipi	The Pipi Fishery is a newly managed fishery with its first management plan declared in 2018. The fishery is now utilising an ongoing quota management regime with access licences issued for Discovery Bay and Venus Bay management zones, each with their own TACC. Pipi harvested commercially are sold for bait or for human consumption. The main commercial harvesting area for the Victorian Pipi Fishery is Discovery Bay with limited activity in Venus Bay. Pipis are harvested in the high impact beach zone using traditional dip nets. Figure 6- shows the Planning Area overlaps a small area fished between 2013-2023. Intensity data for the Pipi Fishery is confidential. the Operational Area does not overlap the Victorian Pipi Fishery.	No	Yes

Rock Lobster Fishery (western zone)	Southern Rock Lobster	The Rock Lobster Fishery is Victoria's second most valuable fishery with a production value of A$13.6 million in 2020/21. Since 2009-10, annual quotas have been set at between 230 and 260 tonnes and have been fully caught each year. In the western zone, most catch is landed through Portland, Port Fairy, Warrnambool, Port Campbell and Apollo Bay. Closed seasons operate for male (15 Sept to 15 Nov) and female (1 June to 15 Nov) lobsters. Southern Rock Lobsters are found to depths of up to 150 m, with most of the catch coming from inshore waters less than 100 m. Figure 6- shows the Operational Area and Planning Area overlap the Southern Rock Lobster Fishery. The Operational Area overlaps reporting grids with up to 24 active vessels while the Planning Area overlaps areas with as many as 101 active vessels between 2013-2023.	Yes	Yes
Scallop (Ocean) Fishery	Commercial Scallop	The Scallop Fishery extends the length of the Victorian coastline from high tide mark to 20 nm offshore. Fishers use a scallop dredge. Doughboy Scallops are taken as by-product but are not harvested in commercial quantities. Temporary closures occur when stocks are low to allow scallop beds to recover. TACC for 2015-16 was set at 135 tonnes, with results from the 2017/18 abundance survey indicating that TACC should remain at the same level. Scallops are mostly fished from Lakes Entrance and Welshpool. The Operational and Planning Areas do not overlap Victorian Scallop Fishery effort.	No	No
Wrasse (Ocean) Fishery	Bluethroat Wrasse Purple Wrasse Small catches of Rosy Wrasse, Senator Wrasse and Southern Maori Wrasse	The Victorian Wrasse (Ocean) Fishery extends the length of the Victorian coastline from high tide mark to 20 nm offshore. Fishers mostly use hook and line. There is limited entry to the fishery with 22 current licences. Total annual catches in 2019-20 was approximately 21.5 tonnes. Figure 6- shows the Operational Area does not overlap reported fishing effort while the Planning Area overlaps reporting grids along the coast with up to 35 active vessels.	No	Yes

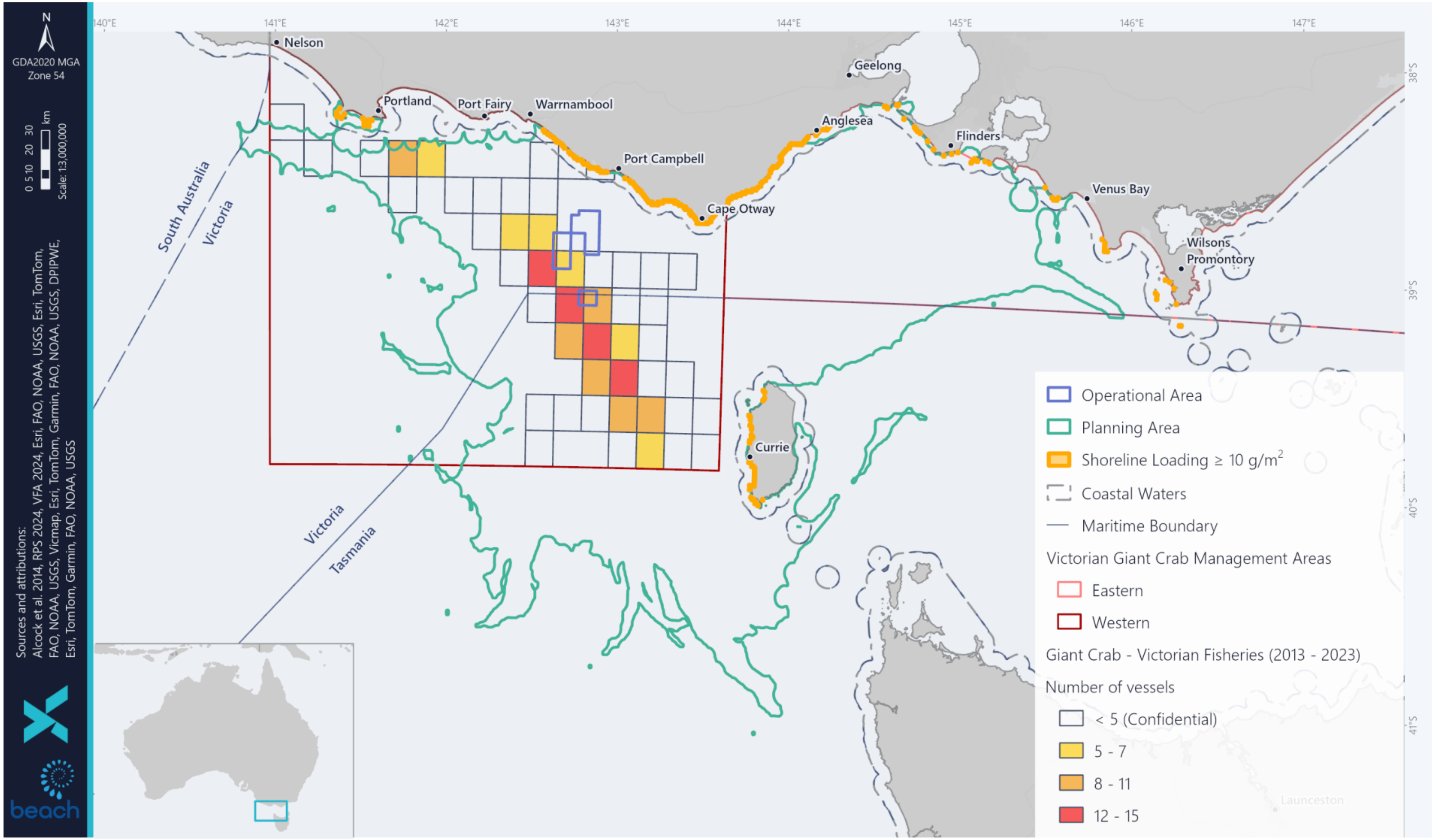


Figure 6-78: Victorian Giant Crab Fishery number of vessels from 2013-2023. Data obtained from VFA 2024

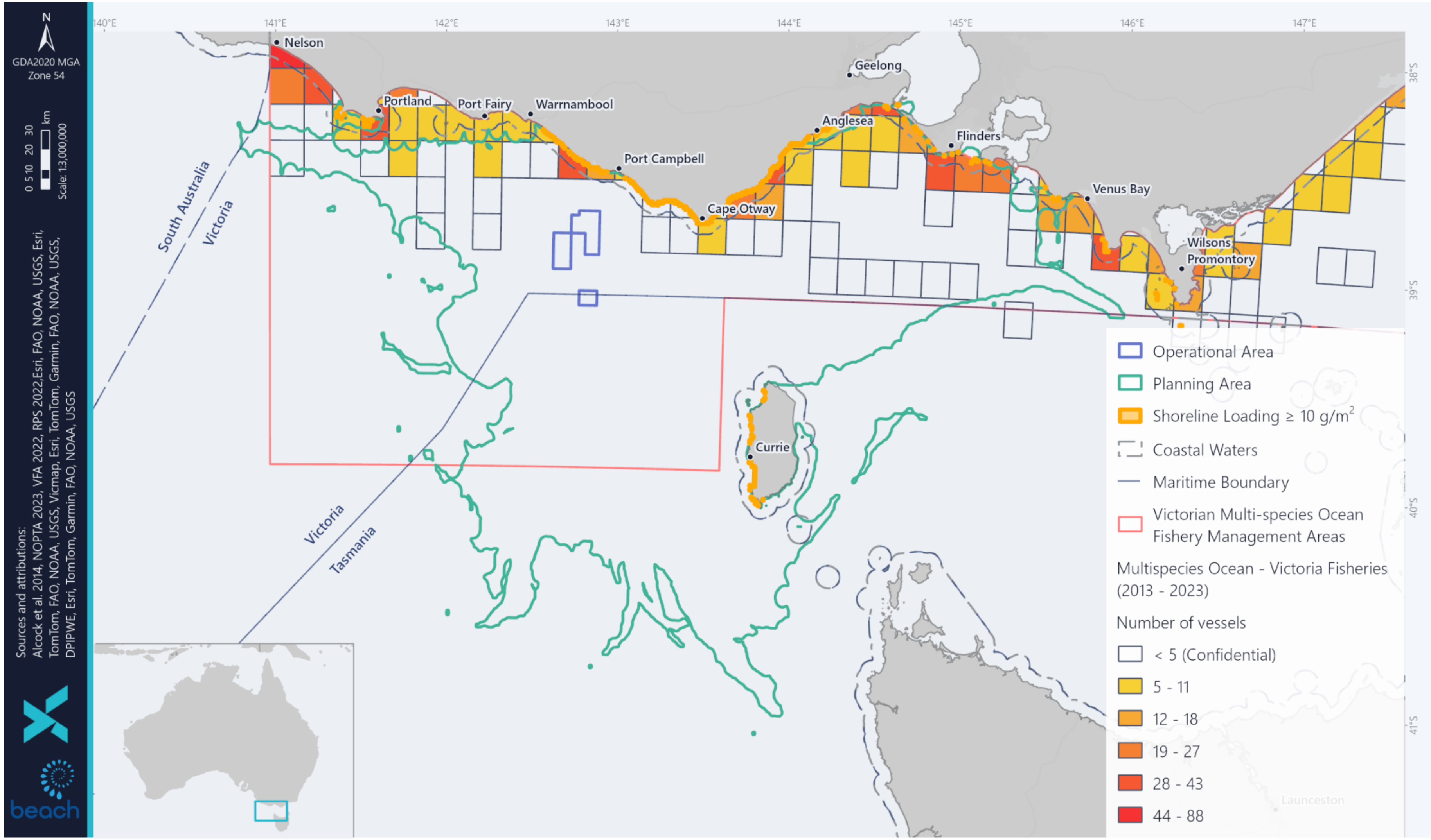


Figure 6-79: Victorian Multispecies Ocean Fisheries number of vessels from 2013-2023. Data obtained from VFA 2024

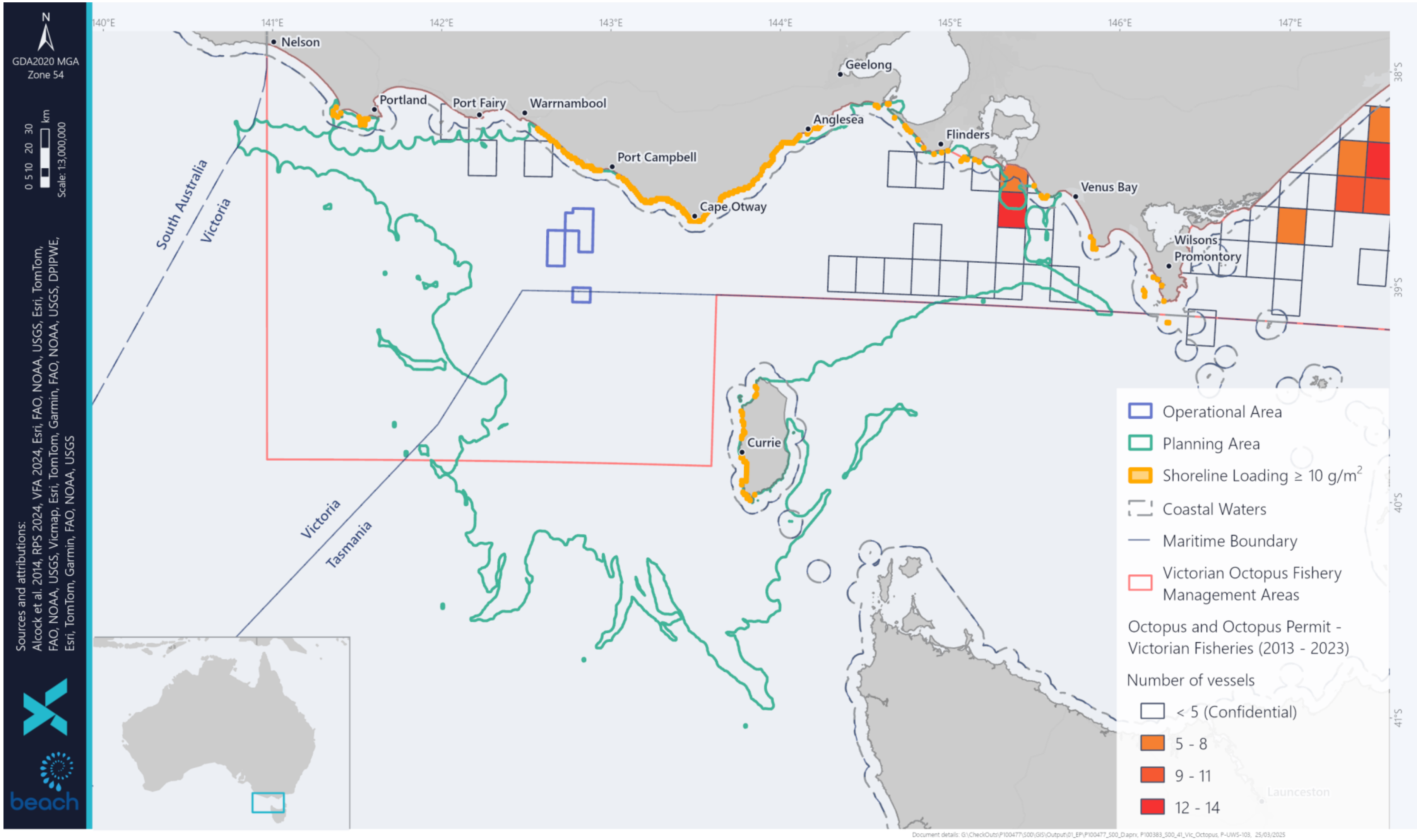


Figure 6-80: Victorian Octopus and Octopus Permit Fishery number of vessels from 2013-2023. Data obtained from VFA 2024

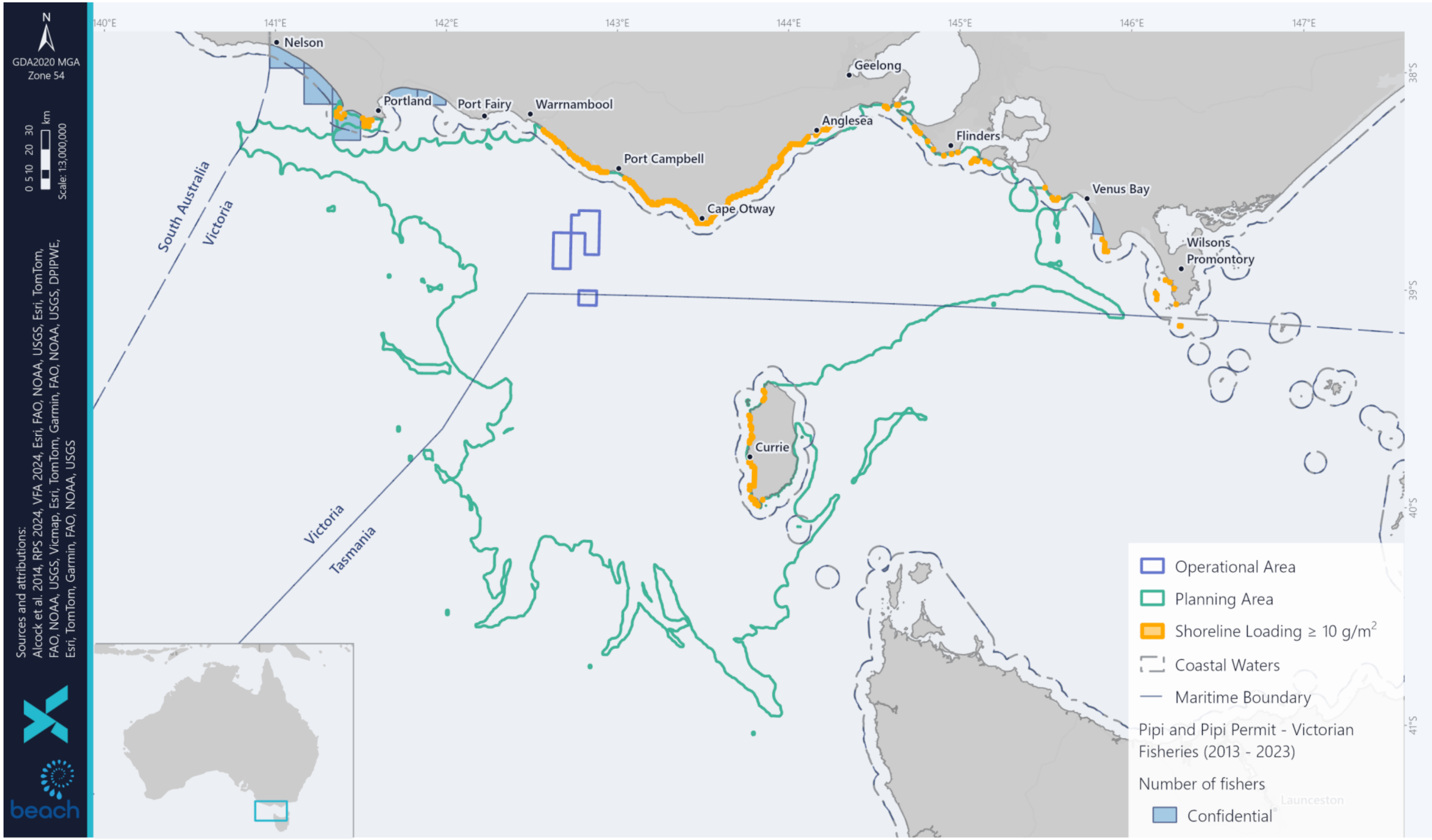


Figure 6-81: Victorian Pipi Fishery number of vessels from 2013-2023. Data obtained from VFA 2024.

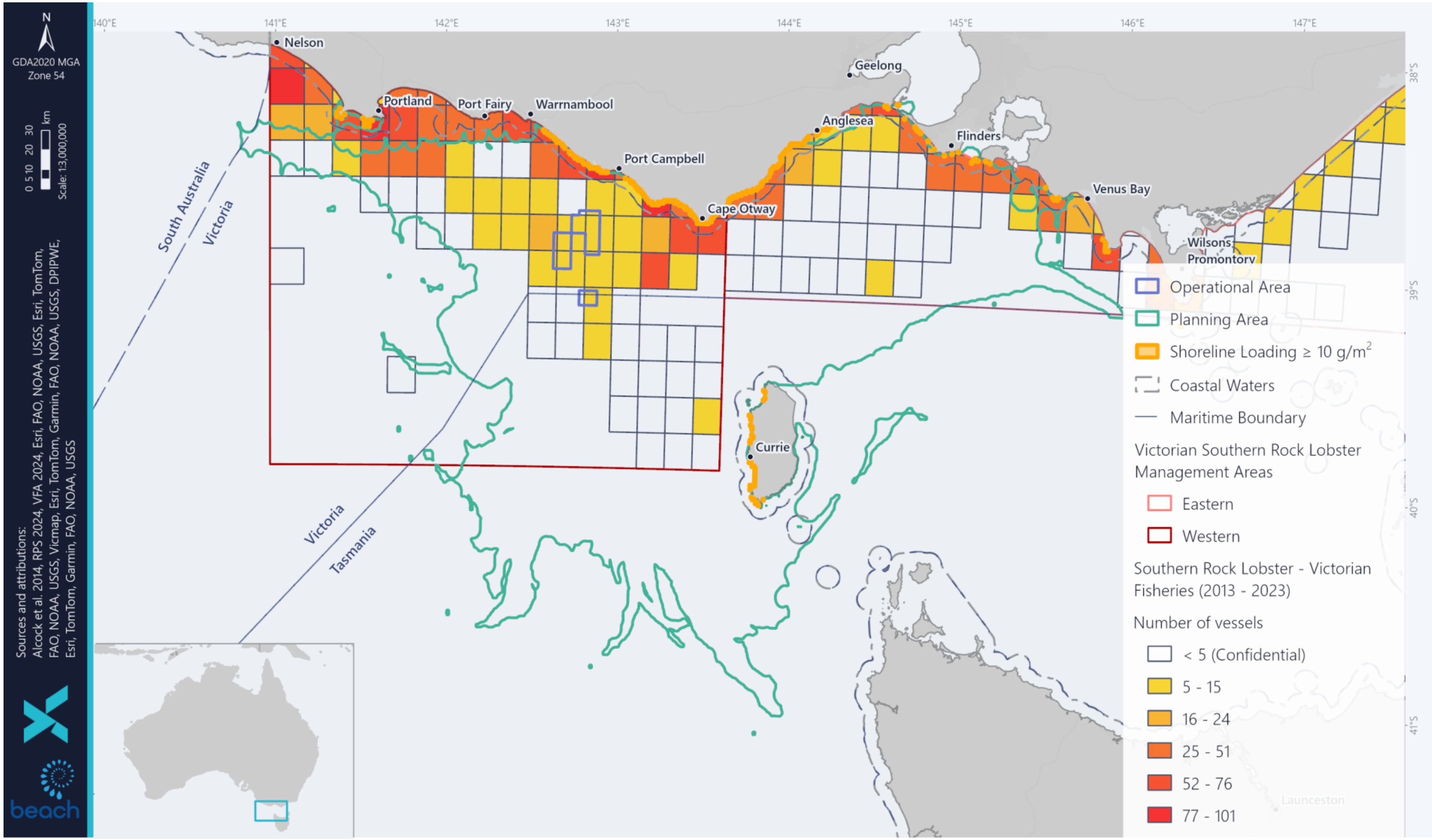


Figure 6-82: Victorian Southern Rock Lobster Fishery number of vessels from 2013-2023. Data obtained from VFA 2024.

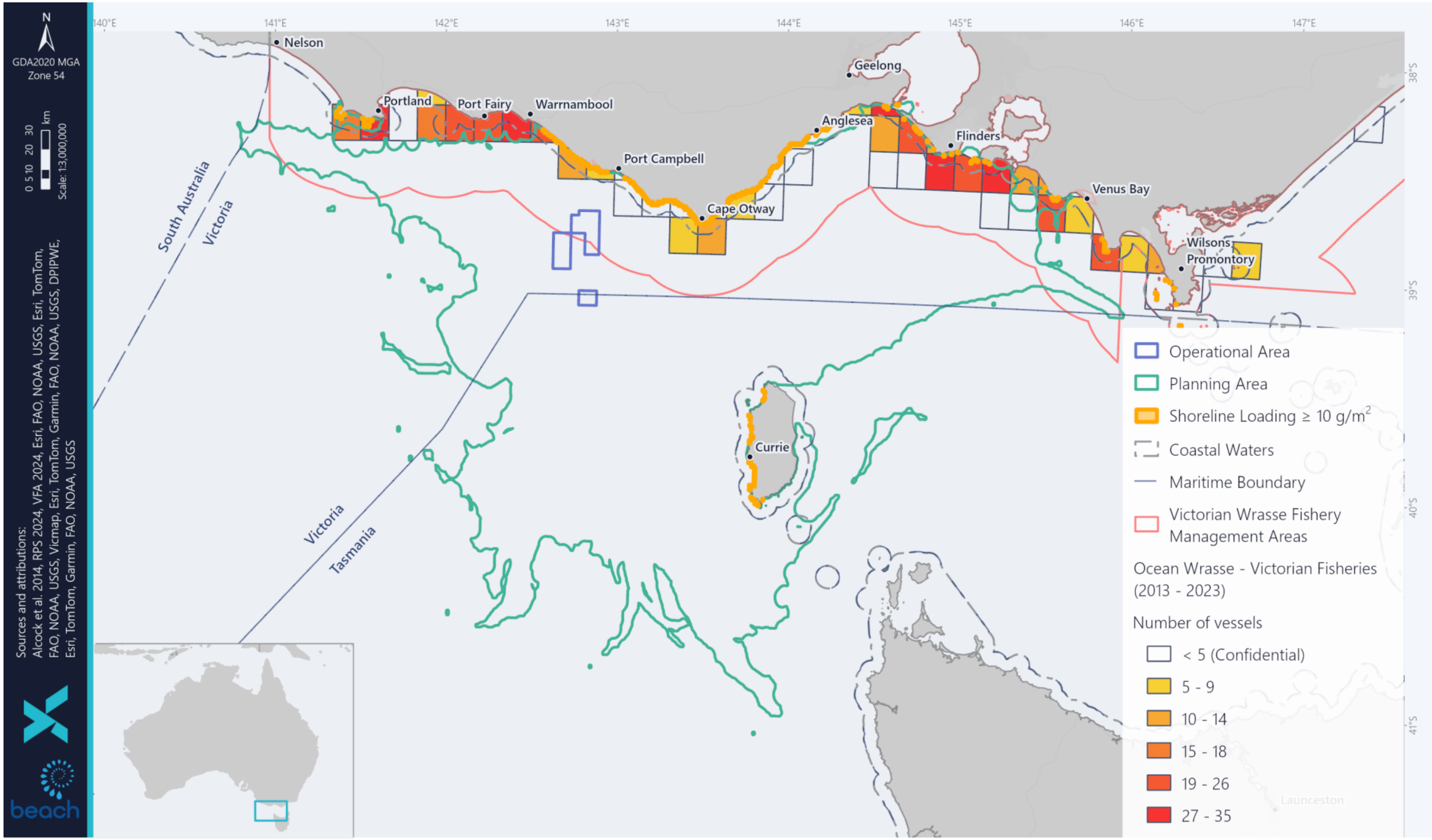


Figure 6-83: Victorian Wrasse (Ocean) Fishery number of vessels from 2013-2023. Data obtained from VFA 2024

6.5.12 Tasmanian Managed Fisheries

Fishing Tasmania manages Tasmania's commercial fisheries under the *Living Marine Resources Management Act 1995*.

All fisheries except for the Giant Crab Fishery and the Rock Lobster Fishery operate within Tasmanian waters. The Giant Crab Fishery and the Rock Lobster Fishery also operate in Commonwealth waters under an Offshore Constitutional Settlement (OCS) between the Australian Government and the Government of Tasmania.

There are eight Tasmanian state-managed commercial fisheries that may overlap the Planning Area:

- Abalone Fishery
- Commercial Dive Fishery
- Giant Crab Fishery
- Marine Plant Fishery
- Rock Lobster Fishery
- Scalefish Fishery
- Scallop Fishery
- Shellfish Fishery

No fishing effort has been identified within the Operational Area. Project information relating to the target species, fishing locations, landed catch, value and other relevant aspects of each fishery is detailed in Table 6-36. Data and information sources are Department of Natural Resources and Environment Tasmania (DNRET 2022) and Australian fisheries and aquaculture statistics 2014-15 (Patterson et al. 2022).

Maps are also provided showing where the number of vessels reported in a Tasmanian Fishery grid between 2011 – 2021 in relation to the Operational Area and/or Planning Area and for the Rock Lobster Fishery and Giant Crab Fishery for which data from Fishing Tasmania is available.

Table 6-36: Tasmanian-managed fisheries within the Operational Area and Planning Area

Fishery	Target species	Description	Fishing Effort in Operational Area	Fishing Effort in Planning Area
Abalone Fishery (Northern, Western and Bass Strait Zones)	Blacklip Abalone Greenlip Abalone	The Tasmanian Abalone Fishery is the largest wild abalone fishery in the world (providing ~25% of global production) and a major contributor to the local economy. Abalone are hand-captured by divers in depths between 5-30 m. Blacklip Abalone are collected around on rocky substrate around the Tasmanian shoreline and are the primary target of the fishery. Greenlip Abalone are distributed along the north coast and around the Bass Strait islands and usually account for around 5% of the total wild harvest. In 2020/21, the gross value of production of the fishery was around A$50 million from a total catch of approximately 1,000 tonnes. The jurisdictional area of the Abalone Fishery is Tasmanian State waters. The Operational Area does not overlap the Abalone Fishery. The Planning Area overlaps the Northern Zone (waters around King Island) of the Abalone Fishery (Figure 6-).	No	Yes
Commercial Dive Fishery (Northern and Western Zones)	Longspined Sea Urchin Shortspined Sea Urchin Wavy Periwinkle	The Tasmanian Commercial Dive Fishery is a capture fishery that targets several different species; the main species collected being sea urchins and periwinkles. In 2020-2021 approximately 180 t of sea urchins and 2.07 t of periwinkles were harvested. Sea urchins and periwinkles accounted for 63% and 37% of the total respectively. Jurisdiction encompasses all Tasmanian State waters (excluding protected and research areas), although licence holders largely operate out of small vessels (<10 m) and effort is concentrated on the south and east costs of Tasmania around ports. The Operational Area does not overlap the Commercial Dive Fishery. The Planning Area overlaps the Northern Zone of the Commercial Dive Fishery at King Island (Figure 6-).	No	Yes
Giant Crab Fishery	Giant crab	The Giant Crab Fishery is a comparatively small fishery with the annual harvest set at 20.7 tonnes but with a high landed value of around A$2 million. The fishery has been commercially targeted since the early 1990s, moving from open access to limited entry. The area of the fishery includes waters surrounding the state of Tasmania generally south of 39°12 out to 200 nm. Within the area of the fishery, most effort takes place on the edge of the continental slope in water depths between 140 m and 270 m. CPUE has declined continually since the inception of the fishery in the early 1990s indicating that it has been overfished. The TAC has been reduced to 20.7 t for 2019/120 and 2021/2022 to address the issue.	No	Yes

		Figure 6- shows the Planning Area overlaps areas with up to 11 active vessels. No fishing effort was identified within the Operational Area. Catch effort data is considered confidential if there are less than 6 vessels active.		
Marine Plant Fishery	Bull kelp Japanese kelp	Marine plants include kelp, seaweed, seagrasses, and algae which are food and habitat for other marine species. To protect Tasmanian marine ecosystems, no marine plants may be harvested directly from the water, except in the *Undaria* fishery. The majority of cast bull kelp is collected from King Island. The right to harvest and process kelp on King Island was granted exclusively to Kelp Industries Pty Ltd in the mid-1970s. About 80 to 100 individuals collect cast bull kelp and transport it to the Kelp Industries plant in Currie. An average annual harvest above 3,000 t (dried weight) has been produced in recent years, accounting for about 5% of the world production of alginates (i.e. the end product of dried bull kelp). The cast bull kelp harvesting on King Island generates about A$2 million annually. Comparatively minor cast bull kelp collection also occurs at two centres of operation on Tasmania's West Coast: around Bluff Hill Point and at Granville Harbour. Japanese kelp is harvested by divers only along Tasmania's east coast where it is already well established. The Planning Area overlaps the area where bull kelp is potentially collected from King Island.	No	Yes
Rock Lobster Fishery	Southern rock lobster	The Rock Lobster Fishery is the other major wild-caught Tasmanian fishery. For 2022-23 the Total Allowable Catch remains at 1,050.7 t. Southern rock lobsters are found to depths of 150 m with most of the catch coming from inshore waters less than 100 m throughout state waters. The fishery is a limited entry with 312 licences. Figure 6- shows the Planning Area overlaps areas with up to 152 active vessels from 2011-2021. The Operational Area does not overlap recent fishing effort for the Tasmanian Rock Lobster Fishery.	No	Yes
Scalefish Fishery (northwest coast)	Multi-species and multi-gear fishery	The Scalefish Fishery is a complex multi-species fishery harvesting a range of scalefish, shark and cephalopod species. Fourteen different fishing methods are used. The highest commercial catches in 2019/20 were reported for southern calamari (85.8 t), wrasse (52.4 t), and eastern school whiting (43.7 t). Due to the fishery being under caught by 26.7% in the previous season 2020/21, the TAC for the 2021/22 season has increased to 30 kg quota unit. The Planning Area overlaps the Scalefish Fishery management area (Figure 6-).	No	Yes
Scallop Fishery	Commercial Scallop	The Scallop Fishery uses a benthic scallop dredge to target one of three species of scallop naturally occurring in Tasmania, the Commercial Scallop (*Pecten fumatus*). The fishery extends	No	Yes

		200 nm from the eastern, western and southern coasts of Tasmania. In the Bass Strait, the fishery extends 3-20 nm offshore along the north coast from King Island to Flinders Island. The Planning Area overlaps the Scallop Fishery Management Area.		
Shellfish Fishery	Katelysia Cockles Venerupis Clam Native Oyster Pacific Oyster	The Shellfish Fishery comprises specific shellfish species hand captured by divers in defined locations on the east coast of Tasmania, namely Angasi oysters in Georges Bay, Venerupis clams in Georges Bay and Katelysia cockles in Ansons Bay. The taking of Pacific oysters, an invasive species, is also managed as part of the fishery but no zones apply. Pacific oysters can be collected throughout all State waters (which includes areas within the Planning Area), as the aim of harvesting these animals is to deplete the wild population. The estimated total value of the shellfish fishery based on landings from 2001-2005 was A$345,538. The Planning Area could potentially overlap areas where Pacific oysters are collected.	No	Yes

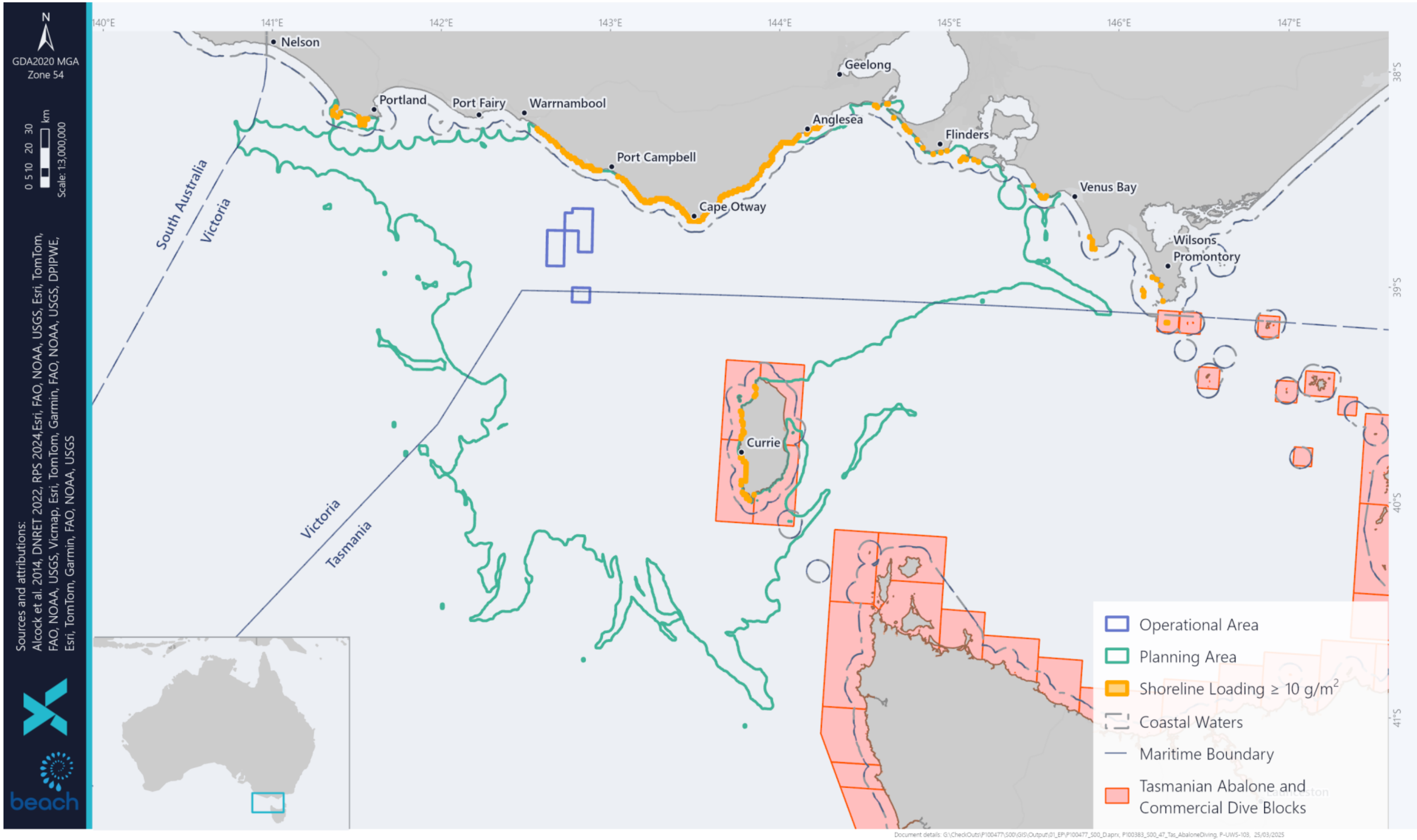


Figure 6-84: Tasmanian Abalone and Commercial Dive Fishery blocks. Data obtained from DNRET 2022.

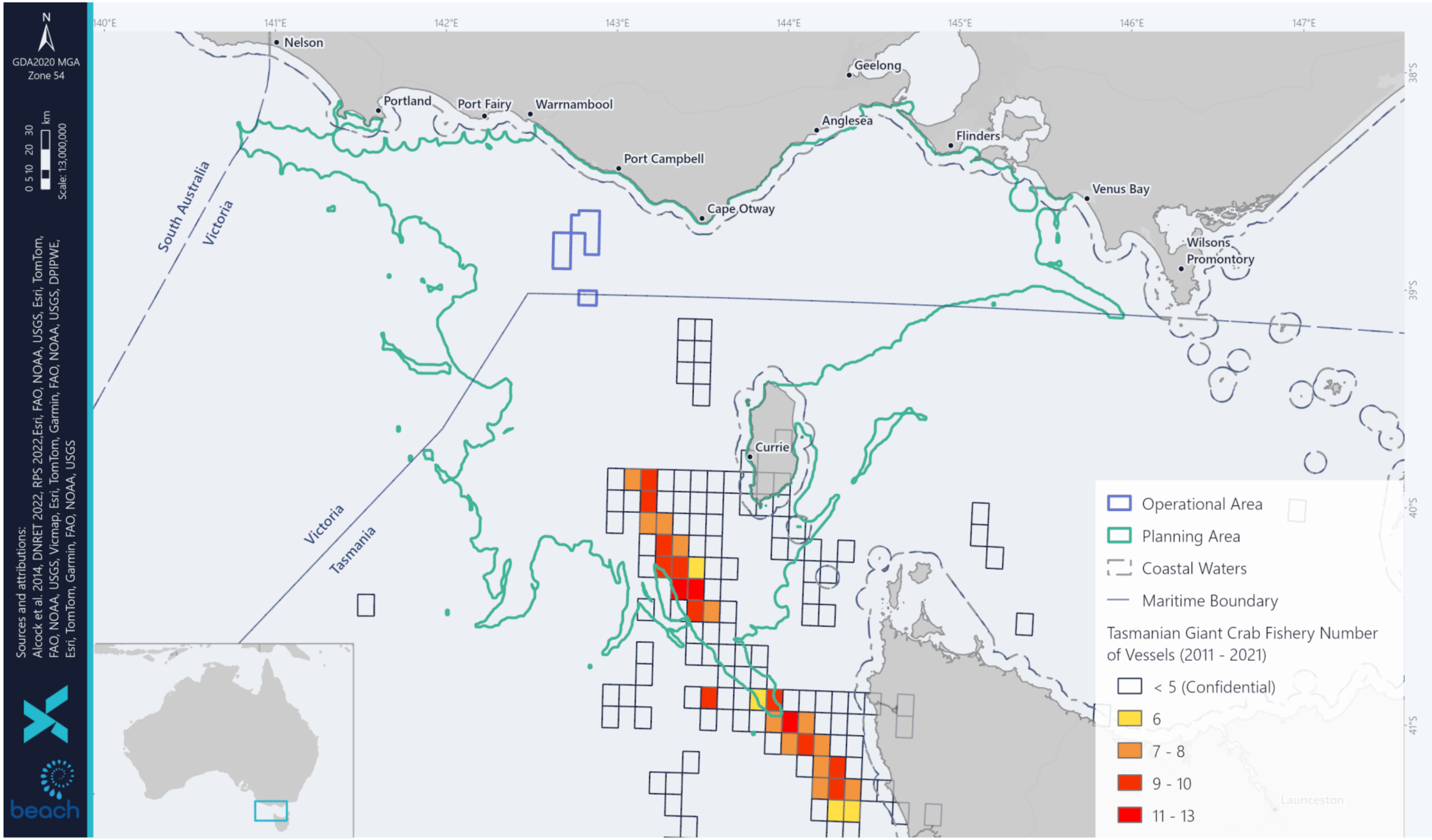


Figure 6-85: Tasmanian Giant Crab Fishery number of vessels from 2011 to 2021. Data obtained from DNRET 2022.

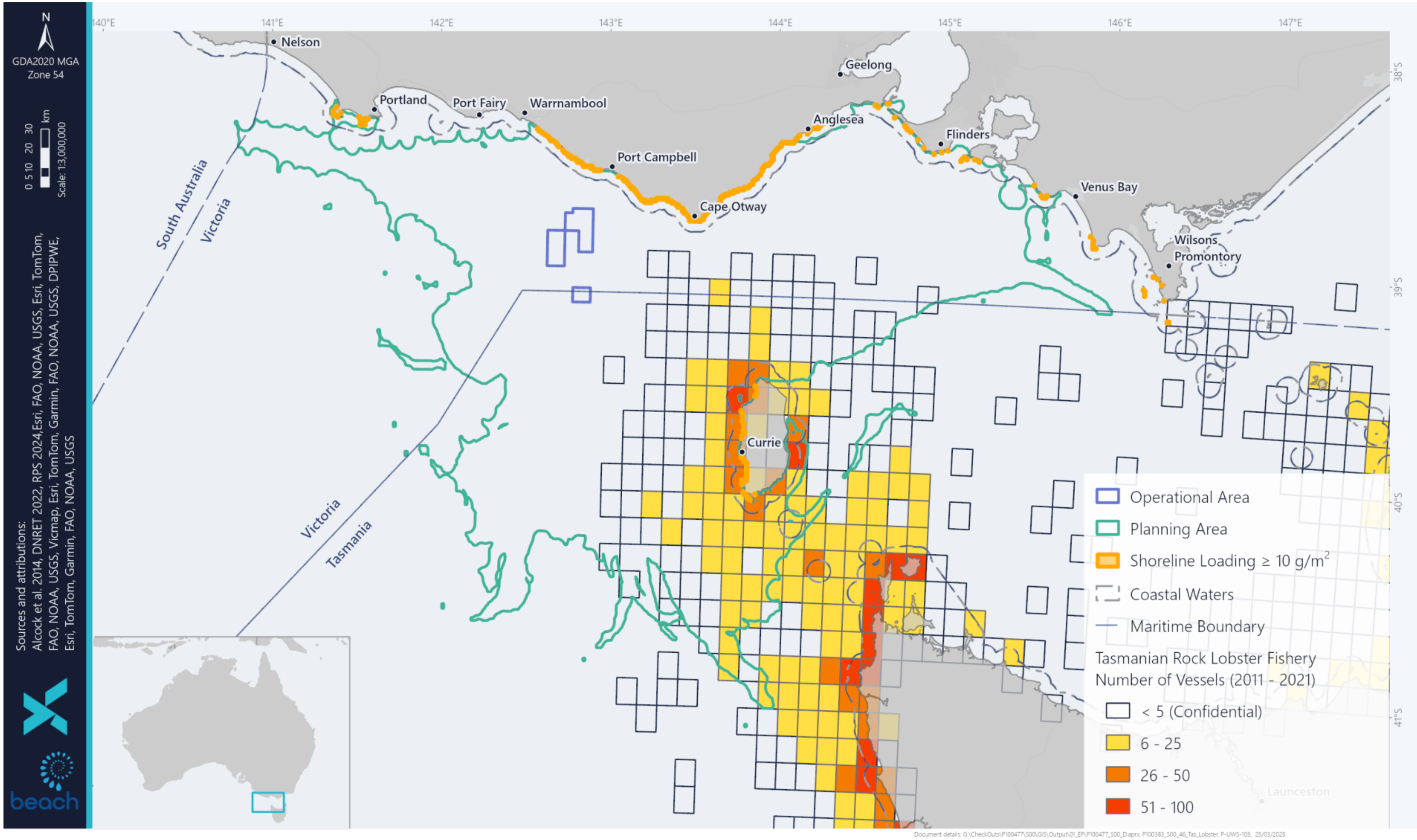


Figure 6-86: Tasmanian Rock Lobster Fishery number of vessels from 2011 to 2021. Data obtained from DNRET 2022.

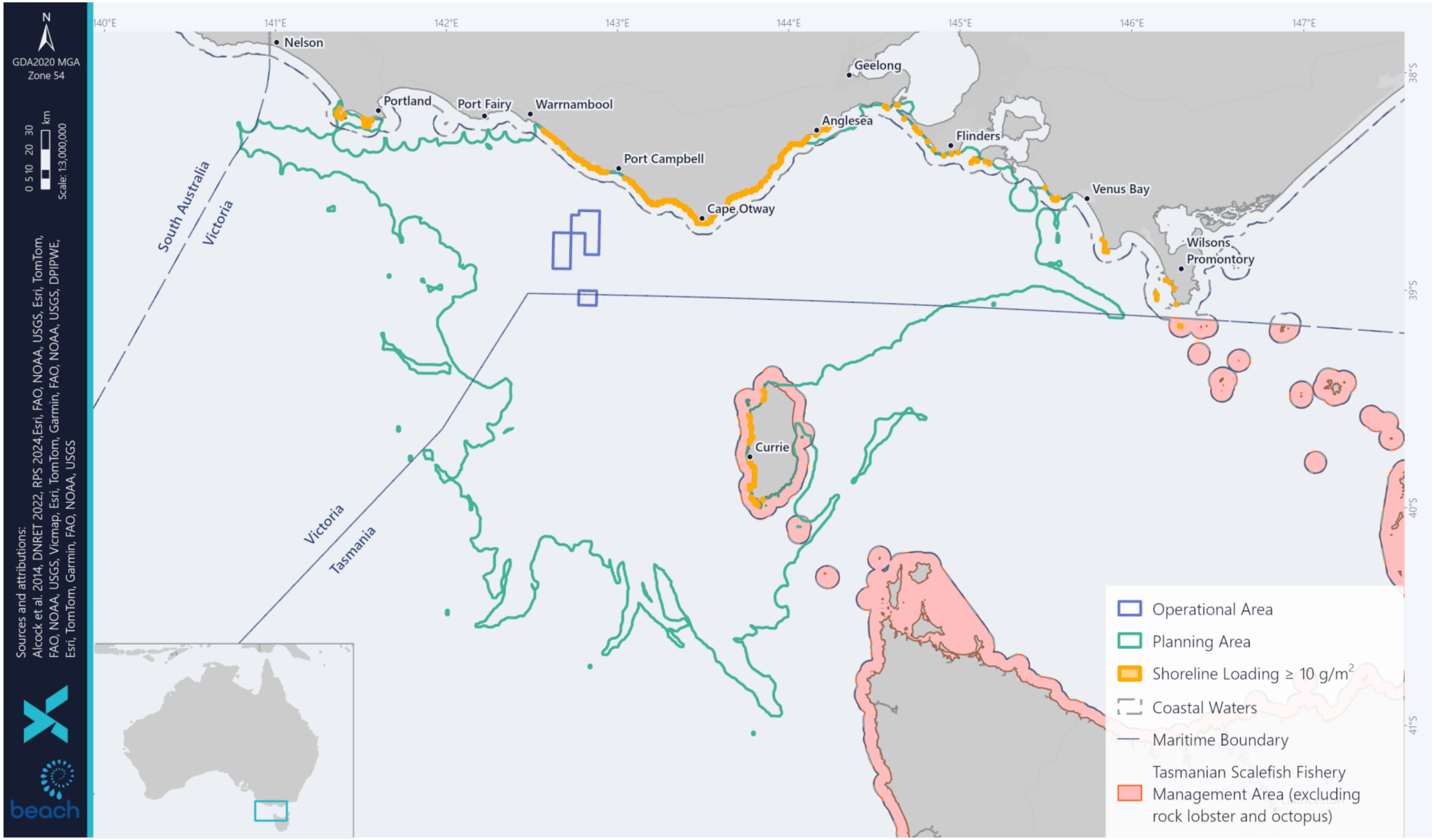


Figure 6-87: Tasmanian Scalefish Fishery management area. Data obtained from DNRET 2022.

6.5.13 South Australian Managed Fisheries

The *Fisheries Management Act 2007* and its regulations provide the legislative framework, objectives, and guiding principles for the management of fisheries in South Australia. Management rules for commercial fisheries are provided in fisheries regulations under the Act.

The Department of Primary Industries and Regions South Australia (PIRSA) is responsible for the ecologically sustainable development of South Australia's aquatic resources and the administration of the *Fisheries Management Act 2007*.

The Operational Area does not overlap any South Australian Fisheries.

Data from PIRSA identified that the Planning Area overlaps the following fisheries:

- Abalone Fishery
- Charter Boat Fishery
- Giant Crab Fishery
- Marine Scalefish Fishery
- Rock Lobster Fishery.

Information relating to the target species, fishing locations, landed catch, value and other relevant aspects of each fishery is included in Table 6-37. Data sources are from PIRSA fishing data from 2013 to 2023 for fishing block 58 which the Planning Area overlaps (PIRSA 2025), unless otherwise noted.

Table 6-37: South Australian-managed fisheries within the Operational Area and/or Planning Area

Fishery	Target species	Description	Fishing Effort in Operational Area	Fishing Effort in Planning Area
Abalone Fishery	Blacklip Abalone Greenlip Abalone	The South Australian commercial abalone fishery takes greenlip and blacklip abalone that inhabit subtidal reefs out to approximately 30 m. Commercial abalone divers mostly operate from large, trailered boats. Divers use surface supplied air from the boat and may use motorised cages to mitigate physical interactions with white sharks. The Planning Area overlaps the Southern Zone of the fishery however the minimum depth of the Planning Area in South Australian waters is 300 m, so abalone fishing within the Planning Area in South Australian waters is not expected. The Southern Zone of the Abalone Fishery records 6 active licences from 2013 to 2023. Hours dived range from 929 to 1,877 per year with annual catch between 86,609 to 177,567 kg.	No	No
Charter Boat Fishery	Various	The Charter Boat Fishery is a limited entry fishery which has ranged between 45 and 75 licences from 2013 to 2023. Peak periods are between December and April (summer) and October. Fishing in inshore regions where water depths are <50 m is the most frequent activity, therefore minimal effort is expected within the Planning Area which has a minimum depth of 300 m in South Australian waters. Seventy-eight species of fish, shark, mollusc, cephalopods, and crustacean are targeted with King George whiting, snapper and bight redfish representing the highest catches. The above information is from Hanamseth (2024). The Planning Area overlaps fishing block 58 which has had up to 6 active licences and up to 151 trips per year from 2013 to 2023 (Figure 6-).	No	Yes
Giant Crab Fishery	Giant Crab	Information from in this section is from McLeay (2024). The giant crab (*Pseudocarcinus gigas*), also known as king crab, is endemic to southern Australian waters and distributed from southern Western Australia to central New South Wales. While they occur at depths ranging from 20 to 600 m, the highest population densities are found at the edge of the continental shelf at depths of approximately 140 to 270 m. Fishers use a maximum of 100 steel-framed pots that must comply with pot dimension specifications.	No	Yes

		Commercial access to the giant crab resource is limited to licence holders in the Miscellaneous Fishery and Rock Lobster Fishery. Total allowable catch in the fishery depends on five-year average of catch per unit effort (CPUE). When CPUE more than 1.98 kg per potlift, TACC is set to 22.1 t per year for the whole fishery, consisting of 13.4 t in the Northern Zone and 8.7 t in the Southern Zone. with total catch ranging from 15.4 t in 2022/21 to 18.4 t in 2017/218. Giant crab fishing season in between 1 October 31 May, with the fishing season in the Southern Zone between 1 October and 30 April. The Planning Area overlaps the southern zone of the fishery. PIRSA could not provide data specific to fishing block 58 as data for the Giant Crab Fishery is confidential.		
Marine Scalefish Fishery	Snapper King George Whiting Southern Garfish Southern Calamari	Information in this section is from Dennis et al. (2024). The Marine Scalefish Fishery is a multi-species and multi-gear fishery. Commercial fishing can be undertaken for more than 60 species of scalefish using a range of 30 different gear types. The Sardine Fishery is a part of the Marine Scalefish Fishery The Marine Scalefish Fishery operates in all coastal waters of South Australia between the Western Australian and Victorian border. For some species the Offshore Constitutional Settlement extends the fishery area out 200 nm to the Australian Exclusive Economic Zone miles. The fishing area includes gulfs, bays and estuaries, excluding the Coorong. Not all species taken by this fishery are scalefish. Other species include squid, worms, sharks. The main species taken are snapper, King George whiting, southern garfish and southern calamari. These 4 species comprise 60% of the total fishery production weight and 70% of the total fishery value. In 2019 fishing for snapper was prohibited in all management zones due to the stock being depleted, except for the south east fishing zone, and currently is in place until June 2026. In 2023 there were more than 200 licences in the fishery. The Planning Area overlaps fishing block 58 in the south east fishing zone where there have been up to 13 active licences and 85 boat days each year from 2013 to 2023. From 2021 to 2023 there were less than 5 active licences, therefore catch effort data is confidential (Figure 6-).	No	Yes
Rock Lobster Fishery	Southern Rock Lobster	The information in the section below is from Linnane et al. (2024). The Rock Lobster Fishery is based on the capture of southern rock lobster (*Jasus edwardsii*). Other species are permitted to be landed and sold, including giant crabs and octopus. Rock lobsters are commercially harvested with pots that are set overnight. Rock lobster licence holders may also harvest marine scalefish as endorsed on their licence.	No	Yes

	The Planning Area is within fishing block 58 of the fishery Southern Zone which is typically open from 1 October to 31 May, though in 2023 the season was extended to 1 September to 31 May (Figure 6-). The annual catch within the Planning Area ranged from 354-502 tonnes from 2013 to 2023. During this period the number of licence holders ranged from 47 to 69.

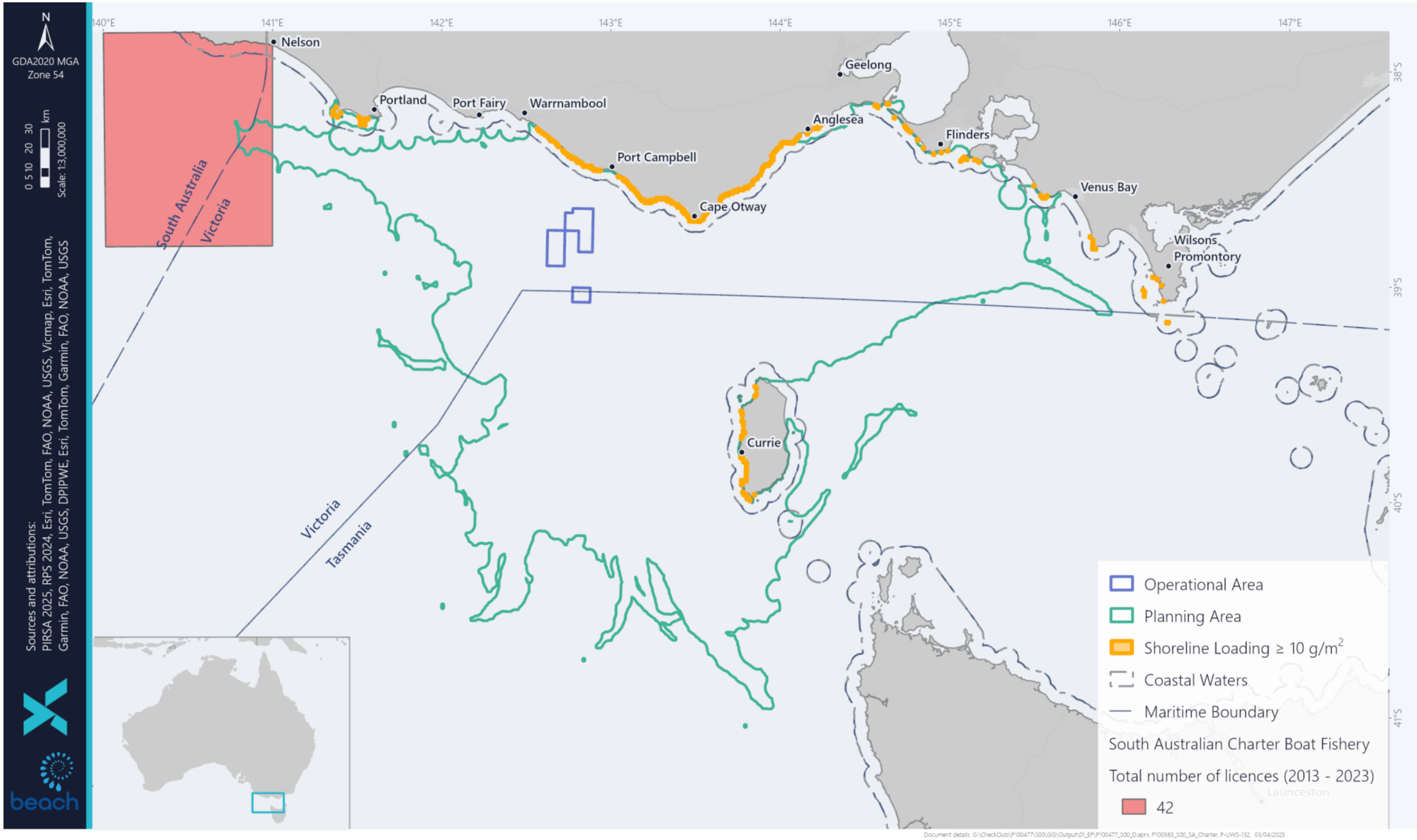


Figure 6-88: South Australian Charter Fishery number of trips from 2013-2023. Data obtained from PIRSA 2025.

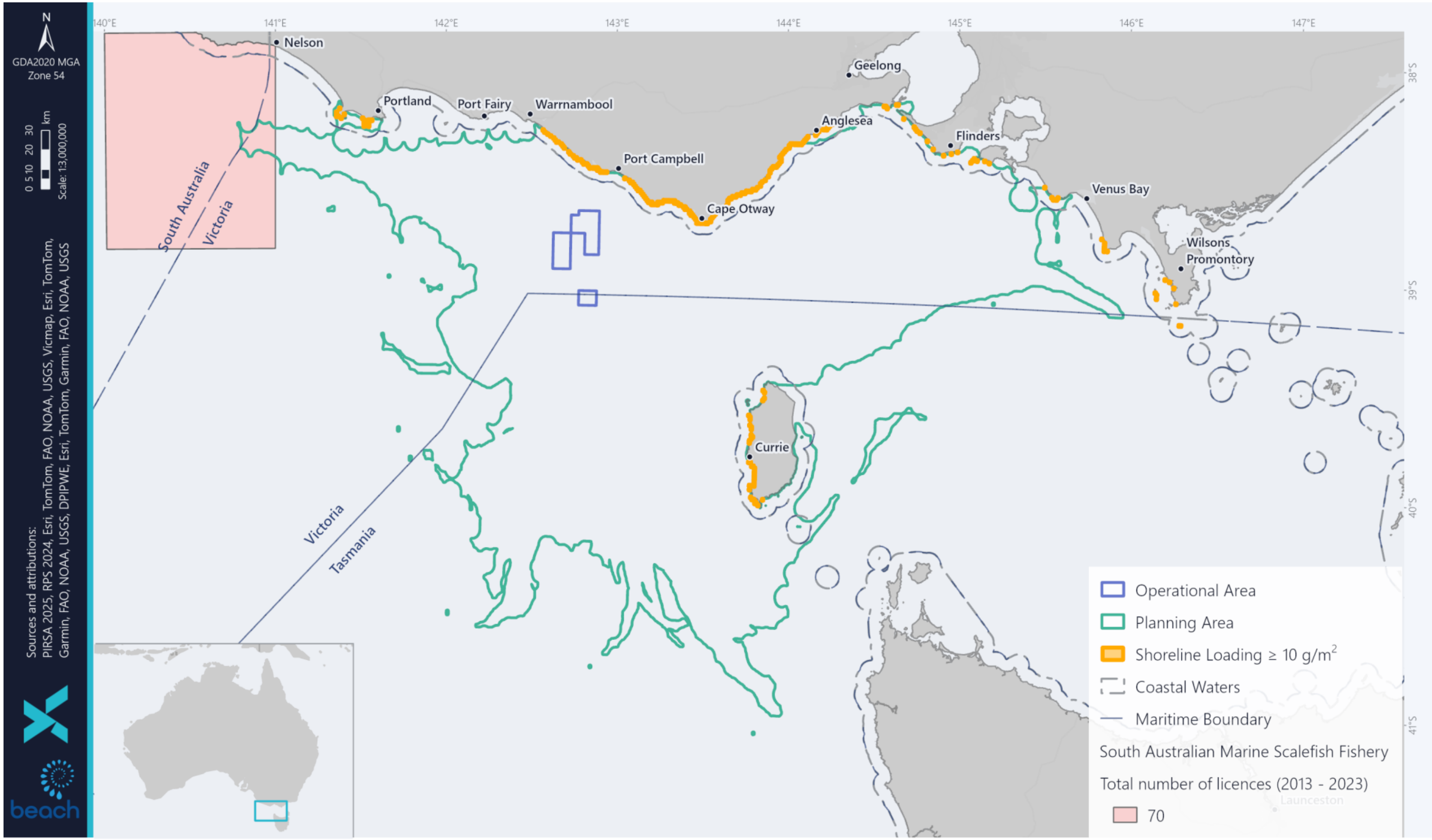


Figure 6-89: South Australian Scalefish Fishery number of boat days from 2013-2023. Data obtained from PIRSA 2025.

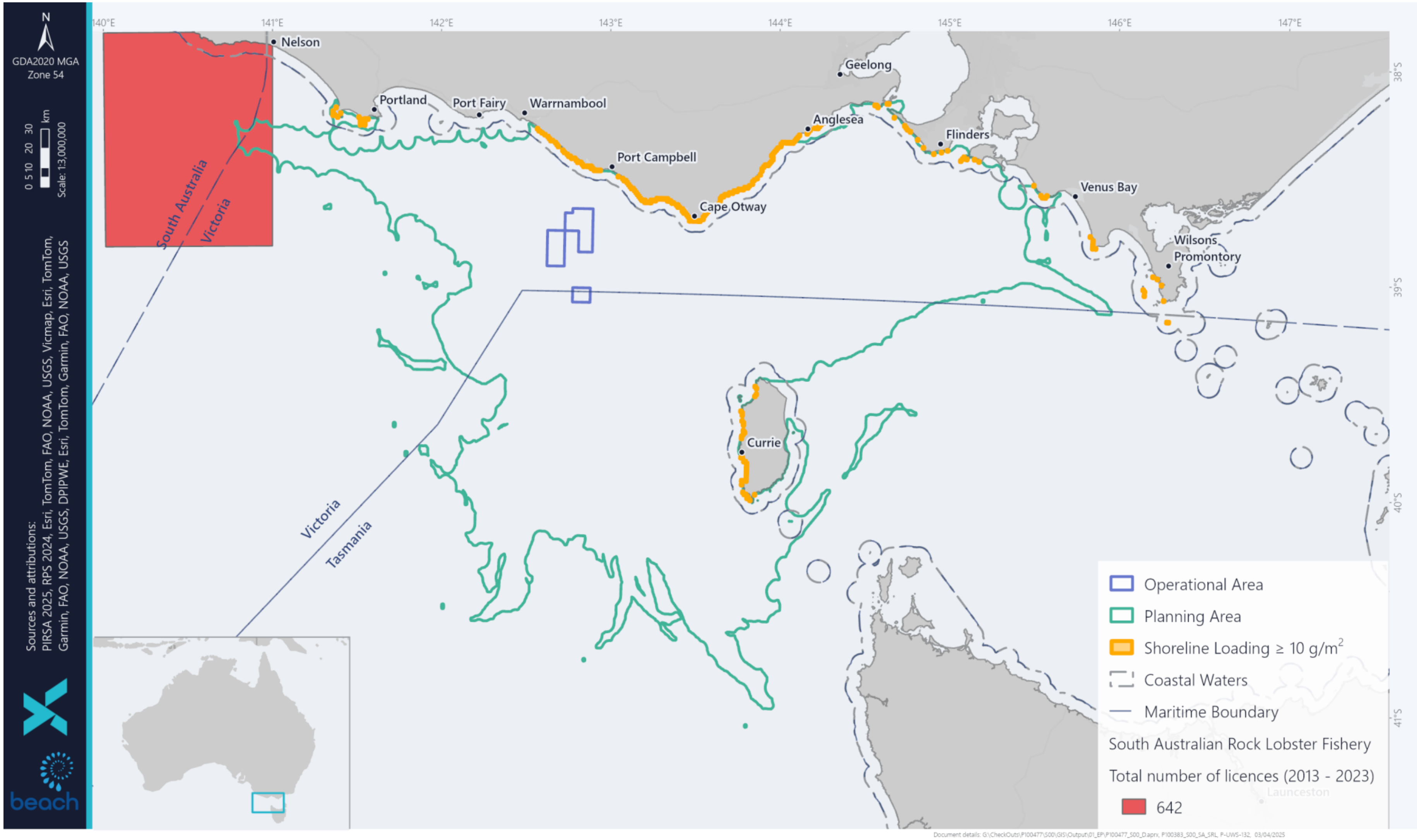


Figure 6-90: South Australian Southern Rock Lobster Fishery number of boat days from 2013-2023. Data obtained from PIRSA 2025.

6.5.14 Seaweed Industry

The Australian seaweed industry is small: currently valued at an estimated GVP of AUD $3 million. Of this, the majority is from one company, Kelp Industries Pty Ltd on King Island in Tasmania, who hand collect plants cast bull kelp (*Durvillea potatorum*) on the beaches from predominantly the west coast of the island, predominantly for export to a large alginate manufacturer and for use in biofertiliser products (Australian Seaweed Institute 2023). Australia Bureau of Statistics (ABS) data shows seaweed exports from Australia are valued at $1.5 million for non-human consumption and it is assumed that this is almost entirely from Kelp Industries exports.

Besides Kelp Industries, other seaweed collectors in Tasmania include Kelpomix and TasKelp. There are also licenses for wild harvest of the invasive species of Undaria in Tasmania (KaiHo Ocean Treasure) and some in Victoria (Australian Seaweed Institute 2023).

The harvesting of native seaweed in Victorian marine waters is prohibited without a permit (*Fisheries Act 1995*) and licences enabling seaweed aquaculture are not currently available in Victoria (VFA 2023).

While there are numerous research projects taking place or being planned, currently there are two projects in Tasmania (Australian Seaweed Institute 2023). The first, is a CRC-P project involving collaboration with Tassal, Spring Bay Seafoods and University of Tasmania (UTAS). This project aims to demonstrate the benefits of Kelps as part of an integrated multitrophic aquaculture approach. The second is a research collaboration between UTAS and Huon Aquaculture in Storm Bay that will also yield its first harvest in late 2020. A Giant Kelp Marine Forest Restoration Plan is sponsored by the Tasmania Smart Seafood Partnership.

6.6 First Nations

6.6.1 Methodology to Identify Cultural Values and Sensitivities

The definition of environment in the OPGGS(E)R includes the people and communities, heritage value of places, and their social, economic, and cultural features. Specifically for First Nations peoples, this includes cultural heritage and sea country values which, in accordance with Indigenous tradition, may be a spiritual and cultural connection that may be affected by the Program.

Beach recognises First Nations Groups and their deep spiritual and cultural connection to the environment. The cultural values and features within the Operational and Planning Area are addressed in this section.

The description of the environment for cultural features and values was developed through:

- Consultation with First Nations Groups with connection to Sea Country in the Operational and Planning Area.
- Review of available publications by First Nations Groups relating to Sea Country.
- Engagement of Extent Heritage Pty Ltd (Extent), a specialist archaeological consulting firm, to undertake a literature review to support the development of a comprehensive description of Sea Country, including cultural values and sensitivities

Through these processes, and in particular, consultation with First Nations Groups, Beach is confident that the cultural heritage values, and cultural features and sensitivities of First Nations groups within the Operational and Planning Area have been identified.

6.6.2 Recognition of First Nations Groups

First Nation Groups and Traditional Owners and connection to Country is recognised through contemporary laws such as the Commonwealth *Native Title Act (1993),* as well as various State laws and agreement making (e.g. *Traditional Owner Settlement Act 2010 (Vic)* and Aboriginal Heritage Acts).

While connection to Country for some First Nations Groups has been formally recognised through native title, other First Nations Groups and their connection and rights to land and sea is recognised through relevant State legislation.

A review of the statutory laws, rights and recognition conferred to First Nations Peoples within the Planning Area is summarised in the below sections.

6.6.2.1 Native Title

The Commonwealth *Native Title Act 1993* is an Australia-wide native title scheme with the following key objectives:

- Providing for the recognition and protection of native title.
- Establishing a mechanism for determining claims to native title.
- Establishing ways in which future dealings affecting native title (future acts) may proceed.

Native title is the formal recognition that Aboriginal and Torres Strait Islander people have rights and interests to land and waters according to their traditional law and customs.

A key principle for native title determination is for First Nation's people to establish and prove that Indigenous people have an unbroken and current connection to their lands and waters and in practicing their culture from the time of European settlement.

Native title can be granted with non-exclusive or exclusive rights to lands and waters. Non-exclusive native title can include, for example, the right to live and camp on an area, and hunt and fish, and can co-exist with the rights of other land users. In sea areas, only non-exclusive native title can be recognised as exclusive native title is considered inconsistent with other common law rights regarding marine access and navigation (NNTT 2010).

The Federal Court of Australia first recognised native title over the sea for the Traditional Owners of Croker Island in Arnhem Land in 1998 (Tribunal File No. DCD 1998/001). Since the Croker Islands Seas native title determination, (non-exclusive) native title in sea country has been recognised along Australia's coastline through numerous claims and determinations under the *Native Title Act 1993*.

A search of the National Native Title Tribunal (the Tribunal) database identified the following native title claims and consent determinations within the Planning Area.

6.6.2.1.1 Victoria

6.6.2.1.1.1 Eastern Maar People

The Eastern Maar People made application to the Federal Court of Australia for a native title claim which was accepted and registered on 20 March 2013 (Tribunal File No. VC2012/001). A consent determination by the Federal Court of Australia recognising the native title rights for the Eastern Maar Peoples was registered on 28 March 2023 (Tribunal File No. VCD2023/001). The native title area is located in south-western Victoria near Port Fairy along the Great Ocean Road, up to Ararat in the north, and to Colac in the East and extends seaward 100 m from the mean low-water mark of the coastline (Figure 6-91; NNTT 2023).

A second consent determination, Eastern Maar People (No 2) was registered on 21 March 2024 (Tribunal File No. VCD2024/001) determining that native title exists in the entire determination area.

The determinations recognise Eastern Maar's non-exclusive right to access, use, and protect public land in accordance with their traditional law and custom. The Eastern Maar First Nations Corporation (EMAC) is the registered native title body corporate under the *Corporations (First Nations and Torres Strait Islander) Act 2006* and manages the native title rights for the Eastern Maar Peoples.

6.6.2.1.1.2 Gunditjmara - Part A

A consent determination recognising the native title rights of the Gunditjmara People was registered on 30 March 2007 (Tribunal File No. VCD2007/001) over 140,000 ha in south-west Victoria (Figure 6-91). The determination recognises Gunditjmara People's native title rights and interests in traditional lands and waters and provides non-exclusive rights to access, use, and protect public land in accordance with their traditional law and custom. The Gunditj Mirring Traditional Owners Aboriginal Corporation (GMTOAC) is the registered native title body corporate under the *Corporations (First*

Nations and Torres Strait Islander) Act 2006 and manages the native title rights for the Gunditjmara Peoples.

6.6.2.1.1.3 Gunditjmara and Eastern Maar

On 27 July 2011, the Federal Court of Australia determined (Tribunal File No. VCD2011/001) that both the Traditional Owners represented by GMTOAC and the EMAC are the native title holders for the land and waters between the Shaw and Eumeralla Rivers from Deen Maar (including Yambuk) to Lake Linlithgow (Figure 6-91). The native title includes Deen Maar (Lady Julia Percy Island) which holds deep and significant cultural association for Traditional Owners.

6.6.2.1.1.4 Wadawurrung People

A native title claim application was registered for the Wadawurrung People on 24 July 2023 (Tribunal File No. VC2022/002). The claim area covers land and waters covering about 12,510 km^2 on the southern coast of Victoria (Figure 6-91). The application area is located southeast of Ararat and extends towards the coast around Sugarloaf, Geelong, and Port Phillip Bay.

6.6.2.1.1.5 Gunaikurnai People

A determination by the Federal Court of Australia recognising the native title rights of the Gunaikurnai People over parts of the determination area was registered on 22 October 2010 (Tribunal File No. VCD2010/001). This determination area exists outside but adjacent to the Planning Area.

The area covers the land and waters, including sea country, from Wilsons Promontory to Newmerella, and includes the culturally significant Nooramunga Marine & Coastal Park and Lakes Entrance and connected wetlands (Figure 6-91). The Gunaikurnai Land & Waters Aboriginal Corporation is the registered native title body corporate under the *Corporations (Aboriginal and Torres Strait Islander) Act 2006 and* manages the native title rights for the Gunaikurnai People.

6.6.2.1.2 Tasmania

There are no native title areas in Tasmania.

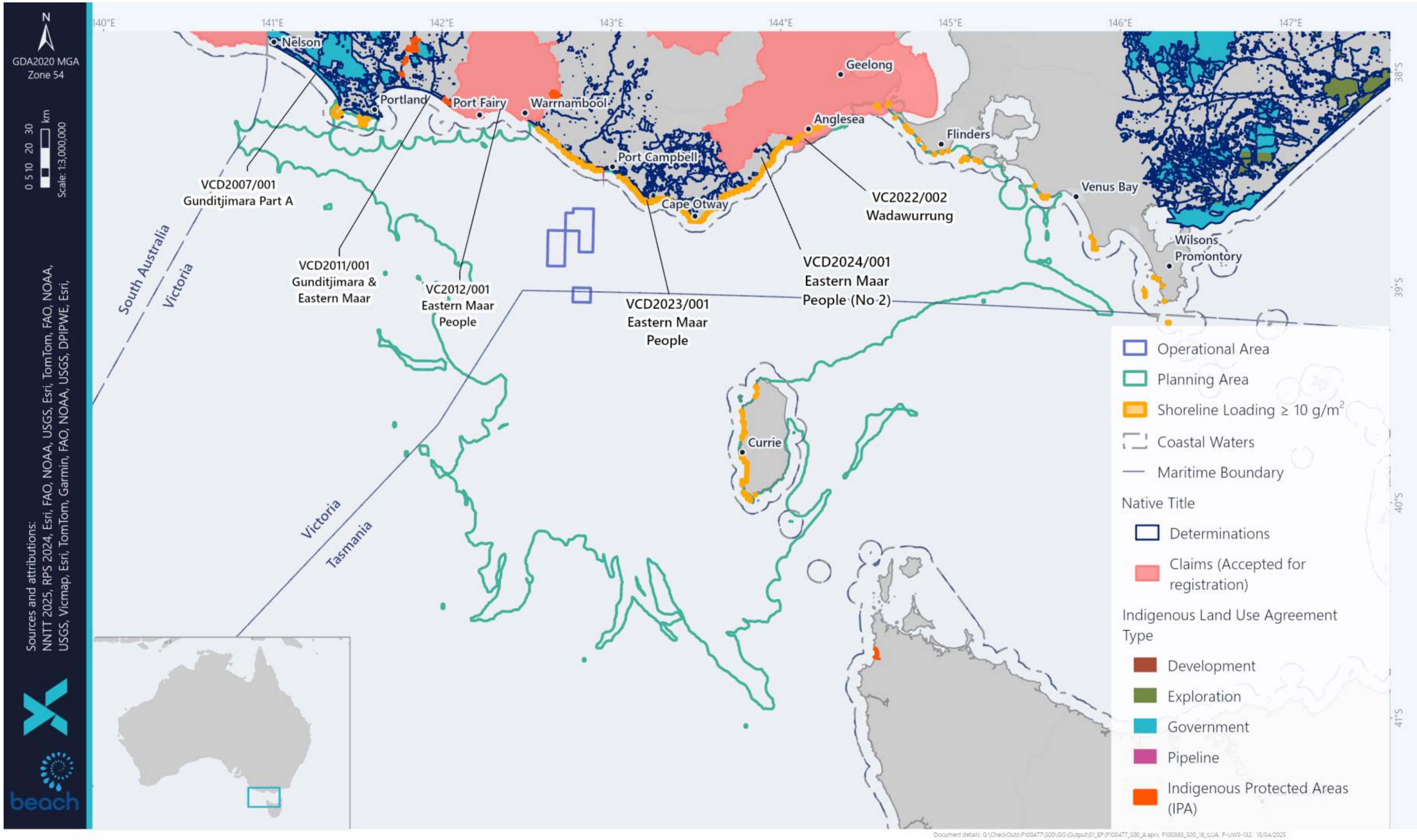


Figure 6-91: Native Title and Indigenous Land Use Agreements within the Planning Area.

6.6.2.2 Registered Aboriginal Parties

As an operator in Victoria, Beach is also cognisant of the *Aboriginal Heritage Act 2006 (Vic)* (AHA 2006 VIC) that recognises a Registered Aboriginal Party (RAP) as the Traditional Owner Corporation to manage and protect First Nations cultural heritage over their Country including coastal and onshore waters. The AHA 2006 VIC recognises RAPs as the primary guardians, keepers and knowledge holders of First Nations cultural heritage and the primary source of advice and knowledge on matters relating to First Nations places or objects in the appointed RAP region.

The following groups are recognised RAPs within the Planning Area described in this EP:

- Bunurong Land Council Aboriginal Corporation
- Eastern Maar Aboriginal Corporation
- Gunditj Mirring Traditional Owners Aboriginal Corporation
- Wadawurrung Traditional Owners Aboriginal Corporation

Figure 6-92 details the location of these Registered Aboriginal Parties.

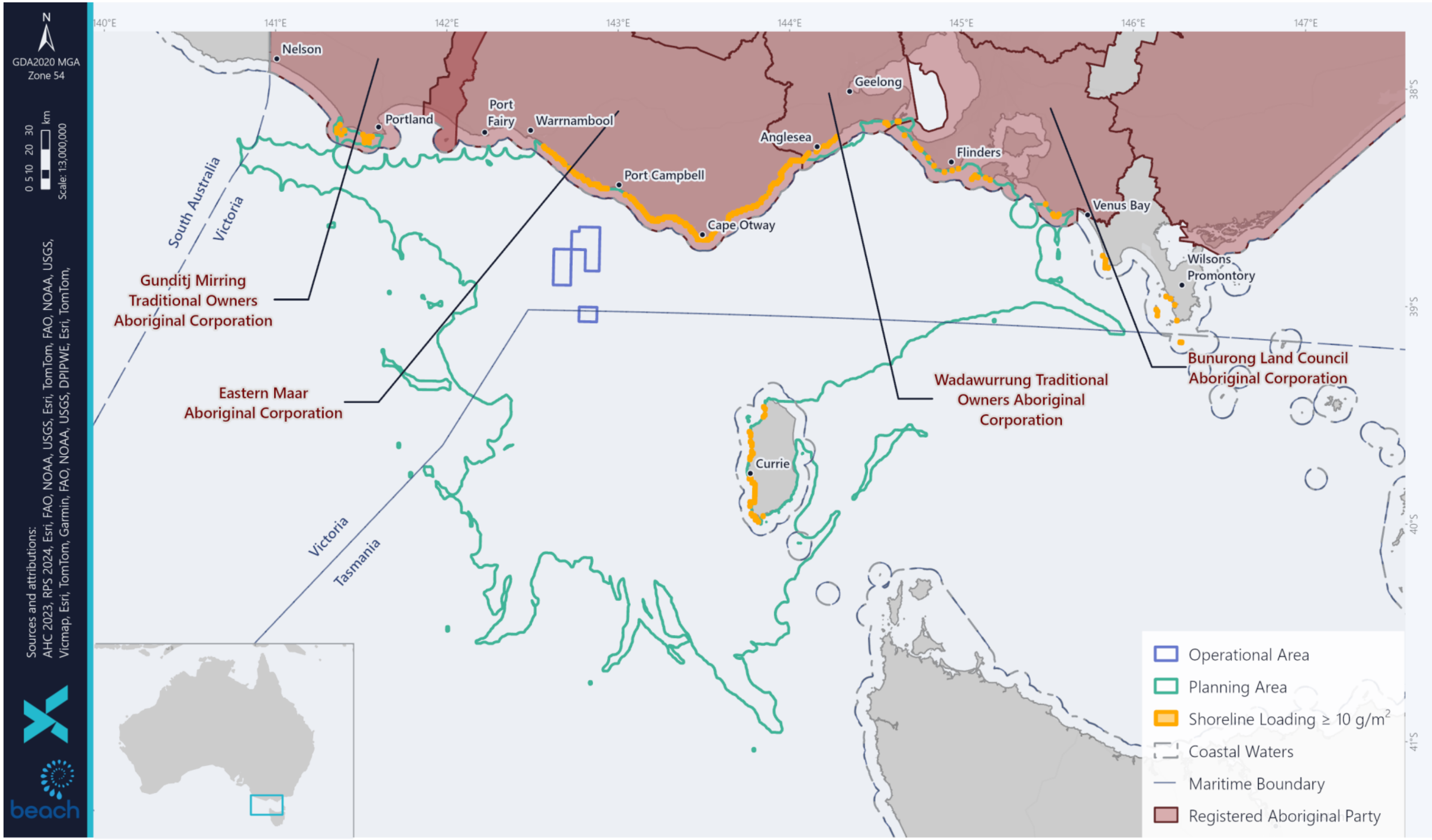


Figure 6-92: Victorian Registered Aboriginal Parties within the Planning Area.

6.6.2.3 Indigenous Land Use Agreements

An Indigenous land use agreement (ILUAs) is a voluntary agreement between a native title group and other parties on the use and management of land and waters. ILUAs are established by the *Native Title Act 1993*.

No registered ILUAs were identified within the Operational Area. The following ILUAs have been identified in the Planning Area:

- VI2006/004: Gunditj Mirring and State of Victoria.
- VI2010/001: Gunditj Mirring Non-Extinguishment Principle ILUA.
- VI2015/002: Gunditjmara – SEAGAS Port Campbell VIC to Torrens Island SA Pipeline ILUA.
- VIA1999/001: BHPP – Minerva.
- VIA2000/004: Blairgowrie.

ILUA locations are shown in Figure 6-91.

6.6.2.4 Land Rights

Most states and territories have legislation which sets out land rights arrangements with First Nations peoples within their jurisdiction. In most cases the statutory land rights legislation does not extend to marine areas. An exception is under the *Traditional Owner Settlement Act 2010* (Vic) which provides the possibility of agreements to extend to marine areas.

6.6.2.4.1 Victoria

In Victoria, the *Traditional Owner Settlement Act 2010* (Vic) was developed as an alternative approach to the native title process that recognises traditional owners' relationship to land and provides certain rights on Crown land.

The Gunaikurnai People entered into an agreement with the State of Victoria under the *Traditional Owner Settlement Act 2010* (Vic). An agreement to commence negotiate a recognition and settlement agreement between the Eastern Maar and the Victorian Government under the *Traditional Owner Settlement Act 2010* was announced in 2017 (Justice and Community Safety (Vic) 2023).

In Victoria, the *Aboriginal Nations Heritage Act 2006* (Vic) recognises a Registered Aboriginal Party as the Traditional Owner to manage and protect First Nations cultural heritage over their Country including coastal and onshore waters.

6.6.2.4.2 South Australia

In South Australia, the *Aboriginal Land Trust Act 2013* (SA) is land rights legislation that provides for land to be acquired, held, and managed by the Aboriginal Lands Trust. No land rights have been granted or agreed under the relevant SA legislation within the Operational or Planning Area.

6.6.2.4.3 Tasmania

Tasmania does not have a First Nations land rights legislative regime. Rather, under the *Aboriginal Lands Act 1995* (Tas), grants of land parcels of historic or cultural significance ‘to promote reconciliation with the Tasmanian Aboriginal community’ may be made and vested in the Aboriginal Land Council of Tasmania. Some islands in the Bass Strait and adjacent to the Planning Area, such as Badger Island and Clarke Island, were returned to the Tasmanian First Nations community under the *Aboriginal Lands Act 1995*.

6.6.2.5 Indigenous Protected Areas

Indigenous Protected Areas (IPAs) are areas of land and sea managed by First Nations groups through their custodianship and stewardship obligations for Country. IPAs deliver biodiversity conservation outcomes for the benefit of all Australians, through voluntary agreements the Traditional Owners of land or sea and the Australian Government. The IPA program has a dual purpose of achieving conservation obligations and providing sustainable uses to deliver social, cultural, and economic benefits for local Indigenous communities. Indigenous People are active participants in the management of IPAs through land and sea ranger programs and other custodian and management activities.

No IPAs were identified in the Operational Area or Planning Area (Figure 6-91). One future sea country IPA is likely to overlap with the Planning Area which is described below.

6.6.2.5.1 Future Sea Country IPAs

The Australian Government, through DCCEEW, is expanding the IPA program. In 2021-22 the Australian Government announced a program to expand the IPA network to include coastal and marine areas (the Sea Country IPA Program). Through the Sea Country IPA Program, the Australian Government is seeking to strengthen the conservation and protection of the marine and coastal environments, while creating employment and economic opportunities for Indigenous People (DCCEEW 2024l).

Of the ten future Sea Country IPA consultation projects announced in 2022, one is located within the Planning Area (DCCEEW 2024l). No spatial data is available for the Sea Country IPAs at the time of writing.

6.6.2.5.1.1 Gunditjmara Sea Country IPA, Victoria (Gunditj Mirring Traditional Owners First Nations Corporation with Eastern Maar First Nations Corporation)

The IPA consultation area is located in south-west Victoria from the Convincing Ground north-east of Portland to Yambuk Lakes in the east. The area includes volcanic plains, rivers, coast, estuaries, and coastal wetlands, and is an important breeding place and nursery for fish, eels, and birds, including nationally listed species. The area's waters encompass sites of national geological and geomorphological importance, and habitat for threatened marine animal species. The area also incorporates important cultural sites such as Deen Maar Island, which has a central role in the creation story of Gunditjmara Country. Whilst Budj Bim is located outside of the Operational Area and Planning Area, the Sea Country IPA Program will allow Traditional Owners to further protect the Budj Bim Cultural Landscape with activities including implementation of on land/sea management activities; community employment and capacity building; sharing and documentation of traditional knowledge; and the development and enhancement of regional partnerships.

6.6.3 Cultural Values and Sensitivities

6.6.3.1 Country and Sea Country Overview

Country is a cultural landscape, and includes the tangible (cultural heritage) and intangible (song, creation stories and cultural practices). First Nations cultural concepts are firmly intertwined with the nature of the environment, of Country. Country describes all aspects of place, environment, spirituality, law, and identity. Part of Country that extends into the oceans is known as Sea Country. Values of Country differ between First Nations groups, and not all First Nations groups and communities in Australia hold the same belief systems as formational pillars of their community or spirituality. Differences can be due to aspects of post-colonialism, such as dispossession, genocide, and cultural practice restrictions.

Due to the varied culture and history of First Nations groups, and in particular owing to various degrees of dispossession and removal from country, loss of connection, and continuation of culture, the responses of First Nations communities to caring for and talking about Country are different throughout Australia. These individualised but community-based beliefs and values contribute to the need for a varied and responsive approach to managing cultural (tangible and intangible) values.

A cultural landscape is about both pre-colonial and contemporary interactions between humans and the physical environment including non-human animals, plants, physical structures, ancestors, song lines, trade routes and other significant cultural connections to Country. Cultural landscapes are reflections of how First Nations people engaged with Country, as they see that landscape features are not just physical features, their understanding is that the landscape intrinsically connects the past and the present to people, stories, and history.

Smyth and Isherwood (2016) describe Sea Country as all estuaries, beaches, bays, and marine areas collectively, within a traditional estate. Sea Country contains evidence of the ancient mystical events by which all geographic features, animals, plants, and people were created. Sea Country contains sacred sites and contains tracks (or song lines) along which mythological beings travelled during the creation period (Smyth and Isherwood 2016). The sea, like the land, is integral to the identity of First Nations groups. Formal recognition of Sea Country rights lags considerably compared to land rights; this could be for a range of reasons including conflicting perspectives and opinions on traditional custodianship of land and how far it extends (Smyth and Isherwood 2016).

Coastal areas were amongst the most densely populated areas, due to abundance of resources. Sea Country, as it does on land, has been found to contain evidence of the ancient Dreamtime events by which all geographic features, animals, plants, and people were created. Sea Country may contain sacred sites, which may be related to these creation events, and it contains tracks (or Songlines) along which ancestral beings travelled during the creation period. Sea Country has a continuing cultural value because of the connection to creation and dreaming stories, ceremonial sites, and places of occupation.

Country is the term often used by First Nations people to describe the lands, waterways, and seas to which they are connected. The term contains complex ideas about law, place, custom, language, spiritual belief, cultural practice, material sustenance, family, and identity (AIATSIS 2022). Sea Country also known as Saltwater Country extends into the Operational Area and Planning Area.

6.6.3.2 Sea Country within the Operational Area and Planning Area

There are First Nations groups with Native Title recognition in areas adjacent to the Operational Area and Planning Area. However, it is important to also acknowledge and respect the intangible cultural values and sensitivities that exist for other First Nations groups described in this section that are not directly adjacent to the Operational Area, due to the interconnectedness of marine ecosystems and existences of various marine fauna and flora and intangible cultural values. Table 6-38 summarises the First Nations peoples groups in relation to the Operational Area and Planning Area.

Table 6-38: First Nations peoples groups within the Operational Area and/or Planning Area

First Nations Group	Operational Area	Planning Area
Eastern Maar	✓	✓
Gunditj Mirring	-	✓
Wadawurrung	-	✓
Bunurong	-	✓
Gunaikurnai	-	-

First Nations Group	Operational Area	Planning Area
Palawa (Tasmania)	✓	✓

The land adjacent the Operational Area and Planning Area is the traditional land of the Eastern Maar Peoples legally represented by the EMAC. EMAC is both a Registered Aboriginal Party and a Recognised Native Title Prescribed Body Corporate. Eastern Maar land extends north to Ararat and encompasses Port Fairy, Warrnambool, Port Campbell, and other areas along the Great Ocean Road. It also extends 100 m out to sea from low tide and therefore includes the iconic Twelve Apostles (EMAC 2024). Based on consultation, Eastern Maar have always had a close connection with Sea Country which has nourished and supported their ancestors for thousands of years. Sea Country for Eastern Maar holds significant Dreaming stories, telling the story of their ancestors movement across Country. Harvesting of eel, or “Kooyang”, is incredibly important to the Eastern Maar today and remains a cultural practice handed down from their ancestors.

The land adjacent the Planning Area includes the traditional lands of the Wadawurrung people. Sea Country, or “Warre” for Wadawurrung extends from Painkalac Creek at Aireys Inlet, east into Port Phillip Bay and to the Werribee River and to the north as far as Mt Emu and Fiery Creeks (Clark 1990). Based on consultation, for the Wadawurrung peoples, Warre, holds the stories and footprints of their ancestors, with Warre being a place to meet, trade, share meals and practice ceremony. Eel, or Beniyak, have cultural significance to the Wadawurrung peoples.

The Wadawurrung native title claim and registration decision (Tribunal File No. VC2022/002) state that the claimants see Wadawurrung country and its waters as an anatomical being, with its head to the south, spine to the east, feet to the north and the arms lying along the Otway coast. This posture and orientation is replicated in traditional burial practices. Names of places in Wadawurrung language also follow the same theme and are named after body parts, like spine, head, tongue, or elbow. The Wadawurrung ‘see our Dja land and Warre sea Country as all one’ (WTOAC 2020).

Also adjacent to the Planning Area is the lands and Sea Country of the Gunditjmara. Gunditjmara recognise four types of landscape across their Country Sea Country, as one of the four, “Koonang Mirring” is defined by the meeting of salt and fresh water. Abundant in shellfish, fish, and birds, it also has a history of conflict and violence between the Gunditjmara and colonial settlers. Koonang Mirring includes the submerged landscape and the place where the spirits of Gunditjmara ancestors cross the sea to Deen Maar (CoA 2017b). The Gunditjmara published their Sea Country Plan, Gunditjmara Nyamat Mirring Plan 2023-2033, on 13 March 2024 (GMTOAC 2023). This plan details Gunditjmara’s values and species of cultural significance in the Sea Country.

The Bunurong First Nations peoples are the Traditional Owners of the Victorian land adjacent to the Planning Area. They are represented by the Bunurong Land Council Aboriginal Corporation (BLCAC). Bunurong Country extends from the Werribee river to Wilsons Promontory includes some of the submerged land bridge to Tasmania. Through consultation with Beach, BLCAC advised that Sea Country is very significant for cultural practices and ceremony. Eels hold special cultural significance for the Bunurong people.

The Operational Area and Planning Area are also adjacent to lutruwita (Tasmania) The palawa (Tasmanian First Nations) are the Traditional Owners of lutruwita (Tasmania). Palawa people have inhabited Tasmania for at least 35,000 years. At the end of the last ice age the sea level rose, and Tasmania became isolated from the mainland of Australia. They survived in the changing landscape partly due to their ability to harvest aquatic resources, such as seals and shellfish. Following conflict between the European colonists and the Tasmanian First Nation peoples, many were relocated to missions on Bruny Island, Flinders Island, and other sites, and finally to Oyster Cove. Through consultation with Department of Premier and Cabinet and Department of Aboriginal Affairs Tasmania, Beach understands that kelp, whales, and mutton birds hold special cultural significance for First Nations peoples on mainland Tasmania, King Island and Flinders Island.

6.6.3.3 Sea Country Values

The Planning Area overlaps the South-east Marine Region. Indigenous uses and values within the South-east Marine Region are described in Sea Country - an Indigenous Perspective (NOO 2002). Specifically, Indigenous activities described in the South-east Marine Region Profile (CoA 2015) state:

Most parts of coastal Australia are of continuing cultural and spiritual significance to Indigenous people, many of whom engage in subsistence hunting, fishing and gathering and depend directly on marine resources for food. Through their involvement in commercial activities, many Indigenous people also depend on marine resources for their income.

Fishing is an important part of Indigenous culture, and a variety of methods and equipment are used, including hand gathering, lines, rods and reels, nets, traps and spears. Indigenous fishing targets a range of species of fish, shellfish, crabs and worms that are used for food, medicine or bait. Abalone, crab and lobster harvesting are important Indigenous fisheries. Indigenous people in south-eastern Australia engage in fishing and shellfish collecting on a regular basis and are involved in commercial fishing activities.

First Nations people in the South-east Marine Region have articulated particular aspirations in terms of access rights and traditional use of marine resources, participation in management processes, and participation in the fishing sector.

First Nations people’s interests in the South-east Marine Region, are diverse and complex. Indigenous people live around the region in major cities, regional centres, small towns and on First Nations land. Coastal areas of southeast Australia were amongst the most densely populated regions of pre-colonial Australia. These highly populated areas provided an abundance of marine and other resources. However, we know that many have been displaced from the coastal areas (NOO 2002).

It is recognised that spiritual corridors extend from terrestrial areas into nearshore and offshore waters, that a number of marine animals are totems for Indigenous people, and that songlines pass through marine parks.

6.6.3.4 Sea Country Values - Resources

6.6.3.4.1 Adornment and Function

Frequently, tangible resources, such as food items, animal and plant species, and other resources, such as stone, bone and wood, are also tied strongly to intangible elements of First Nations culture. First Nations people of Tasmania, the palawa, were noted for creating durable and waterproof containers of sea-kelp threaded and dried to shape on wooden handles. In addition, shells were collected and worn as adornment. Throughout south-eastern Australia, reports of seaweed use include for cultural and ceremonial activity, medicine, clothing, food, fishing, and domestic/shelter uses (Thurstan et. al 2017). The Wadawurrung, for example, used “pink seaweed” as a poultice for jellyfish stings (Lane 1980).

Other fish and shellfish species have been noted by community during consultation, including abalone, cockles, and rock lobster (crayfish). The Eastern Maar have noted the migration routes of crustaceans as of notable significance. The Wadawurrung mention that crayfish, mussels, oysters, pipis, and fish provided important bush tucker, medicines, and other resources. Fish were caught using hooks, nets, and traps (WTOAC 2020). Other species were specifically not eaten or associated with other custom, for example, the Stingray (Baalangurk) was not eaten by the Kurnai (Howitt n.d.). Swans were hunted with boomerangs and spears, whilst other birds were caught in nets woven from plant fibres (WTOAC 2020).

6.6.3.4.2 Eels

It has been well documented that the Gunditjmara employed complex systems of aquaculture, comprising channels, weirs, and dams, to harvest kooyang (eels) on their Country (CoA 2017a). The migration of juvenile eels from freshwater to the ocean to mature and breed is integral to the survival of the species, and their physical health is inherently tied to the spiritually of the Gunditjmara. The aquaculture system is an economic and social base for Gunditjmara society (CoA 2017a). Eels and their migration are also held in social and cultural significance by the Eastern Maar, as neighbours to the Gunditjmara sharing many similar beliefs of their significance. Other coastal and river groups, including the Wadawurrung (buniya) and Bunurung, also utilised eels as an important resource and seek to protect their migration along rivers, creeks, and into the oceans. Section 6.4.9.3 provides more details on eels.

The Kulin and Kurnai Dreaming Story of Lo-an includes Lo-an and his wife Lo-an-tuka surviving mostly on eels cooked in a marin-a-thung (earth oven) on the Yarra flats. After finding a feather on his chest, Lo-an with Lo-an-tuka proceeded to follow the breeze to find the swans that the feather had come from and walked to the shores of Western Port. They camped for a long time feeding on swans and continued following the coastline to Corner Inlet. The Kulin believe they became the stars Sirius and Canopis. The Kurnai believe Lo-an is upon his mountain and looks out towards to sea, watching over the people (Massola 1968).

6.6.3.4.3 Whales

Through consultation, whales and whale migration have been noted as of significance by coastal groups in Victoria. Eastern Maar have noted the migration routes of the southern right and blue whale as of social and cultural importance. The same whale species are similarly noted by the Gunditjmara and Wadawurrung.

First Nations communities in the south-east of Australia often saw whales as spirits that transformed when they entered the water, creating a respectful relationship between whales and First Nations communities.

Kartnubul (whales) have featured in dreaming stories, ceremony, song and dance of Gunditjmara people for millennia. Gunditjmara maintain a strong spiritual connection to all species of whales that travel through Gunditjmara country (GMTOAC RNTBC 2023). Karntabul yarkeen (whale dreaming) stories connect Aboriginal groups all along the coasts of Australia, neighbouring groups in Victoria, including Gunditjmara, still gather today to strengthen the connection of groups to whales and their stories. The arrival of Karntabul in Gunditjmara waters also signifies the beginning of the ‘big wet’ season (May-Oct), 1 of 6 Gunditjmara seasons. Whales are also a food source, in traditional times, tribes would send up smoke signals and gather when whales got beached. Protection of whales is paramount to Gunditjmara spiritual, physical wellbeing (GMTOAC RNTBC 2023).

Whale hunts took place from small, shore-based vessels, and targeted smaller animals (Eldridge 2015). First Nations methods of hunting may have included using fire and smoke to lure the whales to the coast and bays (Eldridge 2015), and the opportunistic utilisation of beached whales also occurred, which may have prompted periods of intense gathering of people and ceremony like those observed by early settlers such as Henty (Eldridge 2015). In Howitt's notes on the Kurnai, whales are called Ganda - 'Dead whales thrown up by the sea were supposed to have been killed by the Mrarts [ghost or spirit] and birds called Yauruk [or Yara-wuk] and sent ashore. The Mrarts then communicated to the Biraaks who told the Kurnai where to go and find the Ganda. (Howitt n.d.).

The Gunaikurnai have noted bottlenose dolphin at Lakes Entrance, and the significance of dolphins is echoed by the Wadawurrung. Wesson (2001) notes that 'the souls of prominent community leaders [were] reincarnated as dolphins and orcas'.

6.6.3.5 Sea Country Intangible Values

Landforms and landscape features in and surrounding watery places are known to hold particular significance for First Nations coastal communities. Islands off the Southern Ocean coastline have cultural importance to First Nations people as Islands of the Dead and are frequently connected to the shore by journey-after-death stories (Draper 2015).

For example, the Gunditjmara of Western Victoria seasonally occupied the caves and escarpments in the coastal limestone karst formation. These caves at Cape Bridgewater are associated with Bunjil who descended from the caves where he resided to walk along the shoreline (Bonwick 1858). The Gunditjmara believe that 'Bunjil, their creator and eagle and his brother Pallian ascended to the sky from Deen Maar in a sheet of flame after creating the land and sea and all living things' (Draper 2015). Mathews (1904) noted that the Gunditjmara buried their dead on the mainland with their heads pointed to Deen Maar island where their souls would be transported to await reincarnation. Dawson (1881) records that a haunted cave, Tarn wirring 'road of the spirits', is believed to form a passage between the mainland and the island, and the good spirit 'Put put cheptech' conveys the spirit from the island to the clouds. Other Islands in south-eastern Australia, such as Kangaroo Island (Karta), hold similar stories.

Contact and post-contact places are also noted to be in or adjacent to Sea Country, and these include sites of massacre and dispossession. The site of the Convincing Ground massacre (1833/34), where a group of whalers murdered Gunditjmara over ownership of a stranded whale, is located north of Allestree on the Portland coast. This place continues to be a place of great sorrow for the community. Other coastal massacre sites include on the Aire River Estuary at Cape Otway (1846), Eurmerella (1842), Freshwater Creek (1843) Twofold Bay (1806), and Cape Grimm (1828) (Newcastle University 2024). Missionary activity and forced removal of First Nations people in Tasmania resulted in detainment of First Nations people on Flinders Island (at Wybalenna). Other First Nations groups were taken to Swan Island and Gun Carriage Island. This detainment resulted in significant loss of life, and a loss of culture, language, and connection.

6.6.3.5.1 Law, Spirituality and Songlines

Intangible heritage refers to the cultural assets, cultural knowledge and intellectual property collectively held by First Nations and may involve practices, oral traditions, ancestral narratives, performing arts, local knowledges and practices concerning nature, the environment, and the universe. Intangible cultural heritage performs an important function of safeguarding to recognise and protect knowledge and skills that are transmitted through it from one generation to the next.

Songlines are described as short songs pertaining to the travels and exploits of ancestral beings during the Dreamtime. These songs are usually sung in association with a ritual activity, particularly dancing (Tonkinson 1972). Songlines are stories ancestral beings which includes creation stories, they are multipurpose the stories educate and uphold traditional lore, they are also communication and trade routes. (Fuller & Busill 2021).

Understanding First Nations songlines and stories also means understanding the Dreaming. Often described as the 'Dreamtime', or 'deep time', recognising the existence of Dreamtime beyond the Western concept of past, present, and future.

First Nation's people around Australia have long had a strong connection to whales, which has significance as totemic ancestors to some groups. The arrival of whales along Australia's coastline marked the arrival of the "elders of the sea", which follows a songline or ancient memory code, that traces the journeys of ancestral spirits as they created the land, animals, and lore.

In Victoria, Koontapool (southern right whales) occur along the coastlines of south-west Victoria in Gunditjmara Sea Country to feed and birth. These Koontapool Woorrkngan Yakeen (Whale Birthing Dreaming Sites), are in coastal bay areas from Port Campbell to Portland, including Warrnambool. These places on Gunditjmara Country are known resting and feeding sites for mothers and calves and are directly related to Gunditjmara Neeyn (midwives), explaining why Gunditjmara is a Matrilineal Nation. (DCCEEW 2024k).

A Kulin Dreaming story includes Angel Cave (between Port Philip and Western Port) where "One Day Bunjil, the All Father, was walking upon the sea, when suddenly there rose a great storm. Bunjil walked to the rocky shore and spoke to it, and immediately the shore rose up into a cliff and the cave was made before his eyes. Bunjil stepped into it and sheltered there till the storm was over' (Massola 1968).

A Kurnai Dreaming story of Port Albert includes the sick frog, Tide-lek, who drank all the water from the land. He didn't feel sick anymore, but he felt bad for leaving the people with nothing to drink. He walked across Port Albert one day and everyone tried to make him laugh to regurgitate the water, but they all failed until No-yang (the eel) danced on his tail and Tide-lek laughed and the land flooded. Many people died or were marooned, forming the islands. The pelican saved people with a large canoe. As part of this Dreaming Story, the pelican also formed the white pipe-clay used for ceremony at White Rock, the southernmost Island of the Seal Group east of Wilsons Promontory (Massola 1968).

As part of the Kurnai creation stories the first man and woman were Borun the pelican, and Tuk the musk duck (VACL 2014). Totemic Species are spiritually important and can be bestowed in a number of ways – through family relations or through ceremony. Randall Mumbler, from the Eurobodalla region, for example, discusses that '… Fish are more likely to be ceremonial totems; it is not common to have a fish as a totem… I have certain species that I can't fish for or eat. These rules have been placed upon me through ceremony and so I stay away from them. There are certain fish that my brother and I never eat. That is also like a conservation thing...it keeps that species alive...” Randal Mumbler (in Donaldson 2012).

The Eastern Maar discuss their connection to Sea Country noting that the sea was ‘central to our culture, economy, and survival. The coastline is home to sites that are important for our Dreaming - Three Sisters Rocks and Deen Maar (Lady Julia Percy Island) where our Ancestors leave the earth. Our connection with our Sea Country extends well beyond the current shoreline to the edge of the continental shelf. While this area is under the sea today, we occupied it for thousands of years and rising sea levels have not washed away the history, physical evidence or our connection (EMAC 2015).

6.6.3.6 Submerged Cultural Heritage and Landscapes

First Nations peoples in Victoria have occupied, used, and managed sea country for thousands of years, including areas now submerged by sea level rise since time immemorial. An understanding of submerged landscapes and sea level changes may be evident from stories from First Nations groups, “Indigenous peoples still relate to land that was inundated by sea during the last ice age and regard it as their own” (NOO 2002).

The lava flows of the World Heritage listed Budj Bim Cultural Landscape (which is outside of the Operational Area and Planning Area) have recently, through ocean scanning methods, been revealed to extend into the sea. The mapping of this geological formation allows the Gunditjmara to connect to Sea Country in new ways assisted by modern technology, as a supplement to their traditional knowledge and ancient connection to the sea. There is potential that early cultural deposits relating to aquaculture systems have been preserved in association with this formation, and as stated above evidence of this kind is highly significant to Gunditjmara.

6.6.3.7 Conservation and Contemporary Cultural Values

It is frequently raised by First Nations communities that ecological protection and sustainability is integral to First Nations cultural and contemporary values. Sea Country Plans, such as those completed by the Wadawurrung (WTOAC 2020), and Eastern Maar (EMAC 2015), highlight the importance of approaches that protect and enhance the environment, including biodiversity, coastal erosion, management of sea level rise and addressing climate change impacts. Goals include managing impacts to whale migration, bird and bat nesting and migration (such as the microbat, bent-wing bat, and orange-bellied parrot), protection of environmentally fragile resources such as seagrass and kelp fields, as well as securing habitat for threatened species such as the leafy seadragon.

‘Increased pollution from coastal communities, agricultural and industrial run off is changing the sea hydrology and choking our sea life with plastics. Our Warre is being overused and heating up with climate changes. We are seeing the loss of our kelp forests and dramatic changes in sea life which we all depend upon’ (WTOAC 2020).

‘Our coastal dunes are layered with living places and hearths from the many generations of our ancestors living, harvesting, sharing meals, trading in these living places, and practicing ceremony here. We have the largest stretch of registered cultural sites in Australia along our coastline. Our fish traps, which were used to catch the abundant fish, have survived the storms and sea level changes. Ochre pits of different colours are dotted along our sandstone and limestone cliffs and headlands. Our sandy beaches, rock pools, rocky platforms and reefs were and continue to be places of abundance for harvesting food and resources like crustaceans, shellfish, and kelp’ (WTOAC 2020).

Seals, or Bithaui or Gurnun in Kurnai (Howitt n.d.), are noted by the Gunaikurnai as a significant species, and habitat for fur seals at Wilsons Promontory Marine National Park is identified as an important resource to be protected, particularly due to the reliance of species on both the land and sea for different life cycle stages. It is therefore considered important that programs for environmental management consider both land and marine environments, as they are interconnected and must be managed as a whole to ensure success (GLAWAC 2015).

Through the processes identified above, and in particular, consultation with First Nations Groups, Beach is confident we have identified the cultural heritage values, and cultural features and sensitivities of First Nations groups identified within the Operational Area and Planning Area.

6.6.4 Assessment of Potential Impacts and Risks to Cultural Values and Sensitivities

Section 7 evaluates the environmental impacts and risks of the Program and identifies where First Nations cultural values and sensitivities may be potentially affected. Where a potential impact to First Nations cultural values and sensitivities has been identified, details of the control measures, if required, to reduce impacts and risks from the Program are of an acceptable level and as low as reasonably practicable are provided.

Table 6-39: Summary of First Nations cultural values and sensitivities and where a potential impact has been identified

	Aspect - Planned							Aspect - Unplanned					Comment
	Light emissions	**Atmospheric emissions**	**Underwater sound**	**Physical presence**	**Seabed disturbance**	**MODU and vessel marine discharge**	**Completions, Interventions and P&A marine discharge**	**Invasive Marine Species**	**Fauna interaction**	**Loss of Materials or Waste**	**Loss of containment**	**Spill Response**	
Cultural Values													
Budj Bim Cultural Landscape													The Budj Bim Cultural Landscape is outside of the Operational and Planning Areas.
Onshore cultural heritage, relics, and artefacts											✓	✓	In the highly unlikely event of a spill onshore cultural heritage, relics and artefacts could be impacted. This is assessed in Section 7.13.5.5. for direct impacts and Section 7.14.7.4 in relation to oil spill response.
Submerged Cultural Heritage					✓								Submerged cultural heritage could be disturbed if present where the MODU anchors and drilling are located. This is assessed in Section 7.6.5.3.
Kelp Seagrass											✓		Section 6.4.3 provides details on kelp and Section 6.4.2 on seagrass. In the highly unlikely event of a spill, impacts to kelp and seagrass could occur if they were in areas where hydrocarbons may be present. This is assessed in Section 7.13.5.1.
Abalone (mutton fish)											✓		Abalone are generally found in water depths up to 30 m (VFA 2024a) which is outside of the Operational Area and EMBAs for planned aspects. In the highly unlikely event of a spill, impacts to abalone could occur if they were in areas where hydrocarbons may be present. This is assessed in Section 7.13.5.2.
Crab Rock lobster (crayfish) Crustacean migration route											✓		Section 6.4.7 provides details on invertebrate species such as crab and rock lobster. First Nations collection of crab and rock lobster would be within nearshore areas outside of the Operational Area. In the highly unlikely event of a spill, impacts to these species could occur if they were in areas where hydrocarbons may be present. This is assessed in Section 7.13.5.2. Impacts to crustacean migration route are not predicted from the program activites. This was raised during stakeholder consultation for the future OGV development in relation to pipelines which are not part of this EP scope.
Bimbalas (blood cockle *Anadara* spp) Mussels Oysters Pipis											✓		Collection of mollusc species such as bimbalas, mussels, oysters and pipis occurs nearshore outside of the Operational Area. In the highly unlikely event of a spill, impacts to the mollusc species could occur if they were in areas where hydrocarbons may be present. This is assessed in Section 7.13.5.2.
Eels (*Kooyang*)	✓		✓			✓	✓				✓		Section 6.4.8 provides detail on eels and their migration. Several EMBAs overlap where migrating eels may be present. See: Light – Section 7.2.5.1 and 7.2.5.4.

	Aspect - Planned							Aspect - Unplanned					Comment
	Light emissions	Atmospheric emissions	Underwater sound	Physical presence	Seabed disturbance	MODU and vessel marine discharge	Completions, Interventions and P&A marine discharge	Invasive Marine Species	Fauna interaction	Loss of Materials or Waste	Loss of containment	Spill Response	
													Underwater sound – Section 7.4.8.4 and 7.4.8.6. Vessel & MODU discharges – Section 7.7.5.2 and 7.7.5.3. Completions, Interventions and P&A discharges – Section 7.8 Loss of Containment – Section 7.13.5.2.
Fish - general	✓		✓			✓	✓				✓		Section 6.4.9.3 provides details on fish. Several EMBAs overlap where fish may be present. See: Light – Section 7.2.5.1 and 7.2.5.4. Underwater sound – Section 7.4.8.4 and 7.4.8.6. Vessel & MODU discharges – Section 7.7.5.2 and 7.7.5.3. Completions, Interventions and P&A discharges – Section 7.8 Loss of Containment – Section 7.13.5.2.
Fish - Blackfish													Blackfish are an inland river fish (VFA 2024b) and therefore outside of the Operational and Planning Areas.
Fish - Mullet													Sea mullet are particularly abundant in estuaries and coastal waters of NSW (DPI 2024). Mullet may also be an inshore species (Feary 2015). In Victoria sea mullet usually live in the less saline areas of Port Phillip, and often venture into the Yarra River (Port Phillip Bay 2024). These areas are not within any of the EMBAs for the planned aspects or unplanned aspects.
Birds - general	✓	✓								✓	✓	✓	Section 6.4.9.4 provides details on the birds with a focus on those that have BIAs or are undertaken biologically important behaviour. The Light EMBA and Operational Area where fauna interaction and loss of waste or materials could occur, overlap a number of bird BIAs. In the highly unlikely event of a spill, impacts to birds could occur if they were in areas where hydrocarbons may be present. They may also be present in areas where access is required for spill response activities. Light – Section 7.2.5.1 Atmospheric Emissions – Section 7.3.5 Fauna Interaction – Section 7.11.5.1 Loss of Materials or Waste – Section 7.12.4.1 Loss of Containment – Section 7.13.5.2 Spill Response – Section 7.14.7.1
Birds - Orange-bellied parrot	✓	✓							✓			✓	Section 6.4.9.4 provides details on the orange-bellied parrot. The Light EMBA and Operational Area where fauna interaction could occur, overlap the orange-bellied parrot migration route. In the highly unlikely event of a spill, impacts to orange-bellied parrots are not predicted as they do not land or forage at sea or on shorelines where hydrocarbons may be present. They may be present in areas where access is required for spill response activities.

	Aspect - Planned							Aspect - Unplanned					Comment
	Light emissions	**Atmospheric emissions**	**Underwater sound**	**Physical presence**	**Seabed disturbance**	**MODU and vessel marine discharge**	**Completions, Interventions and P&A marine discharge**	**Invasive Marine Species**	**Fauna interaction**	**Loss of Materials or Waste**	**Loss of containment**	**Spill Response**	
													Light – Section 7.2.5.1 Atmospheric emissions – Section 7.3.5 Fauna Interaction – Section 7.11.5.1 Spill Response - 7.14.7.1
Birds – muttonbird	✓	✓							✓	✓	✓	✓	Section 6.4.9.4 provides details on the short-tailed shearwater (muttonbird). The Light EMBA and Operational Area where fauna interaction and loss of waste or materials could occur, overlap the short-tailed shearwater foraging BIA. In the highly unlikely event of a spill, impacts to short-tailed shearwaters could occur if they were forage at sea where hydrocarbons may be present. They may also be present in areas where access is required for spill response activities. Light – Section 7.2.5.1 Atmospheric emissions – Section 7.3.5 Fauna Interaction – Section 7.11.5.1 Loss of Materials or Waste – Section 7.12.4.1 Loss of Containment – Section 7.13.5.2 Spill Response – Section 7.14.7.1
Bats													Bats may be present in coastal areas of the Planning Area but impacts from hydrocarbon exposure are not predicted to caves including maternity caves.
Dolphins			✓			✓	✓		✓	✓	✓		Section 6.4.9.7 provides details on dolphins. The Underwater Sound EMBA and Operational Area where discharges, fauna interaction and loss of waste or materials could occur, overlap where dolphins may be present. In the highly unlikely event of a spill, impacts to dolphins could occur if they were in areas where hydrocarbons may be present. Underwater sound – Section 7.4.8.2 Vessel & MODU discharges – Section 7.7.5.2 Completions, Interventions and P&A discharges – Section 7.8 Fauna Interaction – Section 7.11.5.1 Loss of Materials or Waste – Section 7.12.4.1 Loss of Containment – Section 7.13.5.2
Whales Blue Southern right Orcas Migration routes			✓			✓	✓		✓	✓	✓		Section 6.4.9.7 provides details on whales. The Underwater Sound EMBA and Operational Area where discharges, fauna interaction and loss of waste or materials could occur, overlap where whales may be present. In the highly unlikely event of a spill, impacts to whales could occur if they were in areas where hydrocarbons may be present. Underwater sound – Section 7.4.8.2 Vessel & MODU discharges – Section 7.7.5.2

	Aspect - Planned							Aspect - Unplanned					Comment
	Light emissions	**Atmospheric emissions**	**Underwater sound**	**Physical presence**	**Seabed disturbance**	**MODU and vessel marine discharge**	**Completions, Interventions and P&A marine discharge**	**Invasive Marine Species**	**Fauna interaction**	**Loss of Materials or Waste**	**Loss of containment**	**Spill Response**	
													Completions, Interventions and P&A discharges – Section 7.8 Fauna Interaction – Section 7.11.5.1 Loss of Materials or Waste – Section 7.12.4.1 Loss of Containment – Section 7.13.5.2
Seals			✓			✓	✓		✓	✓	✓		Section 6.4.9.6 provides details on seals (pinnipeds). The Underwater Sound EMBA and Operational Area where discharges, fauna interaction and loss of waste or materials could occur, overlap where dolphins may be present. In the highly unlikely event of a spill, impacts to dolphins could occur if they were in areas where hydrocarbons may be present. Underwater sound – Section 7.4.8.2 Vessel & MODU discharges – Section 7.7.5.2 Completions, Interventions and P&A discharges – Section 7.8 Fauna Interaction – Section 7.11.5.1 Loss of Materials or Waste – Section 7.12.4.1 Loss of Containment – Section 7.13.5.2

7 Environmental Impact and Risk Assessment

7.1 Overview

In alignment with the OPGGS(E)R, this section of the EP details the potential environmental impacts and risks associated with Program activities and provides an evaluation of all the impacts and risks appropriate to the nature and scale of each impact or risk. This evaluation includes impacts and risks arising directly or indirectly from the activity and includes potential oil pollution emergencies and the implementation of oil spill response strategies and oil spill monitoring.

In addition, this section details the control measures (systems, procedures, personnel, or equipment) that will be used to reduce potential impacts and risks to ALARP and acceptable levels. EPOs, EPSs and measurement criteria associated with each of the identified control measures are detailed in Section 7.15.

Aspects associated with the use of vessels for oil spill response activities are as per vessel operations in Table 7-1. Other aspects and related impacts and risks associated with oil spill response activities are described in Section 7.13.5.

7.1.1 Cumulative Impacts

The OPP includes a cumulative impact assessment of the Otway Offshore Gas Victoria Project (Beach 2025). Given the Program activities are a part of the Otway Offshore Gas Victoria Project, the cumulative impact assessment (CIA) for the Program activities is considered covered under the CIA detailed in the OPP.

The CIA in Section 8 of the OPP identified additional control measures to address potential cumulative impacts. Recognising the shared responsibility for managing cumulative impacts, Beach will actively collaborate with other petroleum titleholders, share relevant data and promote coordinated efforts to ensure that all reasonably foreseeable projects and activities adhere to acceptable environmental standards to mitigate cumulative impacts.

Observation, incidents, and opportunities for improvement regarding the interaction with other users will be reported to other petroleum titleholders. This additional control has been adopted and included against CM03: Consultation for Implementation of EP, as updated in Section 7.15.

In accordance with OPP-CM51, a review for additional or significantly revised reasonably foreseeable projects was undertaken in accordance with Section 8.2 of the OPP. No additional or significantly revised reasonably foreseeable projects were identified as part of this review. As a result, the CIA in Section 8 of the OPP for the Otway Offshore Gas Victoria Project as a whole is considered a conservative, valid and appropriate CIA for the Program activities.

Table 7-1: Activity – aspect relationship

Activity	Aspect - Planned							Aspect - Unplanned			
	Light emissions	**Atmospheric emissions**	**Underwater sound**	**Physical presence**	**Seabed disturbance**	**MODU and vessel marine discharge**	**Completions, intervention, P&A marine discharge**	**Invasive Marine Species**	**Fauna interaction**	**Loss of materials or waste**	**Loss of containment**
Support Operations											
MODU operations	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓
Vessel operations	✓	✓	✓	✓		✓		✓	✓	✓	✓
Helicopter		✓	✓								
Pre-laid anchors				✓	✓						
Spill response	✓	✓	✓	✓	✓	✓	✓	✓	✓		
Well Activities											
Completions					✓		✓				✓
Intervention					✓		✓				✓
P&A					✓		✓				✓

7.2 Light Emissions

7.2.1 Source of Aspect

During the Program, localised and temporary light emissions will change ambient light levels. As the activity will be undertaken 24 hours a day, lighting on the MODU and vessels is required at night for navigation and to ensure safe operations.

7.2.2 Extent and Duration of Aspect

MODU and Vessel Lighting	
Extent (EMBA)	*20 km for marine turtles, seabirds, and migratory shorebirds.* The extent for MODU and vessel light emissions is based on the National Light Pollution Guidelines for Wildlife (DCCEEW 2023). The guidelines recommend undertaking a light impact assessment where important habitat for listed species sensitive to light are located within 20 km of the light source. The 20 km threshold provides a precautionary limit based on observed effects of sky glow on marine turtle hatchlings demonstrated to occur at 15-18 km and fledgling seabirds grounded in response to artificial light 15 km away (DCCEEW 2023). Seabird grounding, as described in Rodriguez et al. (2014), relates to impacts of onshore fixed light sources such as streetlights and buildings and the effect this can have on young fledgling birds making their first flight from their nests to the open ocean. Thus, 20 km is adopted as the extent at which light emissions may impact marine turtles, seabirds, and migratory shorebirds from the Operational Area during Program activities. *200 m for zooplankton, invertebrates, and fish.* The Guidelines detail that in response to vessel lights zooplankton and their vertebrate predators descend away from the surface; these effects occurred at depths of up to 200 m, and up to 200 m horizontally from the light source. Experiments using light traps also detailed that some fish and zooplankton species are attracted to light sources (Meekan et al. 2001), with traps drawing catches from up to 90 m (Milicich et al. 1992). Thus, 200 m is adopted as the extent at which light emissions may impact zooplankton, invertebrates, and fish. The actual predicted area of impact at any one time will be significantly less than 20 km or 200 m around each well location during Program activities.
Duration	Approximately 150 days for the Program activities (refer to Section 3.2) MODU and vessel navigational and safety lighting is required at night for the duration of the activity. However, light will not be generated across the entire EMBA for the full duration. Instead, light emissions will be limited to a maximum of 20 km around MODU / vessel activities (DCCEEW 2023) for 25 days during well completions at up to 4 well locations, for 15 days during well intervention activities and for 15-20 days during the contingent P&A activity. Concurrent activities would result in multiple light sources (i.e. support vessels and MODU) within the Operational Area at a given time. A maximum of 4 support vessels (1 performing pre-lay and 3 supporting the MODU) and the MODU may be present within the Operational Area at a single time. Concurrent activities are unlikely to occur for more than 13 days at a time (refer Section 3.2.1).
Flaring	
Extent (EMBA)	*63 km for fish, marine turtles and mammals, seabirds, and migratory shorebirds.* The 63 km EMBA for flaring light emissions is based on the light assessment study conducted for the approved OPP, found in Appendix O of the OPP. This is considered to be an appropriate analogue for Program activities as the modelling was conducted within the same geographic location using the same flare rate (65 MMscf per day).

	The 63 km flaring EMBA threshold distance was calculated based on a horizontal boom at a height of 49 m extending horizontally approximately 14 m from the MODU deck with a peak flare rate of 65 MMscf per day. This calculation is considered conservative as it does not account for atmospheric or topographic interactions such as shadowing, absorption or scattering which would naturally occur to some degree. It is therefore likely to overestimate the illuminance distance.
Duration	Flaring associated with well flowback and clean-up is expected to be performed on each well which is completed (maximum of 4 wells). The duration of flaring for unloading a well of well construction fluid to the MODU is in the order of 24 to 48 hours per well and up to 65 MMscf per day being flared.

7.2.3 Predicted Environmental Impacts

The predicted environmental impacts from light emissions are:

- Changes in fauna behaviour through attraction or avoidance of light-sensitive species.
- Changes to the functions, interests, or activities of other users.
- Changes in ambient light leading to changes to aesthetic, and conservation values.

7.2.4 EMBA

Table 7-2: Relevant light EMBAs

Distance	Source	Light emitting scenarios included
20 km	National Light Pollution Guidelines for Wildlife (DCCEEW 2023)	Routine light emissions from both MODU and vessels Precautionary threshold for light impacts to wildlife
63 km	Project Light Modelling Report (Xodus 2024; Appendix O in the OPP)	Light emissions from flaring during flowback and clean-up operations from any location in the Project Area (65 MMscf per day)

The 20 km light EMBA is considered to be highly conservative based on the following studies. These studies used a MODU as the basis for assessing routine light emissions from MODU and vessels given the MODU would be the largest and tallest piece of infrastructure used:

- Beach commissioned Xodus to conduct a light assessment study for the OPP, found in Appendix O of the OPP. The study predicted that the area of potential impact from routine facility lighting would be up to 10 km from the MODU as there was no measurable changes to ambient light intensity levels beyond this distance.
- A light assessment study was undertaken for the Browse FLNG development (Woodside 2014) to assess the likely light intensity levels from a MODU. This study predicted light intensity levels at representative of background levels beyond 12.6 km from the MODU.

Flaring associated with well flowback and clean-up is expected to be performed on each well which is completed. The 63 km EMBA for flaring light emissions is based on the light assessment study conducted for the OPP, found in Appendix O of the OPP. The threshold for this distance corresponding to ambient light levels is an illuminance of 0.001 lux, the equivalent of a new moon. The 63 km EMBA threshold distance was calculated based on a horizontal boom at a height of 49 m extending horizontally approximately 14 m from the MODU deck with a peak flare rate of 65 MMscf per day.

The results of the light EMBA PMST Reports are presented in Appendix I.

Light emissions may impact the following receptors within the light EMBA:

- Zooplankton, invertebrates, and fish
- Seabirds and migratory shorebirds

- Marine turtles
- Commercial fisheries
- Coastal communities

The ecological receptors identified above are values of the following within the light EMBA:

- Conservation values and sensitivities
- Cultural values and sensitivities

7.2.5 Predicted Level of Impact

7.2.5.1 Ecological Receptors

Intermittent light emissions during the Program have the potential to cause temporary behavioural changes to sensitive marine fauna active at night within the area of light glow generated by navigational lighting and flaring activities.

Seabirds may be attracted to the light glow from the MODU and support vessels. Bright lighting can disorientate birds, thereby increasing the likelihood of seabird injury or mortality through collision with a vessel, or mortality from starvation due to disrupted migration or foraging at sea (Wiese et al. 2001). Disorientation may also result in entrapment, stranding, grounding and interference with navigation (DCCEEW 2023). Whilst all bird species are vulnerable to the effects of lighting, seabirds active at night while migrating, foraging, or returning to colonies are most at risk (DCCEEW 2023).

For the light impact assessment, the process outlined in the National Light Pollution Guidelines for Wildlife (DCCEEW 2023) is used. The aim of the guidelines is that artificial light will be managed so wildlife is:

- Not disrupted within, nor displaced from, important habitat.
- Able to undertake critical behaviours such as foraging, reproduction and dispersal.

Identification of marine turtles, seabirds, and migratory shorebirds was undertaken through definition of light EMBAs. Other sensitive species such as zooplankton, invertebrates and fish were identified using the Operational Area based on an extent of impact of 200 m (refer to Section 7.2.2).

The guidelines detail that important habitats are those areas necessary for an ecologically significant proportion of a listed species to undertake important activities such as foraging, breeding, roosting or dispersal.

Artificial light can disrupt turtle nesting and hatching behaviours and is listed as a key threat in the Recovery Plan for Marine Turtles in Australia (CoA 2017). Listed turtle species may occur within the light EMBA, however, no BIAs or habitat critical to survival for marine turtles were identified. In addition, there are no turtle nesting areas in the region. Therefore, impacts to turtles from light emissions are not predicted.

The light-sensitive receptors that may occur within the light EMBAs are:

- Seabirds and migratory shorebirds
- Zooplankton, invertebrates, and fish.

Table 7-3 details light sensitive receptors (shorebirds, seabirds and fish), that may be participating in biologically important behaviours were identified from a PMST search of the light EMBAs (Appendix I). The presence of BIAs were identified from the Australian Marine Spatial Information System (AMSIS) (DCCEEW 2024n).

Table 7-3: Light-sensitive receptors within the light EMBAs with BIAs or undertaking a biologically important behaviour (Appendix I; DCCEEW 2024n)

Receptor	Biologically Important Behaviour	Light EMBA (20 km)	Flaring EMBA (63 km)
Albatross			
Bullers Albatross	Foraging, feeding or related behaviour likely to occur within area	✓	✓
	Foraging BIA	✓	✓
Antipodean Albatross	Foraging, feeding or related behaviour likely to occur within area	✓	✓
	Foraging BIA	✓	✓
Indian Yellow-nosed Albatross	Foraging BIA	✓	✓
Shy Albatross	Foraging, feeding or related behaviour likely to occur within area	✓	✓
	Foraging BIA	✓	✓
Campbell Albatross	Foraging, feeding or related behaviour likely to occur within area	✓	✓
	Foraging BIA	✓	✓
Wandering Albatross	Foraging, feeding or related behaviour likely to occur within area	✓	✓
	Foraging BIA	✓	✓
Black-browed Albatross	Foraging, feeding or related behaviour likely to occur within area	✓	✓
	Foraging BIA	✓	✓
Northern Buller's Albatross	Foraging, feeding or related behaviour likely to occur within area	✓	✓
Northern Royal Albatross	Foraging, feeding or related behaviour likely to occur within area	✓	✓
Salvin's Albatross	Foraging, feeding or related behaviour likely to occur within area	✓	✓
Southern Royal Albatross	Foraging, feeding or related behaviour likely to occur within area	✓	✓
White-capped Albatross	Foraging, feeding or related behaviour known to occur within area	✓	✓

Receptor	Biologically Important Behaviour	Light EMBA (20 km)	Flaring EMBA (63 km)
Petrels			
Common Diving-Petrel	Foraging BIA	✓	✓
Northern Giant Petrel	Foraging, feeding or related behaviour likely to occur within area	✓	✓
Southern Giant Petrel	Foraging, feeding or related behaviour likely to occur within area	-	✓
White-faced Storm Petrel	Foraging BIA	-	✓
Shearwaters			
Flesh-footed Shearwater	Foraging, feeding or related behaviour likely to occur within area	✓	✓
Short-tailed Shearwater	Foraging BIA	✓	✓
	Breeding BIA	-	✓
	Breeding known to occur within area	-	✓
Other			
Australian Fairy Tern	Foraging, feeding or related behaviour likely to occur within area	✓	✓
Black-faced Cormorant	Breeding known to occur within area	-	✓
Little Penguin	Breeding known to occur within area	-	✓
Orange-bellied Parrot	Migration route likely to occur within area	✓	✓
White-fronted Tern	Foraging, feeding or related behaviour likely to occur within area	✓	✓
Fish			
White Shark	Migration route known to occur within area	✓	✓
	Foraging, feeding or related behaviour known to occur within area	-	✓
	Foraging BIA	-	✓

7.2.5.1.1 Albatross

The light EMBA PMST Report (Appendix I) identified likely foraging behaviour for a number of albatross species. Some of these species have foraging BIAs which intersect the light EMBA (Table 7-3). These BIAs are shown in Figure 7-2, Figure 7-3 and Figure 7-4. Though the National Recovery Plan for Albatrosses and Petrels (CoA 2022) identifies light emissions as a threat, it classifies marine infrastructure interactions including those associated with artificial light as having no risk category priority and affecting 'Nil' species in Australian jurisdiction with no actions are identified.

All albatross species are migratory with widespread distributions throughout the Southern hemisphere and have been shown to travel large distances when foraging. For example, the wandering albatross has been shown to cover distance between 3,600 and 15,000 km in a single foraging trip during the breeding season on subantarctic islands (Jouventin and Weimerskirch 1990). The recognised foraging BIAs for albatross species generally cover large areas. For example, the entire South-east Marine Region is recognised as a foraging BIA for the Indian yellow-nosed, Campbell and black-browed albatross species (Figure 7-2). Albatrosses forage most actively during daylight and are less active at night because their ability to see and capture prey from the air is reduced (Phalan et al. 2007).

The potential for light emissions to cause behavioural disorientation to albatrosses foraging at night is expected to be limited to individuals. Due to the expansive distribution of albatross foraging BIAs in southern Australian waters, the absence of breeding BIAs and colonies in the light EMBAs, and albatross foraging behaviours occurring primarily during daylight hours; the potential of behavioural disorientation from temporary light emissions are expected to be limited to individuals and therefore no impacts to albatrosses will occur at a population level.

7.2.5.1.2 Petrels

The light EMBA PMST Report (Appendix I) identified likely foraging behaviour for a number of petrels. Two of these species have foraging BIAs which overlap the light and/or flaring EMBAs (Table 7-3). The BIAs are shown in Figure 7-3 and Figure 7-4. Though the National Recovery Plan for Albatrosses and Petrels (CoA 2022) identifies light emissions as a threat, it classifies marine infrastructure interactions including those associated with artificial light as having no risk category priority and affecting 'Nil' species in Australian jurisdiction with no actions are identified.

Petrel species have a widespread distribution throughout the Southern hemisphere, with wide, recognised foraging areas. Although petrels have been observed to forage at night, they primarily during the day in nearshore areas (Brooke 2004).

The common diving-petrel is listed as marine and does not have a recovery plan or conservation advice. Brooke (2004) details that common diving-petrels spend the night in burrows during the breeding season and seem to forage mainly during the day, although they also forage at night on vertically migrating plankton. They are thought to be fairly sedentary, remaining more or less in the area of their breeding colony year-round, although they may venture into the open ocean to forage outside of the breeding season and migrate to more tropical climates (Brooke 2004). In general, they undertake a unimodal foraging trip duration strategy (consistent short daily foraging trips) during both incubation and chick-rearing periods, unlike other small seabirds within their family (Fromant et al. 2021). However, studies on common diving-petrels within the Bass Strait have shown higher foraging efforts compared to other populations (with foraging trips averaging 71 ± 3 km), potentially due to the sparse distribution of prey (mostly coastal krill) (Formant et al. 2021). There is potential for light emissions from the activity to overlap with the occasional foraging times of the common diving-petrel. The common diving-petrel's foraging BIA is overlapped by the light and flaring EMBAs (Figure 7-3), with the largest light footprint (63 km around the completion wells during flaring) overlapping <3% of the species' foraging BIA.

The northern giant-petrel was identified in the light and flaring EMBA PMST reports as likely to be foraging within the areas (Table 7-3). It is thought to be a predominantly diurnal forager, feeding its chicks during both day and night, however individuals provisioning young typically forage inshore and near nesting areas (DCCEEW 2023). Breeding occurs on Macquarie Island between New Zealand and Antarctica, over 2,000 km from the Operational Area and light EMBAs.

The southern giant-petrel was identified in the flaring EMBA PMST reports as foraging likely within the area (Table 7-3). Light is not identified as a key threatening process for the southern giant-petrel (CoA 2022). Like the northern giant-petrel, this species also feeds its chicks during both day and night and breeds exclusively on Antarctic and sub-Antarctic islands, the closest of which being Macquarie Island, still over 2,000 km from the Operational Area and light EMBAs (DCCEEW 2025b).

The white-faced storm petrel is widely distributed throughout Australia, with the Australian population estimated to be about 25% of the global population (CoA 2020a). The species is migratory, moving from their temperate breeding grounds to tropical and subtropical locations in late March (Underwood and Bunce 2004). A small corner of the foraging BIA for the white-faced storm petrel was identified within the flaring EMBA (Figure 7-4). The white-faced storm-petrel is a listed marine species. Light has not been identified as threatening process for this species (DCCEEW 2023).

The potential for light emissions to cause behavioural disorientation to petrels foraging at night is expected to be limited to individuals. Due to the expansive distribution of petrel foraging BIAs in southern Australian waters, the absence of breeding BIAs and colonies in the light and flaring EMBAs, and petrel foraging behaviours occurring primarily in nearshore areas during the day; the potential of behavioural disorientation from temporary Program light emissions are expected to be limited to individuals and therefore no impacts to petrels will occur at a population level.

7.2.5.1.3 Shearwaters

The light EMBA PMST Report (Appendix I) identified likely foraging and known breeding behaviours for two species of shearwaters within the area. The light EMBAs overlap the short-tailed shearwater foraging BIA (Figure 7-3) and identified that breeding is known to occur within the area. As detailed in Figure 7-3, the flaring EMBA overlaps a breeding BIA for the species at Muttonbird Island. The flesh-footed shearwater was also identified in the light EMBA PMST Reports as foraging likely within the area, however no BIAs exist for this species within the light EMBAs.

This short-tailed shearwater is listed as marine and migratory and does not have a recovery plan or conservation advice. Light has not been identified as a threat to this species (DCCEEW 2023a). When present in Australian waters (September to May) the species are known to typically forage during daylight, returning to the colonies after feeding (AAD 2020). The species has been recorded to predominantly forage during the day and form large aggregations referred to as “rafts” just offshore from their breeding colony just on dusk and enter and leave the colony at night to avoid predators (Warham 1996). The breeding BIA at Muttonbird Island is approximately 30 km from the nearest well to be completed and within Port Campbell National Park, which is predicted to be exposed to a maximum of 0.011 lux during flaring activities, approximately equivalent illuminance to that of a quarter moon (OPP Appendix O). This change in ambient light levels is not expected to be discernible from other light sources in the area and will be of intermittent and temporary duration (up to 2 days per well). By comparison, Phillip Island Important Bird Area receives a maximum light pollution level of 5.3 $nW/sr*cm^2$ and reports between 0.39% and 0.70% of shearwater fledglings affected by grounding events (Rodriguez et al. 2014). This is equivalent to 0.035 lux and therefore more than triple the maximum illuminance subjected to the Muttonbird Island breeding BIA from Program activities. Consequently, given short-tailed shearwaters predominantly forage during the day and would be exposed only to a temporary change in ambient light levels within the flaring EMBA, the potential of behavioural disorientation from temporary Program light emissions are expected to be limited to individuals and therefore no impacts to short-tailed shearwaters will occur at a population level.

The flesh-footed shearwater routinely attends fishing vessels to feed on baited hooks, discarded scraps and prey attracted to the surface by such vessels (DCCEEW 2025b). However, incidental deaths from fishing activities typically involve ingesting baited hooks or hooks embedded in scraps, which won't be a factor for Program activities. While flesh-footed shearwaters may be attracted to the localised artificial light halos created by vessel or flaring activities, they are primarily active at night near their breeding colonies, which are far from the Operational Area (including Lord Howe Island, Saint Paul Island, Western Australia, Smith Island, and New Zealand) (TSSC 2014). As a result, the flesh-footed shearwater has been observed to be accustomed to vessel navigational lighting. Therefore, the addition of light emissions from Program activities is not expected to change existing behaviours of the flesh-footed shearwater being attracted to vessels for opportunistic feeding. Potential impacts to flesh-footed shearwaters are expected to be limited to the attraction of foraging individuals and no impacts will occur at a population level given the absence of breeding BIAs in the light EMBAs.

7.2.5.1.4 Little Penguin

The PMST reports (Appendix I) show the little penguin (*Eudyptula minor*) presence within the within the flaring EMBA as breeding known to occur, however, neither light EMBA overlaps any Little Penguin BIAs (Figure 7-3). Despite the colony of little penguins at Manly, Sydney Harbour, being protected as an endangered population, the Australian population is considered stable at approximately one million birds (Birdlife Australia 2025). The species is known to exhibit a wide foraging range, with individuals able to spend weeks away at sea foraging (McCutcheon et al. 2011). The closest breeding BIA to Program activities exists at Christmas Island located of off nearby King Island, over 80 km from the Operational Area (see Figure 7-3). However, additional breeding sites which are not designated BIAs have been recorded within the flaring EMBA at Middle Island in Warrnambool, the Twelve Apostles and Port Campbell (Norman et al. 2017). Breeding typically occurs from September to February. Studies suggest that penguins were habituated to artificial lights and were unaffected by a 15 lux increase in artificial illumination (Rodriguez et al. 2016). According to the light modelling report conducted for the OPP, found in Appendix O of the OPP, Port Campbell and Warrnambool would be subjected to 0.011 lux and 0.001 lux illuminance, respectively, during flaring activities. As such, Port Campbell would be subjected to the highest illuminance, 0.011 lux, during flaring activities which is equivalent to that of a quarter moon. This change in ambient light levels is not expected to be discernible from other artificial light sources and due to its intermittent and temporary duration (up to 2 days per well) it is not expected to cause impact at a population level. Therefore, as the little penguin is exposed only to a change in ambient light levels within the flaring EMBA, behavioural changes to the little penguin are unlikely.

7.2.5.1.5 Australian Fairy Tern

The Australian fairy tern was identified in the light EMBA PMST Report (Appendix I) as foraging likely to occur within the light EMBA. Australian fairy terns occur along the coasts of Victoria, Tasmania, South Australia and Western Australia and feed on bait-sized fish by hovering and diving into the water (CoA 2020). The Operational Area or light EMBAs do not overlap any BIAs for the Australian fairy tern. The nearest Australian fairy tern foraging BIA is over 490 km north-west. As a result, the impacts from light to Australian fairy terns is not assessed further.

7.2.5.1.6 Black-faced Cormorant

The black-faced cormorant was identified within the flaring EMBA PMST report (Appendix I) as breeding known to occur but does not overlap any black-faced cormorant BIAs (Figure 7-2). The black-faced cormorant is endemic to south-eastern Australia, occurring along the coasts of Tasmania and Victoria. Breeding normally occurs on rocky islands, but also on stacks, slopes and sea cliffs in colonies (CoA 2015). The Operational Area and light EMBAs do not overlap with any BIAs for the black-faced cormorant. The nearest BIAs (foraging and breeding) are located at Christmas Island, over 90 km to the south-east. As a result, the impacts from light to the black-faced cormorants is not assessed further.

7.2.5.1.7 White-fronted Tern

The white-fronted tern was identified in the light EMBA PMST Report (Appendix I) as foraging likely to occur within the light EMBAs. They are a medium sized tern endemic to Australasia breeding in New Zealand and on Flinders and Cape Barren Island off the north-east coast of Tasmania (CoA 2020a). This species can be found in coastal areas, nesting on rocky or sandy beaches and shingle islands in rivers, also on coastal cliffs and deserted barges, often close to the surf (CoA 2020a). The white-fronted tern often feeds in flocks and in winter it feeds over oceanic waters and feeds almost exclusively on fish, but will also take shrimp, feeding in the surf zone or several km out to sea (CoA 2020a).

7.2.5.1.8 Orange-bellied Parrot

The known distribution and probable migration route identified for the Critically Endangered orange-bellied parrot (*Neophema chrysogaster*) overlap the light and flaring EMBAs. The flaring EMBA (63 km around the wells to be completed) overlaps the likely distribution range by ~4.6%, the probable migration route by ~5.3% and the non-breeding range by ~6.2% (Figure 7-5). No BIAs or areas deemed as habitat critical to the survival of the species were identified within the light or flaring EMBAs.

The orange-bellied parrot is a ground feeding parrot which breeds in south-west Tasmanian. They migrate from Tasmania to Victoria between late February and early April (Australian Museum 2020). In Victoria, the orange-bellied parrot mostly occurs in sheltered coastal habitats, such as bays, lagoons and estuaries, or, rarely, saltworks. The parrot's breeding habitat is restricted to south-west Tasmania, where breeding occurs from November to mid-January mainly within 30 km of the coast (Brown and Wilson 1980). During winter, on mainland Australia, orange-bellied parrots are found mostly within 3 km of the coast (DELWP 2016).

The 2023-24 breeding season showed a record number of 92 orange-bellied parrots return to breeding grounds breaking last year's census of 82 birds. Of these 64 orange-bellied parrots were wild-born, with the remaining 28 captive-bred released (NRE Tasmania 2024). Thirty-seven birds were female and the remaining 55 males. As of December 2024, a total of 25 nestlings and one fledgling were counted (NRE Tasmania 2024).

The National Recovery Plan for the orange-bellied parrot (DELWP 2016) identifies that the behaviour of this species may be modified by the presence of barriers such illuminated structure and boats, with the impacts of barriers greatest where they occur on migration routes, though there is little more than anecdotal evidence to support this (Holdsworth 2006). Intermittent Program activity light emissions do not present the same risk as that associated with long-term or permanent illuminated structures or illuminated commercial vessels which are positioned within the migration route, year-round. In addition, in the 15 years of operating the Thylacine A Wellhead Platform, Beach has not recorded any orange-bellied parrots being present. During the Otway Drilling Campaign in 2021/2022, no birds were identified to be attracted or grounded due to MODU or vessel lighting or flaring. Despite light emissions generated from support vessels servicing the Thylacine A Wellhead Platform and the Otway Drilling Campaign in 2021/2022, the 2021 orange-bellied parrot breeding season still showed a record number (at that time) of 70 orange-bellied parrots return to breeding grounds (NRE Tasmania 2023). Light emissions from the support vessels servicing the Thylacine A Wellhead Platform and the Otway Drilling Campaign in 2021/2022 are considered equivalent to the light emissions associated with the Program. Given the observed increase in orange-bellied parrot migration during periods of light emissions from the Thylacine A Wellhead Platform and the Otway Drilling Campaign in 2021/2022, it is anticipated that Program activity light emissions will not adversely impact migration numbers. The light and flaring EMBA overlaps the probable migration route of the orange-bellied parrot by <1% and 5.3%, respectively. Whereas the flaring EMBA overlaps the non-breeding range from Port Fairy east to Cape Otway, overall a 6.2% overlap of total non-breeding range area, not including the infrequent non-breeding range on the entire NSW coast. Changes in ambient light in the non-breeding range associated with short-term flaring (up to 2 days per well) in these areas are predicted to result in an increase in light intensity between 0.001 lux (Warrnambool) and 0.011 lux (Port Campbell National Park). These values represent an approximately equivalent of illuminance from a moonless clear night sky (0.001 lux) to a quarter moon night sky (0.01 lux).

7.2.5.1.9 Zooplankton, Invertebrates and Fish

Intermittent light emissions during Program activities have the potential to cause temporary behavioural changes to fish and plankton within localised artificial light halos surrounding the MODU and vessels. Behavioural changes to fish and plankton are expected to be limited to temporary and localised avoidance or aggregation behaviours (DCCEEW 2022).

Normal working lights on marine research vessels—and, by implication, lights from other sources including fishing boats, cargo vessels, recreational watercraft, jetties and oil and gas platforms—have been shown to cause zooplankton and their vertebrate predators to descend away from the surface; these effects occurred at depths of up to 200 m, and up to 200 m horizontally from the light source (Berge et al. 2020). Since most zooplankton need to ascend to forage on phytoplankton near the water's surface, light pollution may lead to an overall reduction in zooplankton, with cascading effects on their predators, and so on up the food chain (DCCEEW 2023).

Fish may be directly or indirectly attracted to lights. Experiments using light traps have found that some fish and zooplankton species are attracted to light sources (Meekan et al. 2001), with traps drawing catches from up to 90 m (Milicich et al. 1992). Lindquist et al. (2005) concluded from a study of larval fish populations around an oil and gas platform in the Gulf of Mexico that an enhanced abundance of clupeids (herring and sardines) and engraulids (anchovies), both of which are highly photopositive, was caused by the platforms' light fields. The concentration of organisms attracted to light results in an increase in food source for predatory species and marine predators are known to aggregate at the edges of artificial light halos. Shaw et al. (2002), in a similar light trap study, noted that juvenile tunas (Scombridae) and jacks (Carangidae), which are highly predatory, may have been preying upon concentrations of zooplankton attracted to the light field of the platforms. This could potentially lead to increased predation rates compared to unlit areas.

Temporary and localised avoidance behaviours from short-finned eels are also expected from Program activity light emissions. Koster et al. (2021) tracked Australasian short-finned eels off Victoria and found mean night-time swimming depth of all eels showed diel vertical migration in time with the phase of the moon, with the mean depth increasing with increasing moon irradiation. As anguillid eels do not feed during their spawning migration, it has been suggested that the function of the vertical migrations relates to predator avoidance, swimming efficiency, thermal regulation, and control of maturation. Thus, short-finned eels are expected to avoid rather than be attracted to light emissions when migrating as part of inherent predator avoidance behaviours.

The potential impacts to fish and plankton from light emissions are therefore expected to be limited to temporary attraction or avoidance behaviours within localised artificial light halos (200 m around each well). These temporary and localised behavioural changes to fish and plankton from light emissions associated with Program activities will have no change in critical behaviours of these species, such as breeding or migration, or population persistence of prey species.

The consequence to seabirds, migrating shorebirds, zooplankton, invertebrates and fish is assessed as **Minor (1)** and is of an acceptable level based on:

- Lighting on the MODU and support vessels will be limited to that which is required for navigational and safety purposes.
- One MODU will undertake all Program activities within the scope of this EP, therefore light sources within the Operational Area are expected to be limited to the MODU and associated support vessels. Operational light will be generated in the light EMBA for a maximum of 150 days over the course of Program activities.
- During the Beach Otway Drilling Campaign in 2021/2022, no birds were identified to be attracted or grounded due to MODU or vessel lighting.
- Artificial light is listed as a key threat in the Recovery Plan for Marine Turtles in Australia (CoA 2017), however, no biologically important behaviours, BIAs, or habitat critical to survival for marine turtles were identified within the light EMBAs.
- While the National Recovery Plan for Albatrosses and Petrels (CoA 2022) identifies light emissions as a threat, it classifies marine infrastructure interactions including those associated with artificial light as having no risk category priority and affecting ‘Nil’ species in Australian jurisdiction. In addition, no actions are identified.
- Albatross forage most actively during daylight and are less active at night because their ability to see and capture prey from the air is reduced (Phalan et al. 2007).
- Light pollution is listed as a threat to seabirds in the Wildlife Conservation Plan for Seabirds (CoA 2020a), with potential for consequences affecting individuals but not whole populations.
- The orange-bellied parrot, which is classed as critically endangered, may migrate over the light EMBAs between late February and early April and illuminated structures and illuminated boats have been identified as a potential barrier to migration and movement for this species (DELWP 2016). No habitats critical to survival or breeding for the orange-bellied parrot were identified within the light EMBA (DELWP 2016).

- Anecdotal evidence of impacts to the orange-bellied parrot from barriers to migration and movement includes individuals may be killed by flying into barriers (MODU or vessel), and modification of migratory behaviours leading to avoidance of some habitat (DELWP 2016).
- As the light EMBAs overlaps a number of seabird foraging, breeding BIAs, the migratory route for the critically endangered orange-bellied parrot and areas where birds are likely or known to be foraging, breeding, or roosting, the MODU and vessel will have a Lighting Management Plan to minimise external light emissions as required by the National Light Pollution Guidelines.
- The PMST report (Appendix I) identifies a foraging BIA for white sharks within the flaring EMBA. However, the localised extent of the impacts to fish, plankton and invertebrates is predicted to be limited to 200 m from the light source, therefore no impacts to the species are expected.

7.2.5.2 Socio-economic Receptors

7.2.5.2.1 Coastal Communities

Light emissions from Program activities have the potential to impact coastal communities.

Light emissions as a result of routine operations are expected to have a minor impact on coastal communities and will be indistinguishable from other marine traffic within the area given the temporary nature of the light emissions associated with the Program. Given the maximum predicted duration for drilling at each location is 25 days, the low levels of ambient light changes from the routine light will be short-term and fully recoverable. According to light emissions modelling conducted for the OPP, found in Appendix O of the OPP, the coastal receptor which may be exposed to the highest level of illuminance from routine facility lighting is Port Campbell National Park at 0.0002 lux, which equates to less light than a new moon (0.001 lux). Warrnambool, the largest settlement within the light EMBAs, may be exposed to <0.0001 lux from routine facility lighting, equating to less than a moonless overcast night sky (0.0001 lux).

There are several coastal communities and areas conducive to tourism located on the Victorian coast which are within the flaring EMBA (Figure 7-1). Light emissions as a result of short-term flaring (up to 2 days per well) are expected to have a negligible impact on coastal communities due to the low levels of illuminance. The coastal receptor which would be exposed to the highest level of illuminance from short-term flaring is Port Campbell National Park at 0.0111 lux, which is approximately the same as a quarter moon (0.01 lux). Warrnambool, the largest settlement within the flaring EMBA, may be exposed to 0.0014 lux, or approximately the same illuminance as a new moon (0.001 lux).

Given the above, the impact from light emissions is likely to result in **Minor (1)** consequences to coastal communities based on:

- Illuminance from flaring at the closest possible locations to the coast would be comparable to natural ambient light levels of less than a quarter moon (0.01 lux).
- The MODU and vessel will have a Lighting Management Plan to minimise external light emissions as required by the National Light Pollution Guidelines.
- Visibility of routine lighting and the flare when flaring would be reduced by the prevailing weather conditions within the region, and would be comparable to ongoing shipping traffic and historical drilling and flaring activities and within the region.

7.2.5.2.2 Fisheries

The light EMBA overlaps a small area of low and medium relative fishing intensity for the Southern Squid Jig Fishery while the flaring EMBA also overlaps an area of high relative fishing intensity (Figure 7-6). This fishery targets a single species, Gould's squid, using either hand operated or mechanically powered jigs. Squid jigging typically occurs midwater at depths between 50 and 100 m at night using large lights that illuminate the waters around a boat (SETFIA 2023). As squid are attracted to light there is a potential for them to be attracted to the MODU and vessel resulting in them not being able to be caught by the fishery.

Phototactic behaviour (the attraction to artificial light) has been observed both in fish and squids with some species known to have a positive phototaxis by moving towards and aggregating in the illuminated zone of artificial lights (Ibrahim and Hajisamae 1999). Hence fishing with artificial lights (surface light) is one of the most advanced and successful methods to increase the catch rate of squid and pelagic fish (Nguyen and Winger 2019). Whilst research into light levels that may attract squid species is limited, Ibrahim and Hajisamae (1999) found optimal levels to attract big fin reef squid (*Sepioteuthis lessoniana*) varied between 1.5 and 25 lux and the mitre squid (*Loligo chinensis*) between 1.5 and 22.5 lux. In Nguyen and Winger (2019) Japanese squid (*Todarodes pacificus*) are shown to have a preferred range of approximately 10 lux but were also shown to aggregate to levels as low as 0.0034 lux. Modelling by ConocoPhillips (2023), which will utilise the same MODU and support vessels, showed that light emissions from routine operations will reach intensity levels of 1.5 lux within 300 m of the light source. All activities will be of a short duration (<25 days per well), and therefore no long-term effects on local squid fisheries are expected.

Given the above, the impact from light emissions is likely to result in **Minor (1)** consequences to fisheries and is of an acceptable level, based on:

- Lighting on the MODU and support vessels will be limited to that which is required for navigational and safety purposes.
- One MODU will undertake Program activities within the scope of this EP, therefore multiple light sources within the Operational Area are expected to be limited to the MODU and support vessels. Light will be generated in the light EMBAs for a maximum of 150 days over the course of Program activities.
- Visibility of routine lighting and the flare when flaring would be reduced by the prevailing weather conditions within the region, and would be comparable to ongoing shipping traffic and historical drilling and flaring activities and within the region.
- Squid targeted by the Southern Squid Jig Fishery may be attracted to the MODU and vessels but will be available to the fishery when they move outside of the MODU 500 m petroleum safety zone. The light EMBAs overlap a relatively small proportion of the fishery.
- The MODU and vessel will have a Lighting Management Plan to minimise external light emissions as required by the National Light Pollution Guidelines.

7.2.5.3 Conservation Values and Sensitivities

Light emissions have the potential to impact conservation values and sensitivities as well as National Heritage. Relevant receptors identified within the light EMBAs are presented below in Table 7-4.

Table 7-4: Marine Protected Areas, National Parks and National Heritage Places within light EMBAs

Receptor	Protected Area	Intersection with flaring EMBA	Intersection with light EMBA
Australian Marine Park	Apollo Multiple Use Zone (VI)	✓	-
State Marine Reserve	The Arches Marine Sanctuary	✓	-
	Twelve Apostles Marine National Park	✓	✓
	Merri Marine Sanctuary	✓	-
State Territory Reserves	Port Campbell National Park	✓	-
	Great Otway National Park	✓	-
Key Ecological Feature	West Tasmanian Canyons	✓	✓
National Heritage Place	Great Ocean Road	✓	-

Light pollution associated with offshore mining operations (including oil and gas) and other offshore activities is listed as a pressure on the conservation values of the South-east Marine Region (DNP 2025). As described in Section 6.2.2.1, conservation values for the Apollo AMP include seafloor features and habitat for conservation significant bird and mammal species (DNP 2025). Evaluation of light-sensitive fauna including seabirds identified as values of the AMP is conducted in Section 7.2.5.1.

Light emissions are not identified as a key management objective for conservation of natural values associated with the Twelve Apostles Marine National Park (Parks Victoria 2006c), Merri Marine Sanctuary (Parks Victoria 2007d) or The Arches Marine Sanctuary (Parks Victoria 2006c). Conservation values for marine protected areas are detailed in Section 6.2.8. According to the management plans, light-sensitive receptors relevant to the values of the Twelve Apostles Marine National Park, Merri and The Arches Marine Sanctuaries include invertebrates and fish. Based on the evaluation of light-sensitive fauna in Section 7.2.5.1, impacts to invertebrates and fish within the marine reserves are not predicted based on impacts to invertebrates and fish from light only being predicted up to 200 m from the light source. The Operational Area where MODU and vessel lighting will occur is ~18 km from the nearest reserve, Twelve Apostles Marine National Park.

The light EMBA overlaps the West Tasmania Canyon KEF. The values associated with the West Tasmania Canyon KEF are described in Section 6.2.12.2 with light sensitive receptors being fish associated with sponges near canyon heads. Impacts to fish within the West Tasmania Canyon KEF are expected to be low based the greatest diversity is between 200 m and 350 m depth (CoA 2015) and as detailed in Section 7.2.5.1 impacts to fish from light are not predicted in water depths greater than 200 m.

Terrestrial receptors within the light EMBAs include The Great Ocean Road and Scenic Environs National Heritage Place, and Great Otway and Port Campbell National Parks (Table 7-4; Appendix I). Light emissions as a result of routine facility lighting and short-term flaring (up to 2 days per well) are expected to have a negligible impact on these receptors due to the low levels of illuminance reaching the coast. According to the light emissions modelling conducted for the OPP, found in Appendix O of the OPP, during short-term flaring activities Port Campbell National Park may be exposed to a maximum of 0.011 lux, which is approximately the same as a quarter moon (0.01 lux). During routine facility lighting, illuminance may only reach 0.0002 lux, which equates to less light than a new moon (0.001 lux). Cape Otway Light Station Lookout is modelled to be exposed to even less illuminance than this at 0.0029 lux when flaring and less than 0.0001 lux from routine facility lighting (less than a moonless overcast night sky). The Great Ocean Road and Scenic Environs National Heritage Place overlaps the boundaries of the National Parks and therefore subject to the same level of illuminance.

The extent of the impact is predicted to be up to 20 km from each well. The consequence is assessed as **Minor (1)** and is of an acceptable level based on:

- Lighting on the MODU and support vessels will be limited to that which is required for navigational and safety purposes.
- One MODU will undertake all Program activities within the scope of this EP, therefore multiple light sources within the Operational Area are expected to be limited to the MODU and support vessels. Light will be generated in the light EMBAs for a maximum of 150 days over the course of Program activities.
- Impacts to the principal and aesthetic characteristics of the Great Ocean Road and Scenic Environs are predicted to be limited to intermittent visibility of navigation and operational lighting and short-duration flaring from some locations along the Great Ocean Road and Great Ocean Walk at night.
- Visibility of routine lighting and the flare when flaring would be reduced by the prevailing weather conditions within the region, and would be comparable to ongoing shipping traffic and historical drilling and flaring activities and within the region.
- Illuminance from flaring at the closest possible locations to the coast would be comparable to natural ambient light levels of less than a quarter moon (0.01 lux).
- While the National Recovery Plan for Albatrosses and Petrels (CoA 2022) identifies light emissions as a threat, it classifies marine infrastructure interactions including those associated with artificial light as having no risk category priority and affecting 'Nil' species in Australian jurisdiction. In addition, no actions are identified.
- Albatross forage most actively during daylight and are less active at night because their ability to see and capture prey from the air is reduced (Phalan et al. 2007).
- As the light EMBAs overlap a number of seabird foraging and breeding BIAs, the migratory route for the critically endangered orange-bellied parrot and areas where birds are likely or known to be foraging, breeding, or roosting, the MODU and vessel will have a Lighting Management Plan to minimise external light emissions as required by the National Light Pollution Guidelines.
- Light pollution is listed as a threat to seabirds in the Wildlife Conservation Plan for Seabirds (CoA 2020a), with potential for consequences affecting individuals but not whole populations.

- Impacts to invertebrates and fish associated with the Twelve Apostles Marine National Park, Merri and The Arches Marine Sanctuaries and the West Tasmania Canyon KEF are not predicted based on light impacts to invertebrates and fish at a distance of 200 m.

7.2.5.4 Cultural Values and Sensitivities

From Section 6.6.3, the following cultural values and sensitivities have been identified as potentially affected by light:

- Birds including orange-bellied parrot and short-tailed shearwater (muttonbird).
- Fish (including eels).

The marine fauna listed above are connected to places associated with songlines or connected to individuals through ceremony (Section 6.6.3.5). The connection of marine fauna to places or individuals are considered cultural intangible values.

Light emissions have the potential to impact marine fauna that have songlines, or spiritual connection to First Nations people. It is considered that impacts to species at a population level may prevent First Nations people's obligations to maintain spiritual connections and care for culturally significant species and their habitat. If First Nations people's obligations have not been met it may reinforce a sense of powerlessness to members of First Nations groups responsible for these obligations (Holcombe, 2022). As evaluated in Section 7.2.5.1, potential impacts to birds including the orange-bellied parrot, short-tailed shearwater and fish including eels from light emissions will not impact these species at a population level. Minor behavioural changes to birds and fish are expected from the intermittent light emissions generated during Program activities.

As described in Section 7.2.5.1, light emissions will be managed in a manner to not impact on the recovery of the orange-bellied parrot to ensure the proposed activity is not inconsistent with the Recovery Plan for this species. The recovery plan was developed in consultation with First Nations peoples to ensure all activities will respect the cultural knowledge and traditions of Indigenous people throughout the species range. Section 7.2.5.1 details the predicted environmental impact to these receptors and concluded light emissions will not result in impacts at a population level to birds and fish including eels. Based on that assessment the severity of impact to cultural values and sensitivities from light is assessed as **Minor (1)** and of an acceptable level based on:

- Lighting on the MODU and support vessels will be limited to that which is required for navigational and safety purposes.
- One MODU will undertake Program activities within the scope of this EP, therefore multiple light sources within the Operational Area are expected to be limited to the MODU and support vessels. Light will be generated in the Light EMBAs for a maximum of 150 days over the course of Program activities.
- During the Beach Otway Drilling Campaign in 2021/2022, no birds were identified to be attracted or grounded due to MODU or vessel lighting or due to flaring.
- The National Recovery Plan for Albatrosses and Petrels (CoA 2022) identifies light emissions as a threat, it classifies marine infrastructure interactions including those associated with artificial light

as having no risk category priority and affecting 'Nil' species in Australian jurisdiction. In addition, no actions are identified.

- For short-tailed shearwaters, the breeding BIA at Muttonbird Island is subject to temporary and intermittent light emissions equivalent to that of a quarter moon. Compared to the Phillip Island Bird Area which has a baseline maximum light pollution more than three times greater than this, and given this species predominantly forages during the day, the potential of behavioural disorientation from temporary light emissions are expected to be limited to individuals and therefore no impacts to short-tailed shearwaters will occur at a population level.

- Based on the observed increase in the orange-bellied parrot population during periods of light emissions from the Thylacine A Wellhead Platform and the Otway Drilling Campaign in 2021/2022, it is anticipated that the Programs light emissions will also not adversely impact the species population.

- As the light EMBAs overlaps a number of seabird foraging, breeding BIAs, the migratory route for the critically endangered orange-bellied parrot and areas where birds are likely or known to be foraging, breeding, or roosting, the MODU and vessel will have a Lighting Management Plan to minimise external light emissions as required by the National Light Pollution Guidelines.

- No BIAs or spawning areas are identified within the light EMBA for fish or invertebrates and the area (200 m) where invertebrates may be attracted to light is small and temporary.

- Koster et al. (2021) who tracked the Australasian short-finned eels off Victoria, detailed that mean night-time swimming depth of all eels showing diel vertical migration in time with the phase of the moon, with the mean depth increasing with increasing moon irradiation. As anguillid eels do not feed during their spawning migration, it has been suggested that the function of the vertical migrations relates to predator avoidance, swimming efficiency, thermal regulation, and control of maturation. Thus, it would seem that short-finned eels move away from rather than be attracted to light when migrating.

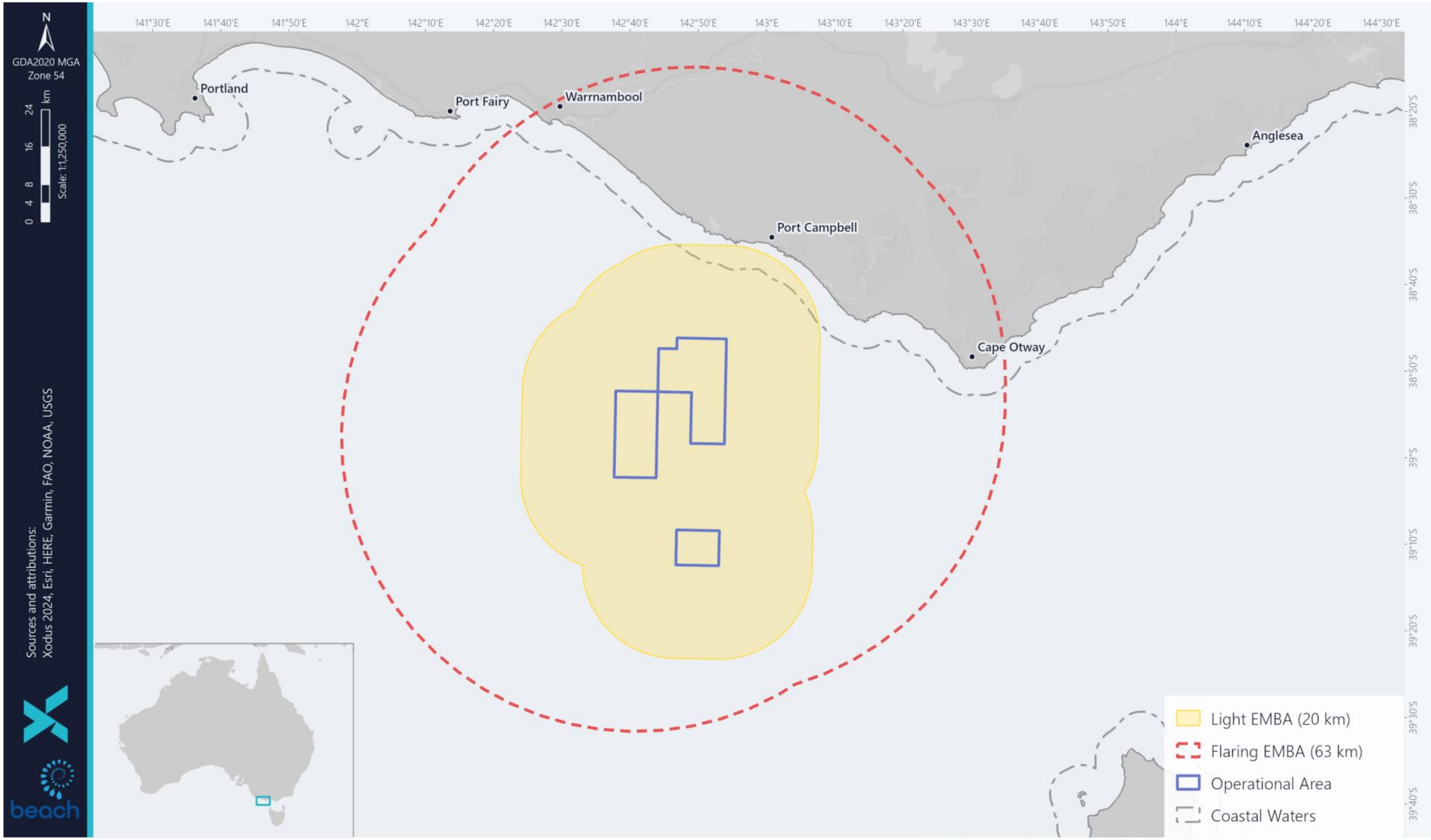


Figure 7-1: Light and flaring EMBA for the Program

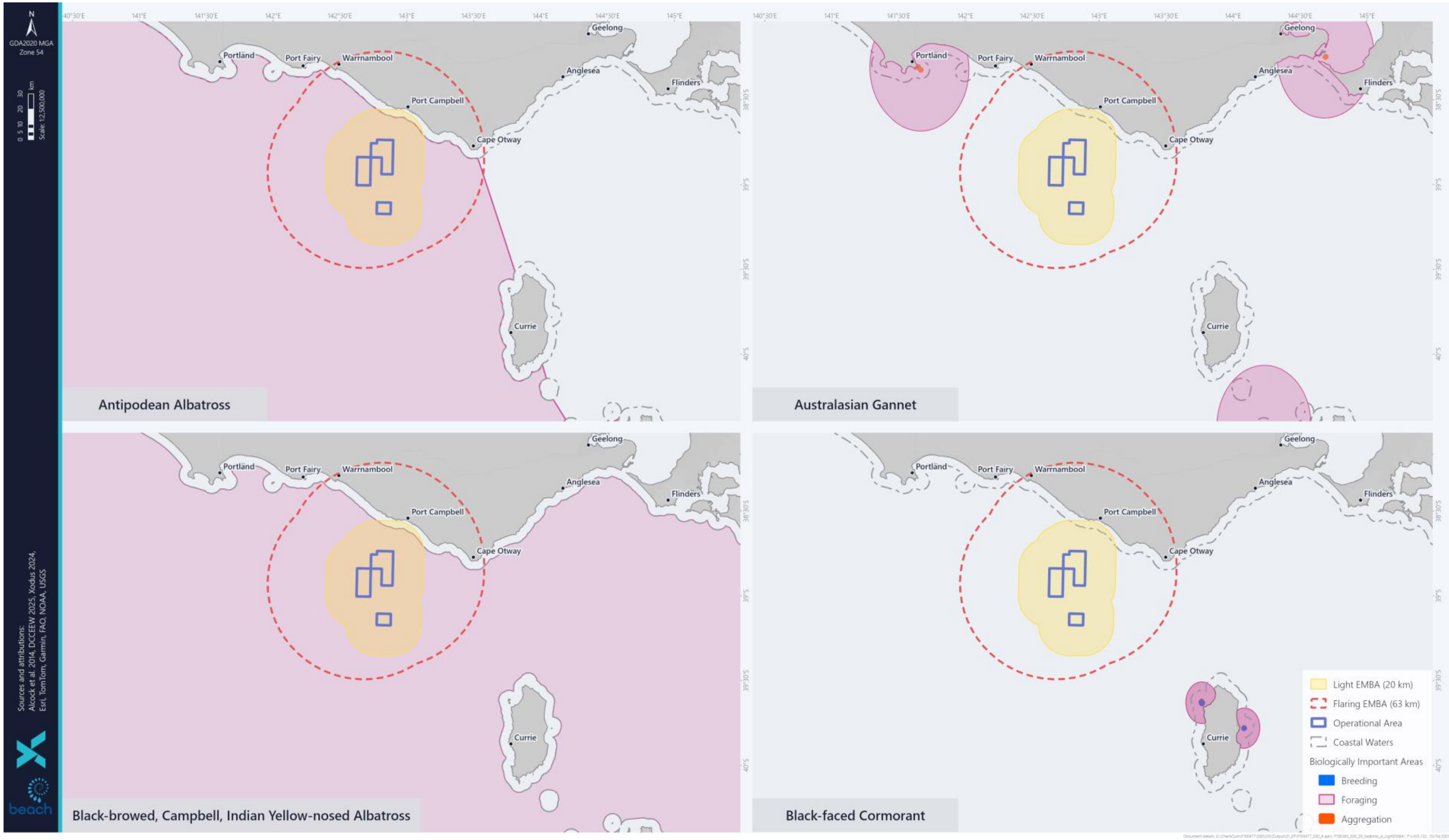


Figure 7-2: Light EMBA, flaring EMBA and BIAs for antipodean albatross, Australasian gannet, black-browed albatross, Campbell albatross, Indian yellow-nosed albatross and black-faced cormorant

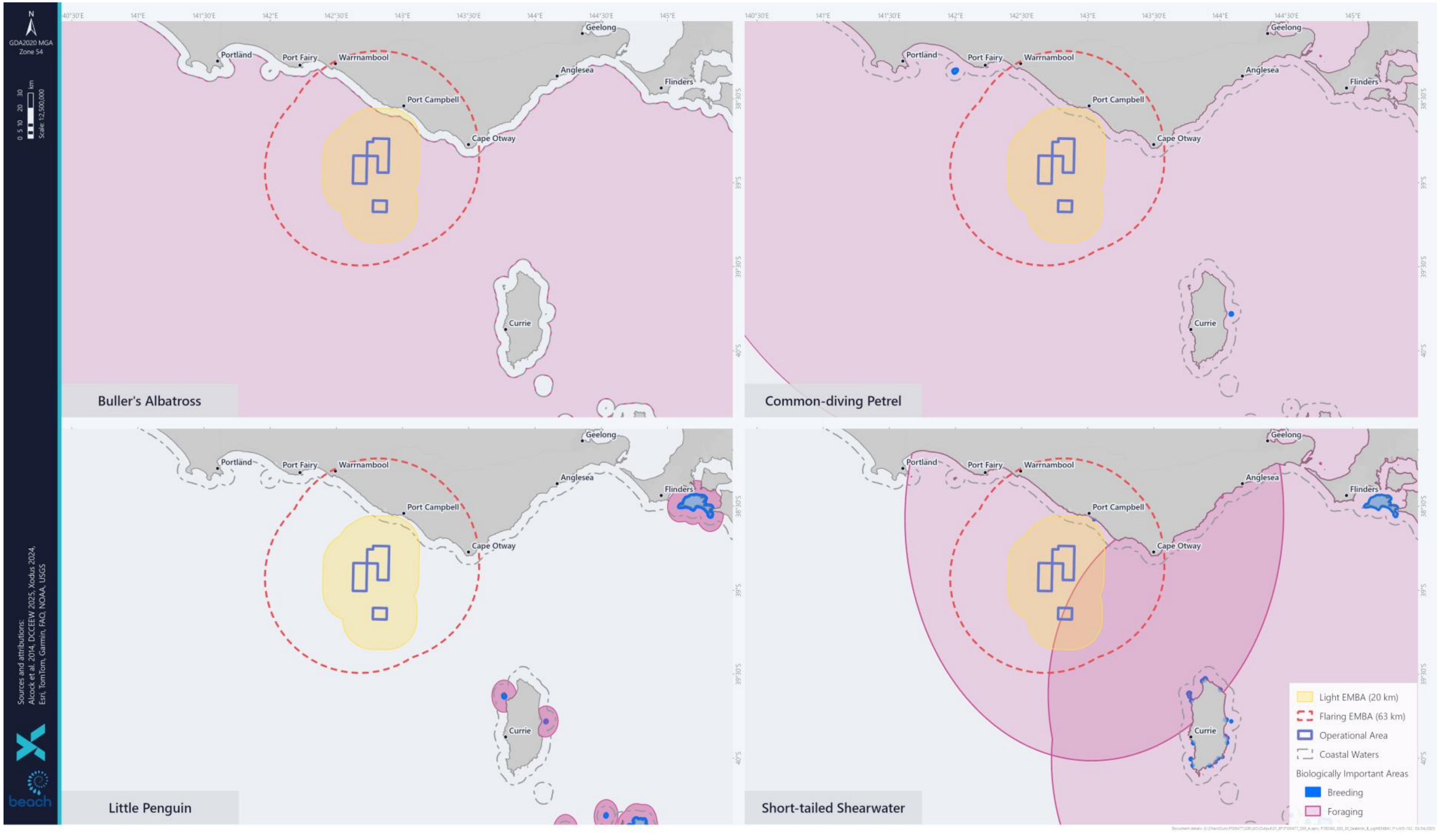


Figure 7-3: Light EMBA, flaring EMBA and BIAs for Buller's albatross, common diving-petrel, little penguin and short-tailed shearwater

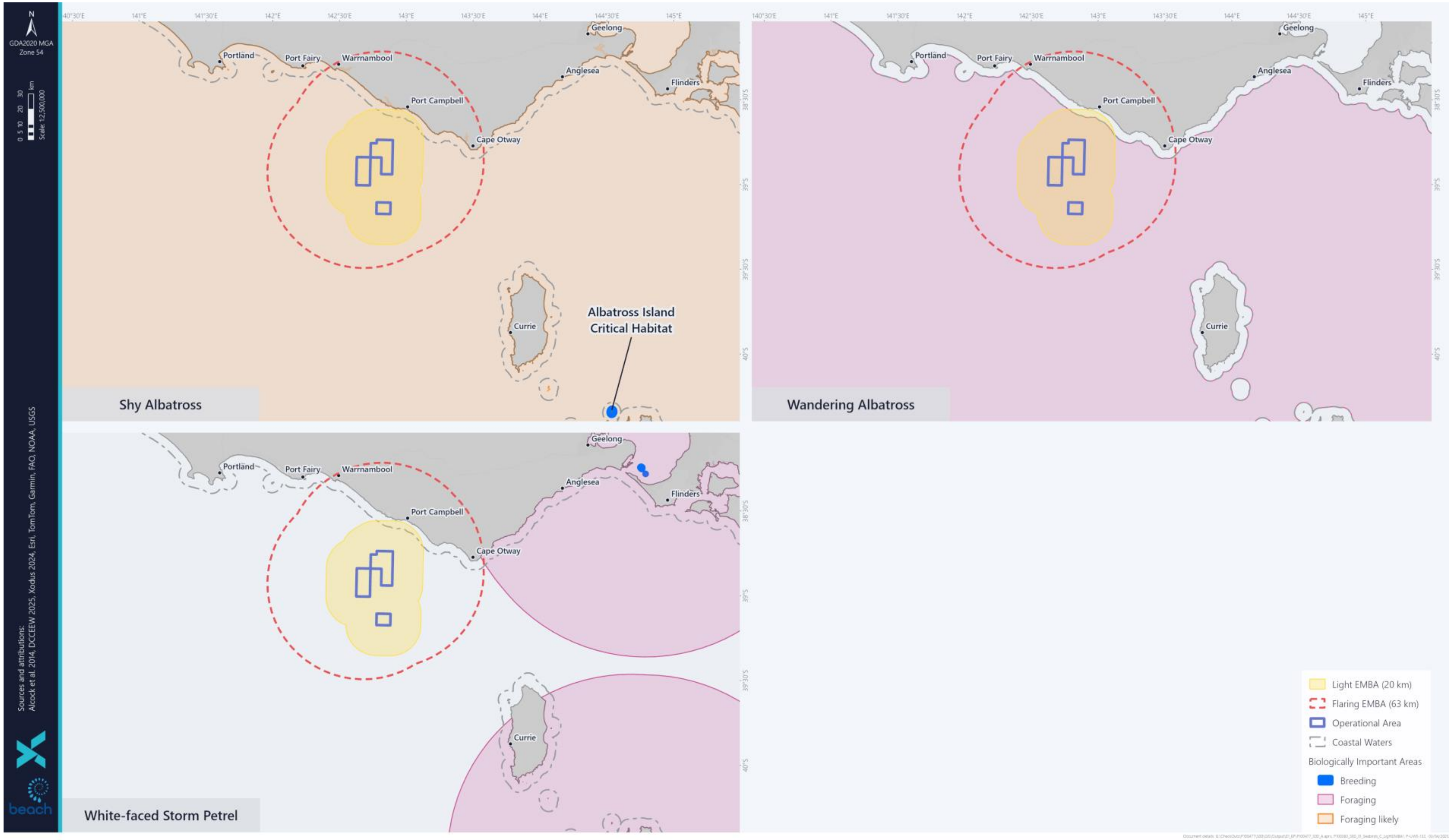


Figure 7-4: Light EMBA, flaring EMBA and BIAs for shy albatross, wandering albatross and white-faced storm petrel

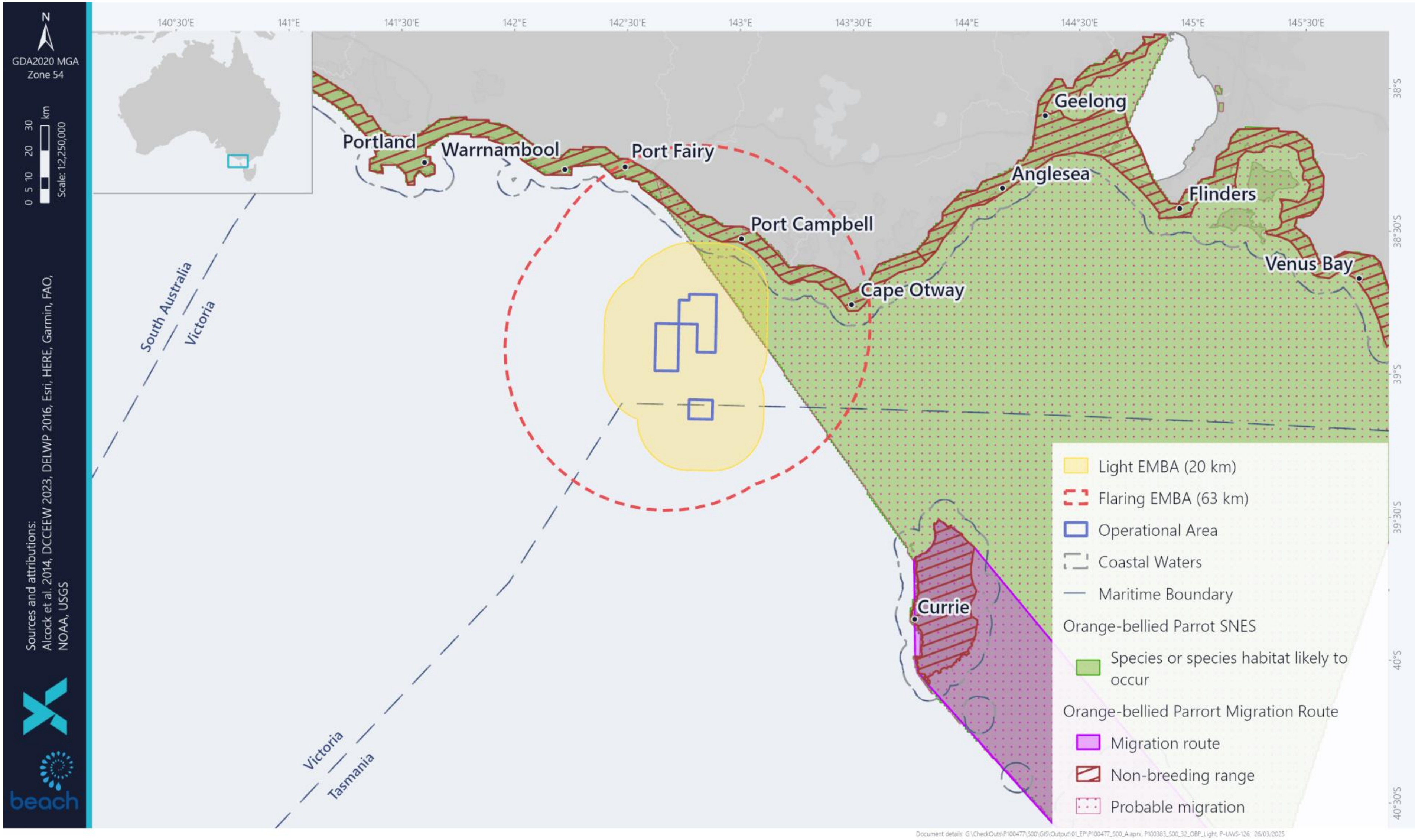


Figure 7-5: Light EMBA, flaring EMBA and orange-bellied parrot migration route

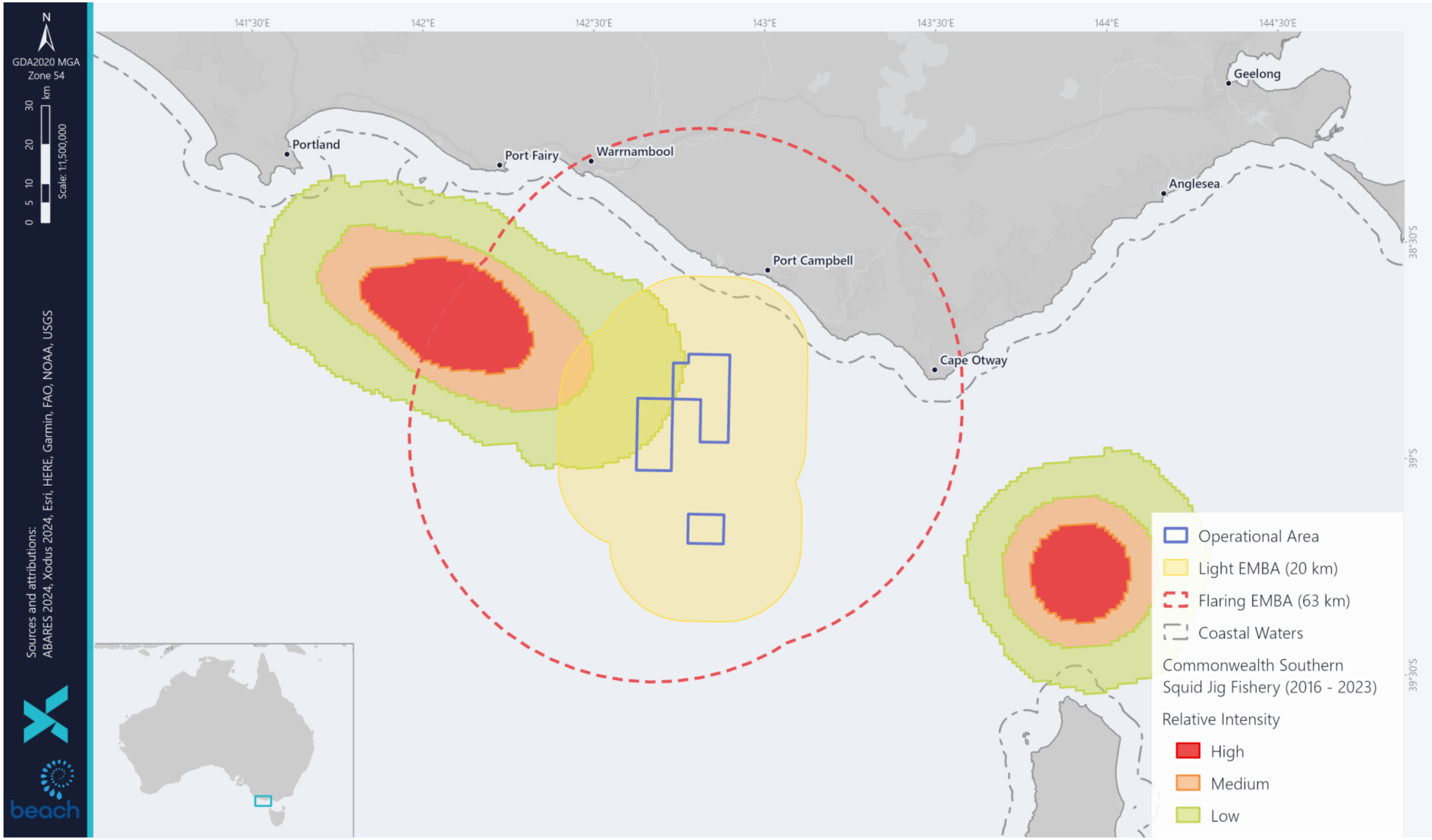


Figure 7-6: Light EMBA, flaring EMBA and Commonwealth Southern Squid Jig Fishery fishing intensity

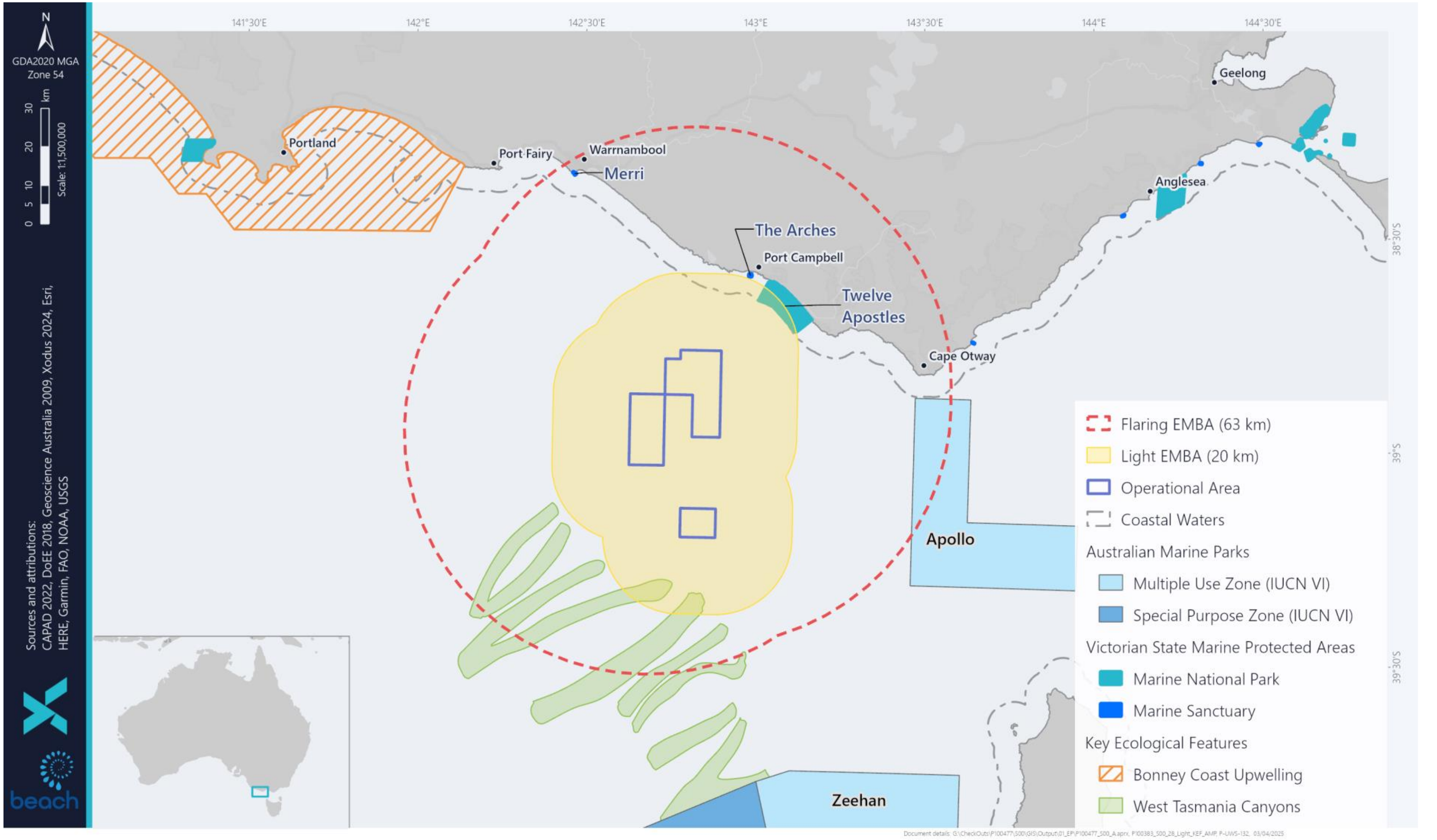


Figure 7-7: Light EMBA, flaring EMBA, Australian Marine Parks, State Marine Protected Areas and KEFs

7.2.6 Demonstration that Impacts will be ALARP

ALARP decision context and justification	ALARP Decision Context: Type A Impacts from light emissions are relatively well understood though there is the potential for uncertainty in relation to the level of impact. Activities are well practised, and there are no conflicts with company values, no partner interests and no significant media interests. Additional controls may be required to ensure impacts can be managed to an acceptable level.	
Adopted Control Measures	**Comparison to Relevant OPP Control Measures or Equivalents**	**Description**
CM01: Marine Assurance Process	CM01 is equivalent to OPP-CM35 Marine Orders. Both controls refer to the application of relevant Marine Orders. Beach Marine Assurance System ensures that the MODU and vessels meet relevant maritime laws and associated Marine Orders.	The MODU and vessels will meet relevant maritime laws and includes pre-commencement MODU and vessel inspections of class certification requirements under the *Navigation Act 2012* and associated Marine Orders. Marine Orders 21 and 30 for the safety of navigation and prevention of collisions require that onboard navigation, watchkeeping, radar equipment, and lighting meets the International Rules for Preventing Collisions at Sea (COLREGs) and industry standards. In addition, workplace lighting is required to support safe working conditions at night in accordance with health and safety requirements.
CM07: Light Management Plan	CM07 is equivalent to OPP-CM13 Lighting Management Procedure. Both controls detail the requirement to develop and support the implementation of a Light Management Plan as per the National Light Pollution Guidelines for Wildlife (DCCEEW 2023).	The National Light Pollution Guidelines for Wildlife (DCCEEW 2023) provide management options for mitigating the effect of light to seabirds. A review of the management options relevant to Program activities is provided in the additional controls section, noting that the light EMBA does not overlap any bird rookeries or nesting areas. Beach will contract appropriately qualified lighting practitioners, together with an appropriately qualified marine biologist or ecologist to develop and support the implementation of a Light Management Plan as per the National Light Pollution Guidelines for Wildlife (DCCEEW 2023). Once safety navigational lighting requirements are met (as per vessel class), the Light Management Plan will detail additional mitigations to ensure artificial lighting is reduced to minimum levels based on the information in the Seabird Light Mitigation Toolbox (DCCEEW 2023) wherever practicable, whilst maintaining safe working conditions and navigation. Specifically, outwards facing lighting will be reduced to minimum levels, wherever practicable.
Additional Control Measures Assessed		

Control	Cost/Benefit Analysis	Control Implemented?
Limit or exclude night-time operations	Elimination of work lights associated with routine operations could result in a minor decrease in lighting. Limiting operations to day-time hours would not eliminate the impact of artificial light required for navigation and safe stand-by operations. Restricting night-time operations would increase the duration of the program and the associated HSE impacts and costs and would be grossly disproportionate the reduction in impact.	No
No flaring	Elimination of the impact of artificial light emissions from flaring on light sensitive receptors. Flaring is required to remove well construction fluid and debris prior to suspension pending tie-in and commissioning. By removing well construction fluid from the well the risk of the well not being able to unload, as well as the risk of formation damage is greatly reduced. Flaring duration will be limited to cleaning up the wells, no well testing is planned. Flaring durations are indicated in Table 3-3.	No
Seasonal timing	Managing the activity to avoid seasonal timings can reduce the risk of adverse impacts from light emissions during environmentally sensitive timings for listed marine fauna. The following seasonal timings were identified for species that may be active at night within the light EMBAs: Orange-bellied parrot: late February to early April (Australian Museum 2020). Common diving-petrel: year-round (DoE 2025). Northern giant petrel: May to October (DoE 2025) Short-tailed shearwater: September to April (AAD 2020) Based on this, there is no period where avoidance of all species is possible. The activity schedule is dependent on availability of the MODU, offshore survey vessels, and well sequence. The costs associated in moving or delaying the activity schedule are considered grossly disproportionate the benefit gained. Prioritising certain species for seasonal avoidance during Program activities will not be feasible given the schedule of the shared MODU for the rig consortium. The MODU schedule is dependent on the actual MODU commencement date, and sequencing of the program activities agreed by all the operators within the consortium. As the program activities could take up to 150 days, there will be some overlap with periods when foraging or migrating birds will be within the light EMBAs. Controls have been identified to ensure lighting is reduced to that for safe operations. In addition, during the Beach Otway Drilling Campaign in 2021/2022, no birds were identified to be attracted or grounded due to MODU or vessel lighting or due to flaring. In 15 years of Beach operating the Thylacine-A Wellhead Platform no orange-bellied parrots have been recorded. In addition, no orange-bellied parrots were observed during the Otway Phase 4 or Phase 5 offshore campaigns.	No

	Avoiding the orange-bellied parrot migration is not commensurate to the level of impacts predicted. Other species are present all year round or for large portion of the year or do not forage at night thus restricting the period when activities will occur does not afford any benefit to these species.	
Change lighting types aboard the MODU and vessels to those with less impact (e.g. use of motion sensors / timers, change colour of lights, reduced intensity, and frequency of lighting)	Changing the colour, intensity, frequency and/or positioning of lighting could potentially reduce the adverse impacts of artificial light on certain fauna. Navigation lighting colours and minimum lighting for crew safety are stipulated by law. Given the variety of marine fauna that may be present and their varying sensitives to different light wavelengths, the control measure is not regarded as being practical and is likely to be of minimal overall benefit. During the Beach Otway Drilling Campaign in 2021/2022, no birds were identified to be attracted or grounded due to MODU or vessel lighting. The costs of replacing lighting are considered grossly disproportionate to the benefit gained.	No
Vessels maintain a dark zone between the orange-bellied parrot migration pathway and the light sources during migration season.	Position of vessels is determined by safe operational requirements. Evaluation of trade-offs indicates an unacceptable navigation and safety risk associated with the establishment of dark zones. Further, repositioning is likely to result in only minor reductions in light emissions. The HSE trade-offs are considered grossly disproportionate to the benefit gained.	No
Reduce unnecessary outdoor deck lighting on all vessels and permanent and floating oil and gas installations in known seabird foraging areas at sea.	The Light Management Plan will include requirements to minimise non-essential lights and outward facing lights ensuring safety navigational lighting and safe work condition requirements are met.	Yes CM07: Light Management Plan
Vessels working in seabird foraging areas during breeding season should implement a seabird management plan to prevent seabird landings on the ship, manage birds appropriately and report the interaction.	A rescue program will not prevent birds grounding, but it has been proven useful to reducing mortality of seabirds, and therefore, an environmental benefit. Preparedness for handling will also reduce safety risks to personnel. Administrative costs of incorporating this program into induction package and implementation throughout activity. The Light Management Plan will include a program for handling grounded birds and reporting requirements.	Yes CM07: Light Management Plan

7.2.7 Demonstration that Impacts will be of an Acceptable Level

Consequence rating	Minor (1)
Likelihood of occurrence	NA (Impact)
Residual risk	NA (Impact)

Acceptability Assessment

Demonstration of acceptability for impacts and risks associated with emissions – light emissions as provided in Section 6.3.5 of the OPP (Otway Offshore Gas Victoria Project), are considered valid and appropriate for the

impact and risk assessment of this aspect for the Program activities. This is supported by the acceptability assessment for this aspect against the evaluation criteria in the following rows. The potential impacts from atmospheric emissions during Program activities meets the defined acceptable levels in the OPP by ensuring the considerations in Section 2.8 are met such that: OPP EPOs relevant to light emissions are implemented through equivalent EP EPOs OPP control measures relevant to the light emissions are implemented through equivalent EP control measures Based on the implementation of relevant and equivalent EPOs and control measures the consequence rating, likelihood of occurrence and residual risk are the same levels as defined in the OPP No changes to internal or external context as defined in the OPP including no new comments (objections and claims) raised against this aspect.	
To meet the principles of ESD	Light emissions were assessed as having a Minor (1) consequence which is not considered as having the potential to result in serious or irreversible environmental damage. There is high confidence in the predicted level of impact as Beach has significant experience operating in the Otway Basin based on their existing offshore developments and associated activities including the Beach Otway Drilling Campaign in 2021/2022.
Internal context	The proposed management of the impact is aligned with the Beach Environment Policy. Activities will be undertaken in accordance with the Implementation Strategy (Section 8).
External context	There have been no stakeholder objections or claims regarding light emissions.
Other requirements	Light emissions will be managed in accordance with the National Light Pollution Guidelines for Wildlife (DCCEEW 2023). The Guidelines recommend: Infrastructure with artificial lighting that is externally visible should have best practice lighting design implemented. Where there is important habitat for seabirds within 20 km of a project, an EIA should be undertaken. These requirements are met by this impact assessment and the implementation of CM07: Light Management Plan. Light pollution is identified as a threat in the Wildlife Conservation Plan for Seabirds (CoA 2020a) and with the following actions relevant to light: Manage the effects of anthropogenic disturbance to seabird breeding and roosting areas. Ensure all areas of important habitat for seabirds are considered appropriately and consistently in the development assessment process. This requirement is met by this impact assessment and the implementation of CM07: Light Management Plan. Light emissions are identified as a threat in National Recovery Plan for Albatrosses and Petrels (CoA 2022) however, no actions are identified. The implementation of vessel Light Management Plans will ensure that lighting is of a level that will not impact on the recovery of threatened albatrosses or petrels. The National Recovery Plan for the Orange-bellied Parrot (DELWP 2016) identifies illuminated boats and structures as a threats with the action of assess the risk from barriers on the migration route. With the action of manage threat if the risk rating warrants action. This requirement is met by this impact assessment and the implementation of CM07: Light Management Plan. The Wildlife Conservation Plan for Migratory Shorebirds (DoE 2015b) identifies light as part of anthropogenic disturbance as threat but has no actions.

	The National Recovery Plan for the Australian Painted Snipe (CoA 2022b) does not identify light as a threat. There are no other recovery plans, conservation advice or listing advice for seabirds within the light EMBAs.
Monitoring and reporting	Reporting of injury to or death of EPBC Act-listed species will be undertaken as detailed in Section 8.3.1.
Acceptability outcome	**Acceptable**
Environmental Performance	Environmental Performance Outcomes (EPOs) represent the measurable levels of environmental performance Beach is seeking to achieve to ensure impacts are of an acceptable level. EPOs relevant to the effective management of impacts associated with light emissions from the program activities are: EPO2: No death or injury to listed threatened or migratory species from the activity; EPO3: Biologically important behaviours can continue while the activity is being undertaken. Section 7.15 sets out the EPS for the control measures identified above, and the measurement criteria to evaluate the achievement of EPOs and EPS. These EPOs are considered equivalent to relevant OPP EPOs as justified in Table 2-2.

7.3 Atmospheric Emissions

7.3.1 Source of Aspect

Atmospheric emissions are generally considered to be any emission or entrainment process from a point, non-point or mobile sources that results in air pollution. This includes air pollutants and greenhouse gas (GHG) emissions. With regard to Program activities, these emission sources include:

- Emissions from combustion of fuel use by the MODU, vessels and helicopters.
- Emissions from flaring of reservoir fluids during well completions activities.
- Fugitive emissions from process equipment such as valves, piping flanges, pumps, storage tanks, compressors, etc. on the MODU and vessels.
- Dust (dry powder) emissions from MODU dry bulk storage tank vents during transfer of bulk dry barite, bentonite, and cement from the vessel to the MODU.

7.3.2 Extent and Duration of Aspect

Program Activities	
Extent	Operational Area Based on the furthest distance of impact.
Support Operations	
Duration	150 days for the full program activities (refer to Section 3.2). Continuous atmospheric emissions will be generated by power generation on the vessels and MODU.
Well Completions and Well Intervention – Flaring	
Duration	Flaring of up to 2 days per well, at up to 65 MMscfd

7.3.3 Predicted Environmental Impacts

The release of GHG emissions, such as carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O), along with air pollutants, such as sulphur oxides (SO_x) and nitrogen oxides (NO_x), can result from the operation of the MODU and vessel engines, helicopters, generators, fixed plant, and equipment, and flaring during well completions activities, e.g., well clean up. Small quantities of dry barite, bentonite and cement will also be released whilst the holding tanks are venting after the transfer of bulk solids.

The predicted environmental impacts from atmospheric emissions are:

- Atmospheric emissions leading to a change in air quality and
- an increase in greenhouse gas emissions.

7.3.4 EMBA

Air quality

Predicted impacts from atmospheric emissions associated with the program activities will be limited to the Operational Area. Receptors which may be affected by atmospheric emissions within the Operational Area include:

- Air quality
- Seabirds.

GHG Emissions

The accumulation of GHG emissions in the atmosphere has been shown to contribute to climate change (BOM and CSIRO 2024, IPCC 2022a). Climate change impacts occur at a global scale over a long timeframe and cannot be attributed to any single source of emissions or specific activities.

Climate change associated with an increase in GHG emissions is likely to affect various values and sensitivities within Australia, such as:

- Physical environment such oceanography, water quality, climate.
- Ecological receptors associated with marine, terrestrial and wetland ecosystems.
- Socio-economic receptors such as coastal communities and fisheries.
- Cultural values and sensitivities.

It is important to acknowledge that climate change impacts cannot be directly attributed to any one activity. Rather they are the result of global GHG emissions minus global GHG sinks, that have accumulated in the atmosphere since the industrial revolution began.

7.3.5 Predicted Level of Impact

7.3.5.1 Air Quality

As the Operational Area is away from coastal settlements and given the limited extent of reduced air quality, adverse impact on local or regional biodiversity, ecological integrity, social amenity, or human health is not predicted.

The Operational Area overlaps foraging BIAs for albatross, petrel, shearwater, gannet and penguin species. No habitat critical to the survival of birds occur within the Operational Area. As it is unlikely that seabirds would remain close to the emission source for an extended period, impacts are not predicted.

Flaring of reservoir gas, diesel combustion, and fugitive emissions will result in emissions of carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O). While these emissions add to the atmospheric GHG load, the absolute emissions from these activities are small on a global scale, representing an insignificant contribution to overall GHG emissions. These emissions are not considered to have a determinable local-scale impact and therefore impacts are considered to be low.

The extent of the area of potential impact is predicted to be close to the emission source for the duration of the emission. The consequence is assessed as **Minor (1)** and is of an acceptable level based on:

- The low level of emissions.
- The open ocean environment and prevailing winds of the Otway Basin mean that atmospheric emissions will rapidly disperse to background levels close to the emission source.
- Impacts to seabirds are not predicted.
- Impacts to coastal communities are not predicted.

7.3.5.2 Greenhouse Gas Emissions

Direct and indirect GHG emissions have been considered for the program activities. Beach reports its Australian scope 1 and scope 2 emissions under the *National Greenhouse and Energy Reporting Act 2007* (NGER), calculated according to the *National Greenhouse and Energy Reporting (Measurement) Determination 2008* (DCCEEW 2022d).

Direct emissions will arise from flaring of well fluids and system upsets during well completions and well intervention activities. For the 6 wells within the Program (Section 3), this is estimated at 58 kt CO_2-e, with fugitive emissions considered immaterial over the duration of activities.

Indirect emissions, from sources not owned or operated by Beach, associated with the Program's activities include vessels, MODU, helicopters, and materials used. These emissions are classified as scope 3 emissions, per the Greenhouse Gas Protocol *"Corporate Accounting and Reporting Standard"* (2004). The indirect emissions from these activities are estimated at 33 kt CO_2-e.

The GHG emissions estimates is based on conservative assumptions about program conditions, such as the longest possible activity duration for each well.

The total GHG emissions estimate for the Program activities is less than 0.021% and 0.115% of the Australian and Victorian carbon budgets, respectively, for the duration of the Program activities.

The emissions associated with the Program activities are small when compared to national emissions, are insignificant on a global scale and are not predicted to have determinable impact.

Although ozone-depleting substances (ODS) are not expected on vessels for the Program activities, there is a potential that ODS may be present. Accidental release and fugitive emissions of ODS have the potential to contribute to ozone layer depletion, attributing to increased ultraviolent radiation reaching the earth's surface from the sun, further accelerating global warming and climate change (WMO 2022).

Physical Environment

Anthropogenic driven climate change has been demonstrated to result in changes in the frequency and intensity of extreme weather events such as droughts, floods, heatwaves, storms, and fire, impacting ecosystem's composition, resilience, and function (IPCC 2022a).

Climate change has been attributed to fundamental changes to the physical and chemical characteristics of the ocean, such as ocean warming, sea levels rising, acidification and deoxygenation (IPCC 2022a). Sea surface temperatures have increased globally over recent decades and are expected to continue to rise. Estimates of warming in the Southern Tasman Sea of between 0.6 to 0.9°C, and between 0.3 to 0.6°C elsewhere along the Australian coast, are predicted by 2030 (Church et al. 2006).

Ecological Receptors

Climate change can result in a range of impacts to specific species, environments, and ecosystems within Australia. It is important to acknowledge that climate change impacts cannot be directly attributed to one activity, as they are the result of global emissions that have accumulated within the atmosphere over time.

The impacts from climate change are highly species-dependent and spatially variable. Some impacts which are already apparent include changes to biodiversity, such as shifts in genetic composition, changes to migration patterns, altered lifecycles and reduced reproduction rates of certain species (Steffen et al. 2009). The increase in the frequency and intensity of extreme weather events has been shown to impact population dynamics, species boundaries, morphology, behaviour, reproduction and ecosystem composition, resilience, and function (IPCC 2022a).

In the marine environment, changes to the physical and chemical characteristics of the environment can result in alterations to species distribution, abundance, seasonal timing, habitat loss, extinction, population declines and increases in the frequency and intensity of thermally induced coral bleaching events (IPCC 2022a, BOM and CSIRO 2022). Increasing acidity, from CO_2 being absorbed by oceans and fresh water, increases the solubility of calcium carbonate, which is the central component of the skeletal material in aquatic organisms (Steffen et al. 2009).

Furthermore, species are globally shifting polewards driven by heat increases, shifts in seasonal timings and ecosystem changes, causing multiple losses of local species, mass mortality events, and loss of specific ecosystems such as kelp forests (IPCC 2022a). The shift will have adverse socio-economic consequences on certain activities which rely on these species such as aquaculture and fisheries.

Socio-economic Receptors

Socio-economic impacts resulting from climate change include impacts to the functions, interests or activities of other users who rely on specific ecological values that may experience adverse impacts, such as commercial and recreational fisheries and aquaculture.

Socio-economic impacts resulting from climate change include impacts to the functions, interests or activities of other users who rely on specific ecological values that may experience adverse impacts, such as commercial and recreational fisheries and aquaculture.

Climate change may impact marine crustacean populations by intensifying habitat loss and interfering with feeding, moulting, reproductive performance, biochemical compositions, behaviour, movement and survival (Azra et al. 2022).

Crustacean responses to climate change vary by species, life-history stage, reproduction status and geographical distribution. For example, research on the southern rock lobster has shown they can increase their resilience to warmer water temperatures (Oellermann et al. 2022). However, the southern rock lobster is restricted by the inability to shift their range further south due to a lack of coastal habitat. Consequently, the main threat from climate change is expected to be climate driven competition with the increasingly abundant eastern rock lobster as it expands its range south (Oellermann et al. 2022).

Conservation Values and Sensitivities

The Zeehan AMP and Apollo AMP are the closest AMPs to the Operational Area. The values of these marine reserves include ecological receptors that may be sensitive to the impacts of climate change.

The South-east Commonwealth Marine Reserves Network Management Plan (DNP 2025) states the impacts of climate change on the marine environment are complex and may include longer lasting marine heatwaves, continued rise in sea level, further ocean acidification, changes to ocean currents and eddies, increased storm frequency, and species range extensions or local extinctions. These multifaceted changes have the potential to significantly impact on marine park values. The Plan states that there is a high level of uncertainty about the effects that climate change related pressures will have on the conservation values protected by the South-east Commonwealth marine reserves.

The Arches Marine Sanctuary and Twelve Apostles Marine National Park are the closest state marine protected areas to the Operational Area. The Great Ocean Road Action Plan which covers the Twelve Apostles Marine National Park, The Arches Marine Sanctuary along with the Great Ocean Road, identifies impacts of climate change to these protected areas.

Whilst the release of GHG emissions is known to contribute to global climate change, the amount estimated to be released as a result of the Program's activities are insignificant on a global scale and is not expected to have determinable impacts to protected areas.

Cultural Values and Sensitivities

Impacts to cultural heritage sites and places of spiritual importance in coastal locations may also be experienced due to rising sea levels. Sea levels have been estimated to have risen on average by 1.2 mm per year between 1920 and 2000 due to climate change (Church et al. 2006). By 2100, research is expecting sea levels to have increased by a further 18 to 59 cm in response thermal expansion and melting of icesheets (Solomon et al. 2007).

Whilst the release of GHG emissions is known to contribute to global climate change, the amount estimated to be released as a result of the program activities is insignificant on a global scale and is not expected to have determinable impacts.

Summary

For the Program activities there is no gas production. The total GHG emissions associated with the Program activities are small (less than 0.021% and 0.115% of the Australian and Victorian carbon budgets, respectively) when compared to national emissions, are insignificant on a global scale and are not predicted to have determinable impact.

The consequence severity of GHG emissions from the program activities on the physical, ecological, conservation, socio-economic and cultural receptors and values described above is assessed as **Minor (1)** and is of an acceptable level based on:

- Although emissions of GHG such as carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O) during the activity will add to the GHG load in the atmosphere, they represent an insignificant contribution on a global scale and are not expected to have determinable impacts. Consequently, impacts are not predicted to affect:

  Species with conservation management plans that identify climate change as a threat.

  Commercially important species, noting that the giant crab and southern rock lobster fisheries in Victoria, and the southern rock lobster fishery in Tasmania having stock listed as a sustainable status (FRDC 2020, 2020a) and neither have a EPBC threatened status, therefore, any minor impact is unlikely to affect the productivity of either population.

  The South-east Commonwealth Marine Reserves Network Management Plan stating that there is a high level of uncertainty around the effects that climate change may have upon the conservation values protected by the reserves (DNP 2013).

- Maintenance of equipment containing ozone depleting substances is controlled to ensure the likelihood of an accidental release or fugitive emissions is minimised.

7.3.6 Demonstration that Impacts will be ALARP

ALARP decision context and justification	**Atmospheric emissions: ALARP Decision Context: Type A.** Impacts from atmospheric emissions are well understood and there is nothing new or unusual. Good practice is defined, and uncertainty is minimal. There are no conflicts with company values, no partner interests, and no significant media interests. No objections or claims where raised by stakeholders in relation to atmospheric emissions. As the impact consequence is rated as Minor (1) applying good industry practice (as defined in Section 2.7.2.1) is sufficient to manage the impact to ALARP. **GHG emissions: ALARP Decision Context: Type B** Impacts from GHG emissions are relatively well understood though there is the potential for uncertainty in relation to the level of impact. Activities are well practised, and there are no conflicts with company values, but there is significant partner and media interest in GHG emissions from oil and gas activities including Beach's activities. Though objections or claims were raised by stakeholders in relation to GHG emissions this was in relation to future development and processing of gas reserves and not specific to the program activities.	
Adopted Control Measures	**Comparison to Relevant OPP Control Measures or Equivalents**	**Description**
CM01: Marine Assurance Process	CM01 is equivalent to OPP-CM35 Marine Orders. Both controls refer to the application of relevant Marine Orders. Beach Marine Assurance System ensures that the MODU and vessels	The MODU and vessels will meet relevant maritime laws and includes pre-commencement MODU and vessel inspections of class certification requirements under the *Navigation Act 2012* and associated Marine Orders. MODU and vessels will comply with Marine Orders – Part 97: Marine Pollution Prevention – Air Pollution (appropriate to vessel class) for emissions from combustion of fuel, including: Hold a valid Air Pollution Prevention certification or equivalent in accordance with MARPOL Annex VI.

	meet relevant maritime laws and associated Marine Orders. CM01 is equivalent to OPP-CM26 Preventative Maintenance System. Both controls details inspection and maintenance of combustion equipment to ensure efficient operation.	Use low sulphur fuel in accordance with Marine Order 97: Marine Pollution Prevent – Air Pollution (Division 7). National (AMSA) and International (IMO / MARPOL) Emissions and Discharge Standards for vessels. Have a Ship Energy Efficiency Management Plan (SEEMP) as per MARPOL 73/78 Annex VI. Engine NOx emission levels will comply with Regulation 13 of MARPOL 73/78 Annex VI. Only MARPOL VI-approved waste incinerators shall be used to incinerate solid combustible waste (food waste, paper, cardboard, rags, plastics). ODS handling procedures as per MARPOL Annex VI, including maintenance of ODS record book where rechargeable systems containing ODS are recharged or repaired. A Preventative Maintenance System is in place that provides a status on the maintenance of equipment and detailed manufacturer's specification on maintenance procedures for: Equipment detailed as a control in this EP which will be inspected to ensure effective operation. Power generation and propulsion systems on the MODU and vessels which will be inspected to ensure efficient operation.
CM02: Vessel and MODU Operating Procedures	CM02 is equivalent to OPP-CM30 Drilling Fluid Inventory. Both controls identify processes to track bulk solids to reduce or avoid discharge or release of bulk materials.	Bulk solids transferred in accordance with bulk transfer procedures to reduce the risk of an unintentional release bulk product (powder) to sea during tank venting. The procedures include standards for: Certified equipment with confirmed integrity (e.g. hose and valves). Transfer processes (e.g. safety, communication, monitoring, inventory, emergency shut down procedures, procedural documents, and spill incident details).

Additional Controls Assessed

Control	Cost/Benefit Analysis	Control Implemented?
Use of low emission vessels	Beach via its Procurement Vetting Process (CM11) assesses suppliers emissions management and via this process would procure low emission vessels if available.	Yes – as per CM11: Procurement Vetting Process
Prohibit use of ODS (ozone depleting substances)	Eliminates emissions associated with ODS activities during the program activities. No rechargeable systems or equipment containing ODS is permitted to be installed on ships constructed on or after 19 May 2005 and no new installation of the same is permitted on or after that date on existing ships. Similarly, no systems or equipment containing ODS is permitted to be installed on ships constructed on or after 1 January 2020 and no new installation of the same is permitted on or after that date on existing ships. Existing systems and equipment are permitted to continue in service and may be recharged as necessary. Beach via its Marine Assurance Process (CM01) assesses suppliers ODS handling procedures as per MARPOL Annex VI. This process	No

	would ensure the prevention of marine air pollution in accordance with the *Navigation Act 2012*. Beach considers the prohibited used of ODS on vessels would result in potential scheduling delays and negative cost-benefit ratio which is grossly disproportionate to the benefit gained.	
No bulk product (powder) transfers	Eliminates impacts to air quality from unintentional release. Bulk product is required to perform the activity and transfers of bulk product are required. Transfer activities are carried out in accordance with MODU owner's procedures to reduce the risk of an unintentional release.	No

7.3.7 Demonstration that Impacts will be of an Acceptable Level

Consequently Rating	Minor (1)
Likelihood of Occurrence	NA (Impact)
Residual Risk	NA (Impact)
Acceptability Assessment Demonstration of acceptability for impacts and risks associated with emissions – atmospheric emissions and emissions – greenhouse gases as provided in Section 6.5.5 and 6.6.5 of the OPP (Otway Offshore Gas Victoria Project), respectively, are considered valid and appropriate for the impact and risk assessment of this aspect for the Program activities. This is supported by the acceptability assessment for this aspect against the evaluation criteria in the following rows. The potential impacts from atmospheric emissions during Program activities meets the defined acceptable levels in the OPP by ensuring the considerations in Section 2.8 are met such that: OPP EPOs relevant to atmospheric emissions are implemented through equivalent EP EPOs OPP control measures relevant to the atmospheric emissions are implemented through equivalent EP control measures Based on the implementation of relevant and equivalent EPOs and control measures the consequence rating, likelihood of occurrence and residual risk are the same levels as defined in the OPP No changes to internal or external context as defined in the OPP including no new comments (objections and claims) raised against this aspect.	
To Meet the Principles of ESD	Air emissions were assessed as having a Minor (1) consequence which is not considered as having the potential to result in serious or irreversible environmental damage. There is high confidence in the predicted level of impact as Beach has significant experience operating in the Otway Basin based on their existing offshore developments and associated activities including the Beach Otway Drilling Campaign in 2021/2022.
Internal Context	The proposed management of the impact is aligned with the Beach Environment Policy, Climate Change Policy, Sustainability Policy, Risk Management Standard, Environment Management Standard and Sustainability Standard as detailed in Section 7.15. Activities will be undertaken in accordance with the Implementation Strategy (Section 7.15).
External Context	There have been no stakeholder objections or claims regarding atmospheric emissions or GHG emissions associated specifically with the program activities.

Other Requirements	The following published material identifies climate change as a threat to the relevant threatened and migratory species within the Operational Area: National Recovery Plan for Albatrosses and Petrels (CoA 2022). Wildlife Conservation Plan for Migratory Shorebirds (DoE 2015b) Conservation Advice for Ardenna grisea (sooty shearwater) (DCCEEW 2023a). National Recovery Plan for the Orange-bellied Parrot Neophema chrysogaster (DELWP 2016). Recovery Plan for Marine Turtles in Australia (CoA 2017). Conservation Management Plan for the Blue Whale (CoA 2015a) National Recovery Plan for the Southern Right Whale (DCCEEW 2024k). Listing Advice: Megaptera novaeangliae Humpback Whale (TSSC 2022). Conservation Advice Balaenoptera borealis (sei whale) (TSSC 2015f). Conservation Advice for Balaenoptera physalus (fin whale) (TSSC 2015e). Recovery Plan for the White Shark (Carcharodon carcharias) (DSEWPaC 2013b).
Monitoring and Reporting	Fuel use will be recorded as detailed in Section 8.3.7. Atmospheric and GHG emissions will be recorded and reported in alignment with the National Greenhouse and Energy Reporting Act 2007 (NGER Act) and National Pollution Inventory as detailed in Section 8.3.7.
Acceptability Outcomes	**Acceptable**
Environmental Performance	Environmental Performance Outcomes (EPOs) represent the measurable levels of environmental performance Beach is seeking to achieve to ensure impacts are of an acceptable level. EPOs relevant to the effective management of impacts associated with atmospheric emissions from the program activities are: EPO5: No substantial reduction of air quality within local airshed caused by atmospheric emissions produced during the activity. Section 7.15 sets out the EPS for the control measures identified above, and the measurement criteria to evaluate the achievement of EPOs and EPS. These EPOs are considered equivalent to relevant OPP EPOs as justified in Table 2-2.

7.4 Underwater Sound

7.4.1 Source of Aspect

Underwater sound will be generated by:

- MODU and support vessel operations
- Transponders for anchor and MODU positioning
- Helicopter operations
- Wellhead cutting

7.4.2 Extent and Duration of Aspect

Vessel and MODU Operations – Well Completions, Contingent P&A	
Extent	2.09 km Based on the furthest distance to a sound exposure criteria.
Duration	150 days for the full Program (refer to Section 3.2). Continuous underwater sound will be generated by the vessels propellor cavitation, thrusters, hydrodynamic flow around the hull, and operation of machinery and equipment.
Wellhead Cutting - Contingent P&A	
Extent	Not distinguishable from the well completion and intervention underwater sound emissions
Duration	~1-2 hours though may take up to 6 hours for more complex wells
Vessel and MODU Operations – Resupply	
Extent	7.02 – 7.89 km Based on the furthest distance to a sound exposure criteria for resupply.
Duration	3 hours per day Based on a review of operational details from Beach's Otway Drilling Campaign, conducted from February 2021 to July 2022, resupply operations are predicted to occur near-daily for an average duration of 3 hours.
Vessel and MODU Operations – Well Intervention	
Extent	1.32 km Based on the furthest distance to a sound exposure criteria.
Duration	15 days per well (refer to Section 3.2).
Concurrent Activities (Thylacine North 1 and Thylacine West 1)	
Extent	12.2 km Based on the furthest distance to a sound exposure criteria.
Duration	9-13 days (refer to Section 3.2.1).

7.4.3 Predicted Environmental Impacts

Potential impacts of underwater sound emissions to marine fauna from Program activities are:

- Behavioural changes.
- Auditory impairment, permanent threshold shift (PTS) and temporary threshold shift (TTS).

7.4.4 EMBA

The sound EMBA is the largest spatial extent where sound levels are predicted to be above sound exposure criteria which are detailed in the relevant receptor's impact assessment sections. The spatial extent where impacts are occurring at any one time will be significantly smaller than the sound EMBA. Acoustic modelling undertaken to determine the sound EMBA is described in Section 7.4.8.1.

Continuous underwater sound emissions may impact ecological receptors within the sound EMBA such as:

- Fish (with and without swim bladders) including commercial species such as sharks and scalefish.
- Marine reptiles.
- Marine mammals.

As different sound exposure criteria apply to these receptors, sound EMBAs for each receptor is defined in the receptor consequence sections to identify potential receptors that may be affected.

Fish and marine mammals are identified as values of the following receptors within the sound EMBA:

- Socio economic receptors
- Cultural values and sensitivities

7.4.5 Predicted Level of Impact: Helicopter

Helicopters are used to transport personnel to and from the MODU. The presence of the helicopter and its associated sound field will be highly transient. On approach to the MODU the helicopter will descend to the helideck where there is greatest potential to ensonify the water column. Sound pressure will be greatest at the sea surface and rapidly diminish with increasing depth. Helicopter engine sound is emitted at a range of frequencies generally, below 500 Hz (Richardson et al. 1995). Richardson et al. (1995) reported helicopter sound (for Bell 214 type) being audible in air for four minutes before it passed over receivers, but only detectable underwater for 38 seconds at 3 m depth and for 11 seconds at 18 m depth for the same flight path. Thus, the predicted extent of impact is between 3 to 18 m for a period of 11–38 seconds twice a day (landing and take-off). Based on such short-term, intermittent sounds the consequence to whales (including pygmy blue whales within the foraging BIA, southern right whales within the migration BIA and fin or sei whales which may also be foraging) and other marine fauna is assessed as **Minor (1)**.

7.4.6 Predicted Level of Impact: Wellhead Cutting

Wellhead cutting required for the contingent P&A of Artisan 1 will typically take approximately 1-2 hours though may take up to 6 hours for more complex wells. Pangerc et al. (2016) described the underwater sound measurement data during an underwater diamond wire cutting of a 32” conductor (10 m above seabed in ~80 m depth) and found that at lower frequencies, the operation was generally indistinguishable above the background noise of the vessel. This is confirmed via acoustic modelling undertaken by JASCO (Koessler and McPherson 2021; Appendix J) who modelled a stationary vessel at Thylacine North 1 on DP plus a stationary vessel on DP using a ROV cutting tool at Geographe 4. This showed an increase of ~30 m for the behaviour exposure criteria compared to an installation vessel on DP and ~6 m for the TTS 24 hour exposure criteria.

As the wellhead cutting will not be distinguishable from the well completions and intervention underwater sound emissions it is inherently part of the assessment of Program sound emissions.

7.4.7 Predicted Level of Impact: Transponders

An array of long baseline and/or ultra-short baseline transponders may be installed on the seabed for metrology and MODU positioning. An array of transponders is proposed within a radius of 500 m from the well.

Transponder transmissions are not continuous but consist of short 'chirps' with a duration that ranges from 3 to 40 milliseconds. Transponders will not emit any sound when on standby and may emit acoustic signals for about 6 hours per well if used. When required for general positioning, they will emit one chirp every 5 seconds (estimated to be required for 4 hours at a time). When required for precise positioning, they will emit one chirp every second (estimated to be required for 2 hours at a time).

Transponders typically emit pulses of medium frequency sound, generally within the range 21 to 31 kHz. The estimated sound pressure level (SPL) would be 180 to 206 dB re 1 µPa at 1 m (Jiménez-Arranz et al. 2017). Based on empirical spreading loss estimates measured by Warner and McCrodan (2011), received levels from transponders may reach the cetacean behavioural response criteria for impulsive sources (160 dB re 1 µPa) out to ~42 m. As detailed in Table 7-6 this is significantly less than the distances to the behavioural response criteria for the vessel and MODU activities.

As the transponders will not be distinguishable from vessel and MODU underwater sound emissions it is inherently part of the assessment of drilling sound emissions.

7.4.8 Predicted Level of Impact: MODU and Vessels

Vessels generate continuous sound from propellor cavitation, thrusters, hydrodynamic flow around the hull, and operation of machinery and equipment. Sound from support vessels operating during drilling activities has been assessed to determine the cumulative impact of multiple continuous sound sources in close proximity.

The MODU will generate sound from onboard equipment vibrations (e.g. pumps, generators, and machinery), and a smaller portion transmitted directly via the drill bit whilst drilling during P&A activities.

The MODU may operate in a thruster assist mode to move into the well location and in emergency situations as per the MODU Safety Case. This system generates variable non-impulsive sound during infrequent operation of up to 6 thrusters in response to feedback from the mooring system. A review of 33 months of historical operational data from the North Sea indicates thrusters are typically not active (>96% of the time) and utilisation is otherwise limited to low loads across a small number of thrusters for short periods, (typically hours) in response to metocean conditions.

Concurrent activities (refer to Section 3.2.1) as a worst-case will include a MODU plus support vessels operating at one location while an AHTS vessel undertakes anchor pre-lay at another. This scenario would have a duration of 9 to 13 days. Modelling scenario of a MODU plus an Offshore Support Vessel (OSV) on standby are representative of concurrent activities (see description of modelling below).

7.4.8.1 Underwater Sound Modelling

JASCO Applied Sciences (JASCO) have performed 3 underwater acoustic modelling studies that are used to inform this impact assessment, including:

- McPherson et al. (2021) Beach Otway Development Acoustic Monitoring: Characterisation, Validation, and Marine Mammals (Appendix J).

  - This study included validation monitoring of drilling operations at Artisan 1. This study also recalculated distances to thresholds at Artisan 1 based on validation monitoring and characterised Monopole Source Levels for project vessels (during transit and under dynamic positioning (DP)) and the Ocean Onyx MODU.

- Koessler and McPherson (2021) Beach Otway Project: Additional and Revised Modelling Study (Appendix J)

  - Revised modelling for Thylacine North 1 and Artisan 1 based on better understanding of the propagation loss in the region gained through the validation monitoring of drilling operations at Artisan 1 (McPherson et al. 2021).

- Welch et al. (2024) ConocoPhillips Otway Exploration Drilling Program.

  - Acoustic modelling study undertaken by JASCO for ConocoPhillips Otway Exploration Drilling Program which used Monopole Source Levels for Ocean Onyx MODU and the Anchor Handling Tug supply vessel as measured by McPherson et al. (2021) for Artisan 1 drilling operations. This study also considered the propagation loss in the region gained through the validation monitoring of drilling operations at Artisan 1 (McPherson et al. 2021). Predictions from VIC/P79 well location (Essington) were therefore considered a highly appropriate proxy for potential concurrent activities in T/L2 (Thylacine North 1 and Thylacine West 1).

Table 7-5 details Program locations and activities applicable to each of the studies and scenarios modelled.

As part of Beach's Drilling Campaign in 2021/2022, in the Otway Basin, JASCO undertook underwater sound monitoring to determine the source levels of the Ocean Onyx semi-submersible MODU and support vessels, and further validate their propagation models (McPherson et al. 2021). The mean monopole source levels for the MODU and support vessels measured in-field during Beach's Drilling Campaign in 2021/2022 (McPherson et al. 2021) were used to inform the MODU and vessel source levels in the JASCO underwater acoustic modelling studies used for this impact assessment (Koessler and McPherson 2021). Details of the mean monopole source levels for the MODU and support vessels are provided in Appendix J.

The modelling study assessed distances from the program activities where underwater sound levels reached exposure criteria corresponding to various levels of potential impact to marine fauna. The marine fauna considered was based on a review of receptors that may be affected by continuous sound, and these were marine mammals, turtles, and fish. The exposure criteria selected for the modelling and the impact assessment were selected as they had been accepted by regulatory agencies and represented current best available science at the time of modelling (Koessler et al. 2020, Matthews et al. 2020).

Recent scientific research has led to updated underwater sound exposure thresholds for marine mammals and turtles as defined by the following updated guidance documents:

- 2024 update to: Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (Version 3.0): Underwater and In-Air Criteria for Onset of Auditory Injury and Temporary Threshold Shifts (NMFS 2024)
- September 2024 Criteria and Thresholds for U.S. Navy Acoustic and Explosive Effects Analysis (Phase 4) (Accomando et al. 2024)

The updated thresholds by NMFS (2024) compared to Southall et al. (2019) identifies more conservative received levels and auditory weighting functions where marine mammals are predicted to experience auditory injury (PTS) and TTS from exposure to anthropogenic sound. It is noted that the unweighted marine mammal behavioural threshold remains unchanged. Accomando et al. (2024) have proposed updated underwater sound exposure thresholds for marine turtles, however the weighting functions have not been published. Without published weighting functions, the updated weighted thresholds cannot be modelled and therefore cannot be applied to impact assessments. Beach will coordinate with JASCO to monitor the availability of this information and determine the process for incorporating it if needed.

Beach recognises that the modelling studies used for this EP may not fully account for these new, more conservative thresholds for auditory injury (PTS) and TTS by NMFS (2024). Beach are committed to remodel relevant scenarios for this activity as soon as reasonably practicable. Beach will continue to liaise with JASCO to understand timeframes required to complete model reconfiguration based on the updated threshold weightings, and time required to re-model scenarios relevant to this activity using updated thresholds. Upon receipt of updated modelling results, Beach will undertake an Environment Plan review in accordance with Section 8.3.5. The review will consist of a comprehensive review of the impact evaluation of underwater sound to understand if any changes in threshold range predictions results in changes to environmental impact or require updates to the Whale Management Procedure (V-1000-P1-RP-0002) (Appendix K). Any revisions to the EP are to be assessed against the criteria for submission of a revised EP to NOPSEMA as detailed in Section 8.3.6 and Management of Change as per Section 8.3.4 shall be evaluated.

Beach anticipates that updated auditory weighting functions, exposure function parameters, and received level thresholds for auditory injury (PTS) and TTS to all marine mammal hearing groups (cetaceans and pinnipeds) may result in broader predicted spatial areas of auditory injury (PTS) and TTS. For example, while the numerical SEL PTS and TTS criteria for LF and HF cetaceans as defined by Southall et al. (2019) are similar (199 and 198 SEL24h, respectively), differences in auditory weightings lead to greater potential spatial impact for LF cetaceans (Table 7-6). This is because LF cetaceans have a wider range of hearing sensitivity compared to HF cetaceans which is represented in the greater auditory weighting for LF cetaceans (Southall et al. 2019). The updated thresholds by NMFS (2024) now considers both the weighting function shape and the weighted threshold value. While these changes could potentially increase the extent of potential auditory injury and TTS, they are not expected to surpass ranges to the behavioural threshold, which remains unchanged and is a substantially lower received sound level threshold. Consequently, the adopted control measures (Section 7.4.9), specifically the Whale Management Procedure (CM08), considers activity zones which are based on ranges to the unchanged behavioural threshold. Use of behavioural effect ranges for adopted controls, will continue to safeguard marine mammals from auditory injury and TTS, thereby meeting EPO2, EPO3, and EPO4 and the acceptable level of impact. Modelling was not undertaken for anchor pre-lay or MODU mooring. As anchor pre-lay and MODU mooring will involve the use of the support vessels on DP, the modelling for resupply is a suitable proxy.

Table 7-5: Program locations and activities with relevant sound modelling studies and scenarios

Location	Program Activities	Relevant Modelling Report	Relevant Modelling Scenario	Justification
Operational Area in permits VIC/L35, VIC/L36, and VIC/P43 Water depths: VIC/L35: Doris 1 – 68 m Artisan 1 – 69 m VIC/L36: La Bella 2 – 92 m VIC/P43: Hercules 1 – 73 m	Completions including MODU Resupply Contingent P&A at Artisan 1 including MODU resupply Anchor pre-lay	Beach Otway Development Acoustic Monitoring: Characterisation, Validation, and Marine Mammals (McPherson et al. 2021) Appendix J McPherson et al. (2021) recalculated distances to thresholds at Artisan 1. Water depth of monitoring location for Artisan 1 is 71.5 m	Scenario 7 MODU Drilling with OSV under DP (4 hour) Water depth: 71.5 m	Modelled scenarios 7 and 8 at Artisan 1 are appropriate proxies for Program activities at Doris 1, La Bella 2 and Hercules 1 based on similar water depths, sound sources and seabed characteristics. Due to the shared location on the Otway Continental Shelf, the sound speed profile and geo-acoustics from Modelled Scenarios 7 and 8 (at Artisan 1) are highly applicable to Doris 1, La Bella 2, and Hercules 1. As detailed in Figure 3-1 the proposed wells are in proximity to each other, within similar water depths and based on the seabed surveys undertaken have similar seabed characterisations (Section 6.4.1), thus underwater sound emissions would travel in a similar manner within these locations. A conservative 4-hour duration was used to model sound from resupply sources as resupply for the Program is anticipated to occur at an average of 3 hours per day.
	Completions including transit support vessel		Scenario 8 MODU Drilling + OSV Transit Water depth: 71.5 m; 70.2 m	
Operational Area in permit T/L2 Water depth: Thylacine North 1 – 99 m Thylacine West 1 – 103 m	Well Intervention including MODU Resupply Anchor pre-lay	Beach Otway Project: Additional and Revised Modelling Study (Koessler and McPherson 2021) Appendix J	Scenario A5 MODU Drilling + 4h OSV Resupply Water depth: ~102 m	Modelled scenarios A5 and A7 at Thylacine North 1 are appropriate proxies for Program activities at Thylacine West 1 based on similar water depths, sound sources and seabed characteristics. Due to the shared location on the Otway Continental Shelf, the sound speed profile and geo-acoustics from modelled scenarios A5 and A7 (Thylacine North 1) are highly applicable to Thylacine West 1. Thylacine North 1 and Thylacine West 1 are ~3.5 km apart and based on the seabed surveys undertaken have similar seabed characterisations (Section 6.4.1), thus underwater sound emissions would travel in a similar manner within these locations. A conservative 4-hour duration was used to model sound from resupply sources as resupply for the Program is anticipated to occur at an average of 3 hours per day.
	Well Intervention including transit support vessel		Scenario A7 MODU Drilling + OSV Standby Transit~ Water depth: ~99 m	
	Concurrent anchor pre-lay and well intervention activities	Otway Exploration Drilling Program: Acoustic Modelling for Assessing Marine Fauna Sound Exposures (Welch et al. 2024)	Scenario 6 MODU Drilling + 8h Resupply Vessel + 24h Anchor Handler (in random locations within a 2 x 4 km box located 2 km from MODU) Water depth: 93 m for MODU and resupply vessel, and 96 m for anchor handler	Modelled scenario 6 in permit VIC/P79 is an appropriate proxy for potential concurrent activities at Thylacine North 1 and Thylacine West 1 based on similar water depths, sound sources and seabed characteristics. Due to the shared location on the Otway Continental Shelf, the sound speed profile and geo-acoustics from modelled scenario 6 (VIC/P79) are highly applicable to Thylacine North 1 and Thylacine West 1. The modelled location for scenario 6 is ~15 km from Thylacine North 1 and Thylacine West 1. Scenario 6 includes sound source representations for:

Location	Program Activities	Relevant Modelling Report	Relevant Modelling Scenario	Justification
				well intervention and resupply activities at Thylacine West 1, as represented by MODU drilling and an adjacent resupply vessel conservatively present for 8 hours anchor pre-lay activities at Thylacine North 1, as represented by the anchor handler present in random locations within a 2 x 4 km box located 2 km away from the MODU and resupply vessel. The anchor handler working within a 2 x 4 km box located 2 km from the MODU as modelled in scenario 6 is considered highly representative of potential pre-lay activities at Thylacine North 1 located ~3.5 km from potential well intervention activities at Thylacine West 1. Given the shared location on the Otway Continental Shelf and representative sound sources modelled (Section 7.4.8.1), the predicted underwater emissions from Scenario 6 are expected to travel in a similar manner during potential concurrent activities at Thylacine North 1 and Thylacine West 1.

Table 7-6: Marine mammal PTS, TTS and behaviour sound exposure criteria and predicted further distances for each well location

Hearing group	SEL24h threshold ($L_{E,24h}$; dB re 1 µPa²·s)	**Artisan 1, Doris 1, La Bella 2, and Hercules 1** Completions including OSV transit Contingent P&A at Artisan 1 including OSV transit [a]	**Artisan 1, Doris 1, La Bella 2, and Hercules 1** Completions including MODU Resupply Contingent P&A at Artisan 1 including MODU resupply Anchor Pre-lay[a]	**Thylacine North 1 and Thylacine West 1** Well Intervention including OSV transit[b]	**Thylacine North 1 and Thylacine West 1** Well Intervention including MODU Resupply Anchor Pre-lay[b]	**Thylacine North 1 and Thylacine West 1** Concurrent anchor pre-lay at Thylacine North 1 and well intervention activities at Thylacine West 1[c]
		R_{max} (km)	R_{max} (km)	R_{max} (km)	R_{max} (km)	R_{max} (km)
PTS						
LF cetaceans	199	-		0.06	0.12	0.18
HF cetaceans	198	-	-	0.04	0.05	0.04
VHF cetaceans	173	0.19	0.2	0.26	0.26	0.21
Phocid seals	201	-	-	0.04	0.05	N/A
Otariid seals	219	-	-	-	0.03	0.02
TTS						
LF cetaceans	179	0.31	0.95	0.39	1.06	1.62
HF cetaceans	178	0.13	0.16	0.13	0.16	0.14

Hearing group	SEL24h threshold ($L_{E,24h}$; dB re 1 µPa²·s)	**Artisan 1, Doris 1, La Bella 2, and Hercules 1** Completions including OSV transit Contingent P&A at Artisan 1 including OSV transit [a]	**Artisan 1, Doris 1, La Bella 2, and Hercules 1** Completions including MODU Resupply Contingent P&A at Artisan 1 including MODU resupply Anchor Pre-lay[a]	**Thylacine North 1 and Thylacine West 1** Well Intervention including OSV transit[b]	**Thylacine North 1 and Thylacine West 1** Well Intervention including MODU Resupply Anchor Pre-lay[b]	**Thylacine North 1 and Thylacine West 1** Concurrent anchor pre-lay at Thylacine North 1 and well intervention activities at Thylacine West 1[c]
		R_{max} (km)	R_{max} (km)	R_{max} (km)	R_{max} (km)	R_{max} (km)
VHF cetaceans	153	1.06	1.09	1.12	1.16	2.96
Phocid seals	181	0.12	0.35	0.12	0.32	N/A
Otariid seals	199	-	-	0.07	0.07	0.07
Behaviour	**SPL threshold (Lp; dB re 1 µPa)**					
Marine mammals	120	2.09	7.02	1.32	7.89	12.2

Note:

- a dash indicates the level was not reached within the limits of the modelling resolution (20 m)
- [a] range to thresholds based on predictions from Scenario 7 and 8 (Artisan 1) as detailed in McPherson et al. (2021)
- [b] range to thresholds based on predictions from Scenario A5 and A7 (Thylacine North 1) as detailed in Koessler and McPherson (2021)
- [c] range to thresholds based on predictions from Scenario 6 (Essington VIC/P79) as detailed in Welch et al. (2024).

7.4.8.2 Marine Mammals

7.4.8.2.1 Exposure Criteria – PTS and TTS

The US National Marine Fisheries Service (NMFS 2018) reviewed available literature to determine exposure criterion for the onset of TTS and PTS for marine mammals based on their frequency hearing range. NMFS (2018) details that after sound exposure ceases or between successive sound exposures, the potential for recovery from hearing loss exists, with PTS resulting in incomplete recovery and TTS resulting in complete recovery.

Southall et al. (2019) reviewed the criteria which have remained the same, however, the mid-frequency cetaceans from NMFS (2018) are classified as high-frequency cetaceans in Southall et al. (2019), and high-frequency cetaceans from NMFS (2018) are classified as very-high-frequency cetaceans in Southall et al. (2019). For this impact assessment the cetacean classification from Southall et al. (2019) are used.

The NFMS (2018) exposure criteria are based on a cumulative sound exposure level (SEL) over a period of 24 hours. Table 7-6 details the criteria and furthest modelled distances to them for each scenario.

The PTS and TTS 24-hour criteria are only relevant to those receptors that are likely to be present in the area of ensonification for a period of 24 hours. For this assessment the PTS and TTS 24-hour criteria was applied to marine mammals that may be undertaking biologically important behaviours, such as calving, foraging, resting or migration (as defined by CoA 2015), that could result in them being within the ensonification area above the PTS and TTS criteria for a period of 24 hours or more.

7.4.8.2.2 Exposure Criteria – Behaviour

Numerous studies on marine mammal behavioural responses to sound exposure have not resulted in consensus in the scientific community regarding the appropriate metric for assessing behavioural reactions. The NFMS (2024) criterion of 120 dB re 1 µPa for non-impulsive sound sources such as vessels is used as the marine mammal behavioural criteria for this assessment as it represents a conservative criterion. Southall et al. (2007) reviewed extensive literature and studies in relation to marine mammal behavioural response to impulsive (seismic, pile driving) and non-impulsive (drilling, vessels) and found that most marine mammals exhibited varying responses between 140 and 180 dB re 1 µPa.

Southall et al. (2021) provides recommendations and discusses the nuances of assessing behavioural response. The authors do not recommend new numerical thresholds for onset of behavioural responses for marine mammals.

Table 7-6 details the furthest modelled distance to the NMFS (2024) exposure criteria for each scenario.

7.4.8.2.3 Phocid Seals

As detailed in Table 7-6, not all well locations modelled the sound exposure criteria for Phocid seals as they have not been known to occur in the Otway Basin area.

Table 7-6 details the maximum distances to the sound exposure criteria for Phocid seals. Welch et al. (2024) does not model for Phocid seals as they are not expected to occur in the region. No Phocid seals were identified within the Sound EMBA based on the PMST Report (Appendix L) thus impacts are not assessed further.

7.4.8.2.4 Otariid Seals

As detailed in Table 7-6, maximum distances to the sound exposure criteria for Otariid seals are:

- Furthest distance to the PTS criteria is reached up to 30 m at the Thylacine wells only.
- Furthest distance to the TTS criteria is reached at 70 m at the Thylacine wells only.
- Furthest distance to behavioural response criteria is reached at 12.2 km.

Based on the PMST Report (Appendix L) the Australian fur-seal and New Zealand fur-seal may occur within the Sound EMBA, but no biologically important behaviours or BIAs were identified.

The consequence is assessed as **Minor (1)** and is of an acceptable level based on:

- There are no biologically important behaviours, biologically important areas, aggregation areas or haul-out areas identified within the sound EMBA.
- PTS and TTS are not predicted as the PTS and TTS 24-hour criteria are only relevant to those receptors that are likely to be present in the area of ensonification for a period of 24 hours, and no biologically important behaviours or biologically important areas were identified within the Sound EMBA for Otariid seals. Sound modelling only predicted Program activities at the Thylacines wells to have the potential for PTS and TTS. Resupply activities are expected to be undertaken within 3 hours, therefore PTS and TTS during resupply activities is not credible. Even though other Program activities have durations greater than 24 hours, it is not considered credible for Otariid seals to remain within 30 and 70 m of the Thylacine wells for the onset of PTS and TTS to occur respectively, given the absence of habitat that encourages site-fidelity within these ranges.
- Breeding colonies for Australian fur-seal and New Zealand fur-seal known to occur along the Victorian coastline, including Deen Maar, and the west side of King Island which are outside of the sound EMBA.
- Potential impacts are expected to be limited to temporary and localised behavioural reactions to Otariid seal individuals that may be passing through during Thylacine well activities.
- Potential impacts will be limited to 25 days during completions activities, 15 days during intervention activities and 15-20 days during P&A, before the noise source moves to a different location. It is not expected that individuals or populations will experience continued underwater noise exposure for the duration of the Program activities (150 days) due to the distance between well locations.

7.4.8.2.5 Very High-frequency Cetaceans

As detailed in Table 7-6, maximum distances to the sound exposure criteria for very high-frequency (VHF) cetaceans are:

- Furthest distance to the PTS criteria is reached at 260 m.

- Furthest distance to the TTS criteria is reached at 2.96 km.
- Furthest distance to behavioural response criteria is reached at 12.2 km.

Based on the PMST Report (Appendix L) very high-frequency cetaceans such as pygmy and dwarf sperm whales may occur within the Sound EMBA, but no biologically important behaviours or biologically important areas were identified.

The consequence is assessed as **Minor (1)** and is of an acceptable level based on:

- There are no biologically important behaviours or biologically important areas for very high-frequency cetaceans within the sound EMBA.
- No threatened very high-frequency cetaceans were identified within the sound EMBA.
- PTS and TTS are not predicted as the PTS and TTS 24 hour criteria are relevant to those receptors that are likely to be present in the area of ensonification for a period of 24 hours, and no biologically important behaviours or biologically important areas were identified within the Sound EMBA for very high-frequency cetaceans. Resupply activities are expected to be undertaken within 3 hours, therefore PTS and TTS during resupply activities is not credible. Even though other Program activities have durations greater than 24 hours, it is not considered credible for very high-frequency cetaceans to remain within 260 m and 2.96 km of Program activities for the onset of PTS and TTS to occur, respectively, given the absence of habitat that encourages site-fidelity within these ranges.
- Potential impacts are expected to be limited to temporary and localised behavioural reactions to very high-frequency cetaceans that may be passing through during Program activities.
- Potential impacts will be limited to 25 days during completions activities, 15 days during intervention activities and 15-20 days during P&A, before the noise source moves to a different location. It is not expected that individuals or populations will experience continued underwater noise exposure for the duration of the Program activities (150 days) due to the distance between well locations.

7.4.8.2.6 High-frequency Cetaceans

As detailed in Table 7-6, maximum distances to the sound exposure criteria for high-frequency (HF) cetaceans are:

- Furthest distance to PTS criteria is reached at 50 m.
- Furthest distance to TTS criteria is reached at 160 m.
- Furthest distance to behavioural response criteria is reached at 12.2 km.

Based on the PMST Report (Appendix L) high-frequency cetaceans such as dolphin species, beaked and toothed whales, may occur within the Sound EMBA, but no biologically important behaviours or biologically important areas were identified.

The consequence is assessed as **Minor (1)** and is of an acceptable level based on:

- There are no biologically important behaviours or biologically important areas for high-frequency cetaceans within the sound EMBA.
- No threatened high-frequency cetaceans were identified within the sound EMBA.
- PTS and TTS are not predicted as the PTS and TTS 24 hour criteria are relevant to those receptors that are likely to be present in the area of ensonification for a period of 24 hours, and no biologically important behaviours or biologically important areas were identified within the Sound EMBA for high-frequency cetaceans. Resupply activities are expected to be undertaken within 3 hours, therefore PTS and TTS during resupply activities is not credible. Even though other Program activities have durations greater than 24 hours, it is not considered credible for high-frequency cetaceans to remain within 50 m and 160 m of Program activities for the onset of PTS and TTS to occur, respectively, given the absence of habitat that encourages site-fidelity within these ranges.
- Potential impacts are expected to be limited to temporary and localised behavioural reactions to high-frequency cetaceans that may be passing through during Program activities.
- Potential impacts will be limited to 25 days during completions activities, 15 days during intervention activities and 15-20 days during P&A, before the noise source moves to a different location. It is not expected that individuals or populations will experience continued underwater noise exposure for the duration of the Program activities (150 days) due to the distance between well locations.

7.4.8.2.7 Low-frequency Cetaceans

As detailed in Table 7-6, maximum distances to the sound exposure criteria for low-frequency (LF) cetaceans are:

- Furthest distance to PTS criteria is reached at 180 m.
- Furthest distance to TTS criteria is reached at 1.62 km.
- Furthest distance to behavioural response criteria is reached at 12.2 km.

Table 7-7 details the low-frequency cetaceans that have biologically important areas and/or biologically important behaviours within the sound EMBA (Appendix L).

Table 7-7: Low-frequency cetaceans with biologically important behaviours within the Sound EMBA

Species	Biologically Important Behaviour
Blue whale	Foraging, feeding or related behaviour known to occur within area.
	Foraging BIA and foraging (annual high use area) BIA.
Fin whale	Foraging, feeding or related behaviour likely to occur within area.
	No BIAs
Pygmy right whale	Foraging, feeding or related behaviour may occur within area.
	No BIAs
Sei whale	Foraging, feeding or related behaviour likely to occur within area.

	No BIAs
Southern right whale	Species or species habitat known to occur within area.
	Migration BIA

7.4.8.2.7.1 Blue Whales

The Sound EMBA overlaps the pygmy blue whale foraging BIA, and both the Operational Area and Sound EMBA overlap the pygmy blue whale foraging (annual high use area) BIA (Figure 7-8).

Foraging behaviour for blue whales has been identified in the area where the PTS, TTS and behavioural sound exposure criteria is reached. As detailed in Section 6.4.9.7, blue whale foraging within the Otway Basin, and hence the area where the PTS, TTS and behavioural criteria is reached, is typically from January to April (Gill et al. 2011) though whales may be present from November to June (McCauley et al. 2018) and therefore overlaps the period when the Program activities are expected to occur.

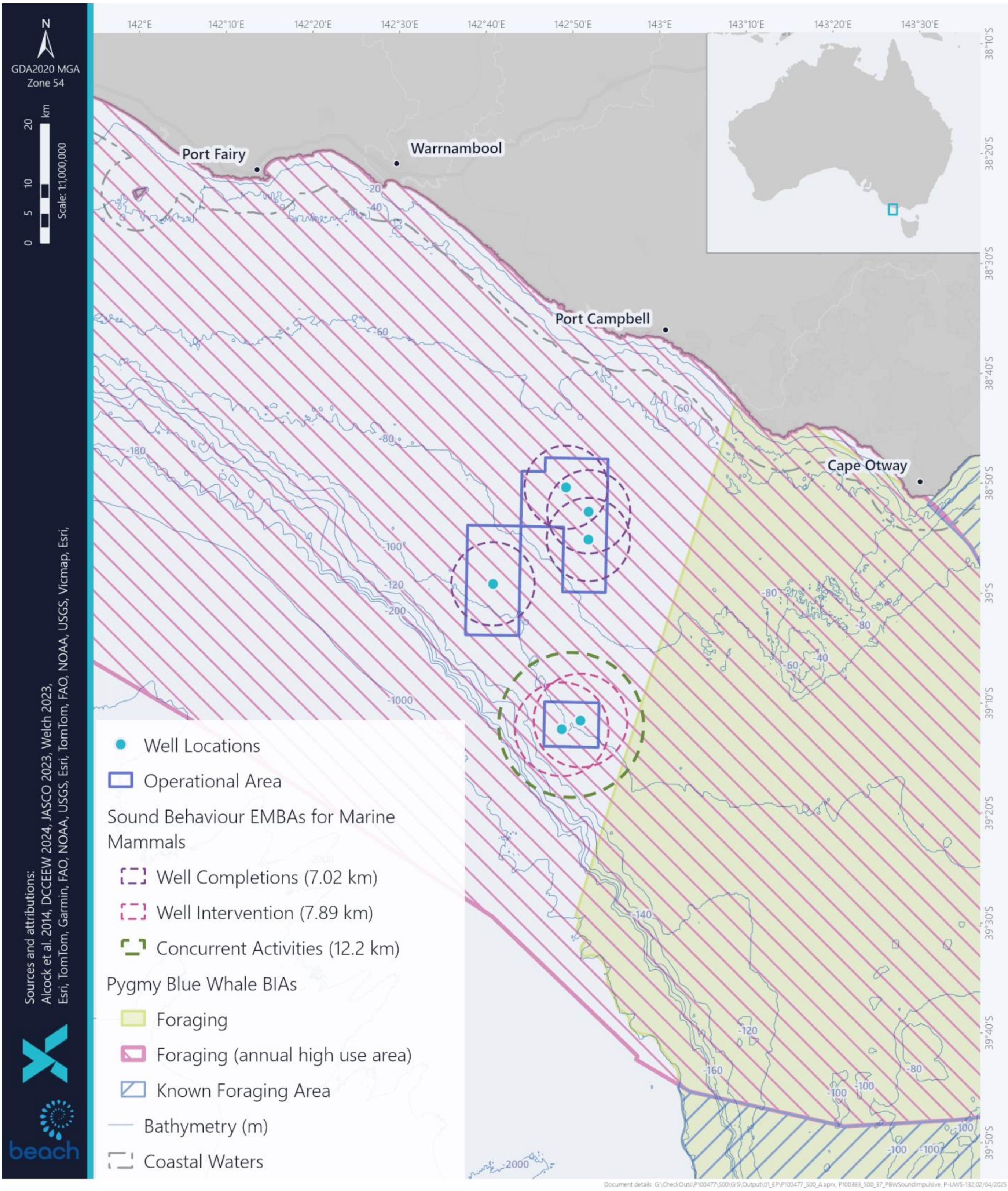


Figure 7-8: Sound EMBAs and pygmy blue whale BIAs

NOPSEMA on their website page Blue Whale Conservation Management Plan – FAQs detail the following:

> *If an offshore project or activity creates noise above relevant published injury and/or behavioural disturbance impact criteria inside a Foraging Area, proponents and titleholders should firstly evaluate all feasible measures to avoid times of the year when blue whales are likely to be foraging.*
>
> *If it is not possible to avoid times of year when there is credible information indicating that blue whale foraging in a Foraging Area is likely, it is important to note that there are requirements of the EPBC Act and the NOPSEMA EPBC Act-endorsed Program that constrain decision makers to 'not act inconsistently' with EPBC Act instruments, such as a recovery plan (e.g. the CMP).*
>
> *Accordingly, in order to demonstrate, with a high level of confidence, that requirements of the CMP will be met, approvals documentation needs to include content such as:*
>
> - *well-founded Environmental Impact Assessment;*
> - *commitment(s) to implement whale detection that will be effective in detecting whales over the extent and duration of predicted impacts, including provision for detection measures to be scalable based on triggers such as activity timing and location, and whale sighting data; and*
> - *associated management measures that are likely to be effective at preventing unacceptable impacts over the extent and duration scales informed by impact predictions and whale detection data gathered during the activity.*
>
> *In all cases, titleholders should refer to the guidance on key terms within the CMP that is available on the DCCEEW website, to inform their EIA and selection of control measures.*

Beach has determined that the risk to all threatened cetaceans that may be undertaking biologically important behaviour during the period of the Program activities cannot be avoided due to variability in timing of environmentally sensitive periods and unpredictable presence of some species, with blue whales potentially present in foraging areas between November to June (McCauley et al. 2018), and southern right whale typically present in the migration BIA from April to October (DCCEEW 2024m). Therefore, there is no period where avoidance of both species is possible.

In addition, Beach is required to meet its requirements under the OPGGS Act and petroleum licence conditions to explore and development gas reserves within their petroleum titles. Titleholders must also P&A suspended wells to comply with the requirements under section 572 of the OPGGS Act to remove all structures, equipment and other property that is neither used nor to be used in connection with operations authorised by the title. To progress these petroleum activities, Beach is planning to commence Program activities no earlier than October 2025 (subject to MODU availability). This MODU campaign will be shared across Beach's Bass and Otway assets, along with other titleholders who also have drilling activities planned in the region. A MODU has been secured by Beach along with three other consortium members operating in the Otway Basin. The driver behind the consortium approach is to realise efficiencies through the execution of multiple wells in one campaign, reducing mobilisation and demobilisation activities and shared use of aviation and shore base support. Being part of a consortium also provides the flexibility to negotiate MODU slot sequencing with other operators therefore optimising MODU utilisation and minimising down-time.

As Program activities could take up to 150 days there will be some overlap with periods when blue whales may be foraging in the Otway Basin.

Thus, in order to demonstrate with a high level of confidence that requirements of the Conservation Management Plan for the Blue Whale (CoA 2015) will be met, Beach has undertaken a well-founded assessment of impacts to foraging blue whales from the Program activities and made commitments to implement a Whale Management Procedure (CM08) that includes whale observation and measures that have proven to be effective at preventing unacceptable impacts to foraging blue whales as per Beach's previous Otway Drilling Campaign.

The Conservation Management Plan for the Blue Whale (CoA 2015a) details that anthropogenic noise in BIAs will be managed such that any blue whale continues to utilise the area without injury, and is not displaced from a foraging area.

DAWE (2021a) defines 'displaced as a foraging area' as:

> *The recovery plan requirement, Action A.2.3, applies in relation to BIAs. A whale could be displaced from a Foraging Area if impact mitigation is not implemented. This means that underwater anthropogenic noise should not:*
>
> - *Stop or prevent any blue whale from foraging.*
> - *Cause any blue whale to move on when foraging.*
> - *Stop or prevent any blue whale from entering a Foraging Area.*
>
> *It is considered that a whale is displaced from a Foraging Area if foraging behaviour is disrupted, regardless of whether the whale can continue to forage elsewhere within that Foraging Area. Mitigation measures must be implemented to reduce the risk of displacement occurring during operations where modelling indicates that behavioural disturbance within a Foraging Area may occur.*

DAWE (2021a) defines 'injury to blue whales' as:

> *For the purpose of interpreting and applying Action Area A.2 of the Blue Whale CMP, injury is both permanent and temporary hearing impairment (Permanent Threshold Shift and Temporary Threshold Shift) and any other form of physical harm arising from anthropogenic sources of underwater noise.*

As detailed in Table 7-6, the extent and duration of impact differs based on the activity being undertaken, however, the consequence is assessed as **Moderate (2)** and is of an acceptable level based on:

- A conservative approach has been taken in applying the sound modelling and results such as the furthest distance to the PTS, TTS and behavioural response sound exposure criteria for the scenarios modelled to assess potential impacts.

- The Conservation Management Plan for the Blue Whale (CoA 2015a) details that shipping and industrial noise are classed as a minor consequence for which the definition is: individuals are affected but no affect at a population level.

- The Conservation Management Plan for the Blue Whale (CoA 2015a) details that "It is the high intensity signals with high peak pressures received at very short range that can cause acute impacts such as injury and death." As Program activities will generate continuous sound and will not generate high intensity signals it is unlikely that Program activities would cause injury or death to foraging pygmy blue whales.

- As the furthest distance to the 24 hour PTS sound exposure criteria is 180 m, PTS impacts to blue whales are not predicted, as it would be highly unlikely for a pygmy blue whale to remain within 180 m of the MODU for 24 hours even if it was foraging in the area.

- As the distances to the 24 hour TTS sound exposure criteria range from 310 m to 1.62 km, it is feasible that a foraging pygmy blue whale may remain within these distances of the MODU while Program activities occur. Thus, Beach will implement a Whale Management Procedure (CM08) that includes whale observation and measures that have proven to be effective at preventing unacceptable TTS impacts to foraging blue whales as per Beach's previous Otway Drilling Campaign.

- Behaviour criteria is reached at a maximum distance of 1.32 km for well intervention, 2.09 km for well completions and P&A and up to 7.89 km for resupply depending on the location. The behavioural criterion is reached at a maximum of 12.2 km for concurrent activities at the Thylacine wells. Within these distances, behavioural response from blue whales may range from biologically unimportant reactions to cessation of feeding to moving away from the sound source.

- The largest area of potential impact within the pygmy blue whale annual high use foraging BIA (total area of 35,627 km^2) is very small, at any one time comprising:

  ~0.01% for the well intervention activities

  ~0.15% for the well completions and P&A activities

  ~1.3% for concurrent activities at Thylacine wells.

  ~2.8% for the resupply and anchor pre-lay activities.

- Potential impacts are expected to be limited to 25 days during completions activities, 15 days during intervention activities and 15-20 days during P&A, before the noise source moves to a different location. It is not expected that individuals or populations will experience continued underwater noise exposure for the duration of the Program activities (150 days) due to the distance between well locations.

- Beach will implement a Whale Management Procedure (CM08) that includes whale observation and measures that have proven to be effective at preventing unacceptable impacts to foraging blue whales as per Beach's previous Otway Drilling Campaign.

7.4.8.2.7.2 Southern Right Whales

The Operational Area and Sound EMBA do not overlap the southern right whale habitat critical to survival (HCTS) (reproduction BIA) but do overlap the southern right whale migration BIA (Figure 7-9). As detailed in Section 6.4.9.7, southern right whales are typically within the migration BIA from April to October (DCCEEW 2024m) which overlaps the period when Program activities are expected to occur.

Beach has determined that the risk to all threatened cetaceans that may be undertaking biologically important behaviour during the period of the Program activities cannot be avoided due to variability in timing of environmentally sensitive periods and unpredictable presence of some species, with blue whales potentially present in foraging areas between November to June (McCauley et al. 2018), and southern right whale typically present in the migration BIA from April to October (DCCEEW 2024m). Therefore, there is no period where avoidance of both species is possible.

In addition, Beach is required to meet its requirements under the OPGGS Act and petroleum licence conditions to explore and development gas reserves within their petroleum titles. Titleholders must also P&A suspended wells to comply with the requirements under section 572 of the OPGGS Act to remove all structures, equipment and other property that is neither used nor to be used in connection with operations authorised by the title. To progress these petroleum activities, Beach is planning to commence Program activities no earlier than October 2025 (subject to MODU availability). This MODU campaign will be shared across Beach's Bass and Otway assets, along with other titleholders who also have drilling activities planned in the region. A MODU has been secured by Beach along with three other consortium members operating in the Otway Basin. The driver behind the consortium approach is to realise efficiencies through the execution of multiple wells in one campaign, reducing mobilisation and demobilisation activities and shared use of aviation and shore base support. Being part of a consortium also provides the flexibility to negotiate MODU slot sequencing with other operators therefore optimising MODU utilisation and minimising down-time. As the Program activities could take up to 150 days, there will be some overlap with periods when southern right whales may be migrating in the Otway Basin.

Thus, in order to demonstrate, with a high level of confidence, that requirements of the National Recovery Plan for the Southern Right Whale (DCCEEW 2024k) will be met, Beach has undertaken an assessment of impacts to migrating southern right whales from the Program activities and made commitments to implement a Whale Management Procedure (CM08) that includes whale observation and measures that have proven to be effective at preventing unacceptable impacts to southern right whales as per Beach's previous Otway Drilling Campaign.

The National Recovery Plan for the southern right whale (DCCEEW 2024k) sets out interim recovery objectives in order to achieve its long-term recovery vision of increasing the population such that species listing under the EPBC Act is no longer required. One of these objectives is relevant to underwater sound:

- Interim objective 2: Anthropogenic threats are managed consistent with ecologically sustainable development principles to facilitate recovery of southern right whales.

The National Recovery Plan details the following actions set out to achieve the above recovery vision and objectives which are relevant to underwater sound:

- Actions within and adjacent to southern right whale BIAs and HCTS should demonstrate that it does not prevent any southern right whale from utilising the area or cause auditory impairment.
- Actions within and adjacent to southern right whale BIAs and HCTS should demonstrate that the risk of behavioural disturbance is minimised.
- Ensure environmental assessments associated with underwater noise generating activities include consideration of national policy and guidelines related to managing anthropogenic underwater noise and implement appropriate mitigation measures to reduce risks to southern right whales to the lowest possible level.
- Quantify risks of anthropogenic underwater noise to southern right whales, including behavioural disturbance, changes to vocalisations, and physiological effects to whales.

As detailed in Table 7-6, the extent and duration of impact differs based on the activity being undertaken, however, the consequence is assessed as **Moderate (2)** and is of an acceptable level based on:

- To quantify risks of underwater sound to southern right whales, 3 underwater acoustic modelling studies were used to information the impact assessment. A conservative approach has been taken in applying the sound modelling and results such as the furthest distance to the PTS, TTS behavioural response sound exposure criteria for the scenarios modelled to assess potential impacts.
- The Sound EMBA does not overlap the southern right whale HCTS (reproduction BIA) and thus no impacts to the HCTS (reproduction BIA) are predicted. As a result, the Program activities do not prevent any southern right whale from utilising the HCTS (reproduction BIA) or cause auditory impairment in the area.
- The Sound EMBA overlaps the southern right whale migration BIA which covers most of southern Australia's offshore waters. Predicted impacts are expected to be limited to biologically unimportant reactions such as moving away from the sound source and there is no impediment to southern right whales moving to and from the HCTS (reproduction BIA). As a result, the Program activities do not prevent any southern right whale from utilising the migration BIA or HCTS (reproduction BIA) or cause auditory impairment in the area.
- The National Recovery Plan for the southern right whale identifies industrial noise, including drilling activities and peripheral vessel support activities, as a threat. This plan classed the threat of industrial noise as a minor consequence for the western population and moderate for the eastern population, both with a likelihood of almost certain. The National Recovery Plan also states that the behavioural impacts of sound on southern right whales are largely unknown and, therefore, a precautionary approach should be taken to the management of potential impacts, particularly in the context of cumulative impacts. As a precautionary approach, Beach have conservatively applied the furthest distance to PTS, TTS and behavioural response sound exposure criteria for the scenarios modelled to assess potential impacts. These conservative distances have been used to inform the observation ranges as defined in CM08 Whale Management Procedure.

- Marine mammal observer data from January 2021 to April 2022 for the drilling program in the Otway Development Area identified 3 southern right whales consisting of a single individual in each month of June, July and August.

- PTS and TTS impacts to migrating southern right whales are not predicted as they are a mobile species migrating through the area to reach coastal habitat or return to southern foraging grounds and studies report swim speeds for the southern right whale of between 3–3.3 km/hr (Mate et al. 2011, Mackay et al. 2015 cited in Charlton 2017).

  As the furthest distance to the 24 hour PTS sound exposure criteria is 180 m, PTS impacts to migrating southern right whales are not predicted, as it would be highly unlikely for a migrating southern right whale to remain within 180 m of the MODU for 24 hours based on their swimming speeds.

  As the distances to the 24 hour TTS sound exposure criteria ranges from 310 m to 1.62 km, TTS impacts to migrating southern right whales are not predicted as southern right whales would only be within the 24 hour TTS sound exposure criteria zone for less than an hour based on their swimming speeds.

- Behaviour criteria is reached at a maximum distance of 1.32 km for well intervention, 2.09 km for completions and P&A and 7.89 km for resupply depending on the location. Behaviour criteria is reached at a maximum of 12.2 km for concurrent activities at the Thylacine wells. Within these distances the behavioural response may range from biologically unimportant reactions to moving away from the sound source.

- Avoidance behaviour may be exhibited if southern right whales are migrating through the area where the behavioural sound exposure criteria is reached. Disturbance of migrating mothers could increase their energy expenditure which could result in a reduction of energy available for their calf and for their return migration (Christiansen et al. 2020). Based on an average swim speed of between 3 and 3.3 km/hr (Mate et al. 2011, Mackay et al. 2015 cited in Charlton 2017) energetic costs would be extremely low if avoidance behaviour occurred for well intervention (1.32 km), completions and P&A (up to 2.09 km), and low for concurrent activities (12.2 km) and resupply (up to 7.89 km) which, on average, occurs for 3 hours.

- Southern right whales may avoid the area where the behavioural sound exposure criteria is reached but there is no impediment to them continuing to and from the HCTS (coastal reproduction BIA). Southern right whales are a highly mobile migratory species that travel thousands of kilometres between habitats used for essential life functions (DSEWPaC 2012). Along the Australian coast, individual southern right whales use widely separated coastal areas (200–1,500 km apart) within a season, indicating substantial coast-wide movement. The longest movements are undertaken by non-calving whales, though calving whales have also been recorded at locations up to 700 km apart within a single season (DSEWPaC 2012). As such, avoidance of the sound EMBA is unlikely to prevent them from undertaking their seasonal migrations or result in significant energy cost.

- Potential impacts will be limited to 25 days during completions activities, 15 days during intervention activities and 15-20 days during P&A, before the noise source moves to a different location. It is not expected that individuals or populations will experience continued underwater noise exposure for the duration of the Program activities (150 days) due to the distance between well locations.

- Beach will implement a Whale Management Procedure (CM08) that includes whale observation and measures that have proven to be effective at preventing unacceptable impacts to migrating southern right whales as per Beach's previous Otway Drilling Campaign. Implementation of CM08 Whale Management Procedure will reduce potential behavioural response to southern right whales to the lowest possible level thereby demonstrating the risk of behavioural disturbance is minimised.

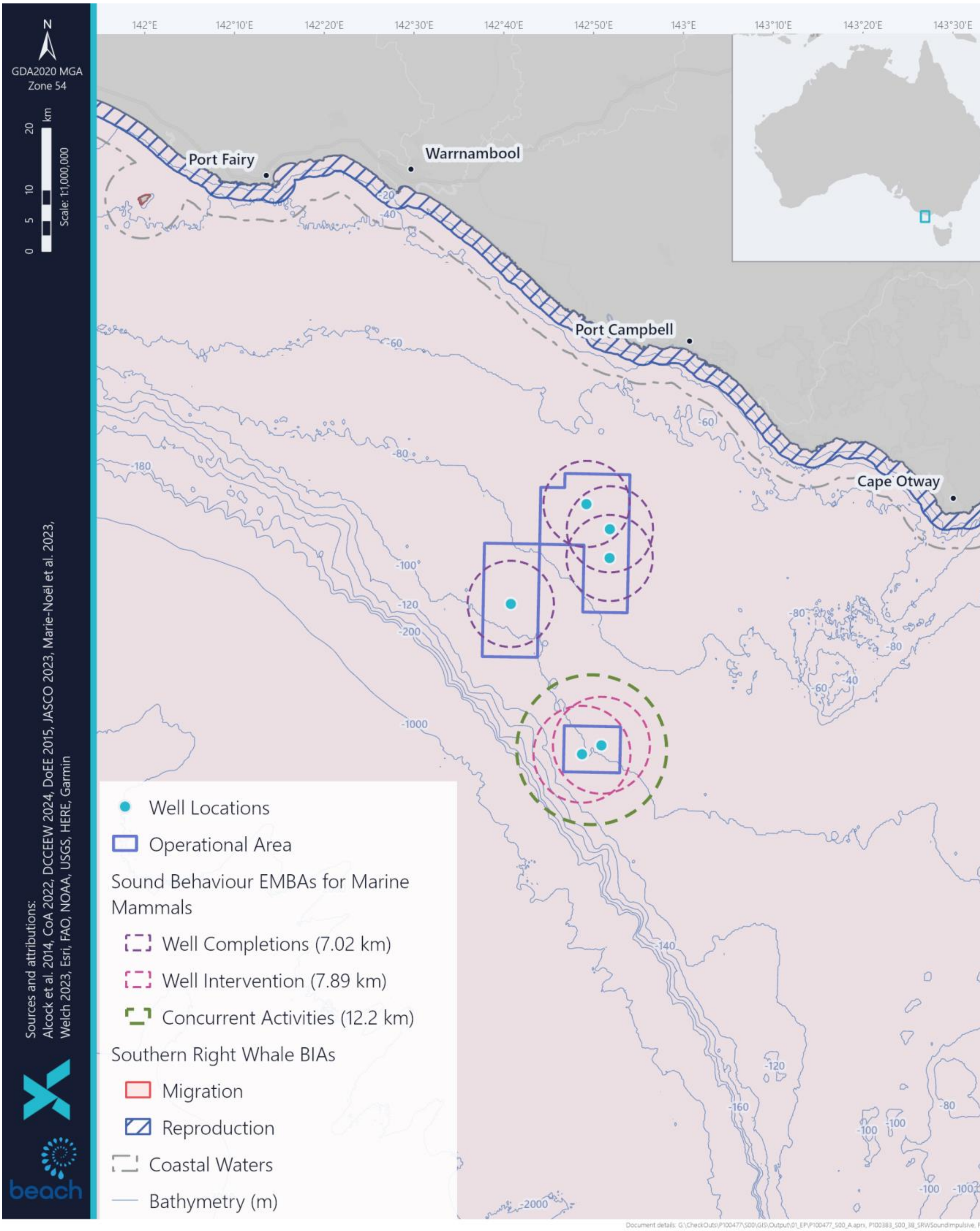


Figure 7-9: Sound EMBAs and southern right whale BIAs

7.4.8.2.7.3 Other Whales

Foraging behaviour for fin, pygmy right and sei whales have been identified within the Sound EMBA (Appendix L). As detailed in Section 6.4.9.7, cetacean foraging within the Otway Basin is typically from January to April (Gill et al. 2011) though whales may be present from November to June (McCauley et al. 2018) which overlaps the period when Program activities are expected to occur.

Beach has determined that the risk to all threatened cetaceans that may be undertaking a biologically important behaviour during the period of Program activities cannot be avoided due to variability in timing of environmentally sensitive periods and unpredictable presence of some species, with fin, pygmy right and sei whales potentially present in foraging areas between November to June (McCauley et al. 2018) and southern right whale typically present in the migration BIA from April to October (DCCEEW 2024m). Therefore, there is no period where avoidance of both species is possible.

In addition, Beach is required to meet its requirements under the OPGGS Act and petroleum licence conditions to explore and development gas reserves within their petroleum titles. Titleholders must also P&A suspended wells to comply with the requirements under section 572 of the OPGGS Act to remove all structures, equipment and other property that is neither used nor to be used in connection with operations authorised by the title. To progress these petroleum activities, Beach is planning to commence Program activities no earlier than October 2025 (subject to MODU availability). This MODU campaign will be shared across Beach's Bass and Otway assets, along with other titleholders who also have drilling activities planned in the region. A MODU has been secured by Beach along with three other consortium members operating in the Otway Basin. The driver behind the consortium approach is to realise efficiencies through the execution of multiple wells in one campaign, reducing mobilisation and demobilisation activities and shared use of aviation and shore base support. Being part of a consortium also provides the flexibility to negotiate MODU slot sequencing with other operators therefore optimising MODU utilisation and minimising down-time. As Program activities could take up to 150 days, there will be some overlap with periods when southern right whales may be migrating in the Otway Basin.

The fin, pygmy right and sei whales do not have conservation management plans. The fin and sei whales have conservation advice (TSSC 2015f; TSSC 2015g) which both identify anthropogenic noise as a threat with the conservation and management actions of:

- Once the spatial and temporal distribution (including biologically important areas) of sei whales is further defined an assessment of the impacts of increasing anthropogenic noise (including from seismic surveys, port expansion, and coastal development) should be undertaken on this species.
- If required, additional management measures should be developed and implemented to ensure the ongoing recovery of fin and sei whales.

As detailed in Table 7-6, the extent and duration of impact differs based on the activity being undertaken, however, the consequence is assessed as **Moderate (2)** and is of an acceptable level based on:

- A conservative approach has been taken in applying the sound modelling and results such as the furthest distance to the PTS, TTS behavioural response sound exposure criteria for the scenarios modelled to assess potential impacts.

- The fin and sei whale’s conservation advice (TSSC 2015f, TSSC 2015g) has a consequence rating for anthropogenic noise and acoustic disturbance as minor with the extent over which the threat may operate as moderate-large.

- There is no conservation advice for the pygmy right whale, as it is not a threatened species, and the Species Profile and Threats Database (DoE 2023) does not identify anthropogenic noise and acoustic disturbance as a threat.

- As the furthest distance to the 24 hour PTS sound exposure criteria is 180 m, PTS impacts to fin, pygmy right and sei whales are not predicted, as it would be highly unlikely for a fin, pygmy right or sei whale to remain within 180 m of the MODU for 24 hours even if it was foraging in the area.

- As the furthest distance to the 24 hour TTS sound exposure criteria for well completions, intervention and P&A is up to 390 m, TTS impacts to fin, pygmy right and sei whales during well completions, intervention or P&A are not predicted as it would be highly unlikely for a fin, pygmy right or sei whale to remain within 390 m of the MODU for 24 hours even if it was foraging in the area.

- As the distances to the 24 hour TTS sound exposure criteria for resupply and concurrent activities range from 950 m to 1.62 km, it is feasible that a foraging fin, pygmy right or sei whale may remain within these distances of the MODU while resupply occurs thus, Beach will implement a Whale Management Procedure (CM08) that includes whale observation and measures that have proven to be effective at preventing unacceptable impacts to foraging fin, pygmy right or sei whales as per Beach’s previous Otway Drilling Campaign.

- Behaviour criteria is reached at a maximum distance of 1.32 km for well intervention, 2.09 km for completions and P&A and 7.89 km for resupply depending on the location. Behaviour criteria is reached at a maximum of 12.2 km for concurrent activities at the Thylacine wells. Within these distances the behavioural response may range from biologically unimportant reactions to cessation of feeding to moving away from the sound source.

- Potential impacts will be limited to 25 days during completions activities, 15 days during intervention activities and 15-20 days during P&A, before the noise source moves to a different location. It is not expected that individuals or populations will experience continued underwater noise exposure for the duration of the Program activities (150 days) due to the distance between well locations.

- Low numbers of fin, sei and pygmy right whales are predicted within the Sound EMBA based on:

  The Sound EMBA is ~70 km from the Bonney coast upwelling KEF which is known as feeding aggregation area (Gill et al. 2011, McCauley et al. 2018) where fin and sei whales have been sighted feeding (Gill et al. 2015, Morrice et al. 2004).

  No biologically important areas were identified for these species.

  Aerial surveys in the Otway region (2002–2013) recorded 7 fin whale sightings consisting of 8 individuals, 12 sei whale sightings consisting of 14 individuals and one pygmy right whale sighting consisting of 100 individuals (Gill et al. 2015). Gill et al. (2015) did observer feeding behaviour for sei and fin whales but noted that it is at least an opportunistic feeding area for these species.

Infrequent presence of fin whales has been recorded in Portland between 2009 to 2016 (Erbe et al. 2016, Aulich et al. 2019).

7.4.8.3 Marine Turtles

The Recovery Plan for Marine Turtles in Australia (CoA 2017) identifies noise interference as a threat to turtles. It details that exposure to chronic (continuous) loud noise in the marine environment may lead to avoidance of important habitat.

In 2006, the Working Group on the Effects of Sound on Fish and Turtles was formed to develop sound exposure criteria for fish and turtles. The Working Group developed guidelines with specific thresholds for different levels of effects for several species groups including turtles.

Popper et al. (2014) details that there is no direct evidence of mortality or potential mortal injury to sea turtles from ship sound emissions.

Popper et al. (2014) found that there was no data to available to propose a quantitative exposure guideline or criteria for marine turtles for continuous sound such as those generated by vessels and MODUs and instead suggested general distances to assess potential impacts. Using semi-quantitative analysis, Popper et al. (2014) suggests that there is a low risk to marine turtles from shipping and continuous sound except for TTS near (tens of metres) to the sound source, and masking at near, intermediate (hundreds of metres) and far (thousands of metres) distances and behaviour at near and intermediate distances from the sound source.

Finneran et al. (2017) presented thresholds for turtle PTS and TTS for continuous sound. Table 7-8 details the criteria and modelled distances to them from the reports detailed Table 7-5. In summary:

- furthest distance to the 24 hour PTS criteria was reached within 60 m
- furthest distance to the 24 hour TTS criteria was reached within 140 m.

From the PMST Report (Appendix L) 3 marine turtle species are likely to or may occur within the Operational Area and Sound EMBA though no BIAs or habitat critical to the survival of the species were identified. No biologically important behaviours were identified.

The extent of the area of impact is predicted to be up to 140 m of a well location whilst the MODU is on location. The consequence is assessed as **Minor (1)** and is of an acceptable level based on:

- The Recovery Plan for Marine Turtles in Australia (CoA 2017) details that exposure to chronic (continuous) loud noise in the marine environment may lead to avoidance of important habitat and no marine turtle important habits are located within the area that maybe impacted by underwater noise.
- Thresholds for turtle PTS and TTS over 24 hours were predicted to occur with a maximum distance of 140 m from each well location where no marine turtle important habitats are located.

- Avoidance behaviour may occur within the Operational Area where no marine turtle important habitats are located.
- Low numbers of marine turtles are predicted in the Operational Area and therefore impacts would be limited to avoidance behaviour of a small number of individuals.
- Potential impacts will be limited to 25 days during completions activities, 15 days during intervention activities and 15-20 days during P&A, before the noise source moves to a different location. It is not expected that individuals or populations will experience continued underwater noise exposure for the duration of the Program activities (150 days) due to the distance between well locations.
- The Recovery Plan for Marine Turtles in Australia does not identify any actions relevant to underwater noise.

7.4.8.4 Fish

Popper et al. (2014) details that there is no direct evidence of mortality or potential mortal injury to fish from ship sound emissions. Popper et al. (2014) details that risks of mortality and potential mortal injury, and recoverable injury impacts to fish with no swim bladder (sharks) or where the swim bladder is not involved in hearing is low and that TTS in hearing may be a moderate risk near (tens of metres) the vessel. For fish with a swim bladder involved in hearing, risks of mortality and potential mortal injury impacts is low. However, some evidence suggests that fish sensitive to acoustic pressure show a recoverable loss in hearing sensitivity or injury when exposed to high levels of sound and Popper et al. (2014) details sound exposure criteria for fish with a swim bladder involved in hearing. Table 7-9 details the criteria and modelled distances to them from the reports detailed Table 7-5. In summary:

- The 48 hour recoverable injury sound exposure criteria was reached only for resupply and concurrent activities at distances of up to 60 m and 30 m, respectively.
- The 12 hour TTS sound exposure criteria was reached only for resupply and concurrent activities at distances at distances of up to 160 m and 140 m, respectively.

As described in Popper et al (2014), masking and behavioural effects can be assessed qualitatively, by assessing relative risk rather than by specific sound level thresholds. In general, any adverse effects of sound on fish behaviour depends on the species, the state of the individuals exposed, and other factors. Relative risk of behavioural effects (high, moderate, low) is given in Popper et al (2014) for animals at three distances from the source defined in relative terms as near (N), intermediate (I), and far (F). Potential for behavioural effects in fish with no swim bladders (e.g. sharks) is described as high relative risk in the near field, moderate relative risk in the intermediate field and low relative risk in the far field.

No habitat critical to the survival of the species or BIAs for the white shark were identified within the sound EMBA according to the PMST Report though they are known to migrate through the area (Appendix L).

Low to medium levels of commercial fishing were identified within the Operational Area with scalefish and shark fishing occurring in the Operational Area (Section 6.5.10).

Eels that have important cultural value to First Nations may also migrate through the Operational Area (Section 6.4.9.3).

The extent of the area of impact is predicted to be up to 160 m of a well location whilst the MODU is on location. The consequence is assessed as **Minor (1)** and is of an acceptable level based on:

- The 48 hour recoverable injury sound exposure criteria was reached only for resupply and concurrent activities at distances of up to 60 m and 30 m, respectively. Impacts to fish are not predicted as:

  Pelagic species such as sharks and scalefish which continually move are unlikely to remain within 60 m of the MODU for 48 hours.

- The 12 hour TTS sound exposure criteria was reached only for resupply and concurrent activities at distances at distances of up to 160 m and 140 m, respectively. Impacts to fish are not predicted as:

  Pelagic species such as sharks and scalefish which continually move are unlikely to remain within 160 m of the MODU for 12 hours.

  Seabed surveys within the VIC/P43 and VIC/P73 titles and Thylacine did not identify site-attached fish and habitats associated with site attached fish (Section 6.4.1.1).

- The Recovery Plan for the White Shark (*Carcharodon carcharias*) (DSEWPaC 2013b) does not identify sound impacts as a threat and no habitat critical to the survival of the species or BIAs were identified.

- A study by Chapius et al. (2019) observed white sharks to show no significant difference in behaviour when exposed to artificially generated sound. A study by Rider et al. (2021) also found no detectable relationship between boat density and shark residency and inferred habituation of sharks to high levels of chronic boat activity in the study area. Based on observations of these studies, it is inferred that MODU and vessel sounds will result in no significant behavioural change to white sharks.

- A study under experimental conditions on Anguillid eels found acoustic stimuli induced behavioural avoidance (increased swimming, speed and movements away from the source) in some European eel and river lamprey (Deleau et al. 2019). With the absence of biologically important habitats for eels in offshore waters of the Otway Basin, potential behavioural impacts may occur to individual migrating eels which would not have an effect on population health.

- Recoverable injury to eels that may migrate through the Otway Basin to deeper waters are not predicted as a study by Koster et al. 2021 tracked 16 short-finned eels found that the average speed was 30.8±7.3 km/day while eels were on the continental shelf and 29.7±11.1 km/day while in deep water. Thus, migrating eels are unlikely to be impacted based on the small distances to the 48 hour recoverable injury (furthest 60 m) and 12 hour TTS (furthest 160 m) sound exposure criteria and the distance eels travel while migrating.

- Impacts to sharks and scalefish that are commercially fished are not predicted based on the small distances to the 48 hour recoverable injury (furthest 60 m) and 12 hour TTS (furthest 160 m) sound exposure criteria. These pelagic species are unlikely to be present for time periods where impacts could occur.

- Potential impacts will be limited to 25 days during completions activities, 15 days during intervention activities and 15-20 days during P&A, before the noise source moves to a different location. It is not expected that individuals or populations will experience continued underwater noise exposure for the duration of the Program activities (150 days) due to the distance between well locations.

Table 7-8: Turtle underwater sound thresholds and modelled distances

Marine Turtles	SEL_{24h} threshold	**Artisan 1, Doris 1, La Bella 2, and Hercules 1** Completions including OSV standby transit Contingent P&A at Artisan 1 including OSV standby transit [a]	**Artisan 1, Doris 1, La Bella 2, and Hercules 1** Completions including MODU Resupply Contingent P&A at Artisan 1 including MODU resupply Anchor Pre-lay[a]	**Thylacine North 1 and Thylacine West 1** Well Intervention including OSV Transit[b]	**Thylacine North 1 and Thylacine West 1** Well Intervention including MODU Resupply Anchor Pre-lay[b]	**Concurrent activities at Thylacine North 1 and Thylacine West 1** Anchor pre-lay at Thylacine North 1 and well intervention activities at Thylacine West 1[c]
		R_{max} (km)	R_{max} (km)	R_{max} (km)	R_{max} (km)	R_{max} (km)
PTS	220 dB re 1 $\mu Pa^2 \cdot s$	-	-	-	0.05	0.06
TTS	200 dB re 1 $\mu Pa^2 \cdot s$	-	-	0.02	0.10	0.14

Note:

- a dash indicates the level was not reached within the limits of the modelling resolution (20 m)
- [a] range to thresholds based on predictions from Scenario 7 and 8 (Artisan 1) as detailed in McPherson et al. (2021)
- [b] range to thresholds based on predictions from Scenario A5 and A7 (Thylacine North 1) as detailed in Koessler and McPherson (2021)
- [c] range to thresholds based on predictions from Scenario 6 (Essington VIC/P79) as detailed in Welch et al. (2024).

Table 7-9: Fish underwater sound thresholds and modelled distances

Fish: Swim bladder involved in hearing	SPL (Lp; dB re 1 µPa)	**Artisan 1, Doris 1, La Bella 2, and Hercules 1** Completions including OSV standby transit Contingent P&A at Artisan 1 including OSV standby transit [a]	**Artisan 1, Doris 1, La Bella 2, and Hercules 1** Completions including MODU Resupply Contingent P&A at Artisan 1 including MODU resupply Anchor Pre-lay[a]	**Thylacine North 1 and Thylacine West 1** Well Intervention including OSV Transit[b]	**Thylacine North 1 and Thylacine West 1** Well Intervention including MODU Resupply Anchor Pre-lay[b]	**Concurrent activities at Thylacine North 1 and Thylacine West 1** Anchor pre-lay at Thylacine North 1 and well intervention activities at Thylacine West 1[c]
		R_{max} (km)	R_{max} (km)	R_{max} (km)	R_{max} (km)	R_{max} (km)
Recoverable injury	170 dB SPL for 48 h	-	0.06	-	0.05	0.03
TTS	158 dB SPL for 12 h	-	0.16	-	0.15	0.14

Note:

- a dash indicates the level was not reached within the limits of the modelling resolution (20 m)
- [a] range to thresholds based on predictions from Scenario 7 and 8 (Artisan 1) as detailed in McPherson et al. (2021)
- [b] range to thresholds based on predictions from Scenario A5 and A7 (Thylacine North 1) as detailed in Koessler and McPherson (2021)
- [c] range to thresholds based on predictions from Scenario 6 (Essington VIC/P79) as detailed in Welch et al. (2024).

7.4.8.5 Socio-economic Receptors

There are no direct impacts to socio-economic receptors from underwater sound. Indirect impacts may occur if impacts to fauna that are a value to a socio-economic receptor occur such as fishing and whale watching.

The consequence of impact to socio-economic receptors from underwater sound is assessed as **Minor (1)**, and is of an acceptable level based on:

- Impacts to commercial fisheries and recreation fishing are not predicated as impacts to fish are not predicted based on the small distance (up to 160 m) to the sound impact criteria as detailed in Section 7.4.8.4.
- Impacts to whale and other marine fauna watching or tours are not precited as sound levels above the sound impact criteria are not predicted in nearshore waters or areas where whale watching or other fauna watching occurs (Figure 7-9).
- Potential impacts are expected to be limited to 25 days during completions activities, 15 days during intervention activities and 15-20 days during P&A, before the noise source moves to a different location. It is not expected that individual socio-economic receptors will experience continued underwater noise exposure for the duration of the Program activities (150 days) due to the distance between well locations.

7.4.8.6 Cultural Values and Sensitivities

From Section 6.6.3, the following cultural values and sensitivities have been identified as potentially affected by underwater sound and the section where potential impacts have been assessed:

- Eels – see Section 7.4.8.4
- Fish – see Section 7.4.8.4
- Dolphins – see Section 7.4.8.2
- Blue whales – see Section 7.4.8.2
- Southern right whales – see Section 7.4.8.2
- Orcas – see Section 7.4.8.2
- Seals – see Section 7.4.8.2

The marine fauna listed above are connected to places associated with songlines or connected to individuals through ceremony (Section 6.6.3.5). The connection of marine fauna to places or individuals are considered cultural intangible values.

Underwater sound has the potential to impact marine fauna that have songlines, or spiritual connection to First Nations people. It is considered that impacts to species at a population level may prevent First Nations people's obligations to maintain spiritual connections and care for culturally significant species and their habitat. If First Nations people's obligations have not been met it may reinforce a sense of powerlessness to members of First Nations groups responsible for these obligations (Holcombe 2022).

The predicted environmental impact to these receptors, assessed in the above listed sections, determined underwater sound may result in behavioural impacts to individuals however will have no affect at a population level. As a result, the consequence of impact to cultural values and sensitivities from underwater sound is assessed as **Moderate (2)** and of an acceptable level based on:

- Impacts to eels that may migrated through the Otway Basin to deeper waters are not predicted to be impacted as a study by Koster et al. 2021 tracked 16 short-finned eels found that the average speed was 30.8±7.3 km/day while eels were on the continental shelf and 29.7±11.1 km/day while in deep water. Thus, migrating eels are unlikely based on the small distances to the 48 hour recoverable injury (furthest 60 m) and 12 hour TTS (furthest 160 m) sound exposure criteria, where migrating eels are unlikely to be present for a duration of time where impacts could occur.

- Impacts to fish are not predicted based on the small distance (furthest 160 m) to the sound impact criteria.

- The PTS and TTS 24 hour sound criteria is based on a dolphin being exposed to the sound source over a period of 24 hours. As the distances to these criteria are small it is highly unlikely that dolphins would stay near the MODU for up to 24 hours to experience PTS and TTS from well completions, intervention or P&A (140 m for 24 hours) or resupply (160 m for 4 hours) as the Sound EMBA is not within an area where they are undertaking a biologically important behaviour.

- As detailed in Section 7.4.8.2, there is the potential for foraging blue whales and migrating southern right whales to be exposed to sound exposure criteria for 24 hour TTS and behavioural response. Thus, Beach will implement a Whale Management Procedure (CM08) that includes whale observation and measures that have proven to be effective at preventing unacceptable impacts to foraging blue whales and migrating southern right whales as per Beach’s previous Otway Drilling Campaign.

- The southern right whale HCTS (reproduction BIA) is outside of the sound EMBA and thus no impacts are predicted.

- The PTS and TTS 24 hour sound criteria is based on a whale being exposed to the sound source over a period of 24 hours. As the distances to these criteria are small it is highly unlikely that orcas would stay near the MODU for up to 24 hours to experience PTS and TTS from well completions, intervention and P&A (140 m for 24 hours) or resupply (160 m for 4 hours) as the Sound EMBA is not within an area where they are undertaking a biologically important behaviour.

- Breeding colonies for Australian fur-seal and New Zealand fur-seal known to occur along the Victorian coastline, including Deen Maar and the west side of King Island, are outside the Sound EMBA.

- The PTS and TTS 24 hour sound criteria is based on a seal being exposed to the sound source over a period of 24 hours. As the distances to these criteria are small it is highly unlikely that seals would stay near the MODU for up to 24 hours to experience PTS and TTS from resupply (70 m for 4 hours) or concurrent activities (70 m for 24 hours) as the Sound EMBA is not within an area where they are undertaking a biologically important behaviour or within aggregation or haul-out areas.

In addition, continuous underwater sound is not considered a credible pathway for impacts to submerged cultural heritage.

7.4.9 Demonstration that Impacts will be ALARP

ALARP decision context and justification	**ALARP Decision Context: Type B** Impacts from sound emissions are relatively well understood though there is the potential for uncertainty in relation to the level of impact based on updated underwater sound exposure thresholds for marine mammals and turtles by NMFS (2024) and Accomando et al. (2024), respectively. Activities are well practised, and there are no conflicts with company values, no partner interests, and no significant media interests. Additional controls may be required to ensure impacts can be managed to an acceptable level.	
Adopted Control Measures	**Comparison to Relevant OPP Control Measures or Equivalents**	**Description**
CM01: Marine Assurance Process	CM01 is equivalent to OPP-CM26 Preventative Maintenance System. Both controls details inspection and maintenance of combustion equipment to ensure efficient operation.	MODU and vessels will have a Preventative Maintenance System that provides a status on the maintenance of equipment and detailed manufacturer's specification on maintenance procedures for: Equipment detail as a control in this EP will be inspected to ensure effective operation. Power generation and propulsion systems on the MODU and vessels will be inspected to ensure efficient operation.
CM08: Whale Management Procedure	CM08 is equivalent to OPP-CM17 and OPP-CM18 Whale Management Procedures. These controls details the implementation of a whale management procedure which outlines specific measures to minimise anthropogenic noise threats to relevant species. CM08 is also equivalent to OPP-CM14 EPBC Regulations 2000 – Part 8 Division 8.1 interacting with cetaceans. These controls specifies the requirements including separation distances for vessel/helicopter practices in accordance with EPBC Regulations 2000 – Part 8 Division 8.1 interacting with cetaceans.	The Whale Management Procedure outlines specific measures to minimise anthropogenic noise threats to relevant species, including the implementation of safe operating distances between vessels and whales, pre-activity surveys for specific activities, night-time and low visibility controls and establishment of safe points for operational activities in accordance with the Safety Case and Well Integrity requirements. The Whale Management Procedure details whale observation measures including utilising 1-2 appropriately qualified marine mammal observers on each support vessel throughout the Program activities.

Additional Controls Assessed		
Control	**Cost/Benefit Analysis**	**Control Implemented**
Seasonal timing	Avoiding periods of marine fauna sensitivity (i.e. whale migration, foraging), reduces the risk of impacts from sound emissions during environmentally sensitive periods for listed marine fauna. There is a high cost in moving or delaying activity schedule. The risk to all listed marine fauna cannot be reduced due to variability in timing of environmentally sensitive periods and unpredictable presence of some species. There is no period when there is not a whale undertaking a biologically important behaviour within the Otway region. Blue whales are expected to be present in varying numbers all year round, with peak presence typically from January to March. Southern right whales are expected to be present in the migration biologically important area (BIA) from April to October and within the HCTS (reproduction BIA) from May to September. In addition, Beach is required to meet its requirements under the OPGGS Act and petroleum licence conditions to explore and development gas reserves within their petroleum titles. Titleholders must also P&A suspended wells to comply with the requirements under section 572 of the OPGGS Act to remove all structures, equipment and other property that is neither used nor to be used in connection with operations authorised by the title. To progress these petroleum activities, Beach is planning a MODU campaign commencing no earlier than October 2025 (subject to MODU availability). This MODU campaign will be shared across Beach's Bass and Otway assets, along with other titleholders who also have drilling activities planned in the region. A MODU has been secured by Beach along with three other consortium members operating in the Otway Basin. The driver behind the consortium approach is to realise efficiencies through the execution of multiple wells in one campaign, reducing mobilisation and demobilisation activities and shared use of aviation and shore base support. Being part of a consortium also provides the flexibility to negotiate MODU slot sequencing with other operators therefore optimising MODU utilisation and minimising down-time. As Program activities could take up to 150 days there will be some overlap with periods when foraging blue whales and migrating southern right whales are in the Otway Basin. Thus, in order to demonstrate with a high level of confidence that requirements of the National Recovery Plan for the Southern Right Whale (DCCEEW 2024k) and Conservation Management Plan for the Blue Whale (CoA 2015a) will be met, Beach has undertaken a well-founded assessment of impacts to foraging blue whales and migrating southern right whales from Program activities and made commitments to implement a Whale Management Procedure (CM08) that includes whale observation and measures that have proven to be effective at preventing unacceptable impacts to blue whales and southern right whales as per Beach's previous Otway Drilling Campaign. The costs associated with restricting operations to avoid periods of sensitivity for both of these species are considered grossly disproportionate given the existing control measures in place to manage potential impacts to whales undertaking biologically important behaviours.	No

Anchoring of vessels	This control is not feasible for the support vessels based on: Vessel standby activities require the vessel to be able to react immediately in the event of an issue on the MODU and to prevent other marine users entering the 500 m petroleum safety zone. Resupply operations require the vessel to use DP to maintain position adjacent to the platform to counter wind and current conditions.	No
Do not operate or limit the operation of MODU thruster assisted mooring system	A review of 33 months of historical operational data from the North Sea indicates thrusters are typically not active (>96% of the time) and utilisation is otherwise limited low loads across a small number of thrusters for short periods, (typically hours) in response to metocean conditions. Evaluation of trade-offs indicates that not using the thruster assist mode increases the likelihood of inability to maintain station, loss of vessel stability due to mooring system fatigue, downtime associated with management of mooring system fatigue, such as anchor relay or conductor replacement, with associated increases in emissions, discharges, seabed impacts and drilling duration. Beach considers that the trade-offs associated with not using the thruster assist mooring system are grossly disproportionate to the benefit gained, being short-term infrequent reductions in variable non-impulsive noise levels.	No
Passive acoustic monitoring (PAM)	PAM can be used to detect marine mammal calls, and support sightings made by Marine Mammal Observers (MMOs). Currently available PAM technologies are most useful in the detection of odontocetes such as sperm whales and dolphins, known to emit regular distinctive clicks and high frequency calls during long dives. Technology development specific to low frequency whale detections including blue whales and southern right whales is currently underway in Australia but is yet unproven. Studies have identified additional research and development is required for reliable continuous real-time or near real-time passive acoustic detection of low frequency whales (Baumgartner et al. 2021). Bearing accuracy and range estimates for low frequency whales from PAM technologies is limited because it is not as accurate as visual observations. The use of an appropriately qualified MMO on each support vessel negates the need for using PAM given low frequency cetaceans (which surface to breath more regularly than deeper water odontocetes) will generally be able to be easily detected. The cost of a PAM system is high and would require a number of permanent moored systems or multiple gliders around the Operational Area with real-time telemetry and analysis. The uncertainties surrounding PAM's detection rates for low-frequency whales raise concerns about its effectiveness in confirming sightings by MMOs. This casts doubt on the cost-benefit ratio of deploying PAM for this purpose. Beach considers using PAM would result in a negative cost-benefit ratio to confirm MMO sightings of low-frequency whales. The high cost, time and effort of PAM is not justified by the uncertain detection rates. Given the uncertainty of PAM detection of low frequency whales, its contribution to mitigation efforts beyond qualified MMO observation on each support vessel would likely be minimal. As a result, PAM would not significantly reduce the impact and risk any further. The additional cost of deploying PAM would also not significantly improve detection rates or provide certainty on low frequency whale	No

	presence compared to the use of a qualified MMO on each support vessel. Beach is working with other operators and acoustic detection companies to determine if it is feasible to use as a control for future campaigns, but at this stage the technology is not yet ready for deployment.	
Aerial surveys	Aerial surveys were not seen as an effective control for the previous Otway Drilling Campaign due to issues with weather delaying flights, and no detections of foraging whales being made by aerial surveys within 3 km of the MODU. The only aerial survey detection of foraging whale was found 60 km south of the MODU. Aerial surveys for detection of whales within 12.5 km of the MODU are not required as monitoring activities can be effectively conducted by the appropriately qualified MMO(s) on each support vessel. The MMO can provide continuous visual monitoring effort throughout Program activities. Due to distance offshore, actual observation times are limited by fuel capacity on smaller aircrafts. Larger aircrafts with greater fuel capacity, while offering longer observation times, would significantly increase the overall cost of the aerial survey. An appropriately qualified MMO present on each support vessel can effectively detect and report the presence of marine fauna within 12.5 km of the vessel, eliminating the need for aerial surveys detecting foraging whales within the maximum 12.5 km observation range. Beach considers the use of aerial surveys would result in a negative cost-benefit ratio. The high cost, time and effort of aerial surveys using larger aircraft is not justified when an appropriately qualified MMO present on each support vessel can effectively detect and report presence of marine fauna 12.5 km from the vessel continuously during Program activities.	No
Satellite imagery	Satellite imagery can be used to gather oceanographic and biological information to support the understanding of presence of marine mammals in the area. Reliability is likely to be low given meteorological conditions in the area and need for cloudless conditions. Challenges identified with tasking conflicts and data accuracy to support identification to species, with limited additional benefit relative to adopted controls.	No
Drone surveys	Drones could provide a method of increasing the observation distance of MMOs. It is not known if drone surveys have been effectively used as a real-time monitoring method to date due to the physical range of drones being limited to 4-5 km. In addition, drone operations are sensitive to wind limiting operations in the Otway Basin. As MMOs will be present on the vessels Beach considers that there is a negligible observation benefit provided by drones. The associated costs, dropped object risk and operational limitations are disproportionate to the negligible environmental benefit.	No
Infra-red systems	Infra-red systems could enhance the ability of MMOs to visually detect the presence of whales within close proximity to the system. Infra-red systems are limited in their effective distance ranges and do not extend out to the distances required to make them effective in this application. Poor performance of infra-red systems has been reported in sea states greater than Beaufort Sea State 4 and conditions such as fog, drizzle, rain limit detections (Verfuss et al. 2018, Smith et al. 2020).	No

	Reliability and effectiveness are unknown/untested and considered lower than direct observations, with limited additional benefit relative to accepted controls.	
Monitoring upwelling events	Monitoring precursors to upwelling events could inform the level of risk of blue whale encounter. There is a lag between changes in sea surface temperature and increased primary production leading to krill swarms, and the presence of feeding whales. This lag has been identified in some studies on upwelling / krill / blue whale foraging presence as between 1 to 4 months. As such, monitoring sea surface temperature and chlorophyll-a monitoring does not provide a robust prediction of blue whale feeding activity.	No
Pre-activity survey for all Project activities	A vessel-based pre-activity survey implemented within the 24 hours prior to the commencement of all Project activities may reduce the risk of impacts from sound emissions. During previous Beach drilling campaigns pre-activity surveys were applied for activities that generated potential injury inducing ensonified ranges greater than the separation distances defined in the EPBC Regulations (Part 8) for low-frequency cetaceans. These pre-activity surveys enforced actions to minimise noise and maintain safety before and after the activity has commenced, often increasing operational duration. However, well completion and well intervention operations present a different scenario. The underwater sound generated by these operations are primarily from transiting support vessels and the operation of machinery and equipment. Critically, the sound profile from these sources is not distinguishable from that of general vessel and MODU operations (vessels will not use DP during these scenarios). Given the similarity of sound sources, adherence to the separation distances defined in the EPBC Regulations (Part 8) is considered a proportionate and sufficient measure to manage potential risks during well completion and intervention operations. Implementing pre-activity surveys for these operations is anticipated to extend operational durations with negligible environmental benefit compared to implementing the EPBC Part 8 separation distances. The associated costs of operational delays are therefore disproportionate to the negligible environmental benefit offered by pre-activity surveys for well completion and well intervention operations. Consequently, pre-activity surveys will not be implemented for well completion and well intervention operations. Pre-activity surveys will be conducted for Project activities that require vessels on DP and wellhead cutting operations i.e. contingent P&A, resupply, anchor pre-lay, MODU mooring, and concurrent activities at the Thylacine wells (as detailed in the WMP in Appendix K). This targeted approach ensures that pre-activity surveys are applied where the control is most likely to provide a meaningful reduction in potential environmental risk.	No

7.4.10 Demonstration that Impacts will be of an Acceptable Level

Consequence rating	Minor (1) to Moderate (2)
Likelihood of occurrence	NA (Impact)
Residual risk	NA (Impact)

Acceptability Assessment	
Demonstration of acceptability for impacts and risks associated with underwater sound provided in Section 6.4.5 of the OPP (Otway Offshore Gas Victoria Project) is considered valid and appropriate for the impact and risk assessment of this aspect for the Program activities. This is supported by the acceptability assessment for this aspect against the evaluation criteria in the following rows. The potential impacts from underwater sound during Program activities meets the defined acceptable levels in the OPP by ensuring the considerations in Section 2.8 are met such that: OPP EPOs relevant to underwater sound are implemented through equivalent EP EPOs OPP control measures relevant to the underwater sound are implemented through equivalent EP control measures Based on the implementation of relevant and equivalent EPOs and control measures the consequence rating, likelihood of occurrence and residual risk are the same levels as defined in the OPP No changes to internal or external context as defined in the OPP including no new comments (objections and claims) raised against this aspect.	
To meet the principles of ESD	Sound emissions were assessed as having a Minor (1) to Moderate (2) consequence which is not considered as having the potential to result in serious or irreversible environmental damage. The exposure criteria used in the modelling and impact assessment were based on the best available science at the time (McPherson et al. 2021, Koessler and McPherson 2021, Welch et al. 2024). However, recent updates to underwater sound exposure thresholds for marine mammals (NMFS 2024) and turtles (Accomando et al. 2024) suggest that the predicted impact range may be underestimated, presenting a level of uncertainty. Beach anticipates that recent updates to sound exposure thresholds could potentially increase the predicted area of potential auditory injury (PTS) and TTS for marine mammal and turtles. However, the proposed control measures, based on unchanged behavioural thresholds, will ensure certainty in preventing auditory injury and TTS and meet the acceptable level of impact. Beach is committed to re-modelling relevant scenarios as soon as reasonably practicable to incorporate these new, more conservative thresholds. Beach will collaborate with JASCO to determine the necessary timeframes for model reconfiguration and re-modelling. Upon receiving the updated modelling results, Beach will conduct a thorough review of the underwater sound impact evaluation to assess any potential changes in threshold range predictions and their implications for environmental impact and controls including the Whale Management Procedure (Appendix K). Any revisions to the EP are to be assessed against the criteria for submission of a revised EP to NOPSEMA as detailed in Section 8.3.6 and Management of Change as per Section 8.3.4 shall be evaluated. This process aims to ensure scientific certainty is attained as soon as reasonably practicable. While some uncertainty remains, Beach is confident that the process to gain scientific certainty and the proposed controls will minimise potential environmental impacts to ALARP levels. This confidence is grounded in Beach's extensive experience operating in the Otway Basin, particularly through their offshore developments and activities, including the 2021/2022 Beach Otway Drilling Campaign.
Internal context	The proposed management of the impact is aligned with the Beach Environment Policy. Program activities will be undertaken in accordance with the Implementation Strategy (Section 8).
External context	There have been no stakeholder objections or claims regarding underwater sound associated with the program activities.
Other requirements	Underwater sound will be managed in accordance with legislative requirements. EPBC Regulations 2000 – Part 8 Division 8.1 interacting with cetaceans requirements are implemented as per CM08: Whale Management Procedure.

	Underwater sound is not listed as a threat in: Recovery Plan for the Australian Sea Lion (DSEWPaC 2013d) Recovery Plan for the White Shark (DSEWPaC 2013b) National Recovery Plan for Albatrosses and Petrels (CoA 2022) Wildlife Conservation Plan for Seabirds (CoA 2020a) Underwater sound is listed as a threat in: Conservation Management Plan for the Blue Whale (CoA 2015a) National Recovery Plan for the Southern Right Whale (DCCEEW 2024k) Conservation Advice for Fin Whales (TSSC 2015e) Conservation Advice for Sei Whales (TSSC 2015f) Recovery Plan for Marine Turtles in Australia (CoA 2017). South-east Marine Parks Network Management Plan 2025 (DNP 2025) Relevant actions from the requirements that list underwater sound as a threat have been met as detailed. Actions from the Conservation Management Plan for the Blue Whale (CoA 2015) applicable to Program activities in relation to assessing and addressing anthropogenic noise have been addressed as per: • Assessing the effect of anthropogenic noise on blue whale behaviour. Section 7.4.8.2 assesses the effects of anthropogenic noise from Program activities on blue whale behaviour. • Anthropogenic noise in biologically important areas will be managed such that any blue whale continues to utilise the area without injury and is not displaced from a foraging area. Section 7.4.8.2 demonstrates that the activity can be conducted in a manner that is consistent with the conservation management plan and will not result in injury or displacement of pygmy blue whales from a foraging BIA. Actions from the National Recovery Plan for the Southern Right Whale (DCCEEW 2024k) applicable to the activity in relation to assessing and addressing anthropogenic noise have been addressed as per: • Anthropogenic noise in biologically important areas will be managed such that risk of behavioural disturbance is minimised and it does not prevent any southern right whale from utilising the area or cause auditory impairment (TTS and PTS). • Ensure environmental assessments associated with underwater noise generating activities include consideration of national policy (e.g., EPBC Act Policy Statement 2.1) and guidelines related to managing anthropogenic underwater noise and implement appropriate mitigation measures to reduce risks to southern right whales to the lowest possible level. Section 7.4.8.2 assesses the effects of anthropogenic noise from Program activities on southern right whales and includes consideration of national policy and guidelines relevant to the Program activities. • Quantify risks of anthropogenic underwater noise to southern right whales, including behavioural disturbance, changes to vocalisations, and physiological effects to whales. Section 7.4.8.2 assesses the effects of anthropogenic noise from the Program activities based on three underwater acoustic modelling studies. Management actions from the fin and sei whales conservation advice (TSSC 2015f, TSSC, 2016g) have been addressed as per: • An assessment of the impacts of increasing anthropogenic noise (including from seismic surveys, port expansion, and coastal development) has been undertaken as per Section 7.4.8.2. • The Whale Management Procedure will be implemented for fin and sei whales to ensure their ongoing recovery. As per the Recovery Plan for Marine Turtles in Australia (CoA 2017), underwater sound is not predicted to impact the recovery of marine turtles as impacts as no marine turtle

	important habitats are located within the area that maybe impacted by underwater sound as detailed in Section 7.4.8.3. The South-east Marine Parks Network Management Plan 2025 (DNP 2025) states petroleum activities states that offshore petroleum activities under the NOPSEMA EPBC Program do not require additional assessment or authorisation by the Director of National Parks because the endorsed program takes account of impacts and risks to marine park values in a manner that satisfies the Director. Further, where the proposed activity is within an Australian Marine Park or may impact the marine park values, the Director is consulted in the preparation of environmental plans under the OPGGS Act. This has been addressed by consultation with DNP (Section 4) and by the submission of this EP to NOPSEMA for acceptance as required under the OPGGS Act.
Monitoring and reporting	Marine Mammal Sighting Reports (Section 8.3.8).
Acceptability outcome	**Acceptable**

Environmental Performance	Environmental Performance Outcomes (EPOs) represent the measurable levels of environmental performance Beach is seeking to achieve to ensure impacts are of an acceptable level. EPOs relevant to the effective management of impacts associated with underwater sound from the Program activities are:
	• EPO2: No death or injury to listed threatened or migratory species from the activity.
	• EPO3: Biologically important behaviours can continue while the activity is being undertaken.
	• EPO4: Anthropogenic noise in biologically important areas and habitat critical to the survival of a species will be managed such that:
	  ○ Any blue whale continues to utilise biologically important areas without injury and is not displaced from a foraging area.
	  ○ It does not prevent any southern right whale from utilising biologically important areas or habitat critical to the survival of a species or cause auditory impairment (TTS and PTS).
	Section 7.15 sets out the EPS for the control measures identified above, and the measurement criteria to evaluate the achievement of EPOs and EPS.
	These EPOs are considered equivalent to relevant OPP EPOs as justified in Table 2-2.

7.5 Physical Presence

7.5.1 Source of Aspect

While the MODU is on a well location there will be a 500 m PSZ around the MODU, and a 3km caution zone around the mooring equipment.

Gazetted safety zones for wells in the Operational Area restrict other users from accessing these specified areas. Each well covered by this EP will already have an existing 500 m PSZ that will remain for its production life. These PSZs have been assessed under previous approvals (Section 1 and 0) and will not be covered under this EP.

If anchors are pre-laid, they may be in place for typically 1 month and up to 3 months prior to the MODU being on location. The surface buoys associated with the anchors will be in place until the MODU is anchored on location to drill the well. The surface buoys have a navigation light.

7.5.2 Extent and Duration of Aspect

MODU on Location	
Extent	500 m PSZ 3 km caution zone where MODU anchors are located
Duration	Completions: 25 days per well at a maximum of 4 well locations. Well interventions: 15 days per well at a maximum of 2 well locations. Contingency P&A: 15- 20 days at a maximum of 1 well.
Pre-laid Anchors	
Extent	3 km caution zone where MODU anchors are located
Duration	Up to 3 months

7.5.3 Predicted Environmental Impacts

The physical presence of anchors, anchor surface buoys, and MODU PSZs can result in the displacement of other marine users.

The physical presence of MODU anchors can result in snagging of fishing equipment.

Concurrent activities could result in pre-lay anchors being present at one well location while the MODU is operating at a separate well location, meaning that temporary impacts resulting from physical presence could occur in two places within the Operational Area at any one time. Additionally, the presence of a PSZ at wellhead locations for the life of the well and/or field presents a different pathway to potential impacts, would likely be present at the same time as concurrent activities.

7.5.4 EMBA

Predicted impacts from the physical presence of anchors, anchor surface buoys (3 km caution zone around the mooring equipment), and MODU (500 m PSZ) will be limited to the Operational Area.

Other marine users likely to occur within the Operational Area are:

- Marine recreation and tourism.
- Offshore Industry
- Commercial fishing
- Cultural values and sensitivities.

7.5.5 Predicted Level of Impact

7.5.5.1 Marine Recreation and Tourism

Marine recreation and tourism could be affected by restricted access to an area within the Operational Area which is located approximately 20 km from the Victorian coast.

Marine recreation and tourism is limited within the Operational Area due to its offshore location, the lack of emergent features and water depths outside of recreational diving depths. Vessel based tourism and recreation activities occurs along the Victorian coastline in water depths approximately less than 11 m (Section 6.5.7). Previous consultation with local vessel charterers and providers of SCUBA tank fills has confirmed that diving activity is generally concentrated around The Arches Marine Sanctuary (20 km from the Operational Area) and the wreck sites of the Loch Ard (22 km from the Operational Area) and sometimes at the Newfield and Schomberg shipwrecks (20 and 21 km from the Operational Area, respectively).

The extent of the impact is predicted to be 500 m from the MODU while on location and a 3km caution zone around the mooring equipment. The consequence is assessed as **Minor (1)** and is of an acceptable level based on:

- A marine or tourism operator would have to avoid 500 m around the MODU, which is a very small area and will not result in a significantly longer sail time or increase in fuel use.
- The Operational Area have not been identified to contain any tourism areas or significant areas for recreational fishing.
- No issues have been raised to date in relation to exclusion of recreational fishing or marine tourism for Beach's existing offshore operations.
- Notices to Mariners will be issued for the program activities and tourism operators can obtain updates from Beach in relation to the Program as per Consultation for Implementation of EP (CM03).
- Although concurrent activities will likely result in multiple sources of impact within the Operational Area at the same time, impact footprints are small and will not overlap therefore potential impact consequence to marine recreation and tourism is not increased by the presence of concurrent activities.
- Temporary impacts will be limited to 25 days (during completions), 15 days (during well interventions), 15-20 days (during contingent P&A) and 13 days (for concurrent activities), before the MODU moves to a different location and (in most cases) the access restriction is removed. It is

not expected that any receptors will experience continued impacts from physical presence for the duration of Program activities (150 days) due to the distance between well locations.

7.5.5.2 Offshore Industry

7.5.5.2.1 Petroleum titleholders

The Operational Area overlaps with the proposed Regia Marine Seismic Survey Activity Planning Area, and ConocoPhillips Drilling Operational Area. Beach is engaging with these companies to stay informed of activity timings to ensure activities can be undertaken in a manner that does not interfere with other marine users to a greater extent than is necessary for the exercise of right conferred by the titles granted. Impacts to other petroleum titleholders are not predicted.

Cumulative impacts associated with activities in the Operational Area are detailed in Section 7.1.1

7.5.5.2.2 Commercial Shipping

The Operational Area includes major and minor shipping routes (Section 6.5.6).

The extent of the impact is predicted to be 500 m from the MODU while on location and a 3km caution zone around the mooring equipment. The consequence is assessed as **Minor (1)** and is of an acceptable level based on:

- A commercial vessel would have to avoid 500 m around the MODU, which is a very small area and will not result in a significantly longer sail time or increase in fuel use.
- No issues have been raised to date in relation to exclusion of shipping for Beach's existing offshore operations.
- Notices to Mariners will be issued for the program activities and tourism operators can obtain updates from Beach in relation to the Program as per Consultation for Implementation of EP (CM03).
- Although concurrent activities will likely result in multiple sources of impact within the Operational Area at the same time, impact footprints are small and will not overlap therefore potential impact consequence to commercial shipping is not increased by the presence of concurrent activities.
- Temporary impacts will be limited to 25 days (during completions), 15 days (during well interventions) and 15-20 days (during contingent P&A), and 13 days (for concurrent activities), before the MODU moves to a different location and (in most cases) the access restriction is removed. It is not expected that any receptors will experience continued impacts from physical presence for the duration of Program activities (150 days) due to the distance between well locations.

7.5.5.2.3 Defence Activities

Historical consultation with the Department of Defence identified that the Operational Area will overlap with restricted airspace. Helicopter operations within the Operational Area, to transfer personnel from the mainland to the MODU or vessels, may interact with Defence operations that restricts airspace within the Operational Area. Helicopters currently access the Thylacine platform approximately once per week and to date there have been no negative interactions. Beach will ensure specified permissions for aircraft movement in restricted airspace will be attained from Air Traffic Control, if helicopter operations are required for the transfer of personnel to the MODU located in the Operational Area overlapping restricted airspace. With specified permissions in place, helicopter operations will have negligible impacts to Defence operations.

7.5.5.3 Commercial Fishing

Table 7-10 details the fisheries that overlap the Operational Area with number of vessels and gear type based on the Commonwealth Fishery Status Report 2024 (Butler et al. 2024), SETFIA Commercial Fishing Data report prepared for Beach (SETFIA 2023) and spatial intensity data (ABARES 2024).

Data sources identified that the main fisheries that could be impacted by permanent exclusion area such as PSZs are the trawl, rock lobster and giant crab fisheries noting:

- Trawl data from the past twenty years showed that most fishing effort is between the 400 and 1,000 m isobath, far outside the water depths of the Operational Area.
- If interaction is unavoidable then fishers may be due compensation as per the Beach Fair Ocean Access Procedure (CM04).

Table 7-10: Fisheries with fishing intensity overlapping the Operational Area

• Fishery	• Percentage Overlap with Operation Area	• Gear Used
• Commonwealth Trawl Sector (Cth)	• 0.1%	• Otter-board trawl
• Gillnet Hook Trap Sector (Cth)	• <0.1%	• Demersal gillnet • Demersal longline • Auto longline • Dropline
• Southern Squid Jig (Cth)	• 0.6%	• Squid jig
• Giant Crab (Vic)	• 1.5%	• Crab pot
• Southern Rock Lobster (Vic)	• 1.1%	• Rock lobster pot

•

• The extent of the impact is predicted to be 500 m from the MODU will on location for non-trawl fisheries and 3 km around the mooring equipment for trawl fisheries whilst trawling. The consequence is assessed as **Minor (1)** and is of an acceptable level based on:

- A fishing vessel would have to avoid 500 m around the MODU, and trawl fisheries would have to avoid 3 km around the mooring equipment which is a very small area and will not result in a significantly longer sail time or increase in fuel use.
- To date commercial fishers and Beach existing operations have co-existed.
- Rock lobsters live in rocky reefs (VFA 2023b) and rocky reefs are not an appropriate substrate for wells thus it is unlikely for areas where rock lobster live and are caught to be within a PSZ.

- Notices to Mariners will be issued for Program activities and commercial fisheries can obtain updates from Beach in relation to the program activities as per Consultation for Implementation of EP (CM03).

- Commercial trawl and giant crab fisheries were identified by SETFIA (2023) as having most fishing effort between the 400 and 1,000 m isobath, far outside the water depths of the Operational Area.

- Beach will continue to consult with commercial fishers including SETFIA (CM03: Consultation for Implementation of EP) in relation to well locations and the process for compensation if fishing exclusion is unavoidable (CM04: Beach Fair Ocean Access Procedure).

- Although concurrent activities may result in multiple sources of impact within the Operational Area at the same time, impact footprints are small and will not overlap therefore potential impact consequence to commercial fishing is not increased by the presence of concurrent activities.

- Temporary impacts will be limited to 25 days (during completions), 15 days (during well interventions) and 15-20 days (during contingent P&A), and 13 days (for concurrent activities), before the MODU moves to a different location and (in most cases) the access restriction is removed. It is not expected that any receptors will experience continued impacts from physical presence for the duration of Program activities (150 days) due to the distance between well locations.

7.5.5.4 Cultural Values and Sensitivities

First Nation cultural activities could be affected by restricted access to an area within the Operational Area.

The extent of the impact is predicted to be 500 m from the MODU while on location and 3 km from the MODU or pre laid anchor buoys. The consequence is assessed as **Minor (1)** and is of an acceptable level based on:

- No First Nations cultural activities have been identified to occur within the Operational Area via stakeholder consultation or during Beach's Otway Operations.

- Notices to Mariners will be issued for the program activities and First Nation's people or groups can obtain updates from Beach in relation to Program activities as per Consultation for Implementation of EP (CM03).

7.5.6 Demonstration that Impacts will be ALARP

ALARP decision context and justification	ALARP Decision Context: Type A Impacts from physical presence are well understood and there is nothing new or unusual. Good practice is defined, and uncertainty is minimal. There are no conflicts with company values, no partner interests and no significant media interests. Though objections or claims where raised by stakeholders in relation to physical presence they have been managed by additional controls. As the impact consequence is rated as Minor (1) applying good industry practice is sufficient to manage the impact to ALARP.

Adopted Control Measures	Comparison to Relevant OPP Control Measures or Equivalents	Description
CM01: Marine Assurance Process	CM01 is equivalent to OPP-CM35 Marine Orders. Both controls refer to the application of relevant Marine Orders. Beach Marine Assurance System ensures that the MODU and vessels meet relevant maritime laws and associated Marine Orders.	Beach Marine Assurance System ensures that the MODU and vessels meet relevant maritime laws and includes pre-commencement MODU and vessel inspections of class certification requirements under the *Navigation Act 2012* and associated Marine Orders, including but not limited to: Marine Order 27 Safety of Navigation and Radio Equipment Marine Order 30 Prevention of Collisions
CM02: Vessel and MODU Operating Procedures	CM02 is equivalent to OPP-CM06 Temporary exclusion/cautionary zones. Both controls refer to the application of 500 m exclusion zone around the MODU. OPP-CM06 refers to a 2 km cautionary zone for mooring system, whereas CM02 refers to a more conservative 3 km zone to ensure potential risks are ALARP.	A 500 m radius PSZ and a 3 km radius cautionary zone will be in place around the MODU when on location and will be monitored by a support vessel. At least one support vessel will accompany the MODU when in operation and when safe to do so (e.g. outside of weather event), to manage interactions with other marine users.
CM03: Consultation for Implementation of EP	CM03 is equivalent to OPP-CM04 Stakeholder consultation. Both controls relate to Beach undertaking consultation for the implementation of the Project which includes the Program activities. CM03 is also equivalent to OPP-CM02 Notifications. Both controls refer to the notification of the Australian Hydrographic Office (AHO) to facilitate the issuing of Notice to Mariners and maintain nautical charts.	As per Sections 4 and 8.5.1, Beach will undertake consultation for the implementation of the EP which will include at a minimum: Notification to all relevant person regarding acceptance of the EP by NOPSEMA. Commencement of activities, exclusion zones, vessel details, supply vessel navigational corridors, pre-lay of anchors and buoys, movement of the MODU to new locations, during activity and cessation notification requirements. On-water communication processes, including SMS messages and radio communication. Consultation with commercial fishing associations (and individual commercial fishers) the ongoing communication of Beach activities to their members, and applying CM04: Beach Fair Ocean Access Procedure. Under the *Navigation Act 2012*, the Australian Hydrographic Office (AHO) are responsible for maintaining and disseminating hydrographic and other nautical information and nautical publications such as Notices to Mariners. AMSA also issue radio-navigation warnings. Notifications to AMSA and AHO will be undertaken as detailed in Section 4.
		Relevant details in relation to the pre-laid anchor buoys, MODU and vessels will be provided to the AHS and AMSA

		and to relevant stakeholders to ensure the presence of the MODU and vessels are known.
CM04: Beach Fair Ocean Access Procedure	CM04 is equivalent to OPP-CM03 Fair Ocean Access Procedure. Both controls refer to the implementation of Beach's Fair Ocean Access Procedure.	Beach's Fair Ocean Access Procedure was developed with input from commercial fishing industry organisations. It sets out Beach's commitment to the principle that a fisher should not suffer an economic loss as a direct result of a Beach project. Beach is committed to a fair, simple and transparent process for a fisher to claim compensation, where the fisher has consulted with Beach in good faith, and provided the fisher has: acted to avoid risks and impacts to a Beach Project; acted to mitigate any economic losses to their business that may arise from avoiding risks and impacts to a Beach Project; Evidence of fishing in the Beach Project area during the same time of year as the Project timing, for at least three years within the last five years, unless there are genuine fishery or fishing practice reasons for lesser periods; historical and current catch and effort evidence; and the ability to demonstrate an economic loss in accordance with this procedure. The procedure details the process whereby a commercial fisher can claim compensation for an economic loss associated with Beach's offshore activities where impacts cannot be avoided. The procedure is described as follows: 7.5.6.1.1 Fisher submits a claim for compensation, using the Beach Claim Form. Claim to be submitted no later than 60 days after completion of the relevant Beach project. 7.5.6.1.2 Beach to acknowledge receipt and provide a single point of contact within 2 business days. 7.5.6.1.3 All claims to be supported by catch and effort evidence. 7.5.6.1.4 Beach may ask to meet with the fisher, together with a representative of their association or other representative if they chose, to clarify details of the claim. 7.5.6.1.5 Beach will use best endeavours to process the claim within 10 business days after a fisher has provided evidence. 7.5.6.1.6 If approved, Beach will make payment within 30 business days (subject to completion of relevant forms). The procedure also includes a process for resolving disputes, which is activated if Beach and a fisher cannot reach an agreement on a fisher's claim within 30 days. This process includes referring the claim to an independent expert.

		An information sheet on the procedure is available in Appendix D.
CM06: MODU Mooring Plan	CM06 is equivalent to OPP-CM09 MODU and vessel anchoring plan. Both controls refer to the use of an anchoring plan to identify suitable anchor placements.	Pre-laid anchors will have a surface buoy with navigation lighting and the position of the buoys will be included in the notification to AHS to be included in the AUSCOAST warnings. Planned retrieval of all mooring equipment, including transponders, from the sea floor as soon as reasonably practicable within 3 months following the completion of the program activities. Final selection for the location of mooring equipment will avoid exclusion areas determined from seabed survey data evaluation reports (CM05) based on the potential presence of the following: Seabed habitat type to avoid areas of high relief outcrops and reefs that are likely to be associated with site-attached fish. Shipwrecks and other maritime archaeological heritage. Submerged cultural heritage. Location of unexploded ordinance.

7.5.7 Demonstration that Impacts will be of an Acceptable Level

Consequence rating	Minor (1)
Likelihood of occurrence	NA (Impact)
Residual risk	NA (Impact)
Acceptability assessment Demonstration of acceptability for impacts and risks associated with physical presence – interaction with other users provided in Section 6.1.5 of the OPP (Otway Offshore Gas Victoria Project) is considered valid and appropriate for the impact and risk assessment of this aspect for the Program activities. This is supported by the acceptability assessment for this aspect against the evaluation criteria in the following rows. The potential impacts from the physical presence of Program activities meets the defined acceptable levels in the OPP by ensuring the considerations in Section 2.8 are met such that: OPP EPOs relevant to physical presence are implemented through equivalent EP EPOs OPP control measures relevant to physical presence are implemented through equivalent EP control measures Based on the implementation of relevant and equivalent EPOs and control measures the consequence rating, likelihood of occurrence and residual risk are the same levels as defined in the OPP No changes to internal or external context as defined in the OPP including no new comments (objections and claims) raised against this aspect.	
To meet the principles of ESD	Physical presence was assessed as having a Minor (1) consequence which is not considered as having the potential to result in serious or irreversible environmental damage. There is high confidence in the predicted level of impact as Beach has significant experience operating in the Otway Basin based on their existing offshore developments and associated activities including the Beach Otway Drilling Campaign in 2021/2022.
Internal context	The proposed management of the impact is aligned with the Beach Environment Policy.

	Activities will be undertaken in accordance with the Implementation Strategy (Section 8).
External context	Stakeholder objections or claims have been assessed in relation to physical presence and appropriate controls have been adopted as detailed in Section 7.5.6.
Other requirements	Physical presence will be managed in accordance with the applicable legislative requirements such as the *Navigation Act 2012* and associated Marine Orders as detailed in Section 7.5.6.
Monitoring and reporting	Monitoring of potential impacts is undertaken via stakeholder consultation as detailed in Section 4.
Acceptability outcome	**Acceptable**
Environmental Performance	Environmental Performance Outcomes (EPOs) represent the measurable levels of environmental performance Beach is seeking to achieve to ensure impacts are of an acceptable level. EPOs relevant to the effective management of impacts associated with physical presence from the program activities are: EPO1: Undertake the activity in a manner that will not interfere with other marine users to a greater extent than is necessary for the exercise of right conferred by the titles granted. Section 7.15 sets out the EPS for the control measures identified above, and the measurement criteria to evaluate the achievement of EPOs and EPS. This EPO is considered equivalent to relevant OPP EPOs as justified in Table 2-2.

7.6 Seabed Disturbance

7.6.1 Source of Aspect

The wells within the scope of the Program activities are pre-existing wells drilled (or planned to be drilled) under the following environment approvals:

- Offshore Gas Victoria (OGV) Drilling and P&A Activities EP (Beach 2025)

  Hercules 1, Doris 1, La Bella 1

- Artisan 1 Exploration Well Drilling Environment Plan (Beach 2021)

  Artisan 1

- Otway Development Drilling and Well Abandonment Environment Plan (Beach 2021)

  Thylacine North 1 and Thylacine West 1

Historical seabed disturbance from drilling these wells (under the above listed approved EPs) will be similar to the seabed disturbance expected during Program activities, as detailed in Table 7-11. Table 7-11 also details the planned Program activities and the pathways that may result in seabed disturbance.

Program activities may result in the re-disturbance of previously impacted areas. A seabed survey was undertaken at the well locations relevant for the Program activities, however seabed survey data is yet to be received. In the absence of current seabed data, a conservative and precautionary approach will be adopted. Seabed disturbance from Program activities will assume that historical seabed disturbance has fully recovered. This assumption is made to ensure that any potential new disturbance resulting from Program activities is not underestimated.

Table 7-11: Pathways for seabed disturbance from planned activities

Activity	Description of pathway	Predicted impact footprint	Total for program
Rig Mooring	Anchors will be used to maintain position of the MODU during normal operations.	Maximum of 12 anchors and chains per well (up to 6 wells). Footprint of up to: 200 m^2 per anchor and chain. 14,400 m^2 (6 wells x 12 anchors x 200 m^2) for Program activities.	14,400 m^2
	Transponder clump weight on seafloor. ~ 8 per well if required. Removed after positioning of rig.	Footprint of up to: 0.2 m^2 each. 9.6 m^2 (6 wells x 8 transponders x 0.2 m^2) for Program activities	9.6 m^2
Well Completion	Removal of downhole (cement) barriers (at Artisan 1, Hercules 1 and / or Doris 1)	Footprint of up to: 25 m^2 each. 75 m^2 (3 wells x 25 m^2) for Program activities	75 m^2

Activity	Description of pathway	Predicted impact footprint	Total for program
	Subsea basket, will be recovered to surface at the conclusion of completion and well flowback operations.	Footprint of up to: 37.75 m^2 per well 226.5 m^2 (6 wells x 37.75 m^2) for Program activities	226.5 m^2
	A XT debris canopy, complete with the XT debris cap, intended to be used on Artisan 1 but may be used on any well, may be stored on the sea floor until it is installed at the conclusion of operations.	Footprint of up to: 0.2 m^2 per well 1.2 m^2 (6 wells x 0.2 m^2) for Program activities	1.2 m^2
Contingent P&A (Artisan 1)	P&A discharges (i.e. cement and drill cuttings) may be present up to 500 m from the well and are described and assessed in Section 7.8	500 m from the well	0.67 km^2 (as per original well)
	Following P&A operations and confirmation of the permanent barriers, the wellhead is cut with the use of a mechanical cutting tool and removed below the mudline (approximately 1.5 m) leaving no remaining well infrastructure on the seabed. The cutting process produces metal shavings (swarf), some of which remain on the seabed.	Swarf is expected to settle immediately and will likely remain within the existing footprint created by P&A discharges. 0.67 m^2 footprint 0.67 m^2 (1 well x 0.67 m^2) for Program activities	Included in P&A discharges
	Removal of existing wellhead.	~ 0.67 m^2 footprint	Included in the above
	ROV dredging to expose guide bases and guideposts.	Beside the wellhead.	Included in the above
Total for Program Activities			**0.685 km^2**

*area previous included in completions well completion

7.6.2 Extent and Duration of Aspect

Seabed Disturbance	
Extent	Per well: 0.0025 km^2 Program activities: 0.025 km^2
Duration	Recovery of seabed habitat within two months.

7.6.3 Predicted Environmental Impacts

Seabed disturbance from Program activities can result in direct and indirect impacts to:

- Benthic habitats including:

  Injury/mortality to fauna from smothering or damage.

Change in water quality from sedimentation and turbidity.

Permanent or temporary change in habitat.

- Subsea infrastructure including UXO.
- Cultural values and sensitivities.

7.6.4 EMBA

Receptors impacted by seabed disturbance will be limited to the subsea infrastructure, benthic invertebrates, sessile epifauna and associated benthic habitats located at each well location. Wells will be located within the Operational Area.

Benthic habitat within the Operational Area is a mixture of carbonate rich coarse to medium sands with areas of exposed limestone substrate (see Section 6.4.1). It is unlikely that extensive areas of rocky reefs or outcrops (where sponges, coral and more diverse fauna may be present) occur within the Operational Area.

Ecological receptors likely to be present within the Operational Area that may be impacted by seabed disturbance include:

- Benthic and filter-feeding epifauna (e.g. sponges, macroalgae, coral, bryozoans, molluscs, ascidians)
- Crustaceans (e.g. giant crabs, rock lobster, shrimp, krill)
- Echinoderms (e.g. urchins, sea cucumbers), and
- Annelids (e.g. polychaete worms).

Further details on benthic habitats and species assemblages are provided in Section 6.4.1.

There are two commercially fished marine benthic invertebrate species which are present within the Operational Area which could be indirectly susceptible to seabed disturbance: the giant crab, and the southern rock lobster.

As detailed in Section 6.5.5 the Operational Area overlaps UXO Zone 1052 King Island.

First Nations submerged cultural heritage as detailed in Section 6.6.3.6, if identified, may be potentially impacted if within the area of seabed disturbance.

7.6.5 Predicted Level of Impact

7.6.5.1 Ecological Receptors

Benthic habitats and associated benthic fauna found within the Operational Area may be vulnerable to seabed disturbance from direct and indirect impacts. Benthic habitats found within the Operational Area include carbonate sands, low relief exposed limestone, sponge beds and unconsolidated sediment supporting bryozoans (IMAS 2017) and are found elsewhere within the region (see Section 6.4.1 for further details).

The biological impacts to benthic habitats and communities depends upon the equipment, footprint, seabed substrate, the frequency and the ecosystem's resilience (Watson et al. 2022). Furthermore, the recovery timeframe following seabed disturbance also varies on several factors, including the species and seabed substrate disturbed (Hiddink et al. 2017), the time of year, larval recruitment, and the local hydrodynamics (Dernie et al. 2003). There is limited information on the recovery of benthic habitats after the removal of anchors and other equipment.

A study on the recovery of seabed following bottom trawling activities identified faster recovery times for coarse-sediment (sand) compared to fine-sediment regions (Hiddink et al. 2017). Dernie et al. (2003) identified that benthic community recovery time following physical disturbance in soft sediment habitats varied from 64 days for low intensity disturbances, up to 208 days following higher intensity disturbance. For Program activities, it is expected that following the removal of anchors and other equipment, disturbed areas will recolonise quickly as impacted areas are small and the benthic habitat is consistent with the low intensity disturbances recovery period, as identified by Hiddink et al. 2017 and Dernie et al. 2003. Impacts are not expected to cause long-lasting changes to population characteristics.

During anchoring activities, there is the potential for soft sediments to be suspended into the water column, which may affect benthic communities by decreasing water quality and/or light penetration near the seabed (NERA 2018). Given the hydrodynamics in open ocean areas, the area of decreased water quality is expected to be localised and temporary, as sediments would settle out of the water column relatively quickly. The seabed in the Operational Area likely consists of a sandy floor within an open ocean area thus impacts in relation to suspended sediments from benthic disturbance would be on a similar localised and temporary scale, or less, as identified by NERA (2018).

The extent of the impact is predicted to be 0.0025 km^2 per well and up to 0.025 km^2 for the Program activities across the Operational Area. The consequence is assessed as **Minor (1)** and is of an acceptable level based on:

- The area of impact is predicted to be small (0.0025 km^2 per well location) compared to the extent of the distribution of the benthic habitats and associated benthic marine fauna found within the Operational Area.
- The PMST Report did not identify any threatened benthic species or ecological communities, critical habitats or BIAs relevant to the benthic environment within the Operational Area.
- Impacts are localised, with the impacted area of seabed predicted to return to pre-impacted state with no long-term effects to habitat, population characteristics or productivity.
- Given the hydrodynamics in open ocean areas, disturbed soft sediments would settle out of the water column relatively quickly with a localised and temporary decrease in water quality.
- Studies on benthic habitat and assemblages within the Operational Area did not identify the area as unique, with similar benthic habitats found elsewhere in the region.
- Well locations will have been selected based on seabed surveys (Beach 2023), allowing for the consideration of seabed habitat type to avoid areas of high relief outcrops and reefs.

- Seabed disturbance associated with Program activities is not predicted to impact marine ecosystem integrity or functioning.

7.6.5.2 Socio-economic Environment

Seabed disturbance has the potential to result in a change to benthic habitat and, subsequently, to associated benthic species. There are two commercially fished marine benthic invertebrate species which are present within the Operational Area which could be indirectly susceptible to seabed disturbance: the giant crab, and the southern rock lobster (Section 6.5.11).

As detailed in Section 6.5.5, the Operational Area overlaps UXO Zone 1052 King Island.

The extent of the impact is predicted to be 0.0025 km^2 per well. The consequence is assessed as **Minor (1)** and is of an acceptable level based on:

- Giant crab and southern rock lobster are mobile species and are generally less vulnerable than sessile taxa to sedimentation, as they are able to move to areas with less sediment accumulation or by more efficiently physically removing particles (Fraser et al. 2017).

- The Operational Area intersect 10 of the 197 Victorian southern rock lobster fishery reporting blocks, and 6 of the 47 Victorian giant crab fishery reporting blocks – all of which have recorded vessel activity with the last 10 years. The Operational Area does not overlap the Tasmanian giant crab or southern rock lobster fishery reporting blocks.

- The southern rock lobster fishery has a stock status listed as sustainable for Victoria, Tasmania and South Australia (FRDC 2020). The giant crab fishery has a stock status listed as sustainable for Victoria and South Australia and depleted for Tasmania (FRDC 2020; 2020a). The depleted stock status for the Tasmanian giant crab fishery is based on data obtain from 2013-2014, and there has been insufficient data for the fishery since 2013 to determine if the stock is recovering (FRDC 2020a).

- Due to the spatial area of seabed which may be disturbed within the wider extent of available fishing grounds and the short duration of the activity, impacts to benthic species of commercial importance are predicted to be localised and insignificant at a population level.

- As rock lobster live in rocky reefs (VFA 2023b) it is unlikely that their habitat would be disturbed as rocky reefs are not an appropriate substrate for anchoring or drilling of a well.

- Well locations have previously been selected based on previous seabed surveys (separate EP (Beach 2023) allowing for the consideration of seabed habitat type to avoid areas of high relief outcrops and reefs.

- The area of impact is predicted to be small compared to the extent of the available and utilised commercial fishing area for the Victorian giant crab and southern rock lobster fisheries.

- The Operational Area overlaps UXO Zone 1052 King Island which is within the 'slight potential' category', meaning there is confirmed history of military activities that may have resulted in numerous residual hazardous munitions, components, or constituents, but where confirmed UXO affected areas cannot be defined (DoD 2022). Beach undertook site surveys ahead of the Otway Drilling Campaign in 2021/2022, with no UXO identified.

7.6.5.3 Cultural Values and Sensitivities

First Nations people, specifically Eastern Maar, highlight that although the edge of the continental shelf is under sea, it was occupied for thousands of years and rising sea levels have not washed away the history, physical evidence, or connection to that part of Sea Country (Section 6.6.3.6). At present, oil and gas infrastructure exists across the Otway Basin and memories and songlines relating to the historical occupation of the present-day seabed are still acknowledged and recognised (Biosis 2023).

Management of intangible cultural heritage can include reducing impacts and risks to environmental features that are associated with intangible cultural heritage (Australia ICOMOS Burra Charter 2013). As per the draft Guidelines for Working in the Near and Offshore Environment to Protect Underwater Cultural Heritage (DCCEEW 2023b) Beach has consulted with First Nations groups and relevant underwater culture heritage researchers and organisations to understand what data could be obtained from seabed survey, as part of a separate EP (Beach 2023), that will be undertaken prior to the drilling of wells to identify First Nations submerged cultural heritage and submerged cultural landscapes. Data from these seabed surveys will be provided to an appropriately qualified underwater archaeologist to identify submerged cultural heritage.

7.6.6 Demonstration that Impacts will be ALARP

ALARP decision context and justification	ALARP Decision Context: Type A Impacts from benthic disturbance are well understood and there is nothing new or unusual. Good practice is defined, and uncertainty is minimal. There are no conflicts with company values, no partner interests and no significant media interests. Though objections or claims where raised by stakeholders in relation to seabed disturbance they have been managed by additional controls. As the impact consequence is rated as Minor (1) applying good industry practice is sufficient to manage the impact to ALARP.	
Adopted Control Measures	**Comparison to Relevant OPP Control Measures or Equivalents**	**Description**
CM03: Consultation for Implementation of EP	CM03 is equivalent to OPP-CM04 Stakeholder consultation. Both controls relate to Beach undertaking consultation for the implementation of the Project which includes the Program activities. CM03 is also equivalent to OPP-CM02 Notifications. Both controls refer to the notification of the Australian Hydrographic Office (AHO) to facilitate the issuing of Notice to Mariners and maintain nautical charts.	As per Sections 4 and 8.5.1 Beach will undertake consultation for the implementation of the EP which will include, at a minimum: Consultation with commercial fishing associations (and individual commercial fishers where identified) regarding well locations, the ongoing communication of Beach activities to their members, and applying CM04: Beach Fair Ocean Access Procedure.
CM06: MODU Mooring Plan	CM06 is equivalent to OPP-CM09 MODU and vessel anchoring plan. Both controls refer to the use of	Pre-laid anchors will have a surface buoy with navigation lighting and the position of the buoys will be included in the notification to AHS to be included in the AUSCOAST Warnings.

	an anchoring plan to identify suitable anchor placements.	Planned retrieval of all mooring equipment, including transponders, from the sea floor as soon as reasonably practicable within 3 months following the completion of Program activities. Final selection of MODU and location of mooring equipment will avoid exclusion areas determined from seabed survey data evaluation reports (CM05) based on the potential presence of the following: Seabed habitat type to avoid areas of high relief outcrops and reefs that are likely to be associated with site-attached fish. Shipwrecks and other maritime archaeological heritage. Submerged cultural heritage. Location of unexploded ordnance.
CM05: Seabed Survey	CM05 is equivalent to OPP-CM10 Seabed assessments. These controls both detail the use of seabed survey data to inform the location of mooring equipment and specialist evaluations.	A seabed survey was undertaken at the well locations relevant for the Program activities. Results of this survey will be used to determine the location of mooring equipment: Seabed habitat type to avoid areas of high relief outcrops and reefs that are likely to be associated with site-attached fish. Shipwrecks and other maritime archaeological heritage. Location of unexploded ordnance. Seabed survey data will be provided to the following appropriately qualified specialists to identify sensitive benthic receptors: • Appropriately qualified specialist to identify seabed habitat types including areas of high relief outcrops and reefs that are likely to be associated with site-attached fish. • Underwater archaeologist to identify shipwrecks and other maritime archaeological heritage. • Geophysical data analyst to identify location of any unexploded ordnance. • Underwater archaeologist to identify submerged cultural heritage and landscapes. The Underwater *Cultural Heritage Act (2018)* requires that any new suspected underwater cultural heritage sites identified through the archaeological review of the seabed surveys will be reported to the Australasian Underwater Cultural Heritage Database (AUCHD) within 21 days of the discovery.

Additional Controls Assessed

Control	**Cost/Benefit Analysis**	**Control Implemented**
No anchoring, i.e. use of MODU with Dynamic Positioning (DP) systems only (i.e. no anchors).	No anchoring of MODU and support vessels within Operational Areas eliminates seabed disturbance from anchor and chain drag/ placement. Anchoring is required to position the MODU. Evaluation of trade-offs indicates use of DP alone for maintaining station is feasible, however, would lead to disproportionately higher continuous noise impacts to sensitive receptors.	No

Use less or smaller anchors to reduce seabed disturbance	Minimises contact with seabed and resultant disturbance. The number and size of anchors used will be determined by the MODU contractor, metocean conditions and safety risks as evaluated in the mooring plan. Reducing the recommended number of anchors represents an unacceptable HSE trade-off that is grossly disproportionate to the benefit gained.	No

7.6.7 Demonstration that Impacts will be of an Acceptable Level

Consequence rating	Minor (1)
Likelihood of occurrence	NA (Impact)
Residual risk	NA (Impact)
Acceptability assessment Demonstration of acceptability for impacts and risks associated with seabed disturbance provided in Section 6.2.5 of the OPP (Otway Offshore Gas Victoria Project) is considered valid and appropriate for the impact and risk assessment of this aspect for the Program activities. This is supported by the acceptability assessment for this aspect against the evaluation criteria in the following rows. The potential impacts seabed disturbance during Program activities meets the defined acceptable levels in the OPP by ensuring the considerations in Section 2.8 are met such that: OPP EPOs relevant to seabed disturbance are implemented through equivalent EP EPOs OPP control measures relevant to seabed disturbance are implemented through equivalent EP control measures Based on the implementation of relevant and equivalent EPOs and control measures the consequence rating, likelihood of occurrence and residual risk are the same levels as defined in the OPP No changes to internal or external context as defined in the OPP including no new comments (objections and claims) raised against this aspect.	
To meet the principles of ESD	Seabed disturbance was assessed as having a Minor (1) consequence which is not considered as having the potential to result in serious or irreversible environmental damage. There is high confidence in the predicted level of impact as Beach has significant experience operating in the Otway Basin based on their existing offshore developments and associated activities including the Beach Otway Drilling Campaign in 2021/2022.
Internal context	The proposed management of the impact is aligned with the Beach Environment Policy. Activities will be undertaken in accordance with the Implementation Strategy (Section 8).
External context	There have been no stakeholder objections or claims regarding seabed disturbance.
Other requirements	Legislative requirement: Section 572 of the OPGGS Act details the requirements for removal of property will be met for the P&A activities.
Monitoring and reporting	A seabed survey was undertaken prior to the commencement drilling wells relevant for the Program activities. In accordance with CM05, results of this survey will be used to determine the location of mooring equipment.
Acceptability outcome	**Acceptable**
Environmental Performance	Environmental Performance Outcomes (EPOs) represent the measurable levels of environmental performance Beach is seeking to achieve to ensure impacts are of an acceptable level. EPOs relevant to the effective

	management of impacts associated with seabed disturbance from the Program activities are: • EPO6: No substantial or unrecoverable change in seabed quality which may adversely impact on biodiversity, ecological integrity, social amenity, cultural values or human health. • EPO7: No impact to submerged cultural heritage. Section 7.15 sets out the EPS for the control measures identified above, and the measurement criteria to evaluate the achievement of EPOs and EPS. These EPOs are considered equivalent to relevant OPP EPOs as justified in Table 2-2.

7.7 Planned Marine Discharges – MODU and Vessels

7.7.1 Source of Aspect

While undertaking the Program activities the MODU and vessels will discharge the following to the marine environment:

- Brine, a by-product of the desalinisation process whereby dissolved salts and minerals are removed from seawater to produce purified freshwater.
- Putrescible waste, being organic waste materials that are prone to decomposition and decay.
- Cooling water, used to remove heat from equipment or processes to preventing overheating and maintain optimal operating conditions.
- Bilge water, a combination of various liquids, such as seawater, rainwater and water from various onboard sources including leaks, condensation, and wastewater.
- Grey water, wastewater generated from sources such as sinks, showers, bathtubs, and washing machines.
- Sewage from toilets.

Quantities of planned MODU and vessel discharges are calculated based on the number of POB and are provided in Table 7-12.

Table 7-12: Estimated MODU and vessel discharges

Discharge Type	**MODU** **140 POB (approx.)**	**Support vessel** **15 POB (approx.)**
Putrescible waste	280 kg / day (1-2 kg pp/day)	30 kg / day (1-2 kg pp/day)
Sewage & Grey water	63 m^3 / day (0.45 m^3 pp/day)	7 m^3 / day (0.45 m^3 pp/day)
Cooling Water	4,800 m^3/d combined (MODU + single vessel)	
RO Brine	170 m^3/day combined (MODU + single vessel)	

7.7.2 Extent and Duration of Aspect

Vessel and MODU Operations - Drilling	
Extent	Operational Area Based on the furthest distance of impact.
Duration	150 days for the full Program activities (refer to Section 3.2) Operational marine discharges will be generated by the MODU and vessels for the duration of the program activities.

7.7.3 Predicted Environmental Impacts

MODU and vessel discharges have the potential to result in an impact to receptors in the marine environment from changes in water quality such as increased temperature, salinity, nutrients and the addition of chemicals and hydrocarbons.

As a result of a change in water quality, further impacts may include:

- Injury/mortality to fauna through toxicity.
- Behavioural changes if fauna habituate to putrescible waste as a food source.
- Changes to the functions, interests, or activities of other users.
- Changes to changes to aesthetic, and conservation values.

7.7.4 EMBA

Predicted impacts from MODU and vessel marine discharges will be limited to the Operational Area.

Receptors potentially affected include:

- Water quality
- Ecological receptors, including plankton, fish, turtles, seabirds, and marine mammals.
- Cultural values and sensitivities.

7.7.5 Predicted Level of Impact

7.7.5.1 Water Quality

MODU and vessel discharges to the marine environment have the potential to alter water quality within the Operational Area. Impacts to water quality will occur from:

- Intermittently elevated nutrient levels from sewage, putrescible waste, and grey water discharges, limited to 500 m from the MODU and vessels based on discharges from a conservative 400 POB fixed facility (NERA 2017).
- Elevated water temperature from cooling water discharges, predicted to be less than 11°C above ambient within 100 m (horizontally) of the discharge point, and 10 m vertically (Woodside 2014).
- Elevated salinity levels and chemical additives from brine discharges, modelled by the US EPA as diluted 40-fold within 4 m with no ocean current (Woodside 2014).
- Intermittently elevated hydrocarbon levels within 100 m of bilge water discharge (Shell 2009), from engine oil, lubricants, fuel residues and other petroleum-based substances that may have leaked or spilled into the bilge.

The extent of the impact is predicted to be 500 m from the well. The consequence is assessed as **Minor (1)** and is of an acceptable level based on:

- Discharges will be of low toxicity with controls such as treatment and chemical assessment in place.
- Discharges will be intermittent and of a low volume and as the discharges are discharged into an open oceanic environment, they are predicted to mix rapidly with the surrounding waters returning to a pre-impacted state without any long-term impacts to water quality.
- Cumulative impacts from planned MODU and vessel discharges may occur for short periods when support vessels are within 500 m of the MODU, i.e. during resupply activities. The small quantities involved, and intermittent nature of the discharges are not predicted to increase the impact extent beyond 500 m based on discharges from a conservative 400 POB fixed facility (NERA 2017).

7.7.5.2 Ecological Receptors

Changes to water quality as a result of MODU and vessel discharges could result in injury / mortality or a change in behaviour of plankton, fish, turtles, seabirds, and marine mammals within 500 m of the MODU and vessels.

The extent of the impact is predicted to be 500 m from the well. The consequence is assessed as **Minor (1)** and is of an acceptable level based on:

- Early life stages of fish (embryos, larvae) and plankton would be most susceptible to toxic exposure from chemicals in discharges, as they are less mobile and therefore can become exposed at the discharge point. However, negligible effects are expected given previous studies on wastewater discharges which show no elevation in levels above background concentrations in proximity to the discharge point (Woodside 2008; 2014; Shell 2009). Therefore, considering the naturally high mortality of plankton and the rapid replacement of the species (Richardson et al. 2017) any impacts from short term exposure to low toxicity discharges are not expected have lethal effects to plankton that are ecologically significant or result in impacts along the food-chain, for example to foraging marine species.
- White shark habitat is known to occur within the Operational Area (Appendix G). Marine discharges from the MODU or vessels are not identified as a threat in the Recovery Plan for the White Shark (Carcharodon carcharias) (DSEWPaC 2013b). Sharks will be transient through the area thus impacts are not predicted due to the low toxicity of discharges and rapid dilution as a result of oceanic conditions.
- No BIAs or protected habitat were identified for fish species within the Operational Area. Although a variety of fish species, including commercial species, maybe be present in the area, impacts are not predicted due to the low toxicity of discharges and rapid dilution as a result of oceanic conditions. In addition, the sporadic discharge of macerated food scraps over short durations are not predicted to result in habituation to this food source.
- No BIAs or critical habitat were identified for marine turtles within the Operational Area although some species may occur. Chemical and terrestrial discharge are identified as a threat in the Recovery Plan for Marine Turtles in Australia (CoA 2017). However, due to the low toxicity of planned discharges and their rapid dilution as a result of oceanic conditions, along with the transient nature of these species within the area, impacts are not predicted to occur.

- The Operational Area overlaps foraging BIAs for albatross, petrel, and shearwater species. As impacts to plankton and fish species are not predicted due to the low toxicity of planned discharges and their rapid dilution as a result of oceanic conditions, impacts to foraging seabirds are not predicted. In addition, the sporadic discharge of macerated food scraps over short durations are not predicted to result in habituation to this food source.

- The Operational Area is within the pygmy blue whale foraging (annual high use area) BIA. Marine discharges from the MODU or vessels are not identified as a threat to the recovery of pygmy blue whales within the Conservation Management Plan for the Blue Whale (DoE 2015c). Marine pollution by acute and chronic chemical discharge is identified as a threat that has minor consequences to the population by only affecting individuals (DoE 2015c). Due to the low toxicity of planned discharges and their rapid dilution as a result of oceanic conditions, impacts are not predicted to occur to foraging blue whales or krill that they forage on.

- The Operational Area is within the southern right whale migration BIA. Marine discharges from the MODU or vessels are not identified as a threat to the southern right whale recovery within the National Recovery Plan for the Southern Right Whale (DCCEEW 2024k). Marine pollution by acute and chronic chemical discharge is identified as a threat that has minor consequences to both east and west populations by only affecting individuals (DCCEEW 2024k). Chemical pollution from sewage and other discharges is identified as a threat to the species, particularly within coastal BIAs or HCTS where regular exposure may occur. However, due to the low toxicity of planned discharges and their rapid dilution as a result of oceanic conditions, along with the transient nature of these species within the area, impacts are not predicted to occur.

7.7.5.3 Cultural Values and Sensitivities

From Section 6.6.3, the following cultural values and sensitivities have been identified as potentially affected by planned marine discharges from the MODU and vessels:

- Eels
- Fish
- Dolphins
- Whales
- Seals

The marine fauna listed above are connected to places associated with songlines or connected to individuals through ceremony (Section 6.6.3.5). The connection of marine fauna to places or individuals are considered cultural intangible values.

MODU and vessel discharges have the potential to impact marine fauna that have songlines, or spiritual connection to First Nations people. It is considered that impacts to species at a population level may prevent First Nations people’s obligations to maintain spiritual connections and care for culturally significant species and their habitat. If First Nations people’s obligations have not been met it may reinforce a sense of powerlessness to members of First Nations groups responsible for these obligations (Holcombe 2022).

The MODU and vessel discharges will be intermittent, low toxicity and of a low volume with the discharges predicted to mix rapidly with the surrounding waters returning to a pre-impacted state without any long-term impacts to water quality (Section 7.7.5.1). Section 7.7.5.2 details the predicted environmental impacts to these receptors and concluded MODU and vessel discharges will not result in impacts at a population level. Thus, for MODU and vessel discharges the consequence is assessed as **Minor (1)** to water quality and ecological receptors and therefore is assessed as **Minor (1)** for associated cultural values and sensitivities.

7.7.6 Demonstration that Impacts will be ALARP

ALARP decision context and justification	**ALARP Decision Context: Type A** Impacts from vessel and MODU marine discharges are well understood and there is nothing new or unusual. Good practice is defined, and uncertainty is minimal. There are no conflicts with company values, no partner interests, and no significant media interests. No objections or claims where raised by stakeholders in relation to vessel and MODU marine discharges. As the impact consequence is rated as Minor (1) applying good industry practice (as defined in Section 2.7.2.1) is sufficient to manage the impact to ALARP	
Adopted Control Measures	**Comparison to Relevant OPP Control Measures or Equivalents**	**Source of good industry practice control measures**
CM01: Marine Assurance Process	CM01 is equivalent to OPP-CM35 Marine Orders. Both controls refer to the application of relevant Marine Orders. Beach Marine Assurance System ensures that the MODU and vessels meet relevant maritime laws and associated Marine Orders.	*The Protection of the Sea (Prevention of Pollution from Ships) Act 1983* regulates Australian vessels with respect to ship-related operational activities and invokes certain requirements of the MARPOL Convention relating to discharge of noxious liquid substances including oil, sewage, putrescible waste, garbage, air pollution etc. These requirements are enacted through Marine Orders. Beach's Marine Assurance System ensures that the MODU and vessels meet relevant maritime laws and includes pre-commencement MODU and vessel inspections of class certification requirements under the *Navigation Act 2012* and associated Marine Orders, including but not limited to: Marine Order 91 Marine Pollution Prevention – Oil. Marine Order 95 Marine Pollution Prevention – Garbage. Marine Order 96: Marine Pollution Prevention – Sewage.
	CM01 is equivalent to OPP-CM26 Preventative Maintenance System. Both controls detail inspection and maintenance of combustion equipment to ensure efficient operation.	MODU and vessels will have a Preventative Maintenance System that provides a status on the maintenance of equipment and detailed manufacturer's specification on maintenance procedures for:

		Equipment detail as a control in this EP will be inspected to ensure effective operation. Power generation and propulsion systems on the MODU and vessels will be inspected to ensure efficient operation.
CM12: Chemical Management Procedure	CM12 is equivalent to OPP-CM29 Chemical selection process. Both controls detail processes to ensure chemicals used are environmentally acceptable.	All chemicals that will or could be discharged to the marine environment must be assessed prior to use to ensure the lowest toxicity, most biodegradable and least accumulative chemicals are selected which meet the technical requirements of the application as per the Beach Chemical Management Procedure described in Section 8.1.18.

7.7.7 Demonstration that Impacts will be of an Acceptable Level

Consequence rating	Minor (1)
Likelihood of occurrence	NA (Impact)
Residual risk	NA (Impact)
Acceptability assessment Demonstration of acceptability for impacts and risks associated with planned discharge – routine operational wastes from vessels provided in Section 6.10.5 of the OPP (Otway Offshore Gas Victoria Project) is considered valid and appropriate for the impact and risk assessment of this aspect for the Program activities. This is supported by the acceptability assessment for this aspect against the evaluation criteria in the following rows. The potential impacts of planned marine discharges from MODU and vessels during Program activities meet the defined acceptable levels in the OPP by ensuring the considerations in Section 2.8 are met such that: OPP EPOs relevant to marine discharges are implemented through equivalent EP EPOs OPP control measures relevant to marine discharges are implemented through equivalent EP control measures Based on the implementation of relevant and equivalent EPOs and control measures the consequence rating, likelihood of occurrence and residual risk are the same levels as defined in the OPP No changes to internal or external context as defined in the OPP including no new comments (objections and claims) raised against this aspect.	
To meet the principles of ESD	Planned marine discharges were assessed as having a Minor (1) consequence which is not considered as having the potential to result in serious or irreversible environmental damage. There is high confidence in the predicted level of impact as Beach has significant experience operating in the Otway Basin based on their existing offshore developments and associated activities including the Beach Otway Drilling Campaign in 2021/2022.
Internal context	The proposed management of the impact is aligned with the Beach Environment Policy. Activities will be undertaken in accordance with the Implementation Strategy (Section 8).
External context	There have been no stakeholder objections or claims regarding planned marine discharges.

Other requirements	Planned marine discharge will be managed in accordance with legislative requirements. As per the impact assessment vessel and MODU marine discharges will not: Impact on the recovery of marine turtles as per the Recovery Plan for Marine Turtles in Australia (CoA 2017). Impact the recovery of the white shark as per the Recovery Plan for the White Shark (Carcharodon carcharias) (DSEWPaC 2013b). Impact the recovery of the Australian sea lion as per the Recovery Plan for the Australian Sea Lion (DSEWPaC 2013d). Impact the long-term survival and recovery of albatross and giant petrel populations breeding and foraging as per the National Recovery Plan for Albatrosses and Petrels (CoA 2022). Impact the conservation of listed seabirds in Australia and beyond as per the Wildlife Conservation Plan for Seabirds (CoA 2020a). Impact the recovery of the blue whale as per the Conservation Management Plan for the Blue Whale (CoA 2015a). Impact the recovery of the southern right whale as per the National Recovery Plan for the Southern Right Whale (DCCEEW 2024k). Impact sei or fin whales, covered by Conservation Advice for Fin Whales (TSSC 2015e) and Conservation Advice for Sei Whales (TSSC 2015f).
Monitoring and reporting	Monitoring and reporting of vessel and MODU discharges will be undertaken as detailed in Section 8.3.7.
Acceptability outcome	**Acceptable**
Environmental Performance	Environmental Performance Outcomes (EPOs) represent the measurable levels of environmental performance Beach is seeking to achieve to ensure impacts are of an acceptable level. EPOs relevant to the effective management of impacts associated with planned marine discharges – MODU and vessels from the program activities are: • EPO8: No impact to water quality at a distance >500 m from the vessel or MODU from planned marine discharges. Section 7.15 sets out the EPS for the control measures identified above, and the measurement criteria to evaluate the achievement of EPOs and EPS. These EPOs are considered equivalent to relevant OPP EPOs as justified in Table 2-2.

7.8 Planned Marine Discharges – Completions, Interventions and P&A

7.8.1 Source of Aspect

Completions, intervention, and P&A Program activities will result in planned discharges to the marine environment (herein termed planned marine discharges). Table 7-13 details the indicative planned marine discharges per well.

In addition, barite, bentonite, and cement remaining at the end of the rig consortium campaign will be managed by the last titleholder using the MODU (which could potentially be Beach) (for further details refer to Section 7.8.9).

Table 7-13: Planned marine discharges from completions, intervention, and P&A activities

Activity	Discharge pathway	Seabed	Surface
BOP function testing	BOP control system full function test. Further details in Section 3.5	Potable water with 1-3% water-soluble control fluid 2.2 m^3	-
Well Completion and Intervention	Removal of downhole (cement) barriers (at Artisan 1, Hercules 1 and / or Doris 1) via drilling with a brine-based fluid. Further details in Section 3.6.8.1 (Item 1).	-	Well suspension brine 240 m^3 Drilled cement per plug 25 m^3
	Inflow testing Further details in Section 3.6.8.1 (Item 2).	-	Water underbalance fluid 96 m^3
	Well bore clean up. Further details in Section 3.6.8.1 (Item 3 and 4).	-	Viscosifiers and surfactants up to 240 m^3
	Completion installation Further details in Section 3.6.8.1 (Item 5 and 6).	-	Excess completion brine up to 800 m^3 Excess packer fluid 36 m^3 Excess completion hydrate inhibiting fluid 24 m^3
Contingent P&A (Artisan 1)	Clean and prepare wellhead Further details in Section 3.9.4	Calci-wash 10 m^3	-
	Displace well with clean overbalance fluid Further details in Section 3.9.5	-	Insitu - inhibited water and brine 150 m^3
	Drill out cement plug(s)	-	WBDF 250 m^3 Drilled cement per plug 25 m^3
	Set and verify permanent cement barriers Further details in Section 3.9.7	-	Cement slurry 70 m^3
	Contingent milling operations Further details in Section 3.9.9.1	-	Milling fluids 240 m^3 Swarf 2 m^3 Drilled cement 3 m^3

Activity	Discharge pathway	Seabed	Surface
BOP function testing	BOP control system full function test. Further details in Section 3.5	Potable water with 1-3% water-soluble control fluid 2.2 m^3	-
			Formation rock 3.5 m^3

7.8.2 Extent and Duration of Aspect

Planned Marine Discharges	
Extent	500 m Based on the furthest distance of impact.
Duration	Discharges will occur intermittently during well completions, interventions and P&A.

7.8.3 Predicted Environmental Impacts

Planned marine discharges have the potential to result in an impact to receptors in the marine environment from:

- Changes in water quality.
- Changes in sediment quality.
- Changes in benthic habitat composition.

As a result of changes in water and sediment quality and benthic habitat composition, further impacts may include:

- Injury /mortality to fauna through toxicity or physical smothering.

7.8.4 EMBA

Predicted impacts from planned marine discharges will be limited to the Operational Areas. Receptors potentially affected are:

- Water quality
- Sediment quality
- Benthic habitat
- Plankton, fish, turtles, and marine mammals.

Benthic habitats and ecological receptors are values of the following within the Operational Area:

- Conservation values and sensitivities
- Socio economic receptors
- Cultural values and sensitivities

7.8.5 Predicted Level of Impact

7.8.5.1 Water Quality

Planned marine discharges to the marine environment have the potential to alter water quality within the Operational Area. Impacts to water quality will occur from:

- Intermittently elevated turbidity levels from drilled cement, cement slurry and calci-wash (removed scale) discharges (Table 7-13). As a conservative approach, predictions of change in water quality extent from modelling of surface cement discharges of approximately 78 m^3 over one hour, conducted for BP (2013) is applied for these discharges. This modelling study predicted suspended solid concentration between 0.005-0.05 mg/m^3 within the extent of the plume (approximately 150 m horizontal and 10 m vertical) over 2 hours (BP 2013). The volume modelled is greater than the discharge volumes predicted for the drilled cement, cement slurry and removed scale discharges (Table 7-13), therefore it is predicted that the concentration of suspended sediments would be lower.

- Elevated salinity levels and chemical additives from well suspension brine, wellbore clean up (completion brine), water underbalance fluid, viscosifiers, surfactants, packer fluid, completion hydrate inhibiting fluid, inhibited water and brine, WBDF, and milling fluid discharges (Table 7-13). These discharges are herein termed drilling fluid discharges. In well-mixed oceans, comparable to the Operational Area, it is expected that the drilling fluid plume is diluted by more than 100-fold within 10 m of the discharge (Neff 2005), with drilling fluid concentration falling to below acute toxicity threshold of 10,000 ppm within 100 m of the discharge source (Neff 2010).

- Intermittently elevated hydrocarbon levels from wellbore clean up discharges (containing <10 m^3 formation water) and BOP hydraulic fluids discharges (Table 7-13). Wellbore clean up discharges will be tested and treated prior to discharge if the OIW content is below 30 ppm. Diluted hydraulic control fluids in potable water are water-based, low toxicity and readily biodegradable. The extent within which the wellbore discharges and BOP hydraulic fluids would disperse is estimated to be within 100 m of the well location (Neff 2010).

The extent of change in water quality from planned marine discharges is expected to be 150 m from the well. The consequence is assessed as **Minor (1)** and is of an acceptable level based on:

- Impacts are expected to be limited to localised, and short-term changes in water quality. Discharges will be intermittent and of a low volume. As a result, planned marine discharges are expected to disperse quickly in the surrounding waters, allowing a rapid return to pre-impact conditions.

- Turbidity impacts are predicted to last less than 4 hours and be restricted to with approximately 150 m horizontal and 10 m vertical. Cement and scale particles are expected to disperse under the action of metocean conditions and eventually settle out of the water column.

- Elevated salinity, chemical additives and hydrocarbon levels are also expected to be restricted to within 100 m of the well and quickly dispersed into surrounding waters.

- All chemicals used in the drilling fluids will be rated Gold/Silver/D or E through Oslo and Paris Conventions (OSPAR) and Offshore Chemical Notification Scheme (OCNS) or have a complete risk assessment.

- Cement, bentonite and barite are listed as a substance that is considered to pose little or no risk to the environment (OSPAR 2021).
- Wellbore clean up discharges will be tested and treated prior to discharge if the OIW content is below 30 ppm.
- Diluted hydraulic control fluids in potable water are water-based, low toxicity and readily biodegradable.
- WBDF have been shown to have little or no toxicity to marine organisms due to the inert / PLONOR (Poses Little or No Risk to the Environment) nature of its components (Jones et al. 1996, Neff 2005). One insoluble component of water-based mud discharges is barite (or Barium sulphate) but is of low bioavailability and toxicity.
- Barite used during Program activities will have very low concentrations of mercury (Hg) and cadmium (Cd) (less than 1 mg/kg and 3 mg/kg respectively) as recommended by the International Finance Corporation (IFC) EHS Guidelines Offshore Oil and Gas Development – Drilling Fluids and Drilled Cuttings Guidance (IFC 2015).

7.8.5.2 Sediment Quality

Planned marine discharges to the marine environment have the potential to alter sediment quality within the Operational Area. Impacts to sediment quality will occur from deposition of scale, swarf, and drilled materials (cement, WBDF-coated cement and formation rock) on the seabed (Table 7-13).

The deposition of these materials on the seabed are expected to result in negligible impacts to sediment quality. Impacts to sediment quality is expected to be highly localised and negligible based on:

- Steel swarf discharged is expected to corrode into insoluble, non-toxic metal oxides that will settle and integrate into the seabed sediment. The presence of insoluble metals oxides will result in negligible impacts to sediment quality.
- Removed carbonate scale discharged as part of wellhead cleaning is expected to consist of calcium carbonate which is non-toxic and expected to integrate into the seabed sediment. Carbonate scale discharges will be of very small quantities and the small amount of scale deposited on the seabed will result in negligible impacts to sediment quality.
- Drilled materials (cement, WBDF-coated cement and formation rock) is expected to pose negligible impacts to sediment quality given these materials are non-toxic. WBDF coated cement is expected to be inert / PLONOR (Poses Little or No Risk to the Environment) given the nature of WBDF (Jones et al. 1996, Neff 2005).

Given the very small quantities of scale, swarf and drilled cement, drilled cement coated in WBDF and formation rock to be discharged, negligible impacts to sediment will occur. Given the inherent low toxicity of these materials and small quantities discharges, the consequence is assessed as **Minor (1)** and is of an acceptable level.

7.8.5.3 Ecological Receptors

Minor (1) changes in water quality from planned marine discharges are expected to result in potential toxic impacts to ecological receptors such as benthic habitats and communities and sensitive marine fauna such as plankton. Change in water quality is anticipated to be localised within 150 m of the well (Section 7.8.5.1). **Minor (1)** changes in sediment quality is also expected to result in the deposition of scale, swarf, and drilled materials (cement, WBDF-coated cement and formation rock) of benthic habitats and communities.

The extent of these impacts are predicted to be within 150 m from the well. The consequence is assessed as **Minor (1)** and is of an acceptable level based on:

- Benthic habitats and communities within this range are expected to be limited to carbonate sands, low relief exposed limestone, sponge beds and unconsolidated sediment supporting low density, patchy assemblages of epifauna (branching bryozoans, gorgonian cnidarians and sponges) (IMAS 2017). These benthic habitats and communities are highly represented within the region (see Section 6.4.1 for further details). Planned marine discharges are expected disperse quickly in the surrounding waters, allowing a rapid return to pre-impact conditions. Exposure of benthic habitats and communities from temporary plumes (change in water quality) is expected to result in highly localised and negligible impacts to epifauna highly represented within the region.

- Impacts from planned marine discharges on susceptible marine fauna are expected to be negligible and highly localised, primarily affecting plankton present within the discharge plumes (change in water quality). While early life stages of fish (embryos, larvae) and plankton are most vulnerable to toxic exposure due to their limited mobility, modelling of the cement discharge plume indicates rapid dispersion of particulates (BP 2013). Concentrations are not expected to reach levels known to impact fish larvae (500 mg/l within 2 hours and 100 mg/l after prolonged exposure) and marine invertebrate larvae (100 mg/l) (Jenkins and McKinnon 2006). Natural fluctuations in phytoplankton, driven by nutrient availability and oceanographic processes, are likely to have a far greater influence on plankton communities than planned marine discharge plumes (Fathom Pacific 2023). The rapid reproductive rates and potential for migration in plankton, combined with the proximity of nutrient-rich upwelling events, will further facilitate recovery. Exposure of plankton from temporary plumes (change in water quality) is expected to result in highly localised and negligible impacts.

- Change in sediment quality is expected to result in localised smothering of benthic habitats and communities around the wells. Smothering and burial of epibenthic fauna may occur out to 100 m of the well with recovery of seabed communities within four months to 3 years based on Jones et al. (2012), Terrens et al. (1998) and Neff (2010). No Threatened Ecological Communities or Key Ecological Features have been identified within the Operational Area. Thus, impacts are predicted to be localised and not impact marine ecosystem integrity or functioning.

7.8.5.4 Cultural Values and Sensitivities

Impacts to First Nations values and sensitivities such as intangible spiritual connection or responsibility to whales, dolphins, seals, fish, and eels are not predicted. The presence of planned marine discharge plumes in the water column will be temporary and localised which prevents any potential injury or mortality to marine fauna from long-term exposure to concentrations of chemicals and suspended sediments.

As detailed in Section 6.6, no First Nations underwater cultural heritage has been identified in the Operational Area. However, First Nations people, specifically Eastern Maar, highlight that although the edge of the continental shelf is under sea, it was occupied for thousands of years and rising sea levels have not washed away the history, physical evidence, or connection to that part of Sea Country (Section 6.6.3.6). At present, oil and gas infrastructure exists across the Otway Basin and memories and songlines relating to the historical occupation of the present-day seabed are still acknowledged and recognised (Biosis 2023).

Management of intangible cultural heritage can include reducing impacts and risks to environmental features that are associated with intangible cultural heritage (Australia ICOMOS Burra Charter 2013). As per the draft Guidelines for Working in the Near and Offshore Environment to Protect Underwater Cultural Heritage (DCCEEW 2023b) Beach has consulted with First Nations groups and relevant underwater culture heritage researchers and organisations to understand what data could be obtained from seabed survey, as part of a separate EP (Beach 2023), that will be undertaken prior to the drilling of wells to identify First Nations submerged cultural heritage and submerged cultural landscapes. Data from these seabed surveys will be provided to an appropriately qualified underwater archaeologist to identify submerged cultural heritage.

7.8.6 Demonstration that Impacts will be ALARP

ALARP decision context and justification	**ALARP Decision Context: Type A** Impacts from planned well completions, interventions and P&A discharges are well understood and there is nothing new or unusual. Good practice is defined, and uncertainty is minimal. There are no conflicts with company values, no partner interests, and no significant media interests. No objections or claims where raised by stakeholders in relation to well completions, interventions and P&A discharges. As the impact consequence is rated as **Minor (1)** applying good industry practice (as defined in Section 2.7.2.1) is sufficient to manage the impact to ALARP

Adopted Control Measures	**Comparison to Relevant OPP Control Measures or Equivalents**	**Description**
CM01: Marine Assurance Process	CM01 is equivalent to OPP-CM26 Preventative Maintenance System. Both controls detail inspection and maintenance of combustion equipment to ensure efficient operation.	MODU and vessels will have a Preventative Maintenance System that provides a status on the maintenance of equipment and detailed manufacturer's specification on maintenance procedures for: Equipment detail as a control in this EP will be inspected to ensure effective operation. Power generation and propulsion systems on the MODU and vessels will be inspected to ensure efficient operation.
CM05: Seabed Survey	CM05 is equivalent to OPP-CM10 Seabed assessments. These controls both detail the use of seabed survey data to inform the location of	A seabed survey was undertaken at the well locations relevant for the Program activities. Results of this survey will be used to determine the location of mooring equipment:

	mooring equipment and specialist evaluations.	• Seabed habitat type to avoid areas of high relief outcrops and reefs that are likely to be associated with site-attached fish. • Shipwrecks and other maritime archaeological heritage. • Submerged cultural heritage and submerged cultural landscapes. Location of unexploded ordnance. Seabed survey data will be provided to the following appropriately qualified specialists to identify sensitive benthic receptors: • Appropriately qualified specialist to identify seabed habitat types including areas of high relief outcrops and reefs that are likely to be associated with site-attached fish. • Underwater archaeologist to identify shipwrecks and other maritime archaeological heritage. • Geophysical data analyst to identify location of any unexploded ordnance. • Underwater archaeologist to identify submerged cultural heritage and landscapes. The *Underwater Cultural Heritage Act (2018)* requires that any new suspected underwater cultural heritage sites identified through the archaeological review of the seabed surveys will be reported to the Australasian Underwater Cultural Heritage Database (AUCHD) within 21 days of the discovery.
CM06: MODU Mooring Plan	CM06 is equivalent to OPP-CM09 MODU and vessel anchoring plan. Both controls refer to the use of an anchoring plan to identify suitable anchor placements.	Pre-laid anchors will have a surface buoy with navigation lighting and the position of the buoys will be included in the notification to AHS to be included in the AUSCOAST Warnings. Planned retrieval of all mooring equipment, including transponders, from the sea floor as soon as reasonably practicable within 3 months following the completion of Program activities. Final selection of MODU and location of mooring equipment will avoid exclusion areas determined from seabed survey data evaluation reports (CM05) based on the potential presence of the following: Seabed habitat type to avoid areas of high relief outcrops and reefs that are likely to be associated with site-attached fish. Shipwrecks and other maritime archaeological heritage. Submerged cultural heritage. Location of unexploded ordnance.
CM09: Program Activities	CM09 is equivalent to OPP-CM38 Waste Management Plan. Both controls detail how waste will be managed in accordance with the Beach Waste Management Plan	Only WBDF will be used for Program activities. Solids control equipment consisting of shale shakers and centrifuges will be used to reduce the concentration of WBDF on cuttings prior to discharge, thereby reducing the total volume of drilling fluid discharged to sea.

	to ensure compliant classification, segregation, storage, transport and disposal of waste.	The shale shakers will be fitted with screens that meet American Petroleum Institute (API) standards for particle size cut points. Centrifuges will be used as required to remove additional finer drilled cuttings/solids that are too small for the shale shakers. Barite will have low concentrations of mercury and cadmium (less than 1 mg/kg and 3 mg/kg respectively). Residual WBDF, cement, barite and bentonite will be used for subsequent wells, and provided to the next operator at the end of the rig consortium campaign. There will be no planned bulk discharges. Beach will follow the below process regarding bulk materials: The final titleholder in the rig consortium campaign will minimise remaining dry bulk materials onboard both the MODU and vessels to as low as reasonably practicable, ensuring well integrity and MODU safety are maintained. Beach commits to continuing to explore safe, feasible options that result in overall environmental benefit to manage excess dry bulk material at the end of the Program activities. This includes transferring excess bentonite, barite or cement back to shore. Beach will follow Australian industry practice at the time the bulk needs to be managed, inclusive of any environmental risk assessments required to supplement the decision. Options for excess dry bulk materials management include: Retaining the products on the MODU to be used for subsequent Beach well activity Retaining the products on the MODU to be used by the next titleholder who has the MODU Transferring to another Beach-contracted MODU operating within the region Transferring to another titleholder-contracted MODU operating in the region Returning to shore for onshore storage and/or disposal if a facility is available, appropriately licensed, safe and technically feasible to transfer to at the end of the campaign should Beach be the last titleholder using the MODU. Industry practice will be followed to minimise or avoid the discharge of excess bulk materials to the marine environment in powder form or as a slurry. Beach will adhere to international best practice standards: • Environmental, Health, and Safety Guidelines Offshore Oil and Gas Development (IFC 2015) –

		Drilling Fluids and Drilled Cuttings Guidance Number 53 requires consideration of discharges of drilling fluids including chemical content. • Environmental, Health, and Safety Guidelines Offshore Oil and Gas Development (IFC 2015) – Drilling Fluids and Drilled Cuttings Guidance Number 59 requires that environmental hazards related to residual chemical additives on discharged cuttings are reduced through the drilling fluid selection.
CM12: Chemical Management Procedure	CM12 is equivalent to OPP-CM29 Chemical selection process. Both controls detail processes to ensure chemicals used are environmentally acceptable.	All chemicals that will or could be discharged to the marine environment must be assessed prior to use to ensure the lowest toxicity, most biodegradable and least accumulative chemicals are selected which meet the technical requirements of the application as per the Beach Chemical Management Procedure described in Section 8.1.18. This control addresses adherence to: Environmental, Health, and Safety Guidelines Offshore Oil and Gas Development (IFC 2015) – Drilling Fluids and Drilled Cuttings Guidance Number 59 that requires operators to carefully select drilling fluid additives, considering their concentration, toxicity, bioavailability, and bioaccumulation potential.

7.8.7 Demonstration that Impacts will be of an Acceptable Level

Consequence rating	Minor (1)
Likelihood of occurrence	NA (Impact)
Residual risk	NA (Impact)
Acceptability assessment Demonstration of acceptability for impacts and risks associated with planned discharge – drill cuttings and fluids and planned discharge – cement, provided in Section 6.7.5 and 6.8.5 of the OPP (Otway Offshore Gas Victoria Project), respectively, is considered valid and appropriate for the impact and risk assessment of this aspect for the Program activities. This is supported by the acceptability assessment for this aspect against the evaluation criteria in the following rows. The potential impacts of planned marine discharges from completions, interventions and P&A during Program activities meet the defined acceptable levels in the OPP by ensuring the considerations in Section 2.8 are met such that: OPP EPOs relevant to planned marine discharges are implemented through equivalent EP EPOs OPP control measures relevant to planned marine discharges are implemented through equivalent EP control measures Based on the implementation of relevant and equivalent EPOs and control measures the consequence rating, likelihood of occurrence and residual risk are the same levels as defined in the OPP No changes to internal or external context as defined in the OPP including no new comments (objections and claims) raised against this aspect.	
To meet the principles of ESD	Planned completions, interventions and P&A discharges were assessed as having a Minor (1) consequence which is not considered as having the potential to result in serious or irreversible environmental damage. There is high confidence in the predicted level of impact as Beach has significant experience operating in the Otway Basin based on their

	existing offshore developments and associated activities including the Beach Otway Drilling Campaign in 2021/2022.
Internal context	The proposed management of the impact is aligned with the Beach Environment Policy. Activities will be undertaken in accordance with the Implementation Strategy (Section 8).
External context	There have been no stakeholder objections or claims regarding planned marine discharges.
Other requirements	Completions, interventions and P&A discharges will be managed in accordance with legislative requirements. The Minamata Convention covers all aspects of the life cycle of mercury, controlling and reducing mercury across a range of products, processes, and industries. Australia ratified the Minamata Convention on 7 December 2021. Countries that have ratified the Convention are bound by international law to put controls in place to manage emissions, releases and disposal of mercury and mercury compounds. At present there are no specific guidelines regarding acceptable levels of mercury waste in drilling fluids. The discharge of drill fluids and cuttings to the marine environment is considered to be standard industry practice. For the Program activities barite mercury and cadmium concentrations will be managed in accordance with IFC EHS Guidelines – Offshore Oil and Gas Development (2015) that represent good international industry practice. As per the impact assessment drilling marine discharges will not: Impact on the recovery of marine turtles as per the Recovery Plan for Marine Turtles in Australia (CoA 2017). Impact the recovery of the white shark as per the Recovery Plan for the White Shark (*Carcharodon carcharias*) (DSEWPaC 2013b). Impact the recovery of the Australian sea lion as per the Recovery Plan for the Australian Sea Lion (DSEWPaC 2013d). Impact the long-term survival and recovery of albatross and giant petrel populations breeding and foraging as per the National Recovery Plan for Albatrosses and Petrels 2022 (CoA 2022). Impact the conservation of listed seabirds in Australia and beyond as per the Wildlife Conservation Plan for Seabirds (CoA 2020a). Impact the recovery of the blue whale as per the Conservation Management Plan for the Blue Whale (CoA 2015a). Impact the recovery of the southern right whale as per the National Recovery Plan for the Southern Right Whale (DCCEEW 2024k). Impact sei or fin whales, covered by Conservation Advice for Fin Whales (TSSC 2015f) and Conservation Advice for Sei Whales (TSSC 2015g).
Monitoring and reporting	Monitoring and reporting of drilling discharges will be undertaken as detailed in Section 8.3.7.
Acceptability outcome	**Acceptable**
Environmental Performance	Environmental Performance Outcomes (EPOs) represent the measurable levels of environmental performance Beach is seeking to achieve to ensure impacts are of an acceptable level. EPOs relevant to the effective management of impacts associated with planned marine discharges for Program activities are:

	• EPO6: No substantial or unrecoverable change in seabed quality which may adversely impact on biodiversity, ecological integrity, social amenity, cultural values or human health. • EPO8: No impact to water quality at a distance >500 m from the vessel or MODU from planned marine discharges. Section 7.15 sets out the EPS for the control measures identified above, and the measurement criteria to evaluate the achievement of EPOs and EPS. These EPOs are considered equivalent to relevant OPP EPOs as justified in Table 2-2.

7.9 Solid Waste Management

7.9.1 Source of Aspect

The activity has the potential to generate MODU and vessel waste and waste generated from the contingency P&A activity at Artisan 1. Depending upon the type and classification of the waste, waste streams generated during the activity will either be discharged to the marine environment (such as liquid and putrescible wastes as evaluated as planned marine discharges from MODU and vessels in Section 7.7) or segregated and backloaded to port for disposal to an appropriately licenced waste facility by an appropriately licenced waste handling contractor (solid waste).

MODU and vessel waste streams (liquid and putrescible wastes) will be handled in accordance with respective MODU and vessel Garbage Management Plans in accordance with MARPOL requirements. Further information is included in the implementation strategy under Beach's waste management standard (Section 8.1.18).

Section 7.12 assesses the risk of an unplanned loss of materials or waste during both routine vessel and MODU operations, and during the removal of well infrastructure as part of P&A activities. This section assesses the potential for indirect impacts associated with waste generated from P&A activities. Waste from P&A activities is generated during the planned recovery and removal of subsea wellheads. The waste inventory from P&A activities is primarily steel and is provided in Table 7-14. The contingency P&A activities are related to Artisan 1, a previously suspended exploration well that had never been completed or used for commercial hydrocarbon production. Waste inventory is not expected to include hazardous material which contains naturally occurring radioactive materials (NORMs).

Waste generated from the P&A activity (refer to Table 7-14) will be collected and transported onshore to an appropriately licensed onshore waste and recycling facility to be managed in line with the accepted waste hierarchy. Further information is included in the implementation strategy under Beach's waste management standard (Section 8.1.18).

Table 7-14: Summary of expected/estimated waste inventory generated during contingent P&A activities

Well name	Item name	Weight	Materials	Proposed fate
Artisan 1	Wellhead	7,560 kg	Steel	Recycle where practicable (Scrap Metal)
	Casing	3,510 kg	Steel	Recycle where practicable (Scrap Metal)

7.9.2 Extent and Duration of Aspect

Solid Waste Management	
Extent	N/A – the extent of the aspect is not applicable given solid waste will be segregated on-board project vessels and the MODU. This waste will be managed in line with the accepted waste hierarchy, ensuring the aspect will not directly interact with the marine environment.
Duration	Solid wastes will be generated during P&A activities.

7.9.3 Predicted Environmental Impacts

Solid waste generated during P&A activities can result in indirect impacts such as:

- Increase in logistics-related GHG emissions from sources not owned or operated by Beach, including vessels used to transport solid waste onshore (refer to Section 7.3.5.2).
- Increase in energy use from sources not owned or operated by Beach, including energy use required to recycle solid waste.
- Increase contribution of waste to landfill facilities not owned or operated by Beach, for solid wastes that are deemed not recyclable.

It is important to note that solid waste generated by this activity is not expected to be contaminated by NORMs given Artisan 1 has not been commercially produced.

Predicted impacts from increase in logistics-related GHG emissions from vessels used to transport solid waste have been evaluated in Section 7.3 as part of atmospheric emissions from MODU and vessel fuel use. No further impact evaluation on GHG emissions has been provided in this section.

7.9.4 EMBA

Predicted indirect impacts from solid waste management associated with the activity are based on sources not owned or operated by Beach. Energy use required for recycling solid waste and contribution of waste to landfill will be conducted at an appropriately licensed onshore waste and recycling facility. Energy use and landfill capacity is expected to be managed in accordance with the facility's licence.

No impacts on valued species or habitats within the Operational Area or Planning Area is expected.

7.9.5 Predicted Level of Impact

Solid waste management in accordance with Beach's waste management standard (Section 8.1.18) ensures wastes are eliminated, reduced, recycled and/or reused as far as reasonably practicable or disposed of appropriately. As a result, solid waste generated from the recovered subsea wellhead will be taken onshore to an appropriately licensed waste facility for recycling or disposal in accordance with the waste management hierarchy.

Solid waste management will result in indirect impacts. Indirect impacts include increase in energy use for recycling, and increase contribution of waste to landfill in terms of capacity.

Solid waste generated during P&A activity includes recovered steel (inventory detailed in Table 7-14) which is expected to be recycled. The recycling process for recovered steel involves energy consumption. Energy consumption for steel recycling is expected to be offset by energy savings from reduced primary steel production. Given energy use during recycling is offset by the decrease in energy consumption for primary steel production, the consequence of this indirect impact is assessed as **Minor (1)** and is of an acceptable level.

Solid waste that cannot be recycled will be disposed of in accordance with relevant waste management arrangements. The disposal of solid waste is expected to increase the contribution of waste to landfill at an appropriately licensed waste facility. In accordance with Beach's waste management standard

(Section 8.1.18), disposal of solid waste to landfill will be reduced to as far as reasonably practicable, such that the recovered steel is expected to be recycled. Given the volume of solid waste contributing to landfill capacity will be reduced to as far as reasonably practicable, the consequence of this indirect impact is assessed as **Minor (1)** and is of an acceptable level.

7.9.6 Demonstration that Impacts will be ALARP

ALARP decision context and justification	ALARP Decision Context: Type A Indirect impacts from solid waste management are well understood and there is nothing new or unusual. Good practice is defined, and uncertainty is minimal. There are no conflicts with company values, no partner interests, and no significant media interests. As the indirect impact consequence is rated as Minor (1) applying good industry practice (as defined in Section 2.7.2.1) is sufficient to manage the impact to ALARP.	
Adopted Control Measures	**Comparison to Relevant OPP Control Measures or Equivalents**	**Description**
CM01: Marine Assurance Process	CM01 is equivalent to OPP-CM35 Marine Orders. Both CM01 and OPP-CM01 refers to the application of relevant Marine Orders. Beach Marine Assurance System ensures that the MODU and vessels meet relevant maritime laws and associated Marine Orders.	The MODU and vessels will meet relevant maritime laws and includes pre-commencement MODU and vessel inspections of class certification requirements under the *Navigation Act 2012* and associated Marine Orders, including but not limited to: Marine Order Part 95 (Marine pollution prevention - garbage) 2018 (giving effect to MARPOL Annex V), to ensure that appropriate garbage management plans and garbage record books are in place for the MODU and each vessel. Marine Order 42 (Carriage, stowage and securing of cargoes and containers) 2016, where relevant, to ensure cargo is packed, loaded, stowed, and secured throughout each voyage.
CM09: Program Activities	CM09 is equivalent to OPP-CM38 Waste Management Plan. Both controls detail how waste will be managed in accordance with the Beach Waste Management Plan to ensure compliant classification, segregation, storage, transport and disposal of waste.	Waste will be managed in accordance with Beach's Waste Management Plan – Otway and Bass Strait Offshore (S4000AD719914) which requires that wastes are eliminated, reduced, recycled and/or reused as far as reasonably practicable and includes requirements for the appropriate disposal, recycling, reuse, tracking and reporting of all wastes.
		Disposal of hazardous decommissioning waste to be compliant with *Hazardous Waste (Regulation of Exports and Imports) Act 1989*.
CM11: Procurement Vetting Process	CM11 is equivalent to OPP-CM38 Waste Management Plan. Both controls detail how waste will be managed in accordance with the Beach Waste Management Plan to ensure compliant classification, segregation, storage, transport and disposal of waste.	Beach via its Procurement Vetting Process will include a preference for the appropriately licenced waste handling contractor and appropriately licenced waste facility contracted to Beach to follow Beach OEMS Standard 10.1.9 Waste Management and Beach's Waste Management Plan – Otway and Bass Strait Offshore (S4000AD719914).

		Beach via its Procurement Vetting Process will assess the appropriately licenced waste facility contracted to Beach must comply with *Hazardous Waste (Regulation of Exports and Imports) Act 1989* for the disposal of any hazardous waste.

Additional Control Measures Assessed

Control	**Cost/Benefit Analysis**	**Control Implemented?**
Abandon subsea well infrastructure in situ	Leaving the subsea well infrastructure in place would minimise the environmental impacts associated with waste management and processing during recovery. Abandoning the subsea well infrastructure in situ forgoes likely recycling opportunities. Abandoning the subsea well infrastructure in situ would shift the waste burden from onshore to offshore by leaving the infrastructure in-place offshore. The time and effort associated with obtaining the necessary regulatory approvals to facilitate in situ abandonment of the subsea well infrastructure makes it unlikely the necessary approvals could be secured within the timeframe required. Abandoning the subsea well infrastructure in situ could lead to additional environmental impacts including ongoing displacement of other marine users associated with possible exclusion zones.	No

7.9.7 Demonstration that Impacts will be of an Acceptable Level

Consequence rating	Minor (1)
Likelihood of occurrence	NA
Residual risk	NA
Acceptability assessment Demonstration of acceptability for impacts and risks associated with accidental discharge – hazardous and non-hazardous materials provided in Section 7.3.7 of the OPP (Otway Offshore Gas Victoria Project) is considered valid and appropriate for the impact and risk assessment of this aspect for the Program activities. This is supported by the acceptability assessment for this aspect against the evaluation criteria in the following rows. The potential risks of solid waste management from Program activities meets the defined acceptable levels in the OPP by ensuring the considerations in Section 2.8 are met such that: OPP EPOs relevant to solid waste management are implemented through equivalent EP EPOs OPP control measures relevant to the solid waste management are implemented through equivalent EP control measures Based on the implementation of relevant and equivalent EPOs and control measures the consequence rating, likelihood of occurrence and residual risk are the same levels as defined in the OPP No changes to internal or external context as defined in the OPP including no new comments (objections and claims) raised against this aspect.	
To meet the principles of ESD	Planned solid waste management was assessed as having a Minor (1) consequence which is not considered as having the potential to result in serious or irreversible environmental damage. There is high confidence in the predicted level of impact.
Internal context	The proposed management of the risk is aligned with the Beach Environment Policy. Activities will be undertaken in accordance with the Implementation Strategy (Section 8).
External context	There have been no stakeholder objections or claims regarding disposal of waste.
Other requirements	Onshore treatment and disposal of wastes is to be undertaken as a component of decommissioning will be in accordance with the respective legislation of the States or Territory. Environment Protection Act (Vic)
Monitoring and reporting	Loss of materials or waste overboard is required to be reported as per Section 8.3.1. Audits and inspections of waste management as part of MODU and vessel weekly offshore inspection throughout the Program activities will be conducted in accordance with Section 8.3.3.
Acceptability outcome	**Acceptable**
Environmental Performance	Environmental Performance Outcomes (EPOs) represent the measurable levels of environmental performance Beach is seeking to achieve to ensure impacts are of an acceptable level. EPOs relevant to the effective management of indirect impacts associated with solid waste management from Program activities are: • EPO10: No unplanned discharge of materials or waste to the marine environment.

	• EPO11: Waste generated will be segregated and disposed of onshore in accordance with relevant legislation. Section 7.15 sets out the EPS for the control measures identified above, and the measurement criteria to evaluate the achievement of EPOs and EPS. This EPO is considered equivalent to relevant OPP EPOs as justified in Table 2-2.

7.10 Establishment of Invasive Marine Species

7.10.1 Source of Aspect

The introduction of invasive marine species (IMS) could occur during MODU and vessel operations as a result of:

- Discharge of ballast water from MODU or vessels containing foreign species.
- Translocation of species through biofouling of:

  MODU pontoons and anchors.

  Vessel hull and niches such as sea chests, bilges, and strainers.

Successful IMS invasion requires the following three steps:

- Colonisation and establishment of the marine pest on a vector (e.g., vessel hull) in a donor region (e.g., home port).
- Survival of the settled marine species on the vector during the voyage from the donor to the recipient region (e.g., Operational Area).
- Colonisation (e.g., dislodgement or reproduction) of the marine species in the recipient region, followed by successful establishment of a viable new local population.

7.10.2 Extent and Duration of Aspect

Extent	Operational Area Introduction of IMS could occur within the Operational Area when the MODU and vessels are present.
Duration	150 days for full Program activities (refer to Section 3.2) Introduction of IMS may occur throughout Program activities.

7.10.3 Predicted Environmental Impact

IMS may become established where conditions are suitable, and these species may have impacts on local ecological and economic values. However, establishment of IMS is mostly likely to occur in shallow waters in areas where large numbers of vessels are present and stationary for an extended period.

If the risk of establishment of IMS is realised this could result in a change in ecosystem dynamics which may include a reduction in native marine species diversity and abundance, displacement of native marine species, socio-economic impacts on commercial fisheries, and changes to conservation values of protected areas and First Nations cultural values and sensitivities.

7.10.4 EMBA

The introduction of IMS could occur within the Operational Area. Receptors potentially directly affected include marine invertebrates and benthic habitats, with indirect affects to commercial fisheries and First Nations cultural values and sensitivities.

7.10.5 Predicted Level of Risk

Successful translocation and establishment of IMS into a new environment depends on several factors. Water currents, upwellings, habitat type, water depth, wave exposure, water temperature, salinity and the distance from the coast are all natural dispersion barriers which have been shown to limit the successful establishment and reproduction of IMS populations (Forrest et al. 2009).

More than 250 marine species have been introduced into Australian waters from around the world. Many of these species remain inconspicuous, but a few have established large populations and become pests. It is estimated that one in 6 to 10 introduced marine species will become a pest (DCCEEW 2024m). Typical habitats of the species currently listed on the Marine Pest website (DAFF 2025) are shallow marine water areas for example Portland and Port Phillip Bays.

The risk of an IMS being able to successfully establish itself will depend on depth, distance from the coast, water movement and latitude. It has been found that highly disturbed environments (such as marinas) are more susceptible to colonisation than open-water environments, where the number of dilutions and the degree of dispersal are high (Paulay et al. 2002). Therefore, the probability of successful IMS settlement and recruitment will decrease in well mixed, deep ocean waters away from coastal habitats (Geiling 2014). In addition, an IMS travelling through several latitudes will also have to survive significant temperature and salinity changes.

In the event of an IMS being introduced to the marine environment, successful colonisation is dependent upon suitable substrate availability. Based on the requirements for successful IMS establishment, the Operational Area does not present an environment that is typically favourable to IMS survival. The Operational Area is in an open-water offshore environment influenced by strong ocean currents associated with the East Australian Current. Ocean currents in the Operational Area are expected to flow up to 5 knots in summer and 2-3 knots in winter, with the area therefore considered a well-mixed high energy offshore environment and are therefore not conducive to IMS establishment.

The probability of successful IMS settlement and recruitment decreases in well-mixed, deep ocean waters away from coastal habitats. IMS colonisation also requires a suitable habitat in which to establish itself, such as rocky and hard substrates or subsea infrastructure. The Australian Government Bureau of Resource Sciences (BRS) established that the relative risk of an IMS becoming established around Australia decreases with distance from the coast. Modelling conducted by BRS (BRS 2007) estimates: 33% chance of colonisation at 3 nm, 8% chance at 12 nm, and 2% chance at 24 nm.

The Operational Area does not present a benthic habitat that is typically favourable to IMS survival and is approximately 12 nm from the Victorian coast.

Established marine pest species can deplete fishing grounds and aquaculture stock, with between 10% and 40% of Australia's fishing industry being potentially vulnerable to marine pest incursion. The Operational Area presents unfavourable conditions for IMS colonisation, therefore the potential for secondary impacts such as socio-economic impacts on commercial fisheries, changes to conservation values of protected areas and changes to First Nations cultural values and sensitivities from IMS colonisation is also considered to be **Remote (A)**.

Given the impact of a successful IMS colonisation has the ability to significantly impact local species and thus change local epifauna and infauna populations permanently, which could also impact State and Commonwealth fisheries, and alter conservation values and First Nations cultural values and sensitivities, the consequences have been evaluated as **Serious (3)**. However, it is considered such an event is **Remote (A)** due to the unfavourable conditions within the Operational Area required for colonisation and the implementation of the Beach Domestic IMS Biofouling Risk Assessment Process in accordance with regulatory requirements to manage the introduction of IMS. In addition, there has been no IMS introductions from Beach's previous Otway Drilling Campaign and ongoing activities in the area.

7.10.6 Demonstration that the Risks will be ALARP

ALARP decision context and justification	ALARP Decision Context: Type B The risk of IMS is well understood and there is nothing new or unusual. Good practice is defined, and uncertainty is minimal. There are no conflicts with company values, no partner interests, and no significant media interests. Additional controls may be required to ensure risks can be managed to an acceptable level.		
Adopted Control Measures	**Comparison to Relevant OPP Control Measures or Equivalents**	**Description**	
CM19: Beach Domestic IMS Biofouling Risk Assessment Process	CM19 is equivalent to OPP-CM36 IMS Management Plan. CM19 is a requirement of the Beach Introduced Marine Species Management Plan (S400AH719916) referenced in the OPP as OPP-CM36.	MODU and support vessels mobilised from domestic waters to undertake activities within the Operational Area will complete the Beach Domestic IMS Biofouling Risk Assessment Process as detailed in the Beach Introduced Marine Species Management Plan (S400AH719916) prior to the initial mobilisation into the Operational Area. The Beach Domestic IMS Biofouling Risk Assessment Process: Validates compliance with regulatory requirements (Commonwealth and State) in relation to biosecurity prior to engaging in activities within the Operational Area. Identifies the potential IMS risk profile of vessels and submersible equipment prior to deployment within the Operational Area. Identifies potentially deficiency of IMS controls prior to entering the Operational Area. Identifies additional controls to manage IMS risk. Prevents the translocation and potential establishment of IMS into non-affected environments (either to or from the Operational Area).	
CM11: Procurement Vetting Process	CM11 is equivalent to OPP-CM37 Australian Ballast Water Management Requirements. CM11 is a requirement of the Australian Ballast Water Management Requirements, referenced in the OPP as OPP-CM37.	Beach undertakes a pre-qualification of all contractors to ensure contractor legal obligations are met including that MODU and vessel operators must comply with the most recent version of the Australian Ballast Water Management Requirements.	
Additional Control Measures Assessed			
Control	**Control Type**	**Cost/Benefit Analysis**	**Control Implemented?**
Only use MODUs/vessels that are based in Victoria to reduce the potential for introducing IMS.	Equipment	Specialised MODU and support vessels are required to undertake the activity. Using MODUs and vessels that are based in Victoria (if available) may reduce the likelihood of introducing an IMS, but this would depend on the IMS risk level of the	No.

		port where the vessel is based. The control measures that are to be implemented are required to be undertaken for vessels from any port in Victoria or Australia. Thus, there is limited environmental benefit associated with implementing this response.	

7.10.7 Demonstration that the Risks will be of an Acceptable Level

Consequence rating	Serious (3)
Likelihood of occurrence	Remote (A)
Residual risk	Low
Acceptable assessment Demonstration of acceptability for impacts and risks associated with the establishment of IMS provided in Section 7.1.5 of the OPP (Otway Offshore Gas Victoria Project) is considered valid and appropriate for the impact and risk assessment of this aspect for the Program activities. This is supported by the acceptability assessment for this aspect against the evaluation criteria in the following rows. The potential risk of establishment of IMS from Program activities meets the defined acceptable levels in the OPP by ensuring the considerations in Section 2.8 are met such that: OPP EPOs relevant to establishment of IMS are implemented through equivalent EP EPOs OPP control measures relevant to the establishment of IMS are implemented through equivalent EP control measures Based on the implementation of relevant and equivalent EPOs and control measures the consequence rating, likelihood of occurrence and residual risk are the same levels as defined in the OPP No changes to internal or external context as defined in the OPP including no new comments (objections and claims) raised against this aspect.	
To meet the principles of ESD	The risk of the establishment of IMS was assessed as Low and the consequence was assessed as Serious (3) which has the potential to result in serious or irreversible environmental damage. However, this is assessed as acceptable based on: There is little uncertainty associated with this aspect as the activities are well known, the cause pathways are well known, and activities are well regulated and managed. The implementation of controls make it a Remote (A) likelihood that IMS will be introduced from the activity resulting in a low residual risk. It is not considered that there is significant scientific uncertainty associated with this aspect. Therefore, the precautionary principle has not been applied. There is high confidence in the predicted level of risk as Beach has significant experience operating in the Otway Basin based on their existing offshore developments and associated activities including the Beach Otway Drilling Campaign in 2021/2022.
Internal context	The proposed management of the impact is aligned with the Beach Environment Policy. Activities will be undertaken in accordance with the Implementation Strategy (Section 8).
External context	There have been no stakeholder objections or claims regarding the introduction or establishment of IMS in relation to the activity.
Other requirements	The impact will be managed in accordance with legislation requirements and guidance, including: Offshore Installations - Biosecurity Guide (DAFF 2023b) National Biofouling Management Guidance for the Petroleum Production and Exploration Industry (MPSC 2018) Australian Ballast Water Management Requirements (CoA 2020c) and Australian Biofouling Management Requirements (DAFF 2023a) gives effect to the *Biosecurity Act 2015* and associated regulations; International Convention for the Control and Management of Ships' Ballast Water and Sediments

	(Ballast Water Convention) and relevant guidelines or procedures adopted by the Marine Environment Protection Committee of the International Maritime Organization (IMO) IMO Biofouling Guidelines There are no EPBC management plans (management plans, recovery plans or conservation advice) which relate specifically to IMS introduction and establishment as a threat. The South-east Commonwealth Marine Reserves Network Management Plan 2025 (DNP 2025) identifies potential sources of invasive species to include climate-driven range changes, vessel ballast and bilge water discharge, vessel biofouling and accidental or deliberate transport of species.as a threat to the AMP network. The implementation of the controls make the likelihood that IMS will be introduced from Program activities and spread to AMPs as Remote (A).
Monitoring and reporting	Impacts from the establishment of IMS will be reported in accordance with the Section 8.3.1.
Acceptability outcome	**Acceptable**
Environmental Performance	Environmental Performance Outcomes (EPOs) represent the measurable levels of environmental performance Beach is seeking to achieve to ensure impacts are of an acceptable level. EPO relevant to the effective management of impacts associated with establishment of invasive marine species from the Program activities is: EPO9: No introduction of a known or potential invasive marine species. Section 7.15 sets out the EPS for the control measures identified above, and the measurement criteria to evaluate the achievement of EPOs and EPS. This EPO is considered equivalent to relevant OPP EPOs as justified in Table 2-2.

7.11 Fauna Interaction

7.11.1 Source of Aspect

MODU, vessel and helicopter movements within the Operational Area may result in unplanned interactions with marine fauna via MODU/vessel or aircraft collision.

Collision with marine fauna may occur as a result of:

- MODU transit, towing and positioning
- Vessel operations
- Helicopter operations.

7.11.2 Extent and Duration of Aspect

Extent	Operational Area Interactions with marine fauna could occur within the Operational Area when the MODU, vessels or helicopter are present.
Duration	Approximately 150 days for Program activities (refer to Section 3.2) Unplanned Interactions with marine fauna may occur during Program activities.

7.11.3 Predicted Environmental Impacts

Interaction with marine fauna can result in environmental impacts including:

- Injury / mortality.
- Change in behaviour.

7.11.4 EMBA

Predicted impacts resulting from MODU, vessel and/or helicopters movements will be limited to the Operational Area.

Ecological receptors potentially at risk from MODU, vessel and/or helicopters movements are:

- Sharks, seals, seabirds, marine turtles, and marine mammals.

The potential risk of a change in behaviour or injury/mortality to marine fauna also has the potential to result in indirect changes to the functions, interests, or activities of the following receptors:

- Cultural values and sensitivities

Receptors which are the most susceptible to vessel collisions are typically characterised as large or slow-moving marine fauna that commonly dwell near the surface and frequent areas associated with a high level of vessel traffic. Species which have either a limited, threatened or geographically concentrated population are also a concern. Cetaceans and marine turtles have been identified as vulnerable to vessel collisions within the National Strategy for Reducing Vessel Strike on Cetaceans and other Marine Megafauna (DoEE 2017). However, other species such as pinnipeds and sharks can also be at risk of a vessel collision. Birds moving through the Operational Area may be at risk of interaction with MODU infrastructure, such as the derrick, or collision with helicopters when in use.

7.11.5 Predicted Level of Risk

7.11.5.1 Ecological Receptors

The National Strategy for Reducing Vessel Strike on Cetaceans and other Marine Megafauna identifies that the consequence of a vessel strike can range from low impact to extreme depending on the circumstance (DoEE 2017). Injuries sustained from vessel collisions are not always lethal. However, many incidents which may not result in direct mortality often result in injuries to the back of the animal and the dorsal fin, resulting in a loss of blood, possible infection, and reduced swimming efficiency, eventually causing an overall reduction in fitness of the individual (Van Waerebeek et al. 2006). Jensen and Silber (200) analysed 292 reported incidents with large cetaceans and identified only seven individuals which appeared to have no signs of injury (Jensen and Silber 2004).

Studies have found that the overall impact and potential fauna mortality in the event of a vessel strike is directly linked to vessel speed, with studies demonstrating an escalation in speed to cause an increase in injury severity to large cetaceans (Vanderlaan and Taggart 2007). Slower moving vessels provide greater opportunity for both fauna and vessel to avoid collision. The most severe injuries have been identified to be caused by vessels travelling faster than 14 knots (Jensen and Silber 2004, Laist et al. 2001). Furthermore, large vessels (>80 m) with modern hull shapes are also correlated with increased injury severity (Laist et al. 2001). Vessel speed may also result in animals, including large whales, being drawn laterally towards the hull of the vessel (Silber et al. 2010).

The behavioural traits of certain species can also make them more vulnerable to vessel and aircraft strike such as slow swimming or flying speed, and the habituation and general lack of awareness of vessel or aircraft noise and the associated danger posed. Some species spend more time at the surface when resting, foraging, or mating making them more vulnerable to vessel strike (DoEE 2017).

White Shark

White shark habitat is known to occur within the Operational Area (Appendix F). The white shark is EPBC-listed as vulnerable. There is limited data regarding strikes to shark species such as white sharks, likely due to lack of collisions being noticed and lack of reporting (Peel et al. 2016).

The extent of the area of risk of interaction with the white shark is within the Operational Area and the risk could only occur while Program activities are undertaken. The consequence is assessed as **Minor (1)** and likelihood as **Highly Unlikely (B)**, and the risk is of an acceptable level based on:

- Collisions are not listed as a threat within the Recovery Plan for the White Shark (DSEWPaC 2013b).
- A vessel strike to a shark is considered highly unlikely as it has not been reported as occurring to date in 15 years of Beach's activities within the Otway and Bass Basins.
- MODU and vessel movements in the Operational Area will be slow (≤ 10 knots as per CM02: Vessel and MODU Operating Procedures) which affords protection to fauna as the most severe injuries have been identified to be caused by vessels travelling faster than 14 knots (Jensen and Silber 2004, Laist et al. 2001).

- An appropriately qualified marine mammal observer will be present on each support vessel to detect the presence of marine fauna and provide instruction to avoid collisions where feasible as per CM08: Whale Management Procedure.
- The consequence of a strike on a single animal is not predicted to affect the overall population or recovery of the white shark.

Marine Reptiles

The Operational Area PMST Report (Appendix F) identified three marine turtle species are likely or may occur within the Operational Area though no BIAs or habitat critical to the survival of the species were identified. No biologically important behaviours were identified.

Vessel strikes have been identified as a threat to marine turtles within the Recovery Plan for Marine Turtles in Australia (CoA 2017). However, there is a limited amount of available data regarding vessel strike to fauna such as marine turtles; potentially due to a lack of vessel collisions being noticed, and a lack of reporting (Peel et al. 2016).

Marine turtles are most vulnerable to vessel collisions when they are either resting or returning to the surface to breathe. Studies have demonstrated that marine turtles spend limited time at the sea surface, approximately 3% to 6%, with dive times recorded from 15 to 60 minutes (Milton and Lutz 2003). A study on green turtles by Hazel (2009) found that individuals only exposed the dorsal-anterior part of the head above the water surface, and for never longer than two seconds.

Turtles can detect sound in water and will generally move from anthropogenic noise-generating sources, such as vessels, within their detection range (Popper et al. 2014). Studies have shown that the ability of turtles to respond and avoid vessels greatly depends on the speed of the vessel. In general, marine turtles are not able to avoid vessels when they are travelling faster than 4 km/h (2.2 knots) (Hazel 2009). The propagation characteristics of sound within the marine environment make it difficult for marine turtles to identify the direction of the source of vessel noise. Furthermore, individual noise from a vessel may be masked within areas of high vessel use and other noise -generating activities, which is likely to limit the ability of marine turtles to identify and avoid approaching vessels (Hazel 2009).

The extent of the area of risk of interaction with marine turtles is within the Operational Area and the risk could occur while Program activities are undertaken. The consequence is assessed as **Minor (1)** and likelihood as **Highly Unlikely (B)**, and the risk is of an acceptable level based on:

- The Recovery Plan for Marine Turtles in Australia (CoA 2017) identifies vessel disturbance as a key threat but details that although the outcome can be fatal for individual turtles, boat strike (as a standalone threat) has not been shown to cause stock level declines.
- Three marine turtle species may occur within the Operational Area, though no BIAs or habitat critical to the survival of the species were identified, and the presence of turtle species is expected to be of a transitory nature only.
- A vessel strike to a turtle is considered highly unlikely as it has not happened to date in 15 years of Beach's activities within the Otway and Bass Basins.

- An appropriately qualified marine mammal observer will be present on each support vessel to detect the presence of marine fauna and provide instruction to avoid collisions where feasible as per CM08: Whale Management Procedure.
- The consequence of a strike on a single animal is not predicted to affect the overall population or recovery of marine turtles.

Birds

The PMST Report for the Operational Area (Appendix F) identified a number of seabird species that may be present in the Operational Area. Table 7-15 identified those species with biologically important behaviour and/or BIAs within the Operational Area and hence are more likely to be present in larger numbers and less transitory. In addition, Viola (2023) identified the following species which landed on a support vessel during the Beach Otway Drilling Campaign from March until 5 April 2022 and from 29 April until 31 May 2022:

- Australasian pipit
- Brush bronzewing
- Galah
- Grey fantail
- Nankeen kestrel
- Rock dove
- Satin flycatcher
- Silvereye.

No species were recorded as injured and all left the vessel within<24 h after arrival (Viola 2023).

Table 7-15: Birds species with biologically important behaviour and/or BIAs within the Operational Area

Receptor	Biologically Important Behaviour
Albatross	
Antipodean albatross	Foraging, feeding or related behaviour likely to occur within area
	Foraging BIA
Black-browed albatross	Foraging, feeding or related behaviour likely to occur within area
	Foraging BIA
Buller's albatross, Pacific albatross	Foraging, feeding or related behaviour likely to occur within area
	Foraging BIA
	Foraging, feeding or related behaviour likely to occur within area

Campbell albatross, Campbell black-browed albatross	Foraging BIA
Indian yellow-nosed albatross	Foraging BIA
Northern Buller's albatross	Foraging, feeding or related behaviour likely to occur within area
Northern royal albatross	Foraging, feeding or related behaviour likely to occur within area
Salvin's albatross	Foraging, feeding or related behaviour likely to occur within area
Shy albatross	Foraging, feeding or related behaviour likely to occur within area
	Foraging BIA
Southern royal albatross	Foraging, feeding or related behaviour likely to occur within area
Wandering albatross	Foraging, feeding or related behaviour likely to occur within area
	Foraging BIA
White-capped albatross	Foraging, feeding or related behaviour known to occur within area
Petrels	
Common diving-petrel	Foraging BIA
Northern giant petrel	Foraging, feeding or related behaviour likely to occur within area
Shearwaters	
Short-tailed shearwater	Foraging BIA
Flesh-footed shearwater	Foraging, feeding or related behaviour likely to occur within area
Other	
Australian fairy tern	Foraging, feeding or related behaviour likely to occur within area
White-fronted tern	Migration route may occur within area

Helicopter, MODU and vessels within the Operational Area have the potential to cause injury / mortality and a change in behaviour to seabirds and migratory birds, specifically species which fly through the Operational Area, or spend extended periods of time on the water surface in high vessel traffic areas. The Wildlife Conservation Plan for Seabirds (CoA 2020a) recognises that seabirds are known to aggregate around oil and gas platforms in above average numbers due to night lighting, flaring, food concentrations and other visual cues (Wiese et al. 2001). While most interactions are harmless, some can be detrimental and may cause injury or death e.g. from collision or indirectly from depleted body reserves (Ronconi et al. 2015). Bird mortality has been documented due to collision with structures, and interactions with flaring activities (Wiese et al. 2001).

The risk of bird collision with helicopter operations is a safety consideration for flights to and from the MODU. The consequence of a helicopter bird strike varies and is influenced by the individual's seasonal distribution, body mass, flocking and flight behaviour, while the probability of a strike is related to the abundances of different bird species on or near the MODU.

The extent of the area of risk of interaction with birds is within the Operational Area and the risk could occur while Program activities are undertaken. The consequence is assessed as **Minor (1)** and likelihood as **Highly Unlikely (B)**, and the risk is of an acceptable level based on:

- The National Recovery Plan for Albatrosses and Petrels (CoA 2022) classifies marine infrastructure interactions including those associated with artificial light as having no risk category priority and affecting 'Nil' species in Australian jurisdiction.
- Albatross, petrels, shearwaters, and terns were identified to have foraging BIAs or foraging behaviour likely within the Operational Area. As detail in the assessment of light impacts (Section 7.2) a Light Management Plan (CM07) will be implemented to minimise light impacts which will also minimise the likelihood of bird species such as albatross, shearwaters, petrels, and terns potentially being attracted to the MODU or vessel where a collision could occur. In 15 years of Beach's activities within the Otway and Bass Basins, an albatross, shearwater or petrel has not been reported on a vessel, MODU or platform.
- A strike to a bird is considered highly unlikely as it has not been recorded in 15 years of Beach's activities within the Otway and Bass Basins.
- The consequence of a strike on a single bird is not predicted to affect the overall population.

Marine Mammals

The Operational Area PMST Report (Appendix F) 27 cetacean species that may occur within the Operational Area and two fur-seal species that may occur within the Operational Area. Table 7-16 details marine mammals that have biologically important areas and/or biologically important behaviours within the Operational Area.

Table 7-16: Marine mammals with biologically important behaviours within the Operational Area

Species	Biologically Important Behaviour
Blue whale	Foraging, feeding or related behaviour known to occur within area.
	Foraging BIA (annual high use area)
Fin whale	Foraging, feeding or related behaviour likely to occur within area.
Pygmy right whale	Foraging, feeding or related behaviour may occur within area.
Sei whale	Foraging, feeding or related behaviour likely to occur within area.
Southern right whale	Migration BIA

Vessel collisions have the potential to result in injury/mortality to marine mammals, such as cetaceans and pinnipeds. Cetaceans and pinnipeds are naturally inquisitive species which are often attracted to offshore vessels, for example dolphins are commonly reported to 'bow ride'. The reaction of cetaceans to an approaching vessel is variable and unpredictable. Often species remain motionless whilst in the vicinity of a vessel, whereas others have been known to be curious, often approaching ships which have stopped or are slow moving. In general they do not approach, and sometimes actively avoid, faster moving vessels (Richardson et al. 1995). For example, humpback whales have been shown to frequently change course to avoid a vessel after detection (WDCS 2006).

Vessel collisions with cetaceans occur more frequently in areas where high vessel traffic and cetacean habitat coincide (WDCS 2006). Peel et al. (2016) analysed the number of vessel collisions with cetaceans within Australian waters, stating at least 109 vessel collisions have been reported since 1840.

However, the paper emphasises a lack of reporting as an issue in confirming exact numbers. Recorded instances of cetacean deaths due to vessel strikes indicate that they are much more likely to be associated with container ships and fast ferries (WDCS 2006). When vessels are stationary or slow moving, the risk of collision with cetaceans is extremely low, as the vessel's size and underwater noise 'footprint' will alert cetaceans to its presence and thus elicit avoidance.

The extent of the area of risk of interaction with marine mammals is within the Operational Area and the risk could occur while Program activities are undertaken. The consequence is assessed as **Minor (1)** and likelihood as **Highly Unlikely (B)**, and the risk is of an acceptable level based on:

- Minimising vessel collision is ranked as a high priority action within the Conservation Management Plan for the blue whale and within the Conservation Advice for fin and sei whales as well as a very high priority action within the National Recovery Plan for the southern right whale (DCCEEW 2024k).
- The foraging BIA for the pygmy blue whale intersects with the Operational Area. The Conservation Management Plan for the Blue Whale (CoA 2015a) details that vessel collisions will impede the recovery of blue whale populations if a sufficient number of individuals in the population lose reproductive fitness or are killed. A vessel strike to a whale is considered highly unlikely as it has not happened to date in 15 years of Beach's activities within the Otway and Bass Basins. It is further reduced by there being an appropriately qualified marine mammal observer on each support vessel to detect the presence of marine fauna and provide instruction to avoid collisions where feasible (CM08: Whale Management Procedure).
- The Operational Area is within a migration BIA of the southern right whale. The National Recovery Plan for the Southern Right Whale (DCCEEW 2024k) lists vessel strike collisions as a major consequence for the eastern population and minor consequence for the western population. The plan does not identify any actions relevant to the program activities but does note that reducing ship strike mortality can be most easily done either by reducing vessel speed or by separating vessels and whales. As both these controls will be implemented, with the MODU and vessels being either stationary or operating at slow speeds (≤ 10 knots as per CM02: Vessel and MODU Operating Procedures) and vessels when transiting maintaining a distance of 300 m from a whale (CM08: Whale Management Procedure), reducing the likelihood of a strike. An appropriately qualified marine mammal observer will be present on each support vessel to detect the presence of marine fauna and provide instruction to avoid collisions where feasible (CM08: Whale Management Procedure).
- The Listing Advice for the Humpback Whale (TSSC 2022) details that the species is no longer listed as Vulnerable and identifies vessel strike as a current impact not threatening or preventing population growth.
- Peel et al. (2016) reviewed vessel strike data (2000-2015) for marine species in Australian waters and identified that there were no vessel interaction reports during the period for Australia sea-lions, Australian or New Zealand fur- seals. There have been incidents of seals being injured by boat propellers, however all indications are rather than 'boat strike' these can be attributed to the seal interacting/playing with a boat, with a number of experts indicating the incidence of boat strike for seals is very low.

- A vessel strike to a marine mammal is considered highly unlikely as it has not been recorded in 15 years of Beach's activities within the Otway and Bass Basins.
- MODU and vessel movements in the Operational Area will be low (≤ 10 knots as per CM02: Vessel and MODU Operating Procedures) which affords protection to fauna as the most severe injuries have been identified to be caused by vessels travelling faster than 14 knots (Jensen and Silber 2004, Laist et al. 2001).
- An appropriately qualified marine mammal observer will be present on each support vessel to detect the presence of marine fauna and provide instruction to avoid collisions where feasible as per CM08: Whale Management Procedure.
- Given the expected low likelihood of vessel strike, and if it did occur it will not affect the long-term recovery of marine mammal species in accordance with relevant conservation plans and advice.

7.11.5.2 Cultural Values and Sensitivities

From Section 6.6.3, the following cultural values and sensitivities have been identified as potentially at risk from MODU, vessel and/or helicopters movements and the section where potential risks have been assessed:

- Birds – see Section 7.11.5.1
- Marine mammals: dolphins, whales, seal - see Section 7.11.5.1

Noting that eels and fish are not identified at risk from MODU or vessel movements.

The marine fauna listed above are connected to places associated with songlines or connected to individuals through ceremony (Section 6.6.3.5). The connection of marine fauna to places or individuals are considered cultural intangible values.

MODU, vessel and/or helicopters movements has the potential to impact marine fauna that have songlines, or spiritual connection to First Nations people. It is considered that impacts to species at a population level may prevent First Nations people's obligations to maintain spiritual connections and care for culturally significant species and their habitat. If First Nations people's obligations have not been met it may reinforce a sense of powerlessness to members of First Nations groups responsible for these obligations (Holcombe 2022).

The predicted environmental risk to these receptors, assessed in the above listed sections, determined fauna interaction with MODU, vessel and/or helicopters movements will have no effect at a population level. As a result, the consequence is assessed as **Minor (1)** and likelihood as **Highly Unlikely (B)**, and the risk to cultural values and sensitivities from fauna interaction is of an acceptable level based on:

- As detail in the assessment of light impacts (Section 7.2), a Light Management Plan (CM07) will be implemented to minimise light impacts which will also minimise the likelihood of bird species such as albatross, shearwaters, petrels, and terns potentially being attracted to the MODU or vessel where a collision could occur. In 15 years of Beach's activities within the Otway and Bass an albatross, shearwater, or petrel has not been reported on a vessel, MODU or platform.

- The consequence of a helicopter strike on a single bird is not predicted to affect the overall population.
- A vessel strike to marine mammals is considered highly unlikely as it has not been recorded to date in 15 years of Beach's activities within the Otway and Bass.
- MODU and vessel movements in the Operational Area will be low (≤ 10 knots as per CM02: Vessel and MODU Operating Procedures) which affords protection to fauna as the most severe injuries have been identified to be caused by vessels travelling faster than 14 knots (Jensen and Silber 2004, Laist et al. 2001).
- An appropriately qualified marine mammal observer will be present on each support vessel to detect the presence of marine fauna and provide instruction to avoid collisions where feasible as per CM08: Whale Management Procedure.
- Given the expected low likelihood of vessel strike, and if it did occur it will not affect the long-term recovery of marine mammal species in accordance with relevant conservation plans and advice.

7.11.6 Demonstration that Risks will be ALARP

ALARP decision context and justification	ALARP Decision Context: Type A The risk of fauna interaction is well understood and there is nothing new or unusual. Good practice is defined, and uncertainty is minimal. There are no conflicts with company values, no partner interests, and no significant media interests. On the basis of the impact assessment completed, Beach considers the control measures identified are appropriate to manage the risk associated with fauna interaction to ALARP.	
Adopted Control Measures	**Comparison to Relevant OPP Control Measures or Equivalents**	**Description**
CM01: Marine Assurance Process	CM01 is equivalent to OPP-CM01 Navigation Safety. Beach Marine Assurance System ensures that the MODU and vessels meet relevant maritime laws and associated Marine Orders. Both CM01 and OPP-CM01 refer to the Beach Marine Assurance Process.	The MODU and vessels will meet relevant maritime laws and includes pre-commencement MODU and vessel inspections of class certification requirements under the *Navigation Act 2012* and associated Marine Orders, including but not limited to: Marine Order 30 - Prevention of Collisions which details the requirements for navigation equipment, watchkeeping, radar and lighting requirements. Marine Order 57: Helicopter Operations ensures the obstacles on the helideck including birds are clear before approach and landing.
CM02: Vessel and MODU Operating Procedures	CM02 is equivalent to the following legislative requirement defined in the OPP, National Strategy for Reducing Vessel Strikes on Cetaceans and other Marine Megafauna, where vessel movements will be aligned to 'Objective 3: Mitigation' of the Strategy by:	Vessel speeds within the Operational Area will be restricted to ≤ 10 knots.

	maintaining slow vessel speeds	
CM07: Light Management Plan	CM07 is equivalent to OPP-CM13 Lighting Management Procedure, such that both documents will provide mitigation details to manage artificial lighting to minimum levels as per the National Light Pollution Guidelines for Wildlife (DCCEEW 2023).	Beach will contract appropriately qualified lighting practitioners, together with an appropriately qualified marine biologist or ecologist to develop and support the implementation of a Light Management Plan as per the National Light Pollution Guidelines for Wildlife (DCCEEW 2023). Once safety navigational lighting requirements are met (as per vessel class), the Light Management Plan will detail additional mitigations to ensure artificial lighting is reduced to minimum levels based on the information in the Seabird Light Mitigation Toolbox (DCCEEW 2023) wherever practicable, whilst maintaining safe working conditions and navigation. Specifically, outwards facing lighting will be reduced to minimum levels, wherever practicable.
CM08: Whale Management Procedure	CM08 is equivalent to OPP-CM14 EPBC Regulations 2000 – Part 8 Division 8.1 interacting with cetaceans. CM08 Whale Management Procedure specifies the requirements including separation distances for vessel/helicopter practices in accordance with EPBC Regulations 2000 – Part 8 Division 8.1 interacting with cetaceans.	The Whale Management Procedure (Appendix K) outlines the requirements of the EPBC Regulations 2000 – Part 8 Division 8.1 interacting with cetaceans, such that: Vessels will adhere to EPBC Regulations 2000 – Part 8 Division 8.1 interacting with cetaceans in relation to distances to cetaceans. Helicopters will adhere to EPBC Regulations 2000 – Part 8 Division 8.1 interacting with cetaceans in relation to distances to cetaceans

7.11.7 Demonstration that Risks will be of an Acceptable Level

Consequence rating	Minor (1)
Likelihood of occurrence	Highly Unlikely (B)
Residual risk	Low

Acceptability assessment

Demonstration of acceptability for impacts and risks associated with interaction with marine fauna provided in Section 7.2.5 of the OPP (Otway Offshore Gas Victoria Project) is considered valid and appropriate for the impact and risk assessment of this aspect for the Program activities. This is supported by the acceptability assessment for this aspect against the evaluation criteria in the following rows.

The potential risk of fauna interaction from Program activities meets the defined acceptable levels in the OPP by ensuring the considerations in Section 2.8 are met such that:

OPP EPOs relevant to fauna interaction are implemented through equivalent EP EPOs

OPP control measures relevant to the fauna interaction are implemented through equivalent EP control measures

Based on the implementation of relevant and equivalent EPOs and control measures the consequence rating, likelihood of occurrence and residual risk are the same levels as defined in the OPP

No changes to internal or external context as defined in the OPP including no new comments (objections and claims) raised against this aspect.

To meet the principles of ESD	The risk of fauna interaction was assessed as Low, and the consequence was assessed as Minor (1) which is not considered as having the potential to result in serious or irreversible environmental damage. There is high confidence in the predicted level of risk as Beach has significant experience operating in the Otway Basin based on their existing offshore developments and associated activities including the Beach Otway Drilling Campaign in 2021/2022.
Internal context	The proposed management of the risk is aligned with the Beach Environment Policy. Activities will be undertaken in accordance with the Implementation Strategy (Section 8).
External context	There have been no stakeholder objections or claims regarding fauna interaction.
Other requirements	Fauna interactions will be managed in accordance with legislative requirements. EPBC Regulations 2000 – Part 8 Division 8.1 interacting with cetaceans requirements are implemented as per CM08: Whale Management Procedure. As per the impact assessment, MODU, vessel, and helicopters movements will not: Impact the recovery of the white shark as per the Recovery Plan for the White Shark (*Carcharodon carcharias*) (DSEWPaC 2013b). Impact on the recovery of marine turtles as per the Recovery Plan for Marine Turtles in Australia (CoA 2017). Impact the long-term survival and recovery of albatross and petrel populations as per the National Recovery Plan for Albatrosses and Petrels (CoA 2022). Impact the conservation of listed seabirds as per the Wildlife Conservation Plan for Seabirds (CoA 2020a). Applicable actions associated with the plan have been addressed as per: Implementing a comprehensive monitoring program of impacts of these offshore platforms should include nature, timing and extent of bird mortality caused by these structures. CM07: Light Management Plan includes recording any injury/deaths of bird species associated with the MODU, vessel or helicopters and reporting is detailed in Section 8.3.1. Impact the recovery of the blue whale as per the Conservation Management Plan for the Blue Whale (CoA 2015a). Actions from the Conservation Management Plan for the Blue Whale (CoA 2015a) applicable to the activity are to: Ensure all vessel strike incidents are reported in the National Ship Strike Database. Vessel collision with protected marine fauna are required to be reported as detailed in Section 8.3.1. Ensure the risk of vessel strikes on blue whales is considered when assessing actions that increase vessel traffic in areas where blue whales occur and, if required, appropriate mitigation measures are implemented. Section 7.11.5.1 details the impact assessment and mitigation measures (controls) to be implemented to ensure impacts are of an acceptable level and ALARP. Impact the recovery of the southern right whale as per the National Recovery Plan for the Southern Right Whale (DCCEEW 2024k). Actions from the National Recovery Plan for the Southern Right Whale (DCCEEW 2024k) applicable to the activity to minimise vessel collisions are to: Assess risk of vessel strike to southern right whales in BIAs. Section 7.11.5.1 details the impact assessment and mitigation measures (controls) to be implemented to ensure impacts are of an acceptable level and ALARP.

	Ensure environmental impact assessments and associated plans consider and quantify the risk of vessel strike and associated potential cumulative risks in BIAs and HCTS. Section 7.11.5.1 details the impact assessment and mitigation measures (controls) to be implemented to ensure impacts are of an acceptable level and ALARP. As detailed in the assessment vessel collision to southern right whales have not been recorded from oil and gas activities off Victoria and as only one MODU and vessels will be present in Otway for Program activities cumulative impacts are not predicted. Ensure all vessel strike incidents are reported in the National Ship Strike Database managed through the Australian Marine Mammal Centre, Australian Antarctic Division. Vessel strikes to marine fauna will be reported in the National Ship Strike Database as per Section 8.3.1. Impact the recovery of sei or fin whales, covered by conservation advice.
Monitoring and reporting	Strikes to protected marine fauna area required to be reported as detailed in Section 8.3.1.
Acceptability outcome	**Acceptable**
Environmental Performance	Environmental Performance Outcomes (EPOs) represent the measurable levels of environmental performance Beach is seeking to achieve to ensure impacts are of an acceptable level. EPOs relevant to the effective management of impacts associated with fauna interaction from the drilling P&A activities are: EPO2: No death or injury to listed threatened or migratory species from the activity. Section 7.15 sets out the EPS for the control measures identified above, and the measurement criteria to evaluate the achievement of EPOs and EPS. This EPO is considered equivalent to relevant OPP EPOs as justified in Table 2-2.

7.12 Loss of Materials and Waste

7.12.1 Source of Aspect

Small quantities of hazardous and non-hazardous materials are used during routine vessel and MODU operations, and consequently result in waste generation which requires handling and storage on vessels and the MODU. Non-hazardous materials could be accidentally dropped or blown overboard due to overfull bins, crane incidents or improper storage or handling. The contingent removal of infrastructure (i.e. wellheads) will generate hazardous decommissioning waste which requires transport and disposal at an onshore facility, this activity may result in the potential for incorrect disposal of waste from infrastructure removal. Hazardous waste may be accidentally dropped or lost overboard as a result of leaks, overfilling of tanks or emergency disconnection of hoses. Spills to the marine environment are covered in Section 7.13.

7.12.2 Predicted Environmental Impacts

In the event of a loss of material or waste overboard, injury/mortality to fauna could occur.

In the event hazardous decommissioning waste is incorrectly disposed of onshore, contamination of air, soil and water at onshore facilities could occur.

7.12.3 EMBA

Loss of material or waste overboard could occur within the Operational Area, potentially impacting:

- Sharks, seabirds, marine turtles, and marine mammals.

The potential risk of injury/mortality to marine fauna also has the potential to result in indirect changes to the functions, interests, or activities of the following receptors:

- Conservation values and sensitivities
- Cultural values and sensitivities.

Incorrect disposal of hazardous decommissioning waste onshore could result in indirect contamination of air, soil, and water at the disposal site/facility. No impacts on valued species or habitats within the Operational Area are expected and therefore are not addressed further in this section.

7.12.4 Predicted Level of Risk

7.12.4.1 Ecological Receptors

The Threat Abatement Plan for the Impacts of Marine Debris on Vertebrate Wildlife of Australia's Coasts and Ocean (CoA 2018) details harmful marine debris impacts on a range of marine life, including protected species of birds, sharks, turtles, and marine mammals. Harmful marine debris refers to all plastics and other types of debris from domestic or international sources that may cause harm to vertebrate marine wildlife. This includes land sourced plastic garbage (e.g. bags, bottles, ropes, fibreglass, piping, insulation, paints, and adhesives), derelict fishing gear from recreational and commercial fishing activities and ship-sourced, solid non-biodegradable floating materials lost or disposed of at sea.

Solids accidently released to the marine environment may lead to injury or death to individual marine fauna through ingestion or entanglement. Impacts will be restricted in exposure and quantity and will be limited to individual fauna. Identified by PMST report (Appendix F) sensitive marine fauna with a potential presence within the Operational Area include:

- White shark habitat is known to occur within the Operational Area. The Recovery Plan for the White Shark (DSEWPaC 2013b) does not identify waste or marine debris as a threat. White shark presence within the Operational Area is expected to be transitory in nature.
- Three marine turtle species (or species habitat) may occur within the Operational Area though no BIAs or habitat critical to the survival of the species were identified. The Recovery Plan for Marine Turtles in Australia (CoA 2017) identified marine debris as a threat.
- The Operational Area overlaps foraging BIAs for albatross, petrel and shearwater species. Marine debris is identified as a threat in the National Recovery Plan for Albatrosses and Petrels (CoA 2022).
- Twenty-seven cetacean species (or species habitat) may occur or are known to occur within the Operational Area. Foraging behaviours were identified for some species (blue, fin, pygmy right and sei whales); no other important behaviours were identified. The Operational Area intersects a foraging BIA for the pygmy blue whale and the migration BIA for the southern right whale. The Conservation Management Plan for the blue whale (CoA 2015) and Conservation Advice for the sei whale (TSSC 2015f) and fin whale (TSSC 2015e) do not identify marine debris as threat. The National Recovery Plan for the Southern Right Whale (DCCEEW 2024k) identifies marine debris as a threat, specifically vessel-sourced, solid, non-biodegradable floating materials disposed of or lost at sea. It details that ingestion of marine debris, however, is thought to be unlikely for southern right whales in Australian coastal waters given whales are less likely to be feeding. No actions from the recovery plan were identified specific to vessel debris.

The PMST Report for the Operational Area did not identify any threatened marine invertebrate species or benthic habitats.

The extent of the area of impact is adjacent to the MODU or support vessels within the Operational Area. The consequence to ecological receptors is assessed as **Minor (1)** and likelihood as **Unlikely (C)**, and the risk is of an acceptable level based on:

- MODU and vessel management systems addressing dropped object, waste storage and chemical handling and storage are well practiced, well understood and will be subject to regular audit for effectiveness and compliance during Program activities.
- An unplanned release of waste will be of a very low volume if an incident occurred, and impacts would be restricted to individual fauna and would not impede the recovery of a protected species.
- Where possible material lost overboard would be recovered.
- The Threat Abatement Plan for the Impacts of Marine Debris on Vertebrate Wildlife of Australia's Coasts and Ocean (CoA 2018) suggests that most marine plastic debris are associated to shipping and fishing activities (fishing gear, balloons and plastic bags).

- Waste will be handled in accordance with AMSA Discharge Standards and respective MODU and vessel Garbage Management Plans. Given this, any waste lost overboard would be in minimal quantities.
- Hazardous decommissioning waste will be disposed on in accordance with *Hazardous Waste (Regulation of Exports and Imports) Act 1989* to prevent the likelihood of incorrect disposal of infrastructure.
- The likelihood of losing waste or other materials overboard is unlikely with the MODU and vessels management systems in place. The consequence of a loss of material or waste overboard would be limited to individuals and not affect an entire population.

7.12.4.2 Socio-economic Receptors

In the event a buoyant object is accidentally released and cannot be recovered by a vessel, the buoyant object may present a navigation or entanglement hazard to commercial fishers and other marine users. Further the buoyant object may become non-buoyant overtime and sink to the seabed, where it may present a snagging hazard on the seafloor for commercial trawling activities.

The extent of the area of impact is adjacent to the MODU or support vessels within the Operational Area. The consequence to socio-economic receptors is assessed as **Minor (1)** and likelihood as **Unlikely (C)**, and the risk is of an acceptable level based on:

- MODU and vessel management systems addressing dropped object, waste storage and chemical handling and storage are well practiced and well understood.
- An unplanned release of waste will be of a very low volume if an incident occurred, and impacts would be restricted to individual marine users or individual fishers.
- Where possible material lost overboard would be recovered.
- Waste will be handled in accordance with AMSA Discharge Standards and respective MODU and vessel Garbage Management Plans. Given this, any waste lost overboard would be in minimal quantities.
- Disposal of hazardous decommissioning waste to be compliant with *Hazardous Waste (Regulation of Exports and Imports) Act 1989* to prevent the likelihood of incorrect disposal of infrastructure.
- The likelihood of losing waste or other materials overboard is unlikely with the MODU and vessels management systems in place. The consequence of a loss of material or waste overboard would be restricted to impacts to individual marine users or individual fishers.

7.12.4.3 Cultural Values and Sensitivities

From Section 6.6.3, the following cultural values and sensitivities have been identified as potentially at risk from a loss of waste or other materials overboard:

- Birds including short-tailed shearwater (muttonbird)
- Dolphins

- Whales
- Seals.

The marine fauna listed above are connected to places associated with songlines or connected to individuals through ceremony (Section 6.6.3.5). The connection of marine fauna to places or individuals are considered cultural intangible values.

Loss of waste or other materials overboard is a potential risk to marine fauna that have songlines, or spiritual connection to First Nations people. It is considered that risks to species at a population level may prevent First Nations people's obligations to maintain spiritual connections and care for culturally significant species and their habitat. If First Nations people's obligations have not been met it may reinforce a sense of powerlessness to members of First Nations groups responsible for these obligations (Holcombe 2022).

Section 7.12.4.1 details the predicted environmental risk to these receptors and concluded loss of waste or other materials overboard will not result in risks at a population level. As a result, the consequence is assessed as **Minor (1)** and likelihood as **Unlikely (C)**, and the risk to cultural values and sensitivities from loss of waste or other materials overboard is of an acceptable level based on:

- MODU and vessel management systems addressing dropped object, waste storage and chemical handling and storage are well practiced and well understood.
- An unplanned release of waste will be of a very low volume if an incident occurred, and impacts would be restricted to individual fauna and would not impede the recovery of a protected species.
- Where possible material lost overboard would be recovered.
- The Threat Abatement Plan for the Impacts of Marine Debris on Vertebrate Wildlife of Australia's Coasts and Ocean (CoA 2018) suggests that most marine plastic debris are associated to shipping and fishing activities (fishing gear, balloons and plastic bags).
- Waste will be handled in accordance with AMSA Discharge Standards and respective MODU and vessel Garbage Management Plans. Given this, any waste lost overboard would be in minimal quantities.
- The likelihood of losing waste or other materials overboard is unlikely with the MODU and vessels management systems in place. The consequence of a loss of material or waste overboard would be limited to individuals and not affect an entire population.

7.12.5 Demonstration that Risks will be ALARP

ALARP decision context and justification	ALARP Decision Context: Type A The risk of loss of materials or waste is well understood and there is nothing new or unusual. On the basis of the impact assessment completed, Beach considers the control measures identified are appropriate to manage the risk associated with loss of materials or waste to ALARP.	
Adopted Control Measures	**Comparison to Relevant OPP Control Measures or Equivalents**	**Description**

CM01: Marine Assurance Process	CM01 is equivalent to: OPP-CM35 Marine Orders OPP-CM38 Waste Management Plan. Both CM01 and OPP-CM01 refers to the application of relevant Marine Orders. Beach Marine Assurance System ensures that the MODU and vessels meet relevant maritime laws and associated Marine Orders. Both CM01 and OPP-CM38 details the compliant classification, segregation, storage, transport and disposal of waste.	The MODU and vessels will meet relevant maritime laws and includes pre-commencement MODU and vessel inspections of class certification requirements under the *Navigation Act 2012* and associated Marine Orders, including but not limited to: Marine Order Part 95 (Marine pollution prevention - garbage) which gives effect to MARPOL Annex V such that: Garbage management plan in place. Garbage record book maintained onboard. Marine Order 42 (Carriage, stowage and securing of cargoes and containers) 2016, where relevant, to ensure cargo is packed, loaded, stowed, and secured throughout each voyage.
CM02: Vessel and MODU Operating Procedures	CM02 is equivalent to OPP-CM39 Lifting. Both CM02 and OPP-CM39 details that lifting equipment will be fit for use. CM02 is equivalent to OPP commitment to recover material lost overboard, where possible (Section 7.3.4 and 7.3.5 of the OPP).	All lifting gear used for deployment and retrieval of equipment over the MODU and vessels is load rated for the working load.
		If deemed safe and effective to do so, support vessels can assist in the recovery of lost materials or waste.
		The recording and reporting of incidents, including those associated with loss of waste or materials overboard is standard in the industry. AMSA JRCC and other marine users will be notified in the event of loss of materials with potential to affect safe navigation.
CM09: Program Activities	CM09 is equivalent to OPP-CM38 Waste Management Plan. Both controls detail how waste will be managed in accordance with the Beach Waste Management Plan to ensure compliant classification, segregation, storage, transport and disposal of waste.	Waste will be managed in accordance with Beach's Waste Management Plan – Otway and Bass Strait Offshore (S4000AD719914) which requires that wastes are eliminated, reduced, recycled and/or reused as far as reasonably practicable and includes requirements for the appropriate disposal, recycling, reuse, tracking and reporting of all wastes.
		Disposal of hazardous decommissioning waste to be compliant with *Hazardous Waste (Regulation of Exports and Imports) Act 1989*.

7.12.6 Demonstration that Risks will be of an Acceptable Level

Consequence rating	Minor (1)
Likelihood of occurrence	Unlikely (C)
Residual risk	Low
Acceptability assessment	
Demonstration of acceptability for impacts and risks associated with accidental discharge – hazardous and non-hazardous materials provided in Section 7.3.7 of the OPP (Otway Offshore Gas Victoria Project) is considered	

valid and appropriate for the impact and risk assessment of this aspect for the Program activities. This is supported by the acceptability assessment for this aspect against the evaluation criteria in the following rows. The potential risk of loss of materials and waste from Program activities meets the defined acceptable levels in the OPP by ensuring the considerations in Section 2.8 are met such that: OPP EPOs relevant to loss of materials and waste are implemented through equivalent EP EPOs OPP control measures relevant to the loss of materials and waste are implemented through equivalent EP control measures Based on the implementation of relevant and equivalent EPOs and control measures the consequence rating, likelihood of occurrence and residual risk are the same levels as defined in the OPP No changes to internal or external context as defined in the OPP including no new comments (objections and claims) raised against this aspect.	
To meet the principles of ESD	The risk of loss of materials or waste was assessed as Low and the consequence was assessed as Minor (1) which is not considered as having the potential to result in serious or irreversible environmental damage. There is high confidence in the predicted level of risk as Beach has significant experience operating in the Otway Basin based on their existing offshore developments and associated activities including the Beach Otway Drilling Campaign in 2021/2022.
Internal context	The proposed management of the risk is aligned with the Beach Environment Policy. Activities will be undertaken in accordance with the Implementation Strategy (Section 8).
External context	There have been no stakeholder objections or claims regarding loss of materials or waste overboard.
Other requirements	Materials and waste on board the MODU vessels will be managed in accordance with legislative requirements. As per the impact assessment, MODU, vessel, and helicopters movements will not: Impact the recovery of the white shark as per the Recovery Plan for the White Shark (*Carcharodon carcharias*) (DSEWPaC 2013B). Impact on the recovery of marine turtles as per the Recovery Plan for Marine Turtles in Australia (CoA 2017). Impact the long-term survival and recovery of albatross and petrel populations as per the National Recovery Plan for Albatrosses and Petrels (CoA 2022). Impact the conservation of listed seabirds as per the Wildlife Conservation Plan for Seabirds (CoA 2020a). Impact the recovery of the blue whale as per the Conservation Management Plan for the Blue Whale (CoA 2015a). Impact the recovery of the southern right whale as per the National Recovery Plan for the Southern Right Whale (DCCEEW 2024k). Impact sei or fin whales, covered by Conservation Advice for Fin Whales (TSSC 2015e) and Conservation Advice for Sei Whales (TSSC 2015f).
Monitoring and reporting	Loss of materials or waste overboard is required to be reported as per Section 8.3.1.
Acceptability outcome	**Acceptable**

Environmental Performance	Environmental Performance Outcomes (EPOs) represent the measurable levels of environmental performance Beach is seeking to achieve to ensure impacts are of an acceptable level. EPOs relevant to the effective management of impacts associated with loss of materials or waste from Program activities are: EPO2: No death or injury to listed threatened or migratory species from the activity; EPO10: No unplanned discharge of materials or waste to the marine environment. Section 7.15 sets out the EPS for the control measures identified above, and the measurement criteria to evaluate the achievement of EPOs and EPS. This EPO is considered equivalent to relevant OPP EPOs as justified in Table 2-2.

7.13 Loss of Containment

7.13.1 Source of Aspect

Program activities have the potential to result in a loss of containment of hydrocarbons.

Guidance on the identification of worst-case credible spill scenarios is given in AMSA's Technical Guidelines for Preparing Contingency Plans for Marine and Coastal Facilities (AMSA 2015) and Technical Report on Calculation of Worst-Case Discharge (SPE 2016). These documents were used to identify potential hydrocarbon spill scenarios for the Program activities as detailed in Section 7.13.4 and Table 7-17.

Table 7-17: Loss of containment resulting in a hydrocarbon spill scenario

Scenario	Description	Worst-case release volume and rate
Loss of containment – hazardous substances stored on MODU and vessels	Routine operation of the MODU and vessels includes handling, use and transfer of hydrocarbons and chemicals with the following were identified as potentially leading to a loss of containment event: Use, handling and transfer of hydrocarbons and chemicals on board. Hydraulic line failure from equipment.	Hydraulic line failure and use of hazardous materials onboard are associated with small volume spill events – with the maximum volume based upon the loss of an intermediate bulk container ~1 m^3.
Loss of containment – marine diesel oil (MDO)	Collision between a Beach contracted vessel and a third-party vessel. Marine diesel oil is used in offshore vessels. During Program activities, an accidental release of fuel may occur. A collision between vessels has the potential to result in a spill of fuel. Marine diesel oil is also used for power generation in the MODU and project support vessels. The following events have the potential to result in a spill of fuel: a collision between a project support vessel and the MODU or third-party vessel. MODU refuelling incident. A vessel collision typically occurs as a result of: mechanical failure/loss of DP navigational error, or foundering due to weather. Grounding is not considered credible due to the water depths (approximately 70 m) and absence	Based on the expected vessels, the largest externally exposed fuel tank size is 603.7 m^3.

Scenario	Description	Worst-case release volume and rate
	of submerged features in the Operational Area.	
Loss of containment –loss of well control (LOWC) condensate	Loss of containment as a result of well integrity failure during Program activities. During the Program activities there is a risk of a loss of well control (LOWC) event as a result of: a loss of well integrity resulting from the failure of multiple well control barriers. a prolonged and uncontrolled influx of formation fluid into the well bore (a well kick).	The MODU will only be at one well location at a time therefore the LOWC events below are not concurrent events. The highest potential discharge volume for wells in the northern fields of the Operational Area (VIC/L35) is 69,118 m^3 over 86 days. The highest potential discharge volume for wells in the southern field of the Operational Area at TW1 (T/L2) is 16,308 m^3 over 86 days.
Existing Infrastructure	Not credible (refer below)	
Suspended wells	Not credible (refer below)	

7.13.1.1 Existing Infrastructure

Beach has assessed the potential spill risk to existing Beach subsea infrastructure (flowline or pipeline) during Program activities and did not identify any credible spill risk. A loss of hydrocarbon (condensate) from flowline or pipeline was considered as anchor mooring patterns for Thylacine North 1 and Thylacine West 1 may be located near existing subsea facilities. Loss of containment from a dropped object or anchor drag resulting in damage to existing subsea infrastructure (flowline and pipelines) associated with the Program was considered. These events were identified as not credible based on the implementation of controls and mitigations eliminating the likelihood of loss of containment from existing flowline and pipelines.

Dropped objects, collision, mooring lines and anchor drag are potential causes to the loss of containment from flowline and pipeline scenario. Beach will be employing a list of controls and mitigations including using StevShark Rex anchors or equivalent (which were previously used in Otway Phase 4 campaign) with no records of anchor slippage. A similar design will be adopted in OGV supported by anchor holding analysis. Mooring system design to mitigate the possibility and consequence of for subsea asset damage in the event of potential line failure by utilising fibre rope and subsurface buoyancies. Pre-laying will be done outside of the exclusion zone, positioning and control with pre-lay vessels. MODU Anchor Release (RAR) system will also be used and activated to allow releasing of the MODU from the moorings should there be an imminent danger to the subsea facilities in event of mooring system failure. The RAR system will be validated as part of the MODU Safety Case Revision. With the above controls and mitigations the likelihood of loss of containment from the flowline and pipeline scenario is assessed to be not credible.

The pipeline loss of containment scenario was not used as the chances of this scenario occurring is reduced to not credible with the above controls and mitigations. Further assessments will be completed as part of the relevant safety cases, including MODU, pipeline and/or operations safety cases for facilities.

7.13.2 Extent and Duration of Aspect

MODU and Vessel operations	
Extent	Maximum extent of hydrocarbon exposure to surface, in-water and shoreline exposure thresholds is called the Planning Area (Table 6-1), based on a combination of marine diesel and condensate loss of containment scenarios.
Duration	86 days based on the time to take to drill a relief well.

7.13.3 Predicted Environmental Impacts

The known and potential environmental impacts of a hydrocarbon spill are:

- Change in water quality.

As a result of a change in water quality, further impacts may occur, which include:

- Injury / mortality to fauna.
- Change in fauna behaviour.
- Change in ecosystem dynamics.
- Changes to the conservation, socio-economic and cultural values and sensitivities.

7.13.4 Hydrocarbon Spill Modelling

Beach commissioned RPS Australia West Pty Ltd (RPS) to conduct quantitative spill modelling for a loss of diesel from a vessel collision and loss of containment (condensate) from Thylacine West 1 and Doris 1 (represented as TW1 and 'northern release location', respectively) (Appendix M). These two locations were selected as representative locations based on closest proximity to receptors, metocean conditions and loss of containment volume to ensure that the spill locations were representative of the potential spill scenarios, volumes, and the Operational Area where the Program activities will occur.

Table 7-19 details the volumes and location modelled and reasoning for the location selection. Figure 7-10 shows the oil spill modelling locations.

The quantitative spill modelling assessment was undertaken for two distinct periods, defined by the unique prevailing wind and general current conditions: summer (November–March) and winter (April–October).

For the condensate LOWC scenarios, Beach has a high degree of confidence in the estimated release rates and timing used for the modelling as they are based on known reservoir properties and flow rates. Release rates and volumes are based on a total loss of containment which assumes the failure of multiple control systems. The modelled duration of 86 days represents the time determined to implement a full dynamic well kill via the drilling of a relief well at any of the well locations. Thylacine fluid composition was used as a conservative analogue for the LOWC scenarios. The release duration represents the time estimated to implement a full dynamic well kill through the drilling of a relief well. This is considered the worst-case scenario for potential gas condensate releases and therefore yields the largest spatial extent that could possibly occur from the Program.

For the MDO scenarios, the surface release represents a loss of inventory from the largest fuel tank on a support vessel due to a hypothetical vessel collision incident and aligns with the methodology recommended in the AMSA Technical guidelines for preparing contingency plans for marine and coastal facilities (AMSA 2015).

7.13.4.1 Hydrocarbon Characteristics

Beach produces gas from the Thylacine field in the Otway Basin and has comprehensive data on its hydrocarbon characteristics. The hydrocarbon characteristics used for the quantitative spill modelling conducted by RPS are detailed in Table 7-18.

All offshore fields in the greater Shipwreck Trough area of the Otway Basin belong to the Austral 2 Petroleum System (Mehin and Link 1994; Foster and Hodgson 1995; Luxton et al 1995; Boreham et al. 2004), consisting of Thylacine Member, Flaxman Formation, and Waarre Formation reservoirs charged by the regionally extensive marine shales, organic-rich mudstones and coals of the underlying Eumeralla Formation source rock (Edwards et al. 1999; Boreham et al. 2004; O'Brien et al. 2009). Based on burial history modelling and geochemical data, this source rock is interpreted as gas/condensate-prone, also evidenced in multiple discoveries across the Otway Basin. As a consequence of all fields in the region being charged from the same source, significant variations in condensate properties are not expected.

An assessment of offset field data from the currently producing Thylacine and Geographe Fields (operated by Beach, with first production in 2007) was made to inform input parameters for spill modelling. Thylacine Field condensate properties are used as the primary analogue, with the exception of the Condensate Gas Ratio (CGR) which is taken from the Geographe Field. The Geographe Field CGR, which features the highest CGR of the Otway wells (16 bbl/MMscf), is used for modelling as it represents the largest potential condensate discharge and therefore worst-case scenario. In addition to the assessment of offset field data from the producing Thylacine and Geographe Fields, well data from Artisan 1 (drilled 2021) and La Bella 1 (drilled 1993) was also assessed to inform hydrocarbon spill modelling. As Artisan 1 and La Bella 1 have not been connected and produced to date, relevant geotechnical data that may be used to inform spill modelling is restricted to downhole MDT sampling undertaken at the time of drilling. As these downhole samples are typically small in volume (further reduced by the low CGR observed in the wells), condensate assay analysis was not undertaken, with compositional information only sufficient to indicate that upon production the CGR in Artisan 1 and La Bella 1 will be lower than that observed in the Thylacine and Geographe Fields. Therefore, the hydrocarbon characteristics for spill modelling are best represented by Thylacine condensate properties with Geographe CGR.

The Thylacine condensate hydrocarbon characteristics are used for the quantitative spill modelling. Beach commissioned RPS to conduct quantitative spill modelling for the vessel collision and loss of well control spill scenarios (RPS 2024).

Thylacine condensate has an API of 44.3 and a density of 804.6 kg/m3 (at 15ºC) with a viscosity value (0.875cP) classifying it as a Group I (not-persistent) oil according to the International Tankers Owners Pollution Federation (ITOPF 2020) and US EPA/USCG classifications.

The condensate is a mixture of volatile and persistent hydrocarbons with high proportions of volatile and semi- to low-volatile components. In favourable evaporation conditions, 64.0% of the oil mass should evaporate within the first 12 hours (BP < 180°C), a further 19.0% is expected to evaporate within the first 24 hours (180°C < BP < 265°C) and a further 16.0% should evaporate over several days (265°C < BP < 380°C). Approximately 1.0% of the condensate is shown to be persistent.

MDO has an API of 37.6 and a density of 829.1 kg/m3 (at 25ºC) with a viscosity value (4.0 cP) classifying it as a Group II (light-persistent) oil according to the International Tankers Owners Pollution Federation (ITOPF 2014) and US EPA/USCG classifications.

The MDO is a mixture of volatile and persistent hydrocarbons with high proportions of volatile and semi- to low-volatile components. In favourable evaporation conditions, about 6.0% of the oil mass should evaporate within the first 12 hours (BP < 180°C); a further 34.6% should evaporate within the first 24 hours (180°C < BP < 265°C); and a further 54.4% should evaporate over several days (265°C < BP < 380°C). Approximately 5.0% of the oil is shown to be persistent.

Table 7-18: Hydrocarbon characteristics of the hydrocarbons modelled for the Program

Hydrocarbon Type	**API**	**Density (kg/m^3)**	**Viscosity (cP)**	**Pour Point (°C)**	**Wax Content (%)**
Thylacine Condensate	44.3	804.6 at 15ºC	0.875 at 15ºC	-50	<1%
Marine Diesel Oil	37.6	829.1 at 15ºC	4.0 at 25ºC	-14	1

Table 7-19: Assessed hydrocarbon release locations

Location	Latitude	Longitude	Water depth (m)	Hydrocarbon Type	Volume (m^3)	Release Duration	Reasoning	Report
Loss of well containment – gas and condensate								
Northern Release Location	38.8552° S	142.8381° E	71.5	Condensate	69,118	86 days	Represents Doris 1, the well located closest to Victorian shoreline. Largest flow rate for Vic/P43 and Vic/P73 wells. Worse case for impacts to Victoria.	RPS 2024
TW1	39.2223° S	142.8386° E	105	Condensate	16,308	86 days	Represents Thylacine West 1, the well located closest to Tasmanian shoreline i.e., King Island. Largest flow rate for T/L2 wells. Worse case for impacts to Tasmania and King Island.	RPS 2024
Vessel Collision -Marine Diesel Oil (MDO) spill								
Northern Release Location	38.8552° S	142.8381° E	N/A	MDO	603.7	6 hours	Furthest northern proposed well location. Largest flow rate for Vic/P43 and Vic/P73 wells. Worse case for impacts to Victoria.	RPS 2024
TW1	39.2223° S	142.8386° E	N/A	MDO	603.7	6 hours	Furthest southern proposed well location. Largest flow rate for T/L2 wells. Worse case for impacts to Tasmania and King Island.	RPS 2024

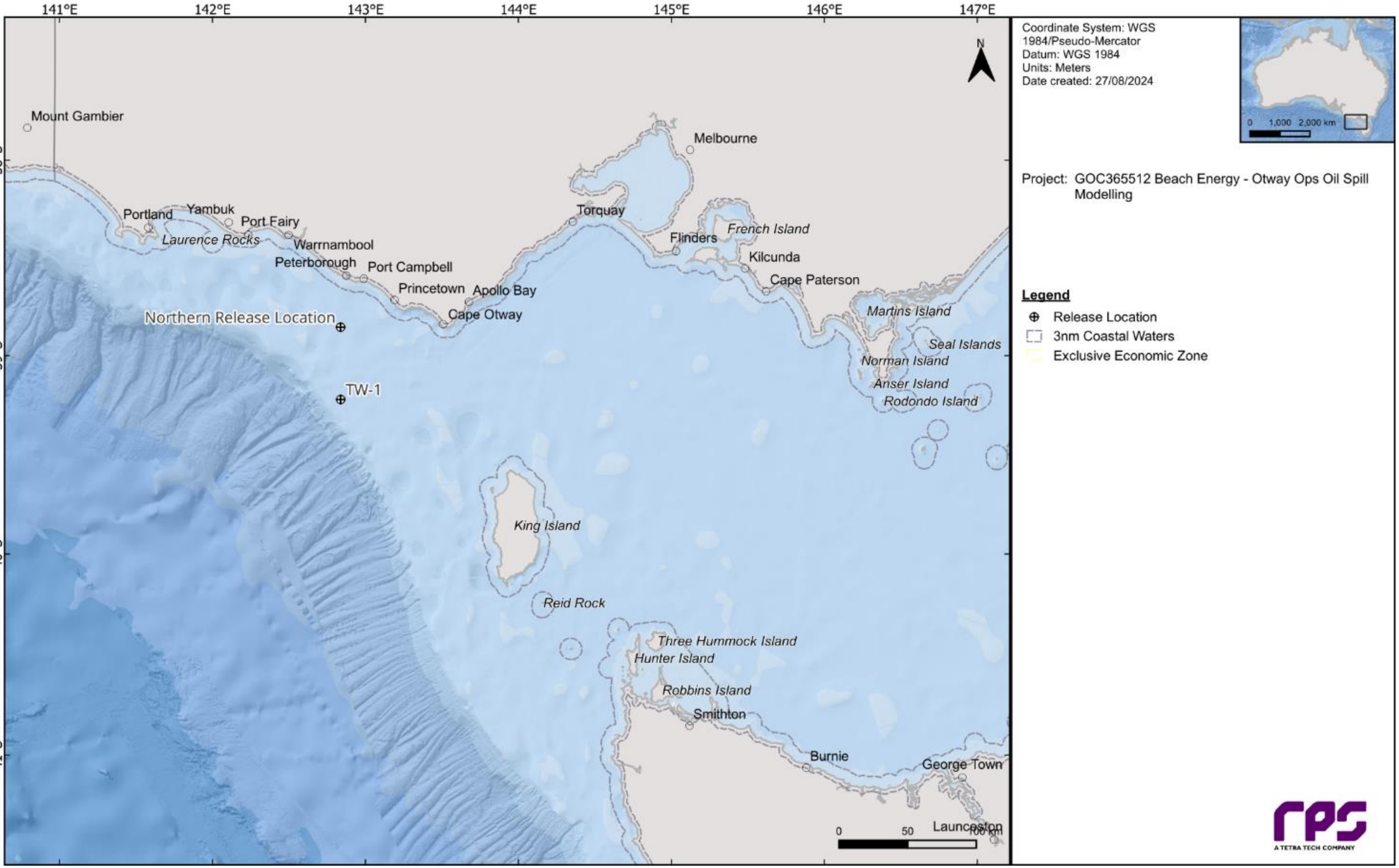


Figure 7-10: Oil spill modelling locations (RPS 2024)

7.13.4.2 Hydrocarbon Exposure Thresholds

A basic foundation for meaningful oil spill modelling is the selection of appropriate oil exposure thresholds. These thresholds are used to interpret the oil spill modelling and inform the risk evaluation, spill response and oil spill monitoring.

The hydrocarbon exposure thresholds used for the spill modelling are based on the NOPSEMA Bulletin: Oil Spill Modelling (NOPSEMA 2019) and are detailed in Table 7-20. Further information on the thresholds is provided in the spill modelling reports (Appendix M).

The following thresholds have been used to:

Predict potential hydrocarbon exposure at conservative (low exposure) concentrations to develop the Planning Area which is used to inform the description of the environment (Section 6) and Offshore and Scientific Monitoring Plan l (OSMP) (Section 8.4.3 and OSMP). Figure 6-1 details the Planning Area.

Inform the oil spill impact and risk evaluation based on the area that may be affected (Section 7.13.5).

Inform oil spill response planning (Section 7.14 and OPEP) based on the actionable thresholds of:

Surface moderate exposure (50 g/m^2).

Shoreline moderate exposure (100 g/m^2).

The Spill Response Planning Areas are detailed in Figure 7-11 for diesel and Figure 7-12 for condensate.

Table 7-20: Hydrocarbon exposure thresholds

	Threshold	Description
Surface		
Low exposure	1 g/m^2	Approximates range of socioeconomic effects and establishes planning area for scientific monitoring.
Moderate exposure	10 g/m^2	Approximates lower limit for harmful exposures to birds and marine mammals.
High exposure	50 g/m^2	Approximates surface oil slick and informs response plan.
Shoreline		
Low exposure	10 g/m^2	Predicts potential for some socio-economic impact.
Moderate exposure	100 g/m^2	Loading predicts area likely to require clean-up effort.
High exposure	1000 g/m^2	Loading predicts area likely to require intensive clean-up effort.
In water (Dissolved)		
Low exposure	10 ppb	Establishes planning area for scientific monitoring based on potential for exceedance of water quality triggers.
Moderate exposure	50 ppb	Approximates potential toxic effects, particularly sublethal effects to sensitive species.
High exposure	400 ppb	Approximates toxic effects including lethal effects to sensitive species.

	Threshold	Description
In-water (Entrained)		
Low exposure	10 ppb	Establishes planning area for scientific monitoring based on potential for exceedance of water quality triggers.
High	100 ppb	As appropriate given oil characteristics for informing risk evaluation.

7.13.4.3 Extent of Hydrocarbon Exposure – Marine Diesel

Below is a summary of the quantitative spill modelling results conducted by RPS for the worst-case credible loss of marine diesel containment release scenario at the Northern Release Location and TW1. Refer to the RPS Reports in Appendix M for further details.

Northern Release Location

- The maximum distance from the release location to the low (1–10 g/m^2), moderate (10–50 g/m^2) and high (>50 g/m^2) surface exposure thresholds was 32.65 km (ESE), 19.85 km (SE) and 10.53 km (SE), recorded during winter months.
- No State waters were predicted to be exposed to surface hydrocarbons at any threshold.
- No conservation values or sensitivities (Section 6.2) were identified to be exposed to surface hydrocarbons at any threshold.
- The probability of accumulation to any shoreline at, or above, the low level (10 g/m^2) threshold was 31% during summer conditions and 27% during winter conditions.
- The minimum time before shoreline accumulation above the low threshold was 4 days (summer) and 2 days (winter), predicted for Cape Otway West.
- The maximum volume ashore for a single spill trajectory during the summer and winter conditions was 30.86 m^3 and 58.33 m^3, respectively, whilst the maximum length of shoreline accumulation at the low threshold was 29.23 km and 43.19 km, respectively.
- Only the receptors that the Northern Release Location resides within were contacted by dissolved hydrocarbon at the low threshold.
- At the depths of 0-10 m the maximum dissolved hydrocarbon concentration was 101.35 ppb and 65.67 ppb during summer and winter respectively.
- At the depths of 0-10 m, during summer and winter, the maximum entrained concentration at any given receptor was predicted to be 11,343.38 ppb and 11,396.24 ppb, respectively.
- Outside of the receptors that the release location resides within, the maximum entrained hydrocarbon exposure predicted during summer and winter was 745.77 ppb and 1,391.43 ppb, respectively.

TW1 Location

- The maximum distance from the release location to the low (1–10 g/m^2), moderate (10–50 g/m^2) and high (>50 g/m^2) surface exposure thresholds was 64.97 km (SE), 49 km (SE) and 10.08 km (SSE), recorded during winter months.
- No State waters were predicted to be exposed to surface hydrocarbons at any threshold.
- No conservation values or sensitivities (Section 6.2) were identified to be exposed to surface hydrocarbons at any threshold.
- The probability of accumulation to any shoreline at, or above, the low level (10 g/m^2) threshold was 9% during winter conditions. No shoreline accumulation was predicted during summer conditions at any threshold.
- The minimum time before shoreline accumulation above the low threshold was 15.02 days, predicted for King Island Council.
- The maximum volume ashore for a single spill trajectory during winter conditions was 9.67 m^3, whilst the maximum length of shoreline accumulation at the low threshold was 17.67 km.
- At the depths of 0-10 m, during the summer and winter conditions the maximum dissolved hydrocarbon concentration was 67.28 ppb and 73.23 ppb during summer and winter, respectively. Outside of the receptors that the release location resides within, the maximum dissolved hydrocarbon exposure during summer and winter was 23.94 ppb and 23.23 ppb, respectively.
- At the depths of 0-10 m, during summer and winter, the maximum entrained concentration at any given receptor was predicted to be 7,505.14 ppb and 7,419.26 ppb, respectively. Outside of the receptors that the release location resides within, the maximum entrained hydrocarbon exposure during summer and winter was 2,776.45 ppb and 1,760.94 ppb, respectively.

7.13.4.4 Extent of Hydrocarbon Exposure - Condensate

Northern Release Location

- The maximum distance from the low (1–10 g/m^2) and moderate (10–50 g/m^2) surface exposure zones was 54.03 km (E) and 5.83 km (ESE), recorded during winter months. No contact was predicted for the high threshold (>50 g/m^2).
- Victorian State waters were predicted to be exposed to surface hydrocarbons at low surface exposure thresholds at a low probability of 3% only during winter conditions.
- No conservation values or sensitivities (Section 6.2) were identified to be exposed to surface hydrocarbons at any threshold.
- The probability of accumulation to any shoreline at, or above, the low level (10 g/m^2) threshold was 99% during summer conditions and 96% during winter conditions. The minimum time before shoreline accumulation at or above the low threshold was 5.7 days (summer) and 3.7 days (winter), predicted for Cape Otway West.

- The maximum volume ashore for a single spill trajectory during the summer and winter conditions was 67.91 m^3 and 87.54 m^3, respectively, whilst the maximum length of shoreline accumulation at the low threshold was 104.17 km and 114.39 km, respectively.

- At the depths of 0-10 m, during the summer and winter conditions the maximum dissolved hydrocarbon concentration was 742.67 ppb and 1,332.51 ppb during summer and winter, respectively. Outside of the receptors that the release location resides within, the maximum dissolved hydrocarbon exposure during summer and winter was 570.15 ppb and 1,332.51 ppb, respectively.

- At the depths of 0-10 m, during summer and winter, the maximum entrained concentration at any given receptor was predicted to be 3,246.16 ppb and 3,192.69 ppb, respectively. Outside of the receptors that the release location resides within, the maximum entrained hydrocarbon exposure during summer and winter was 358.93 ppb and 527.26 ppb, respectively.

TW1 Location

- The maximum distance from the low threshold (1–10 g/m^2) surface exposure zones was 24.49 km (SE) and 18.35 km (S) during summer and winter conditions, respectively. No contact was predicted for the moderate (10–50 g/m2) or high thresholds (>50 g/m^2).

- No State waters were predicted to be exposed to surface oil.

- No conservation values or sensitivities (Section 6.2) were identified to be exposed to surface oil at the low threshold or above.

- The probability of accumulation to any shoreline at, or above, the low level (10 g/m^2) threshold was 32% during summer conditions and 57% during winter conditions. The minimum time before shoreline accumulation at or above the low threshold was 25.38 days (summer) and 21.93 days (winter), predicted for King Island Council.

- The maximum volume ashore for a single spill trajectory during the summer and winter conditions was 6.15 m^3 and 8.36 m^3, respectively, whilst the maximum length of shoreline accumulation at the low threshold was 12.62 km and 13.90 km, respectively.

- At the depths of 0-10 m, during the summer and winter conditions the maximum dissolved hydrocarbon concentration was 770.64 ppb and 1,280.79 ppb during summer and winter, respectively. Outside of the receptors that the release location resides within, the maximum dissolved hydrocarbon exposure during summer and winter was 553.15 ppb and 528.54 ppb, respectively.

- At the depths of 0-10 m, during summer and winter, the maximum entrained concentration at any given receptor was predicted to be 1,111.04 ppb and 1,179.85 ppb, respectively. Outside of the receptors that the release location resides within, the maximum entrained hydrocarbon exposure during summer and winter was 338.67 ppb and 328.89 ppb, respectively.

7.13.5 Predicted Level of Risk

The potential environmental impacts to receptors from hydrocarbon exposure from a loss of containment of condensate and marine diesel are discussed in the following sections.

7.13.5.1 Benthic Habitats

7.13.5.1.1 Macroalgae

Macroalgae	
Predicted Hydrocarbon Exposure	✘ **Surface** ✔ **In-water** ✘ **Shoreline**
Relevant Exposure Thresholds	**Moderate Exposure Thresholds (Dissolved)** **High Exposure Thresholds (Entrained)**
Condensate	**MDO**
Macroalgae communities may be present within the area exposed to in-water hydrocarbons at moderate (dissolved) and high (entrained) thresholds following a LOWC of condensate (RPS 2024). Dissolved hydrocarbons in the upper 0 – 10 m of the water column at the moderate threshold (50 ppb) that could impact algae found within Victorian waters where waters may be shallower than 10 m. Entrained hydrocarbons in the upper 0 – 10 m of the water column at the high threshold (100 ppb) that could impact algae are not predicted in Tasmanian waters or Victorian waters where waters may be shallower than 10 m.	Macroalgae communities may be present within the area exposed to in-water hydrocarbons at moderate (dissolved) and high (entrained) thresholds following a vessel LOC of MDO. In-water exposure (dissolved and entrained hydrocarbons) is only predicted to occur within the 0 -10 m of the water column. Dissolved hydrocarbons in the upper 0–10 m of the water column at the moderate threshold (50 ppb) could impact algae found within Victorian waters where waters may be shallower than 10 m. Entrained hydrocarbons in the upper 0–10 m of the water column at the moderate threshold (50 ppb) could impact algae found within Victorian waters to the west of Cape Otway where waters may be shallower than 10 m. The potential exposure area for MDO is located entirely within the potential exposure area for condensate LOWC (RPS 2024) thus the impact assessment is based on the larger condensate area of exposure.
Predicted Environmental Impact	
In-water	
In-water exposure (entrained and dissolved) at the relevant exposure thresholds is only predicted to occur within the upper 0 – 10 m of the water column; therefore, benthic habitats, such as macroalgae, only have the potential to be exposed within intertidal or shallow nearshore waters. Intertidal macroalgal beds are more prone to oil spills than subtidal beds because, although the mucous coating of the macroalgae prevents oil adherence, oil that is trapped in the upper canopy may be more persistent, which impacts site-attached species. Additionally, when oil sticks to dry fronds on the shore, they can become heavy and break as a result of wave action (IPIECA 2002). The physical effects of smothering, fouling and asphyxiation has been documented from oil contamination in marine plants (Blumer 1971, Cintron et al. 1981). In macroalgae, oil can act as a physical barrier for the diffusion of CO_2 across cell walls (O'Brien and Dixon 1976). The effect of hydrocarbons, however, is largely dependent on the degree of	

Macroalgae
direct exposure and how much of the hydrocarbon adheres to algae, which will vary depending on the oils physical state and relative ‘stickiness’. The morphological features of macroalgae, such as the presence of a mucilage layer or the presence of fine ‘hairs’ will influence the amount of hydrocarbon that will adhere to the algae. A review of field studies conducted after spill events by Connell et al. (1981) indicated a high degree of variability in the level of impact, but in all instances, the algae appeared to be able to recover rapidly from even very heavy oiling. The rapid recovery of algae was attributed to the fact that for most algae, new growth is produced from near the base of the plant while the distal parts (which would be exposed to the oil contamination) are continually lost. Other studies have indicated that kelp beds oiled by crude oil had a 90% recovery within 3-4 years of impact, however full recovery to pre-spill diversity may not occur for long periods after the spill (French- McCay 2004). The toxicity of hydrocarbons to macroalgae varies for the different macroalgal life stages, with water-soluble hydrocarbons more toxic (Van Overbeek and Blondeau 1954, Kauss et al. 1973; cited in O'Brien and Dixon 1976). Toxic effect concentrations for hydrocarbons and algae have varied greatly among species and studies, ranging 0.002–10,000 ppm (Lewis and Pryor 2013). The sensitivity of gametes, larva and zygote stages, however, have all proven more responsive to oil exposure than adult growth stages (Thursby and Steele 2004; Lewis and Pryor 2013). Experiments verified the susceptibility of *Nereocystis luetkeana* (bull kelp – north America) tissue to the direct exposure to several petroleum types. Antrim et al (1995) showed that petroleum treatments resulted in visible tissue damage, with a distinct bleached line being the most visible indication of plant contact with the petroleum. Moderate to heavy colour loss, which was generally followed by rapid decay of tissue, was most pronounced in 24 h exposures to unweathered and weathered diesel. The study did not look at how this would affect the productivity of bull kelp. Entrained hydrocarbon within the water column can also affect light qualities and the ability of macrophytes, including seagrasses and macroalgae, to photosynthesise.
Predicted Level of Impact
Based on the extent and duration of potential exposure, predicted level of impact is based on the condensate LOWC scenarios. The potential impacts detailed above are typically based on oils of a heavier nature than condensate and diesel that are less likely to smother or adhere to macroalgae. In addition, entrained or dissolved hydrocarbons are not predicted in Tasmanian waters or Victorian waters where waters may be shallower than 10 m. Given the restricted range of exposure (shallow nearshore and intertidal waters only), the predicted presence of hydrocarbons at relevant exposure thresholds expected to be in these waters, the anticipated weathering on the condensate (modelling predicted hours after the spill, 22.1% of the oil mass is forecast to have entrained and a further 69.4% is forecast to have evaporated, depending on the wind conditions (RPS 2024)), any impact to macroalgae is not expected to result in long-term or irreversible damage. Consequently, the potential consequence to macroalgae from hydrocarbon exposure at relevant thresholds is considered to be **Minor (1)** as they could be expected to result in minor, short-term damage not affecting ecosystem function.

7.13.5.1.2 Seagrass

Seagrass			
Predicted Hydrocarbon Exposure	✘ **Surface**	✓ **In-water**	✘ **Shoreline**

Seagrass	
Relevant Exposure Thresholds	**Low Exposure Thresholds (Dissolved)** **Low and Moderate Exposure Thresholds (Entrained)**
Condensate	**MDO**
In-water exposure (dissolved or entrained) is only predicted to occur within the upper 0 – 10 m of the water column; therefore, benthic habitat within intertidal or shallow nearshore waters has the potential to be exposed. Note that the greater wave action and water column mixing within the nearshore environment will also result in rapid weathering of the condensate. Seagrass may be present within the area predicted to be exposed to in-water hydrocarbons (e.g. seagrass is known to occur within Twelve Apostles Marine Park, and areas around Warrnambool) Exposure in nearshore and intertidal areas is predicted to only be at a low threshold (10 ppb) for dissolved and entrained hydrocarbons (RPS 2024).	Seagrass may be present within the area predicted to be exposed to in-water hydrocarbons as seagrass is known to occur within Twelve Apostles Marine Park which has the potential to be exposure to entrained hydrocarbons at the moderate threshold (500 ppb). The potential exposure area for MDO is located entirely within the potential exposure area for condensate LOWC (RPS 2024).
Predicted Environmental Impact	
In-water	
In-water exposure (dissolved or entrained) at the relevant exposure thresholds is only predicted to occur within the upper 0–10 m of the water column; therefore, benthic habitat, such as seagrass, only have the potential to be exposure within intertidal or shallow nearshore waters. Intertidal and subtidal seagrass ecosystems can be damaged in a number of ways. Direct mortality from smothering can occur, however, sub-lethal impacts from smothering are more likely to occur than lethal impacts because much of seagrasses' biomass is underground in their rhizomes and less likely to be exposed to hydrocarbons (Zieman et al. 1984). However, exposure also can take place via uptake of hydrocarbons through plant membranes and seeds may be affected by contact with oil contained within sediments (NRDA 2012). Petroleum fractions absorbed into the seagrass tissues, can also lower the organism's tolerance to other stressors and reduce growth rates (Zieman et al. 1984) (Runcie et al. 2010). Studies of offshore benthic seaweeds in the northwest Gulf of Mexico prior to and after the Macondo well blowout at Sackett and Ewing banks (in water depths of 55–75 m) found a dramatic die-off of seaweeds after the spill (60 species pre-spill compared with 10 species post-spill) (Felder et al. 2014). However, these banks are exposed to influences from Mississippi River discharges that vary year to year, so definitive links to the oil spill were not possible. Petroleum residues were observed on Ewing Bank and it is possible that this may have caused localised mortalities. Entrained hydrocarbon within the water column can affect light qualities and the ability of macrophytes, including seagrasses and macroalgae, to photosynthesise.	
Predicted Level of Impact	
Given the restricted range of exposure (shallow nearshore and intertidal waters only) and the predicted low concentrations of hydrocarbons predicted in these waters, any impact to seagrass is not expected to result in long-term or irreversible damage.	

Seagrass
Consequently, the potential consequence to seagrass are considered to be **Moderate (2),** as they could be expected to result in localised minor short-term impacts to habitat of recognised conservation value.

7.13.5.1.3 Soft Corals

Soft Corals	
Predicted Hydrocarbon Exposure	✘ **Surface** ✓ **In-water** ✘ **Shoreline**
Relevant Exposure Thresholds	**Low Exposure Thresholds (Dissolved)** **Low Exposure Thresholds (Entrained)**
Condensate	**MDO**
Corals do not occur as a dominant habitat type within the planning area, however their presence has been recorded around areas such as Wilsons Promontory National Park and Cape Otway where low threshold (10 ppb) concentrations of dissolved or entrained hydrocarbons are predicted.	Corals do not occur as a dominant habitat type within the Planning Area. However, their presence has been recorded around areas such as Twelve Apostles Marine Park and Cape Otway where low threshold (10 ppb) concentrations of entrained hydrocarbons are predicted to be reached (RPS 2024).
Predicted Environmental Impact	
In-water	
Exposure of entrained hydrocarbons to shallow subtidal corals has the potential to result in lethal or sublethal toxic effects, resulting in acute impacts or death at moderate to high exposure thresholds (Shigenaka, 2001). Contact with corals may lead to reduced growth rates, tissue decomposition, and poor resistance and mortality of sections of reef (NOAA, 2010).	
Predicted Level of Impact	
Based on the extent and duration of potential exposure, predicted level of impact is based on the condensate LOWC scenarios. Given the lack of coral reef formations, and the sporadic cover of hard or soft corals in mixed nearshore reef communities along the Otway coast, such impacts are considered to be limited to isolated corals. Also, only low exposure thresholds (10 ppb) are predicted at known coral habitat sites. Consequently, the potential consequence to algae are considered to be **Minor (1)**, as they could be expected to result in localised low-level impacts.	

7.13.5.1.4 Mangroves

Mangroves	
Predicted Hydrocarbon Exposure	**✓ Surface ✓ In-water ✓ Shoreline**
Relevant Exposure Thresholds	**In-water: Moderate Exposure Threshold (Dissolved) and High Exposure Threshold (Entrained)**
Condensate	**MDO**
Mangroves are not a dominant habitat found within the area potentially exposed to hydrocarbons at relevant exposure thresholds. The mangroves found within this south-east region are the most southerly extent of mangroves found in the world. The mangroves within Victoria are located mostly along sheltered sections of the coast within inlets or bays, such as Western Port and Corner Inlet. Small patches of mangroves have been mapped within the Planning Area at the Erskine River (see Section 6.4.4). Dissolved hydrocarbons in the upper 0 – 10 m of the water column at the moderate threshold (50 ppb) that could impact algae found within Victorian waters where waters may be shallower than 10 m. Entrained hydrocarbons in the upper 0 – 10 m of the water column at the high threshold (100 ppb) that could impact algae are not predicted in Tasmanian waters or Victorian waters where waters may be shallower than 10 m. No exposure of shoreline hydrocarbons at the high threshold (100 ppb) is predicted from either to extend only 1 km from the release location. No State waters were predicted to be exposed to surface hydrocarbons at any threshold (RPS 2024).	In-water exposure (dissolved and entrained hydrocarbons) is only predicted to occur within the 0 -10 m of the water column. Dissolved hydrocarbons in the upper 0–10 m of the water column at the moderate threshold (50 ppb) could impact mangroves. Entrained hydrocarbons in the upper 0–10 m of the water column at the moderate threshold (50 ppb) could impact mangroves found within Victorian waters to the west of Cape Otway where waters may be shallower than 10 m. No State waters were predicted to be exposed to surface hydrocarbons at any threshold. The potential exposure area for MDO is located entirely within the potential exposure area for condensate LOWC (RPS 2024).

Predicted Environmental Impact		
Surface	**In-water**	**Shoreline**
Mangroves are considered to have a high sensitivity to hydrocarbon exposure. Mangroves can be killed by heavy or viscous oil, or emulsification, that covers the trees' breathing pores thereby asphyxiating the subsurface roots, which depend on the pores for oxygen. Mangroves can also take up in-water hydrocarbons from contact with leaves, roots or	The change in toxicity levels within the marine environment can penetrate the root surfaces, via the respiratory capabilities of the roots, poisoning the plant. Acute impacts to mangroves can be observed within weeks of exposure, whereas chronic impacts may day months to years to detect.	Hydrocarbon can enter mangrove forests when the tide is high and be deposited on the aerial roots and sediment surface as the tide recedes. This process commonly leads to a patchy distribution of the oil and its effects because different places within the forests are at different tidal heights (IPIECA 1993, NOAA 2014).

Mangroves	
sediments, and it is suspected that this uptake causes defoliation through leaf damage and tree death (Wardrop et al. 1987).	The physical smothering of aerial roots by standard hydrocarbons can block the trees' breathing pores used for oxygen intake and result in the asphyxiation of sub-surface roots (International Petroleum Industry Environmental Conservation Association (IPIECA 1993).
Predicted Level of Impact	
Based on the extent and duration of potential exposure, predicted level of impact is based on the condensate LOWC scenarios. There are only a few isolated mangroves communities that may be exposed to hydrocarbons. Given the non-persistent nature of the hydrocarbon there is expected to be minimal impact from smothering of aerial roots or seedlings. However, if the residual oil does melt, some impact to the root systems and seedlings may occur. Consequently, the potential consequences to mangroves exposed to hydrocarbons is considered to be **Moderate (2)**, as they could be expected to result in minor, short-term damage not affecting ecosystem function.	

7.13.5.1.5 Saltmarsh

Saltmarsh	
Predicted Hydrocarbon Exposure	✘ **Surface** ✓ **In-water** ✘ **Shoreline**
Relevant Hydrocarbon Exposure	**Low and Moderate Exposure Thresholds (Shoreline)**
Condensate	
The modelling predicts potential shoreline exposure at the low (10 g/m^2), and some isolated moderate (100 g/m^2), thresholds where saltmarsh communities and the Assemblages of species associated with open-coast salt-wedge estuaries of western and central Victoria ecological community and Subtropical and Temperate Coastal Saltmarsh Threatened Ecological Communities may be present.	
Predicted Environmental Impact	
Shoreline	
Saltmarsh is considered to have a high sensitivity to hydrocarbon exposure. Hydrocarbon (in liquid form) will readily adhere to the marshes, coating the stems from tidal height to sediment surface. However, heavy oil coating is unlikely due to the highly volatile nature of the condensate hydrocarbon. Oil can enter saltmarsh systems during the tidal cycles if the estuary/inlet is open to the ocean. Saltmarsh vegetation offers a large surface area for oil absorption and tends to trap oil. Similar to mangroves, this can lead to a patchy distribution of the oil and its effects, because different places within the inlets are at different tidal heights.	

Saltmarsh
Evidence from case histories and experiments shows that the damage resulting from oiling, and recovery times of oiled marsh vegetation, are highly variable. In areas of light to moderate oiling where oil is mainly on perennial vegetation with little penetration of sediment, the shoots of the plants may be killed but recovery can be relatively rapid, occurring the following growing season or earlier. However, when oil penetrates the soil and the initial mortality of the vegetation is extensive, recovery to reference conditions may take 3–4 years (Hester and Mendelssohn 2000).
Predicted Level of Impact
Consequently, the potential consequences to saltmarsh exposed to shoreline hydrocarbons is considered to be **Moderate (2)**, as they could be expected to be short-term and localised.

7.13.5.2 Marine Fauna

7.13.5.2.1 Plankton

Plankton	
Predicted Hydrocarbon Exposure	✓ **Surface** ✓ **In-water** ✘ **Shoreline**
Relevant Exposure Thresholds	**In-water: Moderate Exposure Threshold (Dissolved)** **High Exposure Threshold (Entrained)**
Condensate	**MDO**
Plankton (phytoplankton and zooplankton) are found in nearshore and open waters beneath the surface and form the basis for the marine food web. These organisms migrate vertically through the water column to feed in surface waters at night and, when doing so, may be exposed to surface hydrocarbons, however, to a greater extent, hydrocarbons dissolved or entrained in the water column (NRDA 2012). Plankton species are known to be sensitive to the toxic effects of oil at relatively low concentrations and large numbers of planktonic organisms may be affected in the event of a spill event (ITOPF 2014). Plankton risk exposure through ingestion, inhalation and dermal contact. Plankton are likely to be exposed to in-water hydrocarbons within the upper 0 – 10 m of the water column. Effects will be greatest in the area close to the spill source where hydrocarbon concentrations are likely to be highest.	Plankton are likely to be exposed to in-water hydrocarbons. Effects will be greatest in the upper 10 m of the water column and areas close to the spill source where hydrocarbon concentrations are likely to be highest. The potential exposure area for MDO is located entirely within the potential exposure area for condensate LOWC (RPS 2024).

Plankton	
Predicted Environmental Impact	
Surface	**In-water**
Phytoplankton (photosynthetic organisms) can accumulate rapidly, due to their small size and high surface area to volume ratio, therefore populations are typically not sensitive to the impacts of oil (Hook et al. 2016). However, if phytoplankton are exposed to hydrocarbons at the sea surface, their ability to photosynthesise via smothering may be directly affected and would have implications for the next trophic level in the food chain (e.g., small fish) (Hook et al. 2016). In addition, the presence of surface hydrocarbons may result in a reduction of light penetrating the water column, which may again affect the rate of photosynthesis, particularly in instances where there is prolonged presence of surface hydrocarbons over an extensive area. A reduction in the rate of photosynthesis may inhibit growth, depending on the concentration range. For example, photosynthesis is stimulated by low concentrations of oil in the water column (10-30 ppb) but becomes progressively inhibited above 50 ppb. Conversely, photosynthesis can be stimulated below 100 ppb for exposure to weathered oil (Volkman et al. 1994).	Zooplankton (protozoans and animals), such as rotifers, copepods and krill, are vulnerable to hydrocarbons due to their small size and high surface area to volume ratio. Some zooplankton also have high lipid content, which facilitates hydrocarbon uptake and bioaccumulation (Hook et al. 2016). Water column organisms that come into contact with oil risk exposure through ingestion, inhalation and dermal contact (NRDA 2012), which can cause immediate mortality or declines in egg production and hatching rates along with a decline in swimming speeds (Hook et al. 2016). In general, the distribution of zooplankton is closely linked to spatial and temporal patterns in primary production by phytoplankton, which in turn is closely linked to the supply of nutrients and oceanographic processes (Fathom Pacific 2023). Variations in the temporal scale of oceanographic processes therefore are expected to have a greater influence on plankton communities than the direct effect of spilled hydrocarbons. This is because reproduction by survivors or migration from unaffected areas is likely to rapidly replenish any losses from permanent zooplankton (Volkman et al. 1994). Furthermore, the proximity of nutrient-rich seasonal upwelling events which occur within the vicinity will further assist recovery rates. Studies have shown minimal or transient effects on marine plankton (Volkman et al. 1994). Once background water quality conditions have re-established, the plankton community may take weeks to months to recover due to short generation times (ITOPF 2011a), allowing for seasonal influences on the assemblage characteristics.
Predicted Level of Impact	
Plankton are numerous and widespread but do act as the basis for the marine food web, meaning that an oil spill in any one location is unlikely to have long-lasting impacts on plankton populations at a regional level. Once background water quality conditions have re-established, the plankton community may take weeks to months to recover (ITOPF, 2011a), allowing for seasonal influences on the assemblage characteristics. Additionally, with the elevated nutrient loading expected during seasonal upwelling events within the Otway region (November to April), plankton are likely to recover more rapidly than when upwelling of nutrient-rich waters is less prevalent. Consequently, given the limited area exposed by moderate levels of dissolved hydrocarbons, the potential consequence to plankton are considered to be **Minor (1)**, as they could be expected to result in localised low-level short-term and recoverable impacts.	

7.13.5.2.2 Marine Invertebrates

Marine Invertebrates	
Predicted Hydrocarbon Exposure	✘ **Surface** ✓ **In-water** ✘ **Shoreline**
Relevant Exposure Thresholds	**Moderate Exposure Thresholds (Entrained)**
Condensate	**MDO**
In-water invertebrates of value have been identified to include squid, crustaceans (rock lobster, crabs) and molluscs (scallops, abalone). Impact by direct contact of in-water hydrocarbons to benthic species in the deeper areas of potential exposure are not predicted as in-water exposure (dissolved or entrained) is only predicted to occur in the upper 0 – 10 m of the water column. Species located in shallow nearshore or intertidal waters may be exposed to in-water hydrocarbons low thresholds. Several commercial fisheries for marine invertebrates are within the area predicted to be exposed to moderate levels (50 ppb) of entrained in-water hydrocarbons (RPS 2024).	In-water invertebrates of value have been identified to include squid, crustaceans (rock lobster, crabs) and molluscs (scallops, abalone). Impact by direct contact of in-water hydrocarbons to benthic species in the deeper areas of potential exposure are not predicted. Species located in shallow nearshore or intertidal waters may be exposed to in-water hydrocarbons low thresholds. Several commercial fisheries for marine invertebrates are within the area predicted to be exposed to moderate levels (50 ppb) of entrained in-water hydrocarbons. The potential exposure area for MDO is located entirely within the potential exposure area for condensate LOWC (RPS 2024).
Predicted Environmental Impact	
In-water	
The primary modes of exposure for marine invertebrate communities include: Direct exposure to dispersed oil (e.g., physical smothering) from a subsea release of hydrocarbon which remains at the sea floor, Direct exposure to dispersed and non-dispersed oil (e.g., physical smothering) where oil sinks down from higher depths of the ocean, Direct exposure to dispersed and non-dispersed oil dissolved in sea water and/or partitioned onto sediment particles, Indirect exposure to dispersed and non-dispersed oil through the food web (e.g., uptake of oiled plankton, detritus, prey, etc.) (NRDA 2012), and Acute or chronic exposure through surface contact and/or ingestion can result in toxicological risks. Entrained and dissolved hydrocarbons can have negative impacts on marine invertebrates and associated larval forms. Impacts to some adult species (e.g. crustaceans) is reduced as a result of the presence of an exoskeleton, while others with no exoskeleton and larval forms may be more prone to impacts. Exposure to microscopic oil droplets may also impact aquatic biota either mechanically (especially filter feeders) or act as a conduit for exposure to semi-soluble hydrocarbons (that might be taken up by the gills or digestive tract) (French-McCay 2009). Toxicity is primarily attributed to water soluble PAHs, specifically the substituted naphthalene (C2 and C3) as the higher C-ring compounds become insoluble and are not bioavailable.	

Marine Invertebrates
ANZECC (2000) identifies the following 96-hr LC50 concentrations (concentrations that kill 50% of test animals during a 96-hour observation period) for naphthalene (a key PAH dissolved phase toxicant in crude oils): For the bivalve mollusc, *Katelysia opima*, a concentration of 57,000 ppb. For six species of marine crustaceans, a concentration between 850 and 5,700 ppb. If invertebrates are contaminated by hydrocarbons, tissue taint can remain for several months, although taint may eventually be lost. For example, it has been demonstrated that it took 2-5 months for lobsters to lose their taint when exposed to a light hydrocarbon (NOAA 2002). Studies of offshore benthic decapod assemblages (crabs, lobsters, prawns) associated with the seaweeds and benthic substrate in the northwest Gulf of Mexico prior to and after the Macondo well blowout at Sackett and Ewing banks (in water depths of 55–75 m) showed a strong decline in abundance at both banks post-spill (species richness on Ewing Bank reduced by 42% and on Sackett Bank by 29%) (Felder et al. 2014), however, these banks are exposed to influences from Mississippi River discharges that vary year to year, so definitive links to the oil spill were not possible. Petroleum residues were observed on Ewing Bank and it is possible that this may have caused localised mortalities, reduced fecundity of surviving female decapods and/or reduced recruitment (Felder et al. 2014). Felder et al. (2014) also notes that freshly caught soft-sediment decapod samples caught in early and mid-2011 near the spill site exhibited lesions that were severe enough to cause appendage loss and mortality. Other possible impacts from the presence of dispersed and non-dispersed oil include effects of oxygen depletion in bottom waters due to bacterial metabolism of oil (and/or dispersants), and light deprivation under surface oil (NRDA 2012). Water quality in benthic habitats exposed to entrained hydrocarbons would be expected to return to background conditions within weeks to months of contact. Several studies have indicated that rapid recovery rates may occur even in cases of heavy oiling (National Academies Press 2003).
Predicted Level of Impact
Acute or chronic exposure through contact and/or ingestion can result in toxicological risks. Larval or juvenile forms of invertebrates may be more prone to impacts (Suchanek, 1993). Localised impacts to larval stages may occur which could impact on population recruitment that year. Tainting of recreation or commercial species is considered unlikely to occur given exposure is limited to entrained hydrocarbons, however if it did it is expected to be localised and low level with recovery expected. Consequently, the potential consequence to invertebrates, including commercially fished invertebrates are considered to be **Moderate (2)** as they could be expected to result in localised short-term impacts to species of value.

7.13.5.2.3 Fish

Fish			
Predicted Hydrocarbon Exposure	✘ **Surface**	✓ **In-water**	✘ **Shoreline**

Fish	
Relevant Exposure Thresholds	**In-water: High Exposure Threshold (Dissolved)** **Moderate Exposure Threshold (Entrained)**
Condensate	**MDO**
In-water exposure (dissolved or entrained) is only predicted to occur in the upper 0 – 10 m of the water column the surface layers of the water column at high (above 100 ppb) and low thresholds (below 100ppb) for dissolved and entrained hydrocarbons, respectively. Several fish communities in these areas are demersal and therefore more prevalent towards the seabed, as such, exposure to these species is not expected to occur. Any fish or shark species within the surface layers of the water column, may come into contact with the area of predicted exposure for in-water hydrocarbons. The Australian grayling spends most of its life in fresh water, with parts of the larval or juvenile stages spent in coastal marine waters, therefore it is not expected to be present in offshore waters in large numbers. There is distribution and foraging BIAs for the white shark are predicted to be overlapped by the hydrocarbon exposure, however, it is not expected that this species spends a large amount of time close to the surface where thresholds may be highest (RPS 2024).	Entrained hydrocarbon droplets can physically affect fish exposed for an extended duration (weeks to months). Effects will be greatest in the upper 10 m of the water column and areas close to the spill source where hydrocarbon concentrations are likely to be highest. Modelling predicted exposure to dissolved hydrocarbons to in high thresholds (>100 ppb) and entrained hydrocarbons in the moderate threshold (10-100 ppb). Several fish communities in these areas are demersal and therefore more prevalent towards the seabed, which is not likely to be exposed). Therefore, any impacts are expected to be highly localised. The Australian grayling spends most of its life in fresh water, with parts of the larval or juvenile stages spent in coastal marine waters, therefore it is not expected to be present in offshore waters in large numbers. There is a known distribution and foraging BIA for the white shark in the area of exposure, however, it is not expected that this species spends a large amount of time close to the surface where thresholds may be highest. The potential exposure area for MDO is located entirely within the potential exposure area for condensate LOWC (RPS 2024).

Predicted Environmental Impact

In-water

Fish (including) sharks can be exposed to in-water hydrocarbon droplets through a variety of pathways, including:

1. Direct dermal contact (e.g. whilst swimming through oil or waters with elevated dissolved hydrocarbon concentrations and other constituents, with diffusion across their gills (Hook et al. 2016)),
2. Ingestion (e.g. directly or via food base, fish that have recently ingested contaminated prey may themselves be a source of contamination for their predators), and
3. Inhalation (e.g. elevated dissolved contaminant concentrations in water passing over the gills).

Exposure to hydrocarbons entrained or dissolved in the water column can be toxic to fish. Studies have shown a range of impacts including changes in abundance, decreased size, inhibited swimming ability, changes to oxygen consumption and respiration, changes to reproduction, immune system responses, DNA damage, visible skin and organ

Fish
lesions and increased parasitism. However, many fish species can metabolise toxic hydrocarbons, which reduces the risk of bioaccumulation of contaminants in the food web (and human exposure to contaminants through the consumption of seafood) (NRDA 2012). Sub-lethal impacts in adult fish include altered heart and respiratory rates, gill hyperplasia, enlarged liver, reduced growth, fin erosion, impaired endocrine systems, behavioural modifications and alterations in feeding, migration, reproduction, swimming, schooling, and burrowing behaviour (Kennish 1996). Fish exposed to aromatics in the water have been shown to have a reduced aerobic capacity, which may be a result of the process to eliminate ingested oil from the fish (Cohen et al. 2005). However, generally these species are highly mobile species, and their patterns of movements makes it unlikely for them to remain within the area long enough to be exposed to hydrocarbons to experience sub-lethal impacts (ITOPF 2011a). The exception would be in areas such as reefs and other seabed features where species are less likely to move away into open waters (i.e., site-attached species). Pelagic species fish are able to detect and avoid contact with surface slicks meaning fish mortalities rarely occur in the event of a hydrocarbon spill in open waters (Volkman et al. 1994). As a result, wide-ranging pelagic fish of the open ocean generally are not highly susceptible to impacts from surface hydrocarbons. Adult fish kills reported after oil spills, occur mainly to shallow water, near-shore benthic species (Volkman et al. 1994). Fish are most vulnerable to hydrocarbons during their embryonic, larval and juvenile life stages. Embryos and larvae may sustain mechanical damage to feeding and breathing apparatus from contact with oil droplets, and genetic damage, physical deformities and altered developmental timing from hydrocarbons in water (Fodrie and Heck 2011). There may also be chronic effects to fish exposed to hydrocarbons in early life stages, such as disruption of predator avoidance behaviour (Hjermann et al. 2007). Eggs and larvae exposed to weathered concentrations of hydrocarbons in water for a prolonged period of time have been shown to be immunosuppressed (Hjermann et al. 2007). Hydrocarbons in the water column can physically affect fish with high site fidelity. When exposed for an extended duration (weeks to months) coating of gills may lead to lethal and sub-lethal effects from reduced oxygen exchange and coating of body surfaces may lead to increased incidence of irritation and infection. Fish may also ingest hydrocarbon droplets or contaminated food, leading to reduced growth (Volkman et al. 1994). Studies of impacts on bony fishes report that light, volatile oils are likely to be more toxic to fish. Many studies conclude that exposure to PAHs and soluble compounds are responsible for the majority of toxic impacts observed in fish (e.g., Carls et al. 2008; Ramachandran et al. 2004). The threshold value for species toxicity in the water column is based on global data from French et al. (1999) and French-McCay (2002, 2003) This data showed that species sensitivity (fish and invertebrates) to dissolved aromatics exposure of >4 days (96-hour LC50) under different environmental conditions varied from 6 to 400 µg/L (ppb), with an average of 50 ppb. This range covered 95% of aquatic organisms tested, which included species during sensitive life stages (eggs and larvae). Based on scientific literature, a minimum threshold of 6 ppb over 96 hours or equivalent was used to assess in-water low exposure zones (Engelhardt 1983; Clark 1984; Geraci and St Aubin 1988; Jenssen 1994; Tsvetnenko 1998). French-McCay (2002) indicates that an average 96-hour LC50 of 50 ppb could serve as an acute lethal threshold to 50%. Large scale fish kills have rarely been observed as a result of hydrocarbon spills (ITOPF 2011a) (though mortality in aquaculture pens has been reported), which is likely to be because vertebrates can rapidly metabolise and excrete hydrocarbons (Hook et al. 2016). Furthermore, the majority of studies, either from laboratory trials or of fish collected after spill events (including the Hebei Spirit, Macondo, and Sea Empress spills), found evidence of elimination of PAHs in fish tissues returning to reference levels within two months of exposure when subsequently exposed to clean water (Challenger and Mauseth 2011; Davis et al. 2002; Gagnon & Rawson 2011; Gohlke et al. 2011; Jung 2011; Law 1997; Rawson et al. 2011). Recovery of fish assemblages depends on the intensity and duration of an unplanned discharge, the composition of the discharge and whether dispersants are used, as each of these factors influences the level of exposure to potential toxicants. Recovery would also depend on the life cycle attributes of fishes. Species that are abundant, short-lived and highly fecund may recover rapidly. However less abundant, long-lived species may take longer to recover. The range of movement of fishes will also influence recovery. The nature of the receiving environment would influence the level of impact on fishes.

Fish
Predicted Level of Impact
Pelagic free-swimming fish and sharks are unlikely to suffer long-term damage from oil spill exposure because dissolved/entrained hydrocarbons in water are not expected to be sufficient to cause harm (ITOPF, 2010). Subsurface hydrocarbons could potentially result in acute exposure to marine biota such as juvenile fish, larvae, and planktonic organisms, although impacts are not expected cause population-level impacts. Environmental monitoring of pelagic and demersal fishes immediately following the Montara oil spill indicated that fish were exposed to hydrocarbons, although no adverse effects were detected (Gagnon and Rawson 2012, 2011). Further sampling and testing over time indicated that fish captured in close proximity to the Montara wellhead were comparable to those collected from reference sites (Gagnon and Rawson 2012, 2011). Consequently, the potential consequence to fish, including those commercially fished, are considered to be Moderate, as they could be expected to result in localised low-level short-term impacts to species of value. Impacts on eggs and larvae entrained in the upper water column are not expected to be significant given the temporary period of water quality impairment, and the limited geographical extent of the spill. As egg/larvae dispersal is extensive in the upper layers of the water column and it is expected that current induced drift will rapidly replace any oil affected populations. Impacts are assessed as temporary and localised, and therefore considered to be **Moderate (2).**

7.13.5.2.4 Birds

Birds	
Predicted Hydrocarbon Exposure	**✓ Surface ✓ In-water ✓ Shoreline**
Relevant Exposure Thresholds	**Surface: Low Exposure Threshold** **In-water: Moderate Exposure Threshold (Dissolved) and Moderate Exposure Threshold (Entrained)** **Shoreline: Low Exposure Threshold**
Condensate	**MDO**
The extent of in-water hydrocarbons at the moderate threshold (50 ppb) from a LOWC overlaps foraging BIAs for several seabird species, including various albatross species (i.e. antipodean, black-browed, Bullers, Campbell, Indian-yellow-nosed, shy and wandering), petrels (common-diving), shearwaters (short-tailed and wedge-tailed), Australasian gannet, black-faced cormorant and little penguin. In-water hydrocarbons at low threshold were predicted to overlap the breeding BIA for the little penguin (at Phillip Island and the buffer around Christmas Island) (RPS 2024).	Several listed Threatened, Migratory and/or listed marine species have the potential to be rafting, resting, diving and feeding within predicted worst-case extent of exposure to moderate levels of surface hydrocarbons, 19.85 km of the northern release location and 49 km of the TW1 release location. Foraging BIAs for several albatross species, common diving-petrel and short-tailed shearwater are present in the areas with potential to be exposed to moderate levels of surface hydrocarbons.

Birds	
	Foraging and breeding BIAs for little penguins are within the planning area, but not within the predicted area of surface exposure at moderate levels. Colonies of little penguins, without defined BIAs, are known to be present along parts of Port Campbell Bay area; therefore, it is possible that little penguins may be present in the area exposed to surface hydrocarbon at moderate levels. The modelling predicts potential shoreline exposure at the moderate threshold at Cape Otway West and Moonlight Head from MDO release at the north release location. The moderate threshold is not predicted to be reached based on MDO release at the TW1 release location. Several listed threatened, migratory and/or listed marine seabird and shorebird species have the potential to be foraging at these locations. Shorelines at the Otway coast with the potential to be exposed to moderate hydrocarbon thresholds overlap a foraging BIA and a breeding BIA and therefore may expose birds to shoreline hydrocarbons for the short-tailed and wedge-tailed shearwater at Muttonbird Island. The extent of in-water hydrocarbons at the moderate threshold (50 ppb) from a MDO release overlaps foraging BIAs for several seabird species, including various albatross species (i.e. antipodean, black-browed, Bullers, Campbell, Indian-yellow-nosed, shy and wandering), petrels (common-diving and white-faced storm) and shearwaters (short-tailed and wedge-tailed) (RPS 2024).

Predicted Environmental Impact

Surface	In-water	Shoreline
Seabirds rafting, resting, diving or feeding within surface hydrocarbons may be exposed to surface hydrocarbons. Species most at risk include those that readily rest on the sea surface (such as shearwaters) and surface plunging species such as terns and boobies. Direct contact with hydrocarbons is likely to foul plumage, which may result in hypothermia due to a reduction in the ability of the bird to thermo-regulate and impaired waterproofing (ITOPF 2011a). Increased heat loss as a result of a loss of water-proofing results in an increased metabolism of food reserves in the body,	Seabirds could be impacted by in-water hydrocarbon exposure directly (i.e., whilst diving through the water column foraging) or indirectly (i.e. by consuming hydrocarbon-tainted fish, resulting in sub-lethal or toxic impacts). Penguins may be especially vulnerable to oil because they spend a high portion of their time in the water and readily lose insulation and buoyancy if their feathers are oiled. The Iron Baron vessel spill, of 325 tonnes of bunker fuel in Tasmania in 1995, is estimated to have	Shorebird species foraging for invertebrates in intertidal feeding habitats, such as exposed sand and mud flats at lower tides, will be at potential risk of both direct impacts through contamination of individual birds (ingestion or soiling of feathers) and indirect impacts through the contamination of foraging areas that may result in a reduction in available prey items (Clarke 2010). Any direct impact of oil on terrestrial habitats has the potential to contaminate seabirds present at the breeding sites (Clarke 2010). Bird eggs may also be

Birds		
which is not countered by a corresponding increase in food intake and may lead to emaciation (DSEWPaC 2011a). A bird suffering from cold, exhaustion and a loss of buoyancy (resulting from fouling of plumage) may dehydrate, drown or starve (ITOPF 2011a; DSEWPaC 2011a; AMSA 2013). Physical smothering may also result in impaired navigation and flight performance (Hook et al. 2016). Toxic effects on birds, including internal tissue irritation in their lungs and stomachs, may also result where the oil is ingested as the bird attempts to preen its feathers (ITOPF 2011a). The preening process may also spread oil over otherwise clean areas of the body (ITOPF 2011a). Whether this toxicity ultimately results in mortality will depend on the amount consumed and other factors relating to the health and sensitivity of the bird. In a review of 45 marine hydrocarbon spills, there was no correlation between the numbers of bird deaths and the volume of the spill (Burger 1993).	resulted in the death of up to 20,000 penguins (Hook et al. 2016). As seabirds are top order predators, any impact on other marine life (e.g., pelagic fish) from hydrocarbon exposure may disrupt and limit food supply both for the maintenance of adults and the provisioning of young. Furthermore, the foraging BIAs are typical over relatively extensive areas, therefore, impacts are not anticipated at a population level due to the localised and temporary exposure of moderate levels of surface hydrocarbons.	damaged if an oiled adult sits on the nest. Fresh crude was shown to be more toxic than weathered crude, which had a medial lethal dose of 21.3 mg/egg (Clarke 2010). Studies of contamination of duck eggs by small quantities of crude oil, mimicking the effect of oil transfer by parent birds, have been shown to result in mortality of developing embryos (French-McCay, 2009). Shoreline accumulation will be concentrated along the high tide mark while the lower/upper parts are often untouched (IPIECA, 1995). As breeding activities of shorebirds and seabirds generally occurs above the high tide mark, exposure to hydrocarbons is considered unlikely to occur. However, oiled bird species may track oil into their nests, which may then have subsequent impacts on any eggs present. The little penguin, is the species where this would be the highest risk, as they have to traverse through the intertidal area to reach nesting sites.
Predicted Level of Impact		
When first released, MDO has higher toxicity due to the presence of volatile components. Individual birds making contact close to the spill source at the time of the spill (i.e. areas of moderate concentrations >10 g/m^2 out to 19.85 km of the northern release location and 49 km of the TW1 release location) may be impacted; however, it is unlikely that many birds will be affected as the majority of volatile surface hydrocarbons are expected to evaporate or entrain over 24 hours. Seabirds rafting, resting, diving or feeding at sea have the potential to encounter areas where hydrocarbons concentrations are greater than 10 g/m^2 and due to physical oiling may experience lethal surface concentrations. As such, acute or chronic toxicity impacts (death or long-term poor health) to birds are possible but unlikely for an MDO spill because of the limited period of exposure above 10 g/m^2. Due to the hydrocarbon characteristics of MDO, majority of the surface oil is expected to either evaporate or entrain within the first 24 hours under variable-wind conditions. Surface oil is only predicted to remain after 24 hours in calm conditions (RPS, 2024). Therefore, potential impact would likely be limited to individuals, however, impacts to aggregations may occur. Shorebird species foraging for invertebrates in intertidal feeding habitats, such as exposed sand and mud flats at lower tides, will be at potential risk of both direct impacts through contamination of individual birds (ingestion or soiling of feathers) and indirect impacts through the contamination of foraging areas that may result in a reduction in available prey items (Clarke 2010).		

Birds
Any direct impact of oil on terrestrial habitats has the potential to contaminate seabirds present at the breeding sites (Clarke 2010). Bird eggs may also be damaged if an oiled adult sits on the nest. Fresh crude was shown to be more toxic than weathered crude, which had a medial lethal dose of 21.3 mg/egg (Clarke 2010). Studies of contamination of duck eggs by small quantities of crude oil, mimicking the effect of oil transfer by parent birds, have been shown to result in mortality of developing embryos (French-McCay 2009). Shoreline accumulation will be concentrated along the high tide mark while the lower/upper parts are often untouched (IPIECA 1995). As breeding activities of shorebirds and seabirds generally occurs above the high tide mark, exposure to hydrocarbons is considered unlikely to occur. However, oiled bird species may track oil into their nests, which may then have subsequent impacts on any eggs present. The little penguin would be the highest-risk species, as they have to traverse through the intertidal area to reach nesting sites. Based on the worst-case scenario, the modelling predicted the maximum probability of shoreline accumulation at, or above, the moderate (100 g/m^2) threshold from MDO release at the northern release location to occur at Cape Otway West (6% probability) with the minimum time for shoreline contact predicted as 6.8 days with a peak volume ashore of 4.46 m^3 and Moonlight Head (2% probability) with the minimum time for shoreline contact predicted as 7.7 days with a peak volume ashore of 2.45 m^3 (RPS 2024). Acute or chronic toxicity impacts (death or long-term poor health) to seabirds and shorebirds is possible, however, with the minimum time for shoreline contact predicted as 6-7 days, potential contamination of nests and eggs from oiled parent bird species is limited to weathered MDO. The Otway coast, including Cape Otway West and Moonlight Head, is exposed to substantial wave action that would further break down any shoreline hydrocarbons. The limited exposure to shoreline hydrocarbons will prevent potential death or long-term poor health to seabirds and shorebirds over multiple breeding seasons, therefore it is expected that shoreline hydrocarbons will only impact a single breeding season at most. There is the potential for serious impact on valued species or habitats with a consequence considered to be **Serious (3).**

7.13.5.2.5 Marine Reptiles

Marine Reptiles	
Predicted Hydrocarbon Exposure	**✓ Surface ✓ In-water ✓ Shoreline**
Relevant Exposure Thresholds	**Surface: Low Exposure Threshold** **In-water: Moderate Exposure Threshold (Dissolved) and Moderate Exposure Threshold (Entrained)** **Shoreline: Low Exposure Threshold**
Condensate	**MDO**
There may be transiting marine turtles within up to 5.83 km of the northern release locations predicted to be exposed to moderate levels of surface hydrocarbons. However, there are no BIAs or habitat critical to the survival of the species within the	There may be marine turtles in the area predicted to be exposed to high levels (>50 g/m^2) of surface oil. However, no state waters were predicted to be exposed to surface

Marine Reptiles	
area predicted to be exposed to moderate thresholds of surface oil (50-100 ppb). No exposure at the high threshold is predicted from either release location.	hydrocarbons at any threshold. There are no BIAs or habitat critical to the survival of a marine turtle species within this area.

Predicted Environmental Impact

Marine sea turtles are vulnerable to the effects of oil at all life stages—eggs, post-hatchlings, juveniles, and adults in nearshore waters. Several aspects of marine turtle biology and behaviour place them at particular risk (NOAA 2010a), including a lack of avoidance behaviour, indiscriminate feeding in convergence zones, and large pre-dive inhalations. Oil exposure affects different turtle life stages in different ways. Turtles may be exposed to chemicals in oil in two ways:

Internally – eating or swallowing oil, consuming prey containing oil-based chemicals, or inhaling of volatile oil related compounds; and

Externally – swimming in oil or dispersants, or oil or dispersants on skin and body.

Effects of oil on turtles include:

Increased egg mortality and developmental defects,

Direct mortality due to oiling in hatchlings, juveniles, and adults, and

Negative impacts to the skin, blood, digestive and immune systems and salt glands.

Surface	In-water	Shoreline
Marine turtles make large, rapid inhalations before they dive which may result in inhalation of toxic vapours from hydrocarbons in surface waters (Milton and Lutz, 2003). This can lead to respiratory irritation, inflammation, emphysema or pneumonia (NOAA 2010a). Ingested oil may cause harm to the internal organs of turtles. Visibly oiled turtles showed higher indicators of PAH in tissues, stomach content, colon content and faeces compared to non-visibly oiled turtles (Ylitalo et al. 2017). This exposure pathway may cause an increase in the production of white blood cells and may affect the functioning of their salt gland (Lutcavage et al. 1995). Oiling has the potential to cause mortality depending on the size of the individual and the extent of oiling (DWH Natural Resource Damage Assessment Trustees, 2016).	Some individual marine reptiles may come into contact with in-water hydrocarbon exposure while swimming or feeding. Entrained hydrocarbons can adhere to body surfaces (Gagnon and Rawson 2010) and can enter cavities such as the eyes, nostrils, or mouth. This can cause an elevated susceptibility to infections (NOAA 2010a). Records of oiled wildlife during spills rarely include marine turtles, even from areas where they are known to be relatively abundant (Short 2011). An exception to this was the large number of marine turtles collected (613 dead and 536 live) during the Macondo spill in the Gulf of Mexico, although many of these animals did not show any sign of oil exposure (NOAA 2013). Of the dead turtles found, 3.4% were visibly oiled and 85% of the live turtles found were oiled (NOAA 2013). Of the captured animals, 88% were later released, suggesting that oiling does not inevitably lead to mortality.	Marine turtles may experience oiling impacts on nesting beaches when they come ashore to lay their eggs. There is potential for contamination of turtle eggs to result in toxic impacts, such as developmental defects in hatchlings, to developing embryos. Studies on freshwater snapping turtles showed uptake of PAHs from contaminated nest sediments, but no impacts on hatching success or juvenile health following exposure of eggs to dispersed weathered light crude (Rowe et al. 2009). However, other studies found evidence that exposure of freshwater turtle embryos to PAHs results in deformities (Bell et al. 2006, Van Meter et al. 2006). Turtle hatchlings may be more vulnerable to smothering as they emerge from the nests and make their way over the intertidal area to the open water (AMSA 2015). Hatchlings that contact oil residues while crossing a beach can exhibit a range of effects including impaired

Marine Reptiles	
	movement and bodily functions (Shigenaka 2010). Hatchlings sticky with oily residues may also have more difficulty crawling and swimming, rendering them more vulnerable to predation. Marine pollution is listed as a threat to marine turtle in the Recovery Plan for Marine Turtles in Australia, 2017 – 2027, particularly in relation to shoreline oiling of nesting beaches.
Predicted Level of Impact	
Marine turtles are vulnerable to the effects of oil at all life stages. Marine turtles can be exposed to surface oil externally (i.e. swimming through oil slicks) or internally (i.e. swallowing the oil). Ingested oil can harm internal organs and digestive function. Oil on their bodies can cause skin irritation and affect breathing. When first released, MDO has higher toxicity due to the presence of volatile components. Individual marine turtles making contact close to the spill source at the time of the spill (i.e. areas of moderate concentrations >10 g/m^2 out to 19.85 km of the northern release location and 49 km of the TW1 release location) may be impacted; however, it is unlikely that many marine turtles will be affected BIAs or habitat critical to the survival of the species present and the majority of volatile surface hydrocarbons are expected to evaporate or entrain over 24 hours. Shoreline accumulation from condensate will be concentrated along the high tide mark while the lower/upper parts are often untouched (IPIECA 1995). As there are no BIAs or habitat critical to the survival of the species present, exposure to hydrocarbons is considered unlikely to occur. The number of marine turtles that may be exposed to surface condensate is expected to be low as there are no BIAs or habitat critical to the survival of the species present and the localised (up to 5.83 km from the northern release location) extent of condensate exposure above the 10 g/m^2 threshold; however, turtles may be transient within the area. Therefore, potential impact would be limited to individuals, with population impacts not anticipated. Consequently, the potential consequence is considered to be **Moderate (2)**, as they could be expected to result in localised and minor short-term impacts to species of value.	

7.13.5.2.6 Pinnipeds

Pinnipeds	
Predicted Hydrocarbon Exposure	**✓ Surface ✓ In-water ✓ Shoreline**
Relevant Exposure Thresholds	**Surface: Moderate Exposure Threshold** **In-water: Moderate Exposure Threshold (Dissolved) and high Exposure Threshold (Entrained)** **Shoreline: Low Exposure Threshold**

Pinnipeds	
Condensate	**MDO**
The Australian and New Zealand fur-seals may occur within 5.83 km of the northern release location predicted to be exposed to moderate levels (10-50 g/m^2) of surface hydrocarbons. No BIAs, breading colonies or haul outs areas within the area predicted to be exposed to moderate thresholds of surface oil. The modelling predicts potential shoreline exposure at the low threshold (1 g/m^2) at Seal Rocks on King Island which is a New Zealand fur-seal breeding colony. Australian and New Zealand fur-seals may occur within the area of exposure for in-water hydrocarbons. There are no identified BIAs for seals or sea lions within the area of exposure. No known breeding colonies of Australian or New Zealand fur-seals are exposed to moderate dissolved (50 ppb) or high entrained (100 ppb) exposure thresholds. Given the mobility of pinnipeds, there may be small numbers of seals in the areas predicted to be temporarily exposed to moderate dissolved (50 ppb) or high entrained exposure thresholds (100 ppb) in the water column, noting that in-water exposure (dissolved or entrained) is only predicted to occur within the upper 0 -10 m of the water column.	The Australian and New Zealand fur-seals may occur within the area predicted to be exposed to moderate surface hydrocarbons >10 g/m^2. No BIAs, breeding colonies or haul outs areas are within the area of exposure for surface hydrocarbons. Australian and New Zealand fur-seals may occur within the area of exposure for in-water hydrocarbons. There are no identified BIAs for seals or sea lions within the area of exposure. No known breeding colonies of Australian or New Zealand fur-seals are exposed to moderate dissolved or high entrained exposure thresholds. Given the mobility of pinnipeds, there may be small numbers of seals in the areas predicted to be temporarily exposed to moderate (50-100 ppb) dissolved or high (>100 ppb) entrained exposure thresholds in the water column, noting that in-water exposure (dissolved or entrained) is only predicted to occur within the upper 0 -10 m of the water column.

Predicted Environmental Impact		
Surface	**In-water**	**Shoreline**
Pinnipeds are vulnerable to sea surface exposures given they spend much of their time on or near the surface of the water, to breathe and regularly haul out on to beaches. As a result of exposure to surface oils, pinnipeds, with their relatively large, protruding eyes are particularly vulnerable to effects such as irritation to mucous membranes that surround the eyes. Irritation may also occur to mucous membranes that line the oral cavity, respiratory surfaces, and anal and urogenital orifices. Hook et al. (2016) reports that seals appear not to be very sensitive to contact with oil, but instead to the toxic impacts from the inhalation of volatile components.	Pinnipeds are sensitive to in-water hydrocarbon exposure as they will stay near established colonies and haul-out areas, meaning they are less likely to practice avoidance behaviours. This is corroborated by Geraci and St. Aubins (1988) who suggest seals, sea-lions and fur-seals have been observed swimming in oil slicks during a number of documented spills. Hydrocarbons within the water column or consumption of prey affected by the oil may cause sub-lethal impacts to pinnipeds. However, impacts to pinnipeds at a population level are considered very unlikely given their transient,	Breeding colonies may be sensitive to hydrocarbon spills in the event of shoreline accumulation. Individual adults may also be impacted by oil while transiting through the nearshore environments at haul-out sites that may be impacted from the spill event. Following the Iron Baron oil spill (in Tasmania 1995) nearby seal colonies were monitored. The report concluded that reduced pup production was evident on islands close to the spill, but not evident on islands more distant (Pemberton 1999) Conservation Listing Advice for the *Neophoca cinerea* (Australian sea lion) (TSSC, 2010) identifies oil spills as a potential threat to habitat. However, activities within this

Pinnipeds		
For some pinnipeds, fur is an effective thermal barrier because it traps air and repels water. Petroleum stuck to fur reduces its insulative value by removing natural oils that waterproof the pelage. Consequently, the rate of heat transfer through fur seal pelts can double after oiling (Geraci & St. Aubin 1988), adding an energetic burden to the animal. Kooyman et al. (1976) suggest that fouling of approximately one-third of the body surface resulted in 50% greater heat loss in fur-seals immersed in water at various temperatures. Heavy oil coating and tar deposits on fur-seals may result in reduced swimming ability and lack of mobility out of the water. Pinnipeds other than fur-seals are less threatened by thermal effects of fouling, if at all (Helm et al. 2015). Oil has no effect on the relatively poor insulative capacity of sea-lion and bearded and ringed seal pelts, and oiled Weddell seal samples show some increase in conductance (Oritsland 1975; Kooyman et al. 1976, 1977). ITOPF (2011a) demonstrates that species that rely on fur to regulate their body temperature (such as fur-seals) are most vulnerable to oil, as the animals may die from hypothermia or overheating, depending on the season, if the fur becomes matted with oil. It is reported that most pinnipeds scratch themselves vigorously with their flippers and do not lick or groom themselves, so are less likely to ingest oil from skin surfaces (Geraci & St. Aubin 1988). However, mothers trying to clean an oiled pup may ingest oil. Ingested hydrocarbons can irritate or destroy epithelial cells that line the stomach and intestine, thereby affecting motility, digestion and absorption.	highly mobile nature and their typically extensive foraging grounds.	Environment Plan will not be inconsistent with the conservation and management priorities outlined in this advice.

Pinnipeds
Predicted Level of Impact
Breeding colonies (used to birth and nurse until pups are weaned) are particularly sensitive to hydrocarbon spills (Higgins & Gass, 1993) and have shown to be impacted by oil at the moderate and high thresholds. The predicted minimum time for oil to reach the King Island coastline (such as Seal Rocks) was 22 days for the low threshold (1 g/m^2). No contact at King Island was predicted for the moderate or high thresholds. Exposure to surface oil can result in skin and eye irritations and disruptions to thermal regulation. Fur seals are particularly vulnerable to hypothermia from oiling of their fur – however the characteristics of the MDO and Thylacine condensate mean majority of the surface oil is expected to either evaporate or entrain within the first 24 hours under variable-wind conditions. Surface oil is only predicted to remain after 24 hours in calm conditions (RPS, 2024). Therefore, potential impact would be limited to individuals, with population impacts not anticipated. The number of pinnipeds exposed is expected to be low, with population impacts not anticipated. Exposure to moderate dissolved or high entrained exposure thresholds in the water column or consumption of prey affected by the oil may cause sub-lethal impacts to pinnipeds. Due to the temporary and localised nature of the spill, pinnipeds widespread nature, the low-level exposure zones and rapid loss of the volatile components of MDO and condensate in choppy and windy seas (such as that of the area exposed). The potential consequence is considered to be **Moderate (2)**, as they could be expected to result in short term effects and some impact on valued species or habitat.

7.13.5.2.7 Cetaceans

Cetaceans	
Predicted Hydrocarbon Exposure	**✓ Surface ✓ In-water ✘ Shoreline**
Relevant Exposure Thresholds	**Surface: Moderate Exposure Threshold** **In-water: Moderate Exposure Threshold (Dissolved) and High Exposure Threshold (Entrained)**
Condensate	**MDO**
Several threatened, migratory and/or listed cetacean species have the potential to be foraging within 5.83 km of the northern release location predicted to be exposed to moderate levels (10 g/m^2) of surface hydrocarbons. The area of predicted moderate exposure overlaps a foraging BIA for pygmy blue whales and the migration BIA for southern right whale. The release location resides within the boundaries of these BIAs. There may be dolphins within 5.83 km of the northern release location predicted to be exposed to moderate levels of surface hydrocarbons (10 g/m^2). However, it is not identified as	Several threatened, migratory and/or listed cetaceans have the potential to be within the area predicted to be exposed to moderate surface hydrocarbons of >10 g/m^2. Foraging and distribution BIAs for pygmy blue whales and the migration BIA for southern right whales are within the area predicted to be exposed to surface hydrocarbons >10 g/m^2. There are no BIAs of habitat critical to the survival of a dolphin species within the area of exposure. Several threatened, migratory and/or listed marine cetacean species have the potential to be migrating or foraging within the area predicted to be exposed to in-water hydrocarbons.

Cetaceans	
critical habitat, and there are no spatially defined aggregations within the area predicted to be exposed to moderate thresholds (10 g/m^2) of surface oil. BIAs for foraging for pygmy blue whales and the migration BIA for southern right whales are within the area predicted to be exposed to moderate dissolved (50 ppb) or high entrained (100 ppb) exposure thresholds in the water column, noting that in-water exposure (dissolved or entrained) is only predicted to occur within the upper 0 - 10 m of the water column.	BIAs for foraging for pygmy blue whales and the migration BIA for southern right whales are within the area predicted to be exposed to moderate dissolved (50 ppb) or high entrained (100 ppb) exposure thresholds in the water column, noting that in-water exposure (dissolved or entrained) is only predicted to occur within the upper 0-10 m of the water column.

Predicted Environmental Impact

Cetaceans can be exposed to the chemicals in oil through:

Dermal contact, by swimming in oil and having oil directly on the skin and body (NRDA 2012; Hook et al. 2016).

Inhaling volatile oil compounds when surfacing to breathe.

Internal exposure by consuming oil or contaminated prey.

The effects of this exposure include:

Maternal transfer of contaminants to embryos.

Hypothermia due to conductance changes in skin, resulting in metabolic shock (expected to be more problematic for non-cetaceans in colder waters).

Toxic effects and secondary organ dysfunction due to ingestion of oil.

Congested lungs.

Damaged airways.

Interstitial emphysema due to inhalation of oil droplets and vapour.

Gastrointestinal ulceration and haemorrhaging due to ingestion of oil during grooming and feeding.

Eye and skin lesions from continuous exposure to oil.

Decreased body mass due to restricted diet.

Stress due to oil exposure and behavioural changes.

Surface	In-water
Cetaceans may come into contact with surface hydrocarbons when surfacing. However, direct surface oil contact with hydrocarbons is considered to have little deleterious effect on cetaceans, and any effect is likely to be minor and temporary. This may be due to the skin's effectiveness as a barrier to toxicity (Geraci & St Aubin 1988). Cetaceans have mostly smooth skins with limited areas of pelage (hair covered skin) or rough surfaces such as barnacled skin. Oil tends to adhere to rough surfaces, hair, or calluses	Cetaceans exposed to entrained hydrocarbons can result in physical coating as well as ingestion (Geraci and St Aubin, 1988). Such impacts are associated with 'fresh' hydrocarbon, the risk of impact declines rapidly as the hydrocarbon weathers. The susceptibility to ingested hydrocarbon has also been shown to vary with feeding habits. Specifically, toothed whales and dolphins may be susceptible to

Cetaceans	
of animals, so contact with hydrocarbons by cetaceans is expected to cause only minor hydrocarbon adherence. Helm et al. (2015) detailed that oil does not adhere to cetacean's relatively slick skin and it would not be expected to accumulate in or around the eyes, mouth, blow hole, or other potentially sensitive external areas. Insulation is provided by a layer of blubber rather than hair or fur, so it is unlikely oil would compromise the thermoregulatory system of cetaceans. The inhalation of oil droplets, vapours and fumes is a distinct possibility if cetaceans' surface in slicks to breathe (Helm et al. 2015). Exposure to hydrocarbons in this way could damage mucous membranes and damage airways threatening their health. The risk is greatest near the source of a fresh spill because volatile toxic vapours disperse relatively quickly (Helm et al. 2015). The susceptibility to ingested hydrocarbon has also been shown to vary with feeding habits. Baleen whales (such as blue, fin, pygmy right and sei) are not particularly susceptible to ingestion of oil in the water column but are susceptible to oil at the sea surface as they feed by skimming the surface. Oil may stick to the baleen while they 'filter feed' near slicks. Sticky, tar-like residues are particularly likely to foul the baleen plates. However, the structural and chemical integrity of isolated baleen plates of seven species of whales were reported to remain intact when they were soaked in crude oil, gasoline, or tar over long periods (Helm et al. 2015).	ingestion of dissolved and entrained oil as they gulp feed at depth. There are reports of declines in the health of individual pods of killer whales (a toothed whale species), though not the population as a whole, in Prince William Sound after the Exxon Valdez vessel spill (heavy oil) (Hook et al. 2016). Geraci (1988) found little evidence of cetacean mortality from hydrocarbon spills; however, some behaviour disturbance (including avoidance of the area) may occur. Pelagic species have been said to avoid hydrocarbon, mainly because of its noxious odours, but this has not been proven. In the event that avoidance were to occur, the potential for physiological impacts from contact with hydrocarbons would be reduced, however, active avoidance of an area may disrupt behaviours such as migration, or displace individuals from important habitat, such as foraging, resting or breeding. Although, the strong attraction to specific areas for breeding or feeding may override any tendency for cetaceans to avoid the noxious presence of hydrocarbons. Dolphin populations from Barataria Bay, Louisiana, USA, which were exposed to prolonged and continuous oiling from the Macondo oil spill in 2010, had higher incidences of lung and kidney disease than those in the other urbanised environments (Hook et al. 2016). The spill may have also contributed to unusually high perinatal mortality in bottlenose dolphins (Hook et al. 2016).
Predicted Level of Impact	
Geraci (1988) found little evidence of cetacean mortality from hydrocarbon spills; however, some behaviour disturbance (including avoidance of the area) may occur. However, observations during spills have recorded whales and dolphins traveling through and feeding in oil slicks. During the Deepwater Horizon spill cetaceans were routinely seen swimming in surface slicks offshore (and nearshore) (Aichinger Dias et al. 2017). Cetaceans observed during the spill response for the Montara oil spill included oceanic species such as false killer whales, bottlenose dolphins, spotted dolphins and spinner dolphins (Watson et al. 2009). Cetaceans exposed to surface hydrocarbons above moderate exposure thresholds may suffer external oiling, ingestion of oil and inhalation of toxic vapours (Deepwater Horizon Natural Resource Damage Assessment Trustees 2016). In addition, active avoidance of an area may displace individuals or aggregations from important habitat, such as foraging. If whales are foraging at the time of the spill, a greater number of individuals may be present in the plume, however due to the small area of the surface exposure above the impact threshold (5.83 km from release location), this is not likely. Given this is a relatively small area of the total foraging BIA for pygmy blue whales and migration BIA for southern right whales, the risk of displacement to whales is considered low. There is potential for interaction with southern right whales given that the activity window may overlap with the northern migration period of May-June, the peak breeding (July-August) and southern migration period (September-November).	

Cetaceans
The activity window timing may also overlap with the blue whale season for migration and foraging. Visual and acoustic surveys suggest that blue whales are present in the Otway region between November to June, peaking in February and March. As such in the event of a spill potential hydrocarbon exposure could possibly affect blue or other foraging whale species. Dolphins surface to breathe air and may inhale hydrocarbon vapours or be directly exposed to dermal contact with surface hydrocarbons. Direct contact with oil can result in direct impacts to the animal, due to toxic effects if ingested, damage to lungs when inhaled at the surface, and damage to the skin and associated functions such as thermoregulation (AMSA 2010). Dolphins are highly mobile and are considered to have some ability to detect and avoid oil slicks (Geraci and St. Aubin, 1988; Smith et al, 1983). Direct surface hydrocarbon contact may pose little problem to dolphins due to their extraordinarily thick epidermal layer which is effective as a barrier to the substances found in hydrocarbons (Geraci and St. Aubin, 1990; Vol kman et al., 1994). The number of dolphins exposed is expected to be low, with population impacts not anticipated. Due to the rapid weathering of condensate, the potential exposure to surface hydrocarbons is relatively short, with the majority of surface condensate evaporating or entraining within 24 hours (RPS, 2024). Cetacean exposure to entrained hydrocarbons can result in physical coating as well as ingestion (Geraci and St Aubin, 1988; Deepwater Horizon Natural Resource Damage Assessment Trustees 2016). Such impacts are associated with 'fresh' hydrocarbon; the risk of impact declines rapidly as the oil weathers. The potential for impacts to cetaceans and dolphins would be limited to a relatively short period following the release and would need to coincide with seasonal foraging or aggregation event to result in exposure to a large number of individuals, as may be the case during seasonal upwelling events within the Otway region. However, such exposure is not anticipated to result in long-term population viability effects. Consequently, the potential consequence is considered to be **Serious (3)**, as they could be expected to result in serious impact on valued species or habitat.

7.13.5.3 Conservations Values and Sensitivities

7.13.5.3.1 Heritage Properties and Places

Heritage Places	
Predicted Hydrocarbon Exposure	✘ **Surface** ✓ **In-water** ✓ **Shoreline**
Relevant Exposure Thresholds	**Shoreline: Low Exposure Threshold** **In-water: Moderate Exposure Threshold (Dissolved) and High Exposure Threshold (Entrained)r**
Condensate	
The modelling predicted a number of Heritages Properties and Places (National, Commonwealth and Maritime Archaeological) to be present within the area predicted to be exposed to low (10 g/m^2) levels of shoreline hydrocarbons following a LOWC of condensate (RPS 2024). These include:	

Heritage Places	
National Heritage Places (see Section 6.2.3 for further details): Great Ocean and Scenic Environments Point Nepean Defence Sites and Quarantine Station Area, and Quarantine Station and surrounds (within Point Nepean Site). Maritime Archaeological Heritage (see Section 6.2.5 for further details): Historical shipwrecks	
Predicted Environmental Impact	
Shoreline	**In-water**
The values identified of these National Heritage Areas (see Section 6.2.3) have the potential to be impacted by surface hydrocarbons at the low threshold (10 g/m^2). Visible shoreline hydrocarbons may have the potential to reduce the visual amenity of the area, subsequently deterring any tourism or recreational activities, or impacting the cultural significant of the specific Heritage Place. Any impact to the environmental values of the areas (i.e., the unique habitats, species and ecosystem process) from exposure at, or above, the low threshold of shoreline hydrocarbons may also affect the value of the specific heritage areas. Refer also to: Benthic Habitats Marine Fauna Nationally Important Wetlands Recreation and Tourism First Nations	Historical shipwrecks (see Section 6.2.5) have the potential to be impacted by in-water hydrocarbons above the high threshold. The is limited information on the effect of oil spills on historic shipwrecks. One laboratory study looked at how crude oil may impact preservation of steel shipwrecks. Salerno et al. (2018) found that crude oil and chemical dispersant could impact the biodiversity and metabolic function of microbial biofilms colonising metal-hulled shipwrecks this could have downstream effects on corrosion rates of metal hulls, potentially impacting their longevity in the marine environment. The laboratory tests were conducted with 5 mg/l (5000 ppb) of crude oil. However, in-water exposure (dissolved and entrained hydrocarbons) is only predicted to occur within the 0 -10 m of the water column and not predicted to impact maritime archaeological heritage.
Predicted Level of Impact	
Visible shoreline hydrocarbons have the potential to reduce the visual amenity of the area for tourism and discourage recreational activities. The predicted minimum time for oil at the low threshold to reach the Otway coast where the Great Ocean Road and Scenic Environs is located was 3.7 days. The condensate will likely be dissipated by that time. Impacts to historical shipwrecks are not predicted as based on the oil spill modelling (RPS 2024) for in-water hydrocarbons at high thresholds (>400 ppb) are only predicted in 0 – 10 m below the sea surface near to the spill source where water depths are > 50 m.	

Heritage Places
Consequently, the potential consequence to Heritage Properties and Places is considered to be **Moderate (2)**, as they could be expected to result in minor, short-term impacts to an area of recognised conservation value.

7.13.5.3.2 Wetlands

Wetlands	
Predicted Hydrocarbon Exposure	✘ **Surface** ✘ **In-water** ✓ **Shoreline**
Relevant Exposure Thresholds	**Shoreline: Low Exposure Threshold**
Condensate	
Modelling predicted one wetland of international importance (Ramsar listed wetland) Lavinia (see Section 6.2.6) and one Nationally important wetland, Western Port (see Section 6.2.7) to be contacted by shoreline hydrocarbons at the relevant exposure thresholds following a LOWC of condensate (RPS, 2024). The major values for these wetlands have been identified within Section 6.2.6 and Section 6.2.7 and include values such as diverse waterbird diversity, unique ecological processes, shoreline and intertidal habitats, tourism, recreational activities, and sites of cultural significance for First Nations people.	
Predicted Environmental Impact	
Shoreline	
Internationally Important wetlands (Ramsar-listed wetlands) and Nationally Important Wetlands are predominantly saline marsh and estuarine environments that are a continuation from the sea. Therefore, depending on where the shoreline contact occurs there is a potential for shoreline hydrocarbon to move into the estuary and wetlands, potentially impacting the aesthetic and ecological value of the wetland. Visible hydrocarbons stranded on shorelines have the potential to reduce the visual amenity of the area for tourism and discourage recreational activities. Precautionary exclusion from shorelines may be implemented by local governments until water quality monitoring verifies the absence of residual hydrocarbons. This could cause disruption to some recreational and tourism activities within that area. Furthermore, visible hydrocarbons along shorelines may impact the value of a culturally significant sites. Wetland environments are considered to have a high sensitivity to hydrocarbon exposure. The vegetation found in wetlands, are similar to saltmarshes and other estuarine plants, typically have a large surface area for oil absorption and their structure traps oil. The degree of impact of oil on wetland vegetation are variable and complex, and can be both acute and chronic, ranging from short-term disruption of plant functioning to mortality. Spills reaching wetlands during the growing season will have a more severe impact than if oil reaches wetlands during the times when many plant species are dormant. Wetland habitats can be of particular importance for some species of waterbirds, fish, and invertebrates. As such, in addition to direct impacts on plants, oil that reaches wetlands also affects these fauna utilising wetlands during their life cycle.	

Wetlands
Predicted Level of Impact
The minimum time for shoreline accumulation to reach a shoreline associated with the Western Port Nationally Important Wetland shoreline was 55 days at a low threshold (<10 g/m^2) with a probability of 1% during winter conditions. Shoreline accumulation is not predicted at this location during summer conditions. The minimum time for shoreline accumulation to reach King Island shorelines associated with the Lavinia Ramsar site was 27 days at a low threshold (<10 g/m^2) with 7% probability during winter conditions (RPS 2024). Due to the anticipated hydrocarbon weathering and fate of the condensate, majority is expected to have either evaporated or entrained during that time. Modelling predicted between 64% of the volume to evaporate within the first 24 hours, depending on the wind conditions (RPS 2024). Furthermore, given the nature of the condensate, being light non-persistent hydrocarbon, any impacts to coastlines are expected to be localised and short-term. The relatively short duration and low volume means there may be short-term and localised consequences, which are ranked as **Moderate (2)**.

7.13.5.3.3 State Protected Areas – Terrestrial

State Protected Areas - Terrestrial	
Predicted Hydrocarbon Exposure	✘ **Surface** ✘ **In-water** ✓ **Shoreline**
Relevant Exposure Thresholds	**Shoreline: Low Exposure Threshold**
Condensate	**MDO**
Modelling predicted a multiple terrestrial Victorian State Protected Areas within the area predicted to be exposed to low levels of shoreline hydrocarbons following a LOWC of condensate (RPS, 2024). These include the terrestrial state protected areas identified within the planning Area (relevant low exposure threshold for shoreline hydrocarbons) (see Section 6.2.9 for further details for these State Protected Areas). These areas include Bay of Islands, Cape Liptrap, Cape Nelson, Cape Otway shoreline adjacent to Great Otway, Mornington Peninsula, Port Campbell, and Wilsons Promontory. The terrestrial State Protected Areas include values such as terrestrial habitats, ecological communities, unique coastal formations, and culturally significant sites which may be impacted by exposure to shoreline hydrocarbons at the relevant low exposure thresholds (<10 g/m^2).	Modelling predicted several terrestrial State Protected Areas within the area predicted to be exposed to low levels of shoreline hydrocarbons following a vessel LOC of MDO (relevant low exposure threshold (<10 g/m^2) for shoreline hydrocarbons for LOWC) (see Section 6.2.9 for further details for these State Protected Areas). No shoreline contact was predicted for Tasmanian terrestrial state protected areas (RPS, 2024). The potential exposure area for MDO is located entirely within the potential exposure area for condensate LOWC (RPS 2024).

State Protected Areas - Terrestrial
Predicted Environmental Impact
Shoreline
Visible shoreline hydrocarbons have the potential to reduce the visual amenity of the area for tourism and discourage recreational activities within the identified protected areas. Furthermore, hydrocarbons at the relevant threshold may impact values and sensitivities identified for this state protected areas, subsequently reducing the value of these locations. Refer also to: Benthic Habitats Shorebirds Wetlands Coastal Settlements Recreation and Tourism
Predicted Level of Impact
Visible shoreline hydrocarbons have the potential to reduce the visual amenity of the area for tourism and discourage recreational activities within protected areas. The predicted minimum time for oil to reach a shoreline is 3.7 days for the Victorian coast. The condensate is likely to have dissipated during that time due to substantial wave action that would further breakdown any shoreline hydrocarbons. The predicted minimum time for oil to reach King Island was 27 days. As above, the condensate it is likely to have dissipated during that time due to substantial wave action that would further breakdown any shoreline hydrocarbons. Consequently, the potential consequence is considered to be **Serious (3)**, as they could be expected to result in serious impact on valued species or habitat.

7.13.5.3.4 State Protected Areas - Marine

<table>
<tr><th colspan="2">State Protected Areas - Marine</th></tr>
<tr><td>Predicted Hydrocarbon Exposure</td><td>✓ Surface ✓ In-water ✘ Shoreline</td></tr>
<tr><td>Relevant Exposure Thresholds</td><td>Surface: Low Exposure Threshold
In-water: Moderate Exposure Threshold (Dissolved) and High Exposure Threshold (Entrained)</td></tr>
<tr><td>Condensate</td><td>MDO</td></tr>
<tr><td>Bunurong and Point Addis were predicted to be exposed to in-water entrained hydrocarbons at high thresholds.
Twelve Apostles was predicted to be exposed to in-water dissolved hydrocarbons at high thresholds.
Discovery Bay has potential for being impacted at the moderate threshold of in water entrained hydrocarbons.
The Arches MS has potential for being impacted at the moderate threshold of in-water dissolved hydrocarbons.
Twelve Apostles and Port Phillip Heads MNPs and Mushroom Reef MS were predicted to be exposed above the low threshold of in water entrained and/or dissolved hydrocarbons (RPS 2024).</td><td>Modelling predicted that the Twelve Apostles Marine National Park has a 1% probability of being exposed to entrained hydrocarbons at the moderate threshold within the upper 0 -10 m of the water column for up to 6.75 hours.
The Arches and Mushroom Reef Marine Sanctuaries may be exposed to entrained hydrocarbons at the low threshold within the upper 0-10 m of the water column for up to 35.5 hours (2% probability) and 8 hours (1 % probability), respectively (RPS 2024).
The potential exposure area for MDO is located entirely within the potential exposure area for condensate LOWC (RPS 2024).</td></tr>
<tr><td colspan="2">Predicted Environmental Impact</td></tr>
<tr><td>Surface</td><td>In-water</td></tr>
<tr><td>Visible surface hydrocarbons (i.e., a rainbow sheen) have the potential to reduce the visual amenity of the area for tourism and discourage recreational activities.
The values identified for these marine State Protected Areas have the potential to be exposed to surface hydrocarbons at, or above, the low threshold, in the event of a spill incident.
Impact to these receptors from direct or indirect exposure to surface hydrocarbons may cause a subsequent negative impact to the value of the Protected Areas.
Refer also to:
Recreation and Tourism
Seabirds</td><td>The values identified within these State Protected Areas have the potential to be exposed to entrained hydrocarbons at, or above, the moderate threshold in the event of a spill incident.
Impact to these receptors from direct or indirect exposure to in-water hydrocarbons may cause a subsequent negative impact to the value of the State Protected Areas.
Refer also to:
Macroalgae
Seagrass
Soft Corals
Marine Invertebrates</td></tr>
</table>

State Protected Areas - Marine	
	Fish
	Birds
	Marine Reptiles
	Cetaceans
	Heritage Places
	First Nations

Predicted Level of Impact

As impacts are only predicted within 0 – 10 m of the water column values such as the wreck of the Loch Ard, underwater limestone formations of arches and canyons, diverse range of encrusting invertebrates and dive sites are not predicted to be impacted.

The unique limestone rock formations, including the Twelve Apostles, marine habitats representative of the Otway marine bioregion and indigenous culture based on spiritual connection to sea country and a history of marine resource use are unlikely to be impacted by entrained hydrocarbons at the low threshold.

Impacts to Bunurong Marine National Park values, such as abundant and diverse marine flora and fauna, important coastal habitat for threatened species, recreational activities, cultural places and objects of high traditional significance to indigenous people, and important maritime and heritage values, may be impacted by high threshold levels (100 ppb) of entrained hydrocarbons.

Point Addis Marine National Park values, such as the diverse invertebrates, underwater scenery, intertidal reefs, recreational activities, and potential traditional use of the area by indigenous people, may be impacted by high thresholds of in-water entrained hydrocarbons.

The Twelve Apostles Marine National Park values, such as the wreck of the Loch Ard, underwater limestone formations of arches and canyons, diverse range of encrusting invertebrates and dive sites are not predicted to be impacted by high thresholds of dissolved hydrocarbons, given impacts are only predicted within 0 – 10 m of the water column.

The unique limestone rock formations, including the Twelve Apostles, marine habitats representative of the Otway marine bioregion and indigenous culture based on spiritual connection to sea country and a history of marine resource use, may be impacted by in water hydrocarbons at the high threshold.

Consequently, the potential consequence to these State Marine Protected Areas is considered to be **Serious (3)** as they could be expected to result in localised minor short-term impacts to an area of recognised conservation value.

7.13.5.3.5 Australian Marine Parks

Australian Marine Parks	
Predicted Hydrocarbon Exposure	✓ **Surface** ✓ **In-water** ✗ **Shoreline**
Relevant Exposure Thresholds	**Surface: Low Exposure Threshold** **In-water: Low Exposure Threshold (Dissolved) and High Exposure Threshold (Entrained)**
Condensate	**MDO**
Apollo and Zeehan AMPs may be exposed to dissolved in water hydrocarbons at, or above, the low threshold (10 ppb) within the upper 0 -10 m of the water column. Apollo and Zeehan AMPs were predicted to be exposed to in water entrained hydrocarbons at, or above, the low threshold (10 ppb) within the upper 0 -10 m of the water column (RPS 2024). Major conservation values for Australian Marine Parks contacted by hydrocarbons are described in Section 6.2.2.	Apollo AMP may be exposed to entrained hydrocarbons at the high threshold (>100 ppb) within the upper 0 -10 m of the water column for up to 11 hours (RPS 2024). Zeehan AMP may be exposed to entrained hydrocarbons at the high threshold (>100 ppb) within the upper 0 -10 m of the water column for up to 7.25 hours (RPS 2024). No AMPs were predicted to be exposed to dissolved hydrocarbons at any threshold (RPS 2024). Major conservation values for Australian Marine Parks contacted by hydrocarbons are described in Section 6.2.2.
Predicted Environmental Impact	
Surface	**In-water**
Visible surface hydrocarbons (i.e., a rainbow sheen) have the potential to reduce the visual amenity of the area for tourism and discourage recreational activities. The values identified within the AMPs have the potential to be exposed to surface hydrocarbons at, or above, the low threshold, in the event of a spill incident. Impact to these receptors from direct or indirect exposure to surface hydrocarbons may cause a subsequent negative impact to the value of the AMPs. Refer also to: Seabirds Recreation and Tourism First Nations	The values identified within these AMPs have the potential to be exposed to entrained hydrocarbons at, or above, the moderate threshold in the event of a spill incident. However, the exposure of entrained hydrocarbons will be greatest within the upper 0-10 m of the water column and areas close to the spill source. The AMPs are located within various water depths (i.e., 80-120 m for Apollo; 50-70m for Beagle; 40-80 m for Boags; 40-150 m for Franklin, and 50-3,000 m for Zeehan, respectively) therefore, any benthic conservation values within these AMPs, such as ecosystems, habitats and sea-floor features are not predicted to be impacted. Impact to these receptors from direct or indirect exposure to in-water hydrocarbons may cause a subsequent negative impact to the value of the AMPs. Refer also to: Plankton Fish

Australian Marine Parks
Seabirds Pinnipeds Cetaceans First Nations
Predicted Level of Impact
The Apollo AMP is located in waters 80 m to 120 m deep and thus conservation values such as ecosystems, habitats and communities associated with the Western Bass Strait Shelf Transition and the Bass Strait Shelf Province and associated with the seafloor features and the wreck of the MV City of Rayville are not predicted to be impacted. The conservation value of important migration area for blue, fin, sei and humpback whales is unlikely to be impacted as these whales would be moving through the area and thus unlikely to be exposed to in water hydrocarbons within 0 -10 m of the water column for a substantial period to elicit a toxic effect. The Apollo AMP is an important foraging area for black-browed and shy albatross, Australasian gannet, short-tailed shearwater and crested tern. These seabirds forage over an extensive area and are distributed over a wide geographic range. The areas of dissolved hydrocarbon predicted to meet the moderate or high threshold and entrained hydrocarbon predicted to meet the moderate threshold are relatively small compared to the Bass Strait and Otway region. It is these small areas where sub-lethal and toxic effects to birds may occur. There is a low probability that seabirds would be feeding exclusively or predominantly on fish found in the hydrocarbon exposed area, thus there is low probability of seabirds themselves experiencing sub-lethal or toxic impacts as a result of consuming hydrocarbon-tainted fish. The Zeehan AMP is located in waters 50 m to 3,000 m deep and thus conservation values such as ecosystems, habitats and communities associated with the Tasmania Province, the West Tasmania Transition and the Western Bass Strait Shelf Transition and associated with the seafloor features are not predicted to be impacted. The conservation value of important migration area for blue and humpback whales is unlikely to be impacted as these whales would be moving through the area and thus unlikely to be exposed to in water hydrocarbons within 0 -10 m of the water column for a substantial period to elicit a toxic effect. The Zeehan AMP is also an important foraging habitat for black-browed, wandering and shy albatrosses, and great-winged and cape petrels. These seabirds forage over an extensive area and are distributed over a wide geographic range. The areas of dissolved hydrocarbon predicted to meet the moderate or high threshold and entrained hydrocarbon predicted to meet the moderate threshold are relatively small compared to the Bass Strait and Otway region. It is these small areas where sub-lethal and toxic effects to birds may occur. There is a low probability that seabirds would be feeding exclusively or predominantly on fish found in these areas of hydrocarbon exposure, thus there is low probability of seabirds themselves experiencing sub-lethal or toxic impacts as a result of consuming hydrocarbon-tainted fish. Consequently, the potential consequence is considered to be **Serious (3)**, as they could be expected to result in serious impact on valued species or habitat.

7.13.5.3.6 Key Ecological Features

Key Ecological Features	
Predicted Hydrocarbon Exposure	**✓ Surface ✓ In-water ✘ Shoreline**
Relevant Exposure Thresholds	**Surface: Low Exposure Threshold** **In-water: High Exposure Threshold (Dissolved) and High Exposure Threshold (Entrained)**
Condensate	**MDO**
The West Tasmanian Canyons KEF may be exposed to dissolved hydrocarbons at high thresholds (>400 ppb) and entrained hydrocarbons at the high threshold (>100 ppb) within the upper 0 -10 m of the water column. Bonney Coast Upwelling KEF may be exposed to entrained hydrocarbons at low thresholds (10 ppb) within the upper 0-10m of the water column and entrained hydrocarbons at low thresholds. Upwelling East of Eden was predicted to be exposed to low entrained threshold (10 ppb) of in water hydrocarbons. Major conservation values for Key Ecological Features contacted by hydrocarbons are described in Section 6.2.12.	The West Tasmanian Canyons KEF may be exposed to entrained hydrocarbons at the low threshold (10 ppb) within the upper 0 -10 m of the water column for up to 59.25 hours. The Bonney Coast Upwelling KEF may be exposed to entrained hydrocarbons at low threshold (10 ppb) within the upper 0-10 m of the water column for up to 67 hours. No KEF was predicted to be contacted by dissolved hydrocarbons (RPS 2024). Major conservation values for Key Ecological Features contacted by hydrocarbons are described in Section 6.2.12.
Predicted Environmental Impact	
Surface	**In-water**
The values identified within the KEFs have the potential to be exposed to surface hydrocarbons at, or above, the low threshold, in the event of a spill incident. Impact to these receptors from direct or indirect exposure to surface hydrocarbons may cause a subsequent negative impact to the value of the KEFs. Refer also to: Birds	The values identified within these KEFs have the potential to be exposed to entrained hydrocarbons at, or above, the low threshold. However, the exposure of entrained hydrocarbons will be greatest within the upper 0-10 m of the water column and areas close to the spill source. Therefore, the spill is unlikely to intersect with majority of the values of the KEFs which are concentrated within the water column >10 m deep or along the seafloor at varying water depths. Hydrocarbon exposure to the key receptors of the KEFs (e.g. seabirds, pinnipeds and cetaceans) may cause a subsequent negative impact to the value of the KEFs, however is expected to be limited to a small number of individuals, with no impacts to regional populations. Refer also to: Soft Corals Plankton

Key Ecological Features
Fish Birds Marine Invertebrate Cetaceans
Predicted Level of Impact
Hydrocarbons at, or above, low thresholds may cause impacts to receptors (i.e. seabirds) within the area impacted. However, modelling predicted majority of the condensate (64%) to evaporate within the first 24 hours, depending on the wind conditions (RPS, 2024). Therefore, low concentrations are anticipated to remain at the water surface. Modelling predicted the highest probability of exposure to surface and or in-water hydrocarbons at relevant thresholds to occur at the West Tasmania Canyons KEF. The dominant features of the KEFs are associated with the seafloor geology, of eight submarine canyons off the coast of Tasmania, which influence currents. Majority of the values are on the seafloor, therefore, are unlikely to be impacted by in-water hydrocarbons at the relevant thresholds. The impacts from in-water hydrocarbons (dissolved and entrained) at the relevant thresholds are only anticipated to occur within the upper 0 – 10 m of the water column the surface layers of the water column. Given the West Tasmanian Canyons KEF is in water depths > 70 m, the values of the KEFs are not anticipated to be impact. However, plankton populations which are associated with the nutrient-rich waters brought by the currents influenced by the unique seafloor geology may be impacted by in-water hydrocarbon exposure at the relevant thresholds (refer also to Plankton). Consequently, the potential consequence to these KEFs are considered to be **Moderate (2)**, as they could be expected to result in minor, short-term damage to an area of recognised conservation value.

7.13.5.4 Socio-economic Environment

7.13.5.4.1 Coastal Settlements and Recreation and Tourism

Coastal Settlements and Recreation and Tourism	
Predicted Hydrocarbon Exposure	**✘ Surface ✘ In-water ✓ Shoreline**
Relevant Exposure Thresholds	**Shoreline: Low Exposure Threshold**
Condensate	**MDO**
Marine pollution can result in reduced visual aesthetic. The modelling predicts shoreline exposure at the low and moderate threshold along the Otway Coast. The	Marine pollution can result in reduced visual aesthetic. The modelling predicts shoreline exposure at the low threshold along the Otway coast, including: Bay of Islands (1%)

Coastal Settlements and Recreation and Tourism	
minimum time for shoreline accumulation was 3.7 days during winter at Cape Otway West (92%). The areas identified as potentially being overlapped by surface and shoreline hydrocarbons at the relevant exposure thresholds following a vessel LOC of MDO provide areas for a diverse range of tourism and recreational activities, such as: scuba diving, fishing, marine fauna watching, sailing (see Sections 6.5.1, 6.5.7, 6.5.8, and 6.5.9 for further details).	Cape Otway West (24%) Cape Patton (10%) Childers Cove (1%) Moonlight Head (9%) Point Hicks (1%) Port Campbell (2%) around to Lorne (3%) Apollo Bay (8%) Anglesea (1%) There is a low probably of shoreline exposure at the low threshold on King Island (9% from TW1 and 1% from the northern release location). The areas identified as potentially being overlapped by surface and shoreline hydrocarbons at the relevant exposure thresholds following a vessel LOC of MDO provide areas for a diverse range of tourism and recreational activities, such as: scuba diving, fishing, marine fauna watching, sailing (see Sections 6.5.1, 6.5.7, 6.5.8, and 6.5.9 for further details).
Predicted Environmental Impact	
Surface	**Shoreline**
Visible surface hydrocarbons (i.e. a rainbow sheen) have the potential to reduce the visual amenity of the area for tourism and discourage recreational activities. Recreation is also linked to the presence of marine fauna and direct impacts to marine fauna such as whales, birds, and pinnipeds can result in indirect impacts to recreational values. It is important to note that the impact from a public perception perspective may be even more conservative. This may deter tourists and locals from undertaking recreational activities. If this occurs, the attraction is temporarily closed, economic losses to the business are likely to eventuate. The extent of these losses would be dependent on how long the attraction remains closed. Refer also to: Fish and sharks	Visible hydrocarbons stranded on shorelines have the potential to reduce the visual amenity of the area for tourism and discourage recreational activities. In general, recreational and tourism activities are restricted to shallower coastal waters and shorelines. Precautionary exclusion from shorelines may be implemented by local governments until water quality monitoring verifies the absence of residual hydrocarbons. This could cause disruption to some recreational and tourism activities within that area. Furthermore, visible hydrocarbons along shorelines may impact the aesthetic value for tourism and discourage recreational activities that may be operating within the area. However, given the nature of the condensate, being light non-persistent hydrocarbon, any impacts to coastal settlements are expected to be localised and short-term. The wave and tidal action, together with predicted weathering, indicates that

Coastal Settlements and Recreation and Tourism	
Seabirds and Shorebirds Pinnipeds Cetaceans (whales and dolphins) Marine invertebrates	hydrocarbons along shorelines will continually wash off the substrates, and be readily flushed into the water, leading to further weathering.
Predicted Level of Impact	
MDO shoreline oil had potential for exposure on along the Victorian coast including the Otway coast, Port Campbell and Anglesea. The minimum time for shoreline accumulation ranged from 2.03 days at Cape Otway West, 3.18 days at Moonlight Head, 15.05 days at King Island, up to 26.11 days at Anglesea. Visible shoreline hydrocarbons from MDO have the potential to reduce the visual amenity of the area for tourism and discourage recreational activities. Given the minimum time to shoreline accumulation ranged from 2-26 days it is likely that majority of the oil will have dissipated. Both the Otway coast and the west side of King Island are exposed to substantial wave action that would further breakdown any shoreline hydrocarbons. The predicted minimum time for condensate exposure at low thresholds (10 g/m^2) to reach any shoreline was 3.7 days (Cape Otway Westy) up to 89 days (Cape Nelson), Majority of the oil is likely to have dissipated during that time due to substantial wave action that would breakdown any shoreline hydrocarbons. Any impact to receptors that provide nature-based tourism features (e.g. cetaceans, seabirds) may cause a subsequent negative impact to recreation and tourism activities. However, socio-economic impacts, such a reduction in the visual amenity of the area, are more likely to occur at low exposure thresholds. Visible hydrocarbons along the shorelines at these located can change the aesthetic value and discourage any tourism of recreational activities that may occur within the area. However, given the nature of the condensate, being light non-persistent hydrocarbon, any impacts to coastal settlements are expected to be localised and short-term. The wave and tidal action, together with predicted weathering, indicates that hydrocarbons along shorelines will continually wash off the substrates, and be readily flushed into the water, leading to further weathering. Consequently, any impacts are anticipated to be short-term and localised, and potential impacts have been ranked as **Moderate (2)**.	

7.13.5.4.2 Other Marine Users

Other Marine Users	
Predicted Hydrocarbon Exposure	✓ **Surface** ✓ **In-water** ✗ **Shoreline**
Relevant Exposure Thresholds	**Surface: Low Exposure Threshold** **In-water: Low Exposure Threshold (Dissolved) and Low Exposure Threshold (Entrained)**
Condensate	**MDO**

Other Marine Users	
There are no oil and gas platforms, or activities within 5.83 km of the northern release location predicted to be exposed to moderate levels (10 g/m²) of surface hydrocarbons. Shipping may occur within 5.83 km of the northern release location predicted to be exposed to moderate levels (10 g/m²) of surface hydrocarbons	There are no oil and gas operations or activities within the area predicted to be exposed to surface hydrocarbons >10 g/m² (19.85 km from the northern release location and 49 km from the TW1 release location). Shipping occurs within the area predicted to be exposed to surface hydrocarbons >10 g/m² (19.85 km from the northern release location and 49 km from the TW1 release location).
Predicted Environmental Impact	
Surface	
Hydrocarbons at the high threshold may result in oiling of vessel hulls and exclusion of the area until the hydrocarbons evaporation and entrain.	
Predicted Level of Impact	
Physical displacement of vessel marine users may occur due to the establishment of exclusion zones following a spill incident. Due to the nature of the condensate, being a light non-persistent hydrocarbon, with high anticipated evaporation and entrainment rates, exclusion zones are not expected to be long-term and are unlikely to result in significant impacts to other vessel based marine users who may be required to avoid the area. No impacts to subsea cables are predicted from in-water hydrocarbons. No impact to oil and gas operators predicted as there are no non-Beach oil and gas platforms located within the area predicted to be exposed to surface hydrocarbons. Vessels may be present in the area where sea surface oil is present, however, due to the short duration of the surface exposure (approximately 24 hrs depending on weather conditions) deviation of shipping traffic would be unlikely. Any impacts to other marine users has been ranked as **Minor (1),** as they are anticipated to be localised low-level, short-term and recoverable.	

7.13.5.4.3 Commercial Fisheries

Commercial Fisheries	
Predicted Hydrocarbon Exposure	**✓ Surface ✓ In-water ✘ Shoreline**
Relevant Exposure Thresholds	**Surface: Low Exposure Threshold** **In-water: Moderate Exposure Threshold (Dissolved) and High Exposure Threshold (Entrained)**
Condensate	**MDO**

Commercial Fisheries	
The modelling predicted at, or above, moderate exposure (>50 ppb) thresholds for dissolved and high exposure thresholds for entrained (100 ppb) in-water hydrocarbons for both Victorian and Tasmanian state waters for the worst-case scenario modelled (RPS, 2024). Noting that in-water exposure (dissolved or entrained) is only predicted to occur within the upper 0 -10 m of the water column. Several commercial fisheries, including Commonwealth and State managed fisheries, may be intersected by surface or in-water hydrocarbons at the relevant thresholds following a LOWC of condensate (see Sections 6.5.10 to Section 6.5.14 for further details). Commercial fishing may occur within 5.83 km of the release location predicted to be exposed to moderate levels (10 g/m^2) of surface hydrocarbons. Further, in-water exposure to entrained MDO may result in a reduction in commercially targeted seaweed species. Areas along the west side of King Island where bull kelp is collected may be exposed to entrained hydrocarbons at the moderate threshold within the upper 0 -10 m of the water column. The shallow waters of King Island (a location where seaweed collectors harvest bull kelp) was the only nearshore areas predicted to be exposed to in-water hydrocarbons for the worst-case scenario modelled (RPS 2024).	The modelling predicted at, or above, moderate exposure (50 ppb) thresholds for dissolved and high exposure thresholds for entrained (100 ppb) in-water hydrocarbons for both Victorian and Tasmanian state waters for the worst-case scenario modelled (RPS, 2024). Noting that in-water exposure (dissolved or entrained) is only predicted to occur within the upper 0 -10 m of the water column. Commercial fishing occurs within the area predicted to be exposed to moderate surface hydrocarbons >10 g/m2 (19.85 km from the northern release location and 49 km from the TW1 release location). Further, the modelling predicts a low probability of shoreline exposure at the low threshold at King Island (1% from the northern release location and 9% from TW1 release location) where bull kelp may be collected (RPS 2024).
Predicted Environmental Impact	
Surface	**In-water**
Physical displacement of commercial fishers may occur due to the establishment of exclusion zones during the spill response. Visible surface hydrocarbons (i.e. a rainbow sheen) may have the potential to cause impact public perception of the industry, potentially causing a negative economic impact.	As discussed in the relevant sections above (i.e. fish and invertebrates) exposure to in-water hydrocarbons has the potential to impacts species. Due to the sensitivity, a small number of juvenile fish, larvae, and planktonic organisms, may be impacted. In-water hydrocarbon exposure may result in a reduction in commercially targeted marine species (i.e. fish and invertebrate species), subsequently resulting in impacts to commercial fishing productivity. Contamination of target species can cause economic impacts to the industry. Exposure of in-water hydrocarbons to commercially valuable marine plants, such as macroalgae, can cause smothering, resulting in fouling and asphyxiation (Blumer 1971; Cintron et al. 1981). Notably, hydrocarbon smothering can act as a physical barrier for the diffusion of CO_2 across cell walls to macroalgae (O'Brien & Dixon 1976). Any impacts to commercially valuable seaweed have to potential to result in negative economic impacts to the industry.

Commercial Fisheries	
	However, any acute impacts are expected to be limited to individuals and not expected to cause impacts at a population level. Furthermore, impacts are not expected to affect population viability or recruitment. Refer to: Macroalgae Invertebrates Fish
Predicted Level of Impact	
Commercial fishing vessels may be present in the area where sea surface oil is present, however, due to the short duration of the surface exposure (approximately 24 hrs depending on weather conditions) deviation of vessels would be unlikely. A short-term fishing exclusion zone may be implemented. However, given the temporary nature of any surface oil and the low intensity in the area of exposure, there are unlikely to be any significant impact on fisheries in terms of lost catches (and associated income). Further, impacts to commercial fish and invertebrate species are not predicted from surface oil. Experiments verified the susceptibility of *Nereocystis luetkeana* (bull kelp – North America) tissue to the direct exposure to several petroleum types. Antrim et al (1995) showed that petroleum treatments resulted in visible tissue damage, with a distinct bleached line being the most visible indication of plant contact with the petroleum. Moderate to heavy colour loss, which was generally followed by rapid decay of tissue, was most pronounced in 24 h exposures to unweathered and weathered MDO. As bull kelp is collected from the shoreline there is a potential for some plants to be affected and not be suitable for collection and processing. However, given the low levels of shoreline oil predicted (peak volume of 1.38 m^3) it is unlikely to be a significant impact on seaweed collection and associated income. In-water exposure (entrained and dissolved) at the relevant exposure thresholds is only predicted to occur within the upper 0 – 10 m of the water column; therefore, commercially valuable species, such as pelagic and benthic species, are less likely to experience impacts. Furthermore, due to the nature of the condensate, being a light non-persistent hydrocarbon, with high anticipated evaporation and entrainment rates, exclusion zones are not expected to be long-term and are unlikely to result in significant impacts. Further, given the low levels of in-water hydrocarbons predicted, it is unlikely to be a significant impact to commercial fish, invertebrate and seaweed collection and associated income. Consequently, any impacts are anticipated to be short-term and localised, and potential impacts have been ranked as **Moderate (2)**.	

7.13.5.5 Cultural Values and Sensitivities

First Nations	
Predicted Hydrocarbon Exposure	✓ **Surface** ✓ **In-water** ✓ **Shoreline**
Relevant Exposure Thresholds	**Surface: Low Exposure Threshold** **In-water: Moderate Exposure Threshold (Dissolved) and High Exposure Threshold (Entrained)** **Shoreline: Low Exposure Threshold**
Condensate	**MDO**
First Nations cultural values and sensitivities may be present within the area exposed to surface, in-water and shoreline hydrocarbons at relevant thresholds following a vessel LOWC of condensate. These include values related to marine fauna and benthic species such as seagrass and kelp as identified in Section 6.6.3. The modelling predicts visible surface sheen at the low threshold up to approximately 54 km from the northern release location or 24.5 km from the TW1 release location. This oil may be visible as a rainbow sheen on the sea surface during calm conditions. The modelling predicts shoreline exposure at the low threshold within Victorian Traditional Owner areas of Eastern Maar Native Title determination (Tribunal File No. VCD2023/001), Gunditjmara Native Title determination (Tribunal File No. VCD2007/001) and Bunurong Land Council Aboriginal Corporation. The modelling predicts shoreline exposure at the low threshold (1 g/m^2) on the western side of King Island. In-water exposure to hydrocarbons is predicted along coastal First Nations Sea Country including Victorian coastal waters stretching from Discovery Bay to the west to Hopkins River mouth/ Warrnambool in the east. Sea Country predicted to be exposed to in-water exposure to hydrocarbons is adjacent to the Eastern Maar Native Title determination (Tribunal File No. VCD2023/001), Gunditjmara Native Title determination (Tribunal File No. VCD2007/001) and Preminghana Indigenous Protected Area. The extent of the modelled in-water hydrocarbons, moderate dissolved and high entrained, exposure thresholds may overlap areas where species that have cultural value are present. This includes any BIAs. Noting that in-water exposure (dissolved or entrained) is only predicted to occur within the upper 0 -10 m of the water column.	First Nations cultural values and sensitivities may be present within the area exposed to surface, in-water and shoreline hydrocarbons at relevant thresholds following a vessel LOC of MDO. These include values related to marine fauna and benthic species such as seagrass and kelp as identified in Section 6.6.3. The modelling predicts visible surface sheen at the low threshold up to 32.65 km from the northern release location or 64.97 km from the TW1 release location. This oil may be visible as a rainbow sheen on the sea surface during calm conditions. The modelling predicts shoreline exposure at the low and moderate threshold along the Otway coast (Eastern Maar native title claim) and further east at Anglesea (Wadawurrung native title claim). In-water exposure to hydrocarbons are predicted along the Victorian and Tasmanian coastal waters within the planning area which is Sea Country for a number of First Nations groups and is adjacent to the Eastern Maar Native Title claim. No IPAs along coastlines were predicted to be exposed to shoreline hydrocarbons at relevant thresholds (RPS 2024).

Predicted Environmental Impact		
Surface	**In-water**	**Shoreline**

First Nations		
Visible surface hydrocarbons have the potential to reduce the visual amenity of culturally significant areas. The following First Nations cultural values and sensitivities identified in Section 6.6.3 may be present within the area exposed to surface hydrocarbons at relevant thresholds. See also: Birds Cetaceans Pinnipeds	The following First Nations cultural values and sensitivities identified in Section 6.6.3 may be present within the area exposed to in-water hydrocarbons at relevant thresholds and are assessed in the relevant sections: Marine invertebrates Fish Birds Pinnipeds Cetaceans State Protected Areas - Marine	Visible hydrocarbons along a shoreline have the potential to reduce the visual amenity of culturally significant areas. The following First Nations cultural values and sensitivities identified in Section 6.6.3 may be present within the area exposed to shoreline hydrocarbons at relevant thresholds and are assessed in the relevant sections: Birds Pinnipeds State Protected Areas - Marine
Predicted Level of Impact		
Beach understands that First nations people are linked to the marine environment and may be affected by a change in the environment. Due to the hydrocarbon characteristics of condensate, majority of the surface oil is expected to either evaporate or entrain within the first 24 hours under variable-wind conditions. Surface oil is only predicted to remain after 24 hours in calm conditions (RPS, 2024). Therefore, although no long term or permanent changes to marine environment are expected it is considered that the visual presence of floating oil may impact Sea Country at a spiritual level (i.e. rituals, Songlines, culturally important species) and could affect culturally important activities such as mutton birding or affect culturally important species including whales. Visible shoreline hydrocarbons have the potential to reduce the visual amenity of Sea Country. The predicted minimum time for oil to reach a shoreline is 3.7 days for the Victorian coast, and 22 days for King Island. Condensate is likely to have dissipated during that time due to substantial wave action that would breakdown any shoreline hydrocarbons. Although no long term or permanent changes to marine environment are expected it is considered that the visual presence of shoreline oil may impact Sea Country at a spiritual level (i.e. rituals, songlines) and could affect culturally important activities such as mutton birding. The relatively low volume of in-water hydrocarbons means there may be short-term and localised consequences. Although no long-term or permanent changes to marine environment are expected the short-term contamination of Sea Country may result in impacts associated at a spiritual level (i.e. rituals, Songlines, culturally important species) and could affect culturally important activities such as mutton birding or affect culturally important species including eels and whales. Consequently, any impacts are anticipated to be short-term and localised, and potential impacts have been ranked as **Moderate (2)**.		

7.13.6 Demonstration that Risk will be ALARP

ALARP decision context and justification	**ALARP Decision Context: Type B** Vessels have been used for activities within the Otway and Bass Basins including drilling for over a decade with no major incident. Vessel activities are well regulated with associated control measures, well understood, and are implemented across the offshore industry. Well completions, interventions and P&A activities have been ongoing within the Otway and Bass Basin for over a decade with no major incident. These activities are highly regulated with associated control measures, well understood, and are implemented across the offshore industry. However, if a loss of containment occurred this could attract public and media interest. Consequently, Beach believes that ALARP Decision Context B should be applied.	
Adopted Control Measures	**Comparison to Relevant OPP Control Measures or Equivalents**	**Description**
CM01: Marine Assurance Process	CM01 is equivalent to OPP-CM35 Marine Orders. Both controls refer to the application of relevant Marine Orders.	The MODU and vessels will meet relevant maritime laws and includes pre-commencement MODU and vessel inspections of class certification requirements under the Navigation Act 2012 and associated Marine Orders, including but not limited to: Marine Order 21: Safety and emergency arrangements gives effect to SOLAS regulations dealing with life-saving appliances and arrangements, safety of navigation and special measures to enhance maritime safety. Marine Order 27: Safety of navigation and radio equipment gives effect to SOLAS regulations regarding radiocommunication and safety of navigation and provides for navigation safety measures and equipment and radio equipment requirements. Marine Order 30: Prevention of collisions requires that onboard navigation, radar equipment, and lighting meets the International Rules for Preventing Collisions at Sea (COLREGs) and industry standards. Marine Order 31: SOLAS and non-SOLAS certification details survey, maintenance, and certification requirements for vessel class. Marine Order 70: Seafarer Certification details training and competency requirements.
	CM01 is equivalent to OPP-CM26 Preventative Maintenance System. Both controls detail inspection and maintenance of equipment to ensure efficient operation.	Rig and vessels will have a Preventative Maintenance System that provides a status on the maintenance of equipment and detailed manufacturer's specification on maintenance procedures for:

		Equipment detailed as a control in this EP will be inspected to ensure effective operation. Power generation and propulsion systems on the MODU and vessels will be inspected to ensure efficient operation.
	CM01 is equivalent to OPP-CM35 Marine Orders. Both controls refer to the application of relevant Marine Orders.	In accordance with MARPOL Annex I and Marine Order 91 Marine Pollution Prevention – oil, a Shipboard Marine Pollution Emergency Plan (SMPEP) or Shipboard Oil Pollution Emergency Plan (SOPEP) (according to class) is required to be developed based upon the Guidelines for the Development of Shipboard Oil Pollution Emergency Plans, adopted by IMO as Resolution MEPC.54(32) and approved by AMSA. To prepare for a spill event, the SMPEP/SOPEP details: Response equipment available to control a spill event. Review cycle to ensure that the SMPEP/SOPEP is kept up to date. Testing requirements, including the frequency and nature of these tests. In the event of a spill, the SMPEP/SOPEP details: Reporting requirements and a list of authorities to be contacted. Activities to be undertaken to control the discharge of hydrocarbon. Procedures for coordinating with local officials. In addition, spill response kits will be available and routinely checked to ensure adequate stock is maintained.
CM02: Vessel and MODU Operating Procedures	CM02 is equivalent to OPP-CM06 Temporary exclusion/cautionary zones. Both controls refer to the application of 500 m exclusion zone around the MODU. OPP-CM06 refers to a 2 km cautionary zone for mooring system, whereas CM02 refers to a more conservative 3 km zone to ensure potential risks are ALARP.	A 500 m radius PSZ will be published in the Government Notices Gazette for each new well location for the duration of the drilling and will remain in place for those wells which are suspended for future production. A 3 km radius cautionary zone will be in place around the MODU when on location and will be monitored by a support vessel. At least one support vessel will accompany the MODU when in operation and when safe to do so (e.g. outside of weather event), to manage interactions with other marine users.

	CM02 is equivalent to OPP-CM47 Bunkering procedure. Both controls details management of bulk liquids in accordance with bulk transfer procedures.	Bunkering and bulk liquids will be transferred in accordance with bulk transfer procedures to reduce the risk of an unintentional release to sea during transfer. The procedures include standards for: Certified equipment with confirmed integrity (e.g. hose and valves). Transfer process (e.g. safety, communication, monitoring, inventory, emergency shut down procedures, procedural documents, and spill incident details)
		Materials and equipment that have the potential to spill onto the deck or marine environment will be stored within a contained area.
CM03: Consultation for Implementation of EP	CM03 is equivalent to OPP-CM04 Stakeholder consultation. Both controls relate to Beach undertaking consultation for the implementation of the Project which includes the Program activities. CM03 is also equivalent to OPP-CM02 Notifications. Both controls refer to the notification of the Australian Hydrographic Office (AHO) to facilitate the issuing of Notice to Mariners and maintain nautical charts.	As per Section 4, Beach will undertake consultation for the implementation of the EP which will include at a minimum: Notification to all relevant person regarding acceptance of the EP by NOPSEMA. Commencement of activities, exclusion zones, vessel details, supply vessel navigational corridors, pre-lay of anchors and buoys, movement of MODU to new locations, during activity and cessation notification requirements. On-water communication processes, including SMS messages and radio communication. Consultation with relevant First Nations groups (section 6.6.2) regarding identified cultural heritage and cultural landscapes in accordance with CM05: Seabed Survey. Consultation with commercial fishing associations (and individual commercial fishers where identified) regarding well locations, the ongoing communication of Beach activities to their members, and applying CM04: Beach Fair Ocean Access Procedure. Under the Navigation Act 2012, the Australian Hydrographic Office (AHO) are responsible for maintaining and disseminating hydrographic and other nautical information and nautical publications such as Notices to Mariners. AMSA also issue radio-navigation warnings. Notifications to AMSA and AHO will be undertaken as detailed in Section 8.3.1

CM04: Beach Fair Ocean Access Procedure	CM04 is equivalent to OPP-CM03 Fair Ocean Access Procedure. Both controls refer to the implementation of Beach's Fair Ocean Access Procedure.	Beach's Fair Ocean Access Procedure was developed with input from commercial fishing industry organisations (Bass Strait Scallop Industry Association, Scallop Fisherman's Association of Tasmania, South East Trawl Fishing Industry Association and Tasmanian Seafood Industry Council). It sets out Beach's commitment to the principle that a fisher should not suffer an economic loss as a direct result of a Beach Project. The procedure details the process whereby a commercial fisher can claim compensation for an economic loss associated with Beach's offshore activities where impacts cannot be avoided. The procedure is described as follows: 1. Fisher submits a claim for compensation, using the Beach Claim Form. Claim to be submitted no later than 60 days after completion of the relevant Beach project. 2. Beach to acknowledge receipt and provide a single point of contact within 2 business days. 3. All claims to be supported by catch and effort evidence. 4. Beach may ask to meet with the fisher, together with a representative of their Association or other representative if they chose, to clarify details of the claim. 5. Beach will use best endeavours to process the claim within 10 business days after a fisher has provided evidence. 6. If approved, Beach will make payment within 30 business days (subject to completion of relevant forms).

		The procedure also includes a process for resolving disputes, which is activated if Beach and a fisher cannot reach an agreement on a fisher's claim within 30 days. This process includes referring the claim to an independent expert. An information sheet on the procedure is available in Appendix D.
CM09: Program Activities	CM09 is equivalent to OPP-CM45 Preventative maintenance. Both controls detail a system to ensure all wells and subsea infrastructure is maintained to schedule.	The BOP shall be routinely function and pressure tested in accordance with industry standards and preventative maintenance will be in accordance with manufacturer's specifications and in alignment with Drilling Contractor's preventative maintenance system. Prior to campaign commencement a register of suitable relief well rigs will be compiled and updated monthly during the campaign, or more frequently should any change in status of available rigs occur.
CM13: Beach Offshore Oil Pollution Emergency Plan (OPEP)	CM13 is equivalent to OPP-CM48 EP, OPEP and OSMP. Both controls detail the requirement of an accepted OPEP.	Under the OPGGS(E)R, NOPSEMA require that the petroleum activity have an accepted Oil Pollution Emergency Plan (OPEP) in place before the activity commences. In the event of a LOC or LOWC, the OPEP will be implemented. The Offshore OPEP was developed to support all Beach activities offshore Victoria and includes response arrangements for a worst-case LOC / LOWC scenario from the activity. The OPEP also includes Tactical Response Plans (TRPs) for identified protection priority areas within the region. The Victorian Desalination Plant is identified as a sensitive environmental receptor in the Offshore OPEP and forms part of the Powlett River Tactical Response Plan.
CM14: Beach Offshore Operational and Scientific Monitoring Plan	CM14 is equivalent to OPP-CM48 EP, OPEP and OSMP. Both controls detail the requirement of an accepted OSMP.	Under the Environment Regulation, NOPSEMA require that the Environment Plan Implementation Strategy provides for monitoring of an oil pollution emergency. The OSMP details operational monitoring to inform response planning and scientific monitoring to inform the extent of impacts from hydrocarbon exposure and potential remediation requirements.
CM15: Well Engineering and Construction Management System (WECS)	CM15 is equivalent to OPP-CM42 WECS. Both controls detail the requirement for a WECS that ensure well activities are fit for purpose.	Beach has in place an Operational Excellence Management System (OEMS) which includes WECS that ensures Beach well activities are fit for purpose with operational risks managed to a level that is as low as reasonably practicable. It also ensures that changes are made in a controlled manner, that appropriate

		standards are adhered to, and that a sufficiently resourced and competent organisation is in place.
CM16: Source Control Contingency Plan (SCCP), inclusive of Relief Well Plan	CM16 is equivalent to OPP-CM50 Source control. Both controls detail the requirement for a source control emergency response plan to be in place.	The SCCP will be consistent with the International Oil and Gas Producers (IOGP) Report 594 - Subsea Well Source Control Emergency Response Planning Guide for Subsea Wells (2019). A Relief Well Plan will be developed in line with industry guidelines, i.e. OEUK. Beach is a signatory for accessing source control support through the Australian Energy producers Memorandum of Understanding (AEP MoU) arrangement. Mutual aid is a multi-lateral support network that provides a pre-agreed framework for the sharing of equipment and expertise. The key objective is to enable rapid response to control the source as efficiently as possible.
CM17: NOPSEMA Accepted Well Operations Management Plan	CM17 is equivalent to OPP-CM40 WOMP. Both controls detail the requirement for an accepted WOMP to ensure high standard of well integrity.	The WOMP details well barriers and the integrity testing that will be in place for the Program activities. Beach's NOPSEMA accepted WOMP describes the minimum requirements for well barriers during drilling activities.
CM18: NOPSEMA accepted Rig Safety Case	CM18 is equivalent to OPP-41 Rig Safety Case. Both controls detail the requirement for an accepted Safety Base which described how risks are controlled and the system in place to ensure the controls are effectively and consistently applied.	The Offshore Petroleum and Greenhouse Gas Storage (Safety) Regulations 2009 (OPGGS(S)R) set out the requirements for the contents of safety cases. The MODU requires an Australian Safety Case detailing the control in place to prevent a major accident event. The Rig Safety Case: Identifies the hazards and risks. Describes how the risks are controlled. Describes the safety management system in place to ensure the controls are effectively and consistently applied.

Additional controls assessed			
Control	**Control Type**	**Cost/Benefit Analysis**	**Control Implemented?**
Preventative			
Eliminate or substitute the use of diesel.	Equipment	The use of diesel for fuel for vessels and machinery cannot be eliminated. Substituting for another fuel, i.e. Heavy Fuel Oil or bunker fuel oil, would have a higher environmental impact than diesel.	No
Remove support vessels from activity.	Equipment	Vessels are required to support operational activities and provide essential safety standby duties including tracking/intersecting vessels that are coming	No

		towards or close to the rig. Thus, there is an increased risk of collision by removing support vessels from the activity.	
No refuelling to MODU at sea.	Equipment	Eliminates the risk of incidents related to the transfer of fuels to the rig. Refuelling operations are one of the most likely causes of a hydrocarbon spill occurring during marine operations. However, given the offshore location and the inability to bring the MODU into port to refuel, this activity cannot be removed.	No
Reduction			
Reduce the volume of MDO carried.	Equipment	May reduce the total volume of MDO released. Evaluation of trade-offs indicates that carrying less diesel would result in the need for more frequent port visits for refuelling and/or more frequent at-sea bunkering and may increase the risk of transit and bunkering related incidents. The trade-offs and associated costs are grossly disproportionate to the benefit gained.	No
Response			
Relief well rig on standby	Equipment	Any rig on standby would require an in-force Safety Case to operate in Australian Commonwealth waters. The key benefit would be a reduction in the overall shoreline loading from weathered, residual fractions of the condensate. There is no predicted shoreline exposure at moderate or high thresholds. Having a rig on standby would potentially halve the time to implement source control, therefore, the overall potential reduction in exposure to shorelines by halve. Halving the potential loading at a low threshold would produce a marginal overall environment benefit given the nature of weathered condensate. Although conceptual relief well planning will be performed as part of the SCCP, time would still be required to plan the relief well to address the actual situation. Rig availability will be a challenge and on top of this, having a relief well rig on standby would result in significant additional costs (approx. $1M / day) to Beach that that are considered grossly disproportionate to the level of environmental benefit gained given the relatively small level of potential low threshold shoreline oiling.	No

Capping Stack System (CCS)	Equipment	Well CCS is designed to stem the hydrocarbon flow prior to permanent plugging of the well. Beach undertook a feasibility review of CCS and has confirmed that due to the technical complexity (i.e. lack of vertical access above the well in a blowout scenario, significant HSE risks in deploying the capping stack and any Offset Installation methods due to no vertical access) of deploying a capping stack in shallow waters with a gas plume environment and harsh metocean conditions, a relief well is the preferred means of primary source control for the exploration, appraisal, and development wells. Refer to Section 7.14.1 Response Strategy Selection.	No
Dispersant application	Equipment	Chemical dispersants are generally ineffective for gas-condensate hydrocarbon releases. However, dispersants may be effective to reduce VOCs at surface to below lower explosive limits. Given the installation of a capping stack is not a feasible response option for the production or suspended wells, and a relief well would be offset to the release location, there is no potential benefit with applying subsea dispersants.	No

7.13.7 Demonstration that Risks will be of an Acceptable Level

Consequence rating	Minor (1) to Serious (3)
Likelihood of occurrence	LOC MDO: Highly Unlikely (B) based upon AMSA Annual Report 2017-18 (serious incident reports) LOWC condensate: Remote (A) (1.6×10^{-4} for drilling of a normal deep exploration wells and a probability of 1.5×10^{-4} for drilling of appraisal wells based upon gas wells operated to North Sea Standard) ref IOGP Risk Assessment Data Directory Blowout Frequencies September 2019: https://www.iogp.org/bookstore/product/risk-assessment-data-directory-blowout-frequencies/
Residual risk	Low

Acceptability assessment

Demonstration of acceptability for impacts and risks associated with loss of containment provided in Section 7.4.6 of the OPP (Otway Offshore Gas Victoria Project) is considered valid and appropriate for the impact and risk assessment of this aspect for the Program activities. This is supported by the acceptability assessment for this aspect against the evaluation criteria in the following rows.

The potential risk of loss of containment from Program activities meets the defined acceptable levels in the OPP by ensuring the considerations in Section 2.8 are met such that:

OPP EPOs relevant to loss of containment are implemented through equivalent EP EPOs OPP control measures relevant to loss of containment are implemented through equivalent EP control measures Based on the implementation of relevant and equivalent EPOs and control measures the consequence rating, likelihood of occurrence and residual risk are the same levels as defined in the OPP No changes to internal or external context as defined in the OPP including no new comments (objections and claims) raised against this aspect.	
To meet the principles of ESD	The risk of a hydrocarbon spill was assessed as Low, and the highest consequence assessed as Serious (3) which has the potential to result in serious or irreversible environmental damage. However, this is assessed as acceptable based on: There is little uncertainty associated with this aspect as the activities are well known, the cause pathways are well known, and activities are well regulated and managed. The implementation of controls ensures loss of containment from the MODU and vessels are Highly Unlikely (B) and loss of containment from a LOWC event is Remote (A) resulting in a low residual risk. There is high confidence in the predicted level of risk as Beach has significant experience operating in the Otway Basin based on their existing offshore developments and associated activities including the Beach Otway Drilling Campaign in 2021/2022.
Internal context	The proposed management of the risk is aligned with the Beach Environment Policy. Project activities will be undertaken in accordance with the Implementation Strategy (Section 7).
External context	There have been no stakeholder objections or claims regarding loss of containment.
Other Requirements	Vessel activities undertaken during the Program activities will adhere to relevant legislative requirements as detailed in the controls section. Integrity of wells and equipment is managed as per the requirements of the in-force EP, safety cases and WOMPs required under the OPGGS(E)R and Offshore Petroleum and Greenhouse Gas Storage (Safety) Regulations and Offshore Petroleum and Greenhouse Gas Storage (Resource Management and Administration) Regulations 2011, respectively. The South-east Marine Parks Network Management Plan 2025 (DNP 2025) identifies marine pollution including discharge of oil may impact on marine park values. The following Conservation Advice / Recovery Plans identify pollution as a key threat: Recovery Plan for Marine Turtles in Australia (CoA 2017b), identified as acute chemical discharge (oil pollution). National Recovery Plan for the Australian Fairy Tern (*Sternula nereis nereis*) (CoA 2020b). National Recovery Plan for the Australian Painted Snipe (CoA 2022) identified as a deterioration of water quality. Conservation Advice *Calidris ferruginea* (curlew sandpiper) (DoE 2015f) identified as Habitat degradation/ modification (oil pollution). Conservation Advice for *Calidris acuminata* (sharp-tailed sandpiper) (DCCEEW 2024h) identified wetlands and intertidal habitats threatened by acute pollution (oil).

	Conservation Advice for *Arenaria interpres* (ruddy turnstone) (DCCEEW 2024i) identified wetlands and intertidal habitats threatened by acute pollution (oil). Conservation Advice for *Numenius madagascariensis* (far eastern curlew) (DCCEEW 2023o) identified as Habitat degradation/ modification (oil pollution). Conservation Advice for *Calidris tenuirostris* (great knot) (DCCEEW 2024f) identified wetlands and intertidal habitats threatened by acute pollution (oil). Conservation Advice for *Calidris canutus* (red knot) (DCCEEW 2024g) identified wetlands and intertidal habitats threatened by acute pollution (oil). National Recovery Plan for Albatrosses and Petrels 2022 (CoA 2022a). Wildlife Conservation Plan for Migratory Shorebirds – 2015 (DoE 2015b). Wildlife Conservation Plan for Seabirds (CoA 2020a). These Conservation Advice and Recovery Plans identify the following conservation actions: Minimise chemical and terrestrial discharge. Controls have been identified and will be implemented to minimise the risk of minimise chemical discharges. Ensure spill risk strategies and response programs include management for turtles and their habitats, particularly in reference to 'slow to recover habitats', e.g. nesting habitat, seagrass meadows or coral reefs. No habitats for turtles are identified within the Planning Areas. OPEP and OSMP cover management of response to oiled turtles. Ensure appropriate oil-spill contingency plans are in place for the subspecies' breeding sites which are vulnerable to oil spills. OPEP and OSMP cover response strategies for management breeding sites vulnerable to oil spills. Implement measures to reduce adverse impacts of habitat degradation and/or modification. Controls have been identified and will be implemented to reduce adverse impacts of habitat degradation and/or modification.
Monitoring and reporting	Loss of containment resulting in a hydrocarbon spill is required to be reported as per Section 8.3.1. Impacts as a result of a loss of containment resulting in a hydrocarbon spill will be monitored and reported in accordance with the OSMP.
Acceptability outcome	**Acceptable**
Environmental Performance	Environmental Performance Outcomes (EPOs) represent the measurable levels of environmental performance Beach is seeking to achieve to ensure impacts are of an acceptable level. EPOs relevant to the effective management of impacts associated with loss of containment from Program activities are: • EPO1: Undertake the activity in a manner that will not interfere with other marine users to a greater extent than is necessary for the exercise of rights conferred by the titles granted.

	• EPO2: No death or injury to listed threatened or migratory species from the activity. • EPO12: No unplanned loss of containment of hydrocarbons or chemicals to the marine environment. Section 7.15 sets out the EPS for the control measures identified above, and the measurement criteria to evaluate the achievement of EPOs and EPS. These EPOs are considered equivalent to relevant OPP EPOs as justified in Table 2-2.

7.14 Spill Response

This section presents the impact assessment for oil spill response strategies.

Beach has developed a regional Offshore Oil Pollution Emergency Plan (OPEP) which is the primary reference document and key control measure to be implemented in the highly unlikely event of a hydrocarbon release whilst undertaking Program activities.

7.14.1 Response Strategy Selection

Spill response strategies are triggered in the event of a hydrocarbon spill. Not all response strategies are appropriate for every oil spill. Different oil types, spill locations, and volumes require different response strategies, or a combination of response strategies, to form an effective response.

Beach has undertaken a preliminary Net Environmental Benefit Analysis (NEBA) to identify response strategies that will result in the lowest overall impact and maximum protection, or recovery, of environment, socio-economic and cultural values. The NEBA process is undertaken at a strategic level (pre-spill) to identify pre-determined appropriate response strategies. In the event of a spill, an Operational NEBA is undertaken throughout the response, and implementation of specific response strategies is subject to the outcomes of the Operational NEBA.

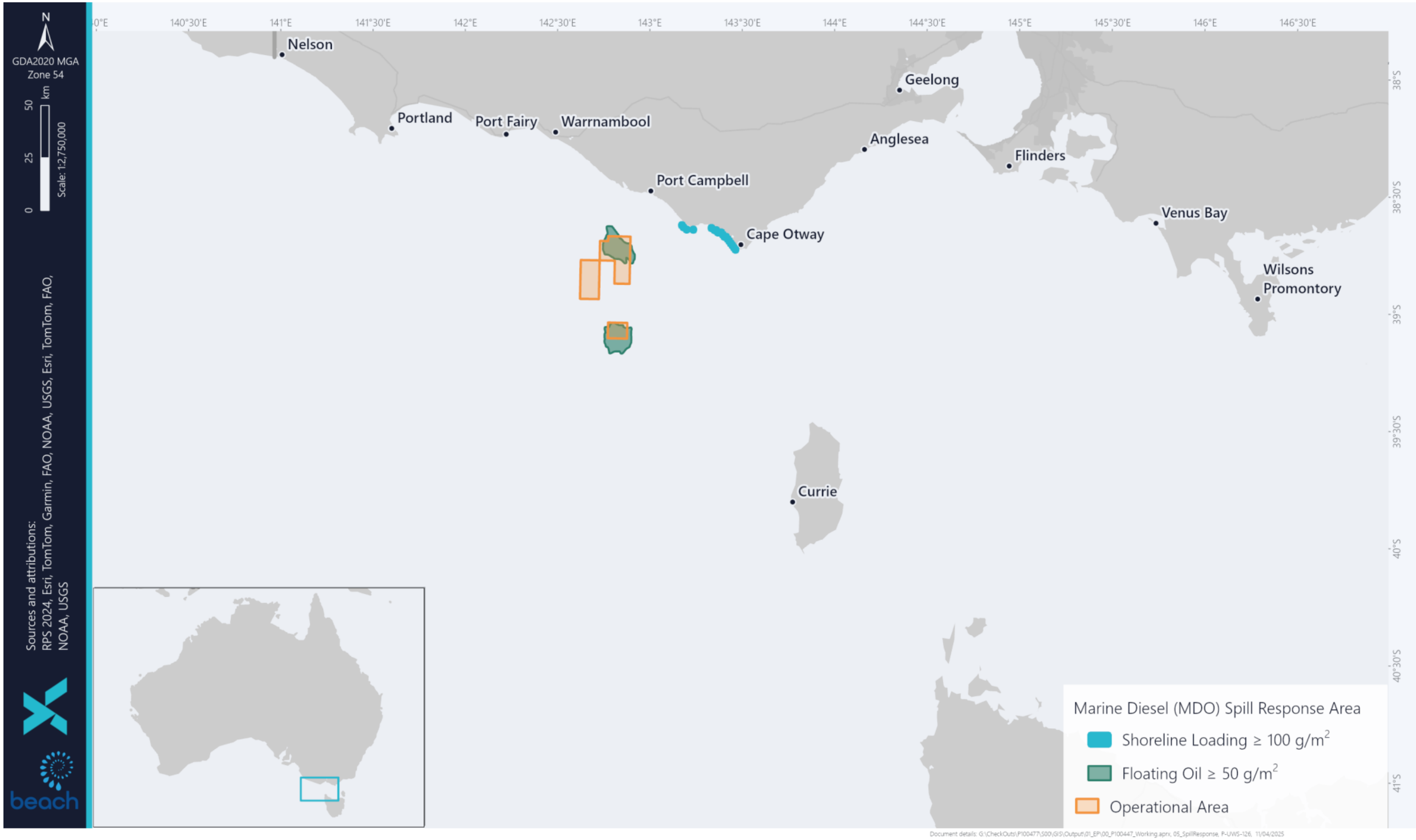


Figure 7-11: Marine Diesel Oil (MDO) spill response area

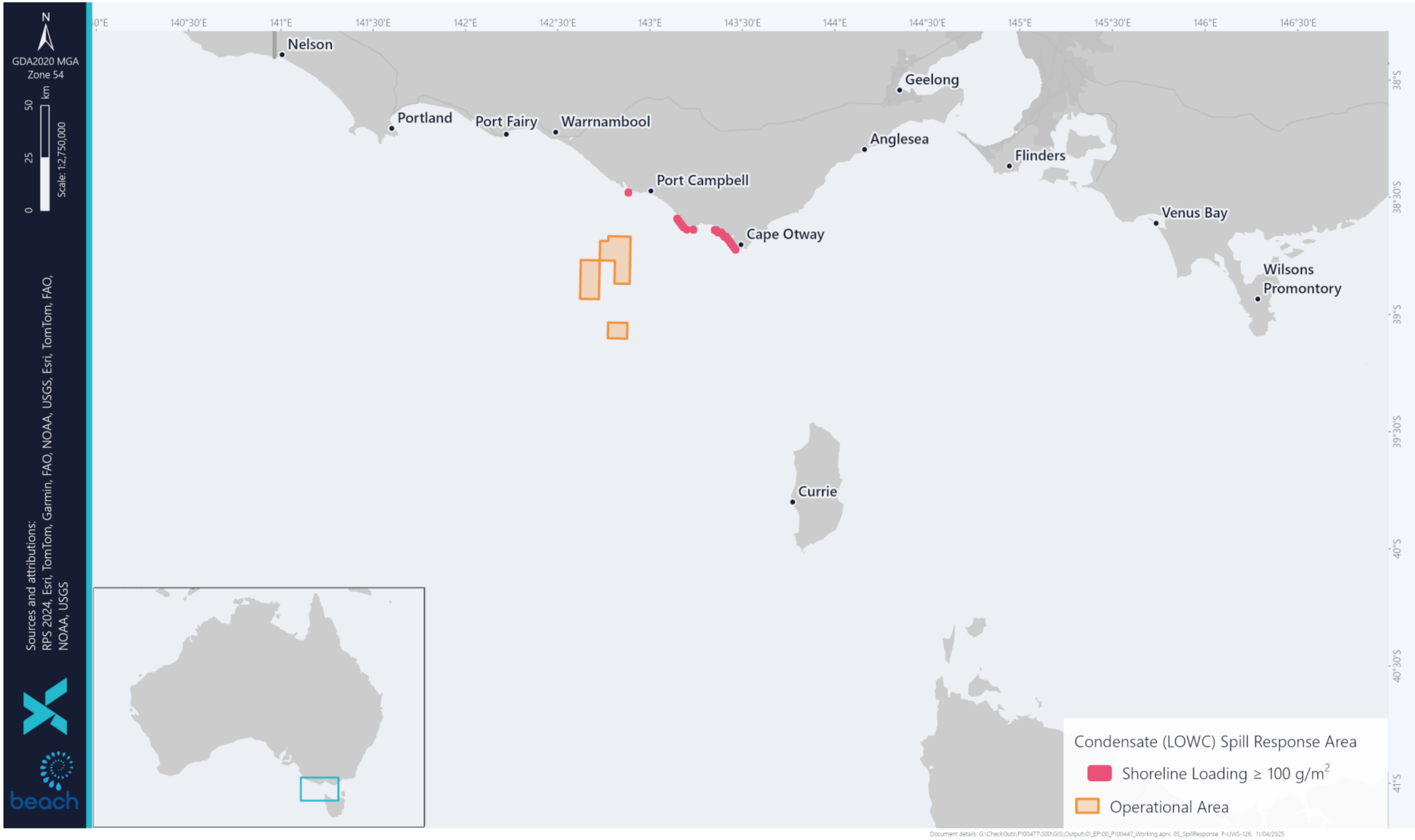


Figure 7-12: Condensate (LOWC) spill response area

Table 7-21 details the review undertaken of current oil spill response strategies and identifies the response strategies that are appropriate to loss of well containment (LOWC) of condensate and an unplanned vessel spill of MDO.

7.14.2 Spill Response Planning Area

Exposure values for oil spill modelling were used to approximate the spatial extent to inform the evaluation and planning for oil spill response and monitoring.

To identify the area where oil spill response strategies would be effective the following actionable hydrocarbon exposure thresholds based on the NOPSEMA Bulletin: Oil Spill Modelling (NOPSEMA 2019) were used:

- Surface moderate exposure (50 g/m^2).
- Shoreline moderate exposure (100 g/m^2).

The Spill Response Planning Area for MDO is shown in Figure 7-11 and LOWC in Figure 7-12.

No areas of actionable shoreline oil (>100 g/m^2) were identified outside of Victoria with the main area being the Otway Coast.

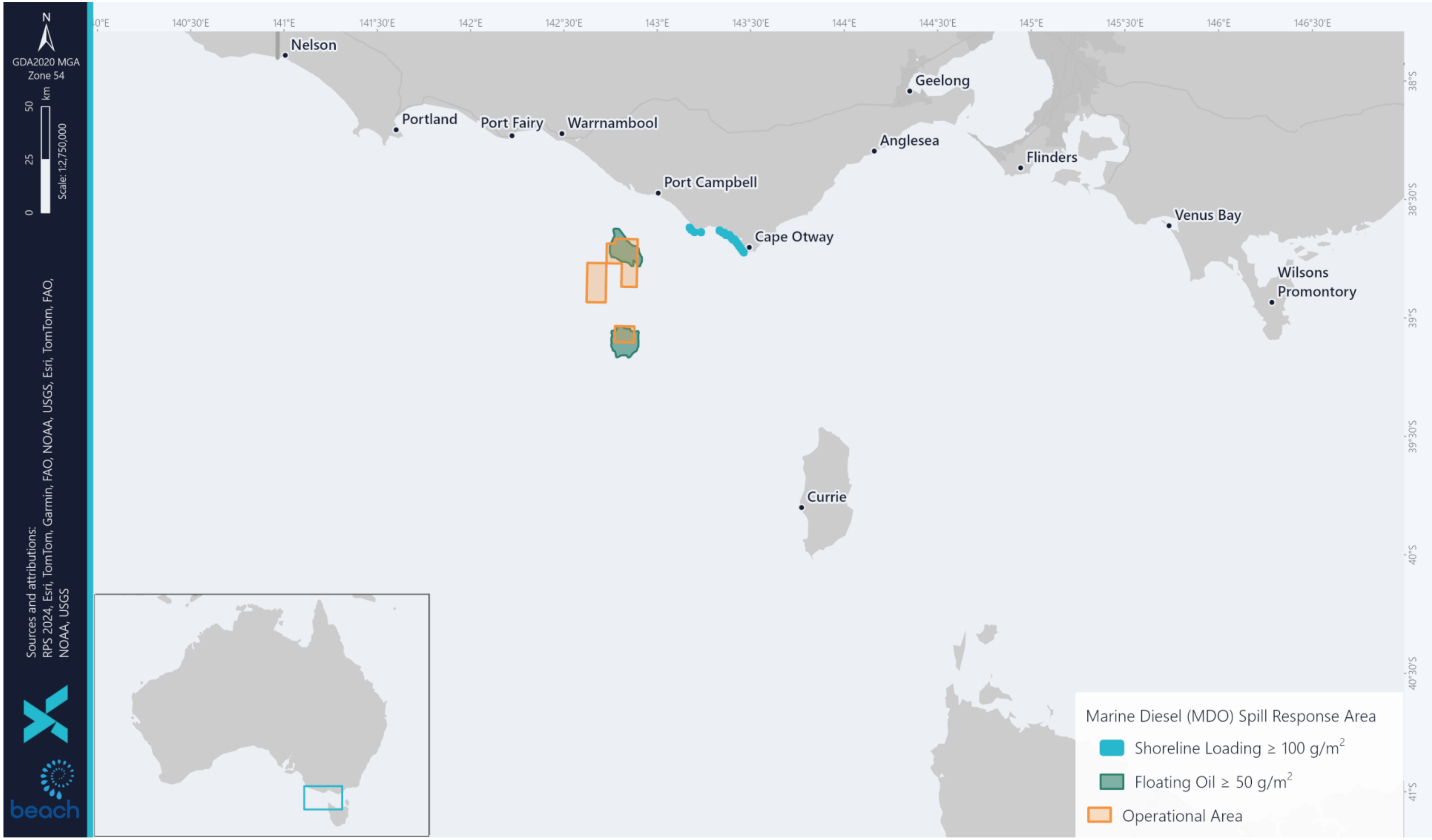


Figure 7-11: Marine Diesel Oil (MDO) spill response area

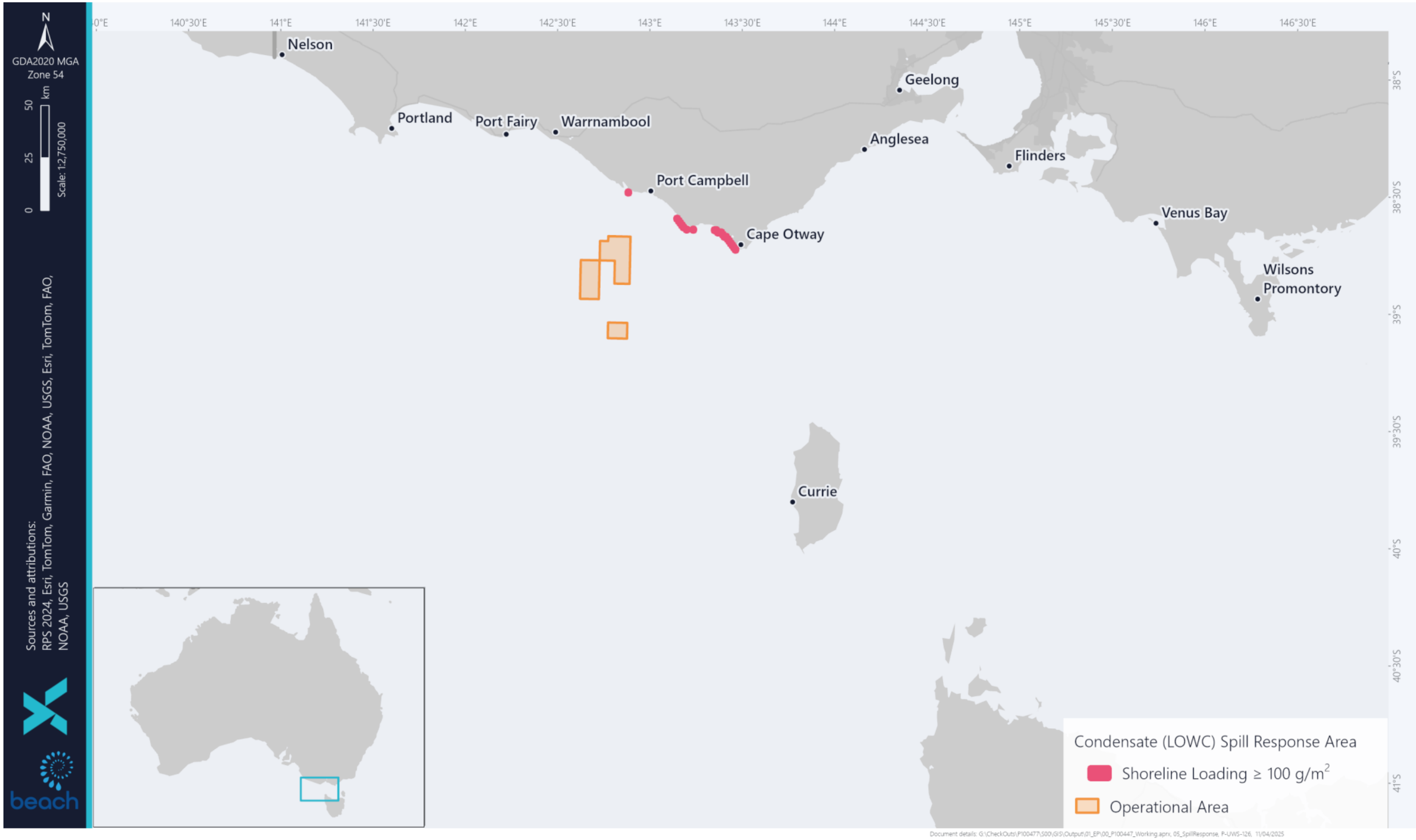


Figure 7-12: Condensate (LOWC) spill response area

Table 7-21: Preliminary NEBA summary - feasibility, effectiveness & ALARP analysis

Response Strategy	Response Description	Hydrocarbon Type	Feasibility, Effectiveness & ALARP Analysis	Net Environmental Benefit	Capability Needs Analysis (See OPEP and OSMP for details)	Capability Assessment
Monitor and Evaluate	Visual – aerial & vessel Satellite Predictive modelling	Gas condensate	Feasible. Effective – Gas condensate expected to spread to thin layers on the sea surface within 1 km of the well location. Monitoring used to inform both response planning and monitoring requirements. Hydrocarbons likely visible on sea surface for duration of LOWC. Visual and satellite operational monitoring implemented during LOWC event. Scientific monitoring implemented to inform extent of impact and remediation requirements. Aerial surveillance is considered more effective than vessel to inform spill response and identify if oil has contacted shoreline or wildlife. Vessel surveillance limited in effectiveness in determining spread of oil. All feasible monitoring techniques have been applied and monitoring personnel and equipment are readily available for deployment. Monitoring buoy maintained aboard MODU whilst undertaking drilling activity for deployment. No further benefit gained by having additional monitoring capability. OSMP details the vessels and personnel to implement the appropriate scientific studies.	Yes	Actionable on-water hydrocarbon thresholds limited to immediate vicinity of well site. Maximum length of shoreline accumulation at the response threshold (moderate) is 14.8 km with a mean of 4.2 km 1 x plane & observer required and/or 1 x vessel & observer and / or 5 x vessels and OSMP study teams. Remote oil spill trajectory modelling (OSTM).	As detailed in OPEP: Tracking buoy on MODU. Aerial contracts in place Aerial observers available via AMOSC. Vessels available for duration of Program activities. OSTM contract in place and available via AMOSC. Environmental monitoring consultants accessible. Implement response as per OPEP and under direction of the State Control Agency (if in State waters). Capability in place and sufficient to implement timely response.
	Visual – aerial and vessel	MDO	Effective - MDO rapidly spreads to thin layers on surface waters. Monitoring used to inform both response planning and monitoring requirements. Aerial surveillance is considered more effective than vessel to inform spill response and identify if oil has contacted shoreline or wildlife. Vessel surveillance limited in effectiveness in determining spread of oil. Scientific monitoring implemented to inform extent of impact and remediation requirements. Both vessel and aerial monitoring capability in place. Trained aerial observers available via AMOSC Core Group and available for deployment. Vessel and aircraft contracts in place. No further benefit gained by having additional monitoring capability.	Yes		
Source Control	ROV Emergency BOP Intervention	Gas condensate	Feasible. Effective. Response strategy that can be rapidly implemented to reduce the release of hydrocarbons into the marine environment whilst undergoing plans for the primary response strategy of a relief well.	Yes	Support vessel Trained personnel Operating equipment (i.e. ROVs/cameras /cutters)	As detailed in OPEP and SCCP: Access to response specialists such as AMOSC/ Oceaneering/Wild Well Control for equipment.
	Relief well	Gas condensate	At the time of writing, the following MODUs have been deemed as being within Australia in the expected time frame of the Program activities. • Ocean Apex (North West Shelf) • Noble Deliverer (Western Australia) • Transocean Endurance (North West Shelf) • Valaris 247 (North West Shelf) Due to the remote location of the Otway Basin, the available MODUs shall be monitored on a monthly basis upon commencement of drilling activities thus ensuring the mobilisation of an alternate rig remains feasible within the assumed timeframe of approximately 35 days (the largest time component of the relief well kill). The ongoing assessment of rig availability shall be conducted with reference to: MODU with a valid Australian Safety Case. MODU with the ability to conduct relief well kill operations. MODU ability to operate in shallow water.	Yes	MODU – with Australian Safety Case. Casing, drill pipe and consumables. 3 x support vessels. Well control personnel as detailed in SCCP.	As detailed in OPEP, SCCP and Relief Well Plan: Access to rig via AEP MoU. Contracts with Well Control Specialists. Relief well mobilisation strategy and schedule. Wells Emergency Team (WET). Implement response as per OPEP, SCCP and Relief Well Plan. Capability in place and sufficient to implement timely response.

		Proximity to the Otway Basins. Ability to engage in a mutual aid agreement with the Operator. Transport of one of the identified MODUs to the Otway Basin is within the 35-day mobilisation estimate provided, assuming a tow speed of ~4 knots. If there are suitable MODUs operating in New Zealand within the expected timeframe of the Program activities (at the time of writing, none are planned to be), the transport from New Zealand waters to the Otway Basin is likely to take approximately half of the duration relative to mobilisation from the North-West Shelf. Interface shall be managed via the Australian Energy Producers 'Memorandum of Understanding (AEP MoU): Mutual Assistance' (to which Beach is a signatory) between Beach, the New Zealand Oil Operator, MODU Contractor, and the Australian Regulator. Source control planning has identified all reasonable controls to implement relief well in a timely manner. Beach considers the potential environmental benefit gained by having a pre-positioned alternate rig on location to be grossly disproportionate given the high financial and logistical support cost associated with having a rig on standby. All reasonable pre-planning has been undertaken to facilitate the timely initiation of a relief well if required.				
Capping stack system (CSS)	Gas condensate	Trendsetter Engineering, as the manufacturer of capping stacks, was engaged by Beach to review various capping stack options and its feasibility. Trendsetter reviewed available concepts promoted within industry and selected the two most viable deployment concepts for further evaluation with the various CSS. The feasibility analyses are detailed in the following two studies: Beach Capping Stack Shallow Water Feasibility Assessment GER-9002748_BE CS Non-Vertical Study Two (2) alternative offset installation (non-vertical access) methods were applied to four (4) different CSS identified by Beach for potential use on a typical shallow water subsea blowout gas well. **Delmar Offset Installation Method** This method requires that the subsea blowout wellhead was left clear, with BOP stack removed previously or not installed at all, so that Delmar's subsea wellhead winches could be established for drawdown operations. For this concept, the subsea winch is the primary installation method, with the mudmat winch drawdown being the secondary installation method. The positioning of the capping stack is solely dependent on the use of the drawdown winches. The subsea hook up would need to be made with vessel support from outside the plume diameter, with adequate safety margin, estimated to be at least 335 m. Furthermore, vertical control is fully dependent on the positive buoyancy of the system, and successful deployment relies heavily on the precisely calculated buoyancy force of the chained buoys, with only minimum control or adjustable measures to compensate the required vertical lifting of the payloads. If the gas plume impact forecast to the buoys is not within the assumed design, then the buoyancy performance will be outside the calculated parameter range. **Trendsetter Offset Installation Method** The Trendsetter method relies on a series of chained oceangoing barges to assist in lifting and deployment of the CSS and BOP adaptor spool. The barges are used to assist positioning and ensure the anchor handling vessel is maintained in a safe zone away from the gas plume. Gas plume impact on oceangoing barges in exclusion zone above blowout well will severely limit the success of the deployment. In addition, two subsea winches, may be deployed on clump weights on the seabed approximately 30 m from the wellhead and used for lowering and guidance of the capping stack over the damaged well. In general, the subsea drawdown system would be recommended with a less heavy 7" 15,000 psi capping stack (Boots and Coots) and to assist with successful guidance of the CSS assembly. Unlike the Delmar method that uses buoyancy modules, these are not required for the Trendsetter method. Furthermore, the	N/A	N/A	N/A	

			use of the drawdown capability is dependent on the wet weight of the stack and the up-thrust forces from the blowout well. The Trendsetter method does require additional vessels available, and the successful deployment would be limited due to the weather and metocean conditions. **Summary** Rough sea states (especially as per prevailing in the Otway Basin), including high waves and longer wave periods define the safe operating limits of CSS deployment. The ability to safely deploy the capping stack using a deck crane or A-frame located on the stern of the deployment vessel is questionable. Furthermore, if the vessel is experiencing too much heave due to wave action, the CSS could unintentionally hit the subsea wellhead during deployment causing damage to the equipment itself and to the wellhead. Support vessels have wind ratings for routine and critical operations, above which, operations may be suspended, and high wind speeds will tend to increase wave heights in open water conditions which can further limit operations. Defining operating limits of acceptable sea states are required for successful deployment of the CCS equipment in adverse sea state environments. The feasibility analysis confirmed a sea state limit of 2 m significant wave height (Hs) and 15 knots winds is required. The Otway Basin is a predominantly moderate to high wave energy environment with wave heights in the summer months averaging between 2.5 and 3.0 m and maximum heights ranging between 5.6 and 7.7 m. Wave conditions are more severe in winter, when mean heights range from 3.1 to 3.7 m and maximum heights are between 7.6 and 10.3 m. In summary, all seasons show a relatively high level of wind and wave activity. Winds in the eastern Otway and western Bass Strait area also are generally strong, exceeding 13 knots for 50% of the time. The sea state in the area does not stay below the limit for a duration long enough for the CCS operation. The conditions are thus not operationally suitable for deployment of the CSS. Furthermore, the gas plume environment in shallow water conditions is manifestly different to a deeper water environment due to the exclusion zone above the wellhead preventing vertical installation of the equipment. Additionally, given the use of a CSS is not operationally suitable for the Program activities, the debris clearance tooling as part of the SFRT is not required (see below).			
	Subsea First Response Toolkit (SFRT)	Gas condensate	Feasible. Potentially effective - may support decision making for source control strategy and potentially allow for debris clearance. Given that the use of a CSS is not operationally feasible, as described above, the use of the SFRT is not required.	NA	NA	NA
	Vessel Source Control	MDO	Effective – primary response strategy for all spills in accordance with vessel SMPEP/SOPEP. Given AMSA is the Control Agency in the event of a vessel collision in Commonwealth waters, and their access to NatPlan resources no further controls are considered.	Yes	Support vessels	Program activities are serviced by multiple support vessels. Capability available at request of AMSA as Control Agency.
Offshore Containment and Recovery	Booms and skimmers	Gas condensate	Not feasible. Actionable surface thickness of 50 g/m^2 is not expected to be reached from LOWC at either release location according to both seasons of spill modelling results.	N/A	N/A	N/A
		MDO	Not feasible. MDO spreads rapidly to less than 10 g/m^2 and suitable thicknesses for recovery are only present for the first 36 hours for a large offshore spill, and there is insufficient mobilisation time to capture residues. In general, this method only recovers approximately 10-15% of total spill residue, creates significant levels of waste, requires significant manpower and suitable weather conditions (calm) to be deployed.			
Protection and Deflection	Nearshore Booms and skimmer	Gas condensate	Potentially feasible. Partially effective. The maximum length of actionable shoreline oil is approximately 23 km with initial shoreline contact predicted to occur within 4 days of the release with a maximum loading of 87.5 m^3 predicted. If operational monitoring indicates shorelines are potentially exposed to actionable levels of hydrocarbons and accessible to response personnel and equipment, protection and deflection may be an effective technique for reducing shoreline loadings.	Subject to operational NEBA	Response personnel Booms & skimmers Waste facilities	As detailed in OPEP: Core responders and equipment available via AMOSC. NRT and NRST available via Control Agency request under NatPlan. Environmental monitoring providers accessible. Waste contracts in place.

			Given Beach have access to both AMOSC equipment and Core Group personnel available for timely deployment as per Tactical Response Plans, no further controls have been identified.			Tactical Response Plans developed for priority response planning areas. Implement response as per OPEP and under direction of the State Control Agency. Capability in place and sufficient to implement timely response.
		MDO	Potentially feasible. Partially effective. The maximum length of actionable shoreline oil is approximately 13 km with initial shoreline contact predicted to occur within 2 days of the release with a maximum loading of 58 m^3 predicted. If operational monitoring indicates shorelines are potentially exposed to actionable levels of hydrocarbons and accessible to response personnel and equipment, protection and deflection may be an effective technique for reducing shoreline loadings. Given Beach have access to both AMOSC equipment and Core Group personnel available for timely deployment as per Tactical Response Plans, no further controls have been identified.	Subject to operational NEBA	Response personnel Booms & skimmers Waste facilities	As detailed in OPEP: Core responders and equipment available via AMOSC. NRT and NRST available via Control Agency request under NatPlan. Environmental monitoring providers accessible. Waste contracts in place. Implement response as per OPEP and under direction of the State Control Agency. Capability in place and sufficient to implement timely response.
Shoreline Clean-up	The active removal and/or treatment of oiled sand and debris	Gas condensate	Feasible. Effective on beaches. The maximum length of actionable shoreline oil is approximately 23 km with initial shoreline contact predicted to occur within 4 days of the release with a maximum loading of 87.5 m^3 predicted. If operational monitoring indicates shorelines are potentially exposed to actionable levels of hydrocarbons and accessible to response personnel and equipment, shoreline clean-up may be an effective technique for reducing shoreline loadings. Given Beach have access to both AMOSC equipment and Core Group personnel available for timely deployment as per Tactical Response Plans, no further controls have been identified.	Subject to operational NEBA	For shoreline clean-up planning the volume of collected oil is multiple by a factor of 10. The clean-up rate is based on 1 m^3 per day per person with clean-up teams based on 10 persons per team.	As detailed in OPEP: Core Group responders and equipment available via AMOSC. NRT and NRST available via Control Agency request under NatPlan. Waste contracts in place. Tactical Response Plans developed for priority response planning areas. Implement response as per OPEP and under direction of the State Control Agency. Capability in place and sufficient to implement timely response.
		MDO	Feasible. Effective on beaches. The maximum length of actionable shoreline oil is approximately 13 km with initial shoreline contact predicted to occur within 2 days of the release with a maximum loading of 58 m^3 predicted. If operational monitoring indicates shorelines are potentially exposed to actionable levels of hydrocarbons and accessible to response personnel and equipment, shoreline clean-up may be an effective technique for reducing shoreline loadings. Given Beach have access to both AMOSC equipment and Core Group personnel available for timely deployment as per Tactical Response Plans, no further controls have been identified.	Subject to operational NEBA	For shoreline clean-up planning the volume of collected oil is multiple by a factor of 10. The clean-up rate is based on 1 m^3 per day per person with clean-up teams based on 10 persons per team.	As detailed in OPEP: Core Group responders and equipment available via AMOSC. NRT and NRST available via Control Agency request under NatPlan. Waste contracts in place. Implement response as per OPEP and under direction of the State Control Agency. Capability in place and sufficient to implement timely response.
Oiled Wildlife Response (OWR)	Capture, cleaning, and rehabilitation of oiled wildlife.	Gas condensate	Feasible. Effective. At the conservative environmental impact surface threshold (10 g/m^2) the predicted exposure is up to approximately 6 km from the release locations. Oiling could also occur on shorelines if fauna are present.	Yes	Personnel Equipment Triage and waste facilities	As detailed in OPEP: Core Group responders and equipment available via AMOSC NRT and NRST available via Control Agency request under NatPlan. See OPEP for details of applicable response and support agencies for the relevant state. Capability in place and sufficient to implement timely response
		MDO	Feasible. Effective. At the conservative environmental impact surface threshold (10 g/m^2) the predicted exposure is up to approximately 49 km from the release location with a maximum residency time of up to 19 days. Oiling could also occur on shorelines if fauna are present.			

Chemical Dispersant Application	Application of chemical dispersants either surface or subsea	Gas condensate	Feasible. Not recommended for Group I oils such as condensate due to the very low viscosity and high volatility – generally no environmental benefit gained by the application of dispersant on Group I oils. Subsea dispersant injection (SSDI) may reduce volatile organic compounds (VOCs) at sea surface within the response area, therefore creating a safer work environment for responders. Given the use of a CSS is not operationally suitable, the application of chemical dispersants to reduce surface VOCs is not required.	No	N/A	N/A
		MDO	Feasible. Although "conditional" for Group II oil, the size of potential spill volume and the natural tendency of spreading into very thin films is evidence that dispersant application will be an ineffective response. The dispersant droplets will penetrate through the thin oil layer and cause 'herding' of the oil which creates areas of clear water and should not be mistaken for successful dispersion (see ITOPF – Technical Information Paper No. 4: The Use of Chemical Dispersants to Treat Oil Spills).	No	N/A	N/A

7.14.3 Response Strategies

7.14.3.1 Source Control

Source control responses for consideration in this plan include:

- ROV Emergency BOP Intervention
- Relief Well
- Subsea First Response Toolkit
- Vessel Source Control

Refer to the well-specific SCCP for the recommended source control strategies.

7.14.3.1.1 ROV Emergency BOP Intervention

Emergency BOP activation involves delivering hydraulic fluid to the BOP stack using an ROV to mitigate any problems that may have arisen with the BOP control system in the event of a loss of well containment.

7.14.3.1.2 Relief Well

Drilling a relief well is the primary source control strategy for wells in the Otway Basin. Each well, or group of similar wells, has a Relief Well Plan (CM16) detailing:

- the relief well strategy for each well or group of similar wells,
- anticipated timeframes to drill a relief well, and
- resources available to implement the Relief Well Plan.

The primary method of well control is via a dynamic well kill by intersecting the well bore below the release location via a relief well and circulating kill weight drilling fluid into the well bore, thus controlling the flow of hydrocarbons from the reservoir. This requires the mobilisation of another suitable MODU to the existing well location.

Relief Well Scope

The scope of drilling a relief well is the same as drilling a standard well although it will be a deviated well due to the need to drill at distance from the original flowing well. A relief well is typically drilled as a straight hole down to a planned kick-off point, where it is turned towards the target using directional drilling technology and tools to get within 30-60 m of the original well. The drilling assembly is then pulled from hole and a magnetic proximity ranging tool is run on wireline to determine the relative distance and bearing from the target well. Directional drilling continues with routine magnetic ranging checks to allow for the original well to be intersected. Once the target well is intersected dynamic kill commences by pumping kill weight mud and cement downhole to seal the original well bore.

Initial relief well planning is part of the well design process, this includes screening of suitable relief well location, relief well design and kill study to optimise planning time required and optimise relief well duration. The long lead items including wellhead and casing will be identified prior to commencement of the campaign. A source control emergency response exercise will also be conducted to validate the planning and arrangements ahead of commencement of drilling operations. Should a blowout emergency occur, further planning for the relief well will begin simultaneously with other well intervention options. Outline relief well plans, and methodology are contained in each well-specific SCCP (CM16) The SCCP details the process for relief well design with key activities prioritised as part of the immediate response operations:

- Mobilisation of well control and relief well specialists.
- Confirmation of relief well strategy with well specialist to define MODU/vessel requirements:
- Confirm relief well location using geophysical site survey data. This will consider the prevailing weather at the time of the incident, seabed infrastructure in the area and directional drilling requirements for well intersection.
- Validate relief well casing design.
- Screen available MODUs in the region with current Australian Safety Case and select MODU with appropriate technical specifications to execute the strategy. A memorandum of understanding has been established between Australian operators (including Beach) to expediate access to suitable MODUs, equipment, and services for relief well drilling. If required Beach is able to request the use of a MODU, equipment, and services, that may be under contract to another operator. Minimum technical specifications for the well kill have been modelled, and the selected MODU will meet these requirements and be capable of operating in the metocean conditions at the relief well location.
- Prepare and submit regulatory documentation required for relief well activities.
- Mobilise necessary equipment and services such as directional drilling equipment and appropriate ranging tools for relief well strategy.

Relief Well Design

The SCCP and Relief Well Plan (CM16) includes technical details as to the design and equipment requirements to drill a relief well. Detailed well kill modelling has demonstrated that the activity wells can be killed via a single relief well. Two relief well sites have been identified for each well location, even though modelling confirms only one relief well is required for the kill operation. This redundancy will give contingency in the event one of the relief well sites is deemed not accessible. Final sites will be chosen based on a risk assessment considering the actual conditions in the event of a loss of containment.

The relief well can be executed using a semi-submersible MODU (moored) similar to that used for Program activities. Moorings are expected to extend approximately 2 km from the MODU and may therefore extend beyond the distance of the Operational Area, which may expand by approximately 1-2 km radius under emergency conditions. The final anchor layout will be based on mooring analysis and MODU configuration.

At least two Anchor Handling Tug Supply (AHTS) vessels would be required to tow the MODU (if unable to self-propel) and install moorings. An active MODU would already be supported by AHTS vessels and hence would likely be accompanied by those vessels during relief well drilling. AHTS vessels could also be sourced from hubs such as the Northwest shelf and Singapore.

MODU Selection

The Otway Basin is considered a remote location and therefore likely to have an impact on the time taken for a suitable MODU to be mobilised to the relief well location. This timeframe has been built into the oil spill modelling. MODU broker reports are used to monitor the MODU market on a monthly basis and, if required, assist in sourcing and contracting a suitable MODU:

- The MODU broker can be contracted to identify and contract a suitably specified MODU (including Australian Safety Case status) within 14 days. This allows sufficient time to engage with other operators as well as drilling contractors to confirm availability of MODUs with suitable technical specifications to meet the required engineering well design. Note that a "sister" MODU to the Equinox will be operating in Australia during the time of the Beach campaign, given the known characteristics of the MODU with regards to the harsh environment and the existing Australian base safety case this will be our first call in emergency.
- To facilitate timely response, Beach is a signatory to the AEP Memorandum of Understanding: Mutual Assistance for transfer of MODUs between operators in the case of an emergency. A MODU that is not currently in operation, or in transit to the next operating well, will be preferential and result in a reduced period from the 14 days predicted for engaging and selecting suitable MODUs. The full 14 days will be required where there are no suitable MODUs not currently in operation and the selected MODU will be required to safely suspend well operations on its existing well prior to commencing mobilisation to Beach's location.

MODU selection for relief well drilling will be based on the following:

- A MODU mobilised from the Norh West Shelf (NWS) or Singapore is likely to take 35 days. These periods have been factored into the relief well schedule within the well-specific Relief Well Plans.
- Rating of well control equipment: MODUs considered shall have equipment rated to at least 10,000 psi to perform the required well kill.
- Water depth: MODU being considered for relief well drilling must be rated for a minimum water depth of 60-100 m.
- Pump capacity of MODU: Suitable to execute the dynamic well kill as per modelling.
- Seabed conditions.
- MODU with a valid Australian Safety Case.
- Proximity to the Otway Basin.
- Ability to engage in a mutual aid agreement with the operator.

Relief Well Installation Timeline

The relief well timeline is largely guided by the location of mobilisation of the MODU drilling the relief well. The three mobilisation points considered are outlined previously. Beach anticipates the mobilisation of an alternate MODU to the Otway Basin and the successful intersection of a flowing well would take approximately 86 days. Details of the most suitable source control methods applicable to the specific wells will be detailed in well-specific Source Control Contingency Plan, inclusive of the Relief Well Plan and dynamic kill modelling ((SCCP and Relief Well Plan (CM16)).

Regulatory Approval Timing Considerations

Planning for relief well drilling will occur in parallel to other tertiary well control responses. A key component of the relief well drilling will be the preparation, submission, and approval of the regulatory documents. Generally, for well operations the regulatory and risk management processes fall on critical path hence in an emergency these documents will require a high level of focus immediately to ensure they are in place prior to arrival of the MODU.

The following documents will require consideration:

- Vessel Safety Case – is required for the selected MODU.
- Scope of validation - is required by NOPSEMA for any proposed significant change to an offshore facility (i.e. MODU or vessel) and to be agreed prior to submission of a safety case revision. Depending on the level of changes required, the time to complete and gain approval could possibly affect the response time to have regulatory documentation in place prior to start of relief well operations.
- Safety Case Revision - will require preparation, submission and approval prior to operations and is expected to be on critical path for relief well activities.
- Well Operations Management Plan (WOMP) –is expected to be suitable for relief well drilling and not expected to require a revision and resubmitted.
- Environmental Plan (EP) – Is designed to provide for source control response activities. Significant changes may require resubmission subject to initial change assessment, though is not expected to affect overall response time.
- Well Activity Notice (WAN) - As part of the preparation of the above documentation a number of formal safety assessments will be conducted as part of risk management these include:

  Hazard Identification (HAZID) workshop (identifies risks, assesses hazards and mitigations to control works site hazards with aim to remove major accident events).

  Hazard Operations (HAZOP) workshop (risk assesses the operational sequence and place controls to reduce hazards to ALARP).

  Risk Assessments for safety critical equipment (vessel equipment, BOP, mooring, fluids handling).

Response Agreements:

Beach maintains contracts/agreements with specialists to supply well control expertise and support for drilling a relief well. This includes:

- Beach primary well control support services (Wild Well Control): Well control specialists with experience in relief wells and the coordination of installation activities.
- Technical writing and risk engineering services to support regulatory documentation workflows and submissions is provided by experienced specialists (e.g. ADD Energy).
- Wellhead and casing materials supplier.
- Beach is party to the Industry Memorandum of Understanding (MoU) to share drilling MODUs, equipment and resources (well site services) in the event of an emergency. The MoU provides for the timely transfer of third-party contractual arrangements involved in the release of a MODU and well site services to the Titleholder for relief well drilling.
- Equipment and materials needed to construct a relief well will be able to be sourced either directly from suppliers or through the industry AEP Mutual Aid MoU. All equipment and materials are tracked and identified prior to the commencement of the offshore activity through the "relief well readiness form" process (refer to OPEP). All equipment and materials are expected to be sourced and transported to site during the safety case revision approval timeframe, MODU transit and anchoring phase for the base and mid case response time model estimates. For the local MODU mobilisation case, an operational MODU would also have equipment and services, with additional equipment and services available via AEP MoU.
- Beach will conduct a relief well readiness check and engage titleholders to ascertain and confirm the level of critical equipment inventories during the operational period for the purpose of drilling a relief well.

7.14.3.1.3 Vessel Source Control

For a vessel spill at sea, the Vessel Master shall implement the Shipboard Marine Pollution Emergency Plan (SMPEP) or Shipboard Oil Pollution Emergency Plan (SOPEP) (equivalent to class).

7.14.3.2 Monitoring and Evaluation

Monitoring and evaluation is conducted to assist in identifying resources that are at risk of exposure, directing response efforts and evaluating the effectiveness of response techniques. Monitoring activities are conducted throughout the incident response and include:

- Manual Spill Trajectory Modelling – manual vectoring and software (e.g. ADIOS) to predict the weathering and trajectory of the hydrocarbon.
- Oil Spill Trajectory Modelling (OSTM) – computer models, and computational techniques estimate the speed and direction of movement, weathering, and dispersal patterns.
- Aerial/Vessel Surveillance– observers on aircrafts or vessels use standard references to characterise surface oil type, movement, and behaviour.
- Satellite Tracking Buoys – are heavy duty floating devices designed for deployment from the MODU, support vessel or helicopters to accurately track a surface hydrocarbon spill. Tracking buoys contain a global satellite tracking system and are used to track the leading edge or centre of a spill and provide an oil spill response team with information to plan the incident response.

- Satellite Imagery – a method that uses remote sensing technologies to identify and track surface oil.

7.14.3.3 Protection and Deflection

Protection and deflection response will be under the direction of the relevant State Control Agency (as detailed in the OPEP) and involve using specialist equipment (e.g. nearshore booms and skimmers) to divert floating oil away from sensitive receptors. Techniques vary depending on the location and type of sensitivity being protected.

7.14.3.4 Shoreline Clean-up

Shoreline clean-up will be under the direction of the relevant State Control Agency (as detailed in the OPEP). Shoreline clean-up involves the deployment of personnel to relevant shorelines to identify response priorities, access points and clean-up techniques required. Shoreline clean-up may involve different manual and mechanical recovery techniques to pre-clean shorelines pre-impact and remove oil and contaminated debris from the shoreline post-impact to reduce environmental impact from stranded, typically weathered, hydrocarbons. Resourcing and equipment details are provided in the OPEP.

Shoreline clean-up consists of different manual and mechanical recovery techniques such as:

- Natural recovery – allowing the shoreline to self-clean (no intervention undertaken).
- Manual collection of oil and debris – the use of people to collect oil from the shoreline.
- Mechanical collection – use of machinery to collect and remove stranded oil and contaminated material.
- Sorbents – use of sorbent padding to absorb oil.
- Vacuum recovery, flushing, washing – the use of high volumes of low pressure water, pumping and/or vacuuming to remove floating oil accumulated at the shoreline.
- Sediment reworking – move sediment to the surf to allow oil to be removed from the sediment and move sand by heavy machinery.
- Vegetation cutting – removing oiled vegetation.

7.14.3.5 Oiled Wildlife Response

The level of oiled wildlife response (OWR) will be determined by data collected via the initial surveillance monitoring. The OWR will be conducted in accordance with the state specific marine oil and chemical spill contingency plans and relevant wildlife response plans, as directed by the relevant State Control Agency (as detailed in the OPEP).

Typical OWR can be separated into three stages, including:

- Wildlife Reconnaissance - situational awareness / visual observations of species present and identification of species that may potentially be impacted by oil exposure and/or response strategies.

- Preventative Actions:

  Deterrence strategies e.g. hazing by auditory or visual scarers.

  Displacement strategies e.g. fencing or barricading techniques.

  Pre-emptive capture - removal of wildlife from an area and transportation to a staging facility or to an area not expected to be impacted.

- Wildlife Rescue:

  Capture of oiled wildlife – action only to be completed by trained wildlife handlers at direction of relevant Control Agency.

  Transportation to field processing facility and / or primary care facility staging.

  Triage – undertaken by trained veterinarians (euthanasia may be required).

  Stabilisation – of wildlife prior to cleaning.

  Cleaning – rinsing, washing, drying to remove contamination.

  Rehabilitation – feeding, swimming, waterproofing, conditioning, pre-releases assessment.

  Release – once approved.

7.14.3.6 Waste Management

Hydrocarbon spills to the marine environment can generate significant amounts of waste that need to be collected, stored, and disposed of appropriately, in accordance with MARPOL 73/78 Annex V – Garbage, relevant Commonwealth and State/Territory laws and regulations. The potential waste that may be generated during an oil spill response may include:

- Offshore recovery (i.e. from containment and recovery), and
- Shoreline clean-up operations (i.e. manual or mechanical collection).

Due to the high volatility nature of both hydrocarbon types (MDO and condensate), and their subsequent susceptibility to weathering processes (i.e. evaporation) significant volumes of waste are not anticipated. Furthermore, containment and recovery has not been identified as a primary or secondary strategy for either the condensate or MDO scenario meaning the waste storage capacity required is likely to be small.

Waste management arrangements will be implemented prior to activity commencement and will need ensure a continuous response can be maintained. For example, in the event of a clean-up operation, temporary waste handling bases will be set up at designated staging areas such as Port Welshpool. The transport of waste material may be required at sea, from sea to land and on land to on land. Liquid transport trucks, flatbed trucks, dump trucks and gully suckers can be utilised to transport waste material through Beach's licensed waste contractor.

7.14.3.7 Environmental Monitoring

The Offshore Operational and Scientific Monitoring Plan (OSMP) provides a framework for Beach's environmental monitoring response for Level 2 and Level 3 offshore hydrocarbon spills from their petroleum activities undertaken in the Otway Basin.

The OSMP is the principal tool for determining the extent, severity, and persistence of environmental impacts from an oil spill and allows titleholders to determine whether their environmental protection goals are met. Operational monitoring can be used to assess how effective the oil spill response is in protecting the environment. Whereas scientific monitoring can be used to direct remediation efforts, typically after the spill response activities are completed.

Oil spill monitoring has been divided into two types:

1. Operational monitoring which collects information about the spill and associated response activities to aid planning and decision making during the response or clean-up operations. Operational monitoring typically finishes when the spill response is terminated.

2. Scientific monitoring (also known as Type II or recovery phase monitoring) which is focussed on non-response objectives and evaluating environmental impact and recovery from the spill and response activities. Scientific monitoring may continue for extended periods after a spill response is terminated.

Operational monitoring studies may be implemented in conjunction with relevant response strategies as described in the OPEP (e.g. Monitoring and Evaluation, Protection and Deflection, Shoreline Clean-up, and OWR.

OSMP techniques vary, depending on the type of spill, location, and status of the response. The use of vessels, aircraft, and shoreline responders (on foot, vehicles) may be required to undertake the techniques identified within the OSMP.

7.14.4 Source of Aspect

Oil spill response strategies that could result in environmental impacts are:

- Source control – drilling of a relief well.
- Shoreline protection and deflection.
- Shoreline clean-up.
- Oiled wildlife response.
- Waste management.

7.14.5 Predicted Environmental Impacts

Impacts and risks associated with source control, and monitoring and evaluation oil spill response strategies are similar to those discussed for vessel and MODU aspects in Section 7. Impacts and risks associated with the following response strategies that are undertaken onshore are assessed in this section:

- OWR.
- Shoreline Protection and Deflection.
- Shoreline Clean-up.

OWR techniques such as hazing, capture and cleaning can cause direct impacts to fauna. In addition, the use of personnel, vehicles, or equipment for shoreline response may disturb nesting or breeding areas.

Shoreline protection, deflection or clean-up strategies can result in damage or removal of habitat, disturbance to fauna and impacts to socio-economic and cultural features.

7.14.6 EMBA

Predicted impacts resulting from onshore oil spill response will be limited to shorelines where the Operational NEBA has identified that onshore oil spill response will have a net environmental benefit. It should be noted that the Oil Spill Response Area does not represent a single spill but is the outcome of the oil spill modelling which typically uses 100 different spill scenarios.

No areas of actionable shoreline oil (>100 g/m^2) were identified outside of Victoria with the main area being the Otway Coast (Figure 7-11 and Figure 7-12).

7.14.7 Predicted Level of Impact

7.14.7.1 Ecological Receptors

The incorrect handling of oiled fauna during the capture, transportation, cleaning, or rehabilitation phase has the potential to result in increased stress levels which may result in increased fauna stress, injury, or mortality. Deliberate disturbance of individuals species away from an oiled environment, such as resting, feeding, breeding, or nesting area, with the intention to limit hydrocarbon exposure may cause further distress to individuals, specifically fauna which display high site fidelity.

Shoreline response may result in impacts to shoreline habitats (e.g. dunes) and vegetation, which increases the potential to disturb fauna which use these shoreline environments. Damage or removal of habitat (such as contaminated sand from beaches) may expose shorelines to erosion processes or decrease in fauna and flora. Any impacts to intertidal shoreline habitats and communities may have indirect effects on ecosystem dynamics through impacts on food chains of the macrofauna communities which they support.

The additional noise as a result of response activities, or the deliberate noise during hazing activities, may result in disturbance to species feeding, breeding, nesting, or resting. Although fauna interactions from oiled wildlife response and shoreline clean-up techniques are expected to be limited to the duration of the response, there is the potential that these effects may result in longer term impacts to local populations where a large proportion of the local population may be exposed to oil and subsequently oiled wildlife response.

Oiled wildlife and shoreline deflection, protection and clean-up preparedness and response will be undertaken in accordance with the relevant EPOs and EPSs detailed within the Offshore Oil Pollution Emergency Plan (OPEP).

Oiled wildlife surveillance and wildlife impact studies are detailed within the OSMP.

The consequence to ecological receptors is assessed as **Moderate (2)** and likelihood as **Highly Unlikely (B)**, and the risk is of an acceptable level based on:

- The likelihood of a spill event. Though offshore drilling spill events have occurred in the industry, Beach has significant experience operating and drilling in the Otway Basin without incident.
- An operational NEBA will be conducted in the event of a spill prior to the implementation of a response to ensure that there is a net environmental benefit of the response techniques. Any oiled wildlife and shoreline deflection, protection and clean-up response will be at the direction of the State Control Agency with Beach providing support.
- In addition, in consultation with State Control Agency and relevant stakeholders, and prior to undertaking shoreline clean-up operations, Beach shall undertake a risk assessment (Beach's risk assessment process will be used unless otherwise directed) to mitigate potential impacts to:

  Shoreline habitats

  Shoreline communities

  Oiled wildlife
- Shoreline protection, deflection and clean-up activities are well practiced and the impacts from these activities are well understood.
- Only trained wildlife handlers will approach and handle oiled fauna to ensure distress and injury is limited and the correct handling of individuals is conducted.
- Only trained response personnel from Beach, AMSA, AMOSC, the relevant state Control Agencies, and subject matter experts will be used to implement the response strategies to ensure best practice is undertaken and the risks are reduced.
- The oil spill response activities will be conducted in accordance with the relevant EPOs and EPSs detailed within the OPEP.

7.14.7.2 Socio-economic Receptors

No areas of actionable shoreline oil (>100 g/m^2) were identified outside of Victoria with the main area being the Otway Coast (Figure 7-11 and Figure 7-12).

Shoreline protection, deflection and clean-up or response actions have the potential to exclude local residents and tourists from coastal areas with indirect impacts local tourism and businesses. The presence of hydrocarbons on shorelines as well as the presence of clean-up operations may necessitate the implementation of exclusion zones (e.g., beach closures).

Depending on the spill scenario, protection, deflection, and clean-up operations are expected to take anywhere from days to months following a spill incident. However, the characteristics and properties of MDO and gas condensate will result in rapid weathering and low expected persistence within the environment. Therefore, any impacts are expected to be localised and relatively short-term.

Shoreline protection, deflection and clean-up preparedness and response shall be undertaken in accordance with the relevant EPOs and EPSs detailed within the OPEP.

Hydrocarbon on shorelines and shoreline sediment impacts studies are detailed within the OSMP.

The consequence to socio-economic receptors is assessed as **Moderate (2)** and likelihood as **Highly Unlikely (B)**, and the risk is of an acceptable level based on:

- The likelihood of a spill event. Though offshore drilling spill events have occurred in the industry Beach has significant experience operating and drilling in the Otway Basin without incident.
- An operational NEBA will be conducted in the event of a spill prior to the implementation of a response to ensure that there is a net environmental benefit of the response techniques. Any shoreline deflection, protection and clean-up response, access to shoreline and closure of areas will be at the direction of the State Control Agency.
- In addition, in consultation with State Control Agency and relevant stakeholders, and prior to undertaking shoreline clean-up operations, Beach shall undertake a risk assessment (Beach's Risk Assessment Process will be used unless otherwise directed) to mitigate potential impacts to socio-economic receptors.
- Shoreline protection, deflection and clean-up activities are well practiced and the impacts from these activities are well understood.
- Only trained response personnel from Beach, AMSA, AMOSC, the relevant state Control Agencies, and subject matter experts will be used to implement the response strategies to ensure best practice is undertaken and the risks are reduced.
- The oil spill response activities will be conducted in accordance with the relevant EPOs and EPSs detailed within the OPEP)

7.14.7.3 Conservation Values and Sensitivities

There is the potential for shoreline oil at actionable thresholds (>100 g/m^2) to occur within the following areas that have conservation values:

- Great Oceans Road and Scenic Environs National Heritage Area
- Lower Aire River Wetlands and Aire River Heritage River
- Great Otway and Port Campbell National Parks
- Twelve Apostles Marine National Park

No areas of actionable shoreline oil (>100 g/m^2) were identified outside of Victoria with the main area being the Otway Coast (Figure 7-11 and Figure 7-12).

Conservation values and sensitivities (ecological, socio-economic and/or cultural) of protected areas can potentially be impacted by onshore spill response activities from access of vehicles, vessels, and responders. Shoreline response activities are undertaken in a manner that prevents impacts and an operational NEBA will be conducted in the highly unlikely event of a spill prior to the implementation of a response to ensure that there is a net environmental benefit of the response techniques. Any shoreline deflection, protection and clean-up response, access to shoreline and closure of areas will be at the direction of the State Control Agency.

Shoreline protection, deflection and clean-up preparedness and response shall be undertaken in accordance with the relevant EPOs and EPSs detailed within the OPEP.

Hydrocarbon on shorelines and shoreline sediment impacts studies are detailed within the OSMP.

The consequence to conservation values and sensitivities is assessed as **Minor (1)** and likelihood as **Highly Unlikely (B)**, and the risk is of an acceptable level based on:

- The likelihood of a spill event. Though offshore drilling spill events have occurred in the industry Beach has significant experience operating and drilling in the Otway Basin without incident.
- An operational NEBA will be conducted in the event of a spill prior to the implementation of a response to ensure that there is a net environmental benefit of the response techniques. Any shoreline deflection, protection and clean-up response, access to shoreline and closure of areas will be at the direction of the State Control Agency.
- In addition, in consultation with State Control Agency and relevant stakeholders, and prior to undertaking shoreline clean-up operations, Beach shall undertake a risk assessment (Beach’s risk assessment process will be used unless otherwise directed) to mitigate potential impacts to:

  Shoreline habitats

  Shoreline communities

  Oiled wildlife

  Cultural heritage sites

  Socio-economic receptors

- Shoreline protection, deflection and clean-up activities are well practiced and the impacts from these activities are well understood.
- Only trained response personnel from Beach, AMSA, AMOSC, the relevant state Control Agencies, and subject matter experts will be used to implement the response strategies to ensure best practice is undertaken and the risks are reduced.
- The oil spill response activities will be conducted in accordance with the relevant EPOs and EPSs detailed within the OPEP.

7.14.7.4 Cultural Values and Sensitivities

There is the potential for shoreline oil at actionable thresholds (>100 g/m^2) to occur along parts of the Victoria coastline with the main area being the Otway Coast (Figure 7-11 and Figure 7-12). No areas of actionable shoreline oil (>100 g/m^2) were identified outside of Victoria and Tasmania (Figure 7-11 and Figure 7-12).

First Nations cultural values and sensitivities such as fauna, flora, objects, and elements of Country with intangible values can potentially be impacted by onshore spill response activities from access of vehicles, vessels, and responders. Shoreline response activities are undertaken in a manner to prevent impacts and an operational NEBA will be conducted in the highly unlikely event of a spill prior to the implementation of a response to ensure that there is a net environmental benefit of the response techniques. Any shoreline deflection, protection and clean-up response, access to shoreline and closure of areas will be at the direction of the State Control Agency.

Shoreline Protection, Deflection and Clean-up preparedness and response shall be undertaken in accordance with the relevant EPOs and EPSs detailed within the OPEP.

Hydrocarbon on shorelines and shoreline sediment impacts studies are detailed within the OSMP.

The consequence to cultural values and sensitivities is assessed as **Minor (1)** and likelihood as **Highly Unlikely (B)**, and the risk is of an acceptable level based on:

- The likelihood of a spill event. Though offshore drilling spill events have occurred in the industry Beach has significant experience operating and drilling in the Otway Basin without incident.
- An operational NEBA will be conducted in the event of a spill prior to the implementation of a response to ensure that there is a net environmental benefit of the response techniques. Any shoreline deflection, protection and clean-up response, access to shoreline and closure of areas will be at the direction of the State Control Agency.
- In addition, in consultation with State Control Agency and relevant stakeholders, and prior to undertaking shoreline clean-up operations, Beach shall undertake a risk assessment (Beach's risk assessment process will be used unless otherwise directed) to mitigate potential impacts to cultural heritage sites.
- Shoreline protection, deflection and clean-up activities are well practiced and the impacts from these activities are well understood.
- Only trained response personnel from Beach, AMSA, AMOSC, the relevant state Control Agencies, and subject matter experts will be used to implement the response strategies to ensure best practice is undertaken and the risks are reduced.
- The oil spill response activities will be conducted in accordance with the relevant EPOs and EPSs detailed within the OPEP.

7.14.8 Demonstration that Impacts will be ALARP

ALARP decision context and justification	**ALARP Decision Context: Type B** Drilling activities have been ongoing within the Otway Basin for over a decade with no major incident. These activities are highly regulated with associated control measures, well understood, and are implemented across the offshore industry.

	However, if a loss of containment occurred and a spill response was required, this could attract public and media interest. Consequently, Beach believes that ALARP Decision Context B should be applied.

Control Measures

All spill response control measures and associated EPOs and EPSs are detailed within the OPEP (VIC 1000 SAF PLN. CDN/ID 18986979).

All relevant operational and scientific monitoring studies are detailed within the OSMP (CDN/ID S4100AH717908) and OSMP Addendum for the Program (V-1000-P1-RP-0005).

Additional Control Measures Assessed

Control	Control Type	Cost/Benefit Analysis	Control Implemented?
Monitor and evaluate: AUVs	Engineering Risk Assessment	This control measure is not expected to provide significant environmental benefit as mobilisation of in-field monitoring, or aerial surveillance may be implemented rapidly via existing contracts. Costs associated with acquiring the equipment, maintenance, and training personnel to use AUVs is considered grossly disproportionate to the benefit gained.	No
Monitor and evaluate: Night-time monitoring – infrared	Engineering Risk Assessment	Side looking airborne radar systems are required to be installed on specific aircraft or vessels. The costs of sourcing such vessels/aircraft is approximately $20,000 per day. Infrared may be used to provide aerial monitoring at night-time, however the benefit is minimal given trajectory monitoring (and infield monitoring during daylight hours) will give good operational awareness. In addition to this, satellite imagery may be used at night to provide additional operational awareness.	No
OWR: Pre-positioning of oiled wildlife response resources.	Precautionary approach	Oiled wildlife response equipment containers for first strike activities are positioned in Geelong (AMOSC). Positioning the equipment any closer to the potential spill area is not considered to provide a considerable environmental benefit considering that any visible shoreline contact is not predicted until day 4-5 of the spill (depending on the spill source location), therefore there is adequate time to deploy equipment positioned in Geelong. Additionally, spill modelling indicates potential (hypothetical) areas of exposure to hydrocarbons, post-spill operational monitoring would be required to predict actual or likely exposure locations, therefore determining an area to pre-position equipment may be inaccurate pre-spill.	No
Shoreline protection and clean up: Tactical Response Plans (TRP)	Precautionary approach	Identified areas for priority protection have pre-populated tactical response plans to reduce response planning timeframes in the event of potential shoreline exposure. Refer to OPEP for TRPs. CM13: Beach Offshore Oil Pollution Emergency Plan	No

Chemical Dispersant: Pre-positioning of dispersant and application equipment.	Precautionary approach	No clear benefit identified as stockpiles of dispersant already available in Melbourne and elsewhere in Australia. Application equipment and dispersant can be readily mobilised to site, with no identified restriction on logistics pathways or response timing.	No

7.14.9 Demonstration that Impacts will be Acceptable

Consequence rating	Minor (1) to Moderate (2)
Likelihood of occurrence	Highly Unlikely (B)
Residual risk	Low
Acceptability assessment Demonstration of acceptability for impacts and risks associated with spill response activities provided in Section 7.4.6 of the OPP (Otway Offshore Gas Victoria Project) is considered valid and appropriate for the impact and risk assessment of this aspect for the Program activities. This is supported by the acceptability assessment for this aspect against the evaluation criteria in the following rows. The potential risk of spill response from Program activities meets the defined acceptable levels in the OPP by ensuring the considerations in Section 2.8 are met such that: OPP EPOs relevant to spill response are implemented through equivalent EP EPOs OPP control measures relevant to spill response are implemented through equivalent EP control measures Based on the implementation of relevant and equivalent EPOs and control measures the consequence rating, likelihood of occurrence and residual risk are the same levels as defined in the OPP No changes to internal or external context as defined in the OPP including no new comments (objections and claims) raised against this aspect.	
To meet the principles of ESD	The risk of spill response activities was assessed as Low, and the highest consequence assessed as Moderate (2) which is not considered as having the potential to result in serious or irreversible environmental damage. While some response strategies may pose additional risk to sensitive receptors, to not implement response activities may potentially result in greater negative impact to the receiving environment and a longer recovery period. Response activities will be undertaken in accordance with controls which reduce and/or prevent additional risks. The mutual interests of responding and protecting sensitive receptors from further impact due to response activities will be managed using a NEBA during response strategy planning in preparedness arrangements, as well as during a response. Proposed response activities are consistent with industry practice.
Internal context	The proposed management of the impact is aligned with the Beach Environment Policy. Activities will be undertaken in accordance with the SCCP including relief well plan, OPEP, TRPs and OSMP.
External context	There have been no stakeholder objections or claims regarding spill response. During any spill response, a close working relationship with key regulatory bodies (Control Agencies) will occur and thus there will be ongoing consultation with relevant persons during response operations.
Other requirements	Response has been developed in accordance with:

	OPGGS Act. AMSA Technical Guideline for the Preparation of Marine Pollution Contingency Plans for Marine and Coastal Facilities (AMSA 2015). South-east Commonwealth Marine Reserves Network Management Plan 2025 (DNP 2025) The following Conservation Advice / Recovery Plans identify pollution as a key threat: Conservation Advice *Balaenoptera borealis* (sei whale) (TSSC 2015f) Conservation Advice *Balaenoptera physalus* (fin whale) (TSSC 2015e) Conservation advice *Neophoca cinerea* Australian sea lion (TSSC 2020). Identified habitat degradation and pollution – Oil spills Recovery Plan for Marine Turtles in Australia (CoA 2017), identified as acute chemical discharge (oil pollution) Conservation Advice *Calidris ferruginea* (curlew sandpiper) (DoE, 2015a) identified as habitat degradation/ modification (oil pollution). Conservation Advice for *Charadrius leschenaultia* (Greater sand Plover) (TSSC 2016a). Identified habitat degradation/ loss (oil pollution) Conservation Advice for *Calidris acuminata (*sharp-tailed sandpiper) (DCCEEW 2024h) identified wetlands and intertidal habitats threatened by acute pollution (oil). Conservation Advice for *Arenaria interpres* (ruddy turnstone) (DCCEEW 2024g) identified wetlands and intertidal habitats threatened by acute pollution (oil). National Recovery Plan for Threatened Albatrosses and Giant Petrels 2011-2016 (DSEWPC 2011b) National Recovery Plan for the Australian Fairy Tern (*Sternula nereis nereis*) (CoA 2020) The following Conservation Advice / Recovery Plans identify habitats degradation/modification as threat, which may be consequence of accidental release of hydrocarbon: Conservation Advice for *Calidris tenuirostris* (great knot) (DCCEEW 2024c). Conservation Advice for *Calidris canutus* (red knot) (DCCEEW 2024f). Conservation Advice for *Limosa lapponica baueri* (Alaskan bar-tailed godwit) (DCCEEW 2024o) Conservation Advice for *Limosa limosa* (black-tailed godwit) (DCCEEW 2024a). Conservation Advice for *Numenius madagascariensis* (far eastern curlew) (DCCEEW 2023c). These Conservation Advice / Recovery Plans identify the following conservation actions: Minimise chemical and terrestrial discharge. Ensure spill risk strategies and response programs include management for turtles and their habitats, particularly in reference to 'slow to recover habitats', e.g. nesting habitat, seagrass meadows or coral reefs. Ensure appropriate oil-spill contingency plans are in place for the subspecies' breeding sites which are vulnerable to oil spills.

	Implement measures to reduce adverse impacts of habitat degradation and/or modification; or No explicit relevant management actions: oil pollution is recognised as a threat. In regard to oil spill response, activities associated with Program activities will not be conducted in a manner inconsistent with the objectives of the respective zones of the AMPs, and the principles of the IUCN Area Categories applicable to the values of the AMPs.
Monitoring and reporting	Impacts will be monitored in accordance with Section 8.4.3.
Acceptability outcome	**Acceptable**
Environmental Performance	Environmental Performance Outcomes (EPOs), Standards (EPS) and measurement criteria for response preparedness and implementation of response activities are detailed in the Beach OPEP (VIC 1000 SAF PLN. CDN/ID 18986979)

7.15 Environmental Performance Outcomes, Standards and Measurement Criteria

As detailed in the OPGGS(E)R the EP must set out the EPOs for the activity against which the performance of the titleholder in protecting the environment is to be measured. In addition, the EP must set EPSs for the control measures identified in the impact and risk assessment and include measurement criteria that the titleholder will use to determine whether each EPO and EPS is met.

The EPOs for the Program activities are listed below with the controls and associated EPS and measurement criteria detailed in Table 7-22.

- EPO1: Undertake the activity in a manner that will not interfere with other marine users to a greater extent than is necessary for the exercise of right conferred by the titles granted.
- EPO2: No death or injury to listed threatened or migratory species from the activity.
- EPO3: Biologically important behaviours can continue while the activity is being undertaken.
- EPO4: Anthropogenic noise in biologically important areas and habitat critical to the survival of a species will be managed such that

  Any blue whale continues to utilise biologically important areas without injury and is not displaced from a foraging area.

  It does not prevent any southern right whale from utilising biologically important areas or habitat critical to the survival of a species or cause auditory impairment (TTS and PTS).
- EPO5: No substantial reduction of air quality within local airshed caused by atmospheric emissions produced during the activity.
- EPO6: No substantial or unrecoverable change in seabed quality which may adversely impact on biodiversity, ecological integrity, social amenity, cultural values or human health.
- EPO7: No impact to submerged cultural heritage*.
- EPO8: No impact to water quality at a distance > 500 m from the vessel or MODU from planned marine discharges.
- EPO9: No introduction of a known or potential invasive marine species.
- EPO10: No unplanned discharge of materials or waste to the marine environment.
- EPO11: Waste generated will be segregated and disposed of onshore in accordance with relevant legislation.
- EPO12: No unplanned loss of containment of hydrocarbons or chemicals to the marine environment.

* In addition to EPO7, all the other EPOs define the performance of Beach in protecting First Nations Cultural Values and Sensitivities as identified in Section 6.6.3.

Table 7-22: Environmental Performance Standards and Measurement Criteria

Control Measure #	Environmental Performance Standard	Measurement Criteria
CM01: Marine Assurance Process	The MODU and vessels will meet relevant maritime laws and includes pre-commencement MODU and vessel inspections of class certification requirements under the *Navigation Act 2012* and associated Marine Orders, included but not limited to: Marine Order 21: Safety and Emergency Arrangements. Marine Order 27: Safety of Navigation and Radio Equipment. Marine Order 30: Prevention of Collisions. Marine Order 31: SOLAS and non-SOLAS Certification. Marine Order 42: Carriage, Stowage and Securing of Cargoes and Containers. Marine Order 57: Helicopter Operations. Marine Order 70: Seafarer Certification. Marine Order 91: Marine Pollution Prevention - Oil Marine Order 95: Marine Pollution Prevention – Garbage. Marine Order 96: Marine Pollution Prevention – Sewage. Marine Order 97: Marine Pollution Prevention – Air Pollution. Marine Order 98: Marine Pollution – Anti-fouling Systems.	Bunker receipts showing use of very low sulphur fuel. SEEMP Oil record book Garbage record book Certification documentation MODU and vessel inspection records
	Oil contaminated water shall be treated via a MARPOL (or equivalent) approved oily water separator and only discharge if oil content less than 15 ppm.	Oil record book Vessel and MODU inspection records
	If ODS are present on the MODU or vessels, the MODU or vessel will have ODS handling procedures as per MARPOL Annex VI, including maintenance of ODS record book where rechargeable systems containing ODS are recharged or repaired.	ODS handling procedures ODS record book Vessel and MODU inspection records
	MODU and vessels will have a Preventative Maintenance System that provides a status on the maintenance of equipment and detailed manufacturer's specification on maintenance procedures for: Equipment detail as a control in this EP will be inspected to ensure effective operation.	Preventative Maintenance System records MODU and vessel inspection records

Control Measure #	Environmental Performance Standard	Measurement Criteria
	Power generation and propulsion systems on the MODU and vessels will be inspected to ensure efficient operation.	
	Waste or materials with potential to be windblown shall be stored in covered containers.	Vessel and MODU inspection records
	Rig and vessels shall have a SMPEP (or equivalent appropriate to class) which is: Implemented in the event of a spill to deck or marine environment. Tested as per the vessel test schedule. Spill response kits will be available and routinely checked to ensure adequate stock is maintained.	SMPEP Vessel and MODU inspection records Vessel and MODU exercise schedule Vessel and MODU exercise records Incident reports
CM02: Vessel and MODU Operating Procedures	Bulk solids transferred in accordance with bulk transfer procedures to reduce the risk of an unintentional release bulk product (powder) to sea during tank venting. The procedures include standards for: Certified equipment with confirmed integrity (e.g., hose and valves). Transfer processes (e.g., safety, communication, monitoring, inventory, emergency shut down procedures, procedural documents, and spill incident details).	Bulk transfer procedures and associated records
	Bunkering and bulk liquids will be transferred in accordance with bulk transfer procedures to reduce the risk of an unintentional release to sea during transfer. The procedures include standards for: Certified equipment with confirmed integrity (e.g., hose and valves). Transfer processes (e.g., safety, communication, monitoring, inventory, emergency shut down procedures, procedural documents, and spill incident details).	Bulk transfer procedures and associated records
	Materials and equipment that have the potential to spill onto the deck or marine environment will be stored within a contained area.	Vessel and MODU inspection records
	A 500 m radius PSZ and a 3 km radius cautionary zone will be in place around the MODU when on location and will be monitored by a support vessel.	PSZ gazette Daily report
	At least one support vessel will accompany the MODU when in operation and when safe to do so (e.g. outside of weather events), to manage interactions with other marine users.	Daily report
	Vessel speeds within the Operational Area will be restricted to ≤ 10 knots.	Vessel log

Control Measure #	Environmental Performance Standard	Measurement Criteria
	All lifting gear used for deployment and retrieval of equipment over the MODU and vessels is load rated for the working load.	Lifting gear rating and load records
	If deemed safe and effective to do so, support vessels can assist in the recovery of lost materials or waste.	Daily report
	The recording and reporting of incidents, including those associated with loss of waste or materials overboard is standard in the industry. AMSA JRCC and other marine users will be notified in the event of loss of materials with potential to affect safe navigation.	Notification records
CM03: Consultation for Implementation of EP	As per Section 4 Beach will undertake consultation for the implementation of the EP which will include at a minimum: Notification to all relevant person regarding acceptance of the EP by NOPSEMA. Commencement of activities, exclusion zones, vessel details, supply vessel navigational corridors, pre-lay of anchors and buoys, movement of the MODU to new locations, during activity and cessation notification requirements. On-water communication processes, including SMS messages and radio communication. Consultation with relevant First Nations groups (Section 6.6) regarding identified cultural heritage and cultural landscapes in accordance with CM05: Seabed Survey. Consultation with commercial fishing associations (and individual commercial fishers) the ongoing communication of Beach activities to their members and applying CM04: Beach Fair Ocean Access Procedure.	Notification records Consultation records
	Observation, incidents, and opportunities for improvement regarding the interaction with other users will be reported to other petroleum titleholders.	
CM04: Beach Fair Ocean Access Procedure	Beach's Fair Ocean Access Procedure was developed with input from commercial fishing industry organisations. It sets out Beach's commitment to the principle that a fisher should not suffer an economic loss as a direct result of a Beach project. Beach is committed to a fair, simple and transparent process for a fisher to claim compensation, where the fisher has consulted with Beach in good faith, and provided the fisher has:	Consultation records

Control Measure #	Environmental Performance Standard	Measurement Criteria
	acted to avoid risks and impacts to a Beach Project acted to mitigate any economic losses to their business that may arise from avoiding risks and impacts to a Beach Project Evidence of fishing in the Beach Project Area during the same time of year as the Project timing, for at least three years within the last five years, unless there are genuine fishery or fishing practice reasons for lesser periods historical and current catch and effort evidence the ability to demonstrate an economic loss in accordance with this procedure. The procedure also includes a process for resolving disputes, which is activated if Beach and a fisher cannot reach an agreement on a fisher's claim within 30 days. This process includes referring the claim to an independent expert. An information sheet on the procedure is available in Appendix D.	
CM05: Seabed Survey	A seabed survey was undertaken at the well locations relevant for the Program activities. Results of this survey will be used to determine the location of mooring equipment: Seabed habitat type to avoid areas of high relief outcrops and reefs that are likely to be associated with site-attached fish. Shipwrecks and other maritime archaeological heritage. Location of unexploded ordnance. Seabed survey data will be provided to the following appropriately qualified specialists to identify sensitive benthic receptors: Appropriately qualified specialist to identify seabed habitat types including areas of high relief outcrops and reefs that are likely to be associated with site-attached fish. Underwater archaeologist to identify shipwrecks and other maritime archaeological heritage. Geophysical data analyst to identify location of any unexploded ordnance. Underwater archaeologist to identify submerged cultural heritage and landscapes. Reports from each specialist evaluation of seabed survey data will be provided to Beach. Beach will assess the reports and identify any areas of overlap, potential	Seabed survey records Consultation records Underwater Cultural Heritage Report Exclusion areas established, if required Cultural heritage management procedures, if required

Control Measure #	Environmental Performance Standard	Measurement Criteria
	risks from proposed activities defined in this EP, and determine any exclusion areas that may be required. Should any submerged cultural heritage be identified, Beach will report the findings in accordance with the *Underwater Cultural Heritage Act 2018*.	
CM06: MODU Mooring Plan	Pre-laid anchors will have a surface buoy with navigation lighting and the position of the buoys will be included in the notification to AHS to be included in the AUSCOAST Warnings.	MODU Mooring Plan
	Planned retrieval of all mooring equipment, including transponders, from the sea floor as soon as reasonably practicable within 3 months following the completion of Program activities.	
	Final selection of MODU position and location of mooring equipment will avoid exclusion areas determined from seabed survey data evaluation reports (CM05) based on the potential presence of the following: Seabed habitat type to avoid areas of high relief outcrops and reefs that are likely to be associated with site-attached fish. Shipwrecks and other maritime archaeological heritage. Submerged cultural heritage. Location of unexploded ordnance.	
CM07: Light Management Plan	Beach will contract appropriately qualified specialists to develop and support the implementation of a Light Management Plan as per the National Light Pollution Guidelines for Wildlife (DCCEEW 2023).	Light Management Plan MODU and vessel inspection records
	Once safety navigational lighting requirements and safe work requirements are met (as per vessel class), the Light Management Plan will detail additional mitigations to ensure artificial lighting is reduced to minimum levels based on the information in the Seabird Light Mitigation Toolbox (DCCEEW 2023) wherever practicable, whilst maintaining safe working conditions and navigation. Specifically, outwards facing lighting will be reduced to minimum levels, wherever practicable.	
CM08: Whale Management Procedure	The Whale Management Procedure (Appendix K) outlines specific measures to minimise anthropogenic noise threats to relevant whale species, including the implementation of safe operating distances between vessels and whales, pre-activity surveys for specific activities, night-time and low visibility controls and	Whale Management Procedure MFO Report Consultation Records

Control Measure #	Environmental Performance Standard	Measurement Criteria
	establishment of safe points for operational activities in accordance with the Safety Case and Well Integrity requirements.	MFO records Training records
	Pre-start actions, start criteria, night-time and low visibility arrangements and noise control actions as detailed in the Whale Management Procedure (Appendix K) will be implemented.	
	One to two appropriately qualified marine fauna observers will be stationed on each of the MODU support vessels at all times whilst drilling activities are occurring. to detect and report the presence of marine fauna. An additional MFO will be stationed on each of the MODU support vessels when daylight hours (between sunset and sunrise) are greater than 12 hours (i.e. – from September to March) When only one MFO is present (i.e. from April to August), the vessel Officer of the Watch (OOW) will support the MFO during breaks, during their duties period. The OOW will be trained in sighting requirements.	
CM09: Program Activities	Only water-based drilling fluids will be used for the Program activities. Solids control equipment consisting of shale shakers and centrifuges will be used once the riser is in place to reduce the concentration of drilling fluid on cuttings prior to discharge. Shale shakers will be fitted with screens that meet American Petroleum Institute (API) standards for particle size cut points.	Drilling Program records
	Barite will have low concentrations of mercury and cadmium (less than 1 mg/kg and 3 mg/kg respectively).	Drilling Program records
	Residual water-based drill fluids, cement, barite and bentonite will be used for subsequent wells, provided to the next operator at the end of the Program.	Drilling Program records
	If Beach is the last titleholder of the rig consortium campaign, management of inventories will meet the requirements of the Minamata Convention best available techniques and environmental practices to control mercury releases. Beach will apply the hierarchy of controls for inventories management i.e. elimination, prevention, reduction and then mitigation, with the last option being to discharge to the marine environment, such that:	Drilling Program records DISC dry bulk working group or relevant minutes of meeting Tracking against high level implementation plan/strategy timeline (see Section 8.5.2)

Control Measure #	Environmental Performance Standard	Measurement Criteria
	• The final titleholder in the rig consortium campaign will minimise remaining dry bulk materials onboard both the MODU and vessels to as low as reasonably practicable, ensuring well integrity and MODU safety are maintained. • Options for excess dry bulk materials management may include: ❍ Retaining the products on the MODU to be used for subsequent Beach well activity ❍ Retaining the products on the MODU to be used by the next titleholder who has the MODU ❍ Transferring to another Beach-contracted MODU operating within the region ❍ Transferring to another titleholder-contracted MODU operating in the region ❍ Returning to shore for onshore storage and/or disposal if a facility is available, appropriately licensed, safe and technically feasible to transfer to at the end of the campaign should Beach be the last titleholder using the MODU. • Beach as part of the DISC Bulk Transfer Working Group will continue to investigate feasible options and ALARP position (including the consideration of commercial aspects of the onshore waste management, appropriate infrastructure installation and safety considerations) to transfer cement, bentonite and barite onshore for storage, re-use or disposal. Beach will apply the hierarchy of controls to remove dry bulk materials from the MODU in order to minimise and avoid discharge to the marine environment where feasible. • Bulk materials management for cement, bentonite and/or barite will focus on storage, handling, recovery, reuse, back-loading and/or disposal onshore, with the objective to identify practices and processes that will aid in reducing the potential for accidental discharge, optimize recovery and reuse, and	Daily Vessel Report, Barge Report

Control Measure #	Environmental Performance Standard	Measurement Criteria
	reduce excess bulk required to be discharged/handled at the end of campaign where possible. • Industry practice will be followed to minimise or avoid the discharge of bulk materials to the marine environment in powder form or as a slurry.	
	The BOP shall be routinely function and pressure tested in accordance with industry standards and preventative maintenance will be in accordance with manufacturer's specifications and in alignment with Drilling Contractors preventative maintenance system.	BOP test records
	Prior to the commencement of Program activities a register of suitable relief well rigs will be compiled and updated monthly during the program, or more frequently should any change in status of available rigs occur.	Relief Well Rig Register
	Waste will be managed in accordance with Beach's Waste Management Plan – Otway and Bass Strait Offshore (S4000AD719914) which requires that wastes are eliminated, reduced, recycled and/or reused as far as reasonably practicable and includes requirements for the appropriate disposal, recycling, reuse, tracking and reporting of all wastes.	Daily Report Garbage record book Service provider waste records Audit and inspection records
	Disposal of hazardous decommissioning waste to be compliant with *Hazardous Waste* (Regulation of Exports and Imports) *Act 1989*.	Audit and inspection records Service provider waste records
CM11: Procurement Vetting Process	Beach via its Procurement Vetting Process will include a preference for the appropriately licenced waste handling contractor and appropriately licenced waste facility contracted to Beach to follow Beach OEMS Standard 10.1.9 Waste Management and Beach's Waste Management Plan – Otway and Bass Strait Offshore (S4000AD719914).	Procurement vetting records
	Beach via its Procurement Vetting Process will assess the appropriately licenced waste facility contracted to Beach must comply with *Hazardous Waste (Regulation of Exports and Imports) Act 1989* for the disposal of any hazardous waste.	
	Beach undertakes a pre-qualification of all contractors to ensure contractor legal obligations are met including that MODU and vessel operators must comply with the most recent version of the Australian Ballast Water Management Requirements.	

Control Measure #	Environmental Performance Standard	Measurement Criteria
	Beach via its Procurement Vetting Process will assess suppliers' emissions management and via this process support low emission vessels if available.	Procurement vetting records
CM12: Chemical Management Procedure	All chemicals that will or could be discharged to the marine environment must be assessed prior to use to ensure the lowest toxicity, most biodegradable and least accumulative chemicals are selected which meet the technical requirements of the application as per the Beach Chemical Management Procedure described in Section 8.1.18.	Chemical assessment records
CM13: Beach Offshore Oil Pollution Emergency Plan	Emergency spill response capability is maintained in accordance with the NOPSEMA accepted OPEP.	OPEP Audit and test records
	Implement spill response in accordance with relevant EPOs and EPSs in the accepted OPEP.	EMT log
CM14: Beach Offshore Operational and Scientific Monitoring Plan	Operational and scientific monitoring capability is maintained in accordance with the NOPSEMA accepted OSMP.	OSMP Readiness and test records
CM15: Well Engineering and Construction Management System	Program activities where relevant will be conducted in compliance with the WECS that ensures: Beach well activities are fit for purpose with operational and well life cycle risks managed to a level that is as low as reasonably practicable. Changes are made in a controlled manner as per the Beach Management of Change Standard. Appropriate standards are adhered to. Sufficiently resourced and competent organisation is in place.	Well Engineering and Construction Management System implementation records
CM16: Source Control Contingency Plan (SCCP), inclusive of Relief Well Plan	Emergency spill response capability is maintained in accordance with the SCCP and Relief Well Plan. The SCCP will be consistent with the IOGP Report 594 - Subsea Well Source Control Emergency Response Planning Guide for Subsea Wells (2019). Relief Well Plan will be developed in line with industry guidelines, i.e. UK Offshore Energies (OEUK)	SCCP Relief Well Plan Audit and test records
CM17: NOPSEMA accepted Well Operations Management Plan	Well integrity shall be maintained in accordance with the NOPSEMA accepted WOMP.	NOPSEMA accepted WOMP Well integrity audit and inspection records

Control Measure #	Environmental Performance Standard	Measurement Criteria
CM18: NOPSEMA accepted Rig Safety Case	The Offshore Petroleum and Greenhouse Gas Storage (Safety) Regulations 2009 (OPGGS(S)) set out the requirements for the contents of safety cases. The MODU requires an Australian Safety Case detailing the control in place to prevent a major accident event. The Rig Safety Case: Identifies the hazards and risks. Describes how the risks are controlled. Describes the safety management system in place to ensure the controls are effectively and consistently applied.	NOPSEMA accepted Rig Safety Case
CM19: Beach Domestic IMS Biofouling Risk Assessment Process	MODU and support vessels mobilised from domestic waters to undertake activities within the Operational Area will complete the Beach Domestic IMS Biofouling Risk Assessment Process as detailed in the Beach Introduced Marine Species Management Plan (S400AH719916) prior to the initial mobilisation into the Operational Area.	Domestic IMS Biofouling Risk Assessment records

8 Implementation Strategy

Regulation 22(1) of the OPGGS(E)R requires that an EP must contain an implementation strategy for the activity. The implementation strategy for the activities within the scope of this EP is detailed in the following sections.

8.1 Environmental Management System

Regulation 22(2) of the OPGGS(E)R requires the that the implementation strategy describe the environmental management system that will be used to ensure that:

- Risks and impacts are identified and reduced to ALARP;
- Control measures are effective in reducing risks and impacts to ALARP and an acceptable level; and
- EPO and EPS are being met.

The Beach Operations Excellence Management System (OEMS) (Figure 8-2 is an integrated health, safety and environment (HSE) management system and includes all HSE management plans and procedures. The OEMS provides guidance on how Beach will meet the requirements of its Environment Policy (

Figure 8-1) and has been developed using the principles of the IOGP Report 510.

The OEMS consists of 5 Management Standards (Table 8-1) that detail specific performance requirements to ensure the effective management of HSE risks and impacts. The Management Standards are complemented by asset and activity specific environmental management procedures and plans, including this EP.

The application of OEMS Management Standards relevant to the activity and the requirements of the OPGGS(E)R are described in the following sections.

beach

Environment Policy

Objective

Beach is committed to conducting operations in an environmentally responsible and sustainable manner.

Strategy

To achieve this, Beach will:

- Comply with relevant environmental laws, regulations, and the Beach Operations Excellence Management System which is the method by which Beach identifies and manages environmental risk.
- Establish environmental objectives and targets, and implement programs to achieve them that will support continuous improvement;
- Identify, assess and control environmental impacts of our operations by proactive management of activities and mitigation of impacts;
- Ensure that incidents, near misses, concerns and complaints are reported, investigated and lessons learnt are implemented;
- Inform all employees and contractors of their environmental responsibilities including consultation and distribution of appropriate environmental management guidelines, regulations and publications for all relevant activities;
- Efficiently use natural resources and energy, and engage with stakeholders on environmental issues; and
- Publicly report on our environmental performance.

Application

This policy applies to all personnel associated with Beach activities.

April 2023

Figure 8-1: Beach Energy's Environment Policy

Figure 8-2: Beach OEMS

Table 8-1: Beach OEMS Standards

OEMS Management Standards	
Standard 1: Core management practices	1.1 OEMS leadership
	1.2 Asset risk management
	1.3 Management of change
	1.4 Incident management
	1.5 Emergency management
	1.6 Assurance and improvement
Standard 2: Integrity and process safety	2.1 Well lifecycle management
	2.2 Plant and pipeline lifecycle management
	2.3 Safety critical elements
	2.4 Pre-startup safety review (PSSR)
	2.5 Safe operating envelope
	2.6 Asset information
Standard 3: People, transport and readiness	3.1 Induction, training and competency
	3.2 Fitness for work
	3.3 Driving
	3.4 Aviation
Standard 4: Safe systems of work	4.1 Permit to work
	4.2 Hot work
	4.3 Energy isolation
	4.4 Confined space
	4.5 Working at height
	4.6 Lifting and load safety
	4.7 Electrical safety
	4.8 Excavation
	4.9 Occupational exposure
Standard 5: Environment and heritage	5.1 Environment permissions documents
	5.2 Cultural heritage
	5.3 Emissions monitoring and reporting

8.1.1 OEMS STANDARD 1: Core Management Practices

Core management practices apply to each of the other four management standards and make the OEMS work as a total system. They are fundamental to achieving successful HSE outcomes. Central to this is leaders embedding the OEMS, reinforcing behaviours and driving continuous improvement. It also includes managing risk, managing change, preparing for emergencies, and learning from incidents. The application of OEMS Standard 1 to the activities within the scope of this EP is described below.

8.1.2 OEMS 1.1 OEMS leadership

OEMS 1.1 requires leaders to demonstrate commitment to the OEMS through specific actions and behaviours. Roles and responsibilities for the activity are described in Section 8.2.

8.1.3 OEMS 1.2 Asset risk management

OEMS 1.2 ensures that HSE risks are identified and minimised so far as reasonably practicable through the identification, management and ongoing review of risks associated with Beach activities. This process is supported by the Beach Risk Management Procedure (CDN/ID 18985371) and is as described in Section 2 of this EP.

8.1.4 OEMS 1.3 Management of Change

OEMS 1.3 ensures that changes are assessed to prevent unwanted consequences. This process is supported by the Beach Management of Change Procedure (CDN/ID 3675087) and is described further in Section 8.3.4.

8.1.5 OEMS 1.4 Incident Management

OEMS 1.4 ensures that incidents are reported and where appropriate investigated to prevent recurrence. This process is supported by the Beach Incident Management Procedure (CDN/ID 18985406) and is described further in Section 8.3.1.

8.1.6 OEMS 1.5 Emergency Management

OEMS 1.5 aims to minimise incident escalation through the deployment of effective emergency plans. It requires that emergency plans are in place to effectively manage credible emergency and security events, and to enable an efficient recovery to normal operations following such an event.

Beach's Crisis and Emergency Management Framework defines the prevention, preparedness, response, and recovery principles to be applied, the organisational structures to support emergency and security measures, and the training and testing protocols that must be in place to assure Beach maintains a state of readiness.

The emergency response framework for the activity is detailed in Section 8.4.

8.1.7 OEMS 1.6 Assurance and Improvement

OEMS 1.6 aims to sustain and improve the effectiveness of the OEMS through the establishment of and reporting against HSE outcomes. It requires that each standard within the 5 OEMS standards establish specific performance metrics. The performance metrics for the activities are described in Section 2.5.1 of this EP and monitoring, reporting and auditing activities are described in Section 8.3.2 and 8.3.3.

8.1.8 OEMS Standard 2: Integrity and Process Safety

Integrity and process safety is fundamental in preventing high consequence incidents. This standard ensures that critical controls are in place and continue to function as intended through regular inspections, testing and maintenance and that essential asset information is current and accessible.

The application of OEMS Standard 2 to the activities is described below.

8.1.9 OEMS 2.6 Asset information

OEMS 2.6 ensures that critical information necessary to the information necessary for the operation, integrity and maintenance of plant and infrastructure is controlled and subject to processes to ensure that the critical information is reviewed and updated in accordance with operational and regulatory requirements. This is supported by the Beach document management system as discussed in Section 8.5.4.

8.1.10 OEMS Standard 3: People Transport and Readiness

Standard 3 is concerned with people arriving at the work location safely and ready to commence activities. It covers management of safe transportation options for people needing to access remote areas and outlines requirements for training and competency and ensures that employees are physically and mentally ready through health and fitness monitoring and assessment.

The application of OEMS Standard 3 to the activities is described below.

8.1.11 OEMS 3.1 Induction, training and competency

OEMS 3.1 ensures that Beach staff and contractor personnel have the appropriate competence to perform the tasks required of their roles. This requires that competencies for specific roles are defined, that adequate training and supervision is provided, and appropriate induction is provided commensurate with specific activities as detailed in Section 8.2.2.

8.1.12 OEMS Standard 4: Safe systems of work

Standard 4 is concerned with high-risk activities and hazardous exposures have the potential to cause serious harm to our people and the environment. The standard ensures:

- the application of procedures and/or work permits to manage these activities,
- that appropriate controls are in place, and
- only authorized and trained personnel perform high-risk activities.

The application of OEMS Standard 4 to the activities is described below.

8.1.13 OEMS 4.9 Occupational exposure

OEMS 4.9 ensures that the appropriate controls are in place to minimise the exposure of personnel and the environment to hazardous materials. This is supported by the Beach Hazardous Chemicals Management Procedure (CDN/ID 18985401) as discussed in Section 8.1.18.

8.1.14 OEMS Standard 5: Environment and heritage

Standard 5 outlines the requirements that Beach must implement to ensure that it manages all aspects of the environment in accordance with its regulatory requirements. Beach operates in environmentally sensitive areas and in close proximity to communities, with potential impacts on stakeholders. Beach has an obligation to ensure that potential impacts from its activities are clearly identified, minimised to ALARP and are acceptable.

The application of OEMS Standard 5 to the activities is described below.

8.1.15 OEMS 5.1 Environment permissions documents

OEMS 5.1 requires that all permission documents (i.e. this EP) must meet all statutory and regulatory compliance requirements and, where appropriate, management plans be developed, implemented and maintained to define, control and monitor and minimise adverse environmental effects. Environmental aspects covered by this standard included those as defined in the OPGGS (E)R (refer to Section 2.5.1)

This EP is an integral part of the OEMS for the activity and is a key document in satisfying OEMS 5.1 as it identifies legislative requirements, impacts and risks and associated management measures to ensure that risks and impacts associated with the activity are ALARP and at an acceptable level.

OEMS 5.1 requires the development and implementation of management plans or procedures to conduct its operations in an environmentally responsible and sustainable manner whether that be through the implementation of existing OEMS procedures and plans, or the identification of activity specific requirements within the EP itself. Beach management plans and procedures for the management of key impacts and risks associated with the activity are detailed in Section 8.1.18.

8.1.16 OEMS 5.2 Cultural heritage

OEMS 5.2 aims to prevent impacts to cultural heritage whilst undertaking activities. It requires that cultural heritage assessments be undertaken to identify and evaluate potential to impact on cultural heritage places and values and to put in place control measures to ensure that to prevent and minimise potential impacts.

8.1.17 OEMS 5.3 Emissions monitoring and reporting

OEMS 5.3 aims to ensure compliance with obligations associated with air emissions. It requires that emissions are managed in accordance with regulatory obligations, that control measures are in place to minimise and manage emissions, and the monitoring is implemented as appropriate. Emissions monitoring for the activities within the scope of this EP are detailed in Section 8.3.7.

8.1.18 OEMS Plans and Procedures

In addition to this EP, there are a number of specific plans and procedures that are essential for the management of key impacts and risks and are considered important components of the OEMS for the for the activity. These plans and procedures are summarised below.

8.1.19 Introduced Marine Species Management Plan (CDN/ID S4000AH719916)

Beach's Introduced Species Management Plan will be applied to the MODUs, vessels and submersible equipment mobilised from domestic waters to undertake the activities within the Operational Area. This includes the completion of Beach's Domestic IMS Biofouling Risk Assessment Process as outlined in Table 8-2 prior to the initial mobilisation into the Operational Area. It should be noted that this domestic IMS biofouling risk assessment process does not include an evaluation of potential risks associated with ballast water exchange. The MODU and vessel operators contracted to Beach must comply with the most recent version of the Australian Ballast Water Management Requirements (Australian Ballast Water Management Requirements – Department of Agriculture and Water Resources 2017).

Table 8-2: Beach IMS risk assessment process

Section	Description
Purpose	Validate compliance with regulatory requirements (Commonwealth and State) in relation to biosecurity prior to commencing the program activities within the Operational Area. Identify the potential IMS risk profile of the MODU, vessels, and submersible equipment prior to deployment within the Operational Area. Identify potential deficiencies of IMS controls prior to entering the Operational Area. Identify additional controls to manage IMS risk. Prevent the translocation and potential establishment of IMS into non-affected environments (either to or from the Operational Area).
Basis of Detailed IMS Biofouling Risk Assessment	The basis by which an independent IMS expert evaluates the risk profile of the MODU / vessel / submersible equipment includes consideration of: Vessel/MODU/immersible equipment details including age, type and condition Previous inspections Anti-fouling coating Seawater intakes Internal marine growth protection system Vessel operational history Number and region of stationary/slow periods Vessel/MODU/immersible equipment mobilisation by land or freight Ballast water

8.1.20 Chemical Management Plan (CDN/ID S4000AD719917)

All chemicals and hazardous materials are managed as per the Chemical Management Plan (S4000AD719917), which details the procedure to be followed by Beach Energy staff and their contractors for the selection, evaluation and approval of chemicals that are planned to be discharged during offshore campaigns.

This process includes the completion of a risk assessment to ensure that the impacts and risks associated with offshore discharge are reduced to ALARP. The risk assessment process considers aquatic toxicity, bioaccumulation and persistence data, along with the discharge concentration, duration, frequency, rate, and volume. Approval is recorded in the Master Offshore Chemical Register for the Project.

Figure 8-3 provides a summary of the offshore chemical environmental risk assessment process.

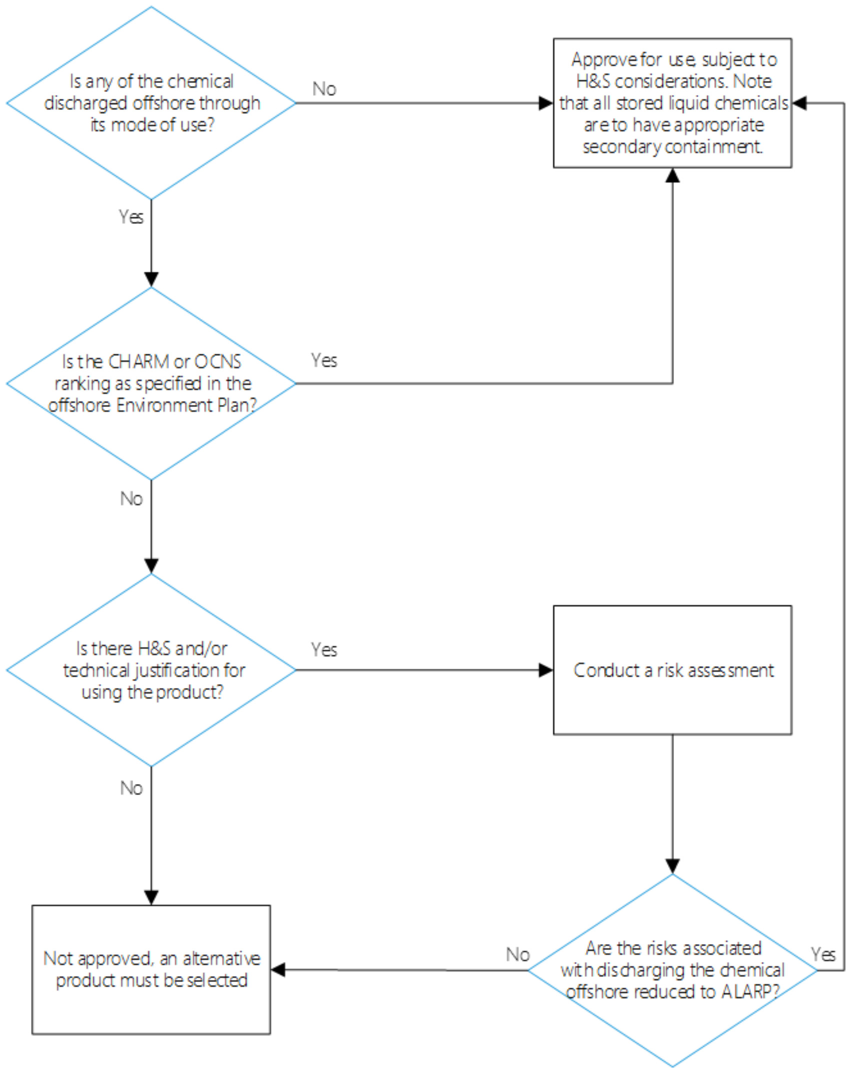


Figure 8-3: Summary of the offshore chemical environmental risk assessment process

8.1.21 Waste Management

Waste generated by the activities will include waste from the operation of the MODU and vessels which will include discharge to the marine environment where appropriate, or storage and transport to onshore facilities for recycling and/or disposal as described in Sections 7.7 and 7.9.

Beach's approach to waste management requires that the lifecycle HSE impacts of Beach's products and services are assessed to enable responsible usage so that the consumption of resources and materials is minimised as far as reasonably practicable, and production of wastes are minimised. As per Beach's Waste Management Plan – Otway and Bass Strait Offshore (CDN/ID S4000AD719914), all wastes from the activities will be managed in accordance with regulatory requirements and the waste hierarchy i.e. wastes are eliminated, reduced, recycled and/or reused as far as reasonably practicable or disposed of appropriately.

Liquid and putrescible wastes will be discharge to the marine environment in accordance with the contractor's MODU and vessel Garbage Management Plans, which have been developed to meet regulatory requirements including MARPOL.

General and hazardous waste streams generated during the activities will be segregated and stored on board prior to backloading to port for disposal to an appropriately licenced waste facility by an appropriately licenced waste transporter in accordance with the contractor's MODU and vessel Garbage Management Plans, which have been developed to meet regulatory requirements including MARPOL. Segregated materials will be recycled where practical. Where options to recycle do not exist, wastes will be disposed of in an appropriately licenced waste management facility.

Where waste streams associated with the activities including fluids and cuttings, and cements (refer Table 8-7 in Section 8.3.7) are to be collected and transported for onshore disposal, this will be managed in accordance with specific procedures to be developed during the contracting of an appropriately licenced service provider consistent with the regulatory requirements identified in Section 5.

Decommissioning wastes associated with the P&A of Artisan will be managed in accordance with specific procedures to be developed during the contracting of an appropriately licenced service provider and consistent with the regulatory requirements identified in Section 5.

Monitoring and measurement of the various waste streams associated with the activity are described in Table 8-7 in Section 8.3.7.

The implementation of these plans and procedures will ensure that wastes from the activities within the scope of this EP are appropriately managed and where appropriate controls as identified in Section 7.7, 7.8, 7.9 and 7.12 are implemented.

8.1.22 Whale management procedure (CDN/ID 19061955)

The Whale Management Procedure (WMP) details how Beach will avoid and minimise anthropogenic noise to whales undertaking biologically important behaviours during Offshore Gas Victoria (OGV) activities, including the Program activities that are the subject of this EP. Implementation of the WMP will ensure that the EPOs for the activities are achieved and sets out specific roles and responsibilities, details the methods to be used to observe for cetaceans during the activities and the mitigations to be implemented in the event that a cetacean is observed within proximity to the activities. The WMP is included in Appendix K.

8.1.23 Light Management Plan Implementation Requirements (V-1000-01-MP-0003)

The Offshore Gas Victoria Light Management Plan Implementation Requirements details the requirements for:

- The development of vessel and MODU specific Light Management Plans (LMPs) to mitigate the risk of impacts to marine birds while undertaking activities for Beach.
- Beach to ensure that contracted vessels and MODUs have developed and implemented specific Light Management Plans.

Operators of all MODUs and vessels utilised for the activities are required to develop specific LMPs using the template provided.

8.2 Responsibilities of Employees and Contractors

Regulation 22(3) of the OPGGS(E)R requires the that the implementation strategy establish a clear chain of command, that sets out the roles and responsibilities of employees and contractors working on the activities. Further, regulation 22(4) requires that the implementation strategy includes measures to ensure that all employees and contractors working on the activities are aware of their responsibilities and have the appropriate competencies and training.

8.2.1 Roles and Responsibilities

Beach aims to ensure that the organisation is equipped, structured, and supported to ensure a healthy, efficient, and successful company. Communications with internal and external bodies, including joint venture partners, is essential to delivering successful projects and operations. The leadership styles and actions demonstrated within Beach will influence the performance of all staff and contractors. Clear levels of authority are necessary to remove organisational ambiguity and to support effective decision making.

Beach's Executive Vice President – Onshore and Offshore Assets has the ultimate responsibility for ensuring that Beach has the appropriate organisation in place to meet the commitments within this EP. However, the General Manager Drilling and Completions has the responsibility and delegated authority to ensure that adequate and appropriate resources are allocated to comply with OEMS and this EP.

The roles responsible for the implementation, management and review of this EP are detailed in Table 8-3.

Roles and responsibilities for an oil pollution emergency response are described in the OPEP.

Table 8-3: Roles and responsibilities for key role for the EP implementation

Role	Responsibilities
Onshore	
Executive Vice President Onshore and Offshore Assets	Responsible for HSE performance of all activities within Beach's assets. Ensures policies and systems are in place to guide the company's environmental performance. Ensures adequate resources are available for the safe operation of all facilities and operations. Ensures that the OEMS continues to meet the evolving needs of the company.
General Manager Drilling and Completions	Ensures: Compliance with the Environment Policy, regulatory and other requirements, and this EP. Communication regarding HSE issues as per Section 8.2.4. Whale Management Procedure is implemented, records obtained, and reporting undertaken. Records associated with activities are maintained as per Section 8.5.4. Personnel who have specific responsibilities pertaining to the implementation of this EP or Oil Pollution Emergency Plan (OPEP) know their responsibilities and are competent to fulfil their designated role.

Role	Responsibilities
	Assurance processes as detailed in Section 8.3.2 are undertaken to confirm that control measures detailed in the EP are effective in reducing the environmental risks of activities to ALARP and acceptable levels, and EPOs and EPSs are continually met. Environmental impacts and risks associated with activities have been identified and any new or increased impacts or risks are managed via the Management of Change (MoC) process detailed in Section 8.3.4. Incidents are managed and reported as per Section 8.3.1. Leads the investigation and reporting of any environmental incidents. EP Performance Report is submitted to NOPSEMA as per Section 8.3.9. Changes to equipment, systems, and documentation where there may be a new or change to an environmental impact or risk or a change that may impact the EP are assessed using the MoC process detailed in Section 8.3.4. Oil spill response arrangements are tested as per the OPEP. Audits and inspections are undertaken in accordance with Section 8.3.3.
Beach Drilling Superintendent	Activities are carried out in accordance with regulatory requirements and this EP. Ensure the Whale Management Procedure is communicated to all MMOs, MODU Senior Drilling Supervisor, Beach personnel offshore and all 3rd party and contractor personnel on the MODU, all helicopter crew and all Vessel Captains and vessel crew. MODU personnel are competent to fulfil their designated role. HSE issues are communicated via systems such as the daily report and daily pre-start meetings. Environmental incidents are managed and reported as per Section 8.3.1. Emissions and discharges identified in Section 8.3.7 are recorded, reviewed, and provided to the General Manager Drilling and Completions. General Manager Drilling and Completions is informed of any changes to equipment, systems, and documentation where there may be a new or change to an environmental impact or risk or a change that may impact the EP as per Section 8.3.4. Weekly MODU inspections are undertaken to ensure ongoing compliance with the EP as per Section 8.3.3 and communicate outcome and any non-conformance to General Manager Drilling and Completions.
Head of Environment	Ensures this EP is revised as required. Whale Management Procedure document owner. Accountable to define the requirements of the business process, ensures appropriate performance metrics are defined and reviewed, tracks lessons learned, and drives continuous improvement. Reviews EP audits. Reviews and approves reportable incident reports to the regulators. Reviews changes to operations for their environmental and regulatory implications.
Senior Environmental Advisor	Maintains ongoing communications with the General Manager Drilling and Completions regarding regulatory requirements and environmental management in general. Prepares environmental inductions and training packages. Monitors environmental performance against this EP. Undertakes assurance processes as detailed in Section 8.3.2 to confirm that control measures detailed in the EP are effective in reducing the environmental risks of activities to ALARP and acceptable levels, and the EPOs and EPSs are continually met. In relation to the Whale Management Procedure:

Role	Responsibilities
	Coordinate the training and implementation of the Whale Management Procedure offshore. Ensures the requirements for the implementation of the Whale Management Procedure are in place prior to the commencement of activities. Reviews the MMO daily report to ensure detection and actions meet the requirements of the Whale Management Procedure. Coordinates and documents the review of effectiveness and compliance with the Whale Management Procedure. Forwards report detailing marine mammal sightings, actions taken as per the Whale Management Procedure, and reasons actions not taken to relevant persons who requested access to this information. Forwards record of marine mammal sightings to DCCEEW Australian Marine Mammal Centre Division. Prepares and submits monthly recordable incident reports to the regulators. Prepares reportable incident reports for submission to the regulators. Supports the MoC process with regard to environmental issues. Supports the investigation and reporting of any environmental incidents. Prepares and submits reportable incident reports to the regulators. Reviews changes to activities with the Head of Environment.
Senior Community Relations Manager	Ensure that relevant persons (as defined in Section 4) have been consulted about the activities to enable the relevant person to make an informed assessment of the possible consequences of the activity on their functions, interests, or activities. Ensure that any requests for updates about the activity that were identified during the EP preparation consultation phase are implemented. Ensure consultation for implementation of the EP (refer Section 8.5.1) is undertaken. Maintains a record of stakeholder consultation including how any objection or claim relevant to the activities was assessed and communicated to the relevant person. Reports stakeholder objections or claims to the General Manager Drilling and Completions and Environmental Advisor for assessment. Keeps relevant persons informed of emergency events that may impact their functions, interests or activities.
Offshore	
MODU Senior Drilling Supervisor	Ensures: Ensures: Activities are carried out in accordance with regulatory requirements and this EP. Personnel complete the induction. Whale Management Procedure is implemented and: Maintain open communication with MMOs. Regularly (daily or more often as operational changes dictate) communicate the status of the activities (i.e. commencing, underway, or at Safe Point) to MMOs. Liaise with the MMO and decide whether actions within this procedure can safely be implemented and take action accordingly. Document reasons for not following this procedure and report same to the Beach Drilling Superintendent and the Beach Environmental Advisor. Provides input into the review of effectiveness and compliance with the Whale Management Procedure.

Role	Responsibilities
	Personnel are competent to fulfil their designated role. HSE issues are communicated via systems such as the daily report and daily pre-start meetings. Environmental incidents are managed and reported as per Section 8.3.1. Emissions and discharges identified in Section 8.3.7 are recorded and provided to the Beach Drilling Superintendent. Beach Drilling Superintendent is informed of any changes to equipment, systems, and documentation where there may be a new or change to an environmental impact or risk or a change that may impact the EP as per Section 8.3.4. Weekly inspections are undertaken to ensure ongoing compliance with the EP as per Section 8.3.3.
Vessel Master	Ensures: Vessel operations are carried out in accordance with regulatory requirements and this EP. Personnel complete the induction. Whale Management Procedure is implemented on the vessel and: Maintains open communication with MMOs. Liaise with MMO and decide whether actions within the Whale Management Procedure can safely be implemented and take action accordingly. Documents reasons for not following the Whale Management Procedure and report same to the MODU Senior Drilling Supervisor Provides input into the review of effectiveness and compliance with the Whale Management Procedure. Vessel personnel are competent to fulfil their designated role. HSE issues are communicated via systems such as the daily report and daily pre-start meetings. Emissions and discharges identified in Section 8.3.7 are recorded and provided to the MODU Drilling Supervisor. Environmental incidents are reported to the MODU Drilling Supervisor within required timeframes as per Section 8.3.1. MODU Drilling Supervisor is informed of any changes to equipment, systems, and documentation where there may be a new or change to an environmental impact or risk or a change that may impact the EP as per Section 8.3.4. Oil spill response arrangements are in place and tested as per the vessel's SMPEP or equivalent.
MODU and vessel personnel	Complete project induction. Report hazards and/or incidents via company reporting processed. Stop any task that they believe to be unsafe or will impact on the environment. Immediately communicate whale sighting to MMOs.
Marine Mammal Observers (MMOs)	Undertake observations and reporting in accordance with the Whale Management Procedure. Provide advice to the MODU Drilling Supervisor and Vessel Master (or delegate) on the requirements of the Whale Management Procedure. Provide input into the review of effectiveness and compliance with the Whale Management Procedure.

8.2.2 Competencies and Training

Beach implements processes to ensure that staff and contractors within the business are fully equipped with the competencies required to perform their assigned duties and are physically and mentally prepared.

Each employee or contractor with responsibilities pertaining to the implementation of this EP shall have the appropriate training and competencies to fulfil their designated role.

To ensure that personnel are aware of the EP requirements to complete a general induction, as a minimum. Records of completion of the induction will be recorded and maintained as per Section 8.5.4. The induction will at a minimum cover:

- Description of the environmental sensitivities and conservation values of the Operational Area and surrounding waters.
- Controls to be implemented to ensure impacts and risks are of an ALARP and acceptable.
- Requirement to follow procedures and use risk assessments/ job hazard assessments to identify environmental impacts and risks and appropriate controls.
- Requirements for interactions with fishers and/or fishing equipment.
- Requirement for responding to and reporting environmental hazards or incidents.
- Locations of known maritime and cultural heritage sites and the process to follow if a maritime and cultural heritage site is identified.
- Cultural heritage sensitivities relating to the Operational Area.
- Whale Management Procedure requirements.
- Lighting requirements as per relevant light management plans
- Procedure for handling grounded birds and reporting requirements.
- Overview of emergency response and spill management plans.

In addition to the activity specific induction, each employee or contractor with specific responsibilities pertaining to the implementation of this EP shall be made aware of their responsibilities, and the specific control measures required to maintain environmental performance and legislative compliance.

8.2.3 Contracts and Procurement

Whilst Beach is the titleholder and proponent for the activities, the MODU and vessel contractor maintains operational control as per the requirements of their management system. To ensure contractors have the capabilities and competencies to implement the control measures identified in Section 7 of this EP, Beach implements processes for the acquisition of external services and materials, and the transportation of those materials to ensure Beach's business interests are met while maintaining compliance with all legal obligations and retaining HSE performance as the top priority.

Beach undertakes a pre-qualification of all contractors in which their HSE systems are reviewed to ensure that their HSE management system (HSEMS) is adequate for meeting their legal obligations and has identified the significant risks and control measures related to the scope of work being undertaken for Beach. This process includes verifying evidence of their HSEMS implementation.

Training and competency of contractor personal engaged to work on Beach activities shall be managed in accordance with the contractor's HSEMS (or equivalent).

Beach will implement control measures that may rely on various suitably qualified persons to provide expert evaluation and recommendations.

Where the requirements for a suitably qualified person are provided in regulations or guidelines, Beach will comply with these requirements. A suitably qualified person is a professional that has the necessary qualification and experience to assess the environment and to ensure risks and impacts are appropriately managed. Examples for assessing criteria for a suitably qualified persons may include:

- Recognised relevant certification, qualification or credentials relevant to the subject / discipline
- Proven competency and experience
- Membership of a relevant professional organisation
- Independence
- Assessments and selection of a suitably qualified person will be carried out by Beach under its OEMS standards

8.2.4 Communications

The General Manager Drilling and Completions has responsibility for ensuring that systems are in place to facilitate the communication of HSE issues. Communication is typically via the daily report and daily operations meetings; and through weekly HSE meetings.

The meetings are used to identify and communicate:

- Environmental Performance.
- Issues associated with implementation of the EP.
- Any proposed changes to equipment, systems, or methods of operation of equipment, where these may be HSE implications.
- Any proposals for the continuous improvement of environmental protection.

8.3 Monitoring and Reporting

Regulation 22(5), (6) and (7) of the OPGGS(E)R require that the implementation strategy:

- Provide for sufficient monitoring recording, audit and management of non-conformance and review of the environmental performance of the activity
- Provide for sufficient monitoring and maintenance of records of emissions and discharges to demonstrate that the EPO and EPS are being met
- Provide for reporting to NOPSEMA in relation to the environmental performance of the activity.

8.3.1 Incident Reporting

The Beach Incident Management Procedure (CDN/ID 18985406) has been developed to:

- Ensure that all incidents (including near misses) are reported, investigated, documented and analysed in a consistent manner;
- Encourage open and practical analysis of incidents, aimed to establish relevant causes so that action can be taken to correct the situation and eliminate or mitigate potential reoccurrence; and
- Address regulatory requirements for managing incidents.

The procedure applies to all incidents associated with the scope of this EP and to all personnel, contractors and visitors working on the activities.

Incident reports and corrective actions for the activities will be managed using the Beach Incident Management System.

Reportable and recordable incidents are identified by the incident notification processes. In addition, recordable incidents are also identified as per the assurance and audit processes detailed in Sections 8.3.2 and 8.3.3.

As part of the review and investigation of incidents additional, or increased, environmental impacts or risks may be identified. These are managed as per the MoC process detailed in Section 8.3.4.

Notification and reporting requirements for environmental incidents to external agencies are provided in Table 8-4.

Table 8-4: Regulatory incident reporting

Requirement	Timing	Contact	Responsible Person
Recordable incident As defined within the OPGGS(E)R a recordable environmental incident is a breach of an EPO or EPS in the EP that applies to the activity that is not a reportable incident.			
As a minimum, the written monthly recordable report must include a description of:	Before the 15th day of the following	NOPSEMA – submissions@nopsema.gov.au	General Manager

Requirement	Timing	Contact	Responsible Person
all recordable incidents which occurred during the calendar month; all material facts and circumstances concerning the incidents that the operator knows or is able to reasonably find out; corrective actions taken to avoid or mitigate any adverse environmental impacts of the incident; and corrective actions that have been taken, or may be taken, to prevent a repeat of similar incidents occurring. The OPGGS(E)R requires a recordable incident report to be submitted if there is a recordable incident, thus nil reports are not required.	calendar month		Drilling and Completions
Reportable incident As defined within the OPGGS(E)R, a reportable incident is an incident relating to the activity that has caused, or has the potential to cause, moderate to significant environmental damage. In the context of the Beach Environmental Risk Matrix moderate to significant environmental damage is defined as any incident of actual or potential consequence category Serious (3) or greater. These risks include: Loss of well integrity resulting in a condensate spill or otherwise. Vessel collision resulting in a loss of containment or otherwise. Introduction of marine pests to the operational area. In addition, the following that does not have an actual or potential consequence category Serious (3) or greater will be reported as a reportable incident: Injury of death of a protected species.			
Initial notification The notification must contain: all material facts and circumstances concerning the incident; any action taken to avoid or mitigate the adverse environmental impact of the incident; and the corrective action that has been taken or is proposed to be taken to stop control or remedy the reportable incident. As soon as practicable after notification of a reportable incident,	Within two hours of becoming aware of incident	NOPSEMA – 1300 674 472 NOPSEMA – submissions@nopsema.gov.au DEECA ERR (Vic)– ERRChiefInspector@ecodev.vic.gov.au (0419 597 010) EPA (Tas): incidentresponse@epa.tas.gov.au (1800 005 171) NOPTA – reporting@nopta.gov.au	General Manager Drilling and Completions

Requirement	Timing	Contact	Responsible Person
a written record of the notification must be given to: NOPSEMA (The Regulator) NOPTA (Titles Administrator) DEECA (Vic) (Department of Responsible State Minister for Vic titles) Department of State Growth who has delegated to EPA Tasmania (Department of Responsible State Minister for Tas Titles)			
Incident Report Initial notification of a reportable incident to the regulator must be followed by a written report. As a minimum, the written incident report will include: the incident and all material facts and circumstances concerning the incident; actions taken to avoid or mitigate any adverse environmental impacts; the corrective actions that have been taken, or may be taken, to prevent a recurrence of the incident; and the action that has been taken or is proposed to be taken to prevent a similar incident occurring in the future.	Not later than 3 days after the first occurrence of the incident	NOPSEMA – submissions@nopsema.gov.au	General Manager Drilling and Completions
Written incident reports to be submitted to NOPTA, DEECA and EPA (Tas) (for incidents in Commonwealth waters).	Within 7 days of written report submission to NOPSEMA	DEECA ERR (Vic)– ERRChiefInspector@ecodev.vic.gov.au (0419 597 010) EPA (Tas): incidentresponse@epa.tas.gov.au (1800 005 171) NOPTA – reporting@nopta.gov.au	General Manager Drilling and Completions
Vessel spill to marine environment All discharges /spills or probable discharges/spills to the marine environment of oil or oily mixtures, or noxious liquid substances in the marine environment from vessels. Reporting info: http://www.amsa.gov.au/forms-and-publications/AMSA1522.pdf.	Verbal notification ASAP	Immediate notification by the Vessel Master to AMSA. Follow-up with Marine Pollution Report (POLREP). Ph: 1800 641 792 Email: rccaus@amsa.gov.au AMSA POLREP: https://amsa-forms.nogginoca.com/public/	Vessel Master

Requirement	Timing	Contact	Responsible Person
Australian Marine Park (AMP) In the event an AMP may be exposed to hydrocarbons	Verbal notification ASAP	Marine Park Compliance Duty Officer – 0419 293 465 Notification must be provided to the Director of National Parks (DNP) and include: titleholder details time and location of the incident (including name of marine park likely to be affected) proposed response arrangements as per the OPEP (e.g. dispersant, containment, etc.) confirmation of providing access to relevant monitoring and evaluation reports when available contact details for the response coordinator. Note: DNP may request daily or weekly Situation Reports, depending on the scale and severity of the pollution incident.	Emergency Management Team (EMT) Lead (or delegate)
Vessel strike with cetacean	Within 72 hours	DCCEEW – online National Ship Strike Database https://data.marinemammals.gov.au/report/shipstrike	Vessel Master
	ASAP for cetacean injury assistance	DEECA Whale and Dolphin Emergency Hotline – 1300 136 017 Seals, Penguins or Marine Turtles 136 186 (Mon-Fri 8am to 6pm) or AGL Marine Response Unit 1300 245 678.	Vessel Master / Senior Environment Advisor
Injury to or death of EPBC Act-listed species	Within seven days	DCCEEW – 1800 803 772 EPBC.Permits@environment.gov.au	Senior Environment Advisor
Suspected or confirmed Invasive Marine Species introduction	Verbal notification ASAP	Agriculture Victoria 136 186 marine.pests@agriculture.vic.gov.au DRET Invasive Species Branch 03 6165 3777 invasivespecies@nre.tas.gov.au	Senior Environment Advisor
Identification of any historic shipwrecks, aircraft, or relics	Written notification within 1 week	Written notification via the notification of discovery of an historic shipwreck or relic online submission form. Notification to the Victorian Department of Transport and Planning, Planning	General Manager Drilling and Completions

Requirement	Timing	Contact	Responsible Person
		Implementation and Heritage Department via email. Notification to the Tasmanian Parks and Wildlife Service, via email.	
Identification of any First Nations cultural heritage relics or sites	Online notification within 24 hours after identification	DCCEEW Australasian Underwater Cultural Heritage Database, online Notification of Discovery of Underwater Cultural Heritage online form.	General Manager Corporate Affairs or First Nations Engagement Manager
Identification of any unexploded ordnance	Written notification within 1 week	Written notification via email to offshore.petroleum@defence.gov.au	General Manager Drilling and Completions

8.3.2 EP Assurance

Table 8-5 provides a summary of the processes (specific measures) undertaken by Beach to ensure that for the duration of the activities within the scope of this EP:

- The environmental impacts and risks of the activity continue to be identified and reduced to a level that is ALARP.
- Control measures detailed in this EP are effective in reducing the environmental impacts and risks of the activity to ALARP and an acceptable level.
- Environmental performance outcomes and standards set out in this EP are being met.

Non-compliances and opportunities for improvements identified via the assurance processes in Table 8-5 and the following sections are communicated to the General Manager Drilling and Completions to report and action in a timely manner.

Tracking of non-compliances and actions is undertaken using Beach's incident management system, which includes assigning a responsible person for ensuring the action is addressed and closed out. Any additional, or increased, impacts or risks identified are managed as per the MoC process detailed in Section 8.3.4.

Where an assurance process identifies a breach of an EPO or EPS in the EP this will be reported as a recordable incident as per Table 8-4.

Table 8-5: EP assurance processes

Process	Frequency	Responsible
Pre-mobilisation EP Assurance Checks covering: EPOs, EPS and implementation strategy requirements.	Prior to commencement	Senior Environment Advisor

Process	Frequency	Responsible
See Section 8.3.3.	of the program activities	
Incident reviews and investigations covering: Review of all incidents to identify any additional, or increased, environmental impacts or risks. Reporting and investigation of incidents to identify any additional, or increased, environmental impacts or risks. See Section 8.3.1.	Weekly As required	Senior Environmental Advisor General Manager Drilling and Completions with support from Senior Environmental Advisor
Activity impact and risk review to ensure impacts and risks can be managed to ALARP and an acceptable level and any additional, or increased, environmental impacts or risks identified. See Section 8.3.5.	As required	General Manager Drilling and Completions with support from Senior Environmental Advisor
EP Performance Report covering: Review of EPOs and EPSs. See Section 8.3.9.	Annually	Senior Environmental Advisor
Activity emissions and discharge records See Section 8.3.7.	As detailed in Section 8.3.7.	General Manager Drilling and Completions

8.3.3 Audits and Inspections

Environmental performance will be reviewed in several ways to ensure that for the duration of the EP:

- EPOs, EPSs and implementation strategy requirements are met.
- Controls measures are effective in reducing the environmental impacts and risks of the activity to ALARP and acceptable levels.
- Any additional, or increased, impacts or risks are identified.

A pre-mobilisation assurance check is undertaken prior to commencement of the activities within the scope of this EP. The assurance check consists of reviewing the EPs EPOs, EPSs, implementation strategy and Whale Management Procedure requirements.

In addition, MODU and vessel weekly offshore inspections will be undertaken for the duration of the activities within the scope of this EP to ensure ongoing compliance with relevant EP requirements. Inspection will include, but not be limited to:

Spill preparedness such as spill kit checks.
Waste management.
Review of any new or changed chemicals that maybe discharged offshore.
Validation that compliance with EPOs and EPSs is maintained.

Non-compliances and opportunities for improvements identified via assurance checks or any other means are communicated to the General Manager Drilling and Completions to report and action in a timely manner. Any additional, or increased, impacts or risks identified are managed as per the MoC process detailed in Section 8.3.4.

Tracking of non-compliances and actions is undertaken using Beach's incident management system which includes assigning a responsible person for ensuring the action is addressed and closed out.

Where an assurance check identifies a breach of an EPO or EPS in the EP this will be reported as a recordable incident as per Section 8.3.1.

The assurance checks inform the annual performance report submitted to the relevant regulator as per Section 8.3.9.

8.3.4 Management of Change Standard

The Beach Management of Change Procedure (CDN/ID 3675087) (MoC Procedure) has been developed to specify the requirements for raising, progressing and closing of a MoC request to ensure that all temporary and permanent changes to the organisation, personnel, systems, procedures, equipment, products, and materials are identified and managed to ensure HSE risks arising from these changes remain at an acceptable level.

It ensures:

- holistic assessment of a proposed change,
- consultation with stakeholder's dependent upon the nature of the change,
- clear accountability for the change.

Changes to equipment, systems and documentation will be managed in accordance with the MoC procedure to ensure that all proposed changes are adequately defined, implemented, reviewed, and documented by suitably competent persons. The MoC process is managed using an electronic tracking database, which provides assurance that all engineering and regulatory requirements have both been considered and met before any change is operational.

Not all changes require a technical MoC review. Each change is assessed on a case-by-case basis. The potential environmental impacts and/or risks are reviewed by a member of the Beach Environment Team to determine whether the MoC review process is triggered using the Environmental Management of Change Offshore Environment Plans Procedure (CDN/ID 18446109).

Where the MoC review processes identifies a change in impacts, risks, or controls compared to those described and assessed in Section 7, and triggers a regulatory requirement to revise this EP, the revision shall be defined, endorsed, completed and communicated in accordance with the MoC Procedure.

8.3.5 Environment Plan Review

Beach may determine that a review of this EP is required when one or more of the following occurs:

- Changes to impacts and risks and/or controls identified during the activities within the scope of this EP.

- Annual environmental performance reporting identifies issues in the EP that require review and/or updating.
- Implementation of corrective actions is required to address internal audits findings or external inspection recommendations.
- Changes to or introduction of new environmental requirements.
- An environmental incident and subsequent investigation identifies issues in the EP that require review and/or updating.
- A modification of the activity is proposed that is not significant but needs to be documented in the EP.
- Changes in understanding of the existing environment in areas such as:

  EPBC Act listed threatened and migratory species.

  Part 13 statutory instruments (recovery plans, threat abatement plans, conservation advice, wildlife conservation plans).

  Marine protected areas and/or plans.

  First Nations cultural heritage/values, Native Title, IPAs, ILUAs and management/Sea Country Plans.

  Commercial fishing and marine users.

- Changes to impacts, risk and controls identified through the Risk Management Processes as per Section 2.4 and Section 2.5.
- New information or changes in information from relevant persons, research, studies, protected species, legal and other requirements. This shall be achieved by:

  Subscription to regulator and relevant industry distribution lists (such as AEP and IOGP).

  Subscription to the NOPSEMA website to identify any new petroleum activities within the Otway Basin that may overlap with activity locations and timings.

  Consultation for implementation of EP as per Section 8.5.1.

Any revisions to the EP are to be assessed against the criteria for submission of a revised EP to NOPSEMA as detailed in Section 8.3.6 and MoC as per Section 8.3.4 shall be evaluated.

8.3.6 Environment Plan Revision

In accordance with the OPGGS(E)R, if a revision of this EP is required it shall be submitted to NOPSEMA as per the regulatory requirements in Table 8-6.

Table 8-6: Regulatory requirement for submission of a revised EP

OPGGS(E)R	EP Revision Submission Requirements
38	With the regulator's approval before the commencement of a new activity.
39(1)	Before the commencement of any significant modification or new stage of the activity that is not provided for in the EP as currently in force.
39(2)	Before, or as soon as practicable after, the occurrence of any significant new or significant increase in environmental impact or risk; or The occurrence of a series of new or a series of increases in existing environmental impacts or risks which, taken together, amount to the occurrence of a significant new or significant increase in environmental impact or risk.
39(3)	A change in titleholder that results in a change in the manner in which the environmental impacts and risks of an activity are managed.

Revisions and re-submission of the EP generally centre around 'new' activities, impacts or risks and 'increased' or 'significant' impacts and risks. Beach defines these terms in the following manner:

New impact or risk – one that has not been assessed in Section 7.

Increased impact or risk – one with greater extent, severity, duration, or uncertainty than is detailed in Section 7.

Significant change –

- The change to the activity that deviates from the EP to the degree that it results in new activities that are not intrinsic to the existing Activity Description in Section 3.
- The change affects the ability to achieve ALARP or acceptability for the existing impacts and risks described in Section 7.
- The change affects the ability to achieve the EPO and EPS contained in Section 7.

A change in the activities, knowledge, or requirements applicable to the activity are considered to result in a 'significant new' or 'significant increased' impact or risk if any of the following criteria apply:

- The change results in the identification of a new impact or risk and the assessed level of risk is not 'Low', acceptable and ALARP.
- The change results in an increase to the assessed impact consequence or risk rating for an existing impact or risk described in Section 7.
- There is both scientific uncertainty and the potential for significant or irreversible environmental damage associated with the change.

• While an EP revision is being assessed by NOPSEMA, any activities addressed under the existing accepted EP are authorised to continue. Additional guidance is provided in NOPSEMA Guideline *When to submit a proposed revision of an EP* (N-04750-GL1705).

Minor EP Revisions

Minor revisions to this EP that do not require resubmission to NOPSEMA will be made where:

- Minor administrative changes are identified that do not impact on the environment (e.g., document references, contact details, etc.).
- A review of the activity and the environmental risks and impacts of the activity do not trigger a requirement for a revision, as outlined in this section.
- Minor revisions to the EP will not be submitted to the regulators for formal assessment. Minor revisions will be tracked in the document control system (refer Section 8.5.4).

8.3.7 Emissions and Discharge Records

In accordance with regulation 22(6) of the OPGGS(E)R, emissions and discharges shall be recorded for the duration of the activities. The source of these emissions and discharges and their management are as described in Sections 7.7, 7.8, 7.11 and 7.12.

Table 8-7 details the types of emissions and discharges that shall be recorded including the monitoring method and frequency of reporting. Air emissions (from fuel combustion) are reported annually as part of statutory *National Greenhouse and Energy Reporting Act* (NGER) 2007 reporting and National Pollution Inventory (NPI) reporting.

Table 8-7: Emissions and discharges monitoring requirements

Emission / Discharge	**Monitoring parameter**	**Recording method**	**Reporting frequency**	**Responsibility**
Fuel	Volume used	Daily report	Daily	MODU Contractor MODU Contractor Vessel Contractor
Fuel	Volume used	Daily report	Daily	
Bilge	Volume discharged	Oil record Book	As required	
Sewage	Volume discharged	Garbage record book	As required	
Putrescible food	Volume discharged	Garbage record book	As required	
Waste	Volume sent to shore for disposal and recycling	Garbage record book	As required	
Drill fluids and cuttings*	% ROC Volume discharged Volume sent to shore	Daily report	Daily	Appropriately licenced service provider
Cement	Volume discharged Volume sent to shore	Daily report	Daily	Appropriately licenced service provider
Completion fluids	Volume discharged Volume sent to shore	Daily report	Daily	Appropriately licenced service provider

Emission / Discharge	Monitoring parameter	Recording method	Reporting frequency	Responsibility
P&A well fluids	Volume discharged Volume sent to shore	Service provider waste records.	As required	Appropriately licenced service provider
Flaring	Volume flared	Daily report Service provider waste records.	As required	MODU contractor Appropriately licenced service provider
Decommissioning waste (i.e. wellheads)*	Volume salvaged and sent to shore	Service provider waste records.	As required	Appropriately licenced service provider
**Drill cuttings and decommissioning waste contingent on Artisan 1 P&A*				

8.3.8 Marine Mammal Sighting Reports

Marine mammal sightings will be recorded and submitted to DCCEEW via the National Marine Mammal Data Portal. Sightings will be submitted annually not more than three months after the anniversary date of the EP acceptance by NOPSEMA. The interval between reports after that will not be more than one year.

8.3.9 Annual Performance Report

In accordance with regulation 22(7) of the OPGGS(E)R, Beach will submit a report on the environmental performance of the program activities to NOPSEMA. Performance will be measured against the EPOs and EPSs described in this EP. The report will be submitted annually not more than three months after the anniversary date of the EP acceptance by NOPSEMA. The interval between annual reports after that will not be more than one year.

8.4 Oil Pollution Emergency Response

Regulations 22(8), (9), (10) and (11) of the OPGGS(E)R require that the implementation strategy contain an oil pollution emergency plan (OPEP) that includes:

- arrangements for responding to a monitoring marine oil pollution,
- monitoring of impacts associated with oil pollution and response activities and
- demonstrating that the response arrangements in the OPEP are consistent with national system for oil pollution preparedness and response.

Further, regulations 22(12), (13) and (14) of the OPGGS(E)R require that the implementation strategy include arrangements for the testing of the response arrangements in the OPEP.

The emergency response framework to be applied to the activities, including the establishment and testing of the OPEP, is outlined in the following sections.

8.4.1 Crisis and Emergency Response Framework

The Beach Crisis and Emergency Management Framework consists of a tiered structure whereby the severity of the emergency triggers the activation of emergency management levels. The emergency response framework contains three tiers based on the severity of the potential impact, as outlined in Figure 8-4. This framework is described in the Beach Emergency Management Plan (EMP) (CDN/ID 18025990).

The responsibilities of the Emergency Response Team (ERT), Emergency Management Team (EMT) and Crisis Management Team (CMT) are outlined in Table 8-8.

The key emergency response arrangements for the activity are outlined below.

8.4.1.1 Beach Emergency Management Plan

The Beach EMP (CDN/ID 18025990) provides the standard mechanism for the Emergency Management Team (EMT) to operate from and includes guidance on effective decision-making for emergency events, identification, assessment, and escalation of events and provides training and exercise requirements. The EMP provides information on reporting relationships for command, control, and communications, together with interfaces to emergency services specialist response groups, statutory authorities, and other external bodies. The roles and responsibilities are detailed for onshore and offshore personnel involved in an emergency, including the response teams, onshore support teams, visitors, contractors, and employees. The EMP details the emergency escalation protocol depending on the nature of the emergency.

Associated with the EMP are the EMT & CMT Roster and EMT & CMT Resource List. These documents constitute a suite of emergency response documents that form the basis for Beach’s response to an emergency situation.

8.4.1.2 Activity Specific Emergency Response Plan

For the activities within the scope of this EP, the Beach Equinox Campaign Wells Offshore ERP (2025 V-1000-35-MP-0015) describes the processes and interfaces for responding to emergency events relating to the campaign and including the interface arrangements between Beach, the MODU, Beach offshore facilities, vessels and helicopters supporting the MODU. The ERP also describes who has primacy for controlling any emergency event. The Campaign ERP will be supported by the Beach EMP.

The Campaign ERP will describe the emergency roles and responsibilities for those on the MODU and vessels and outline the actions to be taken for activity specific scenarios (e.g., loss of containment, vessel emergency, fire, person overboard, fatality, etc). The Campaign ERP defines responsibility for both regulatory and internal reporting requirements of an emergency incident for support as required.

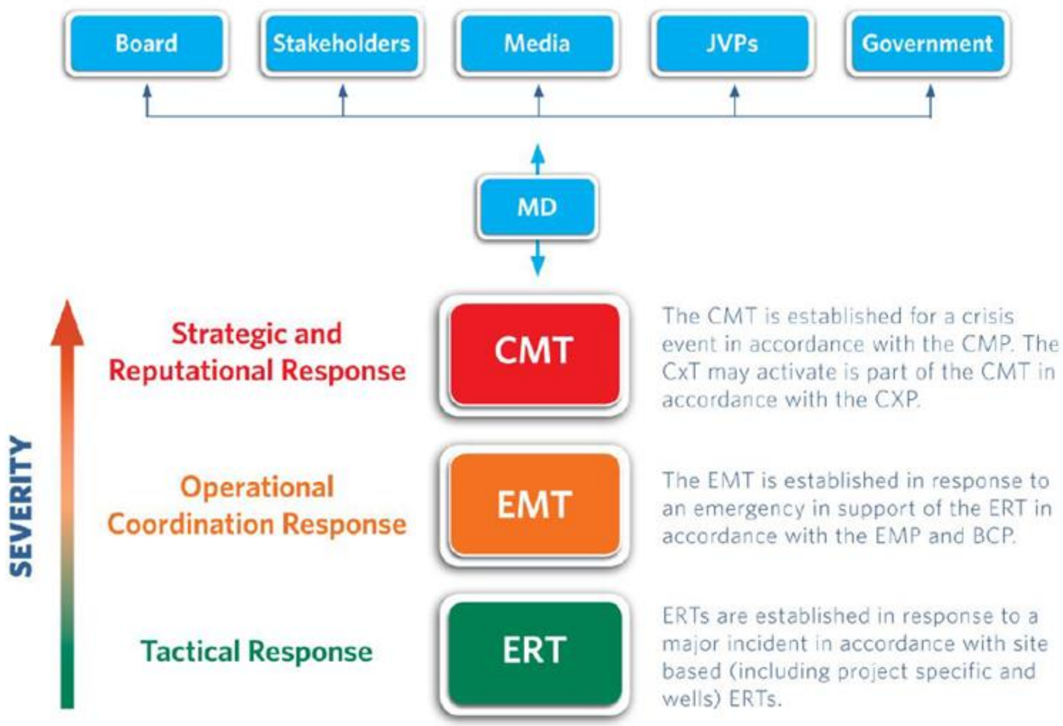


Figure 8-4: Beach Crisis and Emergency Management Framework

Table 8-8: Responsibilities of the Beach crisis and emergency management teams

Team	Base	Responsibilities
CMT	Adelaide head office	Strategic management of Beach's response and recovery efforts in accordance with the Crisis Management Plan. Provide overall direction, strategic decision-making as well as providing corporate protection and support to activated response teams. Activate the Crisis Management Team (CMT) if required.
EMT	Adelaide, Melbourne	Provide operational management support to the Emergency Response team to contain and control the incident. Implement the Business Continuity Plan. Liaise with external stakeholders in accordance with the site-specific Emergency Response Plan. Regulatory reporting.
ERT	Site	Respond to the emergency in accordance with the site-specific ERP.

Team	Base	Responsibilities
	Vessel	

8.4.2 Oil Pollution Emergency Plan

Oil spill response arrangements associated with the activities are detailed in the Beach Offshore Oil Pollution Emergency Plan (OPEP) (VIC 1000 SAF PLN. CDN/ID 18986979).

Section 8.3.3 of this EP and Section 10 (On-Going Response Preparedness and Exercises) of the OPEP detail the processes that Beach will undertake to ensure that oil spill response requirements can be met during the activities.

The MODU and vessels used for the activities will have a SMPEP or equivalent.

8.4.3 Operational and Scientific Monitoring Plan

Operational and scientific monitoring arrangements associated with the program are detailed within the Offshore Operational and Scientific Monitoring Plan (OSMP) (CDN/ID S4100AH717908) and OGV Well Completions, Well Interventions and P&A Program OSMP Addendum (V-1000-P1-RP-0005).

8.4.4 Testing of Spill Response Arrangements

The OPEP details the oil spill response testing arrangements.

8.5 Consultation and Compliance

8.5.1 Community Engagement

Consultation in the course of preparation of the EP has been completed in accordance with the OPGGS(E)R. Regulation 22(15) of the OPGGS(E)R requires that the implementation strategy must provide for appropriate consultation for activities within the scope of this EP. Beach will engage in ongoing consultation and communications during the implementation of this EP and Relevant Persons can provide feedback to Beach on any new relevant matters that may emerge. Beach will assess any new matters and where appropriate, Beach will apply its MoC process as described in Section 8.3.4.

Ongoing engagement will include providing updates and notices for the OGV Project phases and other future activities to keep relevant persons informed as information becomes available. This will be done via one-on-one communications, emails, and provision of information on the Beach website. Records of ongoing consultations will be maintained in Beach's stakeholder consultation database.

Table 8-9: Consultation requirements for implementation of the activity.

Relevant person	Consultation	Timing
All relevant persons	Activity updates including acceptance of EP and start and completion of activities.	As required
Relevant First Nations groups	Consultation regarding implementation of an oil spill emergency response in the unlikely event of a hydrocarbon spill	As required
Relevant Commercial Fishing Associations	Consultation regarding well locations, the ongoing communication of Beach activities to their members, and applying Control Measure 04: Beach Fair Ocean Access Procedure.	After determination of well locations
Relevant persons identified as marine users and relevant government departments and agencies	Notifications of activity commencement, including: type of activity, including pre-lay of anchors and buoys, towing of the MODU to first and subsequent locations, supply vessel contact details and proposed routes. location of activity, coordinates, and map. timing of activity: expected start and finish date and duration. sequencing of locations if applicable. vessel details including call sign and contact. any safety exclusion zones required. Beach contact details. Note: coordinates to be provided as degrees and decimal minutes referenced to the WGS 84 datum.	2 weeks prior to activity commencing
AHO	Vessel contractor to issue notification of activity for publication of notices to mariners (NOTMAR), including: type of activity. geographical coordinates of activity. any exclusion zones required. period that NOTMAR will cover (start and finish date). vessel details including name, Maritime Mobile Service Identity (MMSI), satellite communications details (including	4 weeks prior to activity commencing

	INMARSAT-C and satellite telephone), contact details and call signs. Beach and vessel Contractor contact details. Update AHS of progress, changes to the intended operations including if activity start or finish date changes.	
AMSA - JRCC	Vessel Contractor to issue notification of activity for promulgation of radio navigation warnings, including: type of activity. geographical coordinates of activity. any exclusion zones required. period that warning will cover (start and finish date). vessel details including name, call-sign and MMSI, satellite communications details (including INMARSAT-C and satellite telephone numbers), contact details and calls signs. any other information that may contribute to safety at sea. Beach and vessel Contractor contact person. Update AMSA JRCC of progress, changes to the intended operations including if activity start or finish date changes.	48 – 24 hrs prior to activity commencing
NOPSEMA and Director of National Parks	Regulatory notification of start of activity.	10 days prior to activity commencing
Relevant Persons who have requested vessel location information.	SMS or email messaging undertaken where requested by Relevant Person.	During activity
NOPSEMA and Director of National Parks	Regulatory notification of cessation of activity.	Within 10 days of activity completion

8.5.2 Specific Commercial Fishing Sector Consultation for EP Implementation

- Should any commercial fisher advise in the future that they may be potentially impacted by the activities the following steps would be followed:

  For fishers who have contacted their associations, Beach would consult with the association to gather information about the fisher's fishing patterns and locations and to establish contact for consultation throughout the activity.

  For fishers who have contacted Beach directly, engage with them and gather information about their fishing patterns and locations and to establish contact for consultation throughout the activity.

  Where fishers provide Beach with sensitive fishing data, advise the information will be manged confidentially in accordance with Beach's Privacy Policy, and provide a copy of the policy where requested

- Beach has previously and will continue to offer SMS messaging to commercial fishers and their associations to provide updates before, during and after the activity.
- To facilitate minimising of impacts to each other's activities, Beach will provide regular updates on the locations and timings of pre-laying of anchors and mooring chains; the MODU towing routes and locations, and supply vessels routes.
- Beach has a stated position that fishers should not suffer an economic loss as a direct result of Beach activities. Beach's Fair Ocean Access Procedure for Compensation Claims from Commercial Fishers is explained in clear and simple language in the Fair Ocean Access Information (Appendix D). It summarises Beach's procedures for minimising and mitigating potential impacts to commercial fishing and procedures for compensation claims from commercial fishers. Beach will ensure that the evidence required is not burdensome on the fisher while ensuring genuine claims are processed.

8.5.3 Regulatory Compliance

Regulation 22(16) of the OPGGS(E)R requires that the implementation strategy must comply with the OPGGS Act (the Act), the OPGGS(E)R, any other regulations under the Act, and any other environmental legislation that applies to the activity.

This implementation strategy has been developed to comply with the requirements of OPGGS(E)R as demonstrated in Table 8-9.

Table 8-10: Regulation 22 OPGGS(E)R concordance

OPGGS(E)R	**EP Implementation Strategy Section**
22 Implementation strategy for Environment Plan	
(1) The environment plan must contain an implementation strategy for the activity in accordance with this section	Section 8
Environmental management system	
(2) The implementation strategy must contain a description of the environmental management system for the activity, including specific measures to be used to ensure that, for the duration of the activity:	Section 8.1
(a) the environmental impacts and risks of the activity continue to be identified and reduced to a level that is as low as reasonably practicable; and	Section 8.1.1, OEMS 1.2 and OEMS 1.6
(b) control measures detailed in the environment plan are effective in reducing the environmental impacts and risks of the activity to as low as reasonably practicable and an acceptable level; and	Section 8.1.1, OEMS 1.6 and Section 8.3.5
(c) environmental performance outcomes and environmental performance standards in the environment plan are being met.	Section 8.1.1, OEMS 1.6 and Sections 8.3.2 and 8.3.3.
Responsibilities of employees and contractors	
(3) The implementation strategy must establish a clear chain of command, setting out the roles and responsibilities of employees and contractors in relation to the implementation, management and review of the environment plan, including during emergencies or potential emergencies.	Section 8.2.1 and 8.4.1

OPGGS(E)R	EP Implementation Strategy Section
(4) The implementation strategy must include measures to ensure that each employee or contractor working on, or in connection with, the activity is aware of the employee's or contractor's responsibilities in relation to the environment plan, including during emergencies or potential emergencies, and has the appropriate competencies and training.	Sections 8.2.2, 8.2.3 and 8.2.4
Monitoring and reporting	
(5) The implementation strategy must provide for sufficient monitoring, recording, audit, management of non-conformance and review of the titleholder's environmental performance and the implementation strategy to ensure that the environmental performance outcomes and environmental performance standards in the environment plan are being met.	Section 8.3
(6) The implementation strategy must provide for sufficient monitoring of, and maintaining a quantitative record of, emissions and discharges (whether occurring during normal operations or otherwise), such that the record can be used to assess whether the environmental performance outcomes and environmental performance standards in the environment plan are being met.	Section 8.3
(7) The implementation strategy must state when the titleholder will report to NOPSEMA in relation to the titleholder's environmental performance for the activity. The interval between reports must not be more than 12 months.	Section 8.3.9
Oil pollution emergency response	
(8) The implementation strategy must contain an oil pollution emergency plan and provide for the updating of the plan.	Section 8.4.2 (detail within OPEP)
(9) The oil pollution emergency plan must include adequate arrangements for responding to and monitoring oil pollution, including the following:	Section 8.4.2 (detail within OPEP)
(a) the control measures necessary for timely response to an emergency that results or may result in oil pollution;	Section 8.4.2 (detail within OPEP)
(b) the arrangements and capability that will be in place, for the duration of the activity, to ensure timely implementation of the control measures, including arrangements for ongoing maintenance of response capability;	Section 8.4.2 (detail within OPEP)
(c) the arrangements and capability that will be in place for monitoring the effectiveness of the control measures and ensuring that the environmental performance standards for the control measures are met;	Section 8.4.2 (detail within OPEP)
(d) the arrangements and capability in place for monitoring oil pollution to inform response activities.	Section 8.4.2 (detail within OPEP)
(10) The implementation strategy must provide for monitoring of impacts to the environment from oil pollution and response activities that: (a) is appropriate to the nature and scale of the risk of environmental impacts of the activity; and (b) is sufficient to inform any remediation activities	Section 8.4.3 (detail in the OSMP)
(11) The implementation strategy must include information demonstrating that the response arrangements in the oil pollution emergency plan are consistent with the national system for oil pollution preparedness and response.	Section 8.4.2 (detail within OPEP)
(12) The implementation strategy must include arrangements for testing the response arrangements in the oil pollution emergency plan. The testing	Section 8.4.4 (reference to OPEP)

OPGGS(E)R	EP Implementation Strategy Section
arrangements must be appropriate to the response arrangements and to the nature and scale of the risk of oil pollution for the activity.	
(13) The testing arrangements must include: (a) a statement of the objectives of testing; and (b) a proposed schedule of tests; and (c) mechanisms to examine the effectiveness of response arrangements against the objectives of testing; and (d) mechanisms to address any recommendations arising from tests.	Section 8.4.4 (reference to OPEP)
(14) For the purposes of paragraph (13)(b), the proposed schedule of tests must provide for the following: (a) testing the response arrangements when they are introduced; (b) testing the response arrangements when they are significantly amended; (c) testing the response arrangements not later than 12 months after the most recent test; (d) if a new location for the activity is added to the environment plan after the response arrangements have been tested, and before the next test is scheduled to be conducted—testing the response arrangements in relation to the new location as soon as practicable after it is added to the plan; (e) if a facility becomes operational after the response arrangements have been tested and before the next test is scheduled to be conducted—testing the response arrangements in relation to the facility when it becomes operational.	Section 8.4.4 (reference to OPEP)
Consultation and compliance	
(15) The implementation strategy must provide for appropriate consultation with: (a) relevant authorities of the Commonwealth, a State or a Territory; and (b) other relevant interested persons or organisations.	Section 8.5.1
(16) The implementation strategy must comply with the Act, this instrument, any other regulations made under the Act, and any other environmental legislation applying to the activity.	Section 8.5.3 and 8.5.5Section 8.5.3 and 8.5.5

Section 50 of this EP details the applicable environmental requirements applicable to the activities. The acceptability assessment for each environmental aspect is assessed in Section 77 and specifically details the environmental requirements pertaining to each aspect. The assurance processes described in Section 8.38.3 ensures periodic review to ensure that controls are implemented and to ensure ongoing compliance.

8.5.4 Document Management

Beach document management systems will be utilised for the activity to support safe and efficient operations in a manner that complies with Company and statutory obligations. This EP, and documents and records relevant to the implementation of this EP will be stored and maintained in the Beach document management systems and these records will be made available to regulators upon request.

8.5.5 OPGGS Act 2006 – Maintenance and removal of property

Under subsections 572(2) and 572(3) of the OPGGS Act, a titleholder must maintain property within a title and remove from the title area all structures that are, and all equipment and other property that is neither used nor to be used in connection with the operations. Table 8-11 summarises how the activities will comply with section 572 of the OPGGS Act.

Under subsection 270(3) of the OPGGS Act, before title surrender, all property brought into the surrender area must be removed to the satisfaction of NOPSEMA, or arrangements that are satisfactory to NOPSEMA must be made relating to the property.

This EP includes a contingent activity to P&A Artisan 1 within production licence VIC/L35. This is in the scenario where the Artisan 1 well is not completed. At present, VIC/L35 does not contain other infrastructure or operations and therefore, in the event of a future request to surrender the relevant petroleum licence, this EP provides an assessment of compliance with section 270 of the OPGGS Act for removal of the Artisan wellhead. Compliance with section 270 is summarised in Table 8-11.

Section 3.9.1 provides information on Artisan 1 well history, in-situ fluids and well status. Assessments of seabed disturbance and marine discharges associated with Artisan P&A activities is provided in sections 7.6 and 7.8, respectively.

Further, Artisan 1 was drilled under the accepted Artisan 1 Exploration Well Drilling EP (CDN/IDS4810AH717904 dated 2021) that provides an assessment of the environmental impacts such as benthic disturbance and planned discharges. The Artisan 1 Drilling EP demonstrates compliance with section 270(3) of the OPGGSA.

Based on the nature and scale of environmental impacts and risks from Artisan 1 exploration drilling, no further monitoring, surveys and reports are planned following the P&A of Artisan 1.

Table 8-11: Compliance with OPGGSA – maintenance and decommissioning

Assessment of compliance OPGGSA Section 572 (Maintenance and removal of property etc by titleholder)	
Requirement	**Response**
Section 572(2) A titleholder must maintain in good condition and repair all structures that are, and all equipment and other property that is: (a) in the title area; and (b) used in connection with the operations authorised by the permit, lease, licence or authority.	Section 3.11 of the EP describes well integrity activity for completed well Compliance with section 572(2) will be achieved by Beach's Inspection, Maintenance & Repair for wells and flowlines **Well Maintenance Management** All well integrity inspections, testing and maintenance activities during the Operate Phase are managed per the Beach Well Integrity Management Framework, comprising of the following: • Well Integrity Management Standard (BSTD 6.3) of Beach's Operating Excellence Management System (OEMS) • Well Integrity Technical Standard (WITS) for the Operate & Maintain Phase (CDN/ID 7726350).

Assessment of compliance OPGGSA Section 572 (Maintenance and removal of property etc by titleholder)	
	• Well Integrity Management Plan - Victoria (CDN/ID 19060027) All maintenance activities are managed via the Computerised Maintenance Management System (CMMS). Use of the CMMS is central to asset integrity management. It provides traceability for the scheduling and completion of critical maintenance tasks. Upon completion, inspection results, maintenance records and the well's integrity status are captured in the WIMS database.
Section 572(3) A titleholder must remove from the title area all structures that are, and all equipment and other property that is, neither used nor to be used in connection with the operations: (a) in the title area; and (b) used in connection with the operations authorised by the permit, lease, licence or authority	This EP provides for the contingent P&A and removal of wellhead for Artisan 1 suspended well (Section 3.9).
Section 572(7) This section has effect subject to: (a) any other provision of this Act; and (b) the regulations; and (c) a direction given by NOPSEMA or the responsible Commonwealth Minister under: (i) Chapter 3; or (ii) this Chapter; and (d) any other law	This EP provides for the contingent P&A and removal of wellhead for Artisan 1 suspended well (Section 3.9).

Assessment of compliance OPGGSA Section 270 (Consent to surrender title)	
Requirement	**Response**
Section 270(3) The Joint Authority may consent to the surrender sought by the application only if the registered holder of the permit, lease or licence: c) has, to the satisfaction of NOPSEMA, removed or caused to be removed from the surrender area all property brought into the surrender area by any person engaged or concerned in the operations authorised by the permit, lease or licence; or made arrangements that are satisfactory to NOPSEMA in relation to that property d) has, to the satisfaction of NOPSEMA, plugged or closed off all wells made in the surrender area by any person engaged or concerned in the operations authorised by the permit, lease or licence e) has provided, to the satisfaction of NOPSEMA, for the conservation and protection of the natural resources in the surrender area; and f) has, to the satisfaction of NOPSEMA, made good any damage to the seabed or subsoil in the surrender area caused by any person engaged or concerned in the operations authorised by the permit, lease or licence.	c) This EP provides for the contingent P&A and removal of wellhead for Artisan 1 suspended well (Section 3.9). d) Compliance with relevant WOMP for P&A activities in accordance with section 569(1) of OPGGS Act e) Activities the subject of this EP include contingent P&A and removal of wellhead for Artisan 1. For these activities, this EP assesses the potential impacts to natural resources from planned activities (subject of this EP) and asserts that impacts and expected to be minor and short term (impacts assessment see Section 7 of this EP). In addition, the Artisan 1 Exploration Well Drilling EP assesses environmental impacts and risks of this activity. Both EPs for drilling and P&A of Artisan demonstrate compliance with section 270(3) of OPGGSA for the conservation and protection of the natural resources in the title area. f) Activities within petroleum titles the subject of this EP include contingent P&A and removal of wellhead for Artisan 1. In addition, the Artisan 1

Assessment of compliance OPGGSA Section 572 (Maintenance and removal of property etc by titleholder)	
	Exploration Well Drilling EP assesses environmental impacts and risks. Based on the nature and scale of environmental impacts and risks from Artisan drilling and P&A, no damage to the seabed is expected that would require Beach to "make good" any damage for petroleum title areas that may be subject to surrender under OPGGS Act.

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Appendix A Relevant Persons Identified

Appendix B Report on Consultation

Appendix C Stakeholder Consultation Information

Appendix D GMTOAC Consultation Summary

Appendix E **Fair Ocean Access Information Sheet**

Appendix F **SETFIA Commercial Fisheries Report**

Appendix G EPBC Act Protected Matters Search Tool Report – Operational Area

Appendix H EPBC Act Protected Matters Search Tool Report – Planning Area

Appendix I EPBC Act Protected Matters Search Tool Report – Light and Flaring EMBAs

Appendix J **Acoustic Modelling Reports**

Appendix K Whale Management Procedure

Appendix L **EPBC Act Protected Matters Search Tool Report – Sound EMBA**

Appendix M **Oil Spill Modelling Report**