V-1000-P1-MP-0011

Environment Plan

Offshore Gas Victoria

Geophysical and Geotechnical Seabed Survey

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
0	3.11.2023	Submission to NOPSEMA	PW	Xodus	WM
1	15.12.2023	Resubmission to NOPSEMA	PW	Xodus	WM

Review due	Review frequency
NA	NA

THE THREE WHATS
What can go wrong?
What could cause it to go wrong?
What can I do to prevent it?

OGV Geophysical and Geotechnical Seabed Survey Environment Plan

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Acronyms

Terms/acronym	Definition/expansion
AAQ NEPM	Ambient Air Quality National Environmental Protection Measure
AEP	Australian Energy Producers
AFMA	Australian Fisheries Management Authority
AHS	Australian Hydrographic Service
ALARP	As low as reasonably practicable
AMOSC	Australian Marine Oil Spill Centre
AMP	Australian Marine Park
AMSA	Australian Maritime Safety Authority
ANSI	American National Standards Institute
ANZECC	Australian and New Zealand Environment and Conservation Council
APPEA	Australian Petroleum Production and Exploration Association now AEP
ASAP	As soon as practicable
AUV	Autonomous underwater vehicle
Bass Strait CZSF	Bass Strait Central Zone Scallop Fishery
Beach	Beach Energy Limited
BIA	Biologically important area
BLCAC	Bunurong Land Council Aboriginal Corporation
BTEX	Benzene, Toluene, Ethylbenzene and Xylene
CFA	Commonwealth Fishing Association
CHIRP	Compressed high-intensity radar pulse
CMT	Crisis Management Team
COLREG	Convention on the International Regulations for Preventing Collisions at Sea
CPT	Cone penetrometer test
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DAFF	Department of Agriculture, Fisheries and Forestry (Commonwealth) formerly part of DAWE
DAWE	Department of Agriculture, Water and Environment (Commonwealth) now DCCEEW
DAWR	Department of Agriculture and Water Resources (Commonwealth) now DAFF
DCCEEW	Department of Climate Change, Energy, the Environment and Water (Commonwealth) formerly DAWE
DEECA	Department of Energy, Environment and Climate Action (Victoria) formerly DELWP
DELWP	Department of Environment, Land, Water and Planning (Victoria) now DEECA
DNRET	Department of Natural Resources and Environment Tasmania formerly DPIPWE
DPIPWE	Department of Primary Industries, Parks, Water and Environment (Tasmania) now DNRET
DJPR	Department of Jobs, Precincts and Regions (Victoria) now DJSIR
DJSIR	Department of Jobs, Skills, Industry and Regions (Victoria) formerly DJPR
DO	Dissolved Oxygen
DoEE	Department of the Environment and Energy (Commonwealth) now DCCEEW
DP	Dynamic positioning

Terms/acronym	**Definition/expansion**
EIA	Environmental impact assessment
EMAC	Eastern Maar Aboriginal Corporation
EMBA	Environment that may be affected
EPA	Environmental Protection Authority (Tasmania)
EMPCA	Environmental Management and Pollution Control Act 1994 (Tasmania)
EMT	Emergency Management Team
EP	Environment Plan
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
EPO	Environment performance outcome
EPS	Environment performance standard
ERT	Emergency Response Team
ESD	Ecologically sustainable development
ETBF	Eastern Tuna and Billfish Fishery
FWCAC	Far West Coast Aboriginal Corporation
GHG	Greenhouse gas
HSE	Health, Safety and Environment
HSEMS	Health, Safety and Environment Management System
IC	Incident Commander
IAP2	International Association for Public Participation
IAPP	International Air Pollution Prevention
IMO	International Maritime Organisation
IMS	Invasive marine species
JASCO	JASCO Applied Sciences
JRCC	Joint Rescue Coordination Centre
KEF	Key Ecological Features
Lattice	Lattice Energy Limited
LGA	Local Government Area
LOR	Limit of Reporting
MARPOL	International Convention for the Prevention of Pollution from Ships
MBES	Multi-beam echo sounder
MC	Measurement criteria
MFO	Marine fauna observer
MNES	Matters of National Environmental Significance
MO	Marine Order
MOC	Management of Change
MODU	Mobile Offshore Drilling Unit
MRT	Mineral Resources Tasmania
NatPlan	National Plan for Maritime Environmental Emergencies

Terms/acronym	Definition/expansion
NEBA	Net Environmental Benefit Analysis
NO-3	Nitrate
NOPSEMA	National Offshore Petroleum Safety and Environmental Management Authority
NOTMAR	Notices to Mariners
NRT	National Response Team
NRST	National Response Support Team
OEMS	Operations Excellence Management System
OGUK	Oil and Gas UK
OGV	Offshore Gas Victoria
OPEP	Oil Pollution Emergency Plan
OPGGS(E)R	Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009 (Commonwealth)
Origin	Origin Energy Resources Limited
ORP	Oxidation-Reduction Potential
OSTM	Oil spill trajectory modelling
OWR	Oiled wildlife response
PAH	Poly aromatic hydrocarbons
PBC	Prescribed Body Corporate
PCB	Polychlorinated biphenyls
PK	Peak pressure level
PK-PK	Peak-to-peak pressure level
PMS	Planned maintenance system
POLREP	Marine Pollution Report
PTS	Permanent threshold shift
RAP	Registered Aboriginal Party
RNTBC	Recognised Native Title Body Corporation
ROV	Remotely operated vehicle
SBP	Sub-bottom profiler
SBTF	Southern Bluefin Tuna Fishery
SEL	Sound exposure level
SESSF	Southern and Eastern Scalefish and Shark Fishery
SETFIA	South East Trawl Fishing Industry Association
SIA	Seafood Industry Australia
SITREP	Situation Reports
SIV	Seafood Industry Victoria
SMPEP	Shipboard Marine Pollution Emergency Plan
SMS	Scientific monitoring study
SPF	Small Pelagic Fishery
SPL	Sound pressure level

Terms/acronym	Definition/expansion
SPRAT	Species Profile and Threats Database
SSS	Side scan sonar
SVP	Sound Velocity Profiler
TA	Tuna Australia
TCF	Trillion cubic feet
TEC	Threatened Ecological Community
TISC	Tasmanian Seafood Industry Council
TKN	Total kjeldahl nitrogen
TN	Total nitrogen
TP	Total phosphorus
TRH	Total recoverable hydrocarbon
TTS	Temporary threshold shift
USBL	Ultra-short baseline
UXO	Unexploded ordinance
VFA	Victorian Fishing Authority
Woodside	Woodside Energy

1 Overview of the Activity

Beach Energy (Operations) Limited (Beach), who are wholly owned by Beach Energy Limited , on behalf of their Joint Venture partners, proposes to undertake geophysical and geotechnical seabed surveys within the Otway and Bass Basins in Commonwealth waters (Figure 4-1 and Figure 4-2). The seabed surveys are required to inform the plug and abandonment activities of existing legacy suspended wells, drilling of subsea gas wells and potential tie-ins to connect new gas wells to existing subsea infrastructure.

The proposed seabed surveys will be carried out no earlier than the 1st February 2024 and no later than the 31st December 2028. The seabed surveys are estimated to take up to 200 days for the Otway Operational Area A, 40 days for Otway Operational Area B and 120 days for Bass Operational Area. Figure 4-1 and Figure 4-2 detail the Otway and Bass Operational Areas. The seabed surveys may be done in one campaign or as a number of campaigns.

Geophysical survey methods proposed are:

- Multi beam echo sounder (MBES)
- Side scan sonar (SSS)
- Sub bottom profiler (SBP)
- Magnetometer

Geotechnical sampling proposed are:

- Cone penetrometer testing (CPT)
- Drop coring or vibrocore

In addition, seabed imagery, and sediment and water samples will be undertaken at representative locations to collect baseline data.

Seismic surveys are not included in the activity scope.

1.1 Environment Plan Summary

This Offshore Gas Victoria Geophysical and Geotechnical Seabed Survey Environment Plan (EP) Summary has been prepared from material provided in this EP. The summary consists of the following as required by the Commonwealth Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009 (OPGGS(E)R):

EP Summary Material Requirement	Relevant Section of EP Containing EP Summary Material
The location of the activity	Section 4.1
A description of the receiving environment	Section 7
A description of the activity	Section 4
Details of the environmental impacts and risks	Section 8
The control measures for the activity	Section 8.12
The arrangements for ongoing monitoring of the titleholder's environmental performance	Section 9
Response arrangements in the oil pollution emergency plan	Section 9.9.2 and OPEP
Consultation already undertaken and plans for ongoing consultation	Section 5
Details of the titleholders nominated liaison person for the activity	Section 2.2

1.2 Environment Plan Structure

This EP has been structure with the Environment Impact and Risk Methodology described first to explain the methodology Beach has used to develop the EP.

The next Sections that describe the activity, the consultation with relevant authorities persons and organisations undertaken in the course of preparing the EP, the environmental requirements relevant to the activity and the environmental management of the activity, and the existing environment that may be affected by the activity provide information to inform the evaluation of the environmental impacts and risks of the activity.

The last Section describes the implementation strategy for the activity to ensure that for the duration of the activity:

- Environmental impacts and risks of the activity continue to be identified and reduced to a level that is as low as reasonably practicable.
- 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
- Environmental performance outcomes and environmental performance standards in the environment plan are being met.

2 Introduction

This document has been prepared to meet the requirements of an EP under the Offshore Petroleum and Greenhouse Gas Storage Act 2006 (OPGGS Act) and the OPGGS(E)R. It addresses the activities to be undertaken during the Offshore Gas Victoria (OGV) geophysical and geotechnical seabed surveys (referred to as the seabed surveys), located in Commonwealth waters of the Otway and Bass Basins off the coast of Victoria.

The seabed surveys will be undertaken within titles held by Beach and their Joint Venture partners, and the surrounding area. Figure 4-1 and Figure 4-2 detail the titles in which the seabed surveys will be undertaken.

2.1 Background

Beach has been continuing to ensure natural gas supply through the Otway and Bass offshore natural gas development.

Otway

To date, five development phases have been completed to support natural gas supply via the Otway Gas Plant:

- Phase 1: Otway Gas Plant and unmanned Thylacine offshore platform.
- Phase 2: Inlet Gas Compression.
- Phase 3: Geographe Subsea Development.
- Phase 4: Otway Development Drilling and Geographe Subsea Development
- Phase 5: Thylacine Subsea Development.

To maintain continued economic natural gas production, further phases to develop additional offshore wells are being planned. The activities associated with the next development phases, Otway OGV, are:

- Seabed surveys (scope of this EP).
- Drilling and/or completion of offshore subsea gas wells.
- Plug and abandonment of existing legacy suspended wells.
- Inspections and modifications to existing seabed gas production infrastructure.
- Tie-ins to connect the new gas wells to the existing Otway infrastructure.

Bass

The BassGas Development consists of gas and liquids produced from the Yolla gas field that are transported via a subsea pipeline to the Victorian mainland via a coastal crossing near Kilcunda. Commercial gas production started in June 2006.

To maintain continued economic natural gas production, additional offshore wells are being considered. The activities associated with the next development phases of the BassGas offshore natural gas development (Greater Bass Development) are:

- Seabed surveys (scope of this EP).
- Drilling of offshore subsea gas wells.

- Plug and abandonment of existing suspended wells.
- Inspections and modifications to existing seabed gas production infrastructure.
- Tie-ins to connect the new gas wells to the existing BassGas infrastructure.

2.2 Titleholder and Liaison Person Details

The operator of the Otway and BassGas Developments is Beach Energy (Operations) Limited, a wholly owned subsidiary of Beach Energy Limited. Table 2-1 details the titleholder and the liaison person for the titles 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 2-1Figure 2-1).

Beach shall notify the Regulator (National Offshore Petroleum Safety and Environmental Management Authority [NOPSEMA]) of a change to the titleholder, a change in the titleholder's nominated liaison person or a change in the contact details for either the titleholder or the liaison person during the proposed seabed surveys, in accordance with the OPGGS(E)R.

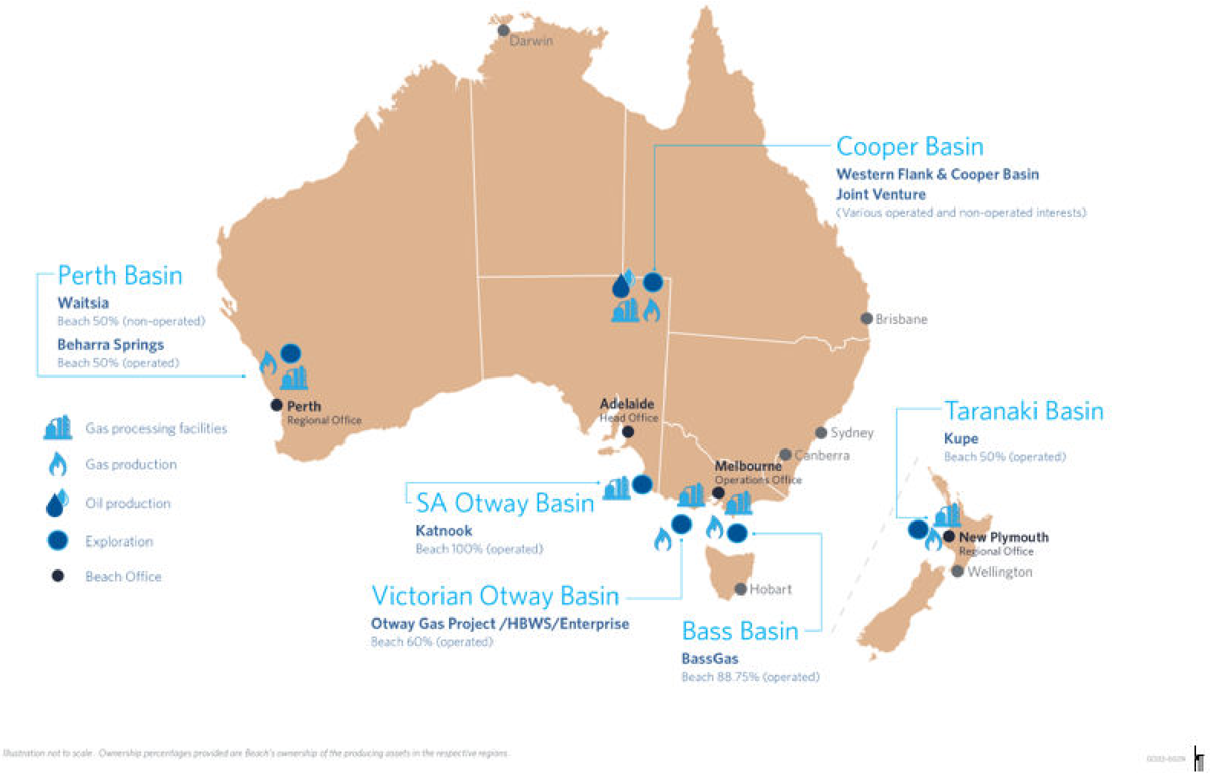


Illustration not to scale. Ownership percentages provided are Beach's ownership of the producing assets in the respective regions.

Figure 2-1: Beach Operations

Table 2-1: Details of Titles, Titleholder and Liaison Person

Petroleum Title(s)	**Titleholders**	
Otway		
VIC/P43	Beach Energy (Operations) Limited – Operator OGOG (Otway) Pty Ltd	
VIC/P73		
VIC/L23	Beach Energy (Operations) Limited – Operator OGOG (Otway) Pty Ltd Beach Energy (Otway) Limited	
T/L2		
T/L3		
T/30P	Beach Energy (Operations) Limited – Operator and sole titleholder	
Non-Beach Titles – Requiring Access Authority		
VIC/L30	Cooper Energy (CH) Pty. Ltd. Mitsui E&P Australia Pty Ltd Peedamullah Petroleum Pty Ltd	
VIC/P44	Cooper Energy (CH) Pty. Ltd. Mitsui E&P Australia Pty Ltd Peedamullah Petroleum Pty Ltd	
VIC/P76	Cooper Energy (MGP) Pty. Ltd.	
VIC/L24	Cooper Energy (CH) Pty. Ltd. Mitsui E&P Australia Pty Ltd Peedamullah Petroleum Pty Ltd	
VIC/P79	ConocoPhillips Australia SH2 Pty Ltd 3D Oil Limited	
T/49P	ConocoPhillips Australia SH1 Pty Ltd 3D Oil T49P Pty. Ltd.	
Bass		
T/L1	Beach Energy (Operations) Limited – Operator Beach Energy Limited Prize Petroleum International Pte. Ltd. Beach Energy (Bass Gas) Limited	
T/RL2	Beach Energy (Operations) Limited – Operator Beach Energy Limited Prize Petroleum International Pte. Ltd.	
T/RL4		
T/RL5		
Titleholder Details		
Beach Energy (Operations) Limited – Operator	Business address	Level 8 80 Flinders Street Adelaide

Petroleum Title(s)	Titleholders	
Otway		
		South Australia 5000
	Telephone number	(08) 8338 2833
	Email address	info@beachenergy.com.au
	Australian Company Number	007 845 338
Titleholder Liaison Person		
Wayne Mothershaw Survey Lead	Business address	Level 8 80 Flinders Street Adelaide South Australia 5000
	Telephone number	(08) 8225 3465
	Email address	Wayne.mothershaw@beachenergy.com.au

3 Environmental Impact and Risk Assessment Methodology

3.1 Overview

This section outlines the environmental impact and risk assessment methodology used for the assessment of the seabed survey 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 3-1 outlines this risk assessment process.

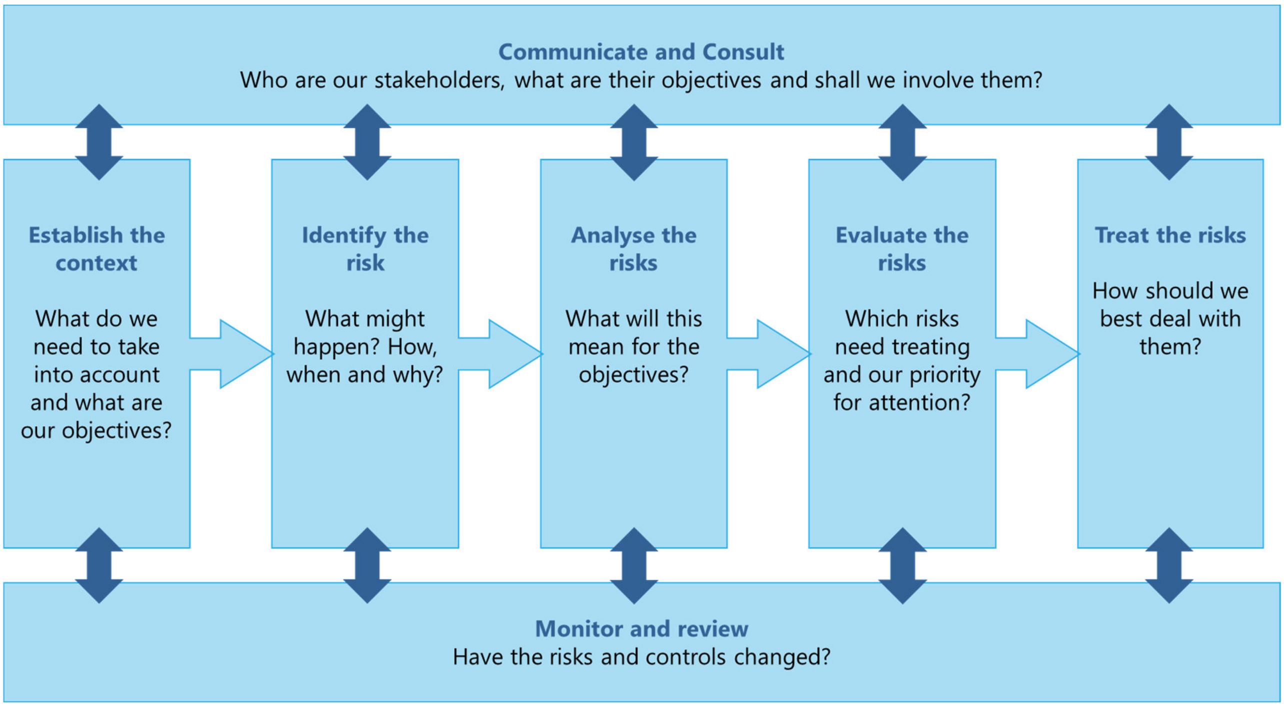


Figure 3-1: Risk Assessment Process

3.1.1 Definitions

Definitions of the term used in the risk assessment process are detailed in Table 3-1.

Table 3-1: Risk assessment process 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.*
Consequence	The consequence of an environmental impact 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.

Term	Definition
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	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	Defined under the OPGGS(E)R as *a statement of the performance required of a control measure.*
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.
Residual risk	The risk remaining after control measures have been applied (i.e. after risk treatment).

3.2 Communicate and Consult

In alignment with the OPGGS(E)R, in the course of preparing 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 is used to inform the EP and the impact and risk assessment undertaken for the activity. Relevant person consultation is an iterative process that continues throughout the preparation of the EP and for the duration of the petroleum activity as detailed in Section 5.

3.3 Establish the Context

Context for the impact and risk assessment process is established by:

- Understanding the regulatory framework in which the activity takes place (described in the Section 6, 'Environmental Requirements').
- Identifying the environmental aspects of the activity that will or may cause environmental impacts or may present risks to the environment (based upon the 'Activity Description' in Section 4).
- Identifying the environment that may be affected, either directly or indirectly, by the activity (based upon the 'Existing Environment' as described in Section 7).
- Understanding the objections or claims of relevant persons and incorporating their feedback and any information provided into the design of the activity where appropriate (outlined in Section 5: Consultation').

3.4 Identify the Potential Impacts and Risks

Potential impacts (planned) and risks (unplanned) associated with the environmental aspects of activity are identified in relation to the environment that may be affected (EMBA) and Planning Areas, 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 8-1 details the aspects identified for the activity.

3.5 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 risk differ. In this way, the controls can be directly linked to the impact or risk.

3.6 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. EPOs have been developed based on the following:

- Ecological receptors: MNES: Significant Guidelines 1.1 to identify the relevant significant impact criteria. The highest category for the listed threatened species or ecological communities likely to be affected is used, for example: endangered over vulnerable. Where appropriate species recovery plan or conservation management plan actions and/or outcomes.

- Commercial fisheries: Victorian Fishing Authority core outcome of sustainable fishing and aquaculture (https://vfa.vic.gov.au/about).

- Marine users: OPGGS Act 2006 (Cth) Section 280.

3.7 Evaluate and Treat the Potential Impacts and Risks

The following steps are undertaken using the Beach environmental risk assessment matrix (Table 3-2) to evaluate the potential impacts and risks:

- Identify the consequences of each potential environmental impact, corresponding to the maximum credible impact.

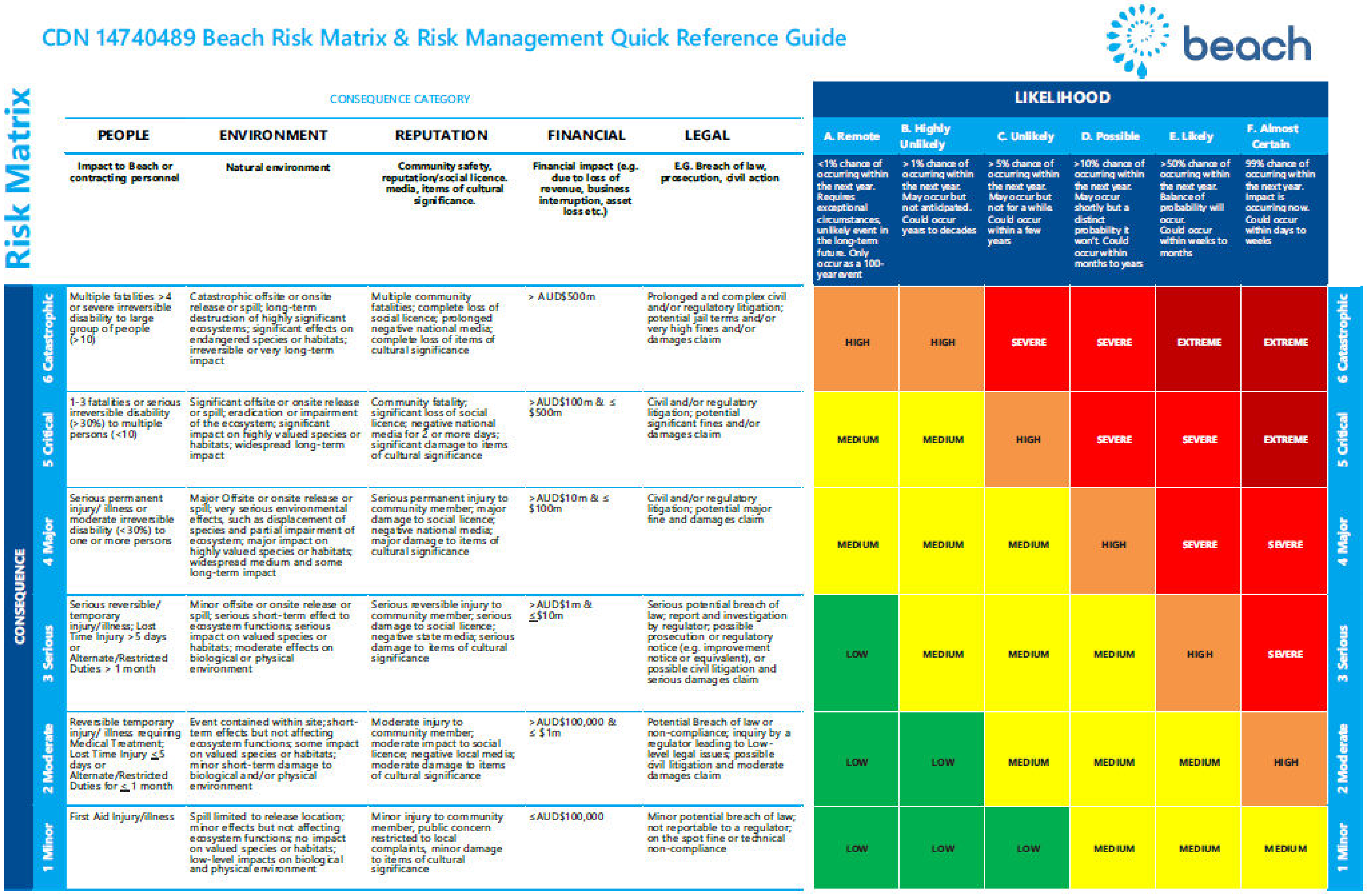
- For unplanned events, identify the likelihood (probability) of unplanned environmental impacts occurring.

- For unplanned events, 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 3.8) and an acceptable level (Section 3.9).

- Establish environmental performance standards for each of the identified control measures.

Table 3-2: Environmental Risk Assessment Matrix



CDN 14740489 Beach Risk Matrix & Risk Management Quick Reference Guide

Risk Matrix

CONSEQUENCE	PEOPLE	ENVIRONMENT	REPUTATION	FINANCIAL	LEGAL	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.)	E.G. 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	> AUD$500m	Prolonged and complex civil and/or regulatory litigation; potential jail terms and/or very high fines and/or damages claim	HIGH	HIGH	SEVERE	SEVERE	EXTREME	EXTREME
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	>AUD$100m & ≤ $500m	Civil and/or regulatory litigation; potential significant fines and/or damages claim	MEDIUM	MEDIUM	HIGH	SEVERE	SEVERE	EXTREME
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	>AUD$10m & ≤ $100m	Civil and/or regulatory litigation; potential major fine and damages claim	MEDIUM	MEDIUM	MEDIUM	HIGH	SEVERE	SEVERE
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	>AUD$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	SEVERE
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	>AUD$100,000 & ≤ $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	≤AUD$100,000	Minor potential breach of law; not reportable to a regulator; on the spot fine or technical non-compliance	LOW	LOW	LOW	MEDIUM	MEDIUM	MEDIUM

3.8 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 2022) 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 2022) 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.

The following section details how the guidance provided in NOPSEMA’s EP decision making guideline (NOPSEMA 2022).

3.8.1 Residual Impact and Risk Levels

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 environmental risk assessment matrix (Table 3-2), the impact consequence is rated as ‘minor’ or ‘moderate’ or risks are rated as ‘low’, ‘medium’ or ‘high.’ In these cases, applying ‘good industry practice’ (as defined in Section 3.8.2.1) is sufficient to manage the risk.

Higher-order Environmental Impacts and Risks

All other impacts and risks are defined by NOPSEMA as higher-order environmental impacts and risks (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 to be higher-order when, using the environmental risk assessment matrix (Table 3-2), the impact consequence is rated as ‘serious’, ‘major’, ‘critical’ or ‘catastrophic’, or when the risk is rated as ‘severe’ or ‘extreme’. In these cases, further controls must be considered as per Section .3.8.2.

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 3-3.

Table 3-3: ALARP determination for consequence (planned operations) and risk (unplanned events)

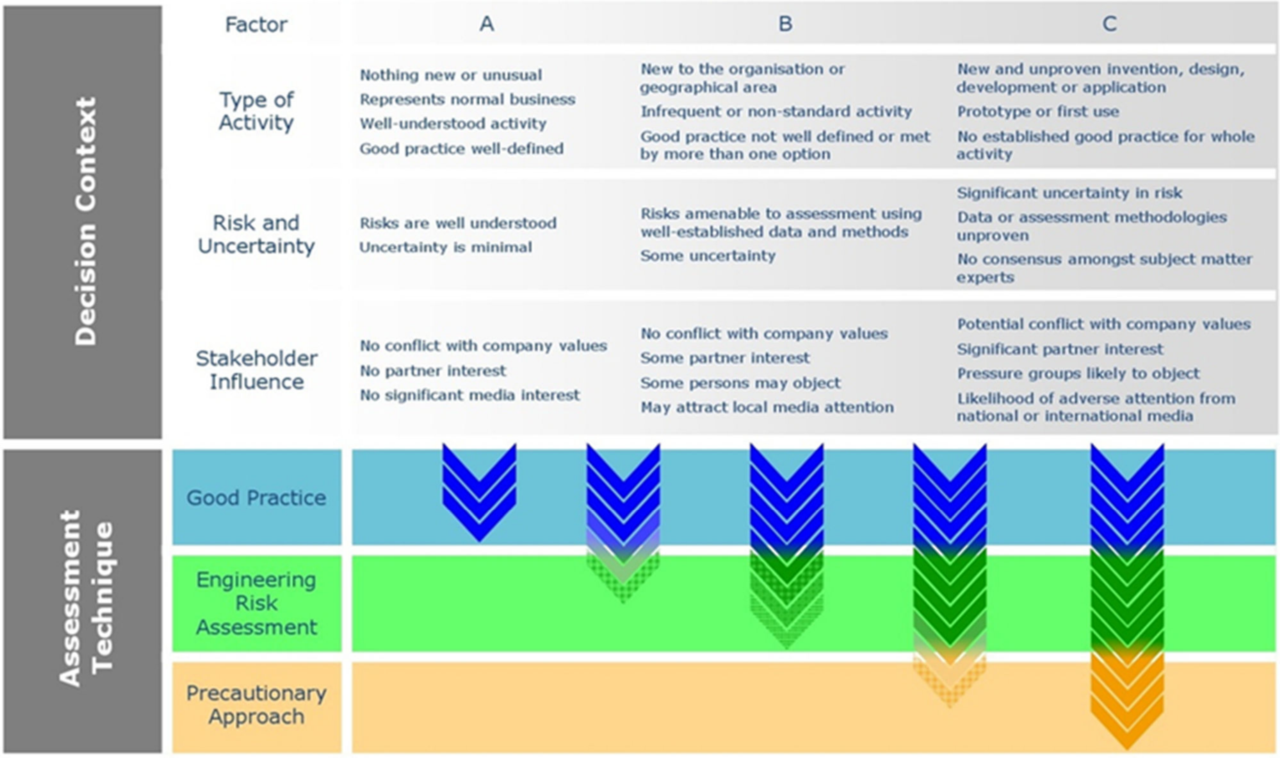
Consequence ranking	Minor	Moderate	Serious	Major	Critical	Catastrophic
Planned operation	Broadly acceptable	Tolerable if ALARP		Intolerable		
Residual impact category	Lower order impacts		Higher order impacts			
Risk ranking	Low	Medium	High	Severe	Extreme	
Unplanned event	Broadly acceptable	Tolerable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

3.8.2 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 3-2). Specifically, the framework considers impact severity and several guiding factors:

- Activity type
- Risk and uncertainty
- Stakeholder influence



Factor	A	B	C
Type of Activity	Nothing new or unusual Represents normal business Well-understood activity Good practice well-defined	New to the organisation or geographical area Infrequent or non-standard activity Good practice not well defined or met by more than one option	New and unproven invention, design, development or application Prototype or first use No established good practice for whole activity
Risk and Uncertainty	Risks are well understood Uncertainty is minimal	Risks amenable to assessment using well-established data and methods Some uncertainty	Significant uncertainty in risk Data or assessment methodologies unproven No consensus amongst subject matter experts
Stakeholder Influence	No conflict with company values No partner interest No significant media interest	No conflict with company values Some partner interest Some persons may object May attract local media attention	Potential conflict with company values Significant partner interest Pressure groups likely to object Likelihood of adverse attention from national or international media

Figure 3-2: 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

3.8.2.1 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 hazards 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.

3.8.2.2 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.

3.8.2.3 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.

3.9 Demonstration of Acceptability

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

Beach considers a range of factors when evaluating the acceptability of environmental impacts and risks associated with its activities. This evaluation works at several levels, as outlined in Section 3.9.1, which is based on Beach's interpretation of the NOPSEMA Environment Plan Content Requirement (NOPSEMA 2022b).

3.9.1 Acceptability Criteria

Beach has defined a set of criteria to determine acceptability of an impact or risk, following risk mitigation. Where an impact or risk is not considered acceptable, further control measures are required to lower the risk, or alternative options will be considered. The Beach acceptability criteria considers:

- Principles of Ecological Sustainable Development (ESD)
- Internal Context
- External Context
- Other requirements

These criteria are described in the following sections and are consistent with NOPSEMA Environment Plan Content Requirement (NOPSEMA 2022b).

3.9.1.1 Principles of Ecologically Sustainable Development

Section 3A of the EPBC Act defines ESD, which is based on Australia's National Strategy for Ecological Sustainable Development (1992) that defines ESD 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.'

Relevant ESD principles and how they are applied by Beach:

- Decision making processes should effectively integrate both long term and short term economic, environmental, social and equitable considerations. This principle is inherently met through the EP development process, as such this principal is not considered separately for each acceptability evaluation.
- 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. If there is, the project shall assess whether there is significant uncertainty in the evaluation, and if so, whether the precautionary approach should be applied.
- 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.
- The conservation of biological diversity and ecological integrity should be a fundamental consideration in decision making. Beach considers if there is the potential to affect biological diversity and ecological integrity through the risk assessment process.

To meet this acceptance criteria, the activity must be carried out in a manner consistent with the relevant ESD principles above.

3.9.1.2 Internal Context

Beach's Operations Excellence Management System (OEMS) includes Elements and Standards relevant to the way Beach operates.

At the core of the OEMS are 11 Elements (see Section 9) which detail specific performance requirements for the implementation of Beach's Environmental 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.

3.9.1.3 External Context

External context considers relevant persons expectations, obtained from consultation.

Beach has undertaken relevant person consultation, which is described in detail in Section 5. 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.

3.9.1.4 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 6)
- Policies and guidelines (described in Section 6)
- International agreements (described in Section 6)
- EPBC Act Management Plans (described in Section 7)
- Australian Marine Park designations (described in Section 7.2.2)

This acceptance criteria is 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, environmental performance objectives and standards are consistent with the nature of the receiving environment based upon formal management plans.

3.10 Monitor 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 environmental performance outcomes, environmental performance standards and measurement criteria that are described for each environmental hazard. Additional aspects of monitoring and review are described in the Implementation Strategy (Section 9).

4 Description of the Activity

This section provides a description of the petroleum activity, including the details of the location in which the activities will occur, in accordance with the OPGGS(E)R.

The objectives of the seabed surveys are to:

- Identify potential seabed debris, obstructions and hazards which could interfere with the positioning and anchoring of the moored Mobile Offshore Drilling Unit (MODU) and subsea infrastructure placement.
- Identify and map the nature and distribution of geomorphological features (canyons, scarps, vents, pinnacles etc.) in the operational areas using side scan sonar (SSS) and multi-beam echo sounder (MBES).
- Identify sub-seabed features and lithology to assist determination of anchor holding capability/limitations and subsea infrastructure locations using sub-bottom profiler (SBP) investigations.
- Accurately measure water depth and map seabed topography across the operational areas.
- Verify the position of existing subsea infrastructure.
- Collect seabed core samples to correlate sub-bottom conditions that may have implications for the MODU anchor holding performance and subsea infrastructure placement.
- Conduct an in-situ cone penetrometer test (CPT) to suitable depth of interest for anchor holding analysis and subsea infrastructure location selection.
- Obtain seabed imagery using a remotely operated underwater vehicle (ROV), autonomous underwater vehicle (AUV) or drop camera.
- Collect sediment and water grab samples at representative locations for baseline data.

4.1 Activity Location and Timing

4.1.1 Operational Area

The proposed seabed survey Operational Areas are shown in Figure 4-1 and Figure 4-2. Coordinates for the Operational Areas are provided in Table 4-2. All seabed survey activities will take place within the Operational Areas though surveys will not be undertaken over the full Operational Areas. The Operational Areas have been developed to provided flexibility for wells and infrastructure locations as planning progresses.

Table 4-1 details the maximum geophysical and geotechnical area that will be surveyed or sampled within the Operational Areas. This information is based on the survey and sample requirements in Table 4-3 and description of the survey activities in Table 4-4 and Table 4-5.

4.1.2 Activity Timing

The proposed seabed surveys will be carried out no earlier than the 1st February 2024 and no later than the 31st December 2028. The seabed surveys are estimated to take up to 200 days for the Otway Operational Area A, 40 days for Otway Operational Area B and 120 days for Bass Operational Area. Figure 4-1 and Figure 4-2 detail the Otway and Bass Operational Areas. The seabed surveys may be done in one campaign or as a number of campaigns.

Table 4-1: Seabed Survey Maximum Geophysical and Geotechnical Areas

Location	**Otway Operational Area A**	**Otway Operational Area B**	**Bass Operational Area**	**Otway Operational Area A**	**Otway Operational Area B**	**Bass Operational Area**
	Geophysical (km^2)			**Geotechnical (m^2)**		
Planned wells (and theoretical relief wells)	1862	441	1029	1140	270	630
Rig Anchors for planned wells (and theoretical relief wells)	588	147	392	1680	360	960
Flowline Routes	250	-	30	300	-	60
Sub-Total	2700	588	1451	2880	630	1650
Total		4739			5400	

Table 4-2: Coordinates of the Operational Areas (GDA94/MGA Zone 52)

Figure Label	Longitude	Latitude
	Otway	
A	142° 42' 59.28707051" E	38° 42' 27.40613511" S
B	143° 02' 58.68718682" E	38° 42' 26.51718496" S
C	143° 02' 59.88160434" E	38° 48' 01.79131645" S
D	143° 05' 05.90668505" E	38° 48' 01.49785643" S
E	143° 05' 04.91813723" E	39° 29' 54.73827566" S
F	142° 50' 04.93141325" E	39° 29' 54.74852490" S
G	142° 50' 04.86931668" E	39° 11' 53.52234015" S
H	142° 35' 04.42825307" E	39° 04' 55.66479548" S
I	142° 35' 06.97527133" E	38° 53' 16.27755141" S
J	142° 42' 57.81442537" E	38° 53' 15.71377720" S
K	142° 53' 54.90803045" E	39° 37' 19.24826662" S
L	143° 14' 07.74583457" E	39° 37' 19.24812185" S
M	143° 14' 07.74598998" E	39° 49' 54.74588568" S
N	142° 53' 54.90817762" E	39° 49' 54.74603369" S
	Bass	
A	145° 09' 42.02832958" E	39° 44' 54.57388230" S
B	145° 55' 05.96309916" E	39° 44' 53.53882048" S
C	145° 55' 06.41895620" E	40° 04' 53.04370738" S
D	145° 09' 42.48417646" E	40° 04' 54.07875718" S

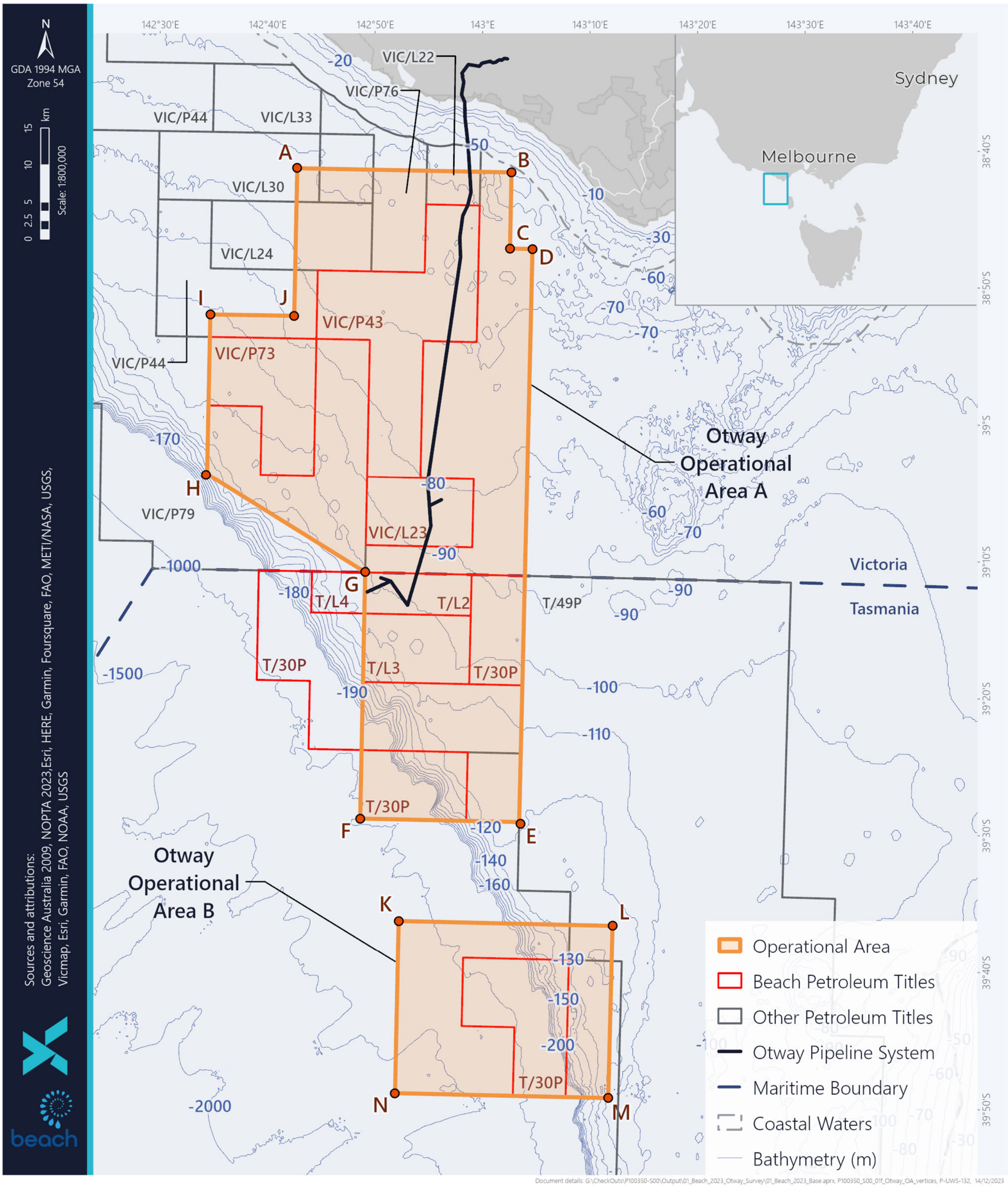


Figure 4-1: Otway Operational Areas and Beach Petroleum Titles

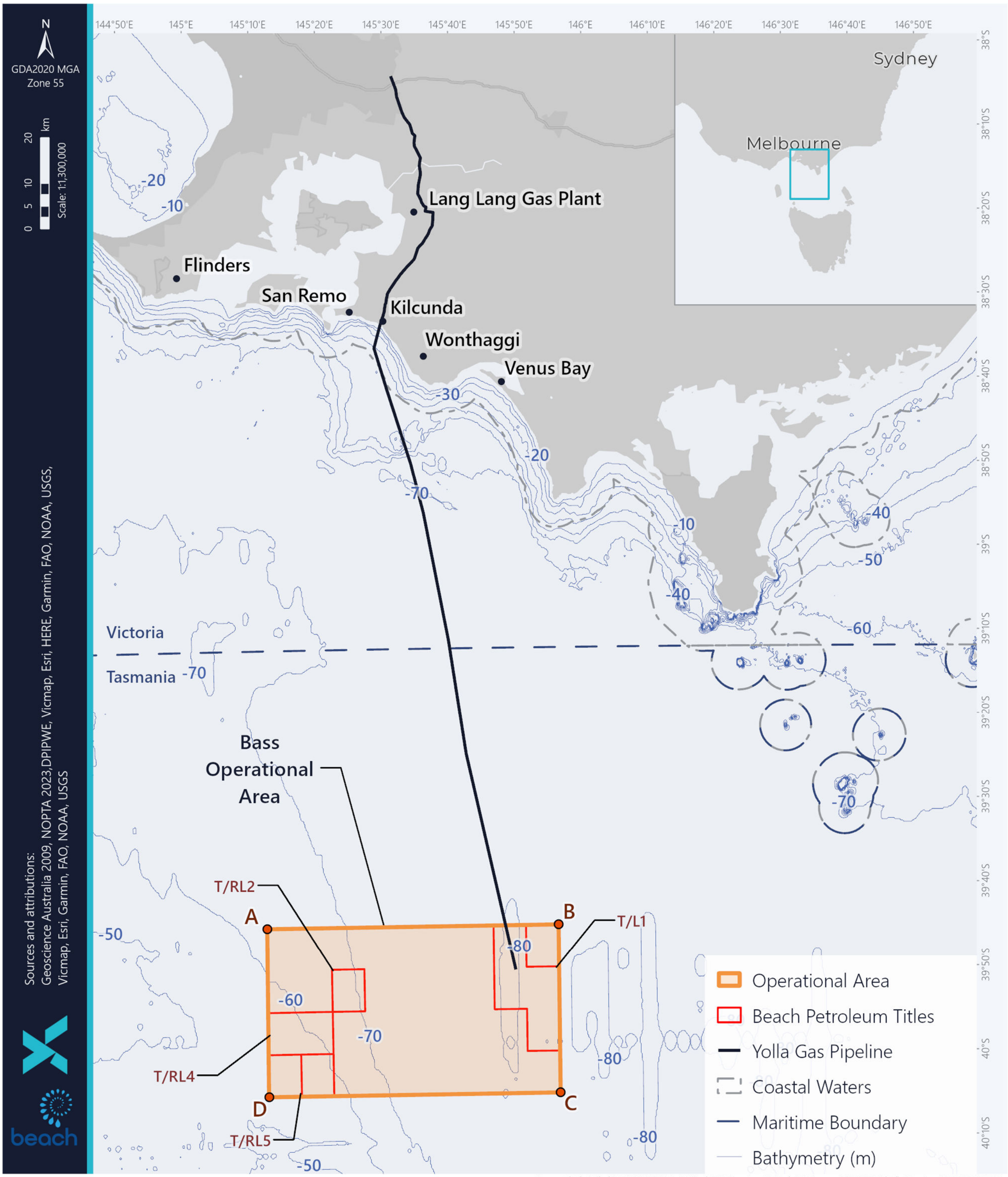


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Figure 4-2: Bass Operational Area and Beach Petroleum Titles

4.2 Seabed Survey Activities

The seabed survey activities will involve geophysical and geotechnical investigations.

Seabed imagery will also be taken using a camera placed overboard via a tether and/or by remotely operated vehicle (ROV) or autonomous underwater vehicle (AUV) and water and sediment samples will be taken for baseline information.

4.2.1 Geophysical Investigations

Geophysical investigations to be undertaken are described in Table 4-4 and the vessel and equipment set up detailed in Figure 4-3. These investigations are designed to support MODU anchoring calculations and detect hazards on or below the seabed so that they can be avoided when determining the placement of the MODU and placement of subsea infrastructure.

Line spacing will consist of nominal 100 m spaced primary lines with crosslines spaced at 500 m. The survey will be acquired in two passes to provide seabed depth and image information for anchor positioning. The line spacing will achieve a 20% overlap of adjacent swathes of processed data.

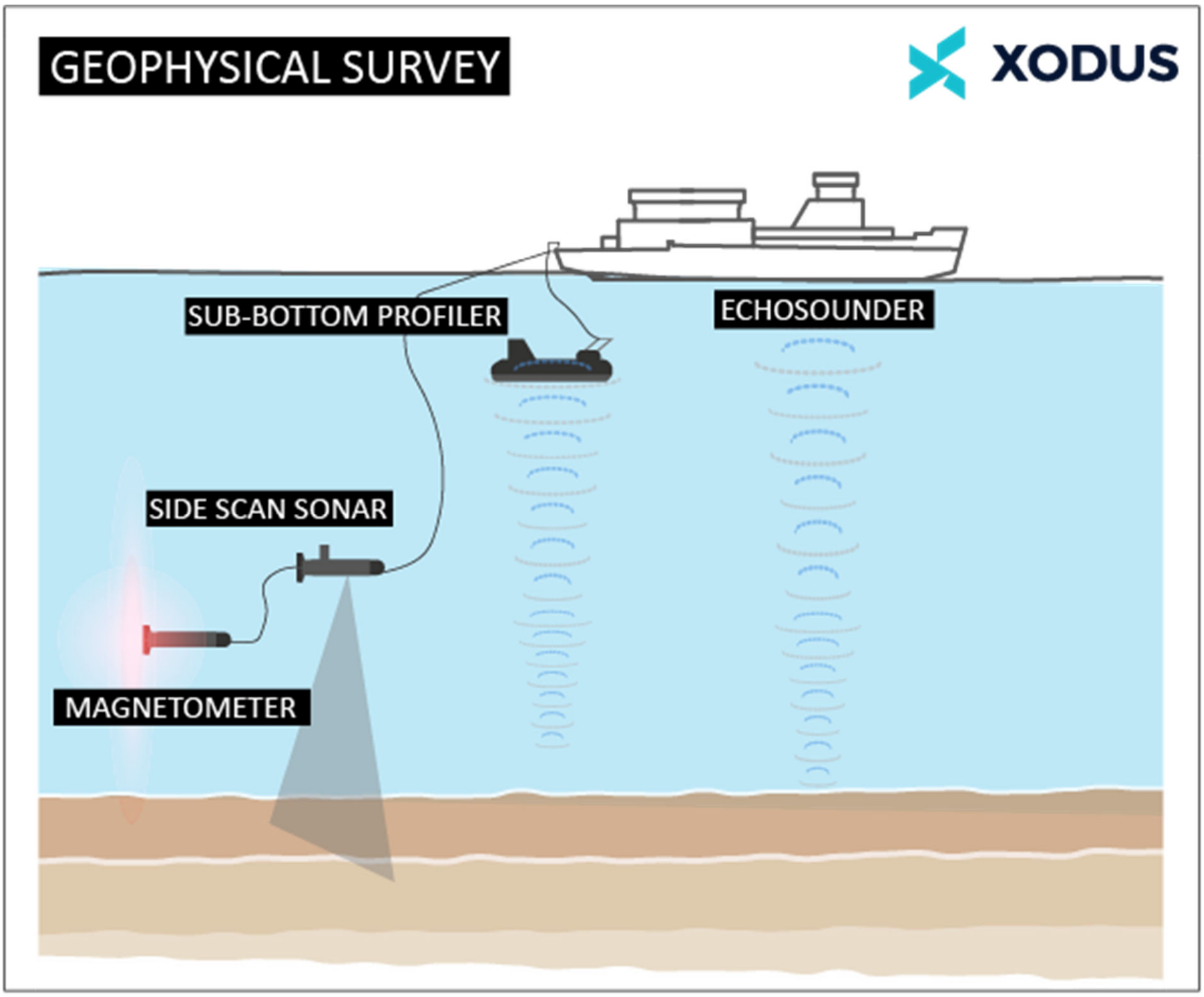

Figure 4-3: Geophysical Survey Equipment

4.2.2 Geotechnical Investigation

A description of the proposed geotechnical investigation is outlined in Table 4-5 and the vessel and equipment set up detailed in Figure 4-4.

Geotechnical methods collect detailed information on the properties of the seabed and the underlying shallow sediments to build up a picture of the local geology of the area. The collected sediments are photographed, described, and tested to determine the load bearing properties of the seabed at potential MODU anchoring locations and validate the results of the geophysical investigations.

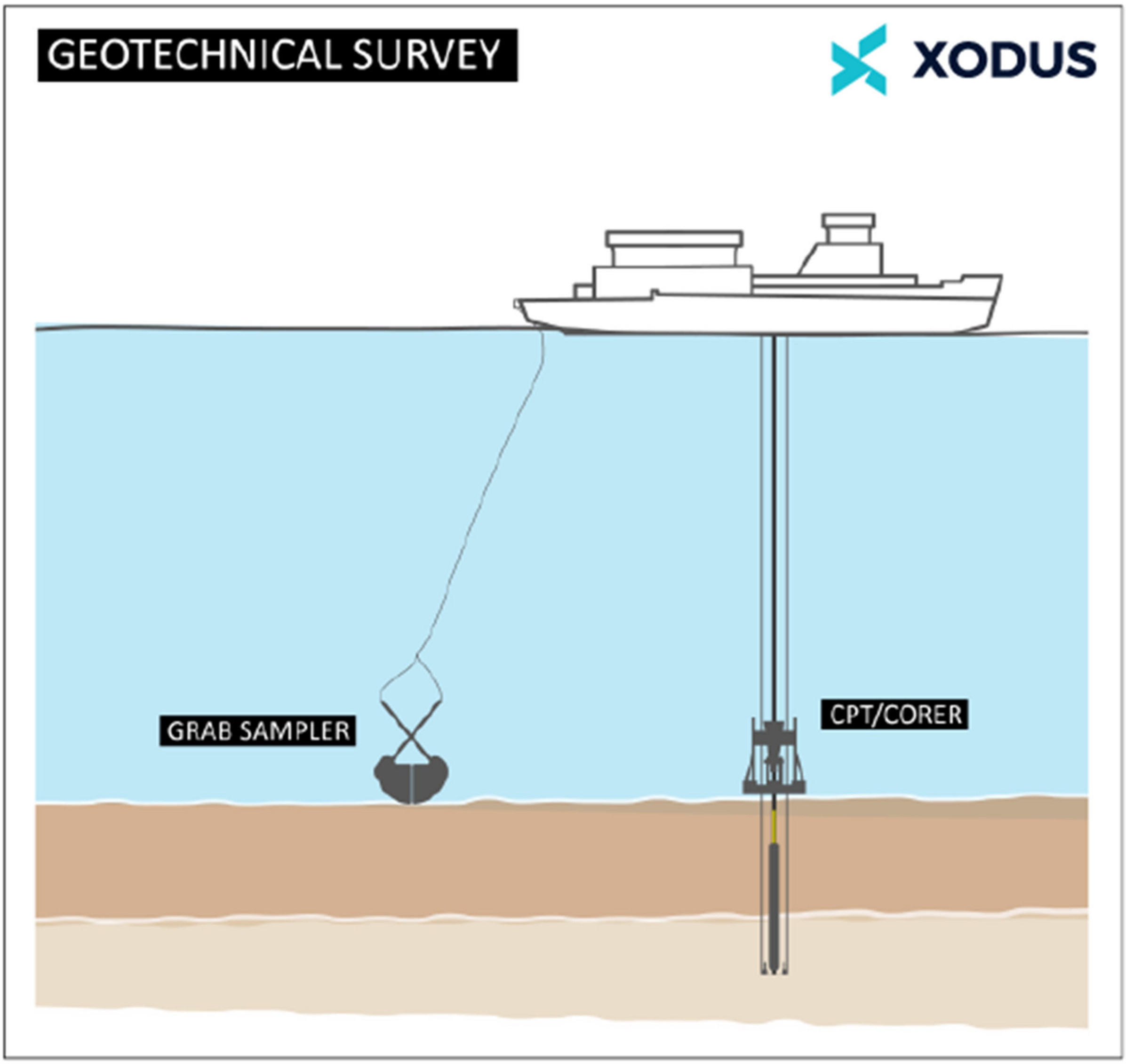

Figure 4-4: Geotechnical and Environmental Sampling Equipment

4.3 Survey Vessel

A vessel will be used to undertake the seabed surveys. The vessel will travel at approximately 4–5 knots (7–9 km/hr) when undertaking the geophysical survey and stationery when undertaking the geotechnical sampling.

The vessel will hold station using dynamic positioning (DP) or propellers as water depths are too deep for anchoring. The use of support vessels is not required. Vessel refuelling will occur at port. Mobilisation of crew to the vessel and any crew change will be at port.

4.4 Remotely Operated Vehicle/Autonomous Underwater Vehicle

A remotely operated vehicle (ROV) is a tethered underwater vehicle deployed from a vessel, while an autonomous underwater vehicle (AUV) is not tethered. ROVs and AUVs are unoccupied, highly manoeuvrable and operated by a crew aboard the vessel.

The ROV or AUV will be equipped at a minimum with a camera and lights.

Table 4-3: Seabed Survey Sample Sites

Operational Area	**Sites** Geophysical Area in km^2 Geotechnical Area in m^2	**Sample**	**Geophysical Survey**				**Geotechnical Samples**				**Environmental Samples**		
			MBES	**SSS**	**SBP**	**Magnetometer**	**CPT to ~30m**	**CPT to ~6m**	**Drop Core/Gravity core**	**Vibrocore**	**Video Image**	**Sediment sample**	**Water sample**
Otway - A	New well site with two theoretical relief well sites 10 new wells x 3 sites = 30 sites P& A wells - relief well sites only 2 P & A wells x 2 = 4 sites Existing well -relief well sites only 2 wells x 2 = 4 site **Total: 38 sites** **Geophysical Area: 1862 km^2** **Geotechnical Area: 1140 m^2**	7 km x 7 km box (49 km^2) at each site with 1 sample (30 m^2) per site Video image, sediment, and water samples at selected representative sites	X	X	X	X	-	X	X	X	X	X	X
Otway - A	Rig anchor locations for planned well locations (10 new, 2 P&A) **Total: 12 sites** **Geophysical Area: 588 km^2** **Geotechnical Area: 1680 m^2**	7 km x 7 km box (49 km^2) at each site with 4 samples (30 m^2 each) within box area Video image and sediment samples at selected representative sites	X	X	X	X	-	X	X	X	X	X	-
Otway - A	Proposed flowline routes **Geophysical Area: 250 km^2** **Geotechnical Area: 300 m^2**	Geophysical survey along flowline routes 10 samples (30 m^2 each) along route Video image and sediment samples at selected representative sites	X	X	X	X	-	X	X	X	X	X	-
Otway - B	New well site with two relief well sites 3 new wells x 3 = 9 sites **Total: 9 sites** **Geophysical Area: 441 km^2** **Geotechnical Area: 270 m^2**	7 km x 7 km box (49 km^2) at each site with 1 sample (30 m^2) per site Video image, sediment, and water samples at selected representative sites	X	X	X	X	-	X	X	X	X	X	X
Otway - B	Rig anchor locations for planned wells (3 new well)s **Total: 3 sites** **Geophysical Area: 147 km^2** **Geotechnical Area: 360 m^2**	7 km x 7 km box (49 km^2) at each site with 4 samples (30 m^2 each) within the box area Video image and sediment samples at selected representative sites	X	X	X	X	-	X	X	X	X	X	-
Bass	New well site with two relief well sites 5 new wells x 3 = 15 sites P & A wells – two relief well sites only 3 x 2 = 6 sites **Total: 21 sites** **Geophysical Area: 1029 km^2** **Geotechnical Area: 630 m^2**	7 km x 7 km box (49 km^2) at each site with 1 sample (30 m^2) per site Video image, sediment, and water samples at selected representative sites	X	X	X	X	X	X	X	X	X	X	X
Bass	Rig anchor locations (5 planned wells, 3 P&A wells) **Total: 8 sites** **Geophysical Area: 392 km^2** **Geotechnical Area: 960 m^2**	7 km x 7 km box (49 km^2) at each site with 4 samples (30 m^2 each) within the box area Video image and sediment samples at selected representative sites	X	X	X	X	-	X	X	X	X	X	-
Bass	Proposed flowline routes **Geophysical Area: 30 km^2** **Geotechnical Area: 60 m^2**	Geophysical survey along flowline routes 2 samples (30 m^2 each) along route Video image and sediment samples at selected representative sites	X	X	X	X	X	X	X		X	X	-

Note: P&A wells carry the meaning of suspended legacy wells to be P&A.

Table 4-4: Description of Proposed Geophysical Assessment Activities

Activity	Purpose	Activity Details
Multi-beam echo sounder (MBES)	Obtain detailed measurements of bathymetry.	A MBES mounted on the vessel hull is likely to be used. A MBES acquires a wide swath (strip) of bathymetry data perpendicular to the vessel track and provides total seabed coverage with no gaps between vessel tracks. MBES systems are available for all water depths between 1 m and 12,000 m. A MBES transmits a broad acoustic pulse from a transducer over a swath across track. The MBES then forms a series of received beams that are each much narrower and form a 'fan' (with a half-angle of 30-60°) across the seabed, perpendicular to the vessel track. The transducer(s) then 'listen' for the reflected energy from the seabed. The fans of seabed coverage produce a series of strips along each track, which are lined up side-by-side to generate two dimensional georeferenced bathymetric maps of the seabed.
Side scan sonar (SSS)	Detect hazards such as existing pipelines, lost shipping containers, boulders, debris, unmarked wrecks, reefs, and craters.	The SSS method of surveying generates oblique acoustic images of the seabed by towing a sonar 'towfish.' The towfish is provided with power and digital telemetry services and towed from the vessel using a reinforced or armoured tow cable. The towfish is equipped with a linear array of transducers that emit, and later receive, an acoustic energy pulse in a specific frequency range. Typically, a dual-channel, dual-frequency SSS is used. SSS is similar to MBES but operates at a wider fan angle. The acoustic energy received by the SSS tow vehicle (backscatter) provides information as to the general distribution and characteristics of the surficial sediment and outcropping strata, as for MBES. Shadows result from areas of no energy return, such as shadows from large boulders or sunken ships, and aid in interpretation of the sonogram image. The SSS towfish is constructed of stainless steel and is a cylindrical torpedo-like device and is typically towed 10-15 m above the seabed depending on water depth and the frequency range. The SSS is towed and operated at the same time as the MBES.
Sub-bottom profiler (SBP)	Determine the layering and thickness of the seabed sediments to a minimum depth of at least 30 m below the seabed.	**Compressed High-Intensity Radar Pulse (CHIRP)** Very high frequency systems including pingers, parametric echo sounding and CHIRP – produce a swept-frequency signal. CHIRP systems usually employ various types of transducers as the source. The transducer that emits the acoustic energy also receives the reflected signal. CHIRP signals typically penetrate only about 5-10 m into the seabed and provide the best resolution, but lowest penetration. A CHIRP is normally hull mounted when used for shallow water operations but may also be towed in a similar fashion to the SSS.

Activity	Purpose	Activity Details
		High-frequency boomers Consist of a circular piston moved by electro-magnetic force (comprising an insulated electrical coil adjacent to a metal plate). The high voltage energy that excites the boomer plate is stored in a capacitor bank. A shipboard power supply generates an electrical pulse that is discharged to the electrical coil causing a magnetic field to repel a metal plate. This energetic motion generates a broadband, high amplitude impulsive acoustic signal in the water column that is directed vertically downward. A boomer system offers a penetration depth of up to 100 m below the seabed. Boomers are mostly surface towed but may also be towed below the surface to avoid sea surface wave noise and movement. The receiver for the boomer system is usually a hydrophone or hydrophone array consisting of a string of individual hydrophone elements located within a neutrally buoyant synthetic hydrocarbon filled tubing. They typically contain eight to 12 hydrophone elements evenly spaced in a tube that is 2.5 to 4.5 m in length and 25 mm in diameter. The SBP system is towed and operated at the same time as the MBES and SSS. The survey is likely to be undertaken in two passes in conjunction with the MBES and SSS.
Magnetometer	Detect large and small metallic objects on or below the seabed (e.g. buried pipelines, petroleum wellheads, shipwreck debris and dropped objects such as unexploded ordinance, cables, anchors, chains) that may not be identified by acoustic means.	A magnetometer sensor is housed in a towfish and is towed as close to the seabed as possible and sufficiently far away from the vessel to isolate the sensor from the magnetic field of the vessel. A magnetometer measures the ambient magnetic field using nuclear magnetic resonance technology, applied specifically to hydrogen nuclei. The magnetometer survey will be conducted simultaneously with the MBES, SSS and SBP, as it can be powered using the same tow cable and power supply. The magnetometer towfish is constructed of stainless steel and is a cylindrical torpedo-like type device. A magnetometer is capable of a sampling rate of at least 1 Hz with a sensitivity of at least 1 nanotesla.
Ultra-Short Baseline (USBL) Positioning System	Position towfish in water depths up to 3,000 m.	A complete USBL system consists of a transceiver, which is mounted on a pole under a vessel, and a transponder or responder on a towfish. A computer, or "topside unit", is used to calculate a position from the ranges and bearings measured by the transceiver. An acoustic pulse is transmitted by the transceiver and detected by the subsea transponder, which replies with its own acoustic pulse. This return pulse is detected by the shipboard transceiver. The time from the transmission of the initial acoustic pulse until the reply is detected is measured by the USBL system and is converted into a range.

Table 4-5: Description of Geotechnical Assessment Activities

Activity	Purpose	Activity Details
Cone Penetrometer Test (CPT)	Determine soil strength and help to delineate soil stratigraphy.	CPT involves the in-situ measurement of the resistance of ground to continuous penetration. This process involves lowering a frame to the seabed and pushing the CPT unit into the sediment at a steady penetration rate (usually 2 cm per second). A frame is lowered to the seabed with the CPT unit integrated into it and operated remotely. When the required penetration depth is reached, all equipment is withdrawn from the seabed. A small hole will remain in the seabed, which will eventually collapse and infill with the movement of seabed sediments. A CPT typically takes 2-2.5 hours to complete. The CPT frame is ~ 5 m x 1 m with a footprint of ~ 5 m^2. The penetration cone is ~ 10 cm in diameter and penetrates the seabed from 6 to 30 m. The CPT sample is required to be taken away from the vibrocore sample to obtain an undisturbed sample.
Coring	Provide samples for undertaking geological analysis of formations below the seabed.	**Drop or Gravity Coring** Drop or gravity coring is normally used on soft, unconsolidated sediment. A gravity corer is a general-purpose tool that relies on its weight for penetration into the seafloor. It is lowered to a predetermined height above the seabed using a wire rope before being allowed to freefall. The resulting core enters the internal sleeve and is held in place by a core catcher. The gravity core has a diameter of ~15 cm with a footprint of ~0.018 m^2. The gravity core penetrates the seabed to ~ 4 -6 m.
		Vibrocore Vibrocoring is a technique for collecting core samples in unconsolidated sediments by using a vibrating device to drive a coring tube into the seabed. Typically, two large electrical motors power two concentric weights, which produce the necessary vibration. Once the unit is on the seabed, the high-power vibrator motors are engaged and drive the core barrel with PVC liner into the seabed. The corers are lowered by winching a cable wire from the vessel at approximately 1-2 m/s, so the duration of lowering and recovery operations in the sample area will be short (20-30 seconds at each site). Sampling itself is of a very short duration at each location (typically 5-10 minutes). The vibrocore frame is ~ 5 m x 5 m with a footprint of ~25 m^2. The vibrocore has a diameter of ~ 15 cm and penetrates the seabed to ~ 4 m.

5 Consultation

5.1 Summary

Beach has consulted relevant persons in the course of preparing this EP in accordance with applicable regulations, case law, guidelines, Beach policies and standards as set out in Section 9.

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, and therefore 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 etc, was designed to ensure that relevant persons were identified and provided sufficient information and a reasonable time period to allow them to make an informed assessment of the potential impacts of the EP activities. Where objections or claims were raised in about adverse impacts of the EP activities, the consultation process enabled an assessment of impacts and new or changed control measures to be adopted in the EP to reduce impacts and risk to an acceptable level and ALARP.

Beach has provided sufficient information in different formats including: information sheets; website content; public notice advertisements; radio advertisements; consultations with Beach technical staff at information sessions and meetings. Relevant persons 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.

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 Beach website and new online consultation hub (Engage Beach); in person and online meetings with individuals and organisations; community and industry drop-in sessions.

Beach has continued to observe broad concerns about climate change and increasing concerns about marine seismic surveys. However, after explaining in direct consultations that the OGV Project and the seabed assessment activities do not include seismic acquisition, minimal additional information was sought, and minimal concerns raised. For the limited concerns raised, Beach has assessed their merits and identified any additional control measures as described in Section 5.12.

Consultation in the course of preparing this environment plan has been completed and Beach believes it has met the regulatory engagement requirements. Ongoing consultation in relation to implementing the activities in this EP (Section 5.16 Ongoing Consultation) and for the development of other EPs required for the OGV Project will continue. Should concerns or feedback about adverse impacts 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 9.8.1.

5.2 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 from seabed assessments to drilling wells, connecting wells, and its ongoing offshore operations. Beach has also consulted with relevant person for its Bass Basin activities including management of suspended wells, seabed assessments, seismic surveys, 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.

Consultation for this EP has been undertaken by providing relevant persons sufficient information on geotechnical and geophysical assessments activities, that Beach has described in the simple collective term of 'seabed assessments'.

Beach has also provided information to relevant persons on the broader context for the seabed assessment activities by explaining that those activities are a part of several phases for Beach's Offshore Gas Victoria (OGV) Project for which additional EPs will be developed after further consultation. Beach has undertaken this holistic approach as it gives relevant persons contextual information on why the seabed assessments are necessary to carry out subsequent activities 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.

5.3 Regulatory Requirements

Table 5-2 shows 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). Beach has also reviewed the Federal court decision in Cooper v NOPSEMA (N0 2) [2023] FCA 1158. with regard to consultation requirements.

5.4 Guidelines Considered

The guidelines detailed in Table 5-1 were also considered in planning and delivering the consultation carried out in the course of preparing this EP:

Table 5-1: Consultation Guidelines Considered

Organisation	Guideline
NOPSEMA	GL2086 – Consultation in the course of preparing an environment plan – May 2023 (NOPSEMA Consultation Guidelines) GN1344 - Environment plan content requirements - December 2022 Title (nopsema.gov.au)GN1488 - Oil pollution risk management - July 2021 GN1785 – Petroleum activities and Australian Marine Parks – May 2023 GL1887 – Consultation with Commonwealth agencies with responsibilities in the marine area – January 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

Table 5-2: OPGGS(E)R, NOPSEMA Guidelines and How Requirements Met

REGULATION *(for consultation)*	**NOPSEMA GUIDELINE**	**HOW REQUIREMENTS WERE MET**
10A Criteria for acceptance of environment plan For regulation 10A, 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 Division 2.2A; and (g)(ii) the measures (if any) that the titleholder has adopted, or proposes to adopt, because of the consultations are appropriate	Regulation 11A 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 reg 10A(g). In order to accept an EP under Regulation 10, NOPSEMA must be reasonably satisfied (as per Regulation 10A) that the EP demonstrates the duty (to carry out consultation with relevant persons required by Regulation 11A) 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. A connection of traditional owners with sea country may constitute an interest for the purposes of regulation 11A(1)(d). Titleholders must demonstrate to NOPSEMA that a reasonable opportunity to be consulted has been afforded to First Nation groups.	**Consultations required by Division 2.2A** 5.15 Report on consultations 5.12 Assessment of merit of objections or claims Shows approach to assessment of objections or claims 5.13 Measures adopted as a result of consultation Shows actual measures adopted as a result of consultation on this EP 5.5 Principles of effective consultation Shows the policy, standards and guidelines Beach applies when planning consultation 5.5.1Consulting groups with communal interests show respect for consulting representative commercial fishers associations. 5.5.2 Consulting First Nations groups and peoples shows an informed and culturally sensitive approach to consulting First Nations groups. holding formal representative roles in their communities.
11A Consultation with relevant authorities, persons and organisations, etc (1) In the course of preparing an environment plan, or a revision of an environment plan, a titleholder must consult each of the following (a 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 Regulation 11A. 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.	**Relevant Persons Identification** Section 5.6 Relevant Person identification methodology sets out a comprehensive methodology followed by research techniques, public notices, and other methods to identify

REGULATION (*for consultation*)	**NOPSEMA GUIDELINE**	**HOW REQUIREMENTS WERE MET**
person): (a) each Department or agency of the Commonwealth to which the activities to be carried out under the environment plan, or the revision of the environment plan, may be relevant; (b) each Department or agency of a State or the Northern Territory to which the activities to be carried out under the environment plan, or the revision of the environment plan, may be relevant; (c) the Department of the responsible State Minister, or 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, or the revision of the environment plan; (e) any other person or organisation that the titleholder considers relevant.	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. Regulation 11A, 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. 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 regulation 11A(1)(d)** The phrase "functions, interests or activities" in regulation 11A(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"	relevant persons. Section 5.7 Relevant persons identified shows the categories and names of relevant persons, alongside their functions, interests and activities.

REGULATION *(for consultation)*	**NOPSEMA GUIDELINE**	**HOW REQUIREMENTS WERE MET**
	Activities: to be read broadly and is broader than the definition of 'activity' in regulation 4 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 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"	
11A 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 regulation 11A(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 11A(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** Section 5.8 Sufficient Information 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.
11A 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 regulation 11A(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, 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.	**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. Section 5.9 Reasonable period shows that a reasonable period has been provided and consultation has been completed.

REGULATION *(for consultation)*	**NOPSEMA GUIDELINE**	**HOW REQUIREMENTS WERE MET**
1A 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** Section 5.14 Sensitive Information shows that relevant persons have been informed of their rights regarding sensitive information.
16 Other information in the environment plan The environment plan must contain the following: (b) a report on all consultations under Regulation 11A 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 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;	**Reporting on consultation in the EP under regulation 16(b)** 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 regulation 11A. The consultation process should also assist the titleholder to meet its obligation under section 280 or 460 of the Offshore Petroleum and 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.	**Report on consultations** Section 5.11 Consultation to minimise impacts on relevant persons rights shows the approach taken to consult to understand and not interfere with others rights. Section 5.15 Report on consultations Includes responses made, assessment of the merits of objections or claims about the adverse impacts of each activity and Beach's response. The report on consultation is in Appendix I. The full text of any response by a relevant person was provided to NOPSEMA on submission of the EP as sensitive information.
14 Implementation strategy for the environment plan (9) The implementation strategy must provide for appropriate consultation with:	Demonstrating in an Environment Plan that ongoing consultation is a part of a titleholder's implementation strategy as required by regulation 14(9), is separate to demonstrating that requirements for relevant persons consultation outlined in this guideline have been met	**Ongoing consultation** Section 5.16 Ongoing Consultation shows the consultation that will continue as part of the implementation strategy for this EP.

REGULATION *(for consultation)*	**NOPSEMA GUIDELINE**	**HOW REQUIREMENTS WERE MET**
- (a) relevant authorities of the Commonwealth, a State or Territory; and - (b) other relevant interested persons or organisations.		

5.5 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:

- Community and Stakeholder Engagement Policy
- Indigenous Participation Policy
- Human Rights Policy
- Community Engagement Standard BSTD 10.2.
  This standard incorporates the International Association of Public Participation (IAP2) Spectrum of Public Participation global best practice model.

5.5.1 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.

Beach respects communal interests held by First Nations groups and has approach consultation as set in Section 5.5.2.

5.5.2 Consulting First 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 Sections 5.3 and 5.4 and has applied these requirements in its approach to identifying and consulting with First Nations relevant persons.

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

1. Provided information on the activities in this EP (and the OGV Project).
2. Provided information on the purpose of consultation.
3. Explained that the identification of cultural values and sensitivities is an important part of preparing EPs as it enables any impacts to be assessed and where applicable for measures to be developed to reduce impacts and risks to an acceptable level and ALARP.
4. Inquired 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.
5. 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.
6. Inquired 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 by the activity that have not yet been afforded the opportunity to provide information that may inform the management of the activity.

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

Beach carried out desk-top research to identify potential individual First Nations person who may be relevant and placed public notice advertisements in relevant publications to facilitate the opportunity for First Nations peoples, or groups who may not be RAPs or a Registered Native Title Body Corporate, to consult with Beach.

5.6 Relevant Persons Identification methodology

5.6.1 Identification Process

In following the law set out in Santos NA Barossa Pty Ltd v Tipakalippa [2022] FCAFC 193 (appeal decision) Beach developed a methodology for identifying and consulting with relevant persons for a previously accepted EP. Beach has reviewed and refined its methodology cognisant of NOPSEMA Guidelines, recent case law, and applicable to the nature and scale of the activities in this EP.

The methodology follows a process of assessing elements of this EP to identify potential relevant persons: defined activities; the spatial extent of the Operational Areas and Planning Areas of the environment that may be affected (EMBA); environmental values and sensitivities; identification and assessment of risks and impacts. After initial identification, the consultation process is used to verify and refine the initial steps. That process is set out in Figure 5-1.

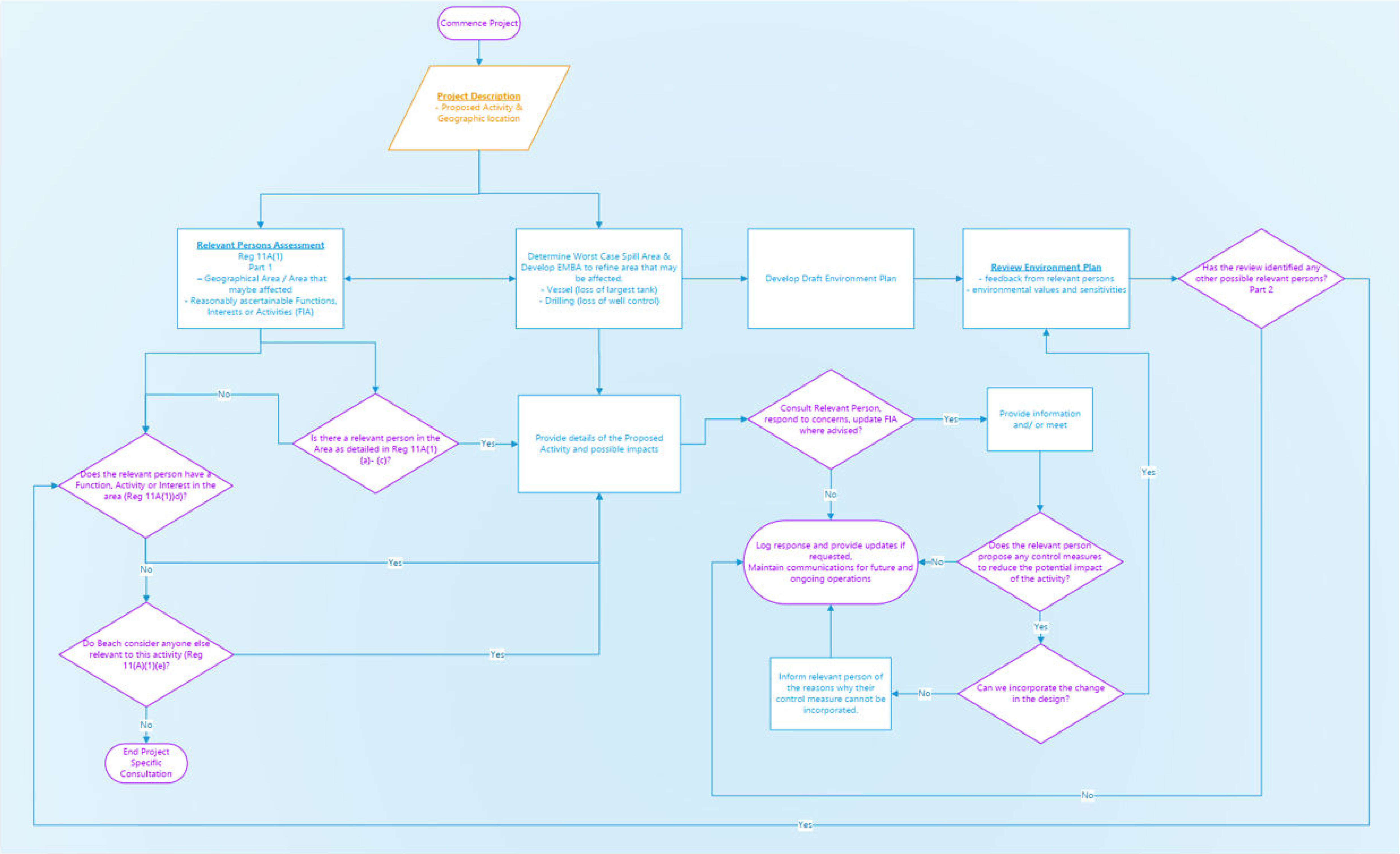

Figure 5-1: Relevant Person Methodology

5.6.2 Geographical Location

The spatial extent of the Operational Areas were determined for the seabed assessment activities, followed by the Planning Areas as determined from the modelling of unplanned release of marine vessel fuel ('spill modelling'). These defined geographic locations were examined in the first steps in the relevant persons identification methodology. This assessment is also used to plan appropriate consultation methods given the nature and scale of the activity and the potential impacts on the relevant persons functions, interests, or activities.

The Planning Area is based on the NOPSEMA Environmental Bulletin A652993 (April 2019) Oil Spill Modelling and includes oil in various phases at low, medium and high thresholds. The Planning Area is conservatively based on the low thresholds which do not result in environmental or ecological impacts.

The low thresholds for shoreline oil and floating oil are considered to have the potential for socioeconomic impacts such as tourism given the oil may be visible. The low thresholds for in-water oil (both dissolved and entrained) are not considered to have environmental, ecological, or socio-economic impacts and are considered appropriate for the planning of scientific monitoring.

There may be persons who have functions, interests, or activities within the Planning Area, as calculated by the oil spill modelling included in the EP, but those functions, interests or activities may not be affected by the activities. Where no environmental or ecological impacts are predicted within a geographical area, defined by the low thresholds, there can be no corresponding impacts on a person's functions, interests or activities.

There may also be instances where potential environmental or ecological impacts are predicted to occur within an area. However, despite a geographical overlap this will not necessarily equate to an impact on a person's functions, interests or activities. Where a person's functions, interests or activities within the Planning Area are not affected, or are only affected in an immaterial or negligible way, they have not been identified as a relevant person (as defined under OPGGS (E)R 11A).

Table 5-3: Geographic Locations and Relevant Person Focus

Area	Potential impacts	Relevant Person Focus
Operational Area Area where the activities will take place.	Temporary displacement of other marine users required to avoid the survey vessel. Temporary, minor, and localised disturbance of the marine environment including seabed, marine fauna and flora. Potential for disturbance to telecommunications infrastructure.	Persons or organisations whose functions, interests or activities may be affected by the physical presence of the vessel, or the temporary disturbance caused by the planned activities, such as: • Commercial fishing industry • Marine transport industry • Offshore energy industry • Telecommunications infrastructure owners • Marine tourism businesses • Environment groups focused on conservation of the marine environment • Groups holding cultural values and sensitivities.
Planning Area The Planning Area is based on the predicted greatest extent of a diesel spill that has been modelled using multiple scenarios to develop a possible area that could be	Modelling of marine diesel spill and impact assessments defines different hydrocarbon contact values of four phases (surface, dissolved, entrained, and accumulated shoreline) that pose different ecological and socio-economic risks. Spill modelling showed shoreline oil at the low threshold had a 2% probability of exposure on the west side of King Island with the minimum time for low threshold shoreline accumulation of 8.13 days. Depending on the location of a spill event in the northern part of the Otway Operational Area, there could be oil	Persons or organisations who have responsibilities for emergency response activities, including Commonwealth and State marine pollution agencies. Consultation with other organisations who may have supporting or communication role, such as Local Government Authorities or parks management authorities.

Area	Potential impacts	Relevant Person Focus
exposed to hydrocarbons at the low thresholds as detailed in Section 8.9.3.2	exposure above the low threshold for areas of the Victorian coast within close proximity to the spill location. Visible shoreline hydrocarbons have the potential to reduce the visual amenity of the area for tourism. The west side of King Island are exposed to substantial wave action that would rapidly breakdown any shoreline hydrocarbons. Visible floating surface hydrocarbons (i.e. a rainbow sheen) have the potential to reduce the visual amenity of the area for tourism. However, this is only predicted for up to 26 hrs and thus unlikely to have a significant impact on visual amenity or discourage recreational activities. The relatively short duration of exposure and low volume of oil likely to reach the shoreline means there may be short-term and localised consequences, which are considered minor. Control measures for safety of navigation and radio equipment (CM#10: MO27) will be in place during operations and a Notice to Mariners will be issued from the AHO requiring a 2 km clearance of the vessel. Given the impact assessment and control measures, the risk of impacts from an unplanned diesel spill from the vessel has been assessed as highly unlikely, with low consequence.	Relevant persons identified in the Planning Area where there is potential for hydrocarbons at moderate or high thresholds.

5.6.3 Defining Relevant Person Categories

The second key step in the relevant persons identification methodology determined the categories of relevant persons whose functions, interests or activities may be affected by the activities in the EP. Relevant persons categories are shown in Table 5-4.

Table 5-4: Identification of Relevant Persons Categories

Environmental Values and Sensitivities	Operational Area	Planning Area	Relevant Person Categories
Conservation Values and Sensitivities			
World Heritage Properties	×	×	NA
Australian Marine Parks: - Apollo - Beagle - Boags - Zeehan	×	✓	Commonwealth Departments / Agencies Indigenous Educational and Research Organisations Tourism/Recreation Environmental Conservation Groups
National Heritage Places: - Great Ocean Road and Scenic Environs	×	✓	Recreational Tourism Indigenous Local Authorities
Commonwealth Heritage Places: none impacted	×	×	NA
Maritime Archaeological Heritage	×	✓	Tourism/Recreation Environmental Conservation Groups
Wetlands of International Importance - Lavinia	×	×	NA
Nationally Important Wetlands: - Aire River/Lower Aire River Wetlands Princetown Wetlands (Victoria) - Lavinia - Princetown	×	✓	State Departments / Agencies Indigenous Educational and Research Organisations Environmental Conservation Groups Tourism/Recreation
Victorian Marine Protected Areas: - Eagle Rock Marine Sanctuary - Marengo Reefs Marine Sanctuary - Merri Merri Sanctuary	×	✓	State Departments / Agencies Indigenous Educational and Research Organisations

Environmental Values and Sensitivities	Operational Area	Planning Area	Relevant Person Categories
• Point Addis Marine National Park • Point Danger Marine Sanctuary • The Arches Marine Sanctuary • Twelve Apostles Marine National Park Victorian Terrestrial Protected Areas: None impacts			Tourism/Recreation Environmental Conservation Groups
Tasmanian Marine Protected Areas: • Kent Group National Park Tasmanian Terrestrial Protected Areas: • Cape Wickham Conservation Area • Cataraqui Point Conservation Area • Seal Rocks Conservation Area/State Reserve	✗	✓	State Departments / Agencies Indigenous Educational and Research Organisations Tourism/Recreation Environmental Conservation Groups
Key Ecological Features: • West Tasmanian Marine Canyons	✗	✓	Commonwealth Departments / Agencies Indigenous Educational and Research organisations Environmental Conservation Groups
Ecological Environment			
The ecological and physical environment described in Chapter 4 provides the basis for further assessment of values and sensitivities, along with impact and risk assessments (Chapter 6) from planned and unplanned activities. The ecological and physical environment includes: • Benthic habitats and species assemblages • Soft sediment (habitat for various species) • Seagrass (coastline presence) • Algae (coastline presence) • Coral • Carbonate sands and exposed limestone (habitat for various species) • Basalt rises (habitat for various species) • Mangroves • Plankton • Invertebrates • Fish • Birds • Marine reptiles	✓	✓	Commonwealth Departments / Agencies State Departments / Agencies Commercial Fishing Indigenous Educational and Research Organisations Environmental Conservation Groups

Environmental Values and Sensitivities	Operational Area	Planning Area	Relevant Person Categories
- Cetaceans - Pinnipeds			
Threatened Ecological Communities: - Assemblages of species associated with open-coast salt-wedge estuaries of western and central Victoria ecological community - Giant Kelp Marine Forests of South East Australia - Subtropical and Temperate Coastal Saltmarsh	✗	✓	Commonwealth Departments / Agencies State Departments / Agencies Indigenous Educational and Research Organisations Environmental Conservation Groups
Socio-economic			
Local Government Areas: - Colac Otway (Vic) - Corangamite (Vic) - Greater Geelong City (Vic) - Flinders (Tas) - King Island (Tas) - Moyne (Vic) - Surf Coast (Vic) - Warrnambool City (Vic)	✗	✓	Local Authorities Indigenous Tourism and Business Associations Commercial Marine Tourism Recreational Fishing Recreational Users Volunteer Emergency Services
Offshore petroleum industry (non-Beach)	✗	✓	Oil and Gas Industry
Other infrastructure Existing: - Indigo Central telecommunications cable - Bass Strait-1 and Bass Strait-2 telecommunications cable Planned - East Coast Cable System - Hawaiki Submarine Cable - Marinus Link	✓	✓	Marine Based Industries
Shipping	✓	✓	Commonwealth Departments / Agencies
Tourism	✗	✓	Local Authorities Tourism and Business Associations

Environmental Values and Sensitivities	Operational Area	Planning Area	Relevant Person Categories
			Tourism/Recreation
Recreation (beach walking, fishing, snorkelling, diving, surfing close to coastline)	✓	✓	Recreational Fishing Recreational Tourism Local Authorities
Commercial fisheries: • Commonwealth • Victoria • Tasmania	✓	✓	Commercial Fishing
Seaweed Industry	✗	✓	Marine Based Industries
First Nations			
Sea Country Native Title Indigenous Protected Areas Indigenous Land Use Agreements	✓	✓	Indigenous
Impacts			
Light emissions: may attract light-sensitive species to vessels	✓	✗	Commonwealth Departments / Agencies Commercial Fishing Indigenous Educational and Research Organisations Environmental Conservation Organisations
Atmospheric emissions: decrease in air quality, greenhouse gas emissions	✓	✗	Commonwealth Departments / Agencies Environmental Conservation Organisations
Underwater sound emissions: temporary, during vessel activities, up to 5.94 km	✓	✗	Commonwealth Departments / Agencies Commercial Fishing Indigenous

Environmental Values and Sensitivities	Operational Area	Planning Area	Relevant Person Categories
			Educational and Research Organisations Environmental Conservation Organisations
Physical presence: Avoidance of vessels	✓	×	Commercial Fishing Marine Based Industries Commonwealth Departments / Agencies
Marine discharge vessels: putrescible waste, sewerage and grey water, cooling and brine water, bilge water and deck drainage. Potential toxicity impacts to marine fauna, increased sea surface temperature and salinity, temporary and localised.	✓	×	Commonwealth Departments / Agencies
Risks			
Introduction and establishment of invasive marine species	✓	✓	Commonwealth Departments / Agencies State Departments / Agencies Commercial Fishing Indigenous Educational and Research Organisations Environmental Conservation Organisations
Disturbance to fauna	✓	×	Commonwealth Departments / Agencies
Accidental discharge of hazardous and non-hazardous materials and waste	✓	×	Commonwealth Departments / Agencies Commercial Fishing Indigenous Educational and Research Organisations Environmental Conservation Organisations

Environmental Values and Sensitivities	Operational Area	Planning Area	Relevant Person Categories
Loss of hydrocarbons – diesel	✓	✓	Commonwealth Departments / Agencies State Departments / Agencies Commercial Fishing Indigenous Local Authorities Tourism and Business Associations Tourism/Recreation Educational and Research Organisations Environmental Conservation Organisations
Hydrocarbon spill response activities	✓	✓	Commonwealth Departments / Agencies State Departments / Agencies

5.6.4 Identifying Relevant Authorities

Relevant authorities, as required in regulations 11A(1)(a) and (b) 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 2023.
- Beach's recent consultation records in BeachConnect (Beach's stakeholder database).
- Desktop research to identify any agency or department changes.
- 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 in regulation 11A(1)(c).

5.6.5 Identifying Relevant Persons or Organisations

Building upon the spatial extent of activities and relevant person category assessments in Table 5-4, the next step involves identifying individual organisations or persons whose functions, interests or activities may be affected by the activities in the EP (Reg 11A(1)(d)).

Table 5-5 sets out the broad approach for most relevant person categories. Further information is provided in Section 5.6.6 for First Nations and Section 5.6.7 for Commercial Fishers categories.

Table 5-5: 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. 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: • Merged Otway and Bass basin offshore project relevant persons lists to create a consolidated master list for OGV Project. • Reviewed master list of organisations and individuals against relevant person categories identified in assessment of totality of environment values, sensitivities, impacts and risks. • Contacted 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 whom they believe may be a relevant person to contact Beach. • Beach creates ongoing opportunities for relevant persons to participate in consultation through: public notice advertisements in local newspapers and radio stations; attending local Beach information sessions. • Through the consultation process, relevant persons functions, interests or activities are updated in BeachConnect when new information is available.
Local knowledge	• Beach's Group Manager Social Performance and Community Relations has carried out wide ranging consultations for offshore and onshore Otway Basin projects since 2014, has extensive knowledge of local community, commercial fishing industry and other relevant persons, and has personally reviewed the relevant persons identifications methodology and consultation plan for this EP.

Activity	Detail
	• 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 potential relevant persons based on the categories identified. • Beach has increased the Victorian Community Engagement function from two persons to 4 persons to carry out local consultation.
Broad based keyword search	• Searched online for potentially relevant persons using key words including: boat; swim; dive; sail; yacht; 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; Port MacDonnell; Beachport; Robe; Burnie; Flinders Island; and King Island. • Investigated and monitored media articles and online campaigns around offshore activity concerns and using the above searches. • Investigated social media channels including: LinkedIn, Facebook, and Instagram in the above searches.
Marine Spatial Planning Framework	• Reviewed the submissions to the Marine Spatial Planning Framework being developed in response to the Victorian *Marine and Coastal Act 2018* to identify additional potentially relevant persons. • Contacted organisations to inquire if they wish to be consulted.
Warrnambool Moyne Shire, and Glenelg Shire Focus	• Beach has an extensive list of relevant persons in Port Campbell, Peterborough, and Timboon with whom engagement has been undertaken for many years. • Whereas relevant persons in Warrnambool, Port Fairy and Portland have historically only involved commercial fishers. • For each relevant person newly identified in Warrnambool and broader Moyne Shire, Beach inquired if they could recommend other relevant persons and this approach successfully identified several additional relevant persons. • Drop-in sessions in Warrnambool, Port Fairy and Portland were added to the schedule.
King Island Focus	• Engagement approach was developed with King Island Council. • Types of organisations engaged include: industry and tourism associations; marine based tourism businesses; coast care groups; fishing industry; and seaweed industry. • King Island Council and King Island Chamber of Commerce also provided additional suggested relevant persons, that Beach contacted.
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. • Engaged with the Director of National Parks as per the NOPSEMA guidance note provided June 2023. Shape files were provided in addition to the suggested 'sufficient information'. • Reviewed database of parties licensed to carry out activities within marine parks.
Conservation Groups	• Based on desktop research of media coverage and organisations, identified further regional and national conservation groups, sought direct engagement, and commenced consultations with organisations who responded. • Given the nature and scale of the activities in this EP, Beach's methodology was evolved to include both regional and national groups focussing on those with a direct interest in the Otway and Bass basin offshore Oil and Gas industry, groups whose interests are potentially most affected such as marine conservation, and where such consultation could contribute further information that would meet the purpose of consultation to identify concerns and implement mitigations. • 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, and around King Island. Identified additional relevant persons offering services such as boat charters, SCUBA diving; equipment hire.
Local Government	• Contacted local government councils Adjacent operational Areas via phone and email to review the correct personnel to liaise with for Beach activity updates and environmental questions or concerns.

5.6.6 Identifying First Nations Groups or Persons

Beach has assets in Victoria that have been in operation for many years. Since becoming operator of those assets, Beach has been investing time to build 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 Manager First Nations Engagement, a First Nations person who also has completed formal studies in land and sea country management.

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. First Nations groups 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 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 held cultural responsibilities to ensure sea country is cared for and sea country was managed very carefully. Contemporary First Nations groups including Registered Aboriginal Parties and Native Title Body Corporates are playing an increasingly important role in the management of this Sea Country, through formalised roles and programs with 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 respectful and effective consultation with Registered Aboriginal Parties 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; and
- 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:
    - Using the National Native Title database to identify any Native title claims or determinations in the area adjacent to our activities.
    - Using the Victorian Aboriginal Heritage Council online map to identify and Recognised Aboriginal parties in Victoria.
    - Researched the Prescribed Bodies Corporate, Registered Aboriginal Parties, Native Title holders and claimants. This research focussed on Victoria and northern Tasmania 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 our relevant person methodology and identify any additional community groups or individual who may be considered relevant.

  - Consulted with Melbourne Local Aboriginal Networks to identify any individuals not aligned with the Prescribed Body Corporates (PBCs) to self-identify.
  - Consulted with Department of Premier and Cabinet Tasmania to identify any additional First Nations corporations, individuals or groups.
  - Consulted with Tasmanian Aboriginal Heritage Council to identify any additional First Nations groups/individuals or corporations that may be relevant.
  - Consulted with local Council authorities on King Island to identify additional First Nations residents who may be considered a relevant person.
  - Review of Commonwealth, State Marine Park Management Plans or Indigenous Protected Areas (IPA's) that overlap the planning area which may identify Traditional Custodians or representative bodies to contact regarding Seas Country and any cultural values.
  - Asked each First Nations group or person consulted if they could identify any other potential Relevant Persons (organisations or people) who may wish to be consulted, alternatively if they did not want to identify them to us, we requested they share our project information to them.
  - Advertised in the Koori Mail and National Indigenous Times newspapers 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. This additional step was undertaken to provide an opportunity for any persons unknowable to Beach, notwithstanding the relevant person identification steps undertaken.
  - Advertised on local First Nations radio stations National Indigenous Radio Service and 3KND Melbourne Aboriginal radio to identify any additional community groups or individuals.
  - 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 using the following search terms:
    - Searched terms relating to potential cultural values and sensitivities including: Sea Country; Saltwater Country; cultural sea country; cultural sea values; cultural values; totems; Sea Country Totems; submerged cultural landscapes; paleo landscapes; songlines; whales; whale songlines; dream time; deep time; dreaming.
    - 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: Victoria; Tasmania; Warrnambool; Peterborough; Port Campbell; Port Fairy; Flinders Island, and King Island.
  - Investigated and monitored media articles identified in the above searches for further relevant persons.
  - Investigated LinkedIn pages for connections associated with identified First nations groups.

The land and sea country adjacent to the Otway Basin Seabed Assessment 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 Corporation (RNTBC) 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.

The land and sea country east of the Otway Basin Seabed Assessment Operational Area and part of the Planning Area is the traditional lands of the Wadawurrung people. The Wadawurrung Traditional Owners Corporation is a Registered Aboriginal Party and representative body for Wadawurrung traditional owners. Wadawurrung aims to restore traditional knowledge and authority over the management of Wadawurrung country including land, waters and coastal areas.

The land and sea country north of the Bass Basin Seabed Assessment Operational Area and Planning Area, 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 have also identified other First Nations groups who may have an interest in the seabed assessment based on a worst-case scenario of an incident in the Planning Areas. They include:

- Gunditj Mirring Traditional Owners Aboriginal Corporation
- Gunaikurnai Land and Waters Aboriginal Corporation
- Aboriginal Land Council Tasmania
- Tasmanian Aboriginal Centre
- Flinders Island Aboriginal Association Inc
- Circular Head Aboriginal Corporation.

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

5.6.7 Identifying Commercial Fishers

The commercial fishing sector is a primary category of relevant person due to the potential displacement impacts of the activities in this EP. Beach has an extensive commercial fisher database and long-term positive relationships with peak commercial fishing associations and many individual fishers. Notwithstanding these existing relationships, given the spatial extent of the activities in this EP and the full scope of the proposed OGV Project activities, Beach has undertaken a comprehensive review of its commercial fisher relevant persons. Steps have included:

- Identified and mapped designated State and Commonwealth fishery areas that may operate in the Operational and Planning areas.
- Reviewed Australian Fisheries Management Authority website to verify relevant fishery associations and contact details.
- Reviewed State based fishery authorities for any relevant fishery associations and contact details.
- Reviewed BeachConnect database to verify relevant fishery associations, pertaining to the types of fisheries that may operate in the Operational and Planning areas.
- Requested fishing data from VFA, Fishing Tasmania (formerly DPIPWE) and AFMA to verify fishing effort within designated fisheries in the operational area, in order to seek consultation with relevant fishing associations and commercial fishers.
- Engaged Seafood Industry Victoria (SIV) who represent all State licenced commercial fishers to contact their members to share Beach's OGV Project and Seabed Assessment information sheets to members, and inquire if they have any questions or concerns about the activities based on their fishing operations.
- Engaged South East Trawl Fishing Association (SETFIA) who represent Commonwealth South East Trawl Sector; Scalefish Hook Sector; Shark Hook, Shark Gillnet Sectors; small pelagic fishery to request their support in contacting their members, share Beach's OGV Project and Seabed Assessment information sheets, and inquire if they have any questions or concerns about the activities based on their fishing operations.
- Reviewed Fisheries Research and Development Corporation website for potential relevant persons.
- Contacted South Australian Department of Primary Industries and Regions – Commercial Fishing for assistance with identifying relevant commercial fishers.

5.7 Relevant Persons Identified

5.7.1 List of Relevant Authorities – 11A(1)(a), (b), (c)

Organisation Name	Roles and responsibilities
1a Department or Agency of the Commonwealth	
Australian Fisheries Management Authority	The Australian Fisheries Management Authority (AFMA) is responsible for the implementation of Commonwealth fisheries policy. In managing Commonwealth fisheries, AFMA pursues objectives as outlined in the Fisheries Management Act 1991, Fisheries Administration Act 1991 and Torres Strait Fisheries Act 1984. In managing Consultation with Commonwealth agencies Guideline National Offshore Petroleum Safety and Environmental Management Authority N-04750-GL1887 A705589 20/01/2023 Page 14 of 19 Commonwealth fisheries, AFMA applies the principles of ecologically sustainable development and complies with the relevant sections of the EPBC Act. AFMA manages Commonwealth fisheries in consultation with the fishing industry and other user groups, such as those that represent traditional fishing, recreational fishing and the environmental non-government organisations. These management processes are used to implement controls, such as limits on catch or effort levels, and regulations of fishing methods in order to manage Australia's fisheries in a sustainable way. AFMA ensures that any broad-scale impacts of offshore petroleum industry development on commercial fishing in Commonwealth waters are considered in decision making by the Department of Industry, Science and Resources. AFMA provides comment on the annual offshore petroleum exploration acreage release prior to their release (this information is made available to operators as part of the release area notices).
Australian Maritime Safety Authority - Joint Rescue Coordination Centre	The Australian Maritime Safety Authority (AMSA) is a statutory authority and its principal functions are to: • promote maritime safety and protection of the marine environment; • prevent and combating ship-sourced pollution in the marine environment; • provide infrastructure to support safe navigation in Australian waters; and • provide a national search and rescue service to the maritime and aviation sectors. AMSA delivers a range of navigational services, primarily aimed at the levy-paying commercial shipping industry. These services provide ships with the ability to navigate safely around Australia's coastline and to and from its ports. AMSA also implements and enforces a range of legislation relevant to the Commonwealth marine area which gives effect to Australia's obligations under various international treaties and conventions
Department of Agriculture, Fisheries and Forestry – Fisheries, Biosecurity and Marine Pests	The Department of Agriculture, Fisheries and Forestry (DAFF) has primary policy responsibility for promoting the biological, economic and social sustainability of Australian fisheries. DAFF provides policy advice to the Australian Government on a range of economic and environmental fisheries issues, including the conservation of marine ecosystems and biodiversity that support commercially valuable fisheries resources. DAFF has primary policy and regulatory responsibility for managing marine pest biosecurity through administering the Biosecurity Act. DAFF's principal functions with respect to marine pest biosecurity are to: • reduce the likelihood of the entry and establishment of exotic marine pests; • provide national leadership in the response to new marine pest incursions and in the management of established marine pests, in cooperation with state and territory governments, and with industry stakeholders;

Organisation Name	**Roles and responsibilities**
	• represent Australia's interests in the establishment of international guidelines and conventions relating to marine pests.
Department of Climate Change, Energy, the Environment and Water -Oceans	The Department of Climate Change, Energy, the Environment and Water (DCCEEW) administers the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act), the Underwater Cultural Heritage Act 2018 and the Environment Protection (Sea Dumping) Act 1981 all of which have some application in the Commonwealth marine area.
Department of Defence - Australian Hydrographic Office	Department of Defence agency responsible for the publication and distribution of nautical charts and other information require for the safety of ships navigating in Australian waters. The AHO issues fortnightly Notices to Mariners for relevant nautical products.
Department of Defence - Infrastructure Division, Defence Support & Reform Group	Manages the development, maintenance and disposal of the Defence estate, including unexploded ordinance (UXO).
Department of Industry, Science and Resources	Responsibilities include offshore oil and gas development and safety, and greenhouse gas storage.
Director of National Parks	The Director of National Parks (DNP) is the statutory authority responsible for administration, management and control of Australian marine parks (AMPs). Under the EPBC Act and subordinate regulations, a range of activities undertaken in an AMP requires approval from the DNP. Petroleum and greenhouse gas activities undertaken in an AMP are assessed by NOPSEMA in accordance with the NOPSEMA EPBC Act Program. Additional assessment by the DNP is therefore not necessary as the NOPSEMA EPBC Act Program considers impacts on marine reserve values. The DNP has authorised offshore petroleum and greenhouse gas exploration activities to occur in certain marine park zones (IUN VI) by issuing class approvals. The class approvals require that titleholders have an accepted EP and operate in accordance with the EP for the allowable activities accepted by NOPSEMA. Additional assessment by the DNP is not necessary if the activity is authorised by a class approval. For details about the locations of AMPs and the class approvals see: parksaustralia.gov.au/marine. NOPSEMA has published guidance in consultation with the DNP and Parks Australia that outlines key considerations during the preparation of EP submissions for activities that are within or have the potential to impact on the values of an AMP.
Indigenous Land and Sea Corporation	Statutory authority providing assistance for acquiring and managing rights and interests in land, salt water and freshwater country.
National Native Title Tribunal	Commonwealth government authority responsible for administering the native Title Act 1993 (Cth) across multiple functions including reviews, meditations and determinations for: Native title applications, and Indigenous land use agreements (ILUAs)
1b Department or Agency of a State	
Aboriginal Heritage Tasmania	Aboriginal Heritage Tasmania aims to protect and promote Tasmania's unique Aboriginal heritage and facilitate the return of land to Tasmania's Aboriginal people. Aboriginal Heritage Tasmania administers the *Aboriginal Heritage Act 1975*, which establishes the Aboriginal Heritage Council of Tasmania, the *Aboriginal Lands Act 1995*, which establishes the Aboriginal Land Council of Tasmania, and the *Native Title (Tasmania) Act 1994*.
Corangamite Catchment Management Authority	Responsibilities include the protection of estuaries on the southern coast Princetown and Anglesea.
Department of Energy, Environment and Climate Action - Marine &Coasts	Protecting and enhancing our coastline and its waters to support business, tourism, recreation, wellbeing and biodiversity.

Organisation Name	Roles and responsibilities
Department of Energy, Environment and Climate Action: EarthResources Regulation	Regulatory body for oil and gas activities in Victorian waters. Required to be notified of reportable incidents. Commencement and cessation notifications are only required for drilling and seismic surveys.
Department of Infrastructure and Transport - Marine Safety SA	Department taking care of boat and marine safety in South Australian ocean and inland waters.
Department of Natural Resources and Environment Tasmania -Biosecurity	Working to prevent pests and diseases that could cause serious impacts if introduced to Tasmanian waters.
Department of Natural Resources and Environment Tasmania -Conservation	The Conservation Assessment Team provide advice and comment to a range of key regulators and stakeholders on development activities that have the potential to impact on natural values.
Department of Natural Resources and Environment Tasmania -Marine/Fisheries (Fishing Tasmania)	Responsible for commercial and recreational fishing and the protection of the ocean and marine life and Fishing Tasmania.
Department of Natural Resources and Environment Tasmania -Strategic Projects and Policy	Responsible for policy.
Department of Natural Resources and Environment Tasmania -Tasmania Parks and Wildlife Services	Responsible for managing the State's marine reserves.
Department of Premier and Cabinet - Office of Aboriginal Affairs -(Tasmania)	Tasmanian Aboriginal people of Lutruwita/Tasmania have had a deep connection to Country for over 40,000 years. We acknowledge with respect the deep history of Aboriginal peoples continuous connection to Country, Waterways, Sea and Sky Country. With respect we acknowledge and honour Elders, past and present and their knowledges that have been handed down through the generations. We acknowledge Tasmanian Aboriginal people that share cultural knowledges and practices keeping culture and heritage alive. The Office of Aboriginal Affairs is one part of the new Aboriginal Affairs Partnership Division, which sits in the Division of Communities, Partnerships and Priorities within the Department of Premier and Cabinet. The Office of Aboriginal Affairs is the touch point, providing high-level consultation with Tasmania's Aboriginal people, organisations and adviser to the Government on policy issues and impacts affecting Aboriginal people of Tasmania. The Office of Aboriginal Affairs team is a dedicated group of people that support and respect the aspirations and goals of Tasmanian Aboriginal people. The team works with Aboriginal people, organisations, and government to better understand and to deliver their policies and programs effectively in an Aboriginal way. The Government is committed to improving the lives of Aboriginal people through the National Agreement on Closing the Gap the Tasmanian Implementation Plan and the Truth-Telling and Treaty further resetting the relationship further with the Tasmanian Aboriginal people. The role of Office of Aboriginal Affairs is to foster exchange between Aboriginal people and the Government of Tasmania to advise the Minister for Aboriginal Affairs and Cabinet on issues impacting Aboriginal people. In partnership with Aboriginal community-controlled organisations and Aboriginal people lead whole of Government and cross-sectoral change to achieve real outcomes for Aboriginal people in Tasmania.

Organisation Name	Roles and responsibilities
Department of Primary Industries and Regions South Australia -Commercial Fishing	Responsible for protecting aquatic environments, licensing and registration of fisheries and fish processors, fisheries management plans, scientific research and innovation and increasing trade and investment in conjunction with industry.
Department of Transport and Planning: Marine Pollution	Ensures Victoria is adequately prepared for and effectively responds to a marine pollution incident in State coastal waters up to three nautical miles (3 nm) offshore.
Environment Protection Authority (EPA) - South Australia	Protects, restores and enhances the environment through risk-based regulation of pollution, waste, noise and radiation.
Environment Protection Authority (EPA) Tasmania	Control Agency for a Level 1 / 2 / 3 Pollution emergency in Tasmanian waters.
Environment Protection Authority (EPA) Victoria	Independent statutory authority responsible for regulating Victorian Environment Protection legislation. Focussed on onshore activities, not offshore.
First Peoples - State Relations (Victoria)	Group within the Department of Premier and Cabinet, responsible for nation-leading work in the areas of cultural rights, self- determination, treaty and truth – an extensive program of priority work with First Peoples. Stated purpose is "Strengthening and engaging communities and managing and protecting cultural heritage".
First Peoples - State Relations (Victoria)	Group within the Department of Premier and Cabinet, responsible for nation-leading work in the areas of cultural rights, self- determination, treaty and truth – an extensive program of priority work with First Peoples. Stated purpose is "Strengthening and engaging communities and managing and protecting cultural heritage".
Heritage Victoria	Protection of maritime heritage / shipwrecks/submerged cultural heritage
Marine and Safety Tasmania	Marine and Safety Tasmania (MAST) is a statutory authority responsible for the safe operation of vessels, provide and manage marine facilities and manage environmental issues relating to vessels.
Office of the Minister for Environment	Advises the Victorian Cabinet on matters relating to environment protection.
Parks Victoria	Statutory Authority responsible for management of Marine Protected Areas, Marine National Parks, Marine Sanctuaries,Marine and Coastal Parks, Marine Parks and Marine Reserves.
Transport Safety Victoria - Maritime Safety Victoria	Management of marine safety in Victoria. Relevant in relation to fishers entering PSZ.
Victorian Fisheries Authority	Independent statutory authority established to effectively manage Victoria's fisheries resources.
1c Department of the Responsible State Minister	
Department of Energy, Environment and Climate Action	Regulatory body for oil and gas activities in Victorian waters. Required to be notified of reportable incidents. Commencement and cessation notifications are only required for drilling and seismic surveys.
Department of State Growth - Mineral Resources Tasmania	Regulatory body for oil and gas activities in Tasmania waters. Required to be notified of reportable incidents. Commencement and cessation notifications are only required for drilling and seismic surveys.

5.7.2 List of Relevant Persons – 11A(1)(d)

Organisation Name	Type	Functions, Interests or Activities
Name withheld	Commercial Fishing	Commercial fisher.
Atlantis Fisheries Consulting Group	Commercial Fishing	Consulting services to encourage and promote sustainable fishing practices to the commercial fishing industry within Australia.
Australian Southern Bluefin Tuna Industry Association	Commercial Fishing	Peak body representing Southern Bluefin Tuna companies in Australia. The SBTF overlaps the operational area.
Australian Wildcatch Fishing (Corporate Alliance Enterprises)	Commercial Fishing	SESS Fisher.
Bass Strait Scallop Industry Association	Commercial Fishing	No information can be found in relation to the Bass Strait Scallop Industry Association other than it is referenced in the Bass Strait Central Zone Scallop Fishery Management Arrangements Booklet 2019.
Commonwealth Fisheries Association	Commercial Fishing	Peak incorporated association representing associations for the following Commonwealth fisheries that have catch effort within the Planning Area: SESS (Commonwealth South East Trawl Sector, Scalefish Hook Sector and the Shark Hook and Shark Gillnet Sectors). Southern Squid Jig Fishery.
Coorong Wild Seafood	Commercial Fishing	Fisher and processor based in Port Macdonnell that fishes in local waters for Southern Rock Lobster, Ocean Jacket, Southern Bluefin Tuna, Bight Redfish, Flathead, Boarfish, John Latchet, Knifejaw and Yellowtail Kingfish. Also operates Coorong Wildside Tours.
Fishwell Consulting	Commercial Fishing	Research advice and consulting services to encourage and promote sustainable fishing practices to the commercial fishing industry within Australia. General interest in Beach activities and service provider to Beach.
Name withheld	Commercial Fishing	Fishing charter fishing in Portland and Port Phillip Bay.
Muollo Fishing	Commercial Fishing	SESS Fisher.
Mures Fishing	Commercial Fishing	SESS Fisher.
Petuna Sealord Deepwater Fishing Pty Ltd	Commercial Fishing	SESS Fisher.
RHG Fisheries	Commercial Fishing	SESS Fisher.
Richey Fishing Company	Commercial Fishing	Commercial scallop, salmon and squid fisher and marine charter service.
Seafood Industry Australia	Commercial Fishing	The national peak-body representing members from the wildcatch, aquaculture and post-harvest sectors of the Australian seafood industry.
South East Trawl Fishing Industry Association	Commercial Fishing	Incorporated association representing commercial fishers in: Commonwealth South East Trawl Sector; Scalefish Hook Sector; Shark Hook, Shark Gillnet Sectors; small pelagic fishery.
Southern Fishermen's Association Inc.	Commercial Fishing	Represents the interests of Lakes and Coorong commercial fishers and is pro-active in promoting improved environmental management practices in the fishery across a number of areas.

Organisation Name	Type	Functions, Interests or Activities
Southern Shark Industry Alliance (SSIA)	Commercial Fishing	Incorporated association with members from the Southern and Eastern Scalefish and Shark Fishery, Gillnet Hook and Trap.
Sustainable Shark Fishing Association	Commercial Fishing	Represents fishers in the Southern and Eastern Scalefish and Shark Fishery (SESS), Gillnet Hook and Trap fisheries.
Toberfish	Commercial Fishing	Portland based Southern & Eastern Scalefish and Shark fisher.
Tuna Australia	Commercial Fishing	Represents statutory fishing rights for owners, holders, fish processors and sellers, and is an associate member of the Eastern and Western tuna and billfish fisheries.
Women in Seafood Australasia	Commercial Fishing	Women in Seafood Australasia (WISA) is the only national organisation representing women working in the seafood industry.
Ferguson Australia	Commercial Fishing	Fisher and processor based in Port Macdonnell that fishes in local waters for Southern Rock Lobster, Ocean Jacket, Southern Bluefin Tuna, Bight Redfish, Flathead, Boarfish, John Dory, Latchet, Knifejaw and Yellowtail Kingfish.
King Island Seafoods	Commercial Fishing	Wholesale lobster seller.
Scallop Fishermen's Association of Tasmania Inc	Commercial Fishing	The Scallop Fishermen's Association of Tasmania actively promotes and protects the best interests of scallop fishermen and processors and negotiates management and season arrangements with the Tasmanian government, DPIPWE and AFMA.
Tasmania Salmonid Growers Association	Commercial Fishing	Tasmania’s peak body representing salmon growers.
Tasmanian Abalone Council Ltd	Commercial Fishing	Peak industry body representing divers, processors and quota holders.
Tasmanian Rock Lobster Fisherman's Association	Commercial Fishing	Peak body representing licenced Tasmanian rock lobster fishers.
Tasmanian Seafood Industry Council	Commercial Fishing	Peak body representing the interests of wild capture fishers, marine farmers and seafood processors in Tasmania.
Tasmanian Seafoods	Commercial Fishing	Fishes for wild abalone, sea cucumber and other seafoods from around the whole of Tasmania, the south coast of Victoria and Western Australia.
Top Fish Tasmania	Commercial Fishing	Tasmania's only state licenced octopus business, fishing in CWLTH and TAS waters. Also fish lobster and giant crab. Have processing facility in Stanley for value adding to octopus for packaged products. Family run business.
Name withheld	Commercial Fishing	Commercial fisher.
Name withheld	Commercial Fishing	Commercial octopus fisher
Name withheld	Commercial Fishing	Warrnambool based lobster fisher.
Name withheld	Commercial Fishing	Rock lobster fisher based in Portland.
Name withheld	Commercial Fishing	Southern Squid fisher.
Name withheld	Commercial Fishing	Rock lobster fisher active in the Portland area.
Name withheld	Commercial Fishing	Shark and seine fisher based in San Remo.
Name withheld	Commercial Fishing	Port Fairy cray fisher who sells directly to the public. Co-owns Öff the Boat', selling direct to the public.
Name withheld	Commercial Fishing	Lobster fisher based in Apollo Bay

Organisation Name	Type	Functions, Interests or Activities
Lakes Entrance Fishermen's Co-operative	Commercial Fishing	Lakes Entrance is situated in the most strategic position of the very large South East trawl area of Australia, which stretches from the Victorian/South Australia border around to the Northern New South Wales and includes Tasmania.
MacTaggart Marine	Commercial Fishing	Lobster fisher based in Apollo Bay.
Name withheld	Commercial Fishing	Rock lobster fisher based in Warrnambool.
Paaratte Eel Company	Commercial Fishing	Eel fisher licensed to operate in the Curdies River, Curdies Inlet and Gellibrand River.
Name withheld	Commercial Fishing	Lobster fisher based in Port Fairy.
Name withheld	Commercial Fishing	Abalone and shark fisher off Portland.
Port Campbell Lobster	Commercial Fishing	Southern Victorian lobster fisher who sells direct to the public.
Port Campbell Professional Fishermans Association	Commercial Fishing	Representing primarily lobster fishers in Port Campbell and Peterborough. Engage via SIV.
Name withheld	Commercial Fishing	Lobster fisher based in Portland.
Name withheld	Commercial Fishing	Port Fairy home port. Fishes Rock Lobster in Apollo Bay region. Fishes shark long line in Western Zone.
Name withheld	Commercial Fishing	Rock lobster fisherman and member of Apollo Bay Fishermans Co-Op.
San Remo Fishing Co-operative	Commercial Fishing	Philip island and Bass Strait fishing co-op
Seafood Industry Victoria	Commercial Fishing	Peak body representing professional fishing, seafood processors and exporters in Victoria. SIV primary contact for State fishers. Prefers to and can engage all licence holders rather than direct contact by Beach.
South Australian Rock Lobster Advisory Council and South Eastern Professional Fishermen's Association	Commercial Fishing	Promotes the South Australian Rock Lobster Industry, with strong links to the South Eastern Professional Fishermen's Association Inc in the Southern Zone Fishery and also the SA Northern Zone Rock Lobster Fishermen's Association Inc in the Northern Zone Fishery. SARLAC is a major stakeholder in Southern Rock Lobster Limited; the national industry body across all of Southern Australia encompassing the relevant fisheries in South Australia, Tasmania, and Victoria.
Southern Rock Lobster Limited	Commercial Fishing	Administers an industry wide levy that funds research, development, and innovation in Australia's Southern rock lobster fishery, underpinning the sustainable harvest of lobsters from the Southern Ocean.
Name withheld	Commercial Fishing	Declared that they fish in the area.
Name withheld	Commercial Fishing	Lobster fisher based in Portland.
Trinsand Fisheries	Commercial Fishing	Squid jig fishing, scallop fishing (in Bass Strait)
Victorian Scallop Fishermen's Association	Commercial Fishing	Represents the interests of scallop fishers operating within the Bass Strait Central Zone Scallop Fishery, the Victorian Scallop Fishery, and the Tasmanian Scallop Fishery.
Warrnambool Professional Fishermen's Association	Commercial Fishing	Members mainly fish for Rock Lobster between Port Fairy and Port Campbell.
Name withheld	Commercial Fishing	Fishes around the Thylacine platform. Commercial Rock Lobster and crab fisher.

Organisation Name	Type	Functions, Interests or Activities
Wild Life Fisheries	Commercial Fishing	Based in Rye, Mornington Peninsula. Dive and fish in Port Phillip Bay and Bass Strait. Sea urchin, abalone and line caught fish.
Name withheld	Commercial Fishing	Based in Port MacDonnell. Fishes lobster in Victorian waters from Portland to Cape Otway. Fishes giant crab near King Island.
Aboriginal Land Council of Tasmania	Indigenous	The statutory body established under Tasmanian law to own and manage land on behalf of Tasmania's Aboriginal Community.
Boon Wurrung Foundation	Indigenous	Represents the traditional people and custodians of the lands from the Werribee River to Wilson Promontory, proud members of the Kulin People – the Boonwurrung and Woi wurrung, Dja dja warrung, Wadawurrung, Taungurung (not coast)
Bunurong Land Council Aboriginal Corporation	Indigenous	Registered Aboriginal Party for an on behalf of the Bunurong People, with lands and waters across greater Melbourne, Mornington Peninsula, and the Bass Coast.
Burrandies Aboriginal Corporation	Indigenous	Burrandies Aboriginal Corporation has been serving the Indigenous Community of the South East of South Australia since 1999. Having a strong connection with local community members and a team that is committed to ensuring that every Indigenous person has the opportunity to reach their potential to participate in the workforce with dignity and pride.
Circular Head Aboriginal Corporation	Indigenous	CHAC is governed by the Corporations Aboriginal and Torres Strait Islander (CATSI) Act. As a registered Aboriginal organisation, CHAC is regulated by the Office of the Registrar of Indigenous Corporations (ORIC) as per the CATSI Act.
Eastern Maar Aboriginal Corporation	Indigenous	Registered Aboriginal Party. Native Title Holders along with Gunditj Mirring Traditional Owners Aboriginal Corporation. Eastern Maar Traditional Owner Settlement Agreement claim area includes Sea Country adjacent the project Planning area. Interests include the protection of Sea Country. However formal Sea Country management activities, alongside government agencies do not currently exist in the Planning Area.
First Nations Legal & Research Services Ltd	Indigenous	Native Title Service Provider provider for Victorian Traditional Owners.
First Peoples Assembly of Victoria	Indigenous	Independent and democratically elected body to represent Traditional Owners and Aboriginal and Torres Strait Islanders in Victoria.
Flinders Island Aboriginal Association Inc	Indigenous	An Aboriginal Community Controlled Organisation. Established in 1971 by a local Aboriginal group, FIAAI is governed by an Aboriginal Board of Management, elected by the local community.
Gunaikurnai Land and Waters Aboriginal Corporation	Indigenous	Recognition and settlement agreement under the Traditional Owner Settlement Act Victoria that does not require recognition or extinguishment of native title under the Native Title Act 1993 (Cth), but provides for the State's recognition of a group of people as the traditional owners for a particular area together with other benefits.
Gunditj Mirring Traditional Owners Aboriginal Corporation	Indigenous	Registered Aboriginal Party. Native Title Holders with Eastern Maar Aboriginal Corporation.
Land and Sea Aboriginal Corporation Tasmania	Indigenous	Land and Sea Aboriginal Corporation Tasmania

Organisation Name	Type	Functions, Interests or Activities
Tasmanian Aboriginal Centre	Indigenous	Represents the political and community development aspirations of the Tasmanian Aboriginal community.
Wadawurrung Traditional Owners Aboriginal Corporation	Indigenous	Registered Aboriginal Party for Wadawurrung country ranging from Aireys Inlet to Werribee South.
Name withheld	Indigenous	A Gunditjmara woman, who is part of the Southern Ocean Protection Embassy Collective, led by Gunditjmara Elders and Mob in Protection of The Southern Ocean and Gunditjmara Sea Country.
ConocoPhillips	Business	Oil and Gas industry in offshore Otway Basin.
Cooper Energy	Business	Oil and Gas industry in offshore Otway Basin. Has current permit areas within the Planning Area but no infrastructure or operations.
Lochard Energy	Business	Oil and Gas industry in onshore Otway Basin and owns the Iona Gas Plant in Port Campbell.
Schlumberger Australia Pty Ltd	Business	Seismic survey operations, may occur in Otway Basin
TGS (previously Spectrum Geo)	Business	Seismic survey operations, may occur in Otway Basin
Apollo Bay Chamber of Commerce	Business	Partners with local businesses to do better business and promote the local area through events and promotion.
One Gippsland	Business	One Gippsland a peak regional advocacy body representing this diverse region. We aim to connect the dots between government, business and community, while also collectively working together to champion the interests of our region and o
Savour King Island	Business	Organises the Festival of King Island
Aventus Consulting	Business	Aventus specialises in providing environmental, safety and well integrity approvals and advice, auditing to the upstream petroleum and broader energy industry, covering all onshore and offshore activities.
Coastal Planning	Business	Specialises in VCAT appeals, development applications, subdivision applications, strategic planning, panel hearing submissions and general statutory planning advice. Services the Great Ocean Road and Otways.
Name withheld Photography	Business	Photographer/drone licence holder in marine parks.
Watersure, Victorian Desalination Plant	Business	Operator of desalination plant providing quality drinking water to the Victorian community.
Esso	Business	Adjacent titleholder in Otway Basin through former operatorship of Minerva Gas Plant.
Apollo Bay Landcare	Environmental Conservation Groups	The group has a strong focus on local environmental issues such as monitoring the nests of the endangered Hooded Plover.
Australian Coastal Society - Victorian Chapter	Environmental Conservation Groups	Contributes to a number of coastal and marine policy reforms happening in Victoria via working groups and submissions.
Australian Conservation Alliance	Environmental Conservation Groups	The Australian Conservation Alliance (ACA) is an organisation comprised of young professionals who advocate for and advance ambitious market-based climate law and policy.
Australian Conservation Foundation	Environmental Conservation Groups	The ACF brings people together to have the biggest possible impact for nature and climate solutions. Advocate against drilling and fracking for gas that could destroy sacred sites.

Organisation Name	Type	Functions, Interests or Activities
Australian Marine Conservation Society	Environmental Conservation Groups	Scientists working with research centres around the globe and conservation experts safeguarding the future of Australian oceans.
Beach Patrol 3280	Environmental Conservation Groups	A volunteer organisation keeping Warrnambool's beaches clean of washed up plastic and rubbish.
Beyond Gas Network	Environmental Conservation Groups	The Beyond Gas Network is a volunteer network of grassroots climate action network. Focus on educating community about the scale and impact of expansion plans proposed by the gas industry to encourage lobbying of state and federal government.
Environment Tasmania	Environmental Conservation Groups	Work with communities on campaigns and initiatives to protect Tasmania's natural environment.
Environment Victoria	Environmental Conservation Groups	Independent charity funded by donations. A community of 40 grassroots member groups and over 200,000 supporters. Campaigning to solve the climate crisis and build a thriving, sustainable society that protects and values nature.
Fight for the Bight	Environmental Conservation Groups	Goal is to protect the Great Australian Bight from exploitation by Big Oil
Friends of Bay of Islands Coastal Park	Environmental Conservation Groups	A community group preserving native vegetation, revegetating, and removal of exotic invasive species.
Friends of the Earth - Melbourne Chapter	Environmental Conservation Groups	Currently running a "No more gas" campaign.
Greenpeace	Environmental Conservation Groups	Have a "Breaking free from fossil fuels" campaign.
International Fund for Animal Welfare	Environmental Conservation Groups	Global non-profit helping animals and people thrive together. Run various programs including marine mammal rescue and research, and marine conservation.
King Island Landcare	Environmental Conservation Groups	Delivers a wide range of environmental/agricultural projects.
Marine Mammal Foundation	Environmental Conservation Groups	Aims to protect the marine environment - for mammals like Southern Right Whales - through research, community engagement, and education. Supported by the Australian Government.
OceanWatch Australia	Environmental Conservation Groups	OceanWatch Australia is a national not-for-profit environmental company that works to advance sustainability in the Australian seafood industry.
Otway Climate Emergency Action Network (OCEAN)	Environmental Conservation Groups	Community group against seismic testing and gas exploration in the Otway Basin.
Port Campbell Community Group	Environmental Conservation Groups	Volunteer group focussed on environment protection of local fauna.

Organisation Name	Type	Functions, Interests or Activities
Protect the West	Environmental Conservation Groups	Interested in SW Vic environment issues.
Surfers For Climate	Environmental Conservation Groups	A sea-roots movement dedicated to positive climate action and heads the campaign 'Don't Drill the Otways'.
Surfrider Foundation Australia	Environmental Conservation Groups	Not-for-profit dedicated to the protection of Australia's waves and beaches through conservation, activism, research and education.
Victorian National Parks Association	Environmental Conservation Groups	VNPA is an independent, non-profit, membership-based group that protects Victoria's unique natural environment and biodiversity through the establishment and effective management of national parks, conservation reserves and other measures. Includes marine parks.
Warrnambool Coastcare Landcare Network	Environmental Conservation Groups	Improving biodiversity in Warrnambool and district and an advocate for the protection of the natural environment.
Wilderness Society Tasmania	Environmental Conservation Groups	Interest in environmental impacts. Against any gas development.
Wilderness Society Victoria	Environmental Conservation Groups	Interest in environmental impacts of activities.
Apollo Bay Police and Ocean Rescue	State Government	Apollo Bay Police activates the ocean rescue volunteer group.
MLC, Member for Western Victoria	State Government	Member of the Victorian Parliament, Legislative Council. Electorate includes South West Victoria.
South Gippsland Shire Council	Local Authorities	Local government area in Gippsland.
Cardinia Shire Council	Local Authorities	Local government area in the south-east of Melbourne between Western Port and the Yarra Ranges.
Bass Coast Shire Council	Local Authorities	Local government area located in the south eastern part of the Victoria.
Burnie City Council	Local Authorities	Local government area in the north-west of Tasmania.
Circular Head Council	Local Authorities	A rural local government body in Tasmania covering the far north-west mainland. Major towns and localities include Arthur River, Marrawah and Stanley, with Smithton being the largest and principal town.
City of Port Phillip	Local Authorities	Local government area on the northern shores of Port Phillip.
Colac Otway Shire Council	Local Authorities	Local government area in the Barwon South West region of Victoria. Opposed to seismic testing for oil and gas in the Otway Basin.
Corangamite Shire Council	Local Authorities	Local government area in the Barwon South West region of Victoria.
District Council of Grant	Local Authorities	Local government area in the Limestone Coast region of South Australia,
East Gippsland Shire Council	Local Authorities	Local government area in Gippsland, Victoria.
Flinders Council	Local Authorities	Flinders Council includes the communities within the Furneaux Group and the islands of eastern Bass Strait up to the Victorian border, including the Hogans Group and the Deal Island Group.

Organisation Name	Type	Functions, Interests or Activities
Glenelg Shire Council	Local Authorities	Local government area including the towns of Casterton, Heywood, Merino and Portland.
Great Ocean Road Coast and Parks Authority	Local Authorities	Delivers better protection and management of the iconic coast and parks of Victoria's Great Ocean Road.
Greater Geelong Council	Local Authorities	Local government area in the Barwon South West region of Victoria.
King Island Council	Local Authorities	Local government body in Tasmania, encompassing King Island.
Mornington Peninsula Shire Council	Local Authorities	Local government area in south eastern Metropolitan Melbourne, Victoria.
Moyne Shire Council	Local Authorities	Local government area in the Barwon South West region of Victoria.
Robe District Council	Local Authorities	Local government area located in the Limestone Coast area of South Australia.
Surf Coast Shire Council	Local Authorities	Local government area in the Barwon South West region of Victoria. Opposed to oil and gas development in the Otway Basin.
Waratah Wynyard Council	Local Authorities	Waratah-Wynyard north- west Tasmania, includes the coastal towns and villages of Wynyard, Somerset, Boat Harbour and Sisters Beach, the rural town of Yolla and the former mining towns of Waratah and Corinna
Wattle Range Council	Local Authorities	Local government area located in the Limestone Coast area of South Australia.
Wellington Shire Council	Local Authorities	Local government area in eastern Victoria.
East Gippsland Catchment Management Authority	Local Authorities	The Authority is one of ten Catchment Management Authorities throughout Victoria established under the Catchment and Land Protection Act 1994 and the Water Act 1988.
Gippsland Ports	Local Authorities	Gippsland Ports' designated waters stretch over 720 kms from Anderson Inlet to Mallacoota on the south-eastern coastline of Victoria at: Mallacoota Inlet, Snowy River (Marlo), Gippsland Corner Inlet and Port Albert, Anderson Inlet (Inverloch) and four waterways: Lake Tyers, Shallow Inlet, Tamboon Inlet and Sydenham Inlet.
Glenelg Hopkins Catchment Management Authority	Local Authorities	The Authority managing inland waterways, as well as the health of estuaries in the region– analysing water levels and quality, and weather conditions for potential closures and re-openings.
Otway Water	Local Authorities	Strong interest in groundwater extraction.
West Gippsland Catchment Authority	Local Authorities	Manage land and water resources in the West Gippsland region
AusOcean	Education and Research Organisations	Australian Ocean Lab (AusOcean) mission is to help our oceans through technology. Develop and apply open source ocean technology to help solve ocean science and conservation challenges.
Blue Whale Study Inc	Education and Research Organisations	Primary research into the ecology of endangered blue whales in south-east Australia.
Deakin University - School of Life and Environmental Sciences	Education and Research Organisations	Research interests in various environment values and sensitivities and support for further research programs with common interests.
King Island Marine Research	Education and Research Organisations	Lobster breeding - research and development.

Organisation Name	Type	Functions, Interests or Activities
Dolphin Research Institute	Education and Research Organisations	DRI's research is focused primarily in the south-eastern region of Victoria, especially Port Phillip, Western Port and the Gippsland Lakes.
Fisheries Research and Development Corporation	Education and Research Organisations	A co-funded partnership between the Australian Government and the fishing and aquaculture sectors, to plan and invest in fisheries research, development and extension activities in Australia.
Institute for Marine and Antarctic Studies, University of Tasmania	Education and Research Organisations	A collaborative research body in marine and Antarctic science between the University of Tasmania, CSIRO Marine and Atmospheric Research, the Australian Antarctic Division and other agencies. Research interests in various environment values and sensitivities and support for further research programs with common interests.
Kina Commercial Diving	Marine Based Industries	Kina Diving specialises in commercial and scientific diving and marine services which include underwater inspection and construction, ship surveys and repair, fishery and environmental surveys, instrument deployment and recovery, project design and management, salvage services and vessel charter.
Star of the South	Marine Based Industries	Offshore Wind developer in Bass Strait.
Kelp Industries Pty Ltd	Marine Based Industries	Source bull kelp from the shores of King Island and process it at their mill. Most product shipped to Norway where alginates are extracted.
TasKelp	Marine Based Industries	Source bull kelp from the shores of King Island and the West Coast of Tasmania and process it at their mill. Product shipped to Scotland where alginates are extracted.
Bass Strait Freight	Marine Based Industries	Bass Strait Freight is a shipping company based in Bridport, a small coastal town, on the North-East Coast of Tasmania. Bridport's close proximity to Flinders Island make it ideally suited to provide regular services to the Furneaux Group of Islands, including Flinders Island, Cape Barren Island and 'as required services' to King Island and Port Welshpool (Victoria).
Bass Strait Transport	Marine Based Industries	Operate a comprehensive freight consolidation and transport service between Mainland Australia and Tasmania daily, specialising in general, time-sensitive, hazardous, and out of gauge/oversize freight
CRE Solutions	Marine Based Industries	Specialising in Trans-Bass (Bass Strait) movements from/to mainland Australia and Tasmania.
Currie Cargoes	Marine Based Industries	Cargo shipping between King Island and Melbourne and King Island and Devonport.
Eastern Line Shipping	Marine Based Industries	Ship cattle to and from King Island and also ship freight from Stanley plus out of Welshpool in Victoria.
Freight Connections	Marine Based Industries	Tasmanian cargo services.
Fresh Freight Tasmania	Marine Based Industries	Operate a door-to-door freight forwarding between Tasmania and Mainland Australia, 7 days a week.
King Island Shipping Group	Marine Based Industries	A new group of community, industry and government representatives who have an interest in improving King Island's shipping and freight services.
Port Anthony	Marine Based Industries	Shipping facility located east of Melbourne in Corner Inlet.
Port of Port Fairy	Marine Based Industries	Operated and managed by Moyne Shire Council, the port is used by commercial fishing enterprises and recreational boaters and anglers. Situated on the Moyne River in Port Fairy.

Organisation Name	Type	Functions, Interests or Activities
Port of Portland	Marine Based Industries	Strategically located on the south-west coast between Melbourne and Adelaide, the Port of Portland is Victoria's only naturally deep-water port, providing a logistics gateway to the rest of Australia and the world, with connectivity to national and rail networks.
Qube Ports	Marine Based Industries	Impact on shipping
SeaRoad Holdings Pty Ltd	Marine Based Industries	Sea freight services. Operate in Bass Strait.
Spirit of Tasmania	Marine Based Industries	Sails from the Port of Melbourne to Devonport. The ferry crosses Port Phillip Bay and Bass Strait and they travel at both day and night time.
Tasports	Marine Based Industries	Takes care of Tasmania's passenger, cargo and community ports. Also runs Bass Island Line; a dedicated shipping service for the King Island community offering a weekly direct service from Devonport.
Toll Group	Marine Based Industries	The Toll Group is an Australian transportation and logistics company with operations in road, rail, sea, air and warehousing. Their sea routes go through Bass Strait region. Toll Shipping transport goods from Melbourne to Tasmania, straight through our permit areas for Prion, also Trefoil Seabed Assessment area.
Basslink	Marine Based Industries	Subsea cable in Bass Strait within the Bass Operational Area.
BW Digiital	Marine Based Industries	Subsea cable in Bass Strait, Hawaiki Nui Project outside of the Operational Areas.
Marinus Link	Marine Based Industries	Marinus Link is a proposed 1500 megawatt capacity undersea and underground electricity connection to further link Tasmania and Victoria as part of Australia's future electricity grid. The cable is located outside of the Operational Areas.
Optus	Marine Based Industries	Telecommunications
Superloop	Marine Based Industries	Owns the subsea Indigo Central communications fibre cable that connects Singapore to Perth to Sydney and is within the Otway Operational Area.
Telstra	Marine Based Industries	Telstra Corporation Limited is an Australian telecommunications company which builds and operates telecommunications
MP, Federal Member for Braddon	Commonwealth Government	Member of the Australian Parliament, House of Representatives. Electorate includes King Island.
MP, Federal Member for Wannon	Commonwealth Government	Member of the Australian Parliament, House of Representative. Electorate includes South West Victoria.
French Island Community Group	Community	French Island is an unincorporated territory with no local government. Instead, the community manages its own affairs as well as some public facilities.
Lang Lang Gas Plant Environment Liaison Group	Community	Activities associated with the Lang Lang Gas Plant. Linda manages and does half yearly (6 months) meetings with the group. Basis for determination of relevant persons: Activity or impact to Lang Lang Gas Plant. Beach may send information on offshore activities to individual members if requested.
Lang Lang District Business and Community Group	Community	Work collectively to enable opportunities that enrich the lives of our diverse community
Port Fairy Boardriders	Community	A social surfing group that also works on local environmental projects.
Timboon Action Group	Community	Volunteer group committed to the promotion and development of the town and community.

Organisation Name	Type	Functions, Interests or Activities
Name withheld	Community	Lobster fisher.
Name withheld	Community	Interests in local environment.
12 Apostles Helicopters & Port Campbell Heliport	Tourism/Recreation	Port Campbell based tourism operator that offers helicopter flights over the 12 Apostles area.
Apollo Bay Dive Centre and Surf n Fish	Tourism/Recreation	Ocean based activities for locals and visitors.
Apollo Bay Fishing Charters	Tourism/Recreation	Ocean based activities for locals and visitors.
Apollo Bay Surf & Kayak	Tourism/Recreation	Ocean based activities for locals and visitors.
Apollo Bay Visitor Information Centre	Tourism/Recreation	Providing information for tourists to the region.
Australian Recreational Fishing Foundation	Tourism/Recreation	The Australian Recreational Fishing Foundation is the peak representative body to the Australian Federal Government.
Dive Industry Association of Australia	Tourism/Recreation	Encourages the exchange of ideas and information on diving- related issues; to seek solutions to matters of common concern, and to offer practical advice and support to its constituent membership.
Far Out Fishing Charters	Tourism/Recreation	Far Out operates Off-Shore Fishing Charters in Lakes Entrance. Off-shore fishing for Gummy Shark, Snapper, Mako Sharks or Flathead.
Gamefishing Association of Australia	Tourism/Recreation	Peak body for recreational gamefishers.
King Island Boat Club	Tourism/Recreation	Based at Grassy Harbour, and the finish to the annual Queenscliff to Grassy Yacht Race.
Long Jetty Prom Cruises	Tourism/Recreation	Offshore tourism activity.
Mersey Yacht Club	Tourism/Recreation	Yacht club based in Devonport TAS. Hosts ocean racing events Melbourne to TAS.
Ocean Racing Club of Victoria	Tourism/Recreation	Various ocean racing events from Brighton.
Outthere Outdoor Activities	Tourism/Recreation	Sea Kayaking and snorkelling.
Port Campbell Visitor Information Centre	Tourism/Recreation	Providing information for tourists to the region.
Port Fairy Yacht Club	Tourism/Recreation	The Club conducts yacht racing offshore from Port Fairy and Portland in the southern ocean and Bass Strait, including hosting the Ocean Racing Victoria " Queenscliff to Port Fairy. Club members also compete in the Melbourne Hobart and Melbourne King Island races and are involved in the Clean Oceans initiative and therefore have an interest in the area.
Port Fairy Angling Club	Tourism/Recreation	Recreational angling club for Port Fairy.
Portland SCUBA	Tourism/Recreation	Offers open water diving courses around Portland.
Portland Sport Fishing Club	Tourism/Recreation	Mainly fish on the open ocean near Portland but also fish the Victorian championships in Gippsland.
Portland Yacht Club	Tourism/Recreation	Members sail inside the harbour as well as access ocean sailing in and around Portland Bay.
RecFish West	Tourism/Recreation	Peak body representing game fishers in WA.
Royal Yacht Club of Tasmania	Tourism/Recreation	Yacht club involved in local (Hobart / river) and ocean sailing activities and events.

Organisation Name	Type	Functions, Interests or Activities
SCUBA Divers Federation of Victoria	Tourism/Recreation	Peak body representing over 25 amateur dive clubs reaching 2500 members.
South Gippsland Yacht Club	Tourism/Recreation	Recreational activity.
Southern Coast Charters	Tourism/Recreation	Marine tourism activity.
Surfcoast Anglers	Tourism/Recreation	A Facebook page dedicated to recreational anglers on Victoria's surf coast and beyond.
TARFish	Tourism/Recreation	Tasmania recreational fishing peak body. Able to communicate on our behalf to all licenced recreational fishers.
Timboon Recreational Fishing Club	Tourism/Recreation	Regional recreational fishing club accessing the Port Campbell jetty boat launch facility.
VR Fish	Tourism/Recreation	Victorian recreational fishing peak body. Able to communicate to all licenced recreational fishers.
Warrnambool Yacht Club	Tourism/Recreation	Only operates in Lady Bay, no ocean racing.
MP, Tasmanian Member for North West, West Coast and King Island	State Departments/Agencies	Member of the Tasmanian Parliament, House of Assembly and Minister for Resources. Electorate includes King Island.
MLC, Member for Western Victoria	State Departments/Agencies	Member of the Victorian Parliament, Legislative Council. Electorate includes South West Victoria.
Office of the Member for Northern Victoria Region	State Departments/Agencies	Member of the Victorian Parliament, Legislative Council.
Office of the Member for Polwarth	State Departments/Agencies	Member of the Victorian Parliament, Legislative Assembly. Electorate includes the Otways and Great Ocean Road.
Office of the Member for South West Coast	State Departments/Agencies	Office of the Member of the Victorian Parliament, Legislative Assembly. Electorate spans from Portland to Warrnambool.
Office of the Member for Western Victoria	State Departments/Agencies	Member of the Victorian Parliament Legislative Council. Electorate includes South West Victoria.
State Member for Western Victoria Region	State Departments/Agencies	Upper House Member of the Victorian Parliament.
State Member for Western Victoria Region	State Departments/Agencies	Upper House Member of the Victorian Parliament.
Victorian Marine and Coastal Council	State Departments/Agencies	The state’s peak advisory body providing independent advice on marine and coastal issues to the Minister for Energy, Environment and Climate Change.
MP State Member for Port Adelaide	State Departments/Agencies	Deputy Premier and Minister for Climate, Environment and Water
Game On Charters	Marine Tourism	Portland based fishing charter targeting Bluefin tuna, gummy shark, big flat head, snapper and nannygai fish.
Go Surf School	Marine Tourism	Ocean based activities for locals and visitors.
Gone Fishing Charters	Marine Tourism	Fishing charter that fishes in Portland (tuna) and Queenscliff (king fish, snapper, gummy shark).
King Island Surf Safaris	Marine Tourism	Ocean based activities for locals and visitors.
King Island Tours	Marine Tourism	Ocean based activities for locals and visitors.
Lakes Entrance Offshore Charters	Marine Tourism	Offers skippered boat charters, fishing trips, crabbing as well as sightseeing charters in the Bass Strait where they catch snapper, gummy shark, flathead and a range of ocean reef fish.
Port Campbell Boat Charters	Marine Tourism	Fishing and diving charter services. Currently in hiatus but would like to be kept informed of Beach projects.
Pro Red Fishing Charters	Marine Tourism	Charters in and around Melbourne in Port Phillip Bay, Westernport Bay, Bass Strait, and Portland.

Organisation Name	Type	Functions, Interests or Activities
Pro-line Fishing Charters	Marine Tourism	Operating from the Southern Ocean, Bass Strait and Port Philip Bay region.
Reel Time Fishing Charters	Marine Tourism	Seasonally running two vessels in Melbourne's Port Phillip Bay. Snapper/King George Whiting/Squid, Western Port Bay's Gummy Shark's and the Southern Ocean of Portland and it's Blue Fin Tuna.
Salty Dog Charters	Marine Tourism	Marine tourism activity.
Sea Myth Fishing Charters	Marine Tourism	Deep sea charters.
Sharkmen Charters	Marine Tourism	Fishing charter operating tours from Melbourne to Portland.
South West Fishing Charters	Marine Tourism	South West Charters offers Deep Sea Fishing, Game Fishing, Bay Fishing, Whale watching, Diving Service
Think Big Fishing Charters	Marine Tourism	Fishing charter for Snapper, Whiting, Gummy Shark, Squid
Wildlife Coast Cruises	Marine Tourism	Licensed tour operator Corner Inlet Marine and Coastal Park.
Great Ocean Road Regional Tourism	Tourism and Business Associations	Independent peak body for tourism operators along the Great Ocean Road and Surf Coast.
King Island Chamber of Commerce	Tourism and Business Associations	Supporting local businesses, with the ability to share information to members.
King Island Regional Development Organisation	Tourism and Business Associations	Supports the development of lifestyle, employment, tourism, and events on King Island.
King Island Tourism/Visitor Information Centre	Tourism and Business Associations	Providing information for tourists to the region.
Port Campbell Progress Association	Tourism and Business Associations	Volunteer group with a focus on local business, sustainable development, and new initiatives.
Twelve Apostles Tourism and Business Group	Tourism and Business Associations	A membership-based organisation that provides leadership for the development and facilitation of local tourism and business initiatives.
Warrnambool Visitor Information Centre	Tourism and Business Associations	Providing information for tourists to the region.
Apollo Bay Surf Life Saving Club	Volunteer Emergency Services	Responsible for keeping local beaches safe and responding to local rescues.
Beachport Surf Life Saving Club	Volunteer Emergency Services	Responsible for keeping local beaches safe and responding to local rescues.
Lakes Entrance Surf Life Saving Club	Volunteer Emergency Services	Responsible for keeping local beaches safe and responding to local rescues.
Port Campbell Surf Life Saving Club	Volunteer Emergency Services	Responsible for keeping local beaches safe and responding to local rescues.

Organisation Name	Type	Functions, Interests or Activities
Port Fairy Surf Life Saving Club	Volunteer Emergency Services	Responsible for keeping local beaches safe and responding to local rescues.
Portland Surf Life Saving Club	Volunteer Emergency Services	Responsible for keeping local beaches safe and responding to local rescues.
Seaspray Surf Life Saving Club	Volunteer Emergency Services	Responsible for keeping local beaches safe and responding to local rescues.
Venus Bay Surf Life Saving Club	Volunteer Emergency Services	Responsible for keeping local beaches safe and responding to local rescues.
Warrnambool Surf Life Saving Club	Volunteer Emergency Services	Responsible for keeping local beaches safe and responding to local rescues.
Wonthaggi Surf Life Saving Club	Volunteer Emergency Services	Responsible for keeping local beaches safe and responding to local rescues.
Woolamai Beach Surf Life Saving Club	Volunteer Emergency Services	Responsible for keeping local beaches safe and responding to local rescues.
Wye River Surf Life Saving Club	Volunteer Emergency Services	Responsible for keeping local beaches safe and responding to local rescues.

5.7.3 List of Other Persons – 11A(1)(e)

Beach has identified the following persons or organisations as a relevant person under regulation11A(1)(e).

Organisation Name	Type	Functions, Interests or Activities
3D Oil Ltd	Marine Based Industries	Oil and Gas industry in offshore Otway Basin. Has current permit areas within the Planning Area but no infrastructure or operations.
Australian Petroleum Production and Exploration Association	Marine Based Industries	APPEA is the voice of the oil and gas industry on the issues that matter, working collaboratively with industry and the community.
Apollo Bay Fishing and Adventure Tours	Tourism/Recreation	Ocean based activities for locals and visitors.
Apollo Bay Sailing Club	Tourism/Recreation	Provides a wide range of sailing and racing opportunities to a diverse range of abilities and age groups.
Pioneer Kayaking	Tourism/Recreation	Marine tourism business based around Phillip Island.
Spindrift International Guiding	Tourism/Recreation	Sea kayaking licensed operator within Victorian marine and coastal park
Australian Communications and Media Authority	Commonwealth Government	Australian government agency responsible for the regulation of broadcasting the internet, radio communications and telecommunications. Relevant stakeholder to obtain information in relation to subsea cables or if predicted impact to subsea cables.
Australian Border Force - Maritime Border Command	Commonwealth Government	Responsible for maritime security. Deters and prevents illegal activities in the Australian Marine Domain.
National Offshore Petroleum Safety Environment Management Authority (NOPSEMA)	Commonwealth Government	Regulator for health and safety, structural (well) integrity and environmental management for all offshore oil and gas operations and greenhouse gas storage activities in Commonwealth waters, and in coastal waters where regulatory powers and functions have been conferred.
CO2CRC	Business	A carbon capture and storage research organisation, with its Otway International Test Centre in Nirranda South.
Australian Oceanographic Services Pty Ltd	Business	Services to offshore energy development companies.
Frying Nemo Fish and Chips	Business	Local tourism trade.
Grassroots Deli Cafe	Business	Local tourism trade.
Great Ocean Road Tourist Park	Business	Accommodation providers in Peterborough.
Peterborough General Store and Takeaway Food	Business	Local tourism trade.
Peterborough Golf Club	Business	Golf club for locals and tourists.

Organisation Name	Type	Functions, Interests or Activities
Peterborough House	Business	Accommodation services.
Peterborough Licensed grocers	Business	Local tourism trade.
Port Campbell Hotel	Business	Local tourism trade.
Port Campbell Take Away	Business	Local tourism business
Port Campbell Trading Co.	Business	Local tourism business
Port Central Apartments	Business	Local tourism business
Port O' Call Motel	Business	Local tourism business
REAL Pizza Pasta Salads	Business	Local tourism business
Sea Foam Villas Port Campbell	Business	Local tourism business
South West Regional Executive Forum	Business	A forum of local business owners and Government leaders who meet monthly.
Waves Cafe, Bar and Restaurant	Business	Local tourism trade.
Otway Gas Plant Community Reference Group	Community	Ongoing community representation to receive activity updates on Beach’s operations and projects, and have the opportunity to ask questions, raise concerns, and seek feedback. The CRG meets every 4 months, Beach tables reports on operations, projects, safety and environment performance, and social performance initiatives.
Peterborough Residents Association	Community	Volunteer community development and / or environment protection groups in towns adjacent planning area.
Port Campbell Board Riders Association	Community	Surfing and advocating for healthy oceans.
Port Campbell Rifle Range	Community	Local sporting club.
Name withheld	Community	Made a comment during the public comment period for Artisan Drilling EP.
Office of the Minister for Agriculture and Minister for Regional Development	State Departments Government	Advises the Victorian Cabinet on matters relating agriculture and regional development.
The Centre for Marine Socioecology	Environmental Conservation Groups	The CMS addresses the current and future use of Australia's marine coasts and oceans. CMS is a collaboration between the University of Tasmania and the Scientific and Industrial Research Organisation (CSIRO), with support from the Australian Antarctic Division.

5.8 Sufficient Information

5.8.1 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 (short copy, long copy, questions and answers, diagrams, 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 5-6 in chronological order. Copies of information are provided are in Appendix H.

Table 5-6: Provision of Sufficient Information

Information Type	Purpose	Key Content	Relevant Person Focus	Date
OGV Project Summary Information Sheet. Accompanying email.	Introduce context and overview of a range of activities in the OGV Project, including Seabed Assessments, that will require consultation for development of different EPs. Commence review of relevant persons.	• Project overview • Phases & timings • Maps • Regulations • Consultation purpose • How to find out more & consult with Beach • Advice regarding sensitive information.	All in BeachConnect database assigned by Beach to OGV Project as potential relevant persons, or 11A(1)(e)	29/05/2023
Beach website.	Information on Beach website provides opportunity for new relevant persons to seek information, self-identify and request consultation.	• OGV Project overview • OGV Project information sheet including Seabed Assessment activity summary.	New potential relevant persons.	29/05/2023
Seabed Assessment Information Sheet. Accompanying email. Beach website updated.	Provide sufficient information on the Seabed Assessment activities to enable potential relevant persons to contact Beach to seek further information or consult with Beach. Email to introduce Seabed Assessment information sheet. Invited participation in Beach's community drop-in information sessions.	• Project overview • Phases & timings • Maps • Activity descriptions • Activity diagrams • Environment description • Regulatory approvals • Maritime safety • Q&As on key concerns • How to find out more & consult with Beach • Drop-in information session dates, times, locations	Any organisations or individuals whose functions, interests or activities may be affected by the activity in the EP. Issued to all in BeachConnect *(if not opted out).*	14/07/2023
Public Notice Advertisements: Information Sessions. Webinar.	Announce OGV Project including Seabed Assessments to unknown potential relevant persons, advise how to find out more, invite consultation, advise public Beach information sessions.	• Start of planning and consultation for OGV Project, including and Seabed Assessments • Consultation purpose • Information sessions • QR code for more info	Unknown potential relevant persons in regional locations adjacent activity areas and areas of the drop-in information sessions.	July, September, October 2023 *(see schedule below)*

Information Type	Purpose	Key Content	Relevant Person Focus	Date
Public Notice Advertisements: Relevant persons identification.	Encourage unknown relevant persons who may be impacted to consult with Beach.	• Project purpose • Activities and timings • EPs and regulations • Consultation purpose • QR code for more info	Unknown potential relevant persons in regional locations adjacent activity areas.	July, September, October 2023 *(see Advertising schedule below)*
Radio Advertisements	Encourage unknown relevant persons who may be impacted to consult with Beach.	30 second commercial with overview of OGV Project over several phases, inviting consultation, how to contact Beach.	Unknown potential relevant persons in regional locations adjacent activity areas.	October 2023 *(see Advertising schedule below)*
Drop-in information sessions	Provide opportunity to consult with Beach technical staff and ask questions or raise concerns. Locations are focussed on community towns adjacent the activity areas.	• Attended by Beach technical staff from environment, drilling, Seabed Assessment project manager and community team. • Information sheets provided. • Posters of maps and diagrams shown.	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.	July, August, September 2023 *(See summary of information sessions dates, locations and outcomes below)*
Updated Seabed Assessment Information Sheet. Accompanying email. Beach website.	Further invitation to consult. Provide updated information sheet. Email to invite participation in further Beach community drop-in information sessions.	• Updated map of operational area in Otway Basin • Emergency planning information • Drop-in information session dates, times, locations	Key focus is for relevant persons whose functions, interests or activities may be affected by the activity in the EP. Issued to all relevant persons in BeachConnect.	22/08/2023
Engage Beach online hub	Dedicated engagement website to deliver project and EP consultation information with streamlined navigation, content delivered in multiple different formats, providing another channel to facilitate feedback and inquiry from relevant persons. A prominent link to Engage Beach was included on the home page of Beach's corporate website.	• Long and short content • Q&A on common concerns • Maps • Diagrams • Summary table of risks, impacts, controls for Seabed Assessment Activities • Downloadable information sheets • Purpose of consultation • Questions and feedback form • Invitation to identify functions, interests or activities and join mailing list	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 potential relevant persons who can request further information and register for ongoing consultation.	10/10/2023

Information Type	Purpose	Key Content	Relevant Person Focus	Date
Email	Additional consultation opportunity. Announce Engage Beach online hub. Webinar details.	• Invitation to participate in Seabed Assessment Webinar hosted by Beach technical staff. • Reminder of purpose of consultation. • Link to Engage Beach online hub. • EP will be submitted end of October. • Further EPs will be developed for OGV Project phases.	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 more information or to ask questions.	11/10/2023
Online Webinar	Provide additional opportunity for consultation and to engage with Beach technical staff about the activities.	• Presentation including: o OGV Project overview o Seabed assessment activities o Emergency response planning • Q&A session	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 more information or to ask questions.	17/10/2023
Fair Ocean Access Information Sheet	Simple explanation of Beach's fishers compensation protocol	• Summary of protocol • How to find out more information	Potentially impacted commercial fishers	Provided to commercial fishers on request

5.8.2 Information Sessions & Webinar

Beach advertised and held eight regional community drop-in sessions, 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 seabed assessment 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. Beach also advertised and held an online webinar, that received a stronger attendance than the drop-in sessions, with representatives from 12 organisations.

Table 5-7 details the schedule of information sessions and the webinar locations, dates, attendees, and consultation summary.

Table 5-7: Summary of Information Sessions and Webinar

Location	Date	Attendees	Concerns, objections, responses where applicable
Port Campbell 4 attendees	24 Jul 2023	Local fisherman & partner	Concerns about fishing impacts from seismic surveys, no interest in OGV Project or Seabed Assessments.
		Community member	OGV Project overview, no questions on Seabed Assessment activities. Beach's sustainability strategy.
		Industry member	Beach's sustainability strategy.

Location	Date	Attendees	Concerns, objections, responses where applicable
Portland 1 attendee	25 Jul 2023	Community member	General discussion on project overview.
Warrnambool 4 attendees	26 Jul 2023	eNGO group members	Concerns about marine life impact from seismic surveys, Beach explained the OGV Project doesn't require seismic surveys.
		Community member	Asked about Carbon Capture and Storage, Beach shared knowledge and approach in Beach's Sustainability Report.
		LGA staff member	Impacts to local fishing industries and OGV Project location and timeframes. Beach explained its fishing area assessments, consultation with fishers, compensation approach.
Port Fairy 4 attendees	30 Aug 2023	eNGO group members	Impact to Port Fairy generally and why is Beach there. Beach explained its aware of offshore activity interest in the community and wanted to be available for consultation. Asked about seabed assessment activities, in particular if it's not a seismic survey then what are we looking for. Explained they are a safety measure to avoid seabed and shallow geological hazards, the equipment used, activities on the sea floor and shallow coring.
		Community member	Asked about OGV Project location and timeframes, Beach explained.
Commercial Fishing Peak Body Forum Warrnambool/ Online 3 attendees	31 Aug 2023	Seafood Industry Victoria Seafood Industry Australia Tuna Australia	• General discussion on OGV Project and specific discussion on seabed assessment activities. Interest in seabed assessments was confirmation of the locations of the activity areas and this was discussed in relation to their fishing areas. No concerns raised about seabed assessment activities. • Further general discussions Beach's compensation approach and industry research. Beach compensation policy circulated post forum.
Commercial Fishers Drop-in information session Warrnambool 8 attendees	31 Aug 2023	Seafood Industry Victoria Abalone Council Victoria Abalone Fishermen Southern Rock Lobster Fishermen	• General discussion on OGV Project and specific discussion on seabed assessment activities. Asked about impacts to local fishing industries from Beach's activities and timeframes, and raised concerns about marine seismic surveys. Beach explained its OGV Project including the seabed assessment activities do not require the use of seismic surveys. • Interest in seabed assessments was confirmation of the locations of the activity areas and this was discussed in relation to their fishing areas. No concerns raised about seabed assessment activities. • Concerns raised about multiple proponent activities leading to confusion and stakeholder fatigue. Beach explained OGV Project and seabed assessment activities and timeframes. • Concerns raised that the compensation approach is based on previous catch rates and does not take into account future impact on catch. Beach explained that its compensation procedure does account for future claims where it can be proved impact was caused by Beach activity.
Burnie	20 Sep 2023	Nil attendees	N/A
King Island	21 Sep 2023	Nil attendees	N/A
Webinar online	17 Oct 2023	EPA SA Savour King Island Protect the West	Beach received questions pertaining to spill response, P&A and seabed footage: • What is the extent or capacity of resources for emergency response? Beach explained it has a contract with AMOSC to

Location	Date	Attendees	Concerns, objections, responses where applicable
		Game Fishing Association Australia Recfishwest Corangamite Council Marinus Link Wye River SLSC Department of Natural Resources and Environment Tasmania Land and Sea Aboriginal Corporation Tasmania South Gippsland Council Life Saving Victoria	manage emergency response. AMOSC have significant resources in terms of people and equipment. Gas proponents would work together to offer expertise and support as well. Beach's emergency response plans have to include its preparedness arrangements, be included in EPs, and be reviewed and accepted by the regulator. • What is the financial capacity to address emergencies? Beach explained that it has insurance in place for these matters. • Asked if the only source of hydrocarbon for a spill risk is diesel? Beach confirmed this was correct and explained that the risk was no more than that from any other ship in the area. • Asked if the seabed footage be available to the public? Beach advised the footage is not usually released to the public. Relevant photos are often included in the EP. We will share footage with the relevant agencies or any interested parties such as academic or research organisation should they be interested.
Otway Gas Plant Community Reference Group 6 attendees	18 Oct 2023	Corangamite Shire Council Community Reference members	Beach provided an overview of OGV activities. Asked is the Seabed Assessment included seismic surveying. Beach confirmed it does not. No further questions raised.

5.8.3 Advertising Schedule

Beach has published two types of public notice advertisements and one type of radio commercial. The purpose, content and relevant person focus for these is explained in Section 5.8.1. The locations, publisher and dates are shown in Table 5-8. Copies of advertisements are provided are in Appendix H.

Table 5-8: Public Notice Advertisements

Local Government Area	Date	Media	Key Purpose
Corangamite Shire, VIC	12 July 2022	Cobden Timboon Coast Times	Advertise information session in Port Campbell
Glenelg Shire, VIC	14 July 2022	The Portland Observer	Advertise information session in Portland and Warrnambool
Corangamite, Moyne, Warrnambool	15 July 2023	The Warrnambool Standard	Advertise information session in Portland and Warrnambool
Corangamite Shire, VIC	26 July 2023	Cobden Timboon Coast Times	Identify unknown potential relevant persons
Colac Otway Shire, VIC	28 July 2023	Colac Herald	Identify unknown potential relevant persons
Corangamite, Moyne, Warrnambool, VIC	29 July 2023	The Warrnambool Standard	Advertise information session in Port Fairy
Mt Gambier, Limestone Coast, SA	1 Sep 2023	The Border Watch	Identify unknown potential relevant persons
Burnie, TAS	11 Sep 2023	The Advocate	Advertise information session in Burnie

Local Government Area	Date	Media	Key Purpose
King Island, TAS	14 Sep 2023	King Island Courier	Advertise information session in King Island
National reach to First Nations audiences	20 Sep 2023	The Koori Mail	Identify unknown potential relevant persons
National reach to First Nations audiences	26 Sep 2023	National Indigenous Times	Identify unknown potential relevant persons
South Gippsland Shire, VIC	10 Oct 2023	South Gippsland Sentinel-Times	Identify unknown potential relevant persons and advertise webinar
East Gippsland Shire, VIC	11 Oct 2023	Bairnsdale Advertiser	Identify unknown potential relevant persons and advertise webinar r
Corangamite Shire, VIC	23 Oct 2023	Cobden Timboon Coast Times	Media release, consultation focus, encouragement to contact Beach
South West VIC	11 – 24 Oct	3CS; Mixx Colac; 3YB; Coast FM	Identify unknown potential relevant persons

5.9 Reasonable Period

Consultation on the OGV Project, that includes the seabed assessment phase of activities, commenced on 29 May 2023 with a project overview of activities, timings and locations to initiate requests for further information and engagement.

A detailed information sheet on the seabed assessment activities was emailed to relevant authorities, relevant persons and other persons identified by Beach on 14 July 2023. Further information and different consultation opportunities were provided up to the end of October 2023, as set out in Section 5.8.

Throughout the 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, and encouraged to contact Beach if they required further information or wished to discuss how the seabed assessment 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. During the consultation for this EP, minimal additional information has been sought, minimal consultation has been sought ,no concerns have been raised regarding insufficient time, some minor concerns regarding the seabed assessment activities have been raised and resolved.

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

5.10 Consultation Methods

Beach understands its regulatory requirements for consultation and that genuine consultation involves a two-way dialogue. Beach also understands that consultation is voluntary for relevant persons, and they are increasingly citing ‘stakeholder fatigue’. Therefore, Beach’s approach to consultation starts with a focus on building long-term relationships with key relevant persons groups by demonstrating understanding for their needs, timelines, the types of information they need and their preferred consultation pathways. Beach has actively sought out consultation with potentially impacted relevant persons and has successfully managed to create consultation opportunities, in particular with key Commercial Fishing groups and First Nations groups despite their stated stakeholder fatigue’.

Beach recognises that the level of consultation is dependent on the nature and scale of the activity, and the potential impacts on the relevant persons functions, interests, or activities. Therefore, that the consultation process should be appropriate for the category of relevant persons and that not all persons or organisations will require the same level of engagement. Table 5-9 shows how Beach has adapted the IAP2 Spectrum of Public Participation model, noting that the fifth level of participation being ‘empower’ is not applicable in the context of safely performing offshore petroleum activities in accordance with OPGGS(E)R.

Table 5-9: 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 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. • First Nation groups to identify cultural values and sensitivities. • Relevant government departments and agencies.	• Impacted commercial fishers • Industry proponents who may be conducting activities in similar locations and times.
Consultation methods	• Information sheets • Beach Website. • Email to Beach database. • Beach online Engagement Hub • Regional public notices introducing the project and inviting self-identification as relevant person. • Targeted public notices for drop-in information session. • Media releases.	• Direct response to questions & concerns (email/phone/meetings) • Phone follow up to potentially impacted RPs who haven't replied. • Email follow up to other no-replies. • Beach online Engagement Hub to encourage questions and consultation. • Request meetings with regional community groups. • Hold community drop-in information sessions.	• 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. • Replies to government responses.	• Request meetings / workshops with associations (in the first instance) to agree on impact assessments, mitigation measures, any research requirements, and compensation approach where applicable. • Individual meetings with commercial fishers confirmed as impacted, to identify mitigations or control measures, and where required, agree on compensation.

5.11 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 seabed assessments and no concerns were raised.

With regard to native title rights, Beach has detailed how it has undertaken and extensive assessment of First Nations relevant persons (Section 5.6.6) and its approach to consulting with First Nations groups (Section 5.5.2) to ascertain whether the seabed assessment activities would impact their functions, interest and activities, and where applicable, their native title rights. No concerns were raised about the seabed assessment activities.

5.11.1 Commercial Fishing Industry Consultation

Beach has developed long-term respectful relationships with the Commercial Fishing industry operating in the Otway and Bass Basins. After consulting with key industry associations, Beach established a peak body round table group to facilitate efficient, productive, and transparent consultation across the different fisheries.

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

- Seafood Industry Victoria (SIV)
- South East Trawl Fishing Industry Association (SETFIA)
- Commonwealth Fishing Association (CFA)
- Seafood Industry Australia (SIA)
- Tuna Australia (TA)
- Tasmanian Seafood Industry Council (TSIC)
- Victorian Fisheries Authority (VFA)

The first meeting was attended by: SIV; SIA; and Tuna Australia. Further meetings will be held on an as-needs basis (as per direction from the groups). General matters discussed included fisheries impacts research, stakeholder fatigue, compensation approach, and petroleum exclusion zones, but no specific concerns were raised regarding seabed assessments due to the minimal disturbance impacts over a short time frame.

Other groups intending to participate include: SETFIA; VFA, and potentially TSIC. The CFA advised they were unable to participate in consultation due to limited resources and directed Beach to dedicated fishery associations, which Beach understands given their role as an umbrella group.

Given the shared marine rights and protections afforded for both the offshore petroleum and commercial fishing industries, Beach respects those rights an undertakes a methodical approach to identifying fishing operations within its operating areas, the potential impacts of its activities, assessing mitigations and controls that may include compensation where there is no effective mitigation or control. The following key steps set out the approach Beach has taken for consultation in this EP, and that Beach would continue to take in the event of a new relevant person being identified or new information emerging regarding an impact:

- Provide information sheet to relevant fishing associations, request direct meetings to provide opportunity for detailed discussion, response to questions, concerns and further information requests.
- Seek information on actual fishing effort, and seek support (including costing proposals where applicable) for engagement with their members, either directly or via the association as applicable.

- Provide additional information to interested fishery groups where requested.
- Send follow up emails and phone key associations and fishers who may fish in the operating area.
- Where fishers have advised they may be potentially impacted by the activity the following steps would be followed:
    - For fishers who have contacted their associations, Beach would liaise with the association to gather information about the fisher’s fishing patterns and locations and to establish contact for ongoing 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 ongoing consultation throughout the activity.
    - Where fishers provide Beach with sensitive fishing data, advise the information will be treated as ‘sensitive’ and not published by NOPSEMA. Provide Beach’s privacy 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.
- Beach will provide regular updates on the locations that the vessel will be operating in as well as the expected duration so fishers can plan their fishing activities with the least disruption.
- Beach has a stated position that fishers should not suffer an economic loss as a result of our 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 (Appendix H1). 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.

5.12 Assessment of Merit of Objections or Claims

Any objections or claims raised during consultation will be substantiated via evidence such as publicly available credible information and/or scientific or fishing data. Where the objection or claim is substantiated, where applicable, it will be 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 will be provided with feedback as to whether their objection or claim was substantiated, and if not why, and if it was substantiated, 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 9.8.1) and the relevant person will be advised of the process.

5.13 Measures Adopted as a Result of Consultation

Objection or Claim Raised	Beach's Assessment of Merit for Seabed Assessment Activities	Measures Adopted
Director of National Parks (DNP) noted Beach are proposing to have one MMO onboard during the activities. Typically for these types of acoustic surveys where there is the potential for interference with cetaceans, it is recommended by the Migratory Species Section within the Department of Climate Change, Energy, the Environment and Water (DCCEEW) (separate to Marine Parks) that there are two dedicated MMOs onboard and that activities are not undertaken during periods of low visibility.	The only DCCEEW guidance Beach has found in relation to MMOs is for seismic surveys, which the seabed assessment activity does not include.	*CM#19: Marine Fauna Observer* Beach has committed to having a dedicated MMO on the seabed survey vessel with at least one crew member to support the MMO. Both the dedicated MMO and crew member are required to have proven experience in whale observation, distance estimation and reporting which is the training requirement for MMOs from DCCEEW guidance. *CM#17: Geophysical Whale Management Procedure* *CM#18: Geotechnical Whale Management Procedure* Additional controls, based on those from the DCCEEW guidance, will be implemented such that sampling can commence at night or in low visibility conditions (i.e., when observations cannot be undertaken) if no more than three whales have been seen in the pre-sampling survey zone in the preceding daylight hours. Three whales would be an indication that there is an increased likelihood of whales being present during the period that observations cannot be undertaken. Though the activity does not include a seismic survey, these controls that align with the DCCEEW guidance, have been applied to ensure interference with cetaceans is managed to an acceptable level.
DNP would like notification of activity start and end dates plus notification of any spill.	Beach acknowledged DNP response and confirmed that the Geophysical and Geotechnical Seabed Survey EP has been updated to include the following: • Emergency responses reporting requirements. • Activity commencement and cessation notifications.	Section 9.10 has been updated to include DNP emergency responses reporting requirements. Section 5.16 has been updated to include DNP Activity commencement and cessation notifications. Beach's internal Offshore Notifications Requirements Procedure has been updated to reflect the notification request.

Objection or Claim Raised	Beach's Assessment of Merit for Seabed Assessment Activities	Measures Adopted
King Island Council raised concerns that there is no spill response equipment on King Island and there are very few qualified responders, potentially one.	A diesel spill from the survey vessel is a highly unlikely event and is no higher risk than any other vessel that is operating in Victorian or Tasmania waters. The survey vessel is required to meet all navigational and Australian Maritime Safety Authority (AMSA) requirements, including Notice to Mariners notification prior to the survey commencing. In the event of a vessel spill, AMSA is the Control Agency and if the spill was likely to enter Tasmanian waters would liaise with the Tasmanian Environmental Protection Authority (EPA), who are the Combat Agency for oil spills in Tasmanian waters. Beach would support any spill response through their contract with Australian Marine Oil Spill Centre (AMOSC) who have equipment and trained responders to support AMSA and the Tasmanian EPA's response.	Additional measures not deemed necessary.
AMSA advised the AHO requires 4 weeks' notice	Beach has followed up with the AHO to confirm the notice period. The AHO has confirmed that 4 weeks is preferable to align with their fortnightly publications.	Section 5.16 has been updated to include AHO notifications requirement. Beach's internal Offshore Notifications Requirements Procedure has been updated to reflect the notification request.
Department of Defence advised that unexploded ordnance (UXO) may be present on and in the sea floor. Beach Energy must, therefore, inform itself as to the risks associated with conducting activities in the area (for example, the detonation of UXO).	Beach has mapped the available UXO information from the Department of Defence database in relation to the Operational Areas (Section 7.5.4). This has identified that the Operational Areas in the Otway Basin overlap UXO Zone 1052 King Island which is within the 'slight potential' category' and UXO Zone SDG087 'Sea Dumping – King Island' SDG087. Beach has provided the Department of Defence with a response.	*CM#16: OGV Seabed Survey Scope of Work* Geotechnical samples will not be taken within known locations of UXO. Geotechnical sample locations will be finalised after the geophysical survey data is obtained and interpretated to identify any UXO.

Objection or Claim Raised	Beach's Assessment of Merit for Seabed Assessment Activities	Measures Adopted
Telstra – Beach enquired about buffer distances between geotechnical seabed sampling locations and seabed telecommunications cables. Through consultation Telstra confirmed that the current cable buffer arrangements to remain in place.	Beach agrees with Telstra that the current buffers remain suitable.	*CM#16: OGV Seabed Survey Scope of Work* Geotechnical samples will not be taken within known locations of telecommunication cables. Geotechnical samples will not be taken within 1 km of a telecommunication cables. Geotechnical sample locations will be finalised after the geophysical survey data is obtained and interpretated to identify any telecommunication cables.

5.14 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 a s sensitive information and not published in the Environment Plans."

5.15 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 were assessed as per the impact and risk assessment process detailed in Section 3 and controls applied where appropriate to ensure impacts and risks are managed to an acceptable level and ALARP.

The report on consultations can be found in Appendix I Consultation Report.

Copies of the full text of any response by a relevant person have been provided to NOPSEMA as a Sensitive Information under Regulation 9(8) of the OPGGS(E)R.

5.16 Ongoing Consultation

Consultation in the course of preparing this EP has been completed.

Beach will continue to consult with relevant persons to meet Regulation 14(9) of the OPGGS(E)R. This includes providing updates and notices for the OGV Project phases and other future activities, including the seabed assessment, 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 5-10 details the ongoing consultation requirements for implementation of the activity.

Table 5-10: Ongoing Consultation Requirements

Relevant person	Notifications	Timing
All relevant persons	Activity updates including acceptance of EP and start and completion of activities.	As required
Relevant persons identified as marine users and relevant government departments and agencies	Notifications of activity commencement, including: • type of activity. • 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.	4 weeks prior to activity commencing

Relevant person	Notifications	Timing
	• 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.	
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

6 Environmental Requirements

This section provides information on 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 seabed surveys are summarised in Table 6-1.

On the basis that a worst-case credible spill has the potential to intersect Victorian and Tasmanian waters, relevant Victorian requirements are described in Table 6-2 and Tasmanian requirements are described in Table 6-3.

Recovery plans, threat abatement plans and species conservation advice applicable to species are detailed in the description of threatened and migratory species (Section 7).

The Seabed Assessment and Geotechnical and Geophysical Survey includes 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 being Petroleum or Greenhouse Gas. Beach will obtain the relevant authority approvals prior to commencing the Survey 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, Beach as an existing petroleum titleholder will seek Access Authority approvals from National Offshore Petroleum Titles Administrator (NOPTA) to acquire the Seabed Assessment and Geotechnical and Geophysical Survey outside Beach's acreage. As part of this process, third party consent agreements will be obtained from the areas covered by any other titleholders. Upon approval of these access authorities from NOPTA, Beach, as an existing petroleum titleholder, will be authorised to conduct petroleum exploration operations or operations related to the recovery of petroleum, outside the boundary of Beach's existing titles. And in accordance with the *Offshore Petroleum and Greenhouse Gas Storage (Resources Management and (Administration) Regulations 2011* (the Regs), Beach will also submit to NOPTA any relevant notifications and data acquired within the Access Authority areas.

6.1 Commonwealth Requirements

Table 6-1: Commonwealth Environmental Requirements Relevant to Seabed Surveys

Legislation/Regulation	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/or Planning Areas as detailed in Section 7.6.	-	Department of Climate Change, Energy, the Environment and Water (DCCEEW)
Australian Ballast Water Management Requirements (CoA 2020a)	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 operators should manage ballast water when operating within Australian seas to comply with the Biosecurity Act. Section 8.8 details these requirements in relation to the management of ballast water.	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)
Australian Biofouling Management Requirements (DAWE 2022a)	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 operators should manage biofouling when operating within Australian seas to comply with the Biosecurity Act. Section 8.8 details these requirements in relation to the management of biofouling.	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

Legislation/Regulation	Scope	Related International Conventions	Administering Authority
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 Biosecurity Amendment (Biofouling Management) Regulations 2021	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. For the activity the Act and regulations regulates vessels entering Australian territory regarding ballast water and hull fouling. Biosecurity risks associated with the activity are detailed in Section 8.8.	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
Environment Protection and Biodiversity	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.	1992 Convention on Biological Diversity and 1992 Agenda 21	DCCEEW

Legislation/Regulation	Scope	Related International Conventions	Administering Authority
Conservation Act 1999 (EPBC Act)	The Act protects Matters of National Environmental Significance (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. The EP must describe matters protected under Part 3 of the EPBC Act and assess any impacts and risks to these. Section 7 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 8 provides an assessment of the impacts and risks from the activity to matters protected under Part 3 of the EPBC Act.	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 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 8 details how these requirements will be applied.	-	DCCEEW

Legislation/Regulation	Scope	Related International Conventions	Administering Authority
Marine Pest Plan 2018–2023: National Strategic Plan for Marine Pest Biosecurity (DAWR 2018)	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 8.8 details how these requirements will be applied.	-	DAFF
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 8.8 details the requirements applicable to vessel activities.	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 (CoA 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 8.7 details the requirements applicable to the activity.	-	DCCEEW
National Strategy for Reducing Vessel Strike on Cetaceans and other Marine Megafauna (CoA 2017a)	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.	-	DCCEEW

Legislation/Regulation	Scope	Related International Conventions	Administering Authority
	Section Section 8 details the requirements applicable to vessel activities.		
Native Title Act 1993 Native Title Legislation Amendment Act 2021	The main objects of this Act are: (a) to provide for the recognition and protection of native title; and (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 or Planning Areas as detailed in Section 7.6.	-	Attorney-General's Department
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 8 details the requirements applicable to vessel activities.	Certain sections of MARPOL International Convention for the Safety of Life at Sea 1974 COLREG 1972	AMSA

Legislation/Regulation	Scope	Related International Conventions	Administering Authority
Offshore Petroleum and Greenhouse Gas Storage Act 2006 (OPGGS Act) OPGGS(E)R	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. Part 2 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 8.	-	NOPSEMA
Protection of the Sea (Prevention of Pollution from Ships) Act 1983	This Act regulates 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:	Various parts of MARPOL	AMSA

Legislation/Regulation	Scope	Related International Conventions	Administering Authority
	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 8 details the requirements applicable to vessel activities.		
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 8.8 details the requirements applicable to vessel activities.	International Convention on the Control of Harmful Anti-fouling Systems on Ships 2001	AMSA
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 8 details the requirements applicable to vessel and platform activities.	-	DCCEEW
Underwater Cultural Heritage Act 2018	Protects the heritage values of shipwrecks, sunken aircraft and relics (older than 75 years) in Australian Territorial waters from the low water mark to the outer edge of the continental shelf (excluding the State's internal waterways).	Agreement between the Netherlands and Australia concerning old Dutch Shipwrecks 1972	DCCEEW

Legislation/Regulation	Scope	Related International Conventions	Administering Authority
	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 7.2.5 provides information on known shipwrecks or sunken aircraft in the Planning Areas.		
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.		

6.2 Victorian Requirements

Table 6-2: 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 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 Cultural Heritage Management Plans 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 7.6 identifies aboriginal heritage sites and any Registered Aboriginal Parties within the Operational and Planning Areas.	Aboriginal Victoria
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.	Oil pollution management in Victorian State waters. Discharge of sewage, oil, garbage, sediment, litter or other wastes and domestic ballast water from emergency response vessels into	Environmental Protection Authority Victoria

Requirements	**Scope**	**Application to Activity**	**Administering Authority**
	The State Environment Protection Policy (Waters of Victoria) designates: • 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 and 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.	Victorian State waters must comply with these requirements. Vessel discharges during the activity and/or spill response are managed as detailed in Section 8.3.	
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 Regulation (Inspector General for Emergency Management)

Requirements	**Scope**	**Application to Activity**	**Administering Authority**
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 7.5.10. Impacts and risks to commercial and recreational fishing are assessed in Section 8.	Victorian Fishing Authority (VFA)
Flora and Fauna Guarantee 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 9.10.	Department of Energy, Environment and Climate Action (DEECA)
Heritage Act 2017	The purpose of the 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 7.2.5 identifies Martine heritage in Commonwealth and State waters. Act may be triggered in the event of impacts to a known or previously un-located shipwreck whilst undertaking emergency response activities. Incident reporting requirements in Section 9.10 details reporting to Commonwealth in first instance.	Heritage Victoria

Requirements	Scope	Application to Activity	Administering Authority
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 8.3 and 8.9.	Maritime Safety Victoria
National Parks Act 1975 (and Regulations 2013)	Establishes a framework for the protection and management of national parks in Australia. 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

Requirements	**Scope**	**Application to Activity**	**Administering Authority**
Wildlife Act 1975 (and Regulations 2013)	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). The *Wildlife (Marine Mammal) Regulations 2019* 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).	Applies where vessels are within State waters responding to a spill event. Prescribed minimum proximity distances to whales, dolphins and 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 9.10.	DEECA

6.3 Tasmanian Requirements

Table 6-3: 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 within the Operational and Planning Areas. No aboriginal heritage sites were identified within the Planning Areas within Tasmanian waters.	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) (and 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. 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.	Defines the EPA's jurisdiction during a spill event. Prescribes the fee structure to waste events and environmental protection notices. Regulates the management and control of controlled wastes. See OPEP	Environmental Protection Authority (EPA) Tasmania

Requirements	Scope	Application to Activity	Administering Authority
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 7.2.5 identifies Martine heritage in Commonwealth and State waters. Act may be triggered in the event of impacts to a known or previously un-located shipwreck whilst undertaking emergency response activities. Incident reporting requirements in Section 9.10 details reporting to Commonwealth in first instance.	Heritage Tasmania
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 occur within the Operational and Planning Areas as described in Section 7.5.11. Impacts and risks to commercial and recreational fishing are assessed in Section 8.	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 8.3.	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 Planning Areas (Section 7.2.10 and 7.2.11).	Tasmania Parks and Wildlife Service

Requirements	Scope	Application to Activity	Administering Authority
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 Areas (Section 7.2.10 and 7.2.11).	Tasmania Parks and Wildlife Service

7 Description of the Environment

The physical, ecological, socio-economic and First Nations existing environment that may be affected by the activity, and/or is used to input into the impact and risk assessment sections, is described in this section, together with the particular relevant values and sensitivities.

The existing environment area has been defined as an 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 a subsequent impact to occur.

Table 7-1 and Figure 7-1 detail the areas associated with the activity that are used to describe the environmental context relevant to the activity and to support the impact and risk assessments.

Table 7-1: Description of Existing Environment Areas

	Zones	Description
Otway	Operational Area	There are two operational areas for the activity in the Otway Basin, Otway Operational Area A and Otway Operational Area B. The EPBC Protected Matters Report for the Otway Operational Areas is provided in Appendix A.1.
	Planning Area	The Planning Area for the Otway activity is within Commonwealth, Victorian and Tasmanian waters and reaches Victorian and Tasmanian shorelines (Figure 7-1). The Planning Area is based on the predicted greatest extent of a diesel spill that has been modelled using multiple scenarios to develop a possible area that could be exposed to hydrocarbons at the low thresholds as detailed in Section 8.9.3.2. The EPBC Protected Matters Report for the Otway Planning Area is in Appendix A.3.
Bass	Operational Area	For the activity in the Bass Basin, there is one Operational Area. The EPBC Protected Matters Report for the Bass Operational Area is provided in Appendix A.2
	Planning Area	The Planning Area for the Bass activity is within Commonwealth, Victorian and Tasmanian waters and reaches Tasmanian shorelines (Figure 7-1). The Planning Area is based on the predicted greatest extent of a diesel spill that has been modelled using multiple scenarios to develop a possible area that could be exposed to hydrocarbons at the low thresholds as detailed in Section 8.9.3.2. The EPBC Protected Matters Report for the Otway Planning Area is in Appendix A.4

7.1 Regulatory Context

The OPGGS(E)R define ‘environment’ as the ecosystems and their constituent parts, natural and physical resources, qualities and characteristics of areas, the heritage value of places and includes the social, economic, and cultural features of those matters. In accordance with the Regulations, this document describes the physical, ecological, and social components of the environment.

A greater level of detail is provided for the following particular values and sensitivities as defined by the OPGGS(E)R which states that particular relevant values and sensitivities may include any of the following:

a) the world heritage values of a declared World Heritage property within the meaning of the EPBC Act;

b) the national heritage values of a National Heritage place within the meaning of that Act;

c) the ecological character of a declared Ramsar wetland within the meaning of that Act;

d) the presence of a listed Threatened species or listed Threatened Ecological Community within the meaning of that Act;

e) the presence of a listed Migratory species within the meaning of that Act;

f) any values and sensitivities that exist in, or in relation to, part or all of:

   a. Commonwealth marine area within the meaning of that Act; or

   b. Commonwealth land within the meaning of that Act.

More detail has been provided where listed threatened or migratory species have a spatially defined biologically important area (BIA), habitat critical to survival or identified biologically important behaviour such as breeding, foraging, resting or migration.

More detail has also been provided in Section 7.2.12 for Key Ecological Features (KEFs) as they are considered as conservation values of the Commonwealth marine area; and in Section 7.2.2 for Australian Marine Parks (AMPs) as they are enacted under the EPBC Act.

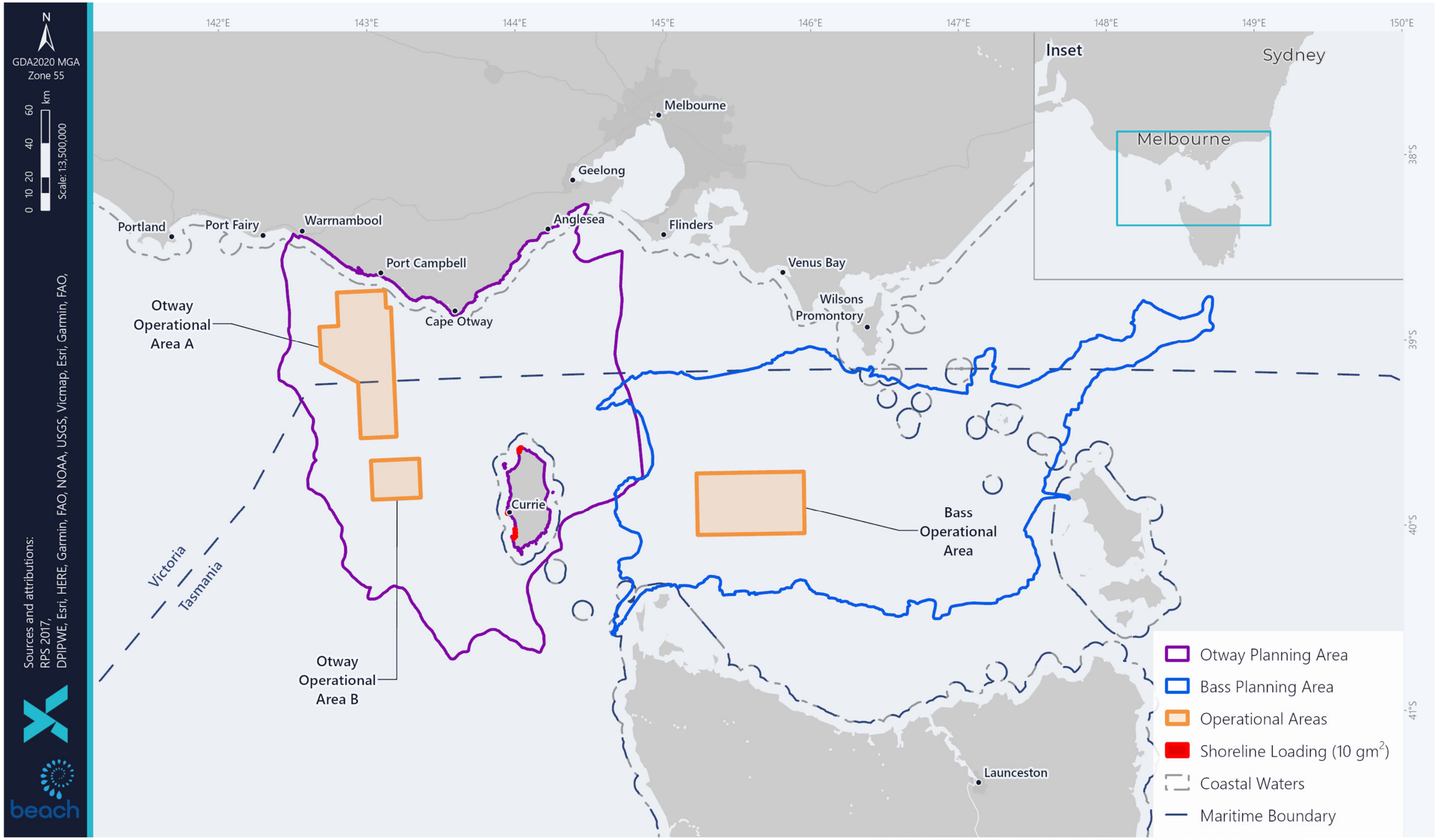

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Figure 7-1: Bass and Otway Operational and Planning Areas for the Geophysical and Geotechnical Seabed Surveys

7.2 Conservation Values and Sensitivities

The following section details the conservation values and sensitivities identified within the Operational and Planning Areas (Table 7-1) identified from EPBC Protected Matters Search Tool (PMST) Reports, referenced material and relevant person consultation.

7.2.1 World Heritage Properties

The PMST Reports (Appendix A) did not identify any World Heritage Areas in the Operational or Planning Areas.

7.2.2 Australian Marine Parks

No Australian Marine Parks (AMPs) were identified within the Bass Operational Area (PMST Report Appendix A) (Figure 7-2).

One AMP was identified within the Otway Operational Area (PMST Report (Appendix A) (Figure 7-2):

- Zeehan

Two AMPs were identified within the Bass Planning Area (PMST Report (Appendix A) (Figure 7-2):

- Beagle
- Boags

Two AMPs were identified within the Otway Planning Area (PMST Report (Appendix A) (Figure 7-2):

- Apollo
- Zeehan

Franklin AMP was also identified in the PMST Report as occurring within the Otway Planning Area, however this is due to the size of the grids used in the PMST and does not actually intersect the Planning Area (Figure 7-2).

All identified AMPs, excluding the western section of Zeehan Marine Park (discussed below), 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 mining (which includes oil and gas activities), 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.

The Zeehan AMP also has an 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 Reserves are managed under the South-east Marine Reserves Management Plan (DNP 2013).

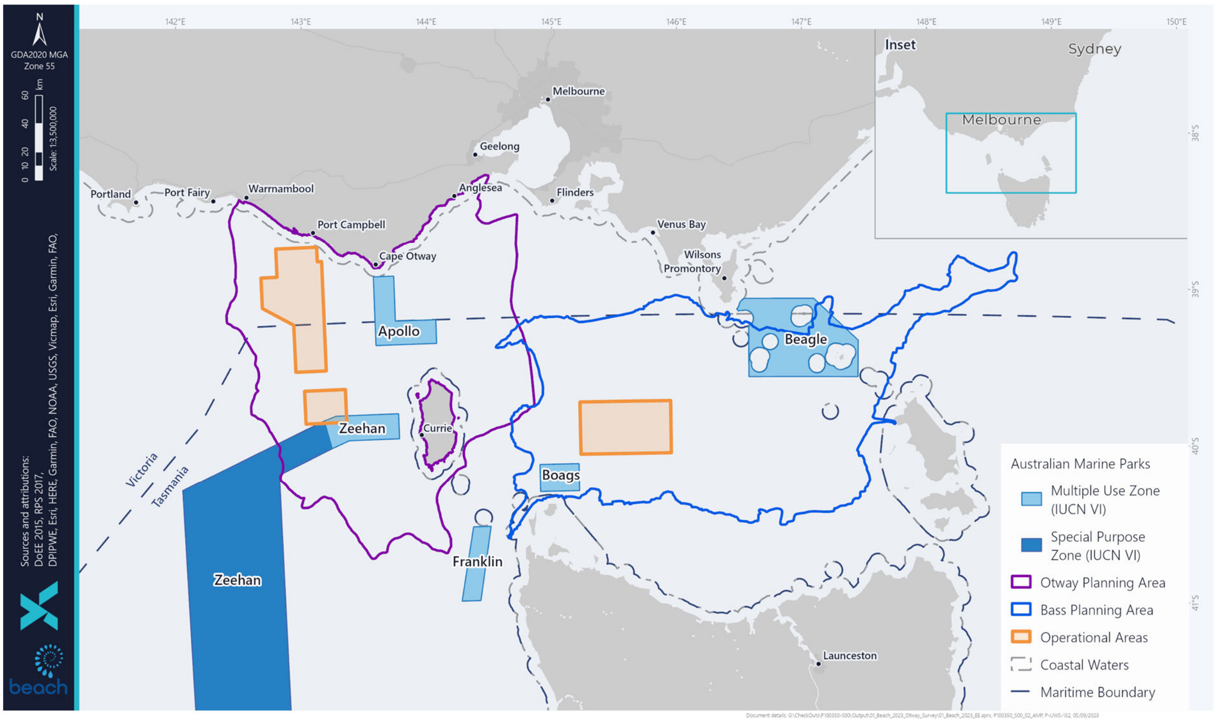


Figure 7-2: Australian Marine Parks within the Operational and Planning Areas

7.2.2.1 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 2013). The reserve 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 2013).

The major conservation values of the Apollo AMP 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 (DNP 2013).

7.2.2.2 Beagle AMP

The Beagle AMP is an area in shallow continental shelf depths of about 50 m to 70 m, which extends around south-eastern Australia to Tasmania covering an area of 2,928 km^2 (DNP 2013). The reserve includes the fauna of central Bass Strait; an area known for its high biodiversity. The deeper water habitats are likely to include rocky reefs supporting beds of encrusting, erect and branching sponges, and sediment composed of shell grit with patches of large sponges and sparse sponge habitats.

The reserve includes islands that are important breeding colonies for seabirds and the Australian fur seal, and waters that are important foraging areas for these species. The species-rich waters also attract top predators such as killer whales and great white sharks.

The major conservation values of the Beagle AMP are:

- Ecosystems, habitats, and communities associated with the Southeast Shelf Transition and associated with the seafloor features: basin, plateau, shelf, and sill.
- Important migration and resting areas for southern right whales.
- It provides important foraging habitat for the Australian fur-seal, killer whale, great white shark, shy albatross, Australasian gannet, short-tailed shearwater, Pacific and silver gulls, crested tern, common diving petrel, fairy prion, black-faced cormorant, and little penguin.
- Cultural and heritage sites including the wreck of the steamship SS Cambridge and the wreck of the ketch Eliza Davies (DNP 2013).

7.2.2.3 Boags AMP

The Boags AMP is a shallow continental ecosystem ranging from 40 m to 80 m depths, covering an area of approximately 537 km^2 (DNP 2013). The Boags AMP is positioned 6.8 km south-west of the Bass Operational Area and is entirely within the Bass Planning Area. The marine park contains a high diversity of benthic fauna typical of the central Bass Strait including crustaceans, polychaete worms and molluscs. The pelagic zone is known to support white shark foraging behaviours. The marine park also supports seabird foraging due to the adjacent seabird breeding colonies on the Hunter group of islands.

The major conservation values of the Boags AMP are:

- Ecosystems, habitats, and communities associated with the Bass Strait Shelf Province and associated with the seafloor features: plateau and tidal sandwave/sandbank
- It provides important foraging habitat for the shy albatross, Australasian gannet, short-tailed shearwater, fairy prion, back-faced cormorant, common diving-petrel and little penguin (DNP 2013).

7.2.2.4 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 reserve 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 tail shearwater (DNP 2013).

The major conservation values for the Zeehan AMP 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 (DNP 2013).

7.2.3 National Heritage Places

One place of National Heritage, Great Ocean Road, and Scenic Environs (historic), was identified within the Otway Planning Area (PMST Report Appendix A) (Figure 7-3). No National Heritage Places were identified within the Bass Operational or Planning Area or Otway Operational Areas.

7.2.3.1 Great Ocean Road and Scenic Environs

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 3000 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.

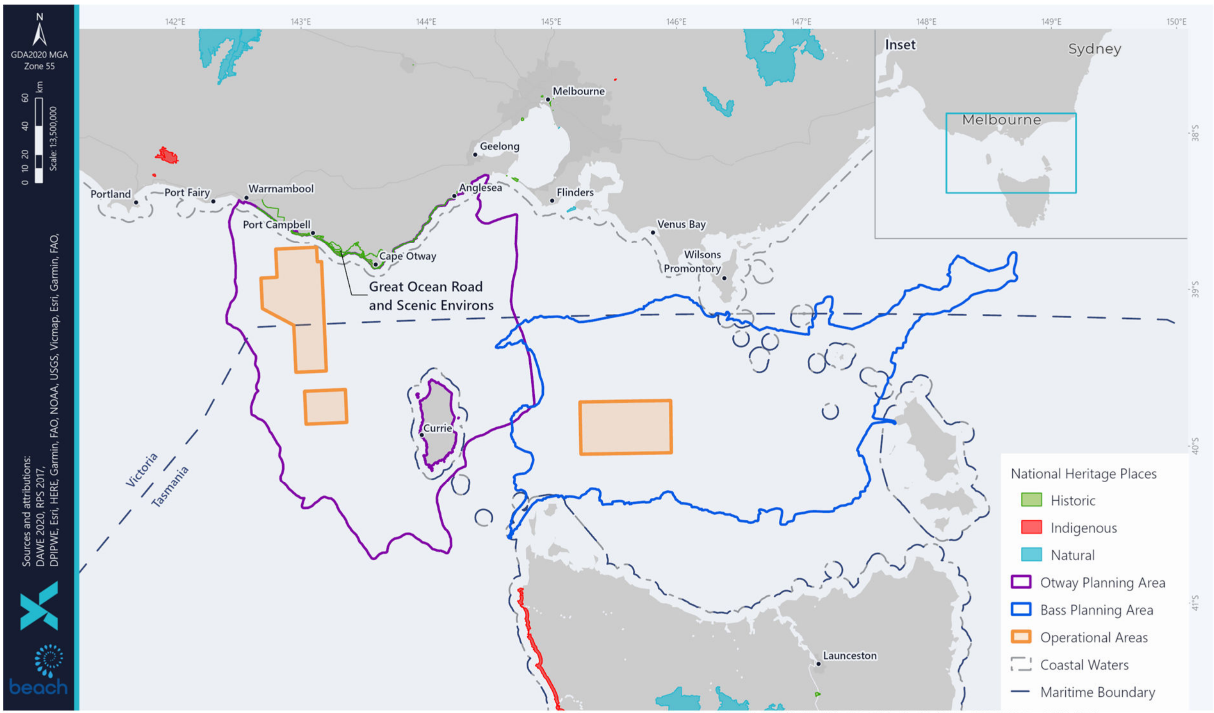


Figure 7-3: National Heritage Places within the Operational and Planning Areas

7.2.4 Commonwealth Heritage Places

No Commonwealth Heritage Places were identified within the Bass or Otway Operational Areas or Bass Planning Area (PMST Report Appendix A) (Figure 7-4). One Commonwealth Heritage Place, Cape Wickham Lighthouse (Historic, Listed place) was identified within the Otway Planning Area (PMST Report Appendix A) (Figure 7-4).

This historic heritage place is located inland of the coastal area that may be affected by a spill and therefore the heritage values associated with lighthouses are not affected (Figure 7-4).

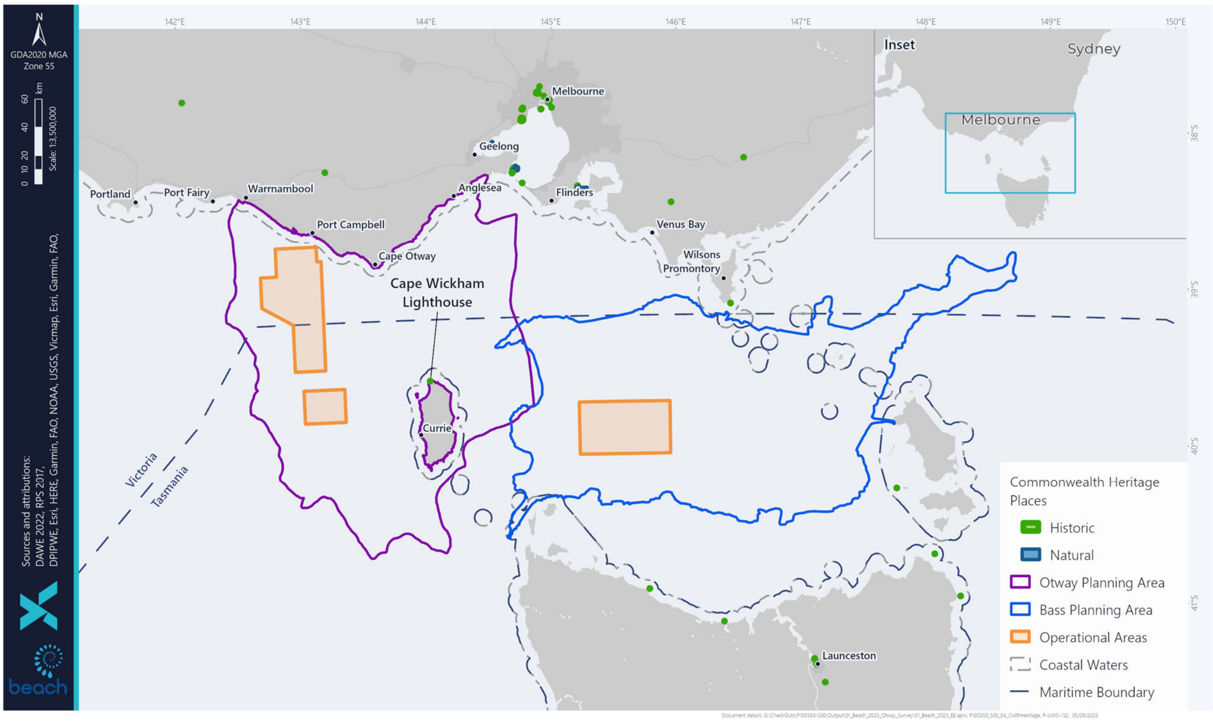


Figure 7-4: Commonwealth Heritage Places within the Operational and Planning Areas

7.2.5 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 *Victorian Heritage Act 2017* (Vic) and in Tasmanian waters under the *Historic Cultural Heritage Act 1995*. 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. 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 Otway 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 (DTP 2023) 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 over 100 historic wrecks within the Otway Planning Area and over 30 historic wrecks within the Bass Planning Area, but none have a protection zone (Figure 7-5). The Otway and Bass Operational Areas each contain one shipwreck, the S.S. Selje and Albert, respectively (Figure 7-5). One additional shipwreck, the Alfred, is located 3 km to the north of the Otway Operational Area (Figure 7-5).

Beach commissioned a seabed site assessment for the Otway Gas Development (Fugro 2020a, Fugro 2020b). The survey extent, including the Thylacine and Geographe gas fields and infrastructure routes, are shown in Figure 7-13. 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 ~100 cm, with the average thickness of the sand patches being ~20-30 cm; precluding burial of a shipwreck.

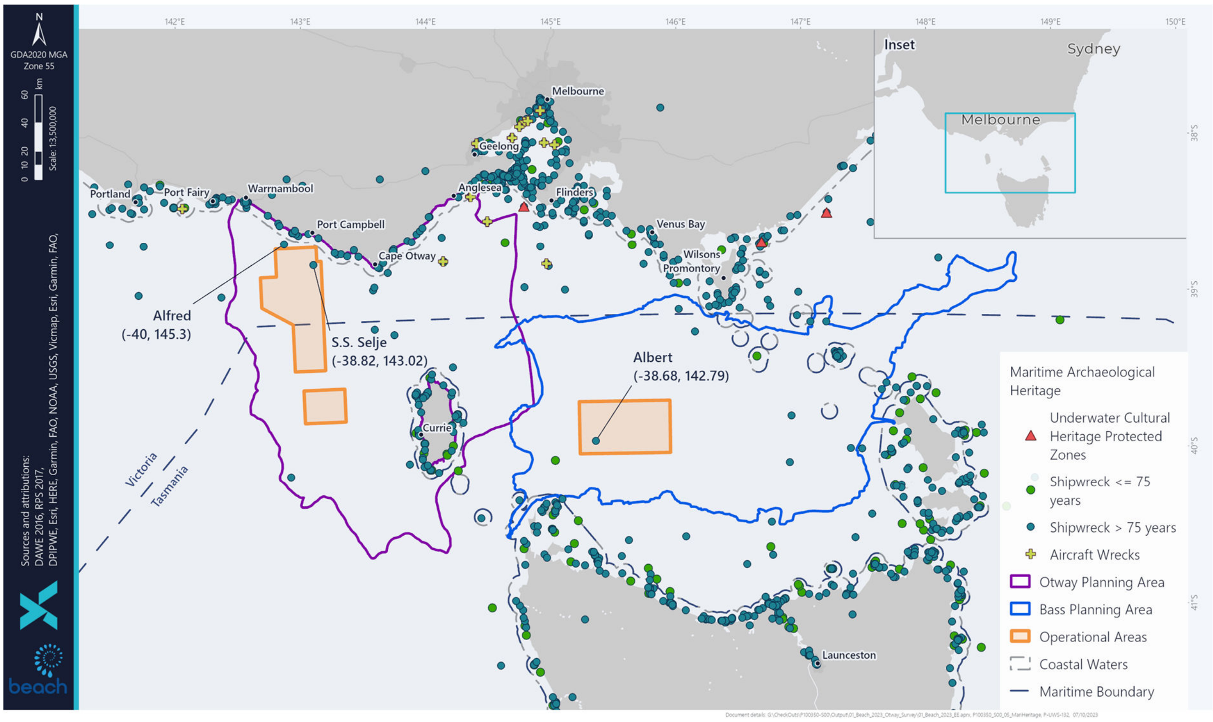


Figure 7-5: Maritime Archaeological Heritage sites within the Operational and Planning Areas

7.2.6 Wetlands of International Importance

No Wetlands of International Importance were identified within the Operational Areas or the Bass Planning Area (PMST Report Appendix A) (Figure 7-6).

One Wetland of International Importance, Lavinia Ramsar-listed wetlands (located on King Island), was identified within the Otway Planning Area (PMST Report Appendix A) (Figure 7-6). One additional Wetland of International Importance, Port Phillip Bay (Western Shoreline) and Bellarine Peninsula, was also identified by the PMST Report as intersecting the Otway Planning Area, however, this is due to the size of the grids used in the PMST and they do not actually overlap the Planning Area (Figure 7-6).

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 Lavinia Ramsar listed wetlands is described in the following section.

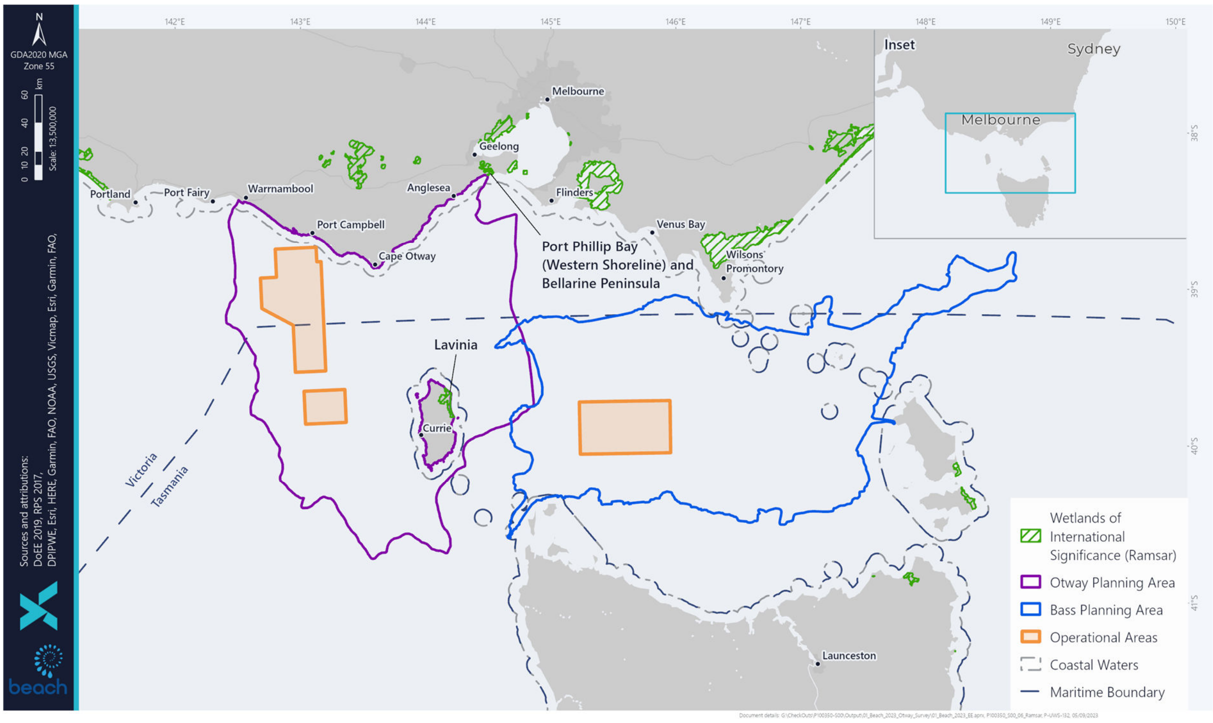


Figure 7-6: Ramsar Wetlands within the Operational and Planning Areas

7.2.6.1 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 (PWS 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.

7.2.7 Nationally Important Wetlands

No Nationally Important Wetlands were identified within the Operational Areas or the Bass Planning Area (PMST Report Appendix A) (Figure 7-7).

The Otway Planning Area PMST Report (Appendix A) identified 12 Nationally Important Wetlands (Figure 7-7). The following wetlands have no connection to the ocean so would not be impacted by a spill or any other aspects associated with the activity, and are not further described:

- Bungaree Lagoon (Tas)
- Lake Flannigan (Tas)
- Pearshape Lagoon 1,2,3,4 (Tas)

Two additional Nationally Important Wetlands, Lake Connewarre State Wildlife Reserve and Lower Merri River Wetlands, were also identified by the PMST, however, this is due to the size of the grids used in the PMST and these wetlands do not actually intersect the Otway Planning Area (Figure 7-7).

The ecological character and values of the remaining relevant Nationally Important Wetlands within the Otway Planning Area are described in the following sections. Information provided on the wetlands is from the DCCEEW Directory of Important Wetlands in Australia.

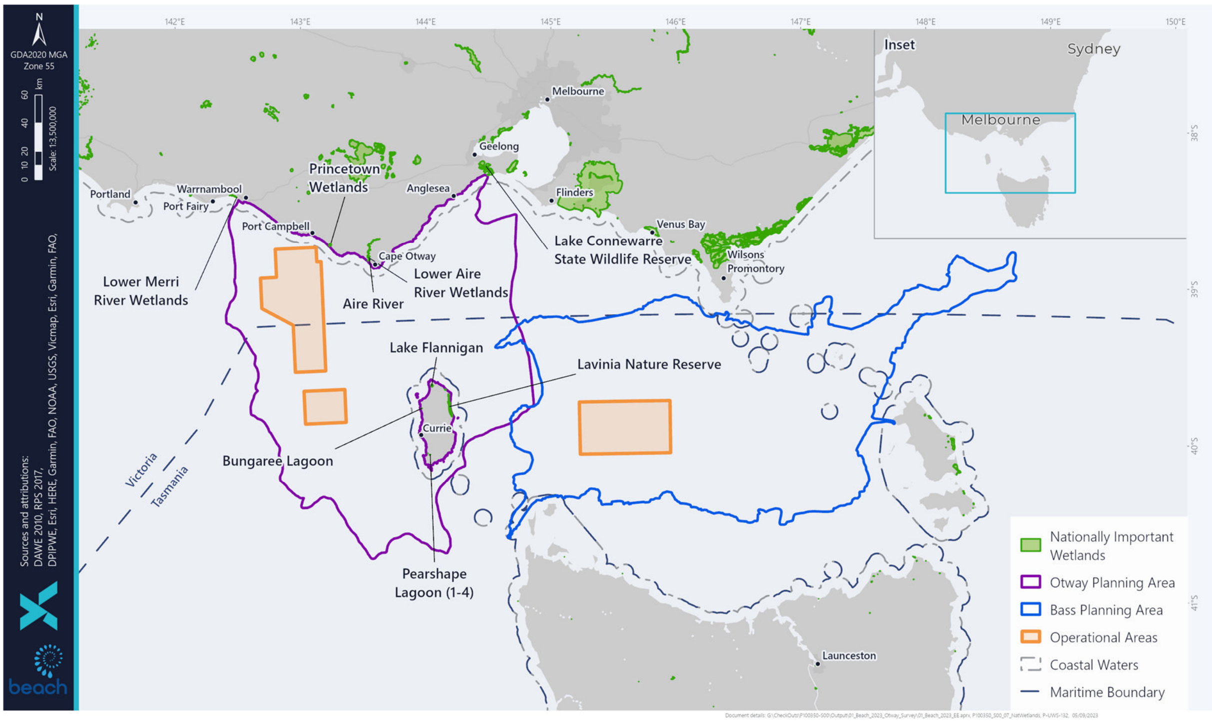


Figure 7-7: Nationally Important Wetlands within the Operational and Planning Areas

7.2.7.1 Aire River/Lower Aire River Wetlands

These Victorian wetlands consist of three shallow freshwater lakes, brackish to saline marshes and an estuary on the Aire River floodplain. This floodplain occurs at the confluence of the Ford and Calder Rivers with the Aire River. It is surrounded by the Otway Ranges and dune-capped barrier along the ocean shoreline.

The Lower Aire River Wetlands have extensive beds of Common Reed and groves of Woolly Tea-tree which can support large numbers of waterbirds. These wetlands act as a drought refuge for wildlife.

Lake Hordern is considered to be of State significance for its geomorphology.

7.2.7.2 Lavinia Nature Reserve

Lavinia Nature Reserve is within the Lavinia Ramsar wetland see Section 7.2.6.1

7.2.7.3 Princetown Wetlands

The Princetown Wetlands consist of swamps of varying salinity on the floodplains of the Gellibrand River and its tributary, the Serpentine (Latrobe) Creek. Wetland types present are a deep freshwater marsh, semi- permanent saline marshes and a shallow freshwater marsh.

The wetlands have extensive beds of Common Reed (*Phragmites australis*) and meadows dominated by Beaded Glasswort (*Sarcocornia australis*) which can support large numbers of waterbirds. Significant numbers of the Swamp Greenhood (*Pterostylis tenuissima* (Nv)) occur in the Princetown Wetlands; this species is found under dense Woolly Tea-tree groves.

The wetlands are used for camping, fishing, boating, duck hunting with parts of the wetlands in the Otway National Park and the Serpentine Creek State Wildlife Reserve.

7.2.8 Victorian Protected Areas – Marine

Victoria has a representative system 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 Bass or Otway Operational Areas (PMST Report Appendix A) (Figure 7-8).

One Victorian marine protected area, Wilsons Promontory Marine National Park, was identified by the PMST as overlapping the Bass Planning Area (PMST Report Appendix A) (Figure 7-8). However, the oil spill modelling did not detect any oil exposure to this marine protected area and thus it is not included in the existing environment or impact assessment.

Seven Victorian marine protected areas were identified within the Otway Planning Area (PMST Report Appendix A) (Figure 7-8):

- Eagle Rock (Marine Sanctuary)
- Marengo Reefs (Marine Sanctuary)
- Merri (Marine Sanctuary)
- Point Addis (Marine National Park)
- Point Danger (Marine Sanctuary)
- The Arches (Marine Sanctuary)
- Twelve Apostles (Marine National Park)

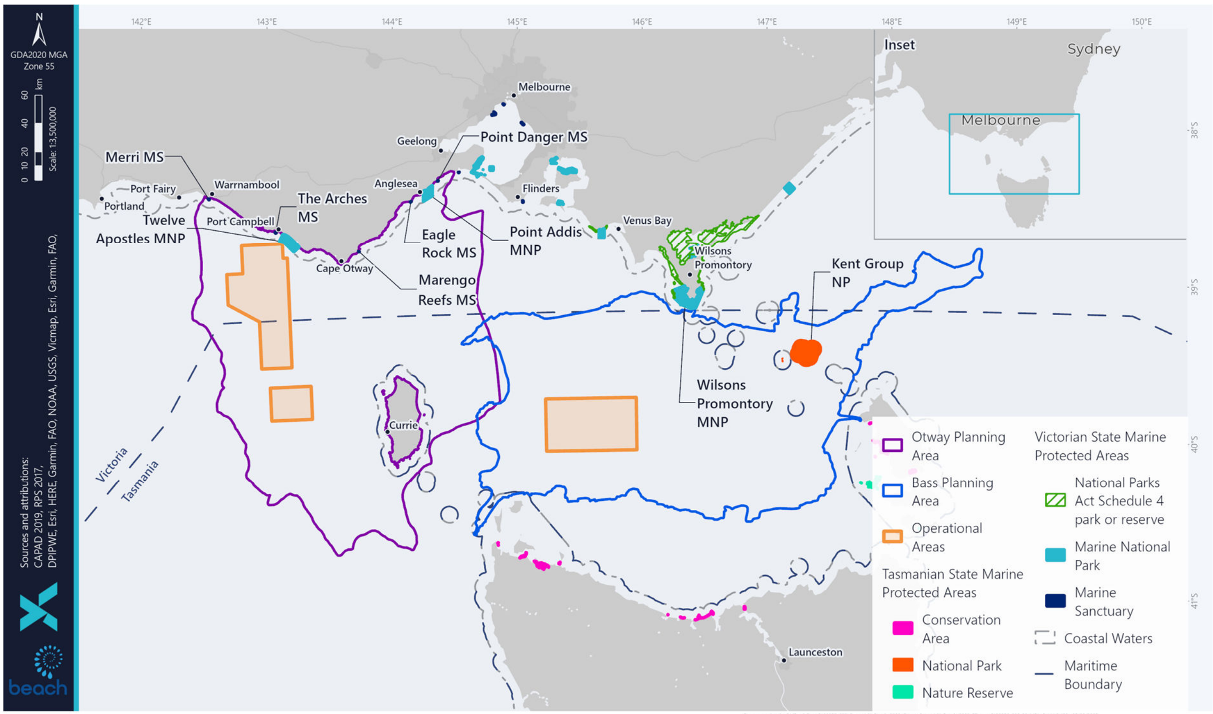


Figure 7-8: State Marine Protected Areas within the Operational and Planning Areas

7.2.8.1 Eagle Rock Marine Sanctuary

The Eagle Rock Marine Sanctuary covers 17.9 ha and is located along the Victorian Surf Coast in the township of Aireys Inlet, approximately 100 km south-west of Melbourne. The sanctuary extends from the intertidal zone to 300 m offshore and protects many habitats including intertidal and subtidal soft sediment as well as intertidal and subtidal reefs.

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

- Sandy beaches, subtidal soft sediments, subtidal rocky reefs, rhodolith beds and intertidal reefs.
- Eagle Rock, a rock stack of geological significance.
- A high diversity of algal, invertebrate and fish species. A survey of the intertidal reef at Eagle Rock Marine sanctuary found that the dominant algae were Neptune’s necklace, sea lettuce and red coralline algae (Braley et al. 1991). Subtidal reefs are dominated by bubble weed, common kelp, and fleshy red algae. (Parks Victoria 2005)
- 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. Coastal flint washed onto this coastline from other regions, attached to the holdfasts of bull kelp, was used for tool manufacture. Caves within Eagle Rock Marine Sanctuary may also have cultural significance (Parks Victoria 2005). Caves and other Indigenous places and objects above the high water mark are outside of the Planning Area.
- 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.

7.2.8.2 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 2007a).

The Marengo Reefs Marine Sanctuary Management Plan (Parks Victoria 2007a) 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.

- Long history of Indigenous use, including many Indigenous places and objects nearby. Indigenous places and objects above the high water mark are outside of the Planning Area.
- 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.

7.2.8.3 Merri Marine Sanctuary

Merri Marine Sanctuary covers 29 ha within the city of Warrnambool in south-western Victoria and protects many habitats including intertidal reef, sand, shallow reef, and rocky overhang. These habitats support many species of algae, invertebrates, fish, and shorebirds. It is managed under the Merri Marine Sanctuary Management Plan (Parks Victoria 2007b) and is classified as IUCN III.

7.2.8.4 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 2005) and is classified as IUCN II. The plan identifies the following environmental, cultural and social values for the park:

- Sandy beaches, subtidal soft sediments, subtidal rocky reefs, rhodolith beds and intertidal reefs.
- A high diversity of algal, invertebrate and fish species.
- 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. Indigenous places and objects above the high water mark are outside of the Planning Area.
- 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.

7.2.8.5 Point Danger Marine Sanctuary

Point Danger Marine Sanctuary covers 21.7 ha between the townships of Torquay and Jan Juc along Victorian Surf Coast, approximately 100 km south-west of Melbourne. It extends 600 m offshore and encompasses an offshore rock platform, protecting many habitats including intertidal and subtidal soft sediment as well as intertidal and subtidal reefs which are home to a large diversity of marine plants and invertebrates.

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

- Sandy beaches, subtidal soft sediments, subtidal rocky reefs, rhodolith beds and intertidal reefs.
- Eagle Rock, a rock stack of geological significance.
- High diversity of algal, invertebrate and fish species. On the Point Danger Marine Sanctuary intertidal reef, 15 algae species have been recorded. Common species include neptune’s Necklace and sea lettuce.
- High diversity of sea slug and other invertebrate communities
- 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. Indigenous places and objects above the high water mark are outside of the Planning Area.
- 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.

7.2.8.6 The Arches Marine Sanctuary

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

7.2.8.7 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 (Plummer et al. 2003).

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 0.1 m^2. 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). 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 by the Twelve Apostles Marine National Park and The Arches Marine Sanctuary Management Plan (Parks Victoria 2006) 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.
- A 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.

7.2.9 Victorian Protected Areas – Terrestrial

No Victorian terrestrial protected areas were identified within the Operational Areas (PMST Report Appendix A) (Figure 7-9).

Numerous Victorian terrestrial protected areas were identified within the Otway Planning Area PMST Report (Appendix A). The following are within the Otway Planning Area that may be impacted by shoreline oil if the vessel spill occurred in the northern portion of the Planning Area (Figure 7-9):

- Aire River Heritage River/Natural Features Reserve
- Bay of Islands Coastal Park
- Great Otway National Park
- Port Campbell National Park

7.2.9.1 Aire River Heritage River/Natural Features Reserve

Aire River is within the located to the west of Cape Otway and empties into the Bass Strait (Figure 7-9). Aire River, including the river mouth and estuary, is part of a designated heritage river under the *Heritage Rivers Act 1992* (Vic.). The heritage river area extends 200 m either side of the river. Aire River is mostly located within the Great Otway National Park and thus is subject to the Great Otway National Park Management Plan (Parks Victoria and DSE 2009). Heritage river values are protected through park and catchment management. The management plan identified the following significant values of the Aire Heritage River that may be within the Planning Area:

- A larger river that is one of the least modified in south-western Victoria.

- Geomorphological sites of significance.
- A high diversity of native fish species including 6 threatened species, and only one introduced fish species.
- Popular areas for fishing, boating, picnicking, and camping on the river's lower reaches.
- Scenic values between Hopetoun Falls and the Great Ocean Road and at the river estuary.

7.2.9.2 Bay of Islands Coastal Park

Bay of Islands Coastal Park is located along the Great Ocean Road in south-west Victoria between Warrnambool and Port Campbell (Figure 7-9). The park comprises 950 ha and incorporates areas above the low water mark (Parks Victoria 1998). Bay of Islands Coastal Park is classified as IUCN Category III which is allocated to protect a natural monument or feature and its surrounding habitats. It shares a management plan with Port Campbell National Park which lists the following natural and cultural values for both parks that may be within the Planning Area:

- A stretch of coastline where the wild Southern Ocean meets rugged limestone cliffs, which are being rapidly and spectacularly eroded.
- Extraordinary geomorphological features, including cliffs, rock stacks, caves, headlands and embayments.
- Significant fauna species, including the hooded plover.
- Evidence of aboriginal activities, including shell middens, stone artefacts and staircases cut into the coastal cliffs. As there is no specific information on the locations of these features it is not known if they are within the Planning Area or above the high water mark.
- Spectacular coastal scenery which has been attracting tourists since the latter decades of the 19th century.

7.2.9.3 Great Otway National Park

Great Otway National Park comprises 103,185 ha and includes much of the coastline from Princetown east to Torquay (Figure 7-9). The park is classified as IUCN Category II which is allocated to protect national parks for ecosystem conservation and recreation. The management plan for Great Otway National Park (Parks Victoria and DSE 2009) identified the following significant existing features that may be within the Planning Area:

- A large area of unmodified coastline, linking the land to marine ecosystems and marine national parks.
- An abundance of biodiversity, with many species and communities found nowhere else in Victoria, some of which are rare and threatened.
- Many sites of geological and geomorphological significance including Artillery Rocks, Dinosaur Cove, Lion Headland, Moonlight Head to Milanesia Beach, Point Sturt and View Point.

7.2.9.4 Port Campbell National Park

Port Campbell National Park is located along the Great Ocean Road in south-west Victoria (Figure 7-9). The park comprises 1750 ha and is classified as IUCN Category II which is allocated to protect national parks. It shares a management plan with Bay of Islands Coastal Park (Parks Victoria 1998) which lists the following natural and cultural values for both parks that may be within the Planning Area:

- A stretch of coastline where the wild Southern Ocean meets rugged limestone cliffs, which are being rapidly and spectacularly eroded.

- Extraordinary geomorphological features, including cliffs, rock stacks, caves, headlands and embayments.
- Significant fauna species, including the hooded plover.
- Evidence of aboriginal activities, including shell middens, stone artefacts and staircases cut into the coastal cliffs. As there is no specific information on the locations of these features it is not known if they are within the Planning Area or above the high water mark.
- Spectacular coastal scenery which has been attracting tourists since the latter decades of the 19th century.

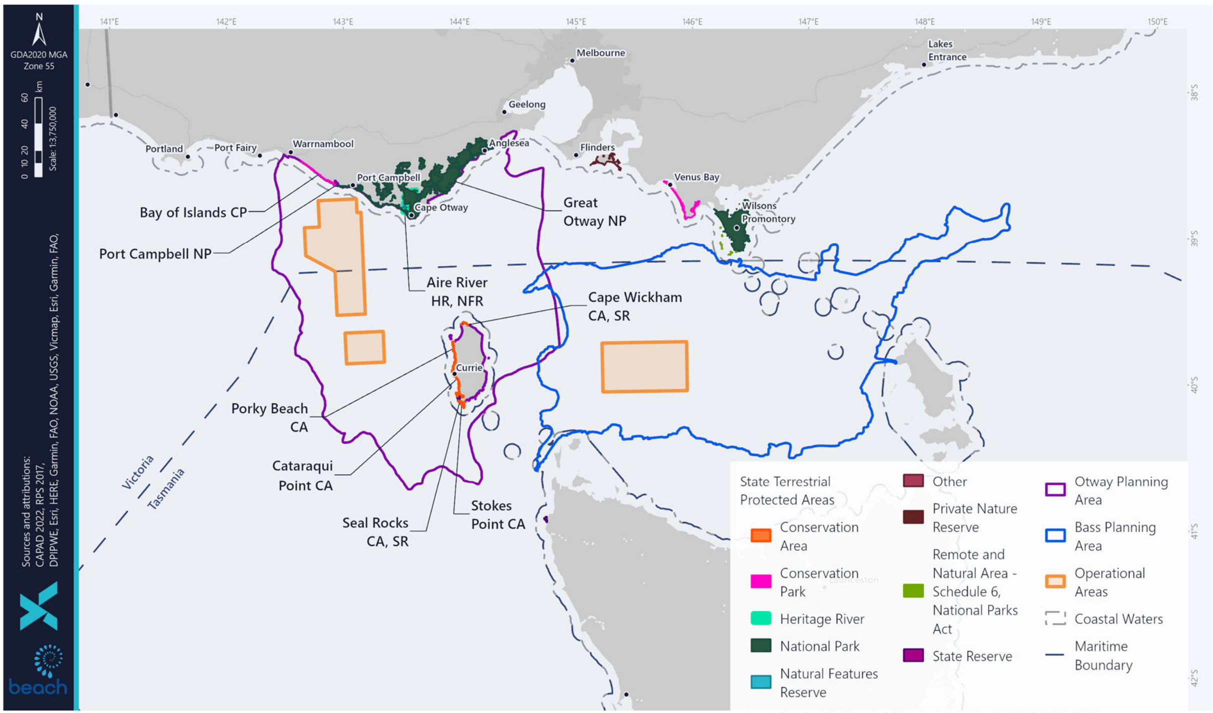


Figure 7-9: State Terrestrial Protected Areas within the Operational and Planning Areas

7.2.10 Tasmanian Protected Areas - Marine

No Tasmanian marine protected areas were identified within the Operational Areas or the Otway Planning Area (PMST Report Appendix A) (Figure 7-8).

One Tasmanian marine protected area was identified within the Bass Planning Area (PMST Report Appendix A) (Figure 7-8):

7.2.10.1 Kent Group National Park

Kent Group National Park is made up of islands and islets, situated halfway between Wilsons Promontory in Victoria and Flinders Island off Tasmania's north-eastern tip. Kent Group National Park is in the middle of Bass Strait where it is subject to a constant barrage of wild seas and currents that with it brings richness in nutrients that supports a unique diversity of marine life. The islands are an important refuge for seabirds along with providing a sanctuary for the Australian fur-seals who make their home on the rocky outcrops (DPIPWE 2020).

7.2.11 Tasmanian Protected Areas – Terrestrial

No Tasmanian terrestrial protected areas were identified within the Bass or Otway Operational Areas or the Bass Planning Area (PMST Report Appendix A) (Figure 7-9).

Numerous Tasmanian terrestrial protected areas were identified within the Otway Planning Areas (PMST Report Appendix A). However, only the following terrestrial protected areas are within the Otway Planning Area where shoreline oil may reach the Tasmanian coastline (Figure 7-9):

- Cape Wickham Conservation Area
- Cape Wickham State Reserve
- Cataraqui Point Conservation Area
- Seal Rocks Conservation Area

7.2.11.1 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. These features are outside of the Planning Area.

It is designated as IUCN Category V which is a protected landscape/seascape. There is no management plan for the Cape Wickham Conservation Area.

7.2.11.2 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.

7.2.11.3 Seal Rocks Conservation Area/State Reserve

Seal Rocks State Reserve is a 5.84 km^2 area on the southwestern 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.

7.2.12 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 in the Bass Operational or Planning Area (PMST Report Appendix A).

The PMST Report (Appendix A) identified the West Tasmanian Marine Canyons KEF as overlapping the southwest portion of both the Otway Operational and Planning Area (Figure 7-10).

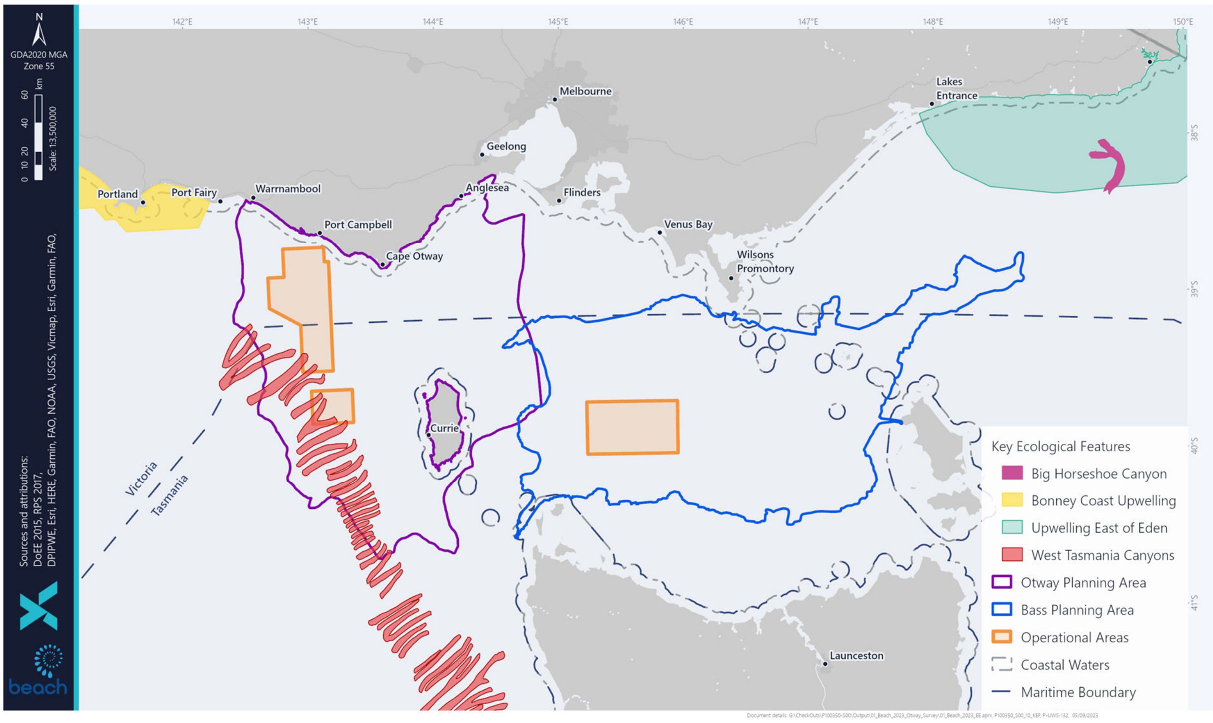


Figure 7-10: Key Ecological Features within the Operational and Planning Areas

7.2.12.1 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. 2008). 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 400 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.

7.3 Physical Environment

7.3.1 Metocean Conditions

7.3.1.1 Climate

The area is typical of a cool temperate region with cold, wet winters and warm dry summers. The regional climate is dominated by sub-tropical high-pressure systems in summer and sub-polar low pressure systems in winter. The conditions are primarily influenced by weather patterns originating in the Southern Ocean. The low-pressure systems are accompanied by strong westerly winds and rain-bearing cold fronts that move from south-west to north-east across the region, producing strong winds from the west, north-west and south-west.

The day-to-day variation in weather conditions is caused by the continual movement of the highs from west to east across the Australian continent roughly once every 10 days.

7.3.1.2 Winds

Bass Strait 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.

Wind data for the Otway Basin from RPS (2022) demonstrated average monthly wind speeds ranging from 14.2 knots (January) to 20.1 knots (July) with maximums ranging between 58.9 knots (February) and 65.8 knots (December. The dominant wind direction throughout the year was from the west, whilst maximum wind speeds were typically associated with westerly winds during all months of the year.

Wind data from the Bass basin from RPS (2023) demonstrated average monthly wind speeds ranging from 15.5 knots (January) to 19.6 knots (July) with maximums oscillating between 39.1 knots (January) and 50.2 knots (July). The wind direction between November to March was generally southwest and northeast, while the winds were mostly blowing from the west during May to October.

7.3.1.3 Tides

Tides are semi-diurnal with some diurnal inequalities (Jones and Padman 1983), generating tidal currents along a north-east/south-west axis, with speeds generally ranging from 0.1 to 2.5 m/s (Fandry 1983). The maximum range of spring tides in western Bass Strait is approximately 1.2 m. Sea level variation in the area can arise from storm surges and wave set up (Santos 2004).

7.3.1.4 Ocean Currents

The East Australian Current is one of the four major currents known to heavily influence on the conditions and biodiversity in Australian oceans and coastal environments. There are also a number of smaller and more complex current systems. All these ocean features can change from season to season, and may be more or less extensive and energetic, depending on climate factors.

Ocean currents in Bass Strait are primarily driven by tides, winds and density-driven flows (Figure 7-11). 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.

Furthermore, during winter, the Bass Strait cascade occurs, a wintertime downwelling caused by cooling of the shallow waters of Bass Strait in the Gippsland Basin. Downwelling currents that originate in the shallow eastern waters of Bass Strait flow down the continental slope to depths of several hundred meters or more into the Tasman Sea. Lateral flushing within the strait results from inflows from the South Australian Current, East Australian Current, and sub-Antarctic surface waters. The importance of this phenomenon is recognised through the designation of the seasonal Bass Cascade Key Ecological Feature.

Surface currents within the permit area have been modelled by combining the HYDROMAP tidal currents and HYCOM ocean currents for 2009 – 2013 inclusive to produce monthly surface currents. These show a rotational aspect because of inflow and outflow to Bass Strait. Although unimodal the currents are stronger from the west in all months excepting February when the currents from the east are the strongest. Minimum currents have been derived as 0.2-0.4 m/s and maximum currents as 0.8-2.0 m/s, with the strongest currents during the months July to October.

7.3.1.5 Waves

Bass Strait is a high-energy environment exposed to frequent storms and significant wave heights. The Otway coast has a predominantly south-westerly aspect and is highly exposed to swell from the Southern Ocean.

There are two principal sources of wave energy in the Otway Basin:

- from the westerly swell from the Great Australian Bight and Southern Ocean
- from locally generated winds, generally from the west and east.

The Otway area is fully exposed to long period 13 second average south-westerly swell from the Southern Ocean as well as periodic shorter 8 second average period waves from the east. Wave heights from these winds generally range from 1.5 m to 2 m, although waves heights to 10 m can occur during storm events and a combination of wind forcing against tidal currents can cause greater turbulence. The largest waves are associated with eastward-moving low pressure and frontal systems that cross the site every 4 to 6 days in winter.

7.3.1.6 Sea Temperature

The waters have average surface temperatures ranging from 14°C in winter to 21°C in summer. However, subductions of cooler nutrient-rich water (upwellings) occur along the seafloor during mid to late summer, though this is usually masked in satellite images by a warmer surface layer.

The upwelled water 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 2010).

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.

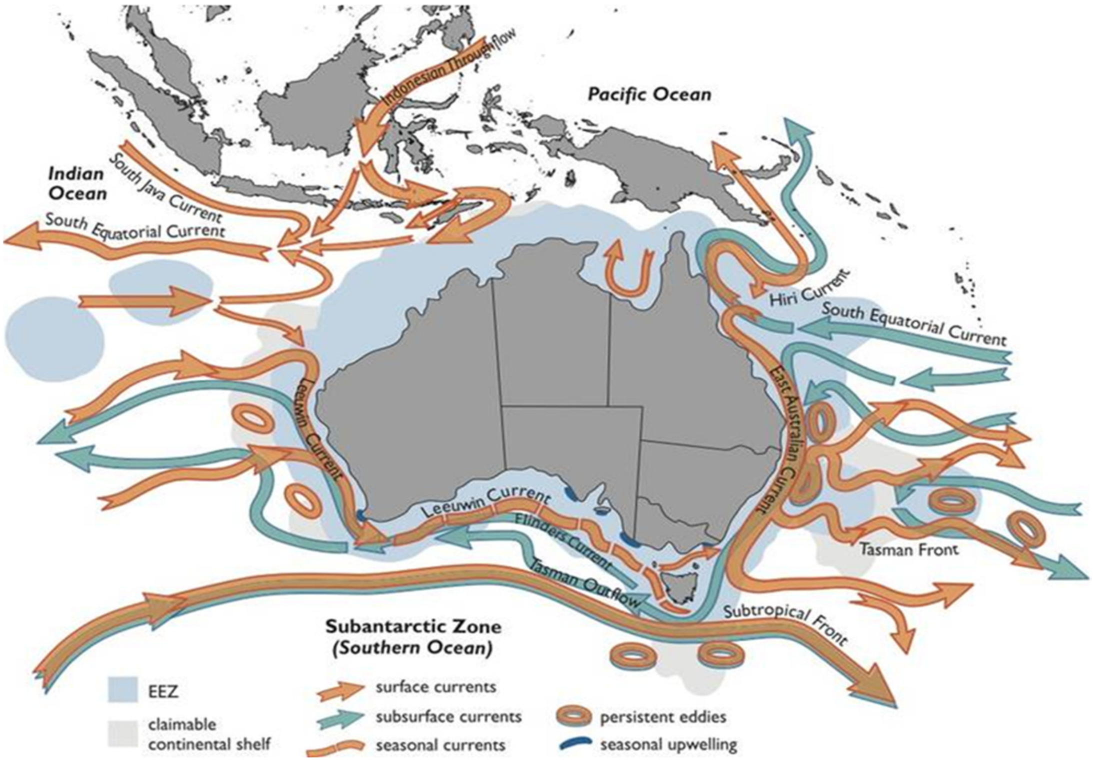


Figure 7-11: Australian Ocean Currents

7.3.2 Ambient Sound Levels

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.

In terms of monitoring work with the Otway and Bass Strait regions, 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 200 Hz, 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 2 kHz (Przeslawski et al. 2016), and biological sound sources including dolphin vocalisations were also recorded.

No acoustic monitoring has been undertaken within the Bass Operational Areas.

Otway Gas Development Acoustic Monitoring

To gain an understanding of the existing marine acoustic environment to inform the impact assessment for the Otway Gas Development acoustic monitoring was undertaken by Woodside (2003). 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. Only one of the loggers (5.9 km) was able to be recovered. A further logger was placed in the shipping lane approximately 60 km due south of Port Fairy to measure ambient noise produced by physical, man-made and biological sources between late November 2001 and early March 2002.

The following features were noted with respect to underwater noise environment at the Thylacine location:

- Thylacine site was relatively quiet with only the passage of several boats (about ten) evident.
- Horizontal banding characteristic of persistent calling by pygmy blue whales was not evident, rather these call types occurred infrequently and at low levels indicating the respective sources were at long range.
- evidence of low-level, distant evening fish choruses only.

The following features were noted with respect to underwater noise environment at the shipping lane location:

- Regular passages of boats evident.
- Regular evening fish choruses, there were also dawn choruses and persistent low level calling by these sources over daytime.
- Blue whale calling persisted over many hours, an example is the first close passage for the season just before midday on 4 January 2002 followed by several more animals a day later.
- Evidence of calling from at least three other whale species.
- 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 are 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 drill rig.

The results for Station 4, the furthest from the drill rig, 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 a larger range than was recorded 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.

7.3.3 Water Quality

Marine water quality considers chemical, physical and biological characteristics with respect to its suitability to support marine life, or for a purpose such as swimming or fishing. Marine water quality can be measured by several factors, such as the concentration of dissolved oxygen (DO), the salinity, the amount of material suspended in the water (turbidity or total suspended solids) as well as the concentration of contaminants such as hydrocarbons and heavy metals.

The Bass Strait and Otway Basin are known for a complex, high energy wave climate and strong ocean currents (Origin 2015), and therefore water column turbidity on the Victorian coastline is subject to high natural variability. Weather conditions in the coastal environment around Port Campbell and Port Ferry are known to influence offshore hydrodynamic conditions and are a driver of sediment dynamics, impacting benthic and pelagic habitats and changing water column turbidity. Wave-driven sediment resuspension generates high turbidity levels within coastal zones, commonly exceeding 50 mg/L (Larcombe et al. 1995), but coastal communities appear generally well adapted to deal with these extrinsic stresses.

7.3.3.1 Bass

The nutrient concentrations in Central Bass Strait are low compared to that of what is seen at its extremities (Gibbs, Tomczak and Longmore 1986, Gibbs 1992). It is hypothesised that this could be due to the biological demands of the Bass Strait waters consuming much of the nutrients before moving into Central Bass Strait (Gibbs 1992). In the nearshore areas of the Planning Area, water quality may be negatively affected through the discharge of polluted waters from rivers, which drain catchments dominated by stock grazing and small coastal settlements (Parks Victoria 2006).

7.3.3.2 Otway

The Otway Basin is characterised by high wave energy and cold temperature waters subject to upwelling events (Bonney coast upwelling) around the continental shelf margin (Origin 2015). Significant upwelling of colder, nutrient rich deep water during summer can cause sea surface temperatures to decrease by 3°C compared with offshore waters (Butler et al. 2002).

An environmental survey was undertaken from November 2019 to January 2020 for the Otway Gas Development (Ramboll 2020). Water samples were collected at two of the gas fields, Artisan and Thylacine. Sample locations are shown in Figure 7-14. The Artisan field is representative of the water quality closer to shore, while the Thylacine field is representative of water quality within the offshore areas.

Insitu measurements were taken for dissolved oxygen (DO), pH and oxidation-reduction potential (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 (ANZECC 2000). 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 compared to the ANZECC (2000) default trigger 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, NO_3, TKN and TN above the LOR, however, none of the measurements exceeded ANZECC trigger values. Concentrations of TP were recorded in all samples, but all measurements were well below ANZECC trigger values. TSS 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 Zn against ANZECC protection level (or trigger values) were below the 90% protection level but concentrations variously exceeded 95 or 99% protection levels. This result is consistent with a slightly disturbed marine system which is described in (ANZECC 2000) 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 the Thylacine_1_2 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 Otway Operational and Planning Areas 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.

7.3.4 Sediment Quality

7.3.4.1 Bass

Sediment sampling has not been undertaken within the Bass Operational Area and will be done as part of this seabed survey.

Origin Energy, as the previous operator of the BassGas Development, undertook several geotechnical surveys in and around the Yolla-A platform. These surveys indicate that the seabed is flat and featureless, with surveys prior to construction indicating the seabed has very soft to soft alternating layers of silty carbonate clay and silty sands containing fragile white shell fragments (Thales Geosolutions 2001).

7.3.4.2 Otway

It is expected that sediment quality within the Operational and Planning Areas will be typical of the offshore marine environment of the Otway Basin.

An environmental survey was undertaken from November 2019 to January 2020 for the Otway Gas Development (Ramboll 2020). Sediment samples were collected at two of the gas fields, Artisan and Thylacine using a Double Van Veen grab sampler (refer to Figure 7-13 for site locations). Due to poor weather conditions sampling had to be reduced. It was decided that 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 Geographe field. Three replicate sediment samples were to be collected at each of the fields, however, this was not always possible because of the compacted substrate. The resulting samples included four replicate samples from Thylacine and two replicate samples from Artisan.

The sediment within all samples and, therefore at both fields, 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 ORP or oxidation reduction potential 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 is 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 Interim Sediment Quality Guidelines low trigger value of 80 mg/kg from the recommended sediment quality guidelines set out in ANZECC (2000). 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 ISQC-Low trigger value.

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 and Planning Areas will be typical of the offshore marine environment of the Otway Basin.

7.3.5 Air Quality

Historical air quality data for the region is available from the Environment Protection Authority (EPA) Victoria air quality monitoring stations, and Cape Grim Baseline Air Pollution Station on Tasmania's west coast.

The Victorian air quality data is collected at 15 performance monitoring stations representing predominantly urban and industrial environments in the Port Phillip and Latrobe Valley regions of Victoria. Results are assessed against the requirements of the National Environment Protection (Ambient Air Quality) Measure for the pollutants carbon monoxide (CO), nitrogen dioxide (NO_2), ozone (O_3), sulfur dioxide (SO_2), lead (Pb), particles less than 10 micrometres in diameter (PM10) and particles less than 2.5 micrometres in diameter (PM2.5). The most recent annual air monitoring report shows Victoria's air quality in 2015 was generally good with AAQ NEPM (Ambient Air Quality National Environmental Protection Measure) goals and standards being met for carbon monoxide (CO), nitrogen dioxide (NO_2), Ozone (O_3) and sulfur dioxide (SO_2). There were some exceedances for particles.

The Geelong monitoring station is the closest to the Operational Areas; however, it is situated in an urban environment and is not representative of the clean air environment over the majority of the Planning Areas. The Cape Grim Baseline Air Pollution Station data is likely a more reliable point of reference for air quality in the Operational and Planning Areas as the air sampled arrives at Cape Grim after long trajectories over the Southern Ocean and is representative of a large area unaffected by regional pollution sources (cities or industry) (CSIRO 2017). The Cape Grim station monitors greenhouse gases (GHGs), including carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O) and synthetic GHGs such as hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulfur hexafluoride (SF6).

Historical air quality data from Cape Grim show that most GHGs have shown continuous increases in concentration since the mid-to-late 1970s with carbon dioxide levels increasing by more than 15% since 1976, and concentrations of methane and nitrous oxide increasing by around 20% and 8% respectively since 1978. The increase in methane levels however has slowed recently and CFCs and halons are in decline. Increases have been attributed to anthropogenic causes, for example, fossil fuel consumption and agricultural practices (CSIRO 2017).

7.3.6 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 Ekman 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 (DoE 2023f).

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 ~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).

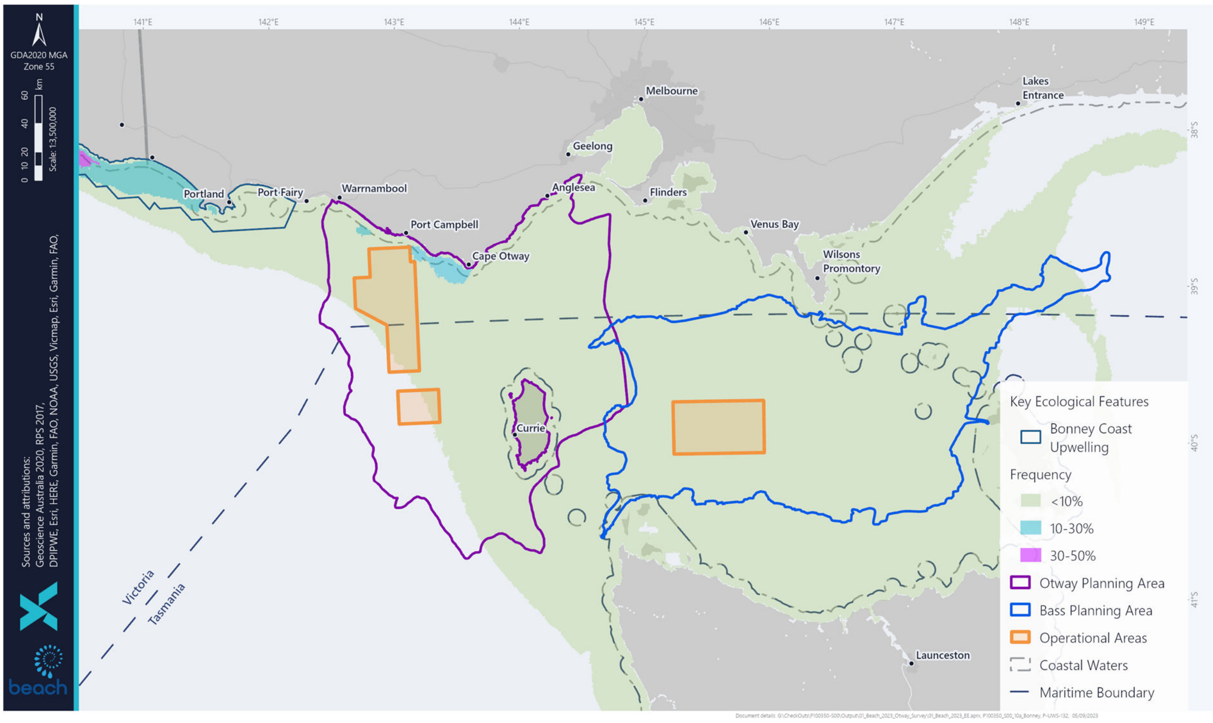


Figure 7-12: Bonney Coast Upwelling Frequency (Source: Huang and Wang 2019, Geoscience Australia 2020)

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.

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 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.

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. Given this, development of management strategies for petroleum activities in the area using prevailing climatic conditions as a predictor of seasonal blue whale abundance is not currently feasible.

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 (Figure 7-12) adjacent to the north-east of Otway Operational Area A. Areas of further increased frequencies of Bonney coast upwellings (30-50% seasonal) were found over 198 km to the west of the Otway Operational Area.

7.4 Ecological Environment

To characterise the ecological environment, a literature search and online resources and databases were reviewed to identify and assess flora and fauna species known to be present or potentially present in the Operational and Planning Area. The following information sources were reviewed to assure consistency with previous assessments and to develop an up-to-date overview of the existing environment.

- Online government databases, publications, and interactive mapping tools, such as the SPRAT database.
- Protected Matters Search Tool (PMST) for Matters of National Environmental Significance (MNES) protected under the EPBC Act.
- Published observations, data, and statistics on marine mammals.
- Reports from scientific experts and institutions, marine biologist and experts in blue whale and southern right whale populations in the Otway area.
- Woodside's Otway Gas Project Environmental Effects Statement/Environmental Impact Assessment (EES/EIS) (2003) (Woodside 2003).
- Santos Casino Gas Field Development Environmental Report (2004) (Santos 2004).
- BHP Billiton's Minerva Environmental Impact Statement and Environmental Effects Statement and Associated Supplemental Environmental Monitoring published research papers (BHP Billiton 1999).
- Origin Energy's Environment Plans for previous activities in the region.
- National Conservation Values Atlas.
- Relevant listings under the Victorian FFG Act 1988 (DEECA 2023)
- Relevant listings under the Tasmanian Threatened Species Conservation Act (1995) (TSC Act)
- Relevant environmental guidelines and publicly available scientific literature on individual species.

7.4.1 Benthic Habitats and Species Assemblages

Benthic communities are biological communities that live in or on the seabed. These communities typically contain light-dependent taxa such as algae, seagrass and corals, which obtain energy primarily from photosynthesis, and/or animals such as molluscs, sponges and worms. Benthic habitats are the seabed substrates that benthic communities grow on or in; these can range from unconsolidated sand to hard substrates (e.g. limestone) and occur either singly or in combination.

7.4.1.1 Bass

Surveys undertaken within the Bass Operational Area recorded a flat and featureless seabed with soft to soft alternating layers of silty carbonate clay and silty sands containing fragile white shell fragments (Thales Geosolutions 2001).

Marine invertebrate diversity in South Australian waters is considered to be high with the Bass Strait containing porifera, cnidarians, bryozoans, arthropods, crustaceans, molluscs, echinoderms, and annelids. Distribution of these species is understood to be irregular with little evidence of distinct biogeographic regions (Poore et al. 1985, Wilson and Poore 1987).

One of the objectives of this seabed survey is to obtain further information on the benthic habitat and species in the Bass Operational Area.

7.4.1.2 Otway

The Otway continental margin is a swell-dominated, open, cool-water carbonate platform which can be divided into depth-related zones (Boreen et al. 1993):

1. Shallow shelf: consisting of exhumed limestone substrates that host encrusting mollusc, sponge, bryozoan, and red algae assemblages.

2. Middle shelf: a zone of swell wave shoaling and production of mega-rippled bryozoan sands.

3. Deep shelf: accumulations of intensely bioturbated, fine bioclastic sands.

4. Shelf edge/top of Slope: nutrient-rich upwelling currents support extensive, aphotic bryozoan/sponge/coral communities.

The dominant benthic habitat throughout the shelf area, as indicated by the seabed and benthic habitat studies, is medium to coarse carbonate sands with areas of low relief exposed limestone (Boreen et al. 1993, BBG 2003, Ramboll 2020). The benthic species assemblages known or likely to be associated with these habitats are described in the following sections.

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 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.

Beach commissioned a seabed site assessment for the Otway Gas Development in 2019 (Ramboll 2020). The seabed site assessment was undertaken from November 2019 to January 2020 and ranged in water depths from 70 to 104 m. The survey extent included the potential subsea development areas and associated flowline / control umbilical routes, and is shown in Figure 7-13. The information from these surveys are relevant for the Otway Operational Areas on the shelf with the one of the objectives of this seabed survey is to obtain further information on the benthic habitat and species on the shelf edge and slope within the Otway Operational Areas.

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. The drop camera locations within the Otway Operational Area are shown in Figure 7-14: Drop Camera and Sample Locations for the Otway Gas Development Seabed Site Assessment. Drop camera images are shown in Figure 7-15 to Figure 7-22 and a summary is provided in Table 7-2.

The composition and percent coverage of epifauna was assessed from photographs of the seafloor. Percentage cover was typically no more than 37%. The seabed at Hot Tap X had the greatest average coverage of epibiota whilst the lowest coverage was recorded along the route between Artisan and Hot Tap Y. Of the gas field sites, Artisan and Hercules had a slightly greater coverage of epifauna. Of the individual epibenthic organisms, Gastropoda sp. 2 (a cone shell) and crionids (featherstars) were the most abundant.

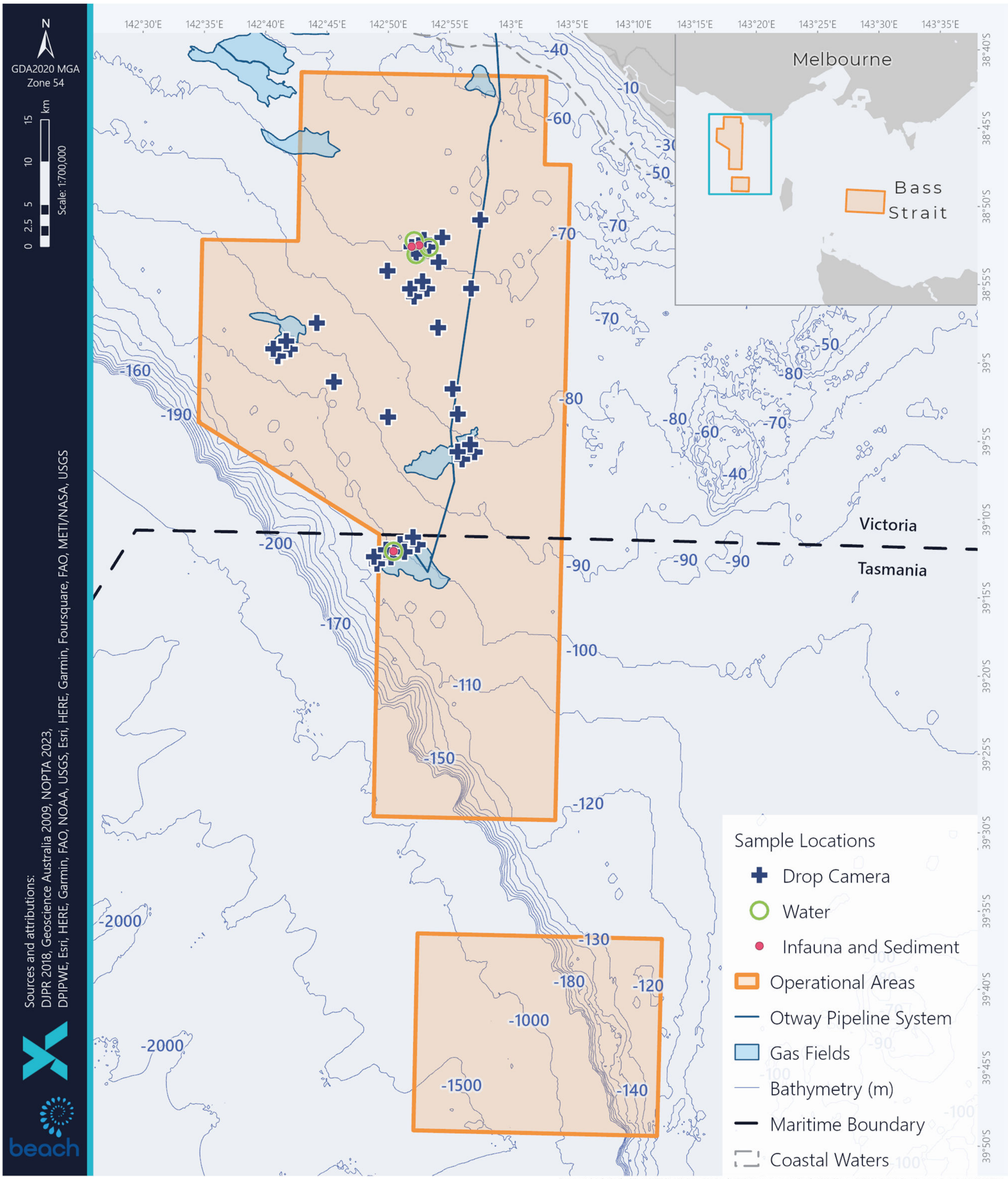
No benthic species or ecological communities listed as threatened under the Environmental Protection and Biodiversity Conservation Act 1999 (the EPBC Act) were identified.

In summary, the seabed is similar across the Otway Operational Area, consisting of carbonate rich coarse to medium sands with areas of exposed limestone substrate (Ramboll 2020, CEE Consultants Pty Ltd 2003; BBG 2003 and Boreen et al. 1993). 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.

Table 7-2: Summary of the Seabed Survey Benthic Habitats

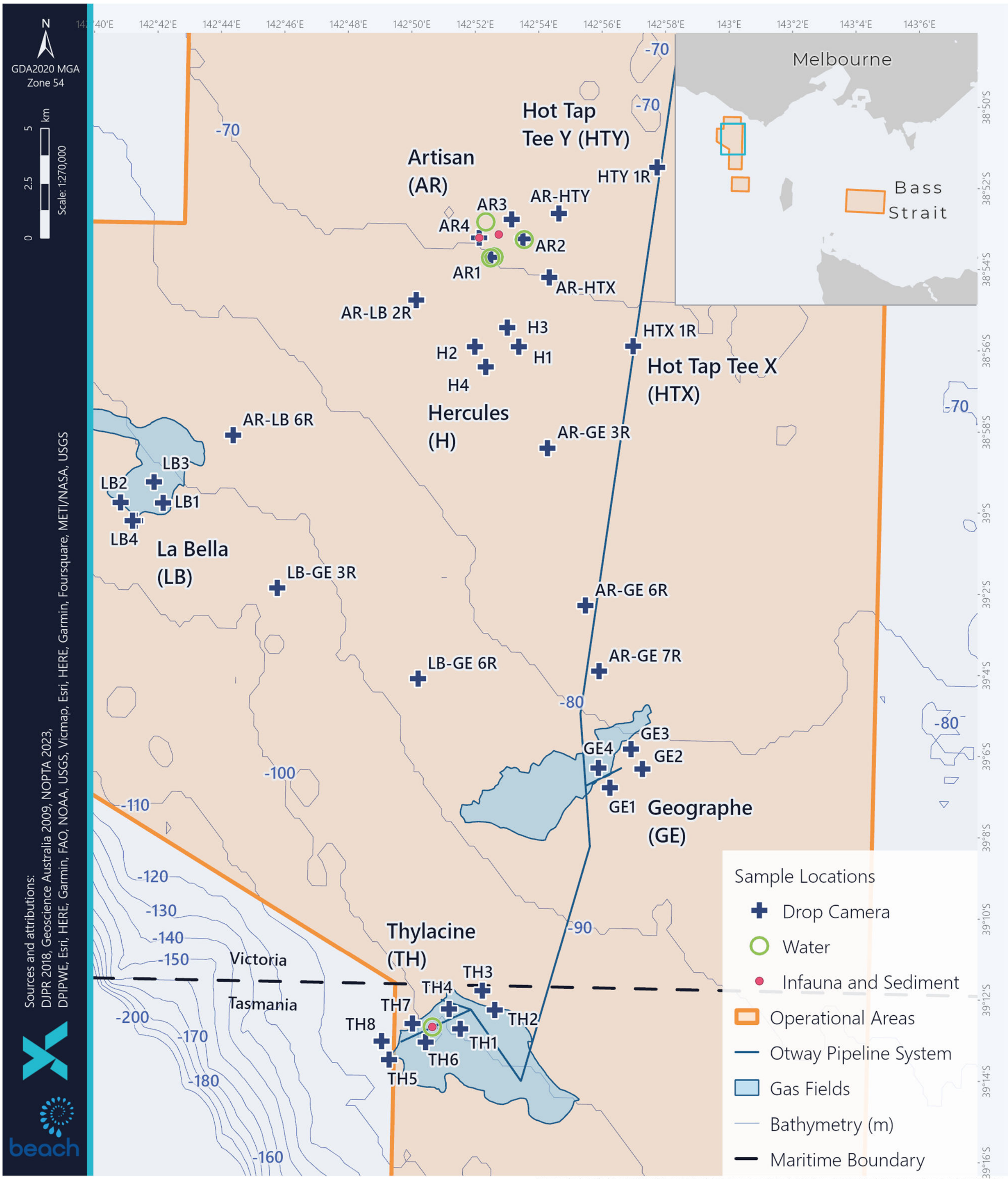
Survey Location	**Summary**
Artisan (Figure 7-15)	Very little bathymetric variation across the survey area with water depths ranging from 68 to 74 m. Seabed topography dominated by exposed rock on the seabed. Small patches of very thin transgressive coarse sand are present across the survey area. Megaripples were seen in some areas, with a wavelength of 1.5 to 2 m and a height of 0.3 to 0.5 m. 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 -1.0 m above ambient seabed. Seabed showed a scattered sessile biota on a sandy seafloor.
Geographe (Figure 7-16)	Very little bathymetric variation across the survey area with water depths ranging from 80 to 91 m. Rocky outcrops of the Port Campbell Limestone show some variable relief up to 2 m. 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).
Thylacine (Figure 7-17)	Seabed depths vary ranging from 92 to 115 m, 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 3 m is identified on the rocky scarp surfaces, which are separated by shallow depressions often with a transgressive sandy infill.

Survey Location	Summary
	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 – 100 m. Infauna was of relatively low abundance and diversity as expected for coarse sand substrates.
La Bella (Figure 7-18)	Water depth varies from 89 to 104 m, 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 7-19)	Very little bathymetric variation across the survey area with water depths ranging from 71 to 77 m. 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 1 m 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.
Proposed Pipeline and Umbilical Routes (Figure 7-20 Figure 7-21 Figure 7-22)	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 1 m 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.



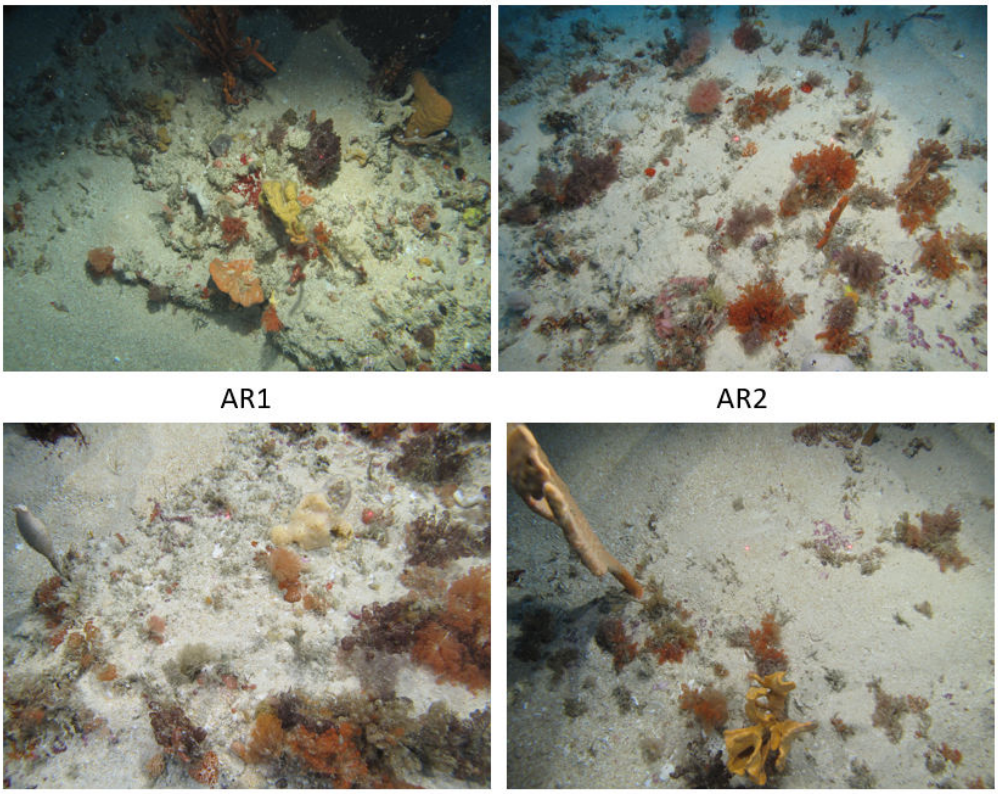
Sources and attributions:
DJPR 2018, Geoscience Australia 2009, NOPTA 2023,
DPIPWE, Esri, HERE, Garmin, FAO, NOAA, USGS, Esri, HERE, Garmin, Foursquare, FAO, METI/NASA, USGS

Figure 7-13: Location of the Otway Gas Development Seabed Site Assessment and the Otway Operational Areas



Document details: G:\CheckOuts\P100350-S00\Output\01_Beach_2023_Otway_Survey\01_Beach_2023_EE.aprx, P100350_S00_19b_DropCameras_Zoom, P-UWS-132, 26/10/2023

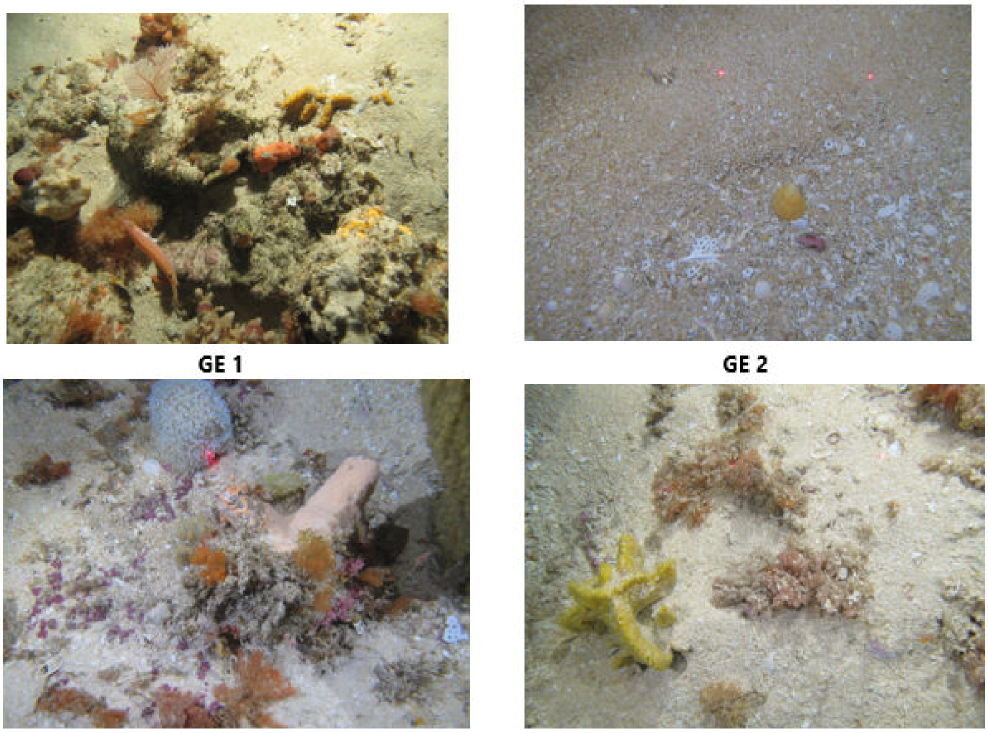
Figure 7-14: Drop Camera and Sample Locations for the Otway Gas Development Seabed Site Assessment



AR1 AR2

AR3 AR4

Figure 7-15: Drop Camera Images at Artisan



GE 1 GE 2

GE 3 GE 4

Figure 7-16: Drop Camera Images at Geographe

TH 1

TH 2

TH 3

TH 4

TH 5

TH 6

TH 7

TH 8

Figure 7-17: Drop Camera Images at Thylacine


La Bella, LB1
La Bella, LB2
La Bella, LB3
La Bella, LB4

Figure 7-18: Drop Camera Images at LaBella

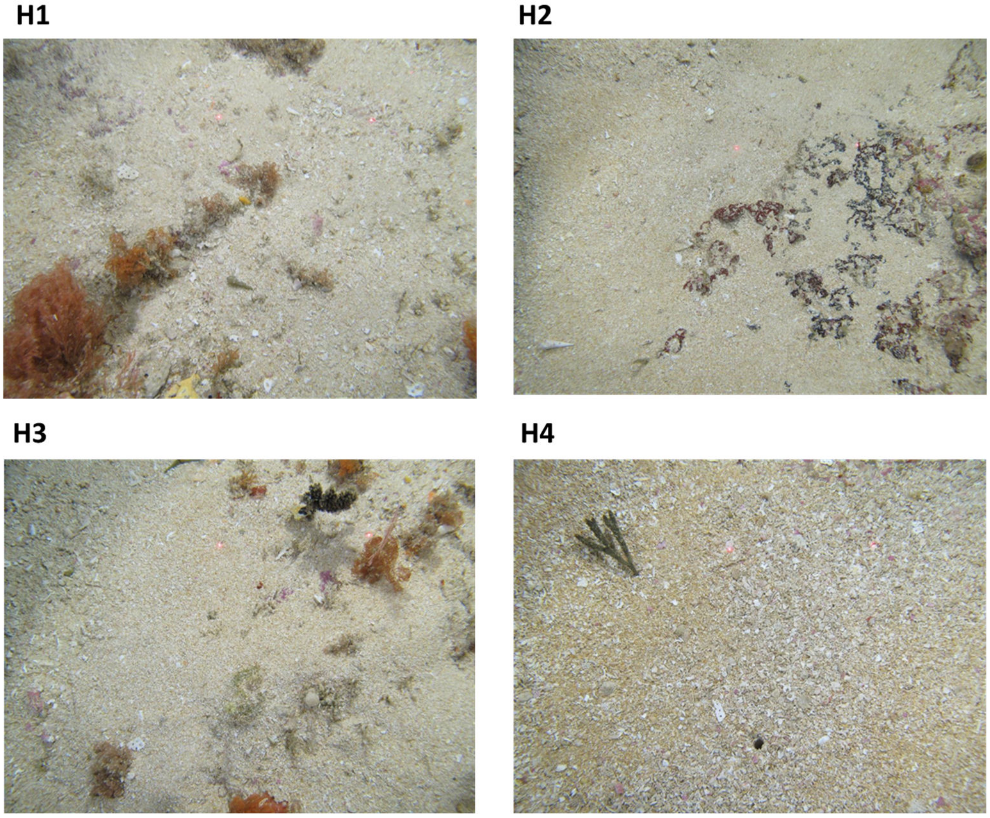
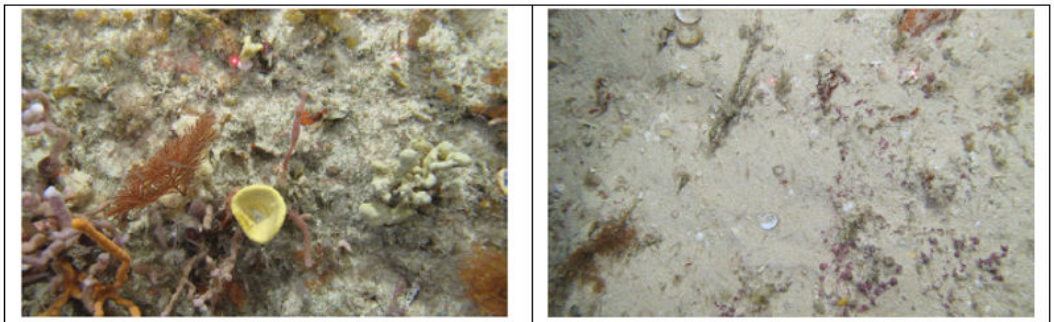

H1
H2
H3
H4

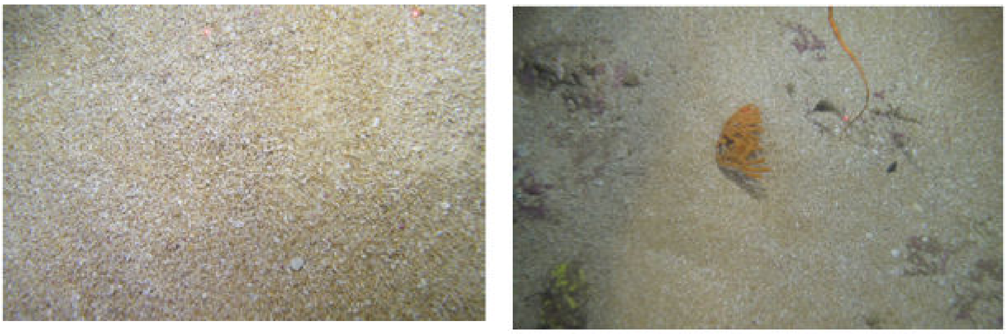
Figure 7-19: Drop Camera Images at Hercules



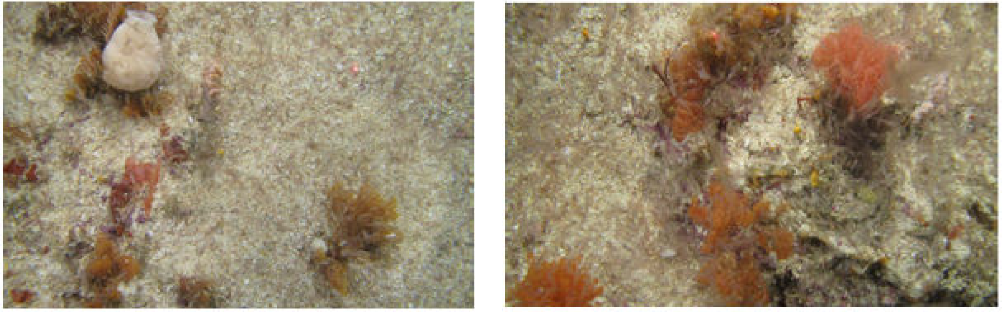
Hot Tap Tee X **Hot Tap Tee X**

Hot Tap Tee Y **Hot Tap Tee Y**

Figure 7-20: Drop Camera Images at Hot Taps

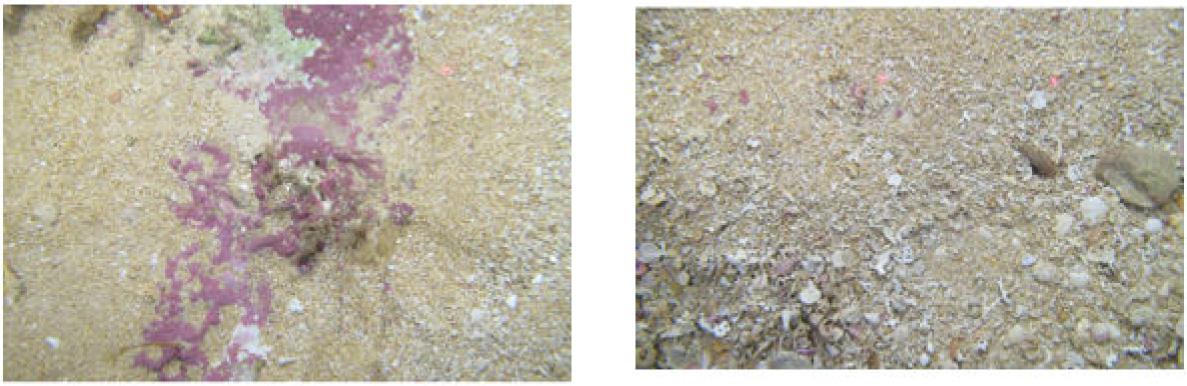


Artisan to Hot Tap Tee Y Route **Artisan to Hot Tap Tee Y Route**



Artisan to Hot Tap Tee X Route **Artisan to Hot Tap Tee X Route**

Figure 7-21: Drop Camera Images at Proposed Flowline Routes



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 7-22: Drop Camera Images at Proposed Flowline Route and Umbilical Routes

7.4.2 Soft Sediment

Unvegetated soft sediments are a widespread habitat in both intertidal and subtidal areas, particularly in areas beyond the photic zone. Factors such as depth, light, temperature, and the type of sediment present can vary the biodiversity and productivity of soft sediment habitat.

The Middle Otway Shelf (70-130 m depth) is a zone of large tracts of open sand with little or no epifauna to characterise the area: infaunal communities and bivalves, polychaetes and crustaceans dominate in the open sand habitat. The Deep Otway Shelf (130 – 180 m) sediments consist of accumulations of intensely bioturbated, fine, bio clastic sands. The Upper Slope of Otway Shelf (> 180 m) incorporates the edge/ top of the shelf which displays nutrient-rich upwelling currents support extensive, aphotic bryozoan/sponge/coral communities. The upper slope is dominated by bioturbated mixture of periplatform bioclastic debris and pelleted foraminiferal/nannofossil mud. Turbidites and resedimentation features are common. Bioturbation and shelf-derived skeletal content decrease progressively downslope and pelagic muds dominate below 500 m.

Scientific surveys have shown that some shallow Victorian sandy environments have notable high levels of animal biodiversity (Parks Victoria 2016). Some of the larger animals found in these soft sediment environments in Victoria include smooth stingray (*Dasyatis brevicaudata*), pipi (*Plebidonax deltoids*), dumpling squid (*Euprymna tasmanica*), common stargazer (*Kathetostoma laeve*) and heart urchin (*Echinocardium cordatum*) (Parks Victoria 2016).

7.4.3 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). Known seagrass meadows within the Otway Planning Area are present along the Victorian coastline (Figure 7-23). The Bass Planning Area overlaps only small seagrass meadows around Deal Island. 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).

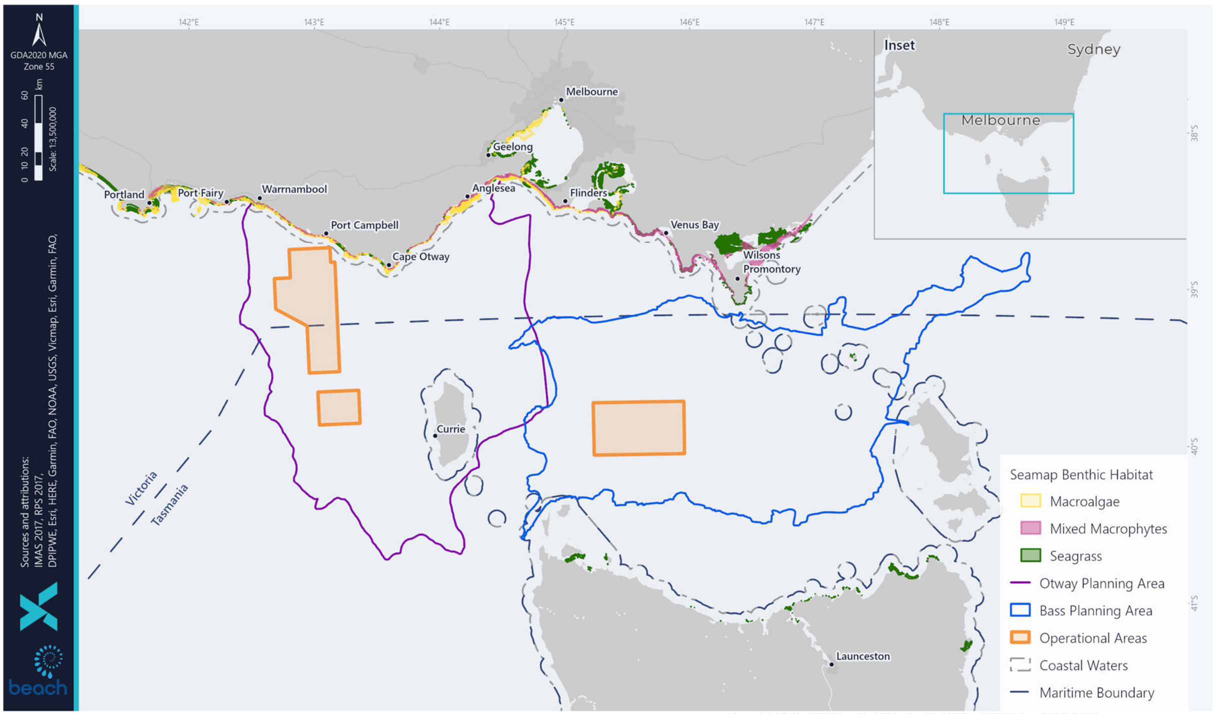


Figure 7-23: Presence of seagrass (and mixed macrophyte) habitat within the Operational and Planning Areas

7.4.4 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 Otway Planning Area, macroalgae are present along the Victorian coastline (Figure 7-23). No macroalgae have been mapped within the Bass Planning 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 2023). 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 2023).

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 7-24.

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.

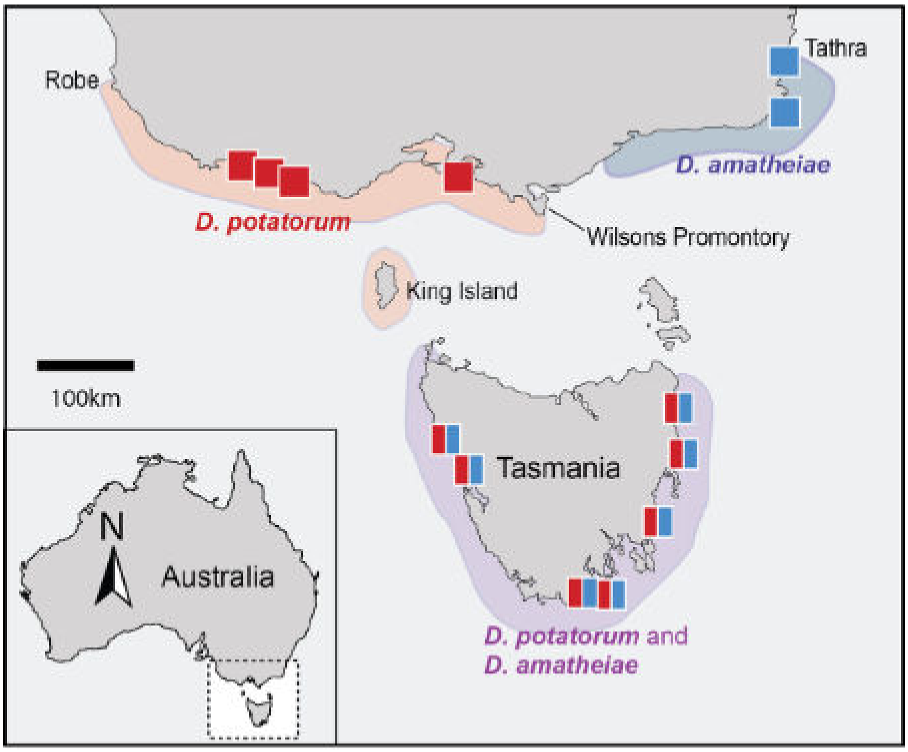


Figure 7-24: Distribution of Bull Kelp off Victoria and Tasmania (Velasquez et al. 2019)

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 in Australia, New Zealand and Chile. In Australia this reportedly dates back 65,000 years (Thurstan et al. 2018). First Nation 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 2023).

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 7.5.12.

7.4.5 Coral

Corals are generally divided into two broad groups: the zooxanthellate (‘reef-building’, ‘hermatypic’ or ‘hard’) corals, which contain symbiotic microalgae (zooxanthellae) that enhance growth and allow the coral to secrete large amounts of calcium carbonate; and the azooxanthellate (‘ahermatypic’ or ‘soft’) corals, which are generally smaller and often solitary

(Tzioumis and Keable 2007). Hard corals are generally found in shallower (< 50 m) waters while the soft corals are found at most depths, particularly those below 50 m (Tzioumis and Keable 2007).

Corals do not occur as a dominant habitat type within the Operational and Planning Area, however, their presence has been recorded around areas such as Wilsons Promontory National Park and Cape Otway. Reef development by hard corals does not occur further south than Queensland (Tzioumis and Keable 2007). Soft corals are typically present in deeper waters throughout the continental shelf, slope, and off-slope regions, to well below the limit of light penetration.

Reproduction methods for cold water corals are not as well understood as warm water corals such as those of the Great Barrier Reef, but it is likely that some are still broadcast spawners (like their tropical counterparts), while others brood, and release formed larvae (Roberts et al. 2009).

7.4.6 Carbonate Sands and Exposed Limestone

Boreen et al. (1993) reported that carbonate sands in the Otway middle shelf support a benthic fauna dominated by bryozoans, infaunal echinoids and assemblages of sponges. Other components include bivalves (commonly *Mysella donaciformis* and *Legrandina bernardi*), *Chlamys* sp. scallops and small gastropods. The sand octopus (*Octopus kaurna*) also inhabits sandy sediments. This description is broadly supported by video footage of the Otway pipeline, which also indicates that hard substrates in mid shelf areas in the west of the operational support low to medium density sponge dominated communities.

Within the inner shelf, Boreen et al. (1993) reported that the benthic communities associated with hard limestone substrates were comprised of sponges, encrusting, and branching coralline algae, poysonellid algae, bryozoa, benthic foraminifera, robust sarpullds, brachiopods, bivalves, gastropods, fleshy red algae and kelp.

A benthic survey of inner shelf sediments in the vicinity of the Minerva Gas Field development, found the seafloor was composed of course, well-sorted sand (Currie and Jenkins 1994). This survey identified 196 species and a total of 5,035 individuals comprised of 63% crustaceans, 15% polychaetes, 8% molluscs and 5% echinoderms. The most abundant species were the bivalve *Katlysia* sp. (12.4 individuals/m^2), the sarconid *Triloculina affinis* (8.9 individuals/m^2), the tanaid isopod *Apsuedes* sp. (8.3 individuals/m^2) and the spionid polychaete *Prionospio coorilla* (4.8 individuals/m^2) (Currie 1995).

Demersal fishes likely to be associated with carbonate sands on the middle and inner shelf include (LCC 1993) eastern stargazer (*Kathetostoma laeve*), elephant shark (*Callorhynchus milli*), greenback flounder (*Rhombosolea taoarina*), gummy shark (*Mustelus antarcticus*), long-snouted flounder (*Ammotretis rostraus*), saw shark (*Pristiophorus nudipinnis*), southern sand flathead (*Platycephalus bassensis*) and southern school whiting (*Sillago bassensis*).

7.4.6.1 Basalt Rises

No basalt rises were identified within the Operational or Planning Areas.

7.4.7 Mangroves

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 (Figure 7-25). Small patches of mangroves have been mapped within the Otway Planning Area at the Cumberland and Erskine Rivers (Figure 7-25). No mangroves have been mapped within the Bass Planning Area.

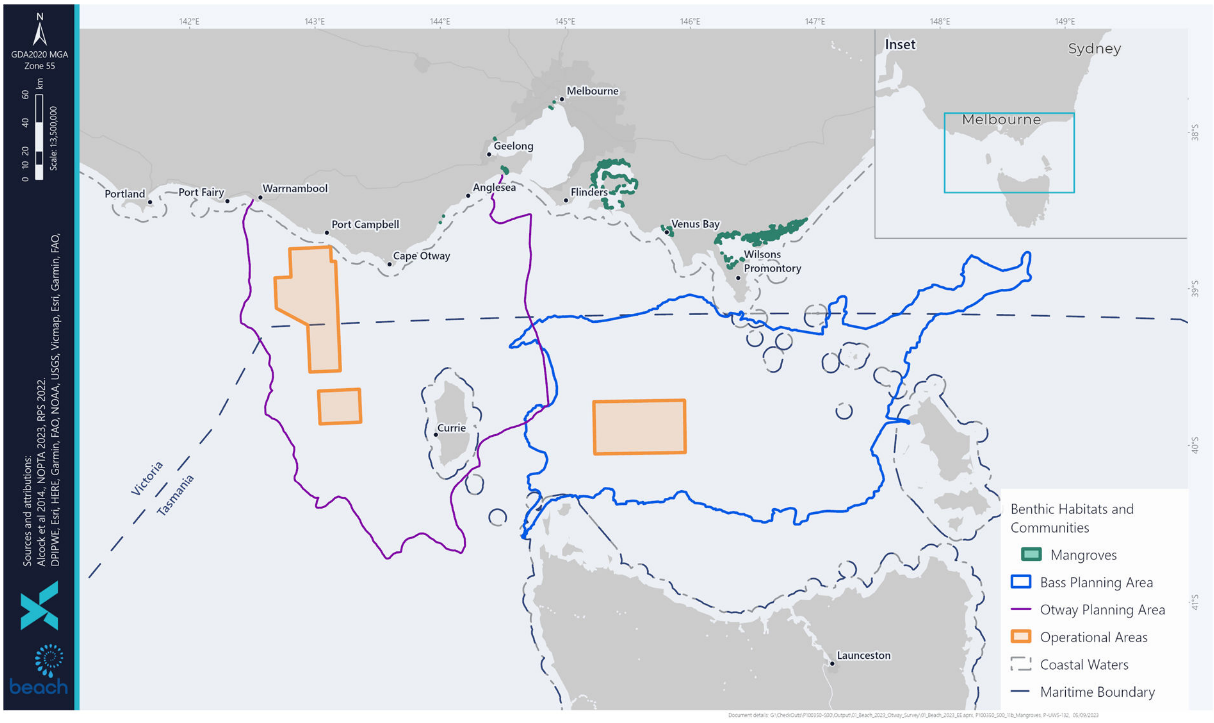


Figure 7-25: Presence of Mangrove Habitat within the Operational and Planning Areas

7.4.8 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 (Figure 7-26; Boon et al. 2011). Within the Otway Planning Area, saltmarsh habitat has been mapped along the Victorian coastline including at 12 Apostles, Curdies Inlet and Thompson Creek (Figure 7-26). Small areas have also been mapped within the Otway Planning Area along the coastline of King Island at Seal River and Yellow Rock River. No saltmarsh has been mapped within the Bass Planning Area.

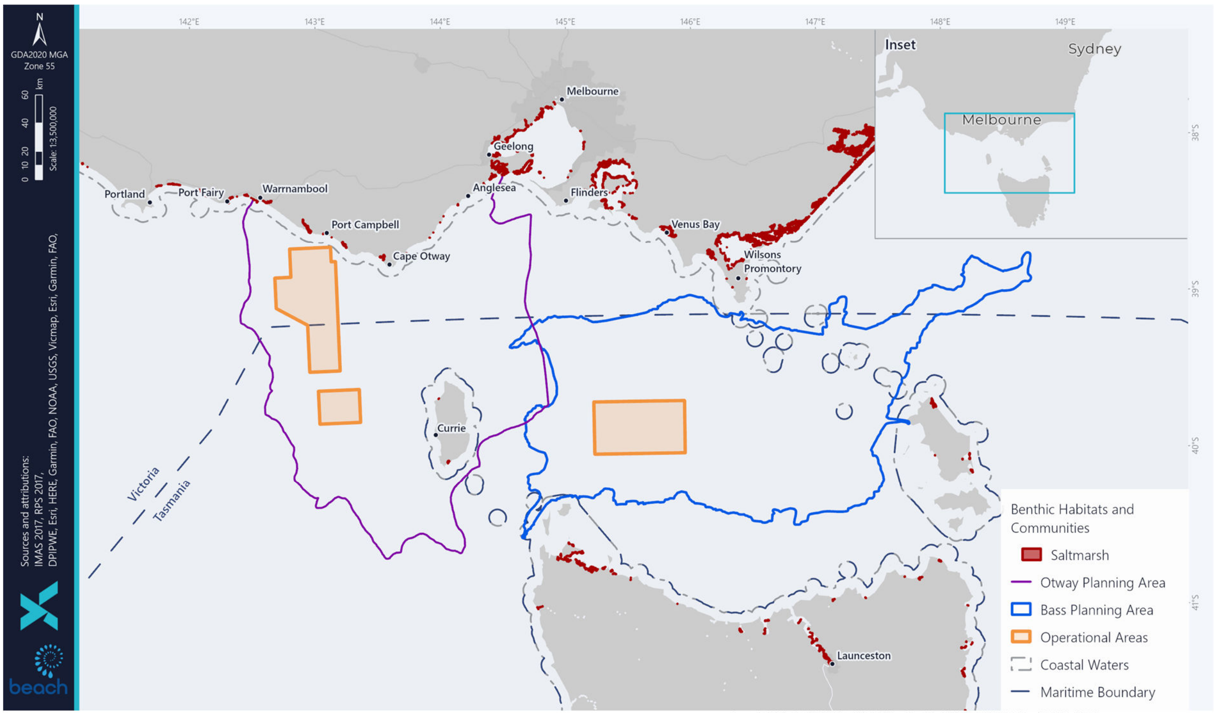


Figure 7-26: Presence of saltmarsh habitat within the Operational and Planning Areas

7.4.9 Plankton

Plankton species are the key component of the food web and support nearly all marine life. Copepods are the most common zooplankton and are some of the most abundant animals on earth. Plankton communities are highly diverse, with members from almost all phyla. Phytoplankton are photosynthetic organisms that drift with ocean currents and are mostly microscopic; however, some gelatinous plankton can be up to 2 m in diameter. Phytoplankton is grazed by zooplankton such as small protozoa, copepods, decapods, krill, and gelatinous zooplankton.

The carrying capacity of marine ecosystems (the mass of fish resources) and recruitment of individual stocks is strongly related to plankton abundance, timing, and composition. In the Planning Areas, the seasonal Bonney coast upwelling is a productivity hotspot, with high densities of zooplankton and are important for fish and whales. Of importance in the region is krill, *Nyctiphanes australis*, which swarms throughout the water column reaching its highest abundance in shallow waters of the continental shelf during nightly vertical migrations, primarily in the summer months (Hosie 1983). During winter months, *N. australis* abundance decreases and becomes relatively scarce in the upper water column. *N. australis* feeds on microalgae and provides an important link in the food chain, particularly for the blue whale. The fisheries in this region account for half of Australia's total annual catch and the main fishery in the region is sardine, which feeds on plankton, illustrating the interdependence of the fishing industry on plankton.

There have been relatively few studies of plankton populations in the Otway and Bass Strait regions, with most concentrating on zooplankton. Watson and Chaloupka (1982) reported a high diversity of zooplankton in eastern Bass Strait, with over 170 species recorded. However, Kimmerer and McKinnon (1984) reported only 80 species in their surveys of western and central Bass Strait.

Plankton distribution is dependent upon prevailing ocean currents including the East Australia Current, flows into and from Bass Strait and Southern Ocean water masses. Plankton distribution in the Planning Areas 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.

7.4.10 Invertebrates

There is a very large number of marine invertebrates in offshore continental shelf 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 habits support a range of animal communities such as sparse sponges to extensive 'thickets" of lace corals and sponges, polychaete worms and filter feeders (Director of National Parks 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 (*Macroctopus maorum*) 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).

Sponge gardens are most commonly found in low light environments on reefs more than 20 metres deep, and on rubble in areas where currents aren't very strong. These habitats flourish in deeper waters or shaded areas because they do not require much light, unlike algae and seagrass. The Bass Strait sponge beds area was identified as one of the 11 unique areas based on reports of large sponge catches in southern Bass Strait, taken on Museum Victoria research cruises conducted between 1979-1983 to assess the marine biodiversity of Bass Strait. Limited further research has been done into the sponge beds in the Bass Strait, but it is assumed that the area has high biodiversity value based on surveys of other sponge beds elsewhere. (Butler et al 2002)

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.

7.4.11 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).

According to the PMST, no TECs occur within the Operational Areas (Appendix A).

The PMST Report (Appendix A) (Figure 7-27) identified the following TECs which are marine or have a coastal component that would be within the Bass Planning Area.

- Giant Kelp Marine Forests of South East Australia

Some of these TECs are terrestrial or inland listings and are therefore outside of the Planning Area

The PMST Report also identified the following terrestrial or inland listings which are outside of the Planning Area.

- Tasmanian Forests and Woodlands dominated by black gum or Brookers gum (*Eucalyptus ovata / E. brookeriana*)
- Tasmanian white gum (*Eucalyptus viminalis)* wet forest

The PMST Report (Appendix A) (Figure 7-27) identified the following TECs which are marine or have a coastal component that would be within the Otway Planning Area:

- Assemblages of species associated with open-coast salt-wedge estuaries of western and central Victoria ecological community
- Giant Kelp Marine Forests of South East Australia
- Subtropical and Temperate Coastal Saltmarsh

The PMST Report also identified the following terrestrial or inland listings which are outside of the Planning Area.

- Grassy Eucalypt Woodland of the Victorian Volcanic Plain
- Natural Damp Grassland of the Victorian Coastal Plains
- Natural Temperate Grassland of the Victorian Volcanic Plain
- Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains
- Tasmanian Forests and Woodlands dominated by black gum or Brookers gum (*Eucalyptus ovata* / *E. brookeriana*)
- Tasmanian white gum (*Eucalyptus viminalis)* wet forest
- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland

Of the TECs listed above, only the Assemblages of species associated with open-coast salt-wedge estuaries of western and central Victoria ecological community, the Giant kelp marine forests of South East Australia and the Subtropical and temperate coastal saltmarsh are marine/coastal features; the rest are terrestrial or inland listings which are outside of the Planning Area (Figure 7-27).

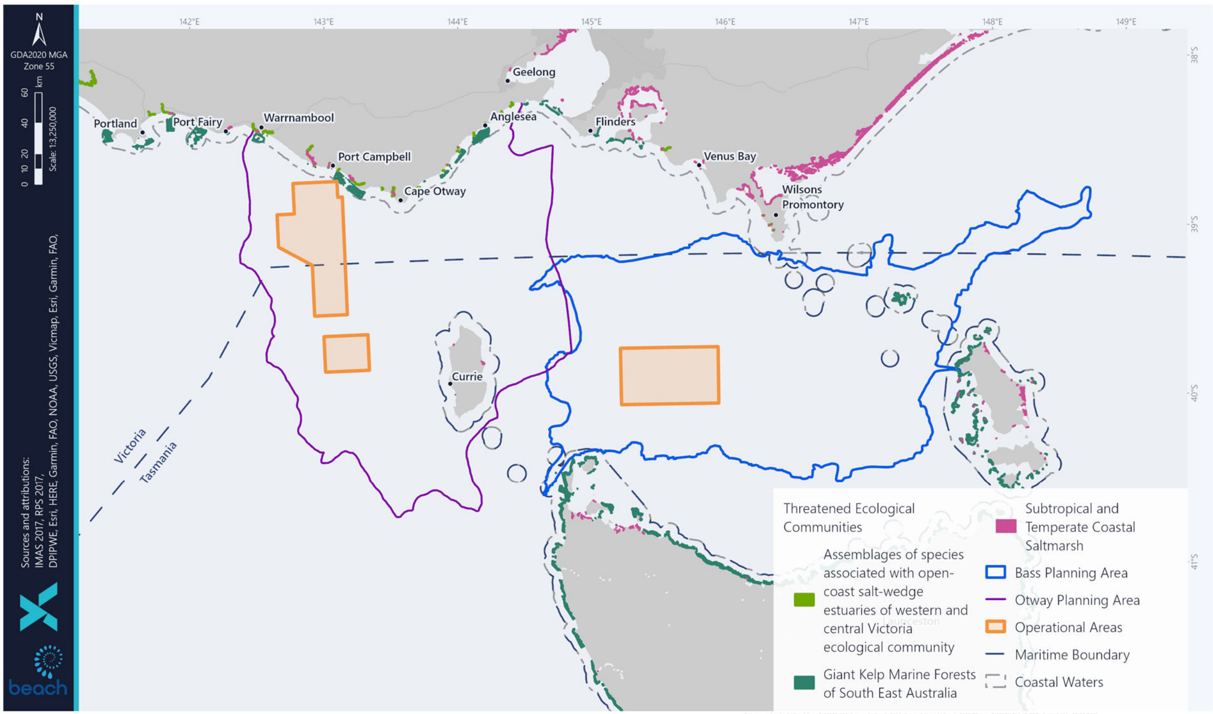


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Figure 7-27: Threatened Ecological Communities within the Operational and Planning Areas

7.4.11.1 Assemblages of species associated with open-coast salt-wedge estuaries of western and central Victoria ecological community

This ecological community 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 ecological community 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 ecological community 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 (e.g. reproduction, feeding, refuge, migration) (TSSC 2018).

7.4.11.2 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 (TSSC 2012).

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 (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 kelp communities in Tasmanian coastal waters occur at depths of 5-25 m.

Figure 7-27 shows that the largest extent of giant kelp marine forests are along the Tasmanian 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 m 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 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 (0.2 ha) of rocky reef (Barton et al. 2012).

7.4.11.3 Subtropical and Temperate Coastal Saltmarsh

The Subtropical and Temperate Coastal Saltmarsh 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 (TSSC 2013). The community is found in coastal areas which have an intermittent or regular tidal influence. Figure 7-27 shows that from Corner Inlet to Marlo there is a substantial amount of subtropical and temperate coastal saltmarsh along the Victorian coastline, but only small patches mapped within the Otway Planning Area.

The coastal saltmarsh 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 saltmarsh community 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 coastal saltmarsh community 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, the 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.

7.4.12 Threatened and Migratory Species

PMST reports were generated for the Operational and Planning Areas to identify the listed threatened and migratory species (Appendix A). The Planning Areas encompass the smaller Operational Areas.

7.4.12.1 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 or Planning Areas are provided in the following sections.

For the purpose of the EP, only species listed as threatened or migratory under the EPBC Act and known or likely to occur in the Operational or Planning Areas are considered to have conservation significance warranting further discussion. Known or likely occurrence was determined by the PMST report or through designation of important habitat (e.g. BIA, habitat critical to the survival of the species).

7.4.12.2 Biologically Important Areas and Critical Habitat to the Survival of the Species

Biologically Important Areas are spatially, and temporally defined areas of the marine environment used by protected marine species for carrying out critical life functions (DCCEEW 2023d). BIAs are designated by identifying areas and times known or likely to be regularly or repeatedly used by individuals or aggregations of a single species, stock, or population for either reproduction, feeding, migration or resting (DCCEEW 2023d).

The Australian Government is currently in consultation with key stakeholders to conduct a review of BIAs, which includes updating the BIA designation framework and geospatial data for priority protected species including cetaceans, marine turtles, Australian sea lions, sharks, dugong, and seabirds (DCCEEW 2023a). Reconsideration of BIA designation and updates to geospatial data is ongoing . This EP uses the best available data at the time of writing, and Beach will review any new information available or changes in information as per the process described in Section 9.12.5.

BIAs within the Operational or Planning Areas are summarised in Table 7-3 with further details in the relevant species sections.

There is no habitat critical to the survival of the species within the Operational Areas or Planning Areas.

The PMST identified habitat critical to the survival of the species at Albatross Island for the Shy Albatross within the Bass Planning Area, however, the border of the Bass Planning Area is approximately 1.9 km from Albatross Island and therefore no potential impacts are predicted. As such, this habitat critical is not discussed further.

Table 7-3: BIAs Identified within the Bass and Otway Operational and Planning Areas

Receptor	Type of BIA	Bass		Otway	
		Operational Area	**Planning Area**	**Operational Area**	**Planning Area**
Birds					
Antipodean albatross	Foraging	>50 km	Overlap	Overlap	Overlap
Australasian gannet	Foraging	>50 km	Overlap	>60 km	Overlap
	Aggregation	>80 km	>19 km	>90 km	>20 km
Black-browed albatross	Foraging	Overlap	Overlap	Overlap	Overlap
Black-faced Cormorant	Breeding	>40 km	Overlap	>39 km	Overlap
	Foraging	>55 km	>300 m	>49 km	Overlap
Buller's albatross	Foraging	Overlap	Overlap	Overlap	Overlap
Campbell albatross	Foraging	Overlap	Overlap	Overlap	Overlap
Common diving-petrel	Foraging	Overlap	Overlap	Overlap	Overlap
	Breeding	>69 km	Overlap	>65 km	Overlap
Indian yellow-nosed albatross	Foraging	Overlap	Overlap	Overlap	Overlap
Little penguin	Foraging	>29 km	Overlap	>40 km	Overlap
	Breeding	>38 km	Overlap	>50 km	Overlap
Short-tailed shearwaters	Foraging	Overlap	Overlap	Overlap	Overlap
	Breeding	>49 km	Overlap	>38 km	Overlap
Shy albatross	Foraging	Overlap	Overlap	Overlap	Overlap
Wandering albatross	Foraging	Overlap	Overlap	Overlap	Overlap
	Breeding	>50 km	>900 m	>130 km	>45 km
Wedge-tailed shearwater	Foraging	>84 km	>14 km	Overlap	Overlap
	Breeding	>219 km	>145	>6 km	Overlap
White-faced storm petrel	Foraging	Overlap	Overlap	>40 km	Overlap
	Breeding	>55 km	>4 km	>150 km	>25 km
Fish					
White shark	Distribution	Overlap	Overlap	Overlap	Overlap
	Foraging	>40 km	Overlap	>39 km	Overlap
Cetaceans					
Pygmy blue whale	Possible Foraging Area	Overlap	Overlap	Overlap	Overlap
	Foraging (annual high use area)	>114 km	>65 km	Overlap	Overlap
	Known Foraging Area	>19 km	Overlap	Overlap	Overlap
Southern right whale	Reproduction	~35 km	Overlap	~4 km	Overlap
	Migration	Overlap	Overlap	Overlap	Overlap

7.4.12.3 Fish

Fish species present in the Operational or Planning Areas 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 7-4 details the listed fish species identified in the Operational and Planning Areas PMST Reports (Appendix A).

Two fish species identified in the PMST Reports are freshwater species, dwarf galaxias and Yarra pygmy perch, as they will be outside of the area potentially affected by the activity they are not discussed further.

Threatened or migratory species that are known or likely to occur in or have an intercepting BIA with the Operational or Planning Areas are discussed in more detail.

Seven species of fish are EPBC Act-listed as Conservation Dependent which do not receive special protection, as they are not considered "Matters of National Environmental Significance" under the EPBC Act. The seven species are targeted by commercial fisheries as detailed in Section 7.5.9 and 7.5.10.

Information on eels is also provided as Beach's consultation with the Eastern Maar Aboriginal Corporation for the Phase 5 installation and commissioning activities identified that they have interests regarding eels and their possible presence within the Planning Areas during their migration and spawning seasons.

Table 7-4: Listed Fish Species identified in the Operational and Planning Areas

	Species name	EPBC Act status			Bass		Otway	
		Listed Threatened	**Listed Migratory**	**Listed marine**	**Operational Area**	**Planning Area**	**Operational Area**	**Planning Area**
Fish								
Australian Grayling	*Prototroctes maraena*	V	-	-	-	SHM	SHM	SHK
		National Recovery Plan for the *Prototroctes maraena* (Australian grayling) (Backhouse et al. 2008). No threats relevant to the activity identified.						
Blue Warehou	*Seriolella brama*	CD	-	-	SHK	SHK	SHK	SHK
Eastern Dwarf Galaxias, Dwarf Galaxias	*Galaxiella pusilla*	V	-	-	-	SHM	-	SHL
Eastern Gemfish	*Rexea solandri* (eastern Australian population)	CD	-	-	-	SHL	-	SHM
Orange Roughy, Deep-sea Perch	*Hoplostethus atlanticus*	CD	-	-	-	SHL	SHL	SHL
Southern Bluefin Tuna	*Thunnus maccoyii*	CD	-	-	SHL	SHL	SHL	SHL
Yarra Pygmy Perch	*Nannoperca obscura*	V	-	-	-	-	-	SHK
Sharks and rays								
Harrison’s Dogfish, Endeavour Dogfish	*Centrophorus harrissoni*	CD	-	-	-	SHL	-	-
Little Gulper Shark	*Centrophorus uyato*	CD	-	-	-	SHL	SHL	SHL
Oceanic Whitetip	*Carcharhinus longimanus*	-	M	-	-	SHM	-	-
Porbeagle, Mackerel	*Lamna nasus*	-	M	-	SHL	-	SHL	SHL
School Shark, Eastern School Shark	*Centrophorus zeehaani*	CD	-	-	SHM	SHL	SHM	SHL
Shortfin Mako, Mako	*Isurus oxyrinchus*	-	M	-	SHL	-	SHL	SHL
Whale shark	*Rhincodon typus*	V	M	-	-	SHM	-	-
		Approved Conservation Advice for the *Rhicodon typus* (whale shark) (TSSC 2015a). Threats relevant to the activity are: Vessel Strike.						
White shark	*Carcharodon carcharias*	V	M	-	SHK	FK	SHK	FK
		Recovery Plan for the *Carcharodon carcharias* (white shark) (DSEWPaC 2013a). No threats relevant to the activity identified.						
Pipefish, seahorse, seadragons								
Australian smooth pipefish	*Lissocampus caudalis*	-	-	L	-	SHM	SHM	SHM
Big-belly seahorse	*Hippocampus abdominalis*	-	-	L	SHM	SHM	SHM	SHM
Brushtail pipefish	*Leptoichthys fistularius*	-	-	L	-	SHM	SHM	SHM
Bullneck Seahorse	*Hippocampus minotaur*	-	-	L	SHM	SHM	-	SHM
Common seadragon	*Phyllopteryx taeniolatus*	-	-	L	SHM	SHM	SHM	SHM
Crested pipefish	*Histiogamphelus briggsii*	-	-	L	-	SHM	SHM	SHM
Deep-bodied pipefish	*Kaupus costatus*	-	-	L	-	SHM	SHM	SHM
Double-end pipehorse	*Syngnathoides biaculeatus*	-	-	L	-	SHM	-	
Hairy pipefish	*Urocampus carinirostris*	-	-	L	-	SHM	SHM	SHM
Half-banded pipefish	*Mitotichthys semistriatus*	-	-	L	-	SHM	SHM	SHM
Javelin pipefish	*Lissocampus runa*	-	-	L	-	SHM	SHM	SHM
Knife-snouted pipefish	*Hypselognathus rostratus*	-	-	L	-	SHM	SHM	SHM
Leafy seadragon	*Phycodurus eques*	-	-	L	SHM	SHM	SHM	SHM

	Species name	EPBC Act status			Bass		Otway	
		Listed Threatened	Listed Migratory	Listed marine	Operational Area	Planning Area	Operational Area	Planning Area
Longsnout Pipefish	*Vanacampus poecilolaemus*	-	-	L	-	SHM	SHM	SHM
Mollison's pipefish	*Mitotichthys mollisoni*	-	-	L	-	SHM	-	SHM
Mother-of-pearl pipefish	*Vanacampus margaritifer*	-	-	L	-	SHM	SHM	SHM
Port Phillip pipefish	*Vanacampus phillipi*	-	-	L	SHM	SHM	SHM	SHM
Pug-nosed pipefish	*Pugnaso curtirostris*	-	-	L	-	SHM	SHM	SHM
Red pipefish	*Notiocampus ruber*	-	-	L	SHM	SHM	SHM	SHM
Rhino pipefish	*Histiogamphelus cristatus*	-	-	L	-	SHM	SHM	SHM
Ring-backed pipefish	*Stipecampus cristatus*	-	-	L	-	SHM	SHM	SHM
Robust pipehorse	*Solegnathus robustus*	-	-	L	SHM	SHM	SHM	SHM
Sawtooth pipefish	*Maroubra perserrata*	-	-	L	SHM	SHM	SHM	SHM
Short-head seahorse	*Hippocampus breviceps*	-	-	L	-	SHM	SHM	SHM
Spiny pipehorse	*Solegnathus spinosissimus*	-	-	L	SHM	SHM	SHM	SHM
Spotted pipefish	*Stigmatopora argus*	-	-	L	-	SHM	SHM	SHM
Trawl pipefish	*Kimblaeus bassensis*	-	-	L	SHM	SHM	-	SHM
Tucker's pipefish	*Mitotichthys tuckeri*	-	-	L	-	SHM	SHM	SHM
Upside-down pipefish	*Heraldia nocturna*	-	-	L	SHM	SHM	SHM	SHM
Wide-bodied pipefish	*Stigmatopora nigra*	-	-	L	-	SHM	SHM	SHM

Listed Threatened
V: Vulnerable
CD: Conservation Dependent
Listed Migratory
M: Migratory
Listed Marine
L: Listed

Likely Presence
SHM: Species or species habitat may occur within area.
SHL: Species or species habitat likely to occur within area.
SHK: Species or species habitat known to occur within area.
FK: Foraging, feeding or related behaviour known to occur within area.

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 NSW, Victoria, and Tasmania, migrating between streams and the ocean. Spawning occurs in freshwater, with timing dependant on many variables including latitude and temperature regimes. Most of its life is spent in fresh water, with parts of the larval or juvenile stages spent in coastal marine waters (DSE 2008), though its precise marine habitat requirements remain unknown (Backhouse and Jackson 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).

The Australian grayling has been recorded from the Gellibrand River (Backhouse and Jackson 2008), making it likely that it occurs in coastal waters. As marine waters are not part of the species' spawning grounds, the Operational and Planning Areas are not likely to represent critical habitat for the species.

Eels

Ecology and Biology
The shortfinned eel (*Anguilla australis australis*) and the longfinned eel (*A. reinhardtii*) both occur naturally within Victoria and are the target species of the Victorian eel fishery (See Section 7.5.10). The eels have differing but overlapping distributions east and south of the Great Dividing Range in estuarine and freshwater catchments (VFA 2022b) (Figure 7-28).

The shortfinned eel is widespread across the southern parts of the Victoria and occurring occasionally in northern streams draining into the Murray River, while the longfinned eel is found within southeast 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). Short-finned 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 long-finned 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 short-finned 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 long-finned eel consumes primarily fish and insects The long-finned eel is larger in size compared to the short-finned, 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).

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 short-finned eels generally mature at 8-12 years of age, whilst females mature at 10-20 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 short-finned glass eels migrate in the winter and spring, while long-finned glass 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 short-finned 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 mouth beach or Killarney beach. Of the 16 tags twelve returned data. The results showed that the shortfinned 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.

Victorian Eel Fishery

Both the long-finned and short-finned 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 shortfinned 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). Short-finned 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.

First Nations Connection to Eels

Eels were, and continue to be, an important resource for certain First Nation 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). Short-finned 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).

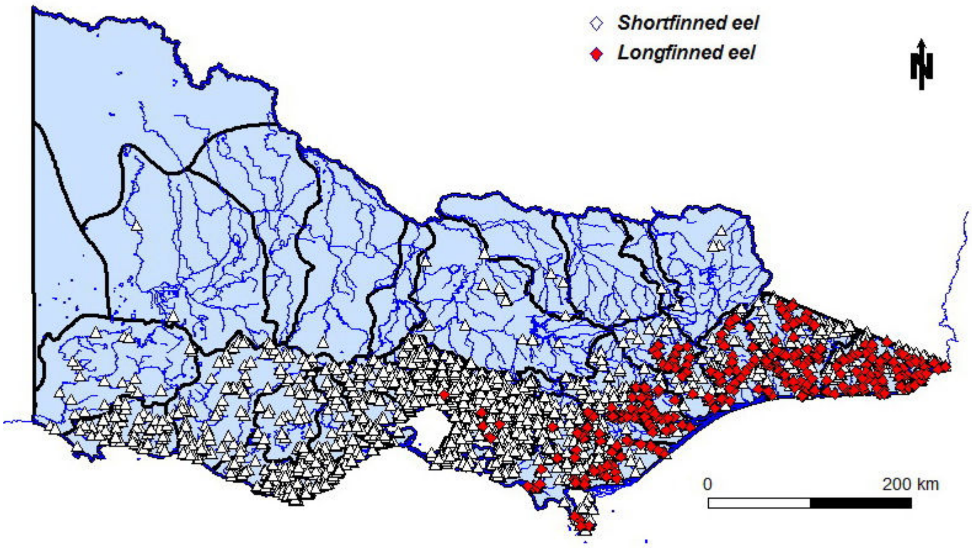

Figure 7-28: Distribution of Longfinned and Shortfinned Eels in Victoria (VFA 2017)

Oceanic Whitetip Shark

The oceanic whitetip shark (*Carcharhinus longimanus*) is a widely distributed tropical and subtropical pelagic species. They are found in water from Cape Leeuwin (Western Australia) through parts of the Northern Territory, down the east coast of Queensland and New South Wales to Sydney (Last and Stevens 2009). They are generally found offshore in the open ocean, on the outer continental shelf, or around oceanic islands in deep water areas. Although they can make deep dives and have been recorded up to 1,082 m deep, they typically live in the upper part of the water column, from the surface to at least 200 m (NOAA 2021a). No known habitat occurs within Victorian or Tasmanian waters (DoE 2023i). The oceanic whitetip shark has the potential to be present within the Bass Planning Area.

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 or Planning Areas in low numbers.

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 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 (GAB) between 2008 and 2011 investigated habitat and migration patterns. It revealed GAB and south east of Kangaroo Island near the norther extent of the Bonney coast upwelling region, to be areas of highest fidelity and indicating critical habitats for juvenile shortfin mako (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 sharks were also analysed from specimens collected by game fishing competitors in Port MacDonnell, South Australia and Portland, Victoria from 2008 and 2010 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 or Planning Areas in low numbers.

Syngnathids

All of the marine ray-finned fish species identified in the EPBC PMST Report are syngnathids, which includes seahorses and their relatives (sea dragon, pipehorse and pipefish). The majority of these fish 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 30 species of syngnathids identified in the EPBC PMST Report, only one (*Hippocampus abdominalis*, big-belly seahorse) 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 syngnathid species listed in the Planning Areas are widely distributed throughout southern, south-eastern and south-western Australian waters.

Whale shark

The whale shark (*Rhincodon typus*) is most commonly seen in waters off Western Australia, Northern Territory and Queensland however is occasionally seen off Victoria and South Australia (DoE 2023t). It is generally found in areas where the surface temperature is 21–25°C, preferably with cold water of 17°C or less upwelling into it. It is generally observed singularly at the surface but can occasionally be in schools or aggregations of up to hundreds of sharks (Compagno 1984). The whale shark is a suction filter feeder and feeds on a variety of planktonic and nektonic prey, including small crustaceans, small schooling fishes and, to a lesser extent, on small tuna and squid. The whale shark (*Rhincodon typus*) is listed as Vulnerable and Migratory under the EPBC Act (TSSC 2015a) and is not likely to occur in the Operational Areas but may be present in the Bass Planning Area in low numbers.

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 including all coastal areas except the Northern Territory (DoE 2023h; DSEWPaC 2013a). Studies of white sharks indicate that they are largely transient. However, individuals are known to return to feeding grounds on a seasonal basis (Klimley and Anderson 1996). In the Australasian region, white sharks differ genetically from other populations and data suggest there are two populations in southern Australia east and west by 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− spring (June−November) and southern region during summer−autumn (December−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 Bass and Otway Operational Areas and the foraging BIA also overlaps both the Bass and Otway Planning Areas (Figure 7-29). 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 New South Wales (NSW). They are more likely to be found between the 60–120 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 South-east Marine Region. It is likely that white sharks are present in the Operational and Planning Areas.

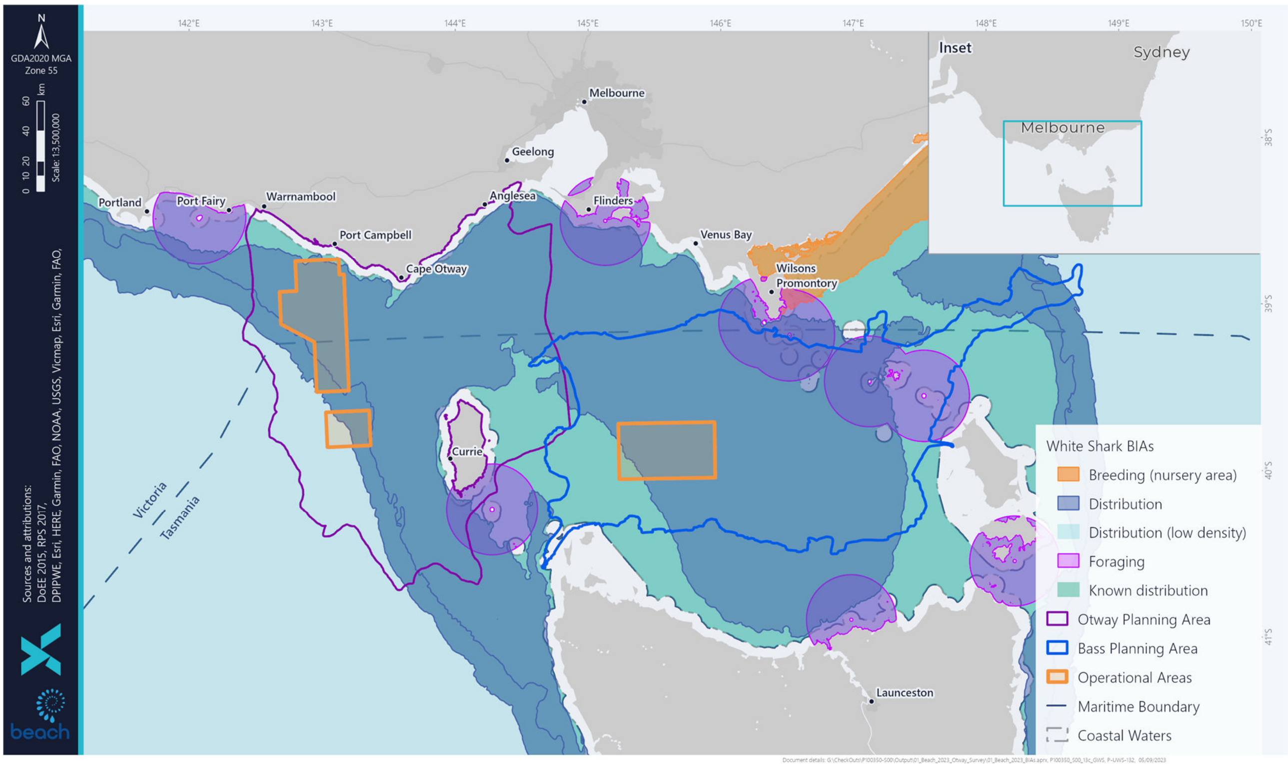

Figure 7-29: BIAs for the White Shark within the Operational and Planning Areas

7.4.12.4 Birds

A diverse array of seabirds and terrestrial birds utilise the Bass Strait and Otway regions and may potentially forage within or fly over the Operational or Planning Areas, resting on islands during their migration. Infrequently and often associated with storm events, birds that do not normally cross the ocean are sometimes observed over the Bass Strait and Otway shelf, suggesting the birds have been blown off their normal course or are migrating.

Bird species listed in the PMST reports are detailed shown in Table 7-5. Threatened or migratory species that are likely or known to occur in or have an intercepting BIA with the Operational or Planning Areas are discussed in more detail.

The following conservation and recovery plans apply to birds with conservation and recovery plans and conservation advice relevant to individual species detailed in Table 7-5.

National Recovery Plan for Albatrosses and Petrels (CoA 2022a). The recovery plan is a co-ordinated conservation strategy for albatrosses and giant petrels listed as threatened. Threats identified relevant to the activity:

- Marine pollution - Minimise the effects of marine debris, plastics, and pollution.
- Marine debris - Minimise the effects of marine debris, plastics, and pollution.
- Artificial lighting – no specific actions relevant to the activity.
- Climate variability and change - no specific actions relevant to the activity.

Wildlife Conservation Plan for Migratory Shorebirds (DoE 2015b). The long-term recovery plan objective for migratory shorebirds is to minimise anthropogenic threats to allow for the conservation status of these bird species. Threats identified relevant to the activity:

- Habitat degradation/ modification (oil pollution).

Wildlife Conservation Plan for Seabirds (CoA 2020b). The Plan aims to provide a national framework for the research and management of listed marine and migratory seabirds and to outline national activities to support the conservation of listed seabirds in Australia and beyond. The Plan includes a summary of Australia’s commitments under international conventions and agreements, and the identification of important habitats within Australia.

Threats identified relevant to the activity:

- Climate change
- Resource extraction
- Marine debris
- Light pollution
- Acute pollution – oil spills, discharges

With the action of manage the effects of anthropogenic disturbance to seabird breeding and roosting areas.

Table 7-5: Listed Bird Species Identified in the Bass and Otway Planning and Operational Areas

Common name	Species name	EPBC Act status			Bass		Otway	
		Listed Threatened	Listed Migratory	Listed marine	Operational Area	Planning Area	Operational Area	Planning Area
Albatrosses								
Antipodean albatross	*Diomedea antipodensis*	V	M	L	FL	FL	FL	FL
Black-browed albatross	*Thalassarche melanophris*	V	M	L	FL	FL	FL	FL
Buller's albatross	*Thalassarche bulleri*	V	M	L	SHM	SHM	FL	FL
Campbell albatross	*Thalassarche impavida*	V	M	L	FL	FL	FL	FL
Chatham albatross	Thalassarche eremita	E	M	L	-	SHM	-	-
Gibson's albatross	Diomedea antipodensis gibsoni *Diomedea gibsoni*	V	-	L	FL	FL	-	-
Grey-headed albatross	*Thalassarche chrysostoma*	E	M	L	SHM	SHM	SHM	SHM
Indian Yellow-nosed Albatross	*Thalassarche carteri*	L	M	L	SHL	SHL	SHL	SHL
Northern buller's albatross, Pacific albatross	*Thalassarche bulleri platei*	V	-	L	SHM	SHM	FL	FL
Northern royal albatross	*Diomedea sanfordi*	E	M	L	FL	FL	FL	FL
Salvin's albatross	*Thalassarche salvini*	V	M	L	FL	FL	FL	FL
Shy albatross	*Thalassarche cauta*	E	M	L	FL	BK	FL	FL
Sooty albatross	*Phoebetris fusca*	V	M	L	SHL	SHL	SHL	SHL
Southern royal albatross	*Diomedea epomophora*	V	M	L	FL	FL	FL	FL
Wandering albatross	*Diomedea exulans*	V	M	L	FL	FL	FL	FL
White-capped albatross	*Thalassarche steadi*	V	M	L	FK	FK	FK	FK
Shearwaters								
Flesh-footed shearwater	*Ardenna carneipes*	-	M	L	FL	FL	SHM	FL
Short-tailed shearwater	*Ardenna tenuirostris* *Puffinus tenuirostris*	-	M	L	-	BK	-	BK
Sooty shearwater	*Ardenna grisea* *Puffinus griseus*	-	M	L	SHM	SHM	FL	SHM
Petrels								
Blue petrel	*Halobaena caerulea*	V	-	L	SHM	SHM	SHM	SHM
		Approved Conservation Advice for the *Halobaena caerulea* (blue petrel) (TSSC 2015d). No threats relevant to the activity were identified.						
Common diving-petrel	*Pelecanoides urinatrix*	-	-	L	-	BK	-	-
Gould's petrel	*Pterodroma leucoptera*	E	-	-	SHM	SHM	SHM	SHM
		National Recovery Plan for *Pterodroma leucoptera leucoptera* (Gould's petrel) (DEC NSW, 2006). No threats relevant to the activity were identified.						
Northern giant-petrel	*Macronectes halli*	V	M	L	FL	FL	FL	FL
Soft-plumaged petrel	*Pterodroma mollis*	V	-	L	SHM	SHM	SHM	SHM
		Approved Conservation Advice for *Pterodroma mollis* (soft-plumaged petrel) (TSSC 2015b). No threats relevant to the activity were identified.						
Southern giant-petrel	*Macronectes giganteus*	E	M	L	FL	FL	SHM	FL
White-bellied storm-petrel	*Fregetta grallaria grallaria*	V	-	-	SHL	SHL	-	SHL
White-faced storm petrel	*Pelagodroma marina*	-	-	L	-	BK	-	-

Common name	Species name	EPBC Act status			Bass		Otway	
		Listed Threatened	**Listed Migratory**	**Listed marine**	**Operational Area**	**Planning Area**	**Operational Area**	**Planning Area**
Other								
Australasian bittern	*Botaurus poiciloptilus*	E	-	-	-	SHM	-	FK
		Approved Conservation Advice for *Botaurus poiciloptilus* (Australasian bittern) (TSSC 2019). No threats relevant to the activity were identified.						
Australian fairy tern	*Sternula nereis nereis*	V	-	-	FL	FL	FL	SHK
		Approved Conservation Advice for *Sternula nereis nereis* (Australian fairy tern) (DSEWPaC 2011a). Threats identified relevant to the activity: 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*) (DAWE 2020). Threats identified relevant to the activity: • Habitat degradation • Climate variability • Pollution No actions specific to the activity were identified.						
Australian painted-snipe	*Rostratula australis*	E	-	-	-	SHM	-	SHK
		Approved Conservation Advice for *Rostratula australis* (Australian painted snipe) (DSEWPaC 2013c). No threats relevant to the activity were identified. National Recovery Plan for the Australian Painted Snipe (CoA, 2022). Threats identified relevant to the activity: • Deterioration of water quality, human disturbance.						
Bar-tailed godwit	*Limosa lapponica*	-	W	L	-	SHM	-	SHK
		Conservation Advice *Limosa lapponica baueri* (bar-tailed godwit (western Alaskan)) (TSSC 2016a). Threats identified relevant to the activity: • Habitat degradation/ loss.						
Black currawong	*Strepera fuliginosa colei*	V	-	-	-	-	-	BL
Black-eared cuckoo	*Chrysococcyx osculans*	-	-	L	-	-	-	FL
Black-faced cormorant	*Phalacrocorax fuscescens*	-	-	L	-	-	-	BK
Black-faced monarch	*Monarcha melanopsis*	-	T	L	-	-	-	SHK
Black-tailed godwit	*Limosa limosa*	-	W	L	-	-	-	RK
Blue-winged parrot	*Neophema chrysostoma*	-	-	L	-	SHL	-	SHK
Cattle egret	*Bubulcus ibis*	-	-	L	-	SHM	-	SHM
Common greenshank	*Tringa nebularia*	-	W	L	-	-	-	SHK
Common noddy	*Anous stolidus*	-	M	L	-	-	-	SHL
Common sandpiper	*Actitius hypoleucos*	-	W	L	SHM	SHM	SHM	SHK
Curlew sandpiper	*Calidris ferruginea*	CE	W	L	SHM	SHL	SHM	SHK
		Conservation Advice *Calidris ferruginea* (curlew sandpiper) (DoE, 2015f). Threats identified relevant to the activity: • Habitat degradation/ loss (oil pollution)						
Double-banded plover	*Charadrius bicinctus*	-	W	L	-	-	-	RK
Eastern curlew	*Numenius madagacariensis*	CE	W	L	SHM	SHM	SHM	SHK
		Conservation Advice for *Numenius madagascariensis* (eastern curlew) (DoE, 2015e). Threats identified relevant to the activity: • Habitat degradation/ loss (oil pollution)						
Eastern hooded plover	*Thinornis cucullatus cucullatus*	V	-	L	-	SHK	-	SHK
Fairy prion	*Pachyptila turtur*	-	-	L	SHM	SHK	SHM	SHK
Fairy prion (southern)	*Pachyptila turtur subantarctica*	V	-	-	SHM	SHK	SHM	SHK

Common name	Species name	EPBC Act status			Bass		Otway	
		Listed Threatened	Listed Migratory	Listed marine	Operational Area	Planning Area	Operational Area	Planning Area
		Approved Conservation Advice for *Pachyptila subantarctica* (fairy prion (southern)) (TSSC, 2015c). No threats relevant to the activity were identified.						
Fork-tailed swift	*Apus pacificus*	-	M	L	-	SHL	SHL	SHL
Forty-spotted Pardalote	*Pardalotus quadragintus*	E	-	-	-	FM	-	-
		Approved Conservation Advice for *Pardalotus quadragintus* (forty-spotted pardalote) (TSSC 2016d). No threats relevant to the activity were identified.						
Gang-gang cockatoo	*Callocephalon fimbriatum*	E	-	-	-	-	-	SHK
Great knot	*Calidris tenuirostris*	CE	W	L	-	-	-	RK
Brown skua, Great skua	*Catharacta skua*	-	-	L	SHM	SHM	SHM	SHM
Greater sand plover	*Charadrius leschenaultii*	V	W	L	-	SHM	-	SHL
		Conservation Advice for *Charadrius leschenaultia* (greater sand plover) (TSSC, 2016b). Threats identified relevant to the activity: • Habitat degradation/ loss (oil pollution)						
Green rosella (King Island)	*Platycercus caledonicus brownie*	V	-	-	-	-	-	SHK
Grey falcon	*Falco hypoleucos*	V	-	-	-	-	-	SHL
Grey plover	*Pluvialis squatarola*	-	W	L	-	-	-	RK
Grey-tailed tattler	*Heteroscelus brevipes*	-	W	-	-	-	-	RK
Hooded plover	*Thinornis rubricollis*		-	L	-	SHK	-	SHK
King Island brown thornbill	*Acanthiza pusilla archibaldi*	E	-	-	-	-	-	SHK
King Island scrubtit	*Acanthornis magna greeniana*	CE	-	-	-	-	-	SHK
Latham's snipe	*Gallinago hardwickii*	-	W	L	-	SHM	-	SHK
Lesser sand plover	*Charadrius mongolus*	E	W	L	-	-	-	RK
Little curlew	*Numenius minutus*	-	W	L	-	-	-	RL
Little penguin	*Eudyptula minor*	-	-	L	-	BK	-	BK
Little tern	*Sternula albifrons*	-	M	L	-	SHM	-	SHM
Magpie Goose	*Anseranas semipalmata*	-	-	L	-	-	-	SHM
Marsh sandpiper	*Tringa stagnatilis*	-	W	L	-	-	-	RK
Masked Owl (Tasmanian)	*Tyto novaehollandiae castanops* (Tasmanian population)	V	-	-	-	SHM	-	-
Nunivak bar-tailed godwit	*Limosa lapponica baueri*	V	-	-	-	SHM	-	SHK
Orange-bellied parrot	*Neophema chrysogaster*	CE	-	L	ML	MK	ML	MK
		National Recovery Plan for the *Neophema chrysogaster* (orange-bellied parrot) (DELWP, 2016). Threats identified relevant to the activity: • Illuminated boats and structures: evaluate risk of lighting on vessels and offshore structures.						
Osprey	*Pandion haliaetus*	-	W	L	-	-	-	SHK
Pacific golden plover	*Pluvialis fulva*	-	W	L	-	-	-	RK
Pacific gull	*Larus pacificus*	-	-	L	-	BK	-	-
Painted honeyeater	*Grantiella picta*	V	-	-	-	-	-	SHK
Pectoral sandpiper	*Calidris melanotos*	-	W	L	SHM	SHM	SHM	SHK
Pied stilt	*Himantopus himantopus*	-	-	L	-	-	-	RK

Common name	Species name	EPBC Act status			Bass		Otway	
		Listed Threatened	**Listed Migratory**	**Listed marine**	**Operational Area**	**Planning Area**	**Operational Area**	**Planning Area**
Pin-tailed snipe	*Gallinago stenura*	-	W	L	-	-	-	RL
Plains-wanderer	*Pedionomus torquatus*	CE	-	-	-	-	-	SHL
Rainbow bee-eater	*Merops ornatus*	-	-	L	-	-	-	SHM
Red knot	*Calidris canutus*	E	W	L	SHM	SHM	SHM	SHK
		Approved Conservation Advice for *Calidris canutus* (red knot) (TSSC 2016c). Threats identified relevant to the activity: • Marine pollution - Evaluate risk of oil spill impact to nest locations and, if required, appropriate mitigation measures are implemented.						
Red-capped plover	*Charadrius ruficapillus*	-	-	L	-	-	-	RK
Red-necked avocet	*Recurvirostra novaehollandiae*	-	-	L	-	-	-	RK
Red-necked phalarope	*Phalaropus lobatus*	-	W	L	-	-	-	RK
Red-necked stint	*Calidris ruficollis*	-	W	L	-	-	-	RK
Regent honeyeater	*Anthochaera phrygia*	CE	-	-	-	-	-	FL
Ruddy turnstone	*Arenaria interpres*	-	W	L	-	-	-	RK
Rufous fantail	*Rhipidura rufifrons*	-	T	L	-	-	-	SHK
Sanderling	*Calidris alba*	-	W	L	-	SHL	-	RK
Satin flycatcher	*Myiagra cyanoleuca*	-	T	L	-	SHK	-	BK
Sharp-tailed sandpiper	*Calidris acuminata*	-	W	L	SHM	SHM	SHM	RK
Silver gull	*Larus novaehollandiae*	-	-	L	-	BK	-	-
Swift parrot	*Lathamus discolour*	CE	-	L	-	SHM	-	SHK
		National Recovery Plan for the Swift Parrot *Lathamus discolour* (Saunders and Tzaros 2011). No threats relevant to the activity were identified.						
Swinhoe's snipe	*Gallinago megala*	-	W	L	-	-	-	RL
Tasmanian azure kingfisher	*Ceyx azureus diemenensis*	E	-	-	-	SHM	-	SHK
Tasmanian wedge-tailed eagle	*Aquila audax fleayi*	E	-	-	-	SHL	-	SHM
Terek sandpiper	*Xenus cinereus*	-	W	L	-	-	-	RK
Whimbrel	*Numenius phaeopus*	-	W	L	-	-	-	RK
White-bellied sea-eagle	*Haliaeetus leucogaster*	-	-	L	-	BK	-	BK
White-fronted tern	*Sterna striata*	-	-	L	FL	FL	FL	FL
White-throated needletail	*Hirundapus caudacutus*	V	T	L	-	SHL	-	SHK
Yellow wagtail	*Motacilla flava*	-	T	L	-	SHM	-	SHM

Common name	Species name	EPBC Act status			Bass		Otway	
		Listed Threatened	Listed Migratory	Listed marine	Operational Area	Planning Area	Operational Area	Planning Area
Listed Threatened		Likely Presence						
CE: Critically Endangered		SHM: Species or species habitat may occur within area.						
E: Endangered		SHL: Species or species habitat likely to occur within area.						
V: Vulnerable		SHK: Species or species habitat known to occur within area.						
Listed Migratory		FL: Foraging, feeding or related behaviour likely to occur within area.						
M: Migratory		FK: Foraging, feeding or related behaviour known to occur within area.						
T: Migratory Terrestrial		RL: Roosting likely to occur within area.						
W: Migratory Wetlands		RK: Roosting known to occur within area.						
Listed Marine		ML: Migratory route likely to occur in area.						
L: Listed		MK: Migratory route known to occur in area.						
		BL: Breeding likely to occur within area.						
		BK: Breeding known to occur within area.						

Albatross and Petrels

Albatrosses 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. 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 Albatrosses and Petrels (CoA 2022a). 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 2022a). There are no islands with colonies of threatened marine seabirds within the Operational or Planning Areas. Albatross Island, supporting a breeding population of approximately 5,000 shy albatross (*Thallassarche cauta*), is the closest breeding colony of threatened seabirds to the Planning Areas.

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 degrees where most species spend most of their foraging time. The Antipodean albatross, black-browed albatross, Buller's albatross, Campbell albatross, Indian yellow-nosed albatross, shy albatross and wandering albatross, have BIAs for foraging that overlap the Operational or Planning Areas (Figure 7-30, Figure 7-31 and Figure 7-32). These BIAs cover either most or all the South-east Marine Region (CoA 2015). Therefore, it is likely that these will be present and forage in the Operational and Planning Areas.

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 (DoE 2015b). 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) (DoE 2015b). There are 15 sites with significant breeding colonies in Tasmania, and three sites with Victoria, for the white-faced storm petrel (DoE 2015b). A foraging BIA has been identified for the common diving-petrel that overlaps with the Operational or Planning Areas. The common-diving petrel also has a breeding BIA that overlaps the Planning Areas. The white-faced storm petrel has a foraging BIA and a breeding BIA that overlaps the Planning Areas.

The grey-headed Albatross breed on the southern and western flanks of Petrel Peak, Macquarie Island and this specie has bred in this same restricted area on Macquarie Island for at least the past 30 years (Terauds et al. 2005). 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. 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 2022a). 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 2022a). 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). 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 2022a). 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. 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 (Marchant and Higgins 1990). Therefore, it is likely that these along with the Tasmanian shy albatross will be present and forage in the Planning Areas and potentially the Operational Areas.

The blue petrel (*Halobaena caerulea*) is listed as vulnerable under the EPBC Act. It breeds in dense but discrete colonies on offshore stacks near Macquarie island (Marchant and Higgins 1990). The Gould's petrel breeds in NSW on Cabbage Tree Island and nearby Boondelbah Island, near Port Stephens (Fullagar 1976). The Northern giant petrel breeds in the sub-Antarctic, and visits areas off the Australian mainland mainly during the winter months (May-October). Immature and some adult birds are commonly seen during this period in offshore and inshore waters from around Fremantle (WA) to around Sydney (NSW) (Pizzey and Knight 1999).

The soft-plumaged petrel is a regular and quite common visitor to southern Australian seas but is more common on the west than in the south and southeast, breeding occurring on south Australian islands (Marchant and Higgins 1990). The southern giant petrel is widespread distributed through the Southern Ocean from the Antarctic to subtropical waters and this species may transit the Planning Areas from time-to-time, foraging for food. 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).

Terns and Shearwaters

The flesh-footed shearwater 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. The species breeds in burrows on sloping ground in coastal forest, scrubland, shrubland 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. 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. 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 2023a). This species is likely to visit the Operational or Planning Areas foraging for food.

The short-tailed shearwater has foraging and breeding BIAs within the Planning Area (Figure 7-32). 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). Short-tailed shearwaters have been identified as a conservation value in the temperate east and south-west marine areas.

The sooty shearwater breeds around New Zealand, southern Australia, and southern South America and, in winter, these birds move to the North Pacific Ocean, but some move into the North Atlantic Ocean, or remain in the southern hemisphere (DCCEEW 2023c).

Caspian tern is the largest turn 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, 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. The Caspian tern usually forages in open wetlands and prefers shallow waters but is also found in open coastal waters, title channels and mud flaps. They can forage 60 km from their nesting site (Higgins and Davis 1996). 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 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 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 New South Wales (Higgins and Davis 1996). Foraging diet consists of pelagic fish, cephalopods, crustaceans, and insects. Terns were observed amongst mixed flocks of seabirds (such as albatross and shearwaters) during the drilling of Geographe-4 in April 2021.

Osprey and White bellied Sea eagle

The white-bellied sea eagle is a large raptor generally seen singly or in pairs, distributed along the coastline of mainland Australia and Tasmania. 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 numbers in Victoria recorded in 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). Breeding is known to occur within the Planning Area, so they are likely to be common visitor.

The osprey is a medium sized raptor extending around the northern coast of Australia from Albany, Western Australia to Lake Macquarie in New South Wales 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 or Planning Areas.

Australasian Gannet

The Australasian gannet generally feeds over the continental shelf or inshore waters. Their diet is comprised mainly of pelagic fish, but also squid and garfish. Prey is caught mainly by plunge-diving, but it is also seen regularly attending trawlers. Breeding is highly seasonal (October–May), nesting on the ground in small but dense colonies (DoE 2015a). Important breeding locations for the Australasian gannet within the Environment Sectors include Pedra Branca, Eddystone Rocks, Sidmouth Rocks, and Black Pyramid (Tasmania) and Lawrence Rocks (Victoria). BIAs for foraging and aggregation occur within the Planning Areas with substantial foraging sites within Port Philip Bay and Port Fairy (Figure 7-30).

Little Penguin

The little penguin 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 (DoE 2015a). Bass Strait has the largest proportion (approximately 60%) of the known breeding colonies in Australia; however, breeding populations are also found on the New South Wales coast. 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). 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. BIAs for breeding and foraging have been identified for the little penguin within the Planning Areas (Figure 7-31). Little penguins are also an important component of the Australian and New Zealand fur-seals' diet (Parliament of South Australia 2011).

Orange-bellied Parrot

The orange-bellied parrot (*Neophema chrysogaster*) (listed as critically endangered under the EPBC Act) breeds in Tasmania during summer, migrates north across Bass Strait in autumn and spends winters on the mainland. The migration route includes the west coast of Tasmania and King Island (Figure 7-33). 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). 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*) (DoE 2023r). There are also non-breeding orange-bellied parrots on mainland Australia, between Goolwa in Australia and Corner Inlet in Victoria. The orange bellied parrot may overfly the coastal waters of the Operational or Planning Areas (Figure 7-33). However, parrots rarely land or forage out at sea and Beach has not recorded the presence of any orange-bellied parrot at any of their offshore facilities or vessels over the past 15 years.

Other Shorebirds

A number of species listed in Table 7-5 use coastal shoreline habitats such as Australian fairy tern, Australasian bittern, curlew sandpiper, eastern curlew, fairy prion, fork-tailed swift, little curlew, pectoral sandpiper, red knot, sharp-tailed sandpiper, 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 and molluscs or fish species or feed on aquatic biota (Parks Victoria 2016). These species may be present on coastal areas of the Operational or Planning Areas.

Many sandpipers including the common, marsh, terek and the broad-billed sandpiper 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 are non-breeding visitors 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 black-faced cormorant, common greenshank, pied stilt, red-necked avocet, red-necked phalarope, red-necked stint, ruddy turnstone, ruff, rufous fantail, sanderling and white-throated needletail and are common along Australia's coastline. The black-faced cormorant has a breeding and foraging BIA off King Island within the Otway Planning Area. Many of these waders 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 or Planning Areas 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 critically endangered 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 Otway Planning Area.

Figure 7-30: BIAs for Antipodean Albatross, Australasian Gannet, Black-browed Albatross, Campbell Albatross, Wandering Albatross and Black-faced Cormorant within the Operational or Planning Areas

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Figure 7-31: BIAs for the Buller's Albatross, Common Diving-petrel, Indian Yellow-nosed Albatross and Little Penguin within the Operational or Planning Areas

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Figure 7-32: BIAs for Short-tailed Shearwater, Shy Albatross, Wedge-tailed Shearwater and White-faced Storm Petrel within the Operational and Planning Areas

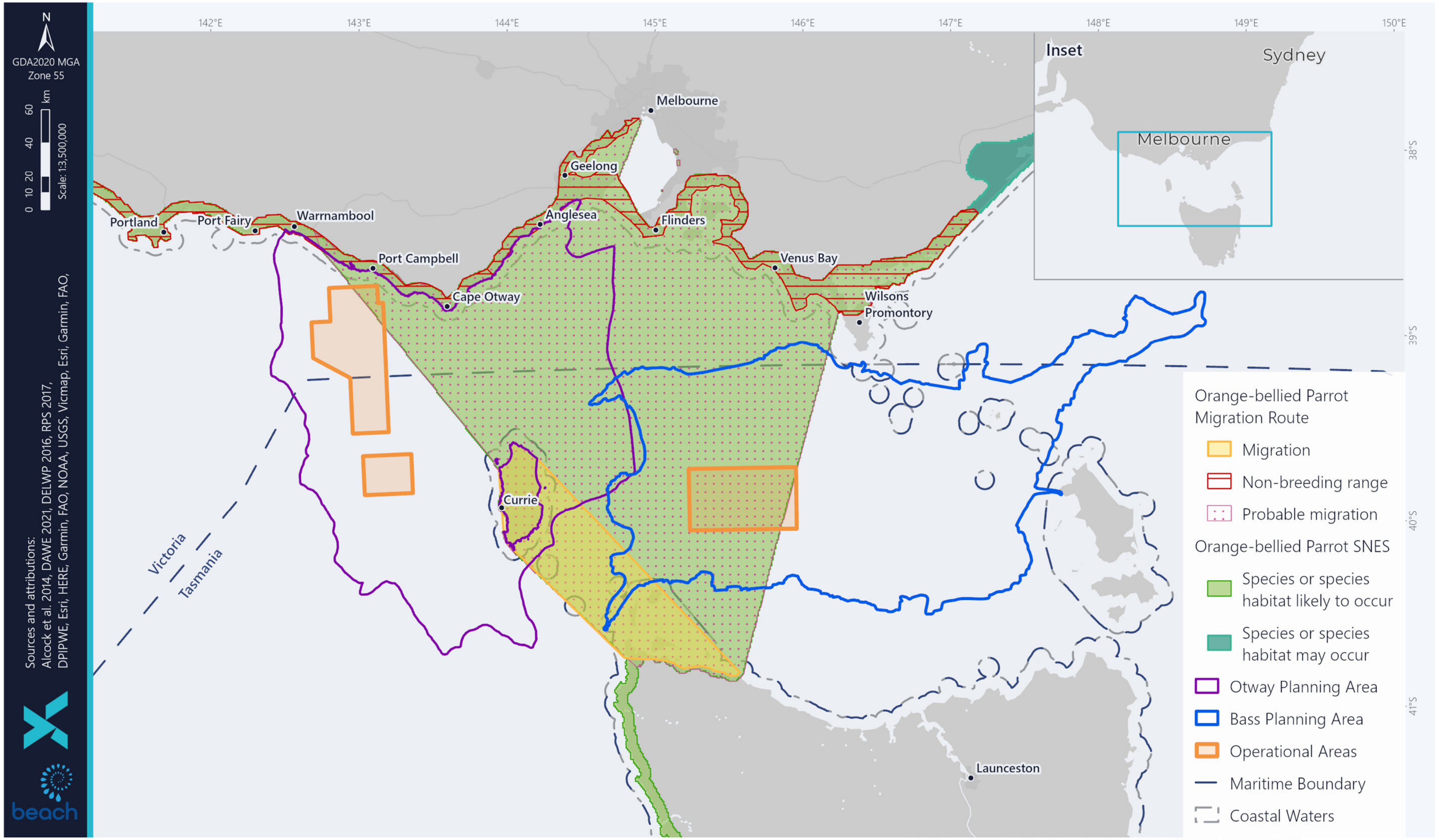

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Figure 7-33: Distribution of the Orange-bellied Parrot within the Operational and Planning Areas

7.4.12.5 Marine Reptiles

The PMST Reports for the Operational or Planning Areas identified three marine turtle species with varying likelihoods of occurrence (Table 7-6, Appendix A). All three species of marine turtles are protected by the Recovery Plan for Marine Turtles in Australia (Commonwealth of Australia 2017b). Foraging is known to occur for only one species, the leatherback turtle, within the Otway Planning Area. There are no identified BIAs or critical habitats for marine reptiles in the Operational or Planning Areas.

The Recovery Plan for Marine Turtles in Australia (Commonwealth of Australia 2017b) details that the long-term recovery plan objective for marine turtles is to minimise anthropogenic threats to allow for the conservation status of marine turtles. Threats identified relevant to the activity are:

- Chemical and terrestrial discharge
- Marine debris
- Light pollution
- Habitat modification
- Vessel strike
- Noise interference
- Vessel disturbance

Table 7-6: Listed Turtle Species Identified in the Operational and Planning Areas

Common name	Species name	EPBC Act status			Bass		Otway	
		Listed threatened	**Listed migratory**	**Listed marine**	**Operational Area**	**Planning Area**	**Operational Area**	**Planning Area**
Green turtle	*Chelonia mydas*	V	M	L	SHM	SHM	SHM	SHM
Leatherback turtle	*Dermochelys coriacea*	E	M	L	SHL	SHK	SHL	FK
		Approved Conservation Advice for *Dermochelys coriacea* (leatherback turtle) (DEWHA, 2008). Threats identified relevant to the activity are as per the recovery plan.						
Loggerhead turtle	*Caretta caretta*	E	M	L	SHL	SHK	SHL	SHK
Listed Threatened E: Endangered V: Vulnerable Listed Migratory M: Migratory Listed Marine L: Listed		Likely Presence FK: Foraging, feeding or related behaviour likely to occur within area. SHL: Species or species habitat likely to occur within area. SHM: Species or species habitat may occur within area. SHK: Species or species habitat known to occur within area.						

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 5-10 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 NSW, Victoria and South Australia. There are no known nesting or foraging grounds for green turtles offshore Victoria; they occur only as rare vagrants in these waters (DoE 2023j), therefore it is expected they would only be occasional visitors in the Bass and Otway Planning Areas.

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 (Commonwealth of Australia, 2017b). 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, particularly to the southwest of Cape Otway. It is mostly a pelagic species, and away from its feeding grounds is rarely found inshore (Commonwealth of Australia 2017b). 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). Bass Strait is one of three of the largest concentrations of feeding leatherbacks (DSE 2009). The major threat to leatherback turtles is by-catch and habitat pollution. In the Bass Strait, leatherbacks are at risk of entanglement from crayfish and pot float lines, ingestion of marine debris as ocean currents and wind can accumulate floating debris where turtles feed (DSE 2009).

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 Bass and Otway Planning Areas.

Loggerhead Turtle

The loggerhead turtle (*Caretta caretta*) is globally distributed in tropical, sub-tropical waters 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 (Commonwealth of Australia 2017b). Due to waters depths, it is unlikely loggerhead turtles would be present in most of the Bass Planning Area. The Otway Planning Area overlaps more nearshore waters which may provide suitable habitat along the Otway coast.

7.4.12.6 Cetaceans

The PMST Reports identify several cetaceans that potentially occur in the Bass and Otway Operational and Planning Areas (Appendix A). Table 7-7 details cetaceans identified in the PMST Reports[1]. Threatened or migratory species that are likely or known to occur in the area or have an intercepting BIA with the Operational and Planning Areas are discussed in more detail in the following sections.

The Bass Strait and 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 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.

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).

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) (See Section on blue whales).

These surveys recorded 133 sightings of 15 identified cetacean species consisting of seven mysticete (baleen) whale species, eight odontocete (toothed) species and 384 sightings of dolphins (Table 7-8 and Table 7-9). 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.

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[1] Note that, due to current updates being made to the EPBC PMST database, the reports included in Appendix A falsely omit an overlap with the southern right whale BIAs. Beach has use the data provided in the National Conservation Values Atlas, which has recently been updated, to describe the proximity and nature of southern right whale BIAs in the operational and planning area.

Species of cetacean sighted in the period 31 October to 19 December 2010 during the Speculant 3D Transitions Zone Seismic Survey undertaken by Origin Energy, recorded species of common dolphin (*Delphinus* spp.), bottlenose dolphin (*Tursiops* spp.), unidentified small cetaceans and fur-seals.

Origin Energy conducted a survey for cetaceans focused on Origin operations and permit in the Otway basin from June 2012 through to March of 2013. Table 7-9 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 drill rig and support vessels at the Artisan-1, Geographe-4, Geographe-5, Thylacine North-1 and West-1 drilling locations. Table 7-11 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). Further detail on marine fauna observations of blue whales through to 30 April 2022 is provided in the section on blue whales).

Table 7-7: Listed Cetacean Species Identified in the Operational and Planning Areas

Common name	Species name	EPBC Act status			Bass		Otway	
		Listed threatened	Listed migratory	Listed cetacean	Operational Area	Planning Area	Operational Area	Planning Area
Whales								
Andrew's beaked whale	*Mesoplodon bowdoini*	-	-	L	-	SHM	SHM	SHM
Antarctic minke whale	*Balaenoptera bonaerensis*	-	M	L	-	SHL	SHL	SHL
Arnoux's beaked whale	*Berardius arnuxii*	-	-	L	-	SHM	SHM	SHM
Blainville's beaked whale	*Mesoplodon desirostris*	-	-	L	-	SHM	SHM	SHM
Blue whale	*Balaenoptera musculus brevicauda* and *intermedia*	E	M	L	SHL	SHL	FK	FK
		Conservation Management Plan for the Blue Whale (DoE 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 activity 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.						
Bryde's whale	*Balaenoptera edeni*	-	M	L	-	SHM	-	-
Cuvier's beaked whale	*Ziphius cavirostris*	-	-	L	-	SHM	SHM	SHM
Dwarf sperm whale	*Kogia simus*	-	-	L	-	SHM	SHM	SHM
False killer whale	*Pseudorca crassidens*	-	-	L	SHL	SHL	SHL	SHL
Fin whale	*Balaenoptera physalus*	V	M	L	FL	FL	FL	FL
		Approved Conservation Advice for *Balaenoptera physalus* (fin whale) (TSSC 2015e). Threats relevant to the activity 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	*Mesoplodon grayi*	-	-	L	-	-	-	SHL
Hector's beaked whale	*Mesoplodon hectori*	-	-	L	-	SHM	SHM	SHM
Humpback whale	*Megaptera novaeangliae*	-	M	-	SHK	SHK	SHL	SHK
		Approved Listing Advice for *Megaptera novaeangliae* (humpback whale) (DAWE 2022b). 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 activity: • Marine debris • Noise interference • Pollution • Vessel disturbance and strike No explicit relevant management actions.						
Killer whale, orca	*Orcinus orca*	-	M	L	SHL	SHL	SHL	SHL
Long-finned pilot whale	*Globicephala melas*	-	-	L	-	SHM	SHM	SHM
Minke whale	*Balaenoptera acutorostrata*	-	-	L	SHM	SHM	SHM	SHM
Pygmy right whale	*Caperea marginata*	-	M	L	FM	FM	FM	FM
Pygmy sperm whale	*Kogia breviceps*	-	-	L	-	SHM	SHM	SHM
Sei whale	*Balaenoptera borealis*	V	M	L	FL	FL	FL	FL

Common name	**Species name**	**EPBC Act status**			**Bass**		**Otway**	
		Listed threatened	**Listed migratory**	**Listed cetacean**	**Operational Area**	**Planning Area**	**Operational Area**	**Planning Area**
		Approved Conservation Advice for *Balaenoptera borealis* (sei whale) (TSSC 2015f). Threats identified relevant to the activity: • 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.						
Short-finned pilot whale	*Globicephala macrorhynchus*	-	-	L	SHM	SHM	SHM	SHM
Southern right whale	*Eubalaena australis* *Balaena glacialis australis*	E	M	L	SHK	SHK	SHK	BK
		Conservation Management Plan for the Southern Right Whale 2011-2021 (DSEWPaC 2012a). Draft National Recovery Plan for the Southern Right Whale (DCCEEW 2022a). Threats identified relevant to the activity: • 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.						
Sperm whale	*Physeter macrocephalus*	-	M	L	-	SHM	SHM	SHM
Strap-toothed beaked whale	*Mesoplodon layardii*	-	-	L	-	SHM	SHM	SHM
True’s beaked whale	*Mesoplodon mirus*	-	-	L	-	SHM	SHM	SHM
Dolphins								
Bottlenose dolphin	*Tursiops truncatus*	-	-	L	SHM	SHM	SHM	SHM
Common dolphin	*Delphinus delphis*	-	-	L	SHM	SHM	SHM	SHM
Dusky dolphin	*Lagenorhynchus obscures*	-	M	L	SHM	SHL	SHL	SHL
Indian ocean bottlenose dolphin	*Tursiops aduncus*	-	-	L	-	SHL	SHL	SHL
Risso’s dolphin	*Grampus griseus*	-	-	L	SHM	SHM	SHM	SHM
Southern right whale dolphin	*Lissodelphis peronii*	-	-	L	-	SHM	SHM	SHM
Listed Threatened E: Endangered V: Vulnerable Listed Migratory M: Migratory Listed Cetacean L: Listed		Likely Presence SHM: Species or species habitat may occur within area. SHL: Species or species habitat likely to occur within area. SHK: Species or species habitat known to occur within area. FK: Foraging, feeding or related behaviour known to occur within area. FL: Foraging, feeding or related behaviour likely to occur within area FM: Foraging, feeding or related behaviour may to occur within area.						

Table 7-8: Cetacean Species Recorded during Aerial Surveys 2002–2013 in Southern Australia

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	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

SRW = southern right whales; ROR = rorquals; ODO = other odontocetes; DOL = dolphins.

Table 7-9: Temporal Occurrence of Cetaceans Sighted during Aerial Surveys from November 2002 to March 2013 in Southern Australia

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

Species	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
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

*Species sighted 2 or fewer times.

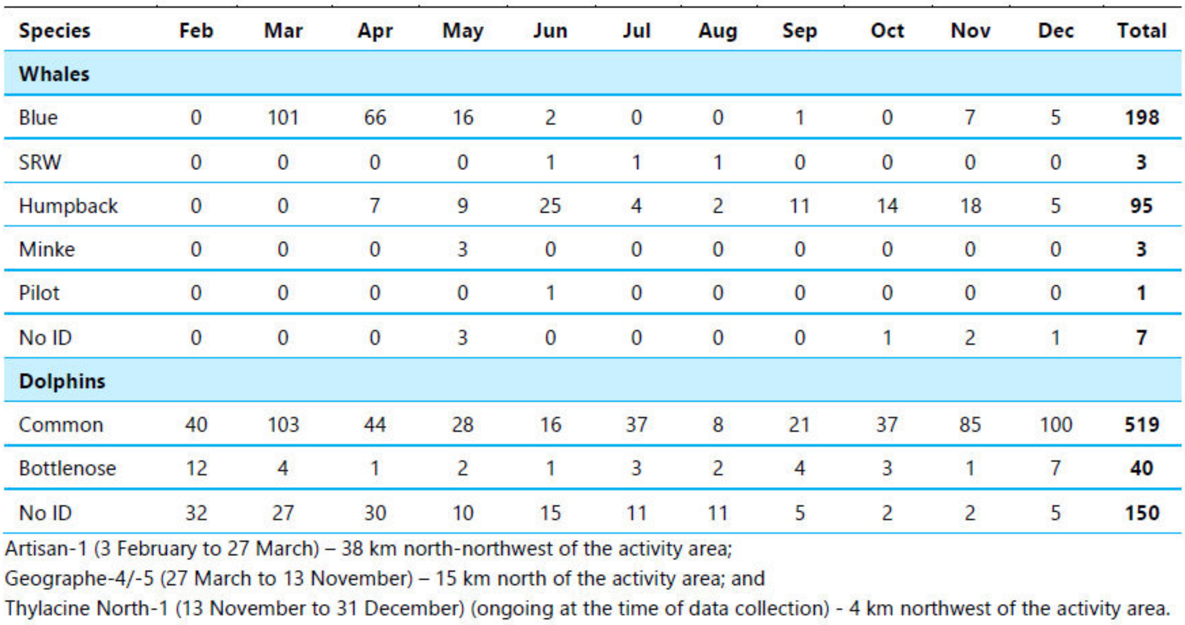
Note: Numbers denote animals sighted per 1,000 km survey distance for each month, pooled for all years (i.e. the 12-month period from Oct–Sep).

Table 7-10: Observed Cetaceans in the Otway Basin

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

*September values averaged over two surveys on 1 and 11 September 2012. Totals include individuals from both September surveys

Table 7-11: Marine Fauna Observations at Project locations during the Otway Drilling Project in 2021



Species	Feb	Mar	Apr	May	Jun	Jul	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**

Artisan-1 (3 February to 27 March) – 38 km north-northwest of the activity area;
Geographe-4/-5 (27 March to 13 November) – 15 km north of the activity area; and
Thylacine North-1 (13 November to 31 December) (ongoing at the time of data collection) - 4 km northwest of the activity area.

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 2023c). 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 2023c). The species primarily feeds in the Antarctic during summer on Antarctic krill and does not appear to feed much while in the breeding grounds of lower latitudes (DoE 2023c).

The Antarctic minke whale has been observed within the region however there are no BIAs in the Operational and Planning Areas. Therefore, it is likely that they would be uncommon visitors in the Planning Areas.

Blue Whale

The pygmy blue whale has a foraging (annual high use area) BIA within the Otway Operational and Planning Areas (Figure 7-34). The known foraging area BIA for the pygmy blue whale overlaps the Otway Operational Area and both Bass and Otway Planning Areas (Figure 7-34).

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.

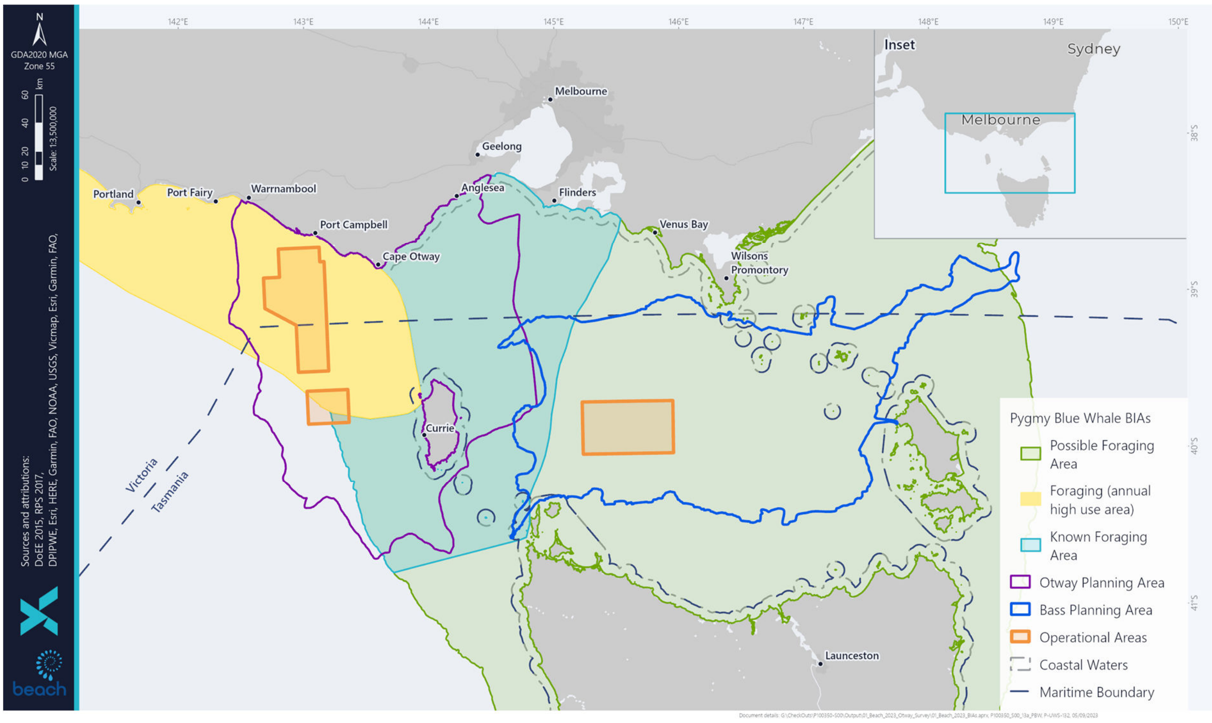


Figure 7-34: Pygmy Blue Whale BIAs within the Operational and Planning Areas

Status

The blue whale (*Balaenoptera musculus*) is listed as an endangered species under the Australian Government 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 whale unless otherwise specified is generally synonymous to both species. The blue whale has a recovery plan that identifies threats and establishes actions for assisting the recovery of blue whale populations using Australian waters (Commonwealth of Australia 2015b).

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. 2008). 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, WA and the Bonney Upwelling, SA and Victoria constitute the same population (Attard et al. 2018, in Commonwealth of Australia, 2015b). 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).

Global pygmy blue whale abundance estimates range from 2,000 to 5,000 individuals (Reilly et al. 2018). 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° South, 115–125° East) (Commonwealth of Australia 2015b).

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. 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. The Otway region is an important migratory and foraging area for blue whales, as shown by passive acoustic monitoring and aerial surveys (Gavrilov 2012; McCauley et al. 2018; Gill et al. 2011).

Underwater acoustic monitoring programs have detected Antarctic and pygmy blue whale calls in the Otway Region. Acoustic detection of Antarctic blue whales indicates that they occur along the entire southern coastline of Australia (McCauley et al. 2018). Pygmy and Antarctic blue whales were acoustically detected by Origin Energy between February and October 2011 in the Otway Basin, east of the Thylacine-A wellhead platform. The presence of Antarctic blue whales in the area is considered rare (Gavrilov 2012). However, recent acoustic studies have estimated an increase in the abundance of blue whales off Portland, Victoria (McCauley et al. 2018). From 2009-2016 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).

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 7-35). 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) 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).

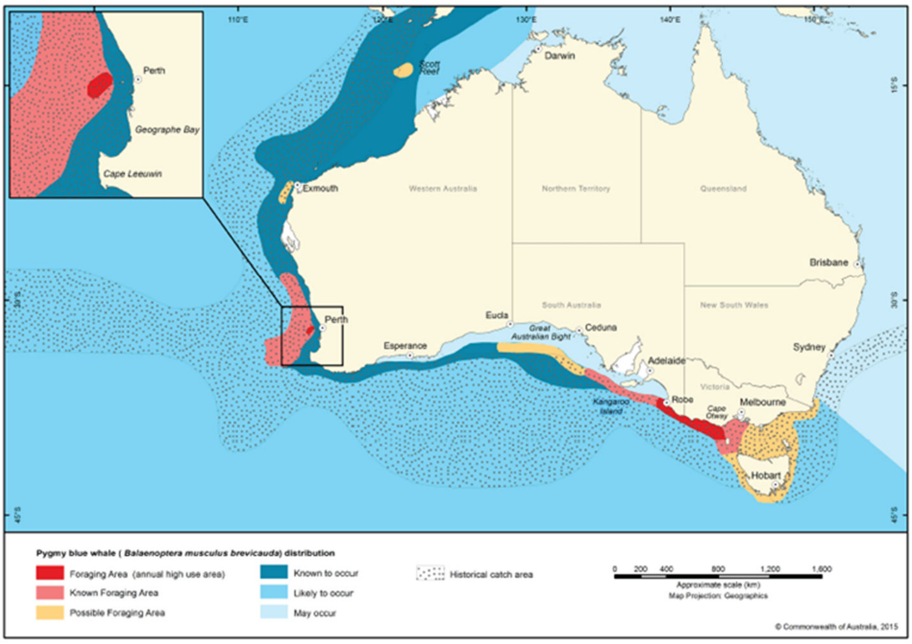
The seasonal distribution and abundance of blue whales are variable across years and influenced by climate variables. The time and location of the appearance of blue whales in the east generally coincides with the upwelling of cold water in summer and autumn along the coast (the Bonney coast upwelling) and the associated aggregations of krill that they feed on (Gill and Morrice 2003). The Bonney coast 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.

There are two known seasonal feeding aggregations areas in Australia, the Bonney Coast Upwelling KEF and adjacent waters off South Australia and Victoria (Figure 7-35), and the Perth Canyon KEF and adjacent waters in Western Australia. The abundance of pygmy blue whales varies within and between seasons, but they typically forage in the Otway region between January and April. 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 (Commonwealth of Australia 2015). 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-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. One occasion all three types were detected between April and June with more commonly two calls present over this period during other years.

Pygmy blue whales have three migratory stages around Australia; the “southbound migration stage” where predominantly between October to December (sometimes into January) whales travel from Indonesian waters down to the WA coast, the “southern Australian stage” where between January and June whales spread across the southern Australian waters, and the “northbound migration stage” where whales travel back up to Indonesia between April and August. The “southern stage” involves animals searching for prey. The Bonney coast upwelling is a strong predicator of pygmy blue whale presence at Portland where whale presence in the area is linked to prey availability (McCauley et al. 2018). Passive acoustic monitoring in southern Australia during 2000-2017 focused on the distribution and population parameters of both subspecies of blue whales in southern and western Australia. In Portland sea noise data was available from 2009 to early 2017. In 2009 and 2011 pygmy blue whales arrived in November or December whereas in the other years, calls were not detected until January or February. There was substantial variation in presence within a season, with some whales remaining in the Portland detection area until mid-June each year. Acoustic loggers located east of the Thylacine platform from February to October 2011 detected pygmy blue whales between February and early June, with the greatest abundance from March to mid-May.

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. 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. The number of pygmy blue whale calling in Portland could be expected in increase yearly with whale population growth (McCauley et al. 2018).

Photo identification, genetics and telemetry studies provide information on whale movements and connectivity. 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.



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 7-35: Pygmy Blue Whale Foraging Areas around Australia (Commonwealth of Australia 2015b)

Foraging

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 (Figure 7-35). 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 2023d). 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 zig-zagging '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 the blues have finished feeding, they will move from the feeding area to commence searching for another area.

Diving behaviour of blue whales associated with feeding at depth was observed by Gill and Morrice (2003) in the Otway region, who note that blue whales dived steeply, submerging for 1 – 4 minutes, then returned to the surface. Tagging of a pygmy blue whale at the Perth Canyon identified 1677 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.
- 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).

Although the maximum recorded dive time was 112 minutes, the mean dive time of 6.1 minutes ± 5.2 provides confidence that the typical dive time is less than 30 minutes (Möller et al. 2015). Tagging of eight blue whales off California (Irvine et al. 2019) identified that dive durations were as long as 30.7 minutes, and no feeding lunges were recorded during dives > 20 minutes in duration.

Surveys

Several aerial and noise studies of blue whales within the Otway Basin have been conducted and are summarised below.

Aerial Surveys (2001-02 to 2006-07)

Gill et al. (2011) undertook 69 seasonal aerial surveys for blue whales between Cape Jaffa and Cape Otway over six seasons (2001-02 to 2006-07). This study found that the general pattern of seasonal movement of blue whales is from west to east, with whales foraging in between the Great Australian Bight and Cape Nelson in November and spreading further east in December. Whales are typically widely distributed throughout Otway shelf waters from January through to April (Gill et al. 2011) (Figure 7-37 and Figure 7-38).

Blue whale encounter rates in the central and eastern study (Cape Nelson to Cape Otway) area by month is shown in Figure 7-36 with sighting and effort data presented geographically in Figure 7-37 and Figure 7-38. Data is pooled for all seasons, for central and eastern areas, overlaid on gridded aerial survey effort (10 km x 10 km squares), represented as minutes flown per grid square (key, upper right). 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). The Planning Area is within the central and eastern areas and the Operational Area on the outer edge of the eastern area.

There had been fewer than 50 sightings of blue whales in Bass Strait up to the year 1999, but since that time feeding blue whales have been more regularly observed in the Discovery Bay area and more generally along the Bonney coast from Robe to Cape Otway. 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 7-37).

Based on the pooled aerial survey data (2001-2007), 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.

The data from Gill et al. (2011) shows:

- 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 during November for any season despite significant effort. Pooled monthly encounter rates increased from 1.6 whales 1,000 km–1 in December, 5 whales 1,000 km–1 in January,

peaked at 9.8 whales 1,000 km–1 in February, dropped slightly to 8.8 whales 1,000 km–1 in March, then declined sharply to a single sighting for May (0.4 whales 1,000 km–1).

- Encounter rates in central and eastern zones peaked in February, coinciding with peak upwelling intensity and primary productivity.

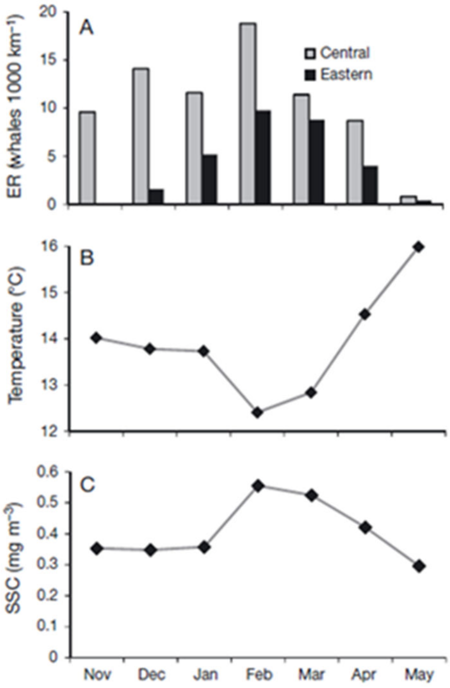
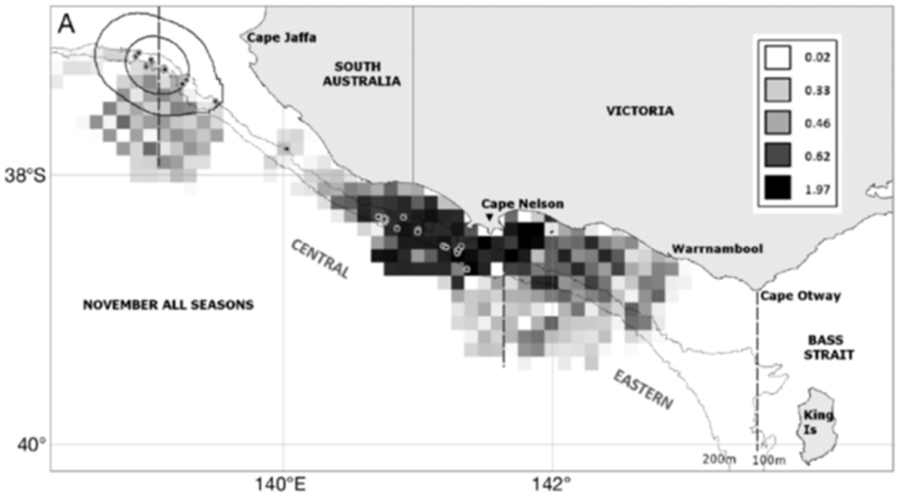
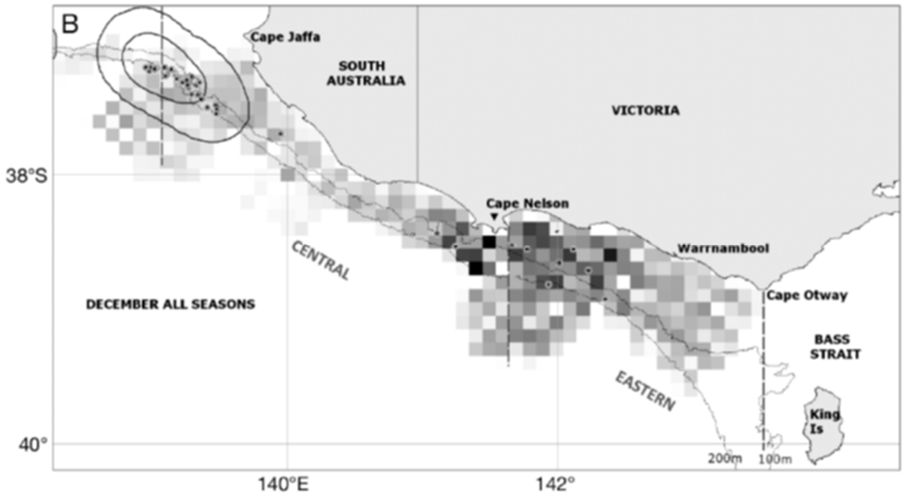


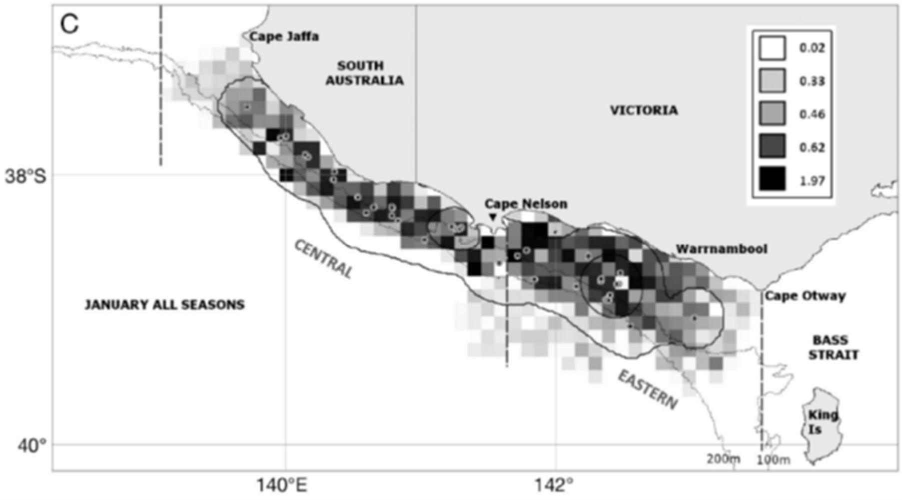
Figure 7-36: Blue Whale Encounter Rates in the Central and Eastern Study (Cape Nelson to Cape Otway) Area by Month (Gill et al. 2011)



November



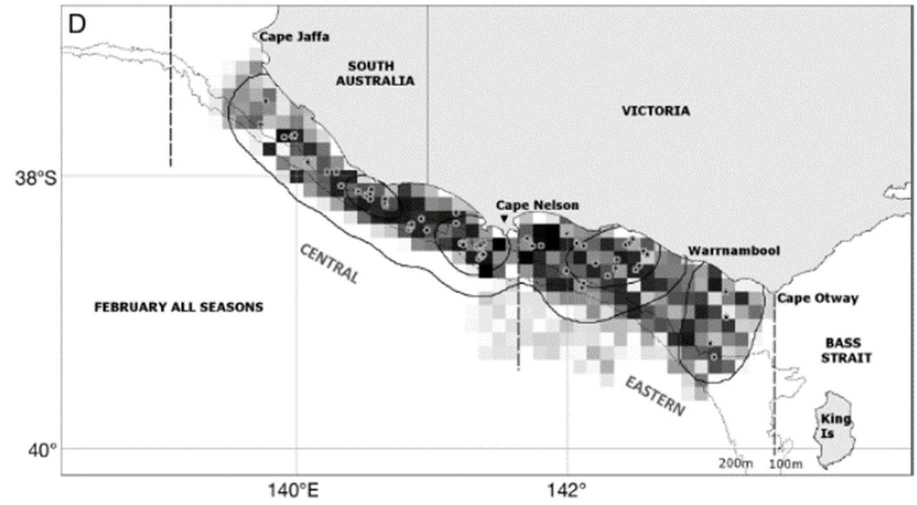
December



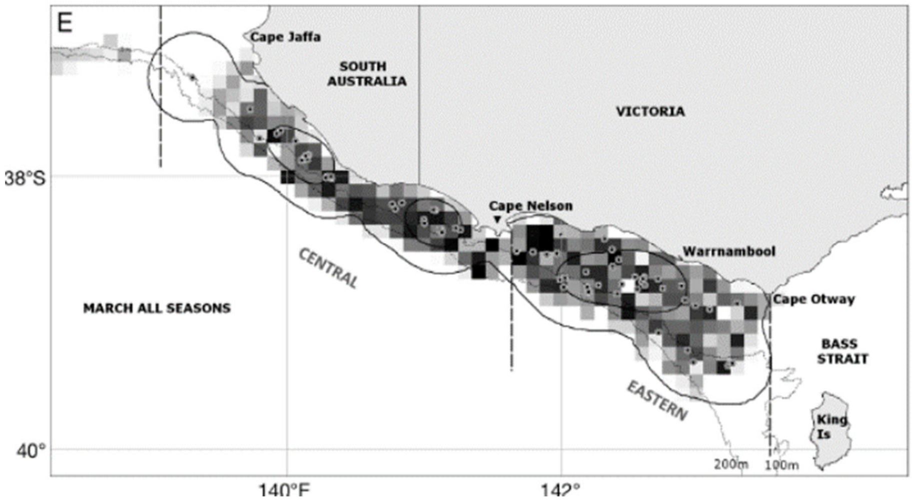
January

Figure 7-37: Blue Whale Sightings in the Otway Basin (Nov, Dec, Jan) (Gill et al. 2011)

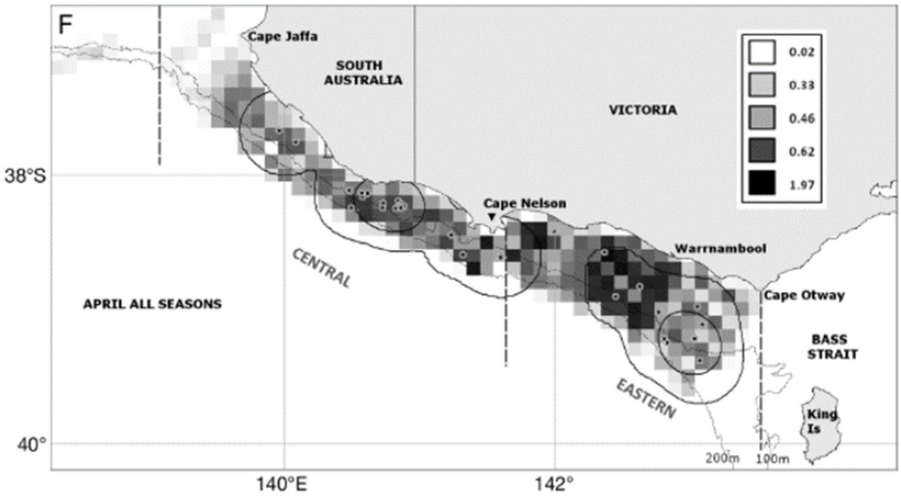
Note: Dots represent blue whale sightings while squares are aerial survey effort (10 km x 10 km squares) represented as minutes flown per grid square (key, upper right corner of the November and January figures).



February



March



April

Figure 7-38: 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 x 10 km squares) represented as minutes flown per grid square (key, upper right corner of the April figure).

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. 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. 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 7-39 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 7-39 and Figure 7-40). 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-December 2012 evidently tailed off during the next few months (Gill 2020)

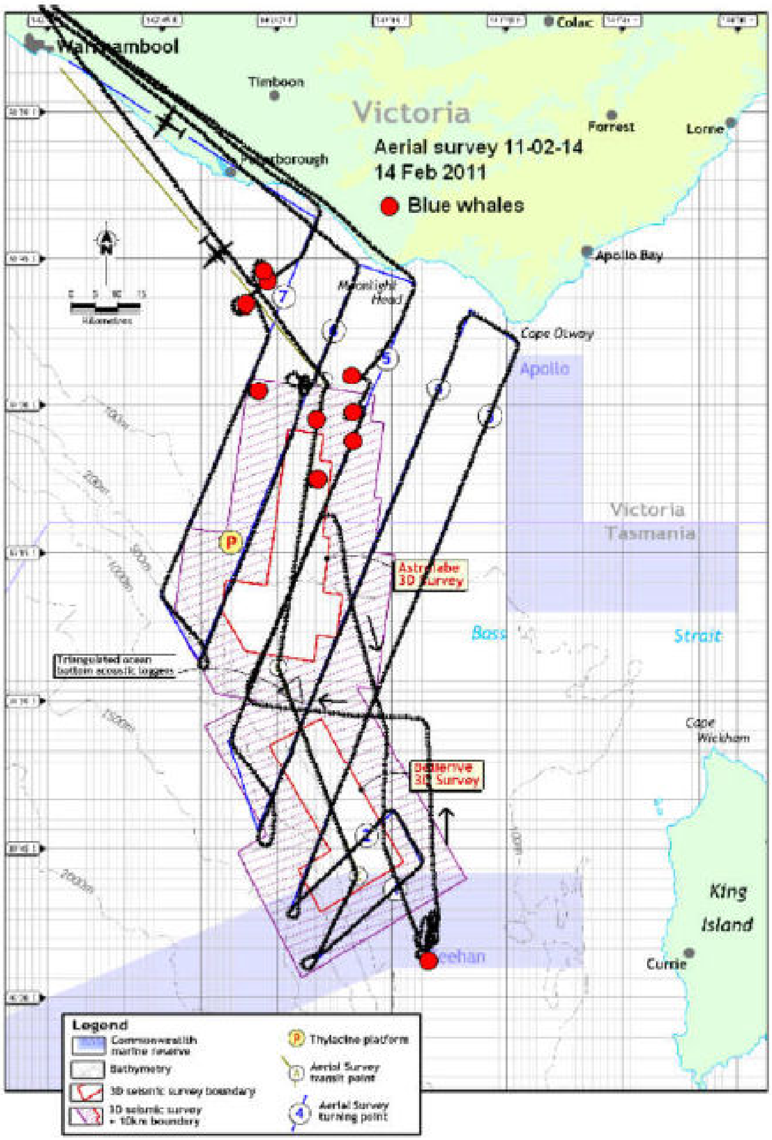


Figure 7-39: Blue Whale Sightings during an Aerial Survey for Origin Energy in February 2011 (Gill 2020)

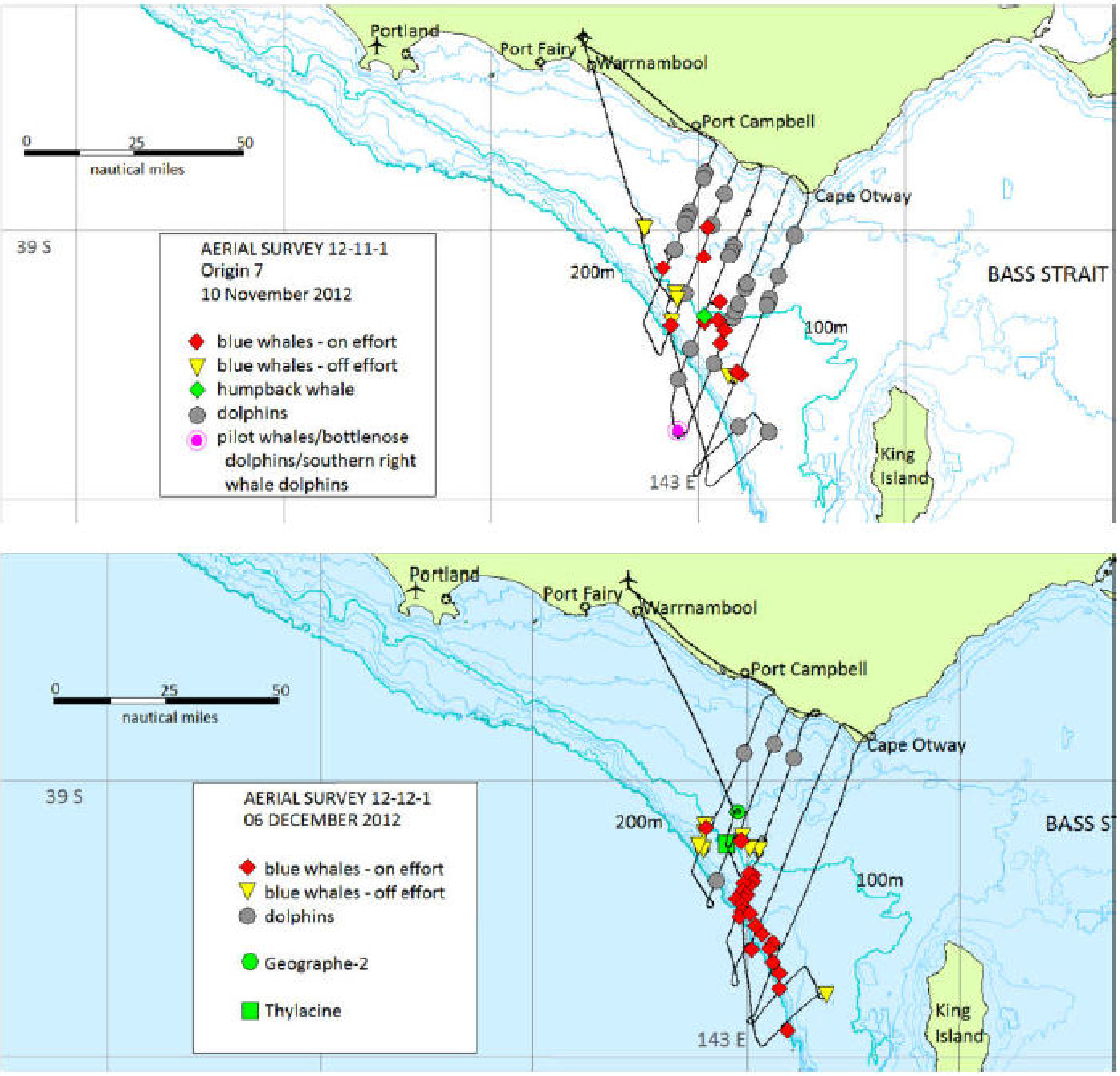


Figure 7-40: Blue Whale Sightings during an Aerial Survey for Origin Energy in November and December 2012 (Gill 2020)

<u>Tagging Study (2015-2016)</u>

Möller et al. 2020 analysed data from the tags of 13 pygmy blue whales who were tagged in the Bonney upwelling region in January 2015 with tags transmitting up to March 2016. In summary:

- Whale 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 (Figure 7-41).
- 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.

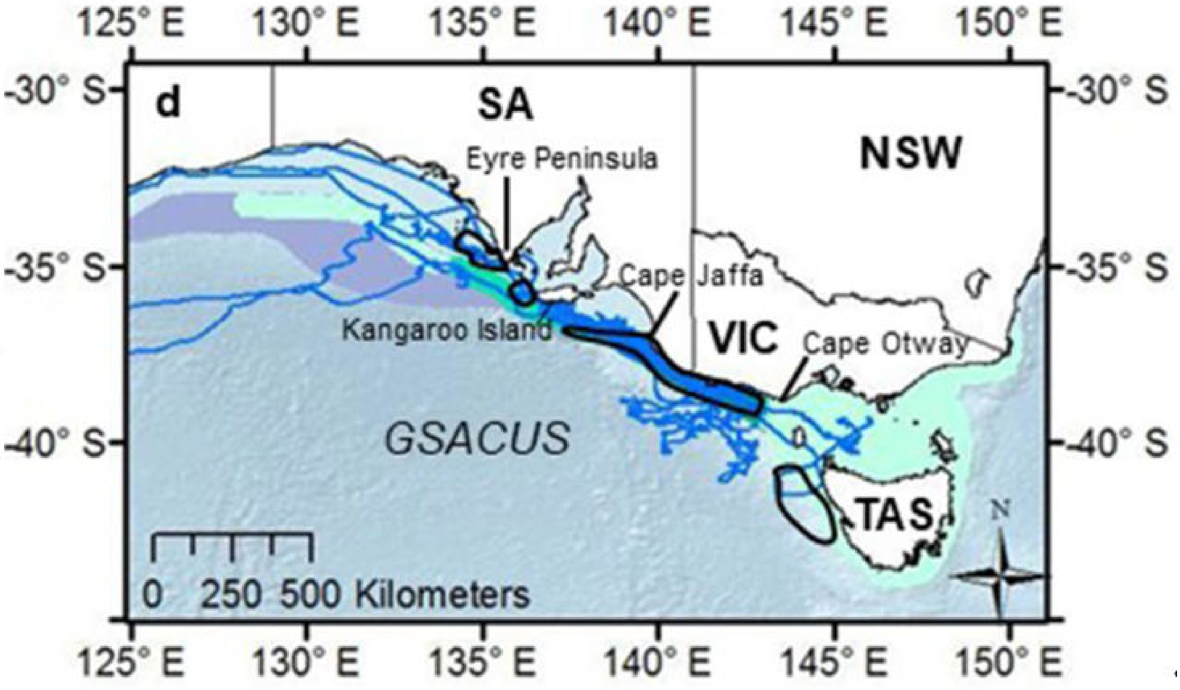


Figure 7-41: Tracks of 13 Pygmy Blue Whales in the GSACUS (Möller et al. 2020)

Passive Acoustic Recorders (2009-2017)

Between 2009 and 2016 the Integrated Marine Observing System (IMOS) has been recording underwater sound south of Portland, Victoria. McCauley et al. (2018) analysed the data from to look at blue whale presence, distribution, and population parameters.

McCauley et al. (2018) analysed data from passive acoustic recorders that were located around Australia to look at blue whale presence, distribution and population parameters. The primary sites comprised central Bass Strait, western Tasmania, the southeast Australian coast and the Great Australian Bight area. Each study area had multiple receivers and may have had several sites sampled within the area. Temporal sampling focussed on the southern Australian site south west of Portland, Victoria. Data was used from 2004 to 2016. The study concluded:

- 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). McCauley et al. (2018) suggests that acoustic detection of Antarctic blue whales indicate they predominantly occur along the entire southern coastline.
- Pygmy blue whales have three migratory stages around Australia; the “southbound migration stage” were predominantly between October to December (sometimes into January) whales travel from Indonesian waters down to the WA coast, the “southern Australian stage” where between January and June whales spread across the southern

Australian waters, and the "northbound migration stage" 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.
- Along the southern Australian coastline pygmy blue whales are most frequently detected towards the east along the Bonney coast over late February to early June, utilising secondary productivity produced by a seasonal upwelling event.
- Within a season it is difficult to predict whale numbers and their specific locations, but when correlated across seasons the strength and persistence of this upwelling event as given by time integrated water temperature south of Portland, significantly correlates with time integrated number of individual whales calling from the same site.
- The Bonney coast upwelling is a strong predicator of pygmy blue whale presence at Portland where whale presence in the area is linked to prey availability.
- Sea noise data was available from the Portland site from 2009 to early 2017 detailed:
    - In 2009 and 2011 pygmy blue whales arrived in November or December whereas in the other years, calls were not detected until January or February (Figure 7-42). There was substantial variation in presence within a season, with some whales remaining in the Portland detection area until mid-June each year.
    - There was considerable variability in whale persistence and presence within a season (Figure 7-42) with no consistent trend other than a peak in presence somewhere over February to June.
- 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. 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.
- The number of pygmy blue whale calling in Portland could be expected in increase yearly with whale population growth.

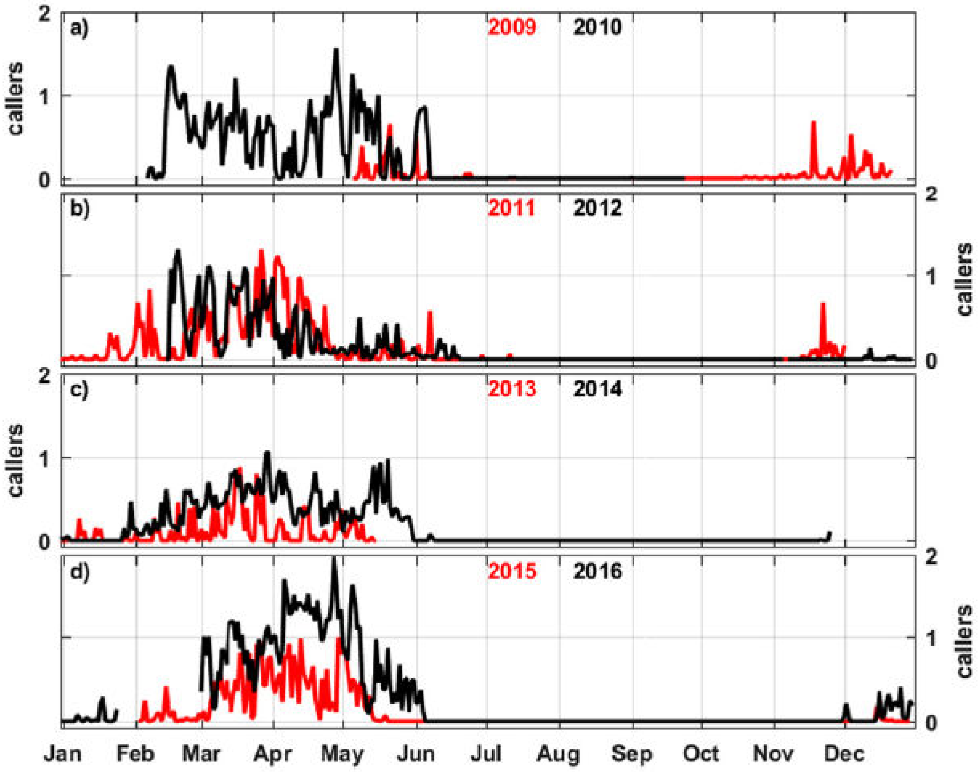


Figure 7-42: Mean Number of Individual Pygmy Blue Whales Calling (McCauley et al. 2018)

<u>Beach Surveys (2019-2022)</u>

During the Beach Otway Development Seabed Survey (November 2019 to January 2020) there were four 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.

As detailed in Section 7.3.2, JASCO completed a monitoring study for Beach in relation to exploration drilling activities at the Artisan-1 well from the 1 Feb 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 in the Otway Development Area, 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).

The Blue Whale Study was engaged to undertaken aerial surveys from February to May 2021 to identify blue whale and krill surface swarms within the Otway Development Area and outside of this 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 with 19 blue whales sighted.
- The first blue whale was sighted 25 February and final blue whale sighted 7 April.
- 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 drilling 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 7-43), 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 7-44 shows all whale sightings by MFOs between 2 February 2021 and 31 March 2022 across all well locations. Note that many observations were made whilst in transit.

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 7-12). 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 7-12).

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 7-12 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.

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 7-45 shows the detection function for all data; Figure 7-46 shows the detection functions under different visibility conditions; Figure 7-47 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 7-47. Detection probabilities for this case, along with those for 'excellent visibility' conditions (Figure 7-46) and 'all' data (Figure 7-45) were extracted to provide probabilities in 500 m increments (Table 7-13). To allow these probabilities to be applied to the management zones shown in Table 7-12, the average probability for each management zone was calculated and expected numbers and densities calculated for the three scenarios (Table 7-14).

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 7-48Figure 7-48. 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.

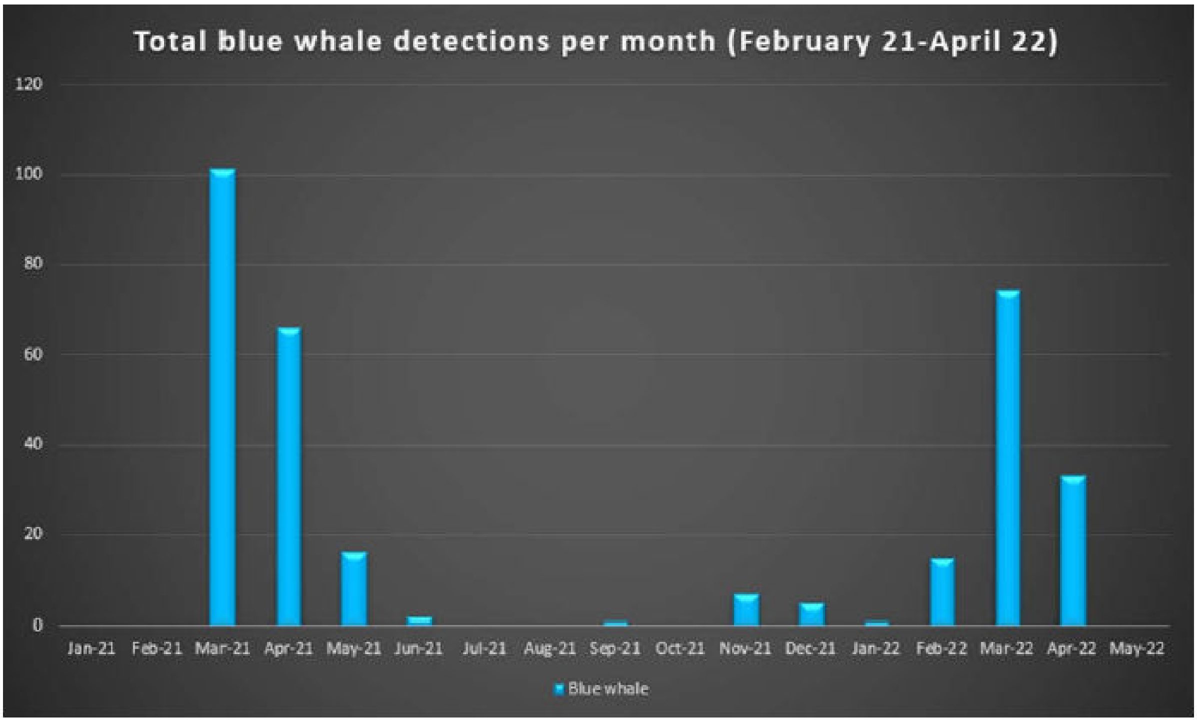


Figure 7-43: Blue Whale Sightings for the Otway Drilling Campaign

Table 7-12: 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					

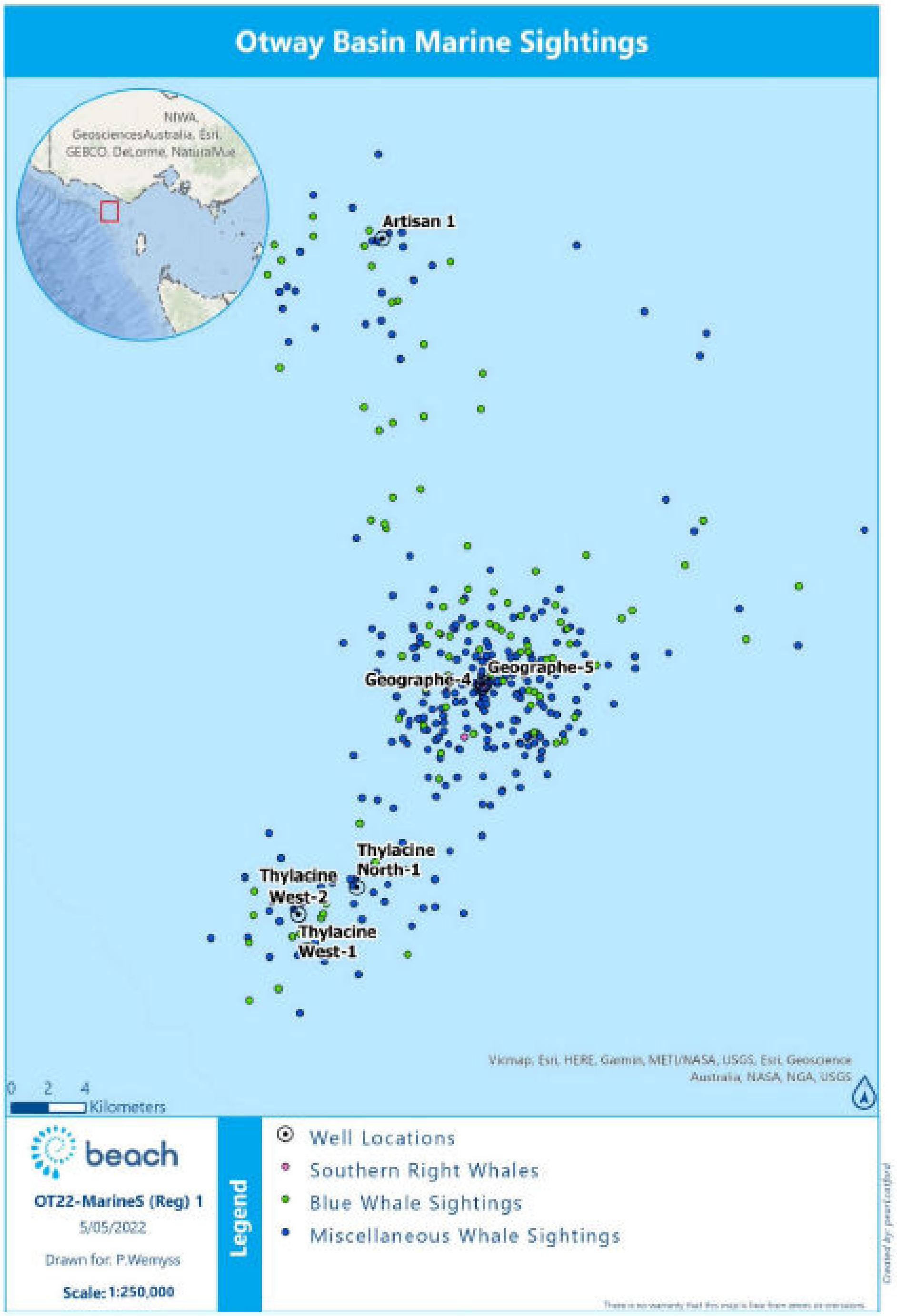


Figure 7-44: Whale Sightings between 2 February 21 – 31 March 2022

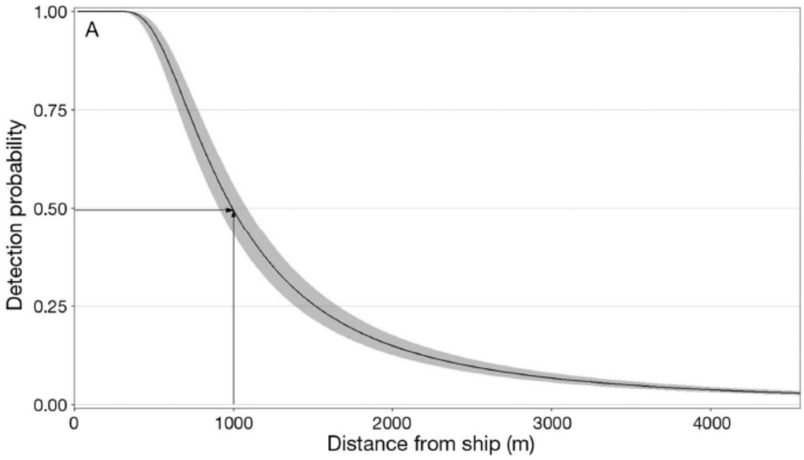


Figure 7-45: Detection Probability as it Varies with Distance between Ships and Whales in and near Glacier Bay National Park from 2008 to 2015 (Williams et al. 2016)

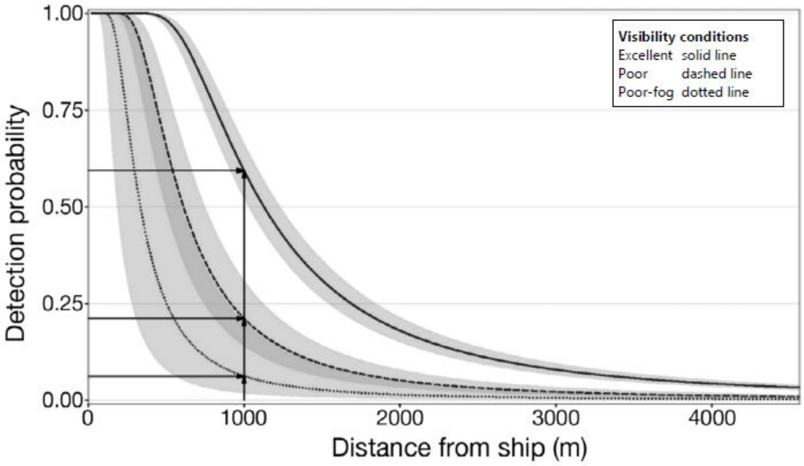


Figure 7-46: Detection Probability of Humpback Whales under Different Visibility Conditions (Williams et al. 2016)

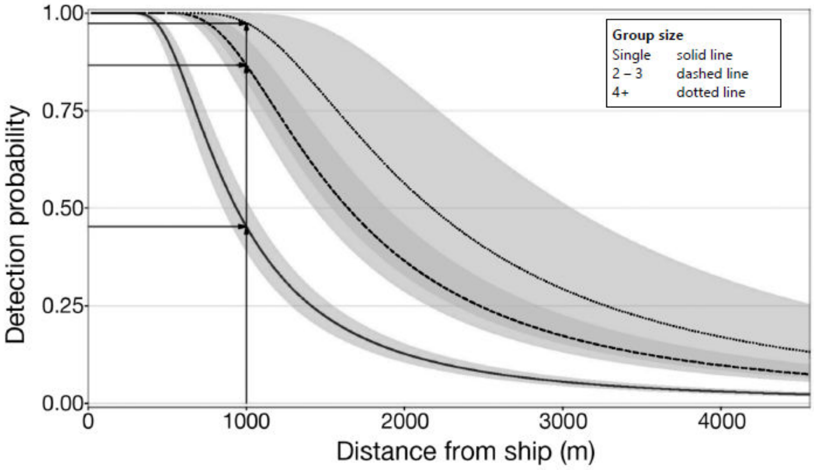
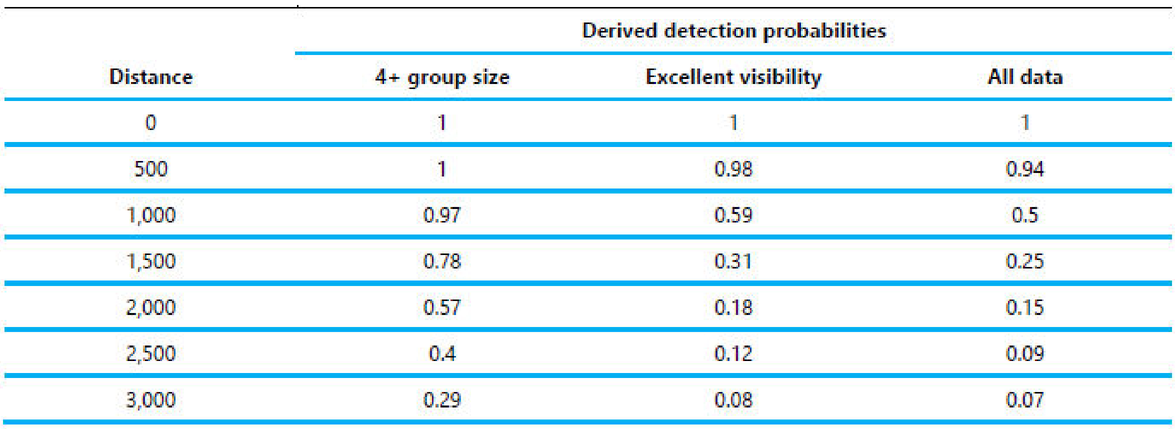


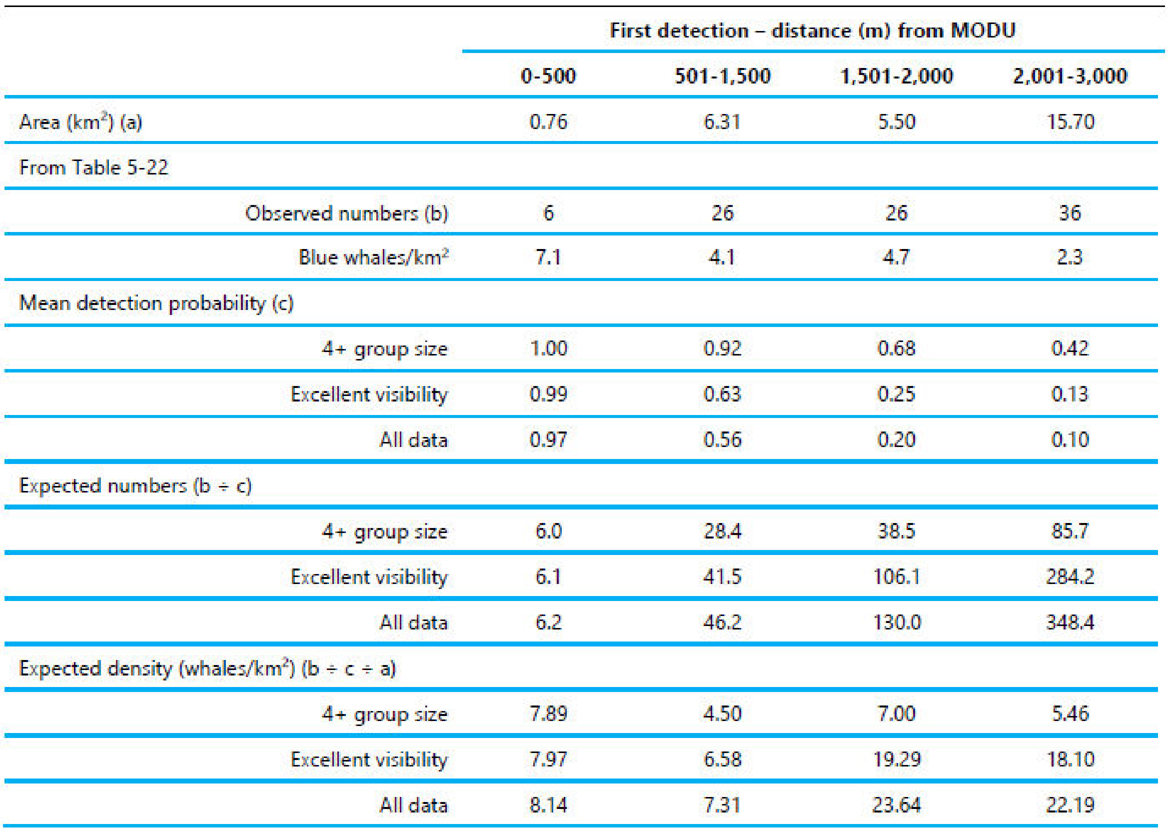
Figure 7-47: Probability of Detecting Whale Groups of Different Sizes of Humpback Whales (Williams et al. 2016)

Table 7-13: 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 7-14: 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 7-12 in this EP.



	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

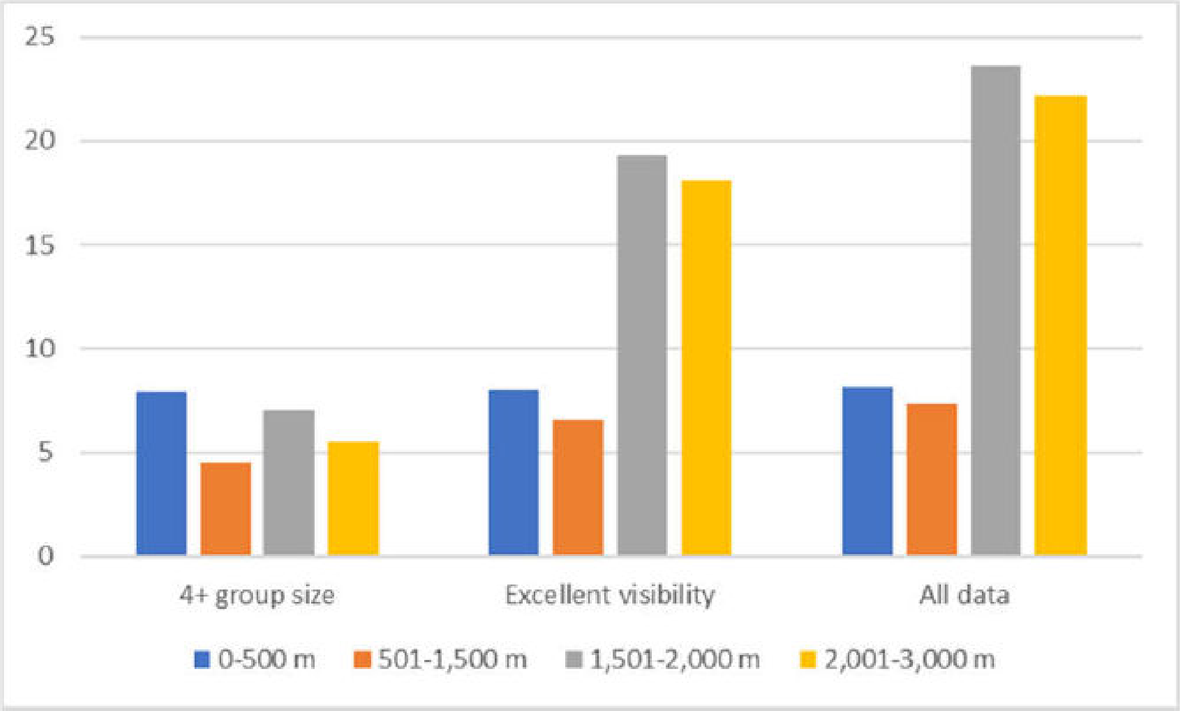


Figure 7-48: Expected Density (blue whales/km^2) for each Management Zone

Fin Whale

Fin whales are considered a cosmopolitan species and occur from polar to tropical waters and are rarely in inshore waters (DoE 2023e). 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 coast upwelling, Victoria, along the continental shelf in summer and autumn months (Gill 2002). Fin whales in the Bonney coast 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 2002-2013 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 coast 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.

As there are no BIAs for the fin whale in the Operational Areas or Planning Areas, they are likely to be uncommon visitors.

Humpback Whale

Humpback whales (*Megaptera novaeangliae*) 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. Along the southeast coast of Australia, the northern migration starts in April and May while the southern migration peaks around November and December (DAWE 2022b). 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. 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 (DAWE 2022b). Feeding occurs where there is a high krill density, and during the migration this primarily occurs in Southern Ocean waters south of 55°S (DAWE 2022b).

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 thirty 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 are 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 (CoA 2015). The nearest BIA which is important habitat for migrating humpback whales is Twofold Bay, a resting area off the NSW coast (DCCEEW 2023c).

During Origin's Enterprise 3D seismic survey undertaken during early November 2014, 16 humpback whales were sighted (RPS 2014). During Beach's Otway drilling campaign in 2021, which includes the Operational Area, 95 humpback whale detections were made, with the highest numbers being during June, September, October, and November.

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.

Killer Whale

Killer whales (*Orcinus orca*) are 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 2023s)

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 or Planning Areas. No killer whales were detected during Beach's Otway drilling campaign, which includes the Operational Area location. Therefore, it is likely that they would be uncommon visitors in the Operational or Planning Areas.

Long-finned Pilot Whale

The long-finned pilot whale (*Globicephala melas*) is distributed throughout the northern and southern hemispheres in circumpolar oceanic temperate and subantarctic waters containing zones of higher productivity along the continental slope. They sometimes venture into the shallower waters of the shelf (< 200 m) in pursuit of prey species. Stomach contents confirm that squid are the main prey of long-finned pilot whales in Australian waters, although some fish are also taken (DoEE, 2019f). No key localities have been identified in Australia (Bannister et al. 1996) however they are considered reasonably abundant (DoEE, 2019f).

There is some (inconclusive) evidence that suggests the species moves along the edge of the continental shelf in southern Australian waters (Bannister et al. 1996) in response to prey abundance at bathymetric upper slopes and canyons (DoE 2016g). Records from Tasmania indicate mating occurs in spring and summer with 85% of calves born between September and March although births do occur throughout the year.

No calving areas are known in Australian waters (DoE 2023l).

The long-finned pilot whale has been identified in surveys over the Bass Strait and eastern Great Australian Bight; however, there are no BIAs in the Operational Area or Planning Area. During works undertaken by Origin Energy, long-finned pilot whales have been seen sporadically, such as, a sighting of approximately 30 whales occurred during the 2014 Enterprise MSS. No long-finned pilot whales were detected during Beach's Otway drilling campaign, which includes the Otway Operational Areas. It is likely that they would be uncommon visitors to the Operational and Planning Areas.

Minke Whale

The minke whale (*Balaenoptera acutorostrata*) is a widely distributed baleen whale that has been recorded in all Australian waters except the Northern Territory. The whales can be found inshore although they generally prefer deeper waters. In summer they are abundant feeding throughout the Antarctic south of 60°S but appear to migrate to tropical breeding grounds between 10°S and 20°S during the Southern Hemisphere winter (Kasamatru 1998; Reilly et al. 2008). Although the exact location of breeding grounds is unknown, mating occurs between August to September with calving between May and July (Bannister et al. 1996).

A few animals have been sighted during aerial surveys of the Bonney coast upwelling. The minke whale has been observed within the region, however, there are no BIAs in the Operational Area or Planning Area. During Beach's Otway drilling campaign in 2021, which included the Operational Area, three minke whale detections were made during May. Therefore, it is likely that they would be uncommon visitors in the Operational or Planning Areas.

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 (DoE 2023g). 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, Kangaroo Island (SA) and southern Eyre Peninsula (SA) 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 Energy did not observe it during the 2010 Speculant MSS and 2014 Enterprise MSS. Also, there are no BIAs identified in the Operational or Planning Areas. No pygmy right whales were detected during Beach's Otway drilling campaign, which includes the Otway Operational Area. Therefore, it is likely to be an uncommon visitor in the Operational and Planning Areas.

Sei Whale

Sei whales 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; subantarctic 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; Thiele et al. 2000; Chatto and Warneke 2000; Bannister 2008a).

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).

There are no known mating or calving areas in Australian waters. No sei whales were detected during Beach's Otway drilling campaign, which includes the Operational Area. Thus, the sei whale is likely to be an uncommon visitor to the Operational or Planning Areas.

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 Draft National Recovery Plan for the Southern Right Whale (DCCEEW 2022a) provides an update to BIAs and emerging aggregation areas. The proposed changes which are available on the National Conservation Values Atlas are:

- Reproduction BIA - where mating, calving, nursing and/or presence of neonates are known, or likely, to occur. For Victoria this is the nearshore area between Portland and Port Campbell (Figure 7-49).
- Migration BIA - where southern right whales are known, or likely, to use for movement between regions that support biologically important behaviour (e.g., coastal movement between reproductive areas) ((Figure 7-49).

In addition, no 'Critical Habitat' as defined under section 207A of the EPBC Act have been identified, or included, in the Register of Critical Habitat.

The Otway and Bass Operational Areas overlap the southern right whale migration BIA while the Otway and Bass Planning Areas overlap the southern right whale migration and reproduction BIAs (Figure 7-49).

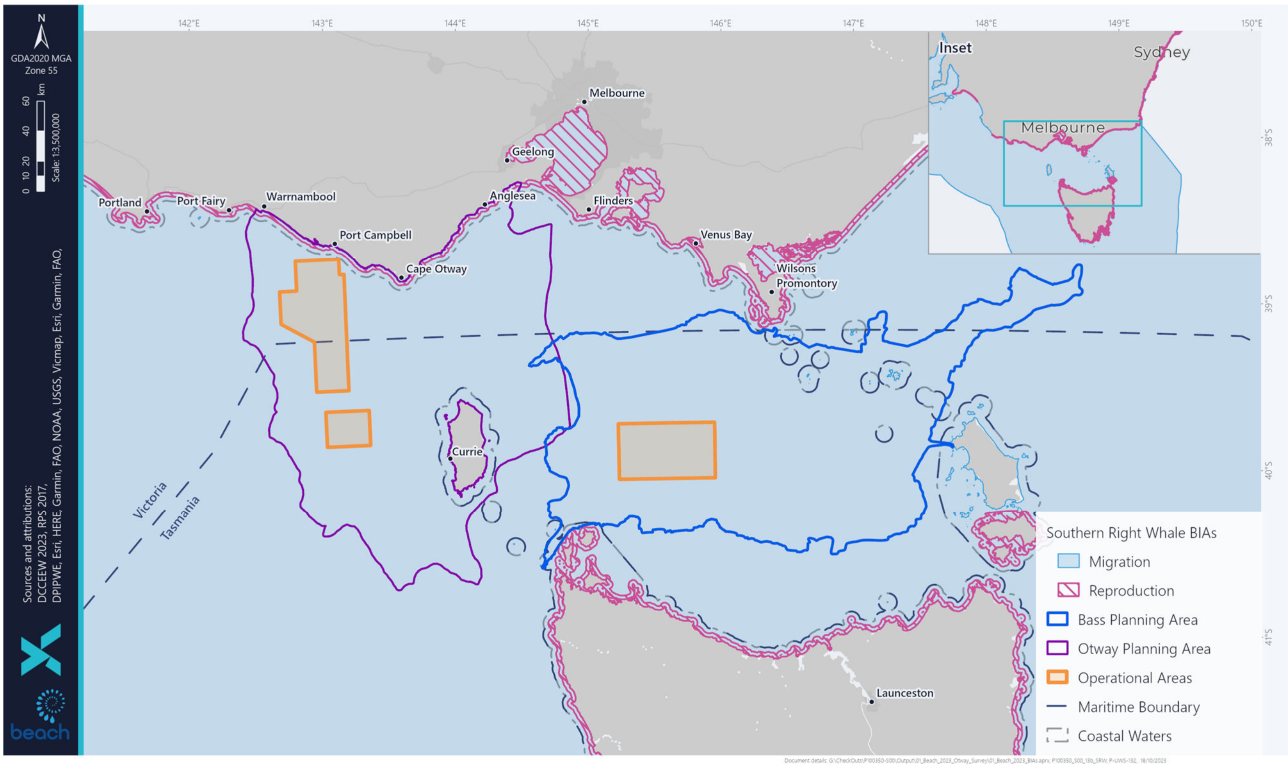


Figure 7-49: Southern Right Whale BIAs within the Operational and Planning Areas

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 (DSEWPaC 2012a). 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).

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 2022a). They are distributed across thirteen primary aggregation areas along the southern coast of Australia (Figure 7-50) (DSEWPaC 2012a). 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 (DSEWPaC 2012a). There are occasional sightings further north, with the extremities of their range recorded at Hervey Bay and Exmouth (DSEWPaC 2012a).

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 (DSEWPaC 2012a) (Figure 7-50). 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 (DSEWPaC 2012a) (Figure 7-50).

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 (DSEWPaC 2012a). 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 (DSEWPaC 2012a). The Victorian and Tasmania coastal waters are known to include migrating habitat and SRW 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 (Table 7-11) consisting of a single individual in each month of June, July and August.

The Conservation Management Plan for the Southern Right Whale (DSEWPaC 2012a) reports that known and potential threats that may have individual or population level impacts to southern right whales include: entanglement in fishing gear, vessel disturbance, climate variability and change, noise interference, habitat modification and overharvesting of prey.

Cultural significance

The Draft National Recovery Plan for the Southern Right Whale (DCCEEW 2022a) 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 7-50: Aggregation Areas for Southern Right Whales (DSEWPaC 2012a)

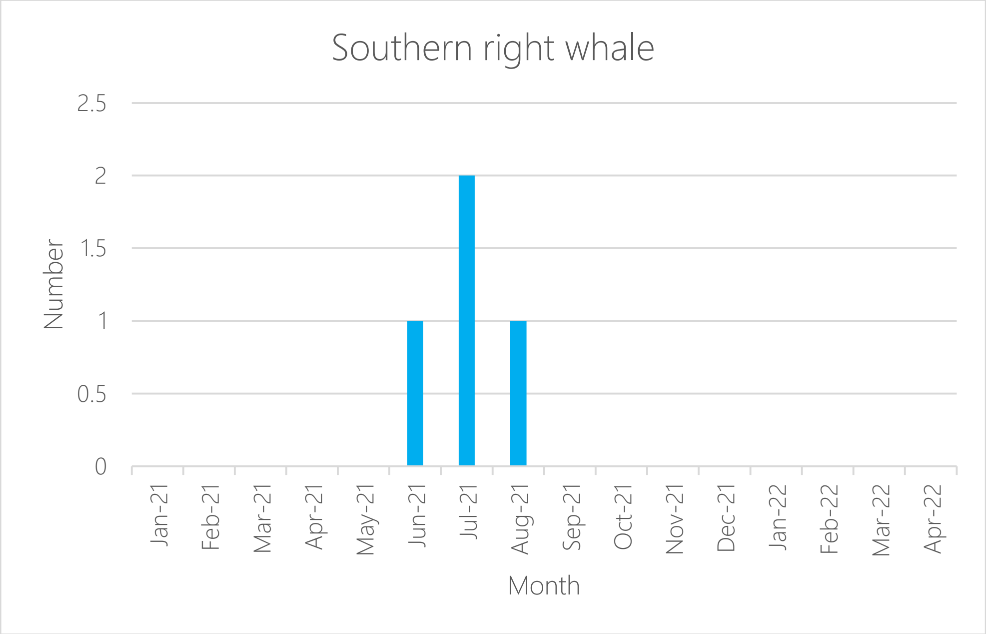


Figure 7-51: Southern Right Whale Sightings for the Otway Drilling Campaign

Sperm Whale

The sperm whale (*Physeter macrocephalus*) has a worldwide distribution and has 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 2023w). 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 2023w). Concentrations of sperm whales are generally found where seabeds 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 2023w).

Females and young males are restricted to warmer waters (i.e., north of 45ºS) and are likely to be resident in tropical and sub-tropical waters year-round. 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. For species in oceanic waters, there is a more generalised movement of sperm whales' southwards in summer and northwards in winter (DoE 2023w).

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 east near Kangaroo Island in South Australia. Therefore, it is likely they would be uncommon visitors in the Operational or Planning Areas.

Bottlenose Dolphin

The bottlenose dolphin (*Tursiops truncates*) has a worldwide distribution from tropical to temperate waters. While the species is primarily coastal, they are also found inshore, on the shelf and open oceans.

They are associated with many types of substrate and habitats, including mud, sand, seagrasses, mangroves and reefs (DoE 2023v). Bottlenose dolphins are known to associate with several cetacean species such as pilot whales, white-sided, spotted, rough-toothed and Risso's dolphins, and humpback and right whales (DoE 2023v).

There are two forms of bottlenose dolphin, a nearshore form and an offshore form. The nearshore form occurs in Southern Australia including the Otway Basin area, while the offshore form is found north of Perth and Port Macquarie in NSW. Most populations are relatively discrete and reside in particular areas, such as individual resident populations in Port Phillip Bay, Westernport Bay, Spencer Gulf, Jervis Bay and Moreton Bay. There may be some migration and exchange between the populations, but it is likely that most encountered near the Victorian coasts are local residents.

During Beach's Otway drilling campaign in 2021, which included the Operational Area, 40 bottlenose dolphin detections were made, spread across the year. However, no BIAs for this species have been identified in the Operational or Planning Areas.

Common Dolphin

The common dolphin (*Delphinus delphis*) is an abundant species, widely distributed from tropical to cool temperate waters, and generally further offshore than the bottlenose dolphin, although small groups may venture close to the coast and enter bays and inlets. They have been recorded in waters off all Australian states and territories. Stranding statistics indicate that common dolphins are active in Bass Strait at all times of the year, though less so in winter (DoE 2023k).

Common dolphins are usually found in areas where surface water temperatures are between 10°C and 20°C, and in habitats also inhabited by small epipelagic fishes such as anchovies and sardines.

In many areas around the world common dolphins show shifts in distribution and abundance, suggesting seasonal migration. The reason for this seasonal migration is unknown however in New Zealand the shift appears to be correlated with sea surface temperature and in South Africa, the species occurrence appears to be correlated with the annual sardine run (DoE 2023k). They are abundant in the Bonney coast upwelling during the upwelling season, and very scarce outside the season.

Dusky Dolphin

The dusky dolphin (*Lagenorhynchus obscures*) is rare in Australian waters and has been primarily reported across southern Australia from Western Australia to Tasmania with a handful of confirmed sightings near Kangaroo Island and off Tasmania (DoE 2023n). 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). 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 2023n).

No dusky dolphins were detected during Beach's Otway drilling campaign, which included the Otway Operational Area.

Indian Ocean Bottlenose Dolphin

The Indian Ocean bottlenose dolphins are found in tropical and sub-tropical coastal and shallow offshore waters of the Indian Ocean, Indo-Pacific Region and the western Pacific Ocean bottlenose dolphins are distributed continuously around the Australian mainland, but the taxonomic status of many populations is unknown. Indian Ocean bottlenose dolphins have been confirmed to occur in estuarine and coastal waters of eastern, western and northern Australia and it has also been suggested that the species occurs in southern Australia (Kemper 2004).

In south-eastern Australia, inshore Indian Ocean bottlenose dolphins show a high degree of site fidelity to some local areas and appear to belong to relatively small communities or populations (Möller et al. 2002).

No Indian Ocean bottlenose dolphins were detected during Beach's Otway drilling campaign, which included the Otway Operational Area.

Risso's Dolphin

The Risso's dolphin (*Grampus griseus*) is a widely distributed species found in deep waters of the continental slop and outer shelf from the tropics to temperate regions. The species prefer warm temperate to tropical waters with depths greater than 1,000 m, although they do sometimes extend their range into cooler latitudes in summer (Bannister et al. 1996). They are thought to feed on cephalopods, molluscs, and fish.

Risso's dolphin has been observed in the region, however no BIAs have been identified in the Operational Area or Planning Area. No Risso's dolphins were detected during Beach's Otway drilling campaign, which included the operational are. Therefore, it is likely they would be uncommon visitors in the Operational Areas and Planning Areas.

Southern Right Whale Dolphin

The southern right whale dolphin (*Lissodelphis peronnii*) is a pelagic species found in Southern Australian waters but generally well offshore in deep water or on the outer edges of the continental shelf between the subtropical and subantarctic convergence (DoE 2023o). No key localities have been identified in Australian waters however preferred water temperatures range from approximately 2-20°C (DoE 2023o). Of the limited southern right whale dolphin stomachs examined, myctophids and other mesopelagic fish, squid and crustaceans have been recorded, and euphausiids are also thought to be potential prey (DoE 2023o). It is unknown whether the southern right whale dolphin is a surface or deep-layer feeder (Bannister et al. 1996).

Calving areas are not known, however there is evidence that the calving season occurs between November to April (DoE 2023o).

The southern right whale dolphin has been observed in the region; however, no BIAs have been identified in the Operational Area or Planning Area. No southern right whale dolphins were detected during Beach's Otway drilling campaign, which included the Operational Area. Therefore, it is likely they would be uncommon visitors in the Operational or Planning Areas.

7.4.12.7 Pinnipeds

The PMST reports identified two pinniped species that potentially occur in the Bass and Otway Operational and Bass Planning Areas and three that potentially occur in the Otway Planning Area (Table 7-15)(Appendix A). The Operational and Planning Areas do not overlap any BIAs for pinnipeds.

Table 7-15: Listed Pinniped Species identified in the Operational and Planning Areas

Common name	**Species name**	**EPBC Act status**			**Bass**		**Otway**	
		Listed threatened	**Listed migratory**	**Listed marine**	**Operational Area**	**Planning Area**	**Operational Area**	**Planning Area**
Australian fur-seal	*Arctocephalus pusillus*	-	-	L	SHM	BK	SHM	SHL
Australian sea lion	*Neophoca cinereal*	E	-	L	-	-	-	SHK
		Conservation Listing Advice for the *Neophoca cinerea* (Australian sea lion) (TSSC 2020). Threats relevant to the activity are: • Entanglement in marine debris, disturbance, harassment, displacement, habitat degradation, oil spills, pollution, toxins and climate change. Recovery Plan for the *Neophoca cinerea* (Australian sea lion) (DSEWPaC 2013b). Threats relevant to the activity 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						
New Zealand fur-seal	*Arctocephalus forsteri*	-	-	L	SHM	SHM	SHM	SHM
Listed Threatened E: Endangered Listed Marine L: Listed		Likely Presence SHL: Species or species habitat likely to occur within area. SHM: Species or species habitat may occur within area. SHK: Species or species habitat known to occur within area. BK: Breeding known to occur within area						

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.

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 (Figure 7-52). 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. Australian fur-seals are present in the region all year, with breeding taking place during November and December.

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 (Arnould and Kirkwood 2007; Hume et al. 2004; Robinson et al. 2008).

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 – 80 m and generally within 100 – 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 nine days (Kirkwood et al. 2010; Hume et al. 2004).

As there are two breeding sites within the Bass Planning Area, it is likely that Australian fur-seal would be present in the Bass Planning Area. The Otway Planning Area contains three Australian fur-seal colonies but no breeding or haul-out sites. During Beach's Otway drilling campaign in 2021, which included the Otway Operational Area, sightings of Australian fur seal were made throughout the year.

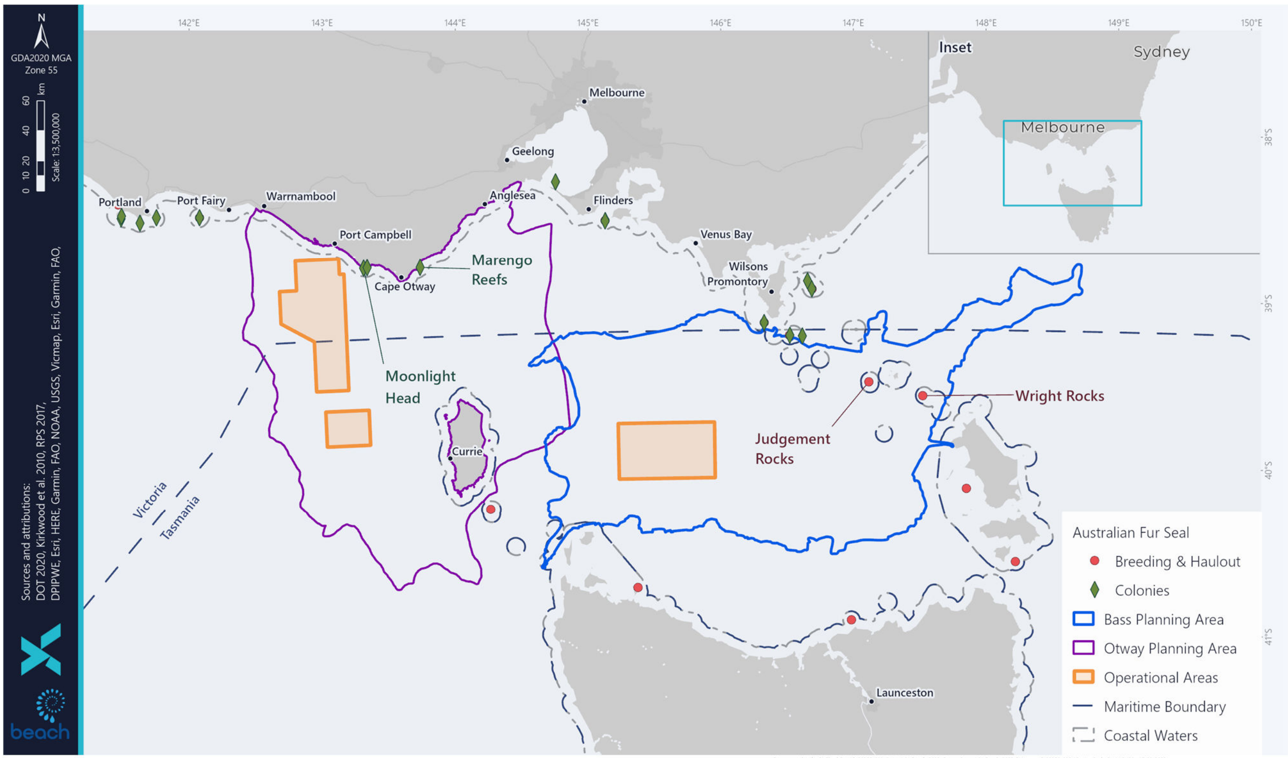


Figure 7-52: Locations of Australian Fur-seal Breeding Colonies and Haul Out Sites (Kirkwood et al. 2010)

New Zealand Fur-seal

New Zealand fur-seal (*Arctocephalus forsteri*) are found in the coastal waters and offshore islands of South and 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 and, Kanowna Island (near Wilsons Promontory) and The Skerries in eastern Victoria.

Figure 7-53 illustrates the known breeding colonies of New Zealand fur-seal (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). Within the Otway Planning Area, Seal Rocks (off King Island) is a known New Zealand fur-seal breeding colony (Figure 7-53). The Bass Planning Area overlaps the known New Zealand fur-seal breeding colony at Kent Group (Figure 7-53).

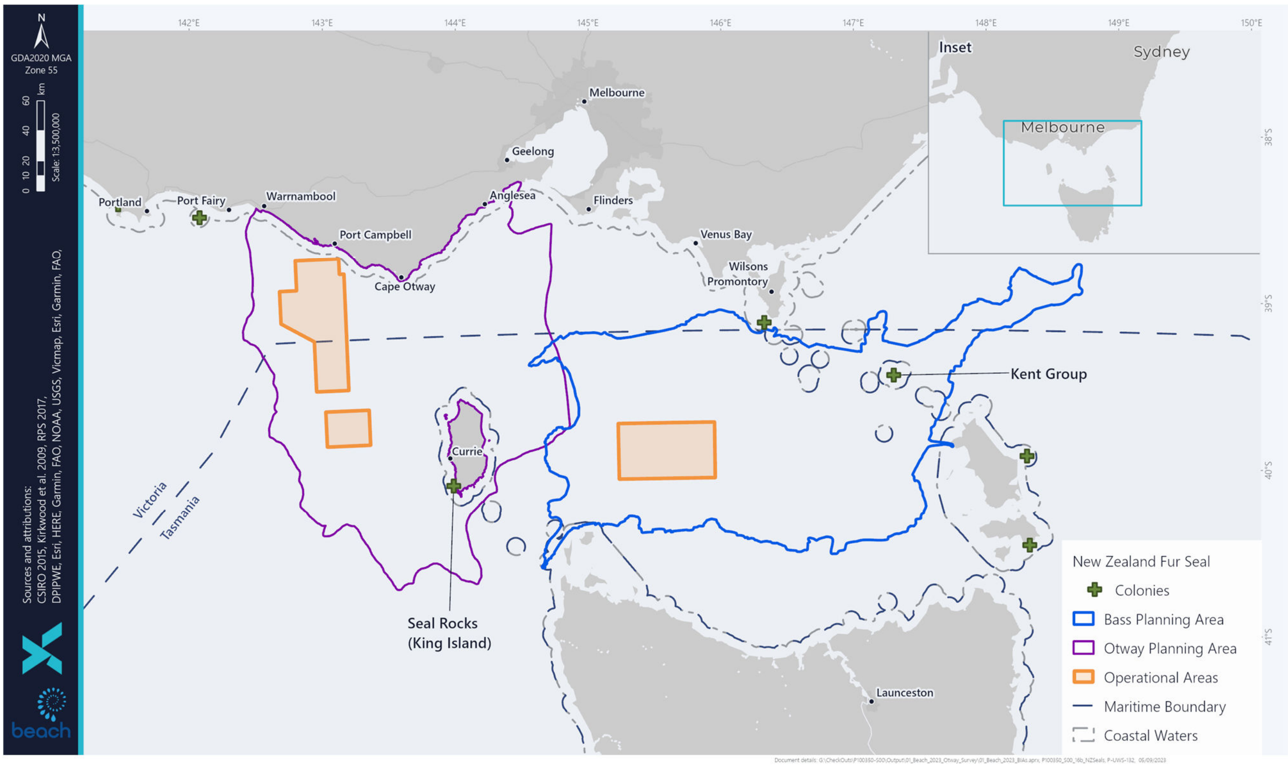


Figure 7-53: Locations of New Zealand Fur-seal Breeding Colonies (Kirkwood et al. 2009).

Australian Sea Lion

The Australian sea lion is the only endemic, and least abundant, pinniped that breeds in Australia (DoE 2013b). 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). During Beach's Otway drilling campaign in 2021, which included the Otway Operational Area, there were no sightings of Australian sea lion.

The Australian sea lion is a specialised benthic forager i.e. it feeds primarily on the sea floor (DSEWPaC 2013b). 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 2013b). They typically feed on a range of prey including fish, cephalopods (squid, cuttlefish and octopus), sharks, rays, rock lobster and penguins (DSEWPaC 2013b) They typically forage up to 60 km from their colony but can travel up to 190 km when over shelf waters (Shaughnessy 1999).

7.4.12.8 Pest Species

Invasive marine species (IMS) are marine plants or animals that have been introduced into a region beyond their natural range and have the ability to survive, reproduce and establish. More than 200 non-indigenous marine species including fish, molluscs, worms, and a toxic alga have been detected in Australian coastal waters.

It is widely recognised that IMS can become pests and cause significant impacts on economic, ecological, social and cultural values of marine environments. Impacts can include the introduction of new diseases, altering ecosystem processes and reducing biodiversity, causing major economic loss, and disrupting human activities (Brusati and Grosholz, 2006).

In the South-east Marine Region, 115 marine pest species have been introduced and an additional 84 have been identified as possible introductions, or 'cryptogenic' species (NOO 2002a). Several introduced species have become pests either by displacing native species, dominating habitats, or causing algal blooms.

The commercial port of Portland is located approximately 100 km to the west of the Otway Operational Area. According to the Nationally Introduced Marine Pest Information System (NIMPIS), 11 pest species have been recorded in Portland (DAFF 2023a). Of these, one species, Japanese kelp (*Undaria pinnatifida*) is on the Australian Priority Marine Pest List (DAFF 2021). Japanese kelp has also recorded by NIMPIS at Apollo Bay within the Otway Planning Area (DAFF 2023a).

7.5 Socio-Economic Environment

This section describes the socio-economic environment within the Bass and Otway Operational Areas and Planning Areas.

7.5.1 Coastal Settlements

7.5.1.1 Bass

There are no coastal settlements or Local Government Areas (LGAs) within the Bass Operational Area. The Bass Planning Area intersects the Flinders Council LGA (Figure 7-54).

7.5.1.2 Otway

There are no coastal settlements or LGAs within the Otway Operational Areas. The nearest settlement to the Otway Operational Area is Port Campbell. The Otway Planning Area is within the following LGAs (Figure 7-54):

- Colac Otway Shire
- Corangamite Shire
- Greater Geelong City
- King Island Council
- Moyne Shire
- Surf Coast Shire
- Warrnambool City

The larger Victorian coastal settlements within the Planning Area are described below based on ABS (2021) census data:

- 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 mangers 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.
- Peterborough has a population of 322 and a median age of 54. Of those in the labour force, 48.2% work fulltime and 32.3% work part-time. Dairy cattle farming and hospitals employ 16% of the workforce and managers, technicians and trades make up 38.5% of occupations. Port Campbell has a population of 440 and a median age of 40. Of those in the labour force, 44.4% work fulltime and 38.8% work part-time. The accommodation and dairy farming industries employ 22.8% of the workforce and the managers, professionals and labourers make up 58.1% of occupations.
- Warrnambool has a population of 35,406 and a median age of 42. Of those in the labour force, 53.3% work fulltime 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 34.6% of occupations.

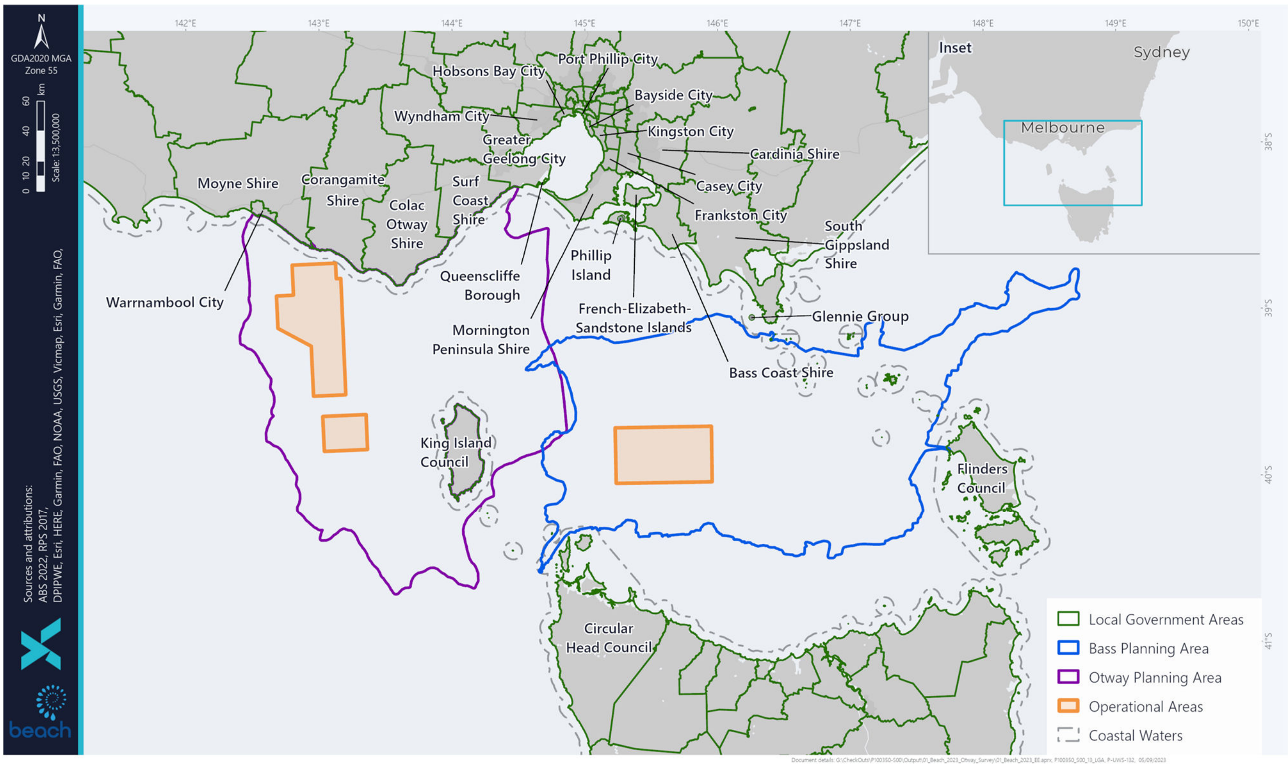


Figure 7-54: Local Government Areas within the Operational and Planning Areas

7.5.2 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. Otway Operational Area A overlaps the Cooper Energy Casino and Henry gas fields, Casino-Henry pipeline, Minerva gas field and pipeline, as well as a ConocoPhillips Australia exploration titles (VIC/P79 and T/49P). Otway Operational Area B overlaps ConocoPhillips Australia exploration title (T/49P). There is no non-Beach oil and gas infrastructure within the Bass Operational Area.

The Cooper Energy Casino and Henry gas fields and Casino-Henry pipeline, the Minerva gas field and pipeline, and the ConocoPhillips Australia exploration titles are within the Otway Planning Area. The Bass Planning Area overlaps a small portion of the Liberty Petroleum exploration title (VIC/P78) as well as the BassGas pipeline.

7.5.3 Other Infrastructure

The Victorian Desalination Plant, located at Wonthaggi, is located 128 km north of the Bass Operational Area and is over 60 km inshore of the Bass 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 Superloop Indigo Central telecommunications cable, which connects Perth and Sydney through southern Australia, intersects the Otway Operational Area. There are two Telstra telecommunications cables located in central Bass Strait, Bass Strait-1, and Bass Strait-2, which intersect the Bass Operational Area. The Basslink submarine cable is located 83 km east of the Bass Operational Area within the Bass Planning Area (Figure 7-55).

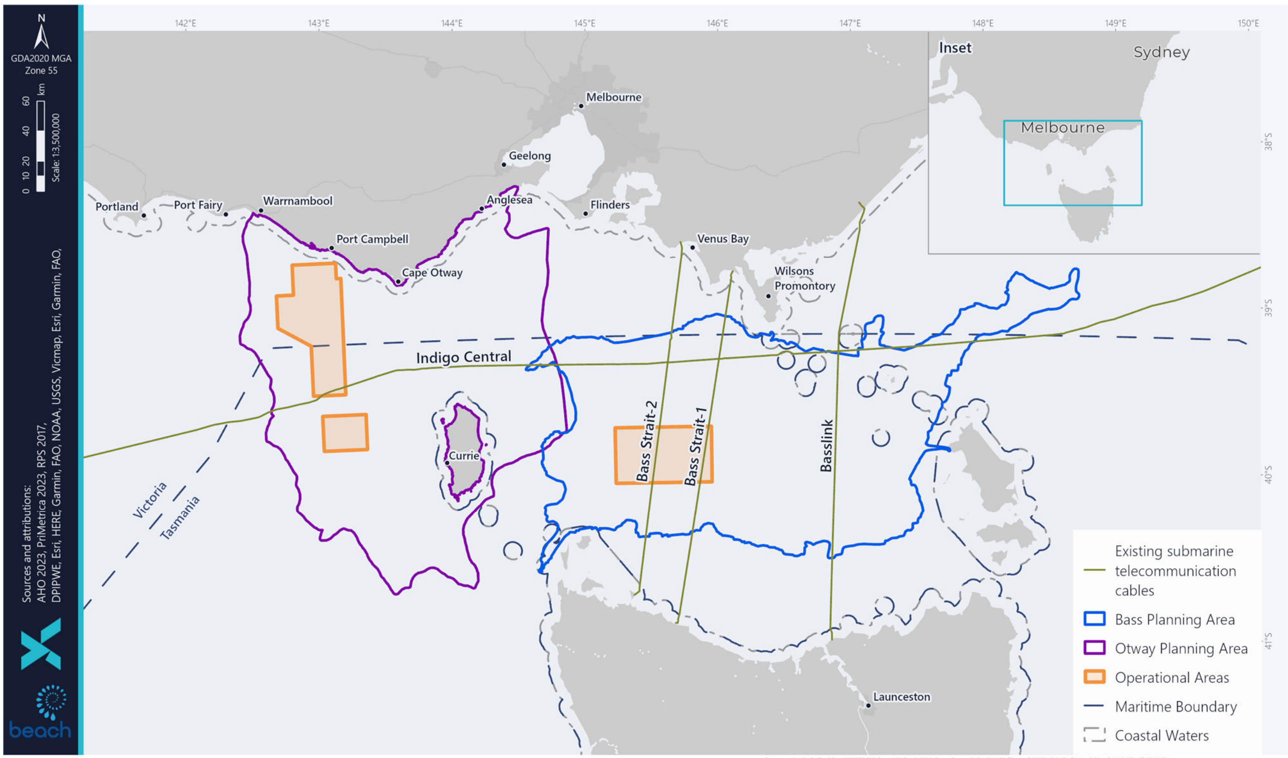


Figure 7-55: Existing Submarine Telecommunication Cables within the Operational and Planning Areas

Three new cables are planned to be installed in the next 5 years that are within the Bass 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 (Figure 7-56).

No spatial data is available yet for the East Coast Cable System or Hawaiki Nui – Hawaiki Submarine Cable.

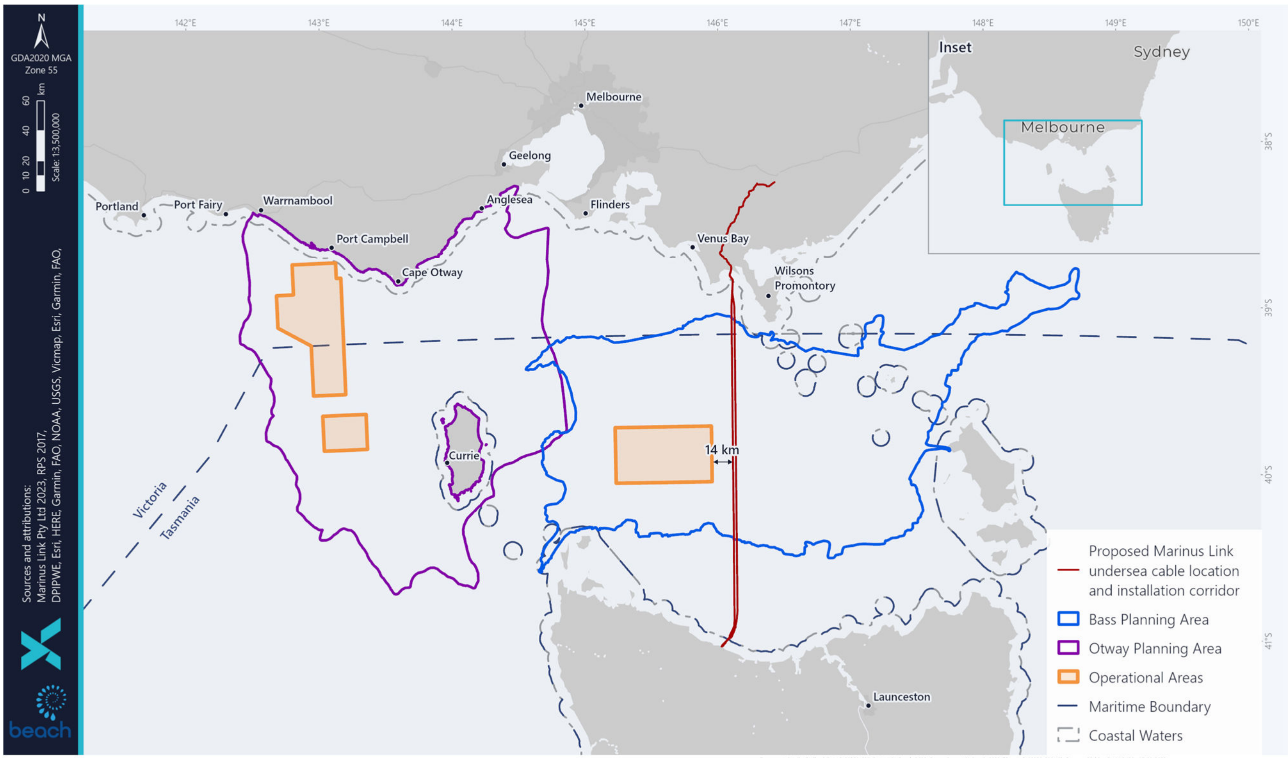


Figure 7-56: Proposed Marinus Link Undersea Cable Location and Installation Corridor

7.5.4 Defence Activities

Consultation with Department of Defence (ID 1521) identified that the Operational Area are 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 2023) indicates that the Otway Operational Areas are located within a UXO Zone 1052 King Island (Figure 7-57), 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). The site was used during 1954 as an Air-to-Air Firing Range (DoD 2022).

Otway Operational Area B also overlaps UXO Zone SDG087 'Sea Dumping – King Island', which intersects the western border of the Operational Area (Figure 7-57). This area is identified as having been used for dumping at sea of ordnance and other items, namely ammunition including cartridges, projectiles, and fuses (DoD 2022).

Otway Operational Area B is located 22 km east of UXO Zone SDC006 'Sea Dumping – King Island' and 34 km east of UXO Zone SDG136 'Sea Dumping - Victorian Coast' (Figure 7-57). Otway Operational Area A is located 21 km east of UXO zone SDG110 'Sea Dumping – Bass Strait' (Figure 7-57). These zones are also in the sea dumping category which means the area has been identified as having been used for historical sea dumping of waste material that may include explosive ordnance (DoD 2022).

Beach undertook site surveys ahead of the Otway Drilling Campaign with no UXO identified. No UXO zones have been identified within the Bass Operational Area (Figure 7-57). One of the objectives of this seabed survey is to identify any potential UXO within the Operational Areas.

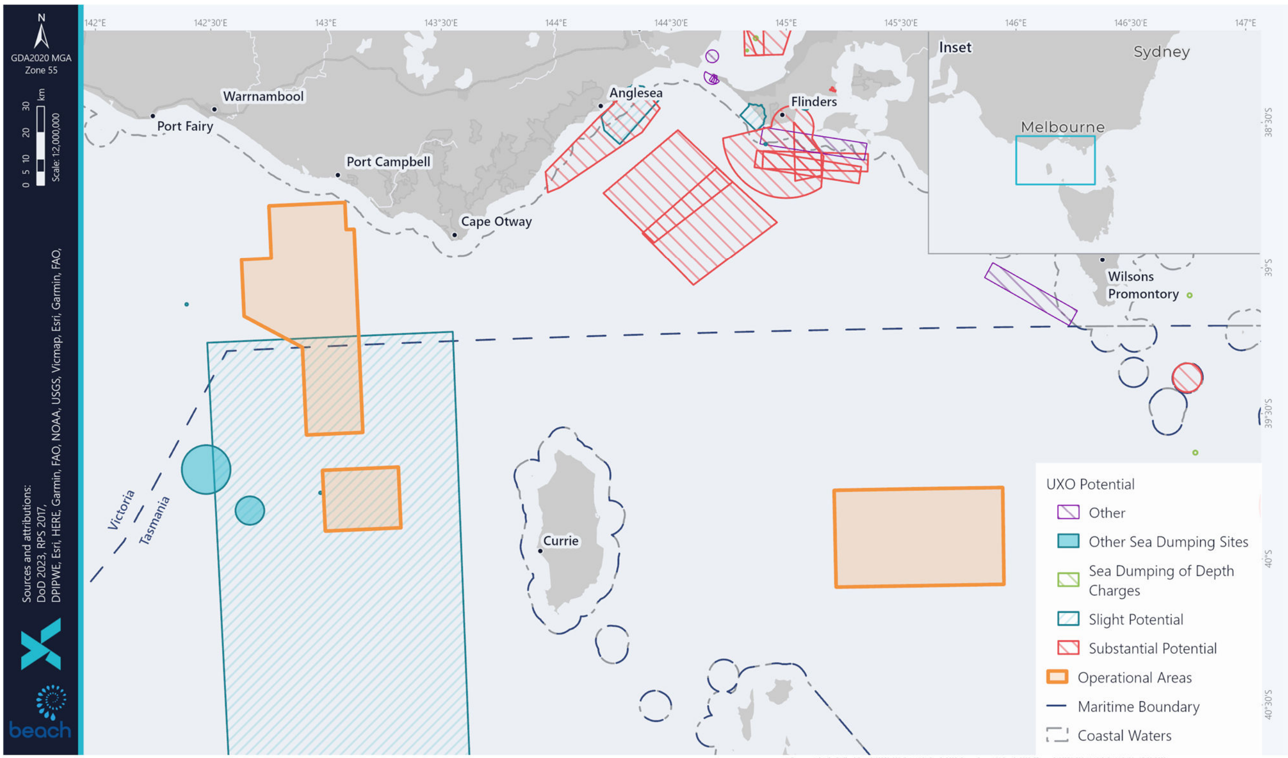


Figure 7-57: UXO within the Operational Areas

7.5.5 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 7-58). 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.

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).

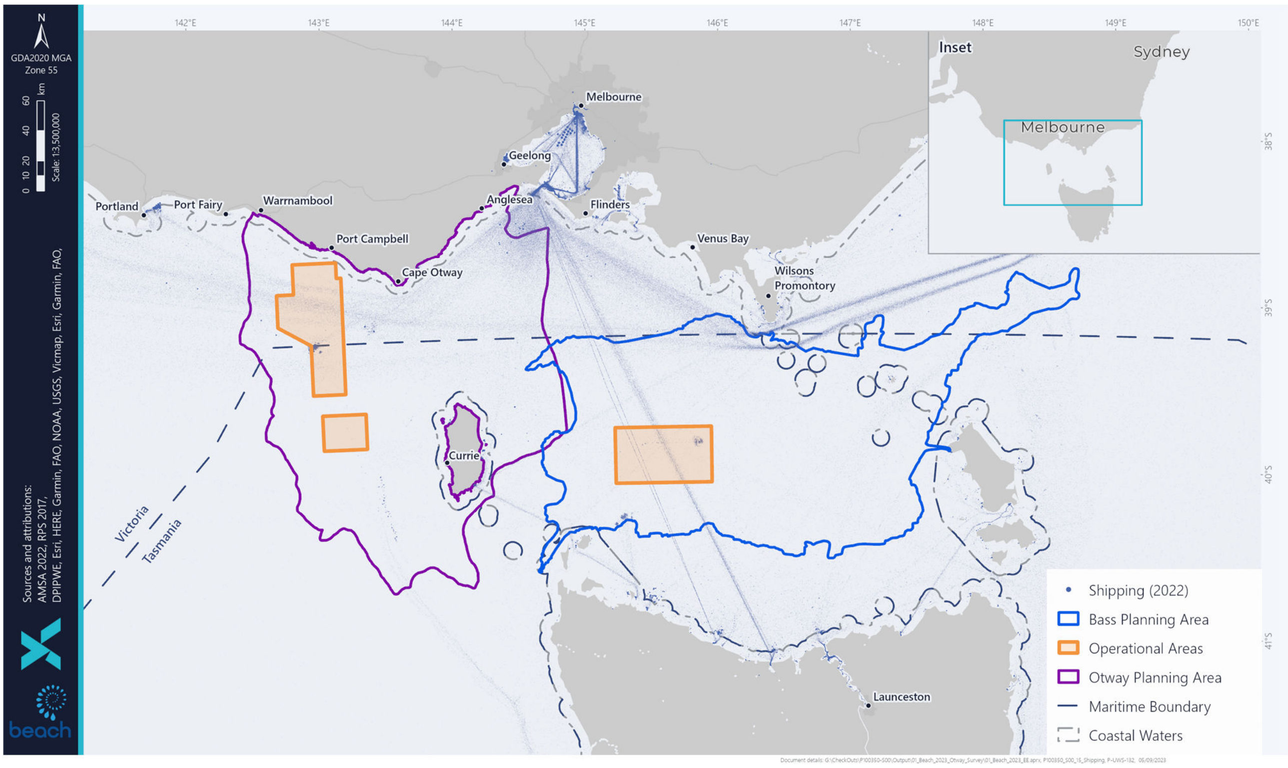


Figure 7-58: Vessel Traffic within the Operational and Planning Areas

7.5.6 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.

7.5.7 Recreational Diving

Recreational diving occurs along the Victorian coastline. Popular diving sites near Peterborough include several shipwrecks such as the Newfield, which lies in 6 m of water and the Schomberg in 8 m of water. Peterborough provides several 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 (4-11 m of water) which can be accessed from shore or via boat. Open water dives to shipwrecks off the coast of Wilsons Promontory, such as the wreck of the SS Cambridge and the SS Gulf of Carpentaria are also common spots for recreational divers.

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.

7.5.8 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 fisheries that occur within the Planning Areas 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 Bass and Otway Planning Areas. Recreational scallop and squid fishing primarily occurs within Port Phillip Bay and Western Port and as such fishing for these species is unlikely within the Planning Area. Pipi harvesting occurs in Venus Bay, inshore of the Planning Areas, 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 near shore areas of the Otway Operational Area.

7.5.9 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 Areas are:

- Bass Strait Central Zone Scallop Fishery (Bass Strait CZSF)
- 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

Information relating to the target species, fishing locations, landed catch, value and other relevant aspects of each fishery is included in Table 7-16. The data in Table 7-16 is from the Commonwealth Fishery Status Report 2022 (Patterson et al. 2022) unless indicated.

Maps of fishing intensity for 2010–2020 (latest data available from AFMA) are provided where there is an overlap with fishing intensity and the Operational Areas and/or Planning Areas. The maps show the maximum area fished and the fishing intensity. Fishing intensity is mapped to show high, medium, and low intensity. The fishing intensity data, has been filtered to exclude catch from areas where fewer than 5 boats operated during a given year. The maximum area fished shows the area fished by all fishers aggregated by 1-degree (111 km × 111 km) grid cells.

From the review of data in Table 7-16 and maps it was identified that the following fisheries have fishing intensity within the Planning Areas, Bass Strait CZSF, ETBF, SPF, SESSF and Southern Squid Jig Fishery and the Bass Strait CZSF, ETBF, SESSF and Southern Squid Jig Fishery have fishing intensity within the Operational Areas.

Table 7-16: Commonwealth Managed Fisheries within the Planning Area

Fishery	Target species	Description	Fishing Effort Operational Area		Fishing Effort Planning Area	
			Bass	Otway	Bass	Otway
Bass Strait Central Zone Scallop Fishery	Scallops	The Bass Strait Central Zone Scallop Fishery operates in the Bass Strait between the Victorian and Tasmanian and starts at 20 nm from their respective coastlines. Commercial scallops in the Bass Strait Central Zone Scallop Fishery are mainly found at depths of 35-100 m and are caught using a steel dredge that is towed by the vessel along muddy to coarse sand substrates. Fishing effort is concentrated around King and Flinders Islands (Figure 7-59). Currently 10 active boats using towed dredges. Fishing season is 1 April to 31 December. Actual catch in 2021 was 2,344 tonnes. The major landing ports are Beauty Point, Devonport and Stanley (Tasmania); Apollo Bay, Lakes Entrance, Melbourne, Port Welshpool, Queenscliff and San Remo (Victoria) Total fishery value in 2021 was A$4.7 million. Fishing mortality: not subject to overfishing. Biomass: Not over fished. There has been fishing effort in the Bass and Otway Planning Areas based on ABARES data for 2013 – 2021. The Operational Areas overlap the maximum area fished which contains confidential fishing intensity due to less than five vessels operating. Figure 7-59 shows the total area fished with the highest fishing intensity occurring around King Island within the Bass and Otway Planning Areas.	Yes	Yes	Yes	Yes
Eastern Tuna and Billfish Fishery	Albacore tuna Bigeye tuna Yellowfin tuna Swordfish Striped marlin	The Eastern Tuna and Billfish Fishery is a longline and minor line fishery that operates in water depths > 200 m from Cape York to Victoria. Fishery effort is typically concentrated along the NSW coast and southern Queensland coast. No Victorian ports are used. In 2017 there was some fishing effort in Victoria at low levels. The number of active vessels has decreased within the fishery from around 152 in 1999 to 35 in 2021. Actual catch in the 2021 season was 5,148 tonnes. Total fishery value in 2021 was A$35.6 million. Fishing mortality: not subject to overfishing. Biomass: Overfished – striped marlin. All other species not overfished. The Bass and Otway Planning Areas and the Otway Operational Areas overlap the maximum area fished based on ABARES data for 2013–2021 (Figure 7-60). The maximum area fished contains confidential fishing intensity due to less than five vessels operating. There has been no fishing effort within the Bass Operational Area based on ABARES data for 2013–2021. Figure 7-60 shows the maximum area fished that overlaps the project areas as well as the closest fishing intensity data to the project, occurring approximately 123 km east of the Bass Planning Area.	No	Yes	Yes	Yes
Skipjack Tuna Fishery (Eastern)	Skipjack tuna	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	No	No
Small Pelagic Fishery (Western sub-area)	Jack mackerel Blue mackerel Redbait Australian sardine	The Small Pelagic Fishery extends from the southern Queensland to southern Western Australia. Fishers use midwater trawls and purse seine nets. Geelong is a major landing port. Total retained catch of the four target species was 18,878 tonnes in the 2021-22 season. Fishery effort generally concentrated in the near-shore Great Australian Bight to the west and south of Port Lincoln. Fishing mortality: not subject to overfishing. Biomass: Not over fished. Figure 7-61 shows the Bass Planning Area overlaps the maximum area fished based on ABARES data for 2013 – 2021. The maximum area fished contains confidential fishing intensity due to less than five vessels operating. There has been no fishing effort in the Bass or Otway Operational Areas or Otway Planning Area based on ABARES data 2013 – 2021.	No	No	Yes	No
Southern and Eastern Scalefish and Shark Fishery (SESSF) Commonwealth Trawl Sector: Danish-seine	Blue-eye trevalla Blue grenadier Eastern school whiting Orange roughy Pink ling Ribaldo Tiger flathead	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. Fishing in the CTS is generally concentrated along the 200 m bathymetric contour. Total retained catch of the fishery (combined with otter-board trawl and scalefish hook subsectors) was 19,501 tonnes in the 2021-22 season. In 2020-2021, the fishery value was A$64 million. No value is provided for 2021-22 season. Thirty-two otter-board trawl vessels were active during the 2021-2022 fishing season. Fishing mortality: some species subject to overfishing. Biomass: some species over fished. There has been fishing effort in the Bass and Otway Operational and Planning Areas based on ABARES data for 2013–2021/22. (Figure 7-62). The Bass Planning Area overlaps areas of low and medium relative fishing intensity. The Operational Areas and Otway Planning Area overlap the maximum area fished, which contains confidential fishing intensity due to less than five vessels operating.	Yes	Yes	Yes	Yes
Southern and Eastern Scalefish and Shark Fishery (SESSF) Commonwealth Trawl Sector: Otter-board trawl	Blue-eye trevalla Blue grenadier Eastern school whiting	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.	No	Yes	Yes	Yes

Fishery	Target species	Description	Fishing Effort Operational Area		Fishing Effort Planning Area	
			Bass	Otway	Bass	Otway
	Orange roughy Pink ling Ribaldo Tiger flathead	Fishing in the CTS is generally concentrated along the 200 m bathymetric contour. Total retained catch of the fishery (combined with Danish-seine and scalefish hook subsectors) was 19,501 tonnes in the 2021-22 season. In 2020-2021, the fishery value was A$64 million. No value is provided for 2021-22 season. Nineteen Danish-seine vessels were active during the 2021-2022 fishing season. Fishing mortality: some species subject to overfishing. Biomass: some species over fished. The Otway planning and Operational Areas overlap areas of low relative fishing intensity as well as the maximum area fished based on ABARES data for 2013–2021 (Figure 7-63). The Bass Planning Area overlaps the maximum area fished and the north-east corner overlaps areas of low to medium relative fishing intensity (Figure 7-63). The maximum area fished contains confidential fishing intensity due to less than five vessels operating. There has been no fishing effort in the Bass Operational Area based on ABARES data for 2013–2021/22 (Figure 7-63).				
Southern and Eastern Scalefish and Shark Fishery (SESSF) Gillnet, Hook and Trap Sector: Scalefish Hook Sub-Sector	Blue-eye trevalla Blue grenadier Eastern school whiting Orange roughy Pink ling Ribaldo Tiger flathead	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. Fishing is generally concentrated along the 200 m bathymetric contour. Total retained catch of the fishery (combined with CTS) was 19,501 tonnes in the 2021-22 season. In 2020-2021, the fishery value was A$64 million. No value is provided for 2021-22 season. Twenty-one scalefish hook vessels were active during the 2021-2022 fishing season. Fishing mortality: some species subject to overfishing. Biomass: some species over fished. The Bass and Otway Planning Areas and Otway Operational Areas overlap with the maximum area fished based on ABARES data for 2013 – 2021 (). The maximum area fished contains confidential fishing intensity due to less than five vessels operating. No fishing effort occurred within the Bass Operational Area based on ABARES data for 2013–2021 (Figure 7-64).	No	Yes	Yes	Yes
Southern and Eastern Scalefish and Shark Fishery (SESSF) Gillnet, Hook and Trap Sector: Shark Gillnet Sector	Gummy shark Elephantfish Sawsharks School shark	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. Fishing is generally concentrated east of King Island. During the 2021-22 season, 27 shark gillnet vessels were active which hauled a total of 27,820 km of net. Total retained catch of the target species was 2,150 tonnes in the 2021-22 season. In 2020-21, the fishery value was A$28.84 million. No value is provided for 2021-22 season. Fishing mortality: school shark is uncertain. Biomass: school shark is over fished. There has been fishing effort in the Bass and Otway Planning and Operational Areas based on ABARES data for 2013 – 2021/22 (Figure 7-65).	Yes	Yes	Yes	Yes
Southern and Eastern Scalefish and Shark Fishery (SESSF) Gillnet, Hook and Trap Sector: Shark Hook Sub-Sector	Gummy shark Sawsharks Elephantfish Sawsharks School shark	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. Fishing is generally concentrated off the South Australian coast, but fishing activity also occurs in the waters around Flinders Island, particularly between Flinders Island and Tasmania. During the 2021-22 season, 40 shark hook vessels were active and set a total of 2,493,920 hooks. Total retained catch of the target species was 2,150 tonnes in the 2021-22 season. No value is provided for 2021-22 season. In 2020-21, the fishery value was A$28.84 million. Fishing mortality: school shark is uncertain. Biomass: school shark is over fished. The Bass Planning Area overlaps an area of low relative fishing intensity based on ABARES data for 2013 – 2021 (Figure 7-66). The Otway Planning and Operational Areas and Bass Operational Area overlap the maximum area fished (Figure 7-66). The maximum area fished contains confidential fishing intensity due to less than five vessels operating. There has been no fishing effort in the Bass or Otway Operational Areas or Otway Planning Area based on ABARES data for 2013–2021/22	Yes	Yes	Yes	Yes
Southern Squid Jig Fishery	Gould's squid (arrow squid)	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. In 2021, the actual catch of 939 tonnes was worth A$3.30 million. In 2021 there were eight active vessels in the fishery with the landing ports being Triabunna (Tasmania); Queenscliff and Apollo Bay (Victoria). Fishing mortality: not subject to overfishing. Biomass: Not over fished. The Otway Operational Area overlaps an area of low relative fishing intensity and the Otway Planning Area overlaps an area of low and medium relative fishing intensity based on ABARES data for 2013–2021. The Bass Operational and Planning Areas overlap the maximum area fished, which contains confidential fishing intensity due to less than five vessels operating (Figure 7-67). Figure 7-67 shows the total area fished with squid jig in 2021 with the highest fishing intensity occurring near Portland within the Otway Planning Area.	Yes	Yes	Yes	Yes

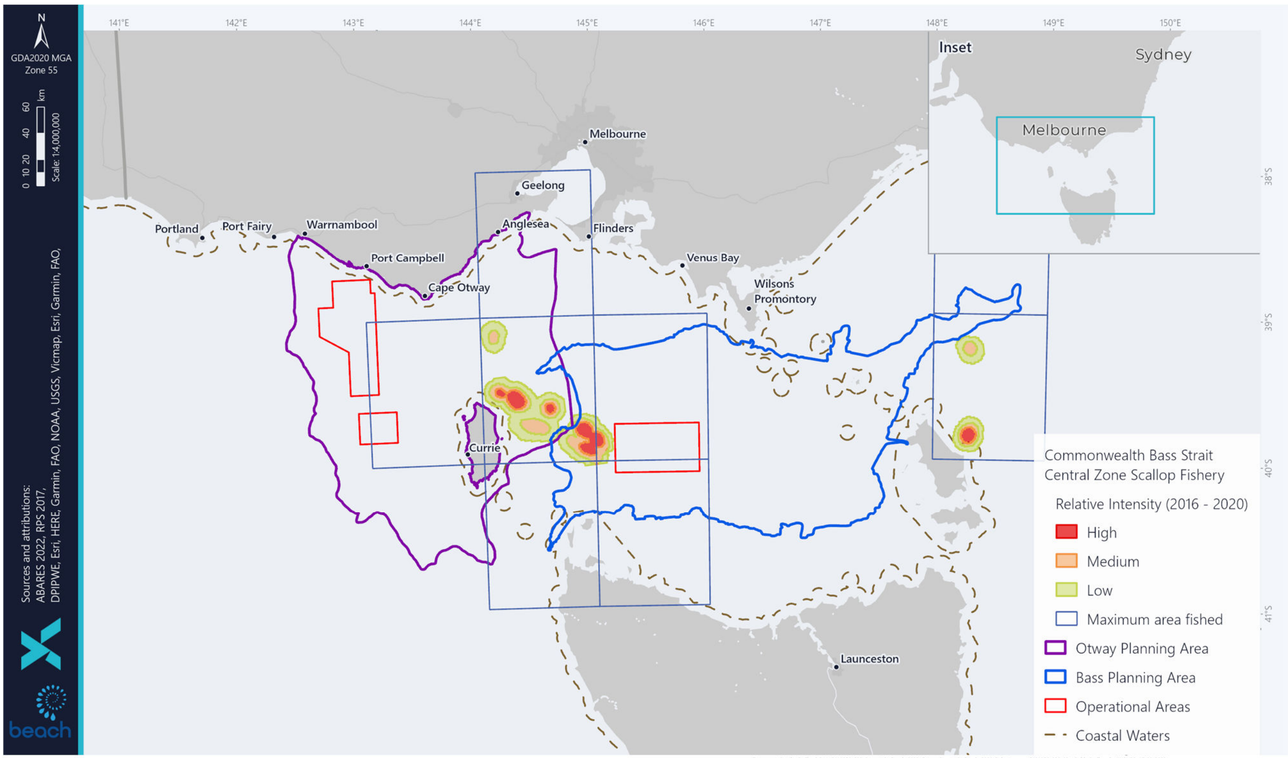


Figure 7-59: Commonwealth Bass Strait Central Zone Scallop Fishery Fishing Intensity (effort, net length, m/km2) and Maximum Area Fished

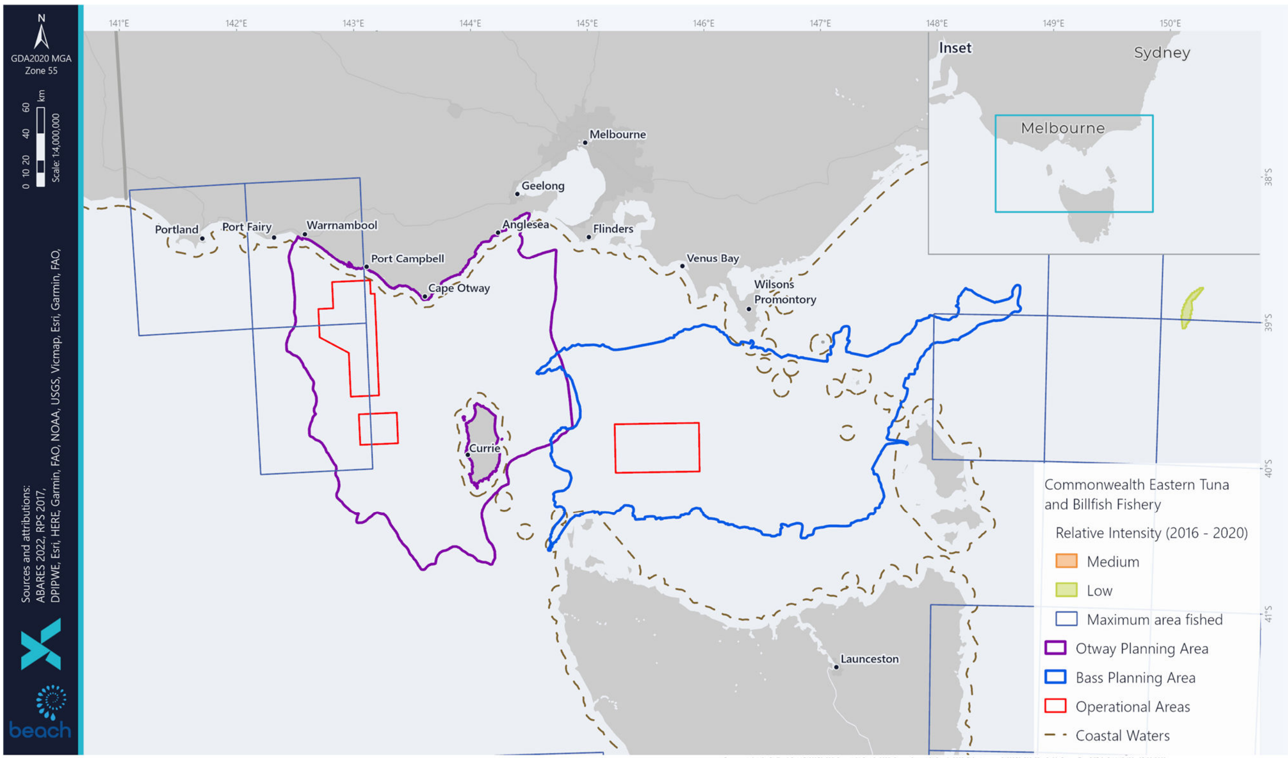


Figure 7-60: Commonwealth Eastern Tuna and Billfish Fishery Fishing Intensity (effort, net length, m/km^2) and Maximum Area Fished

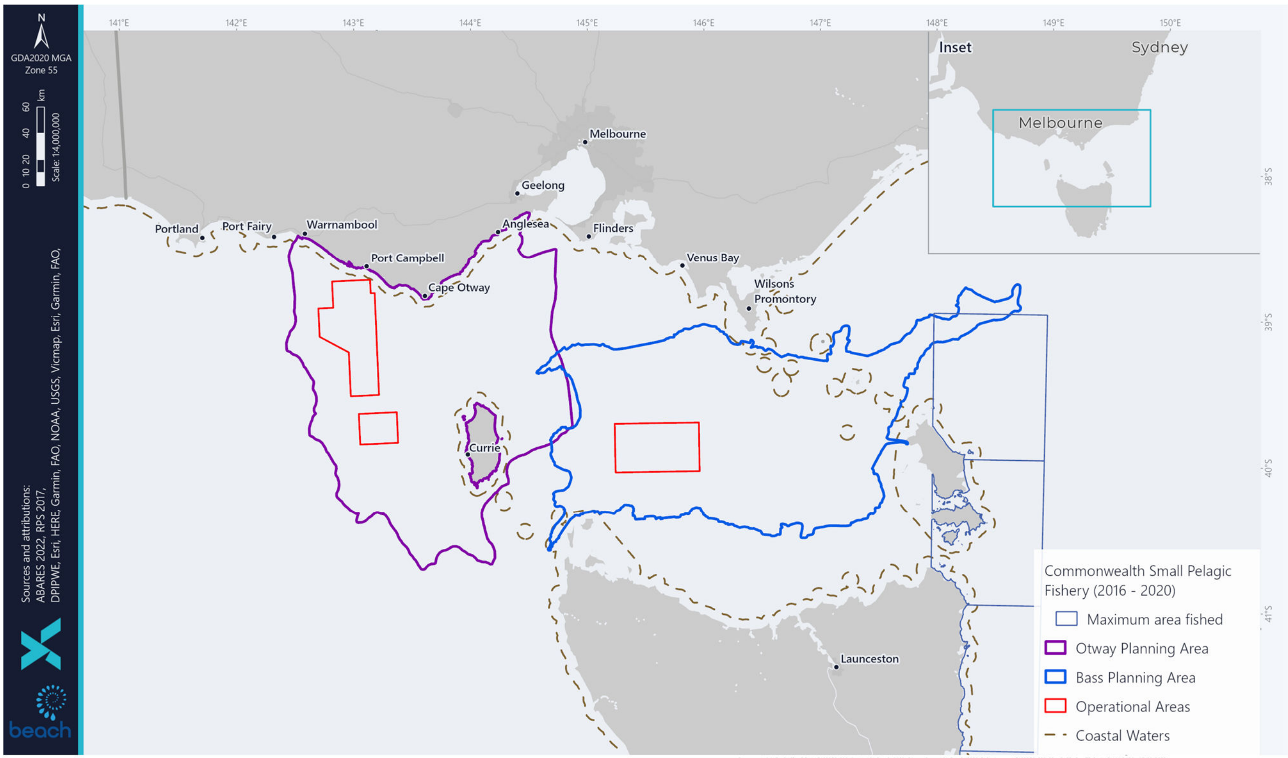


Figure 7-61: Commonwealth Small Pelagic Fishery Fishing Intensity (effort, net length, m/km^2) and Maximum Area Fished

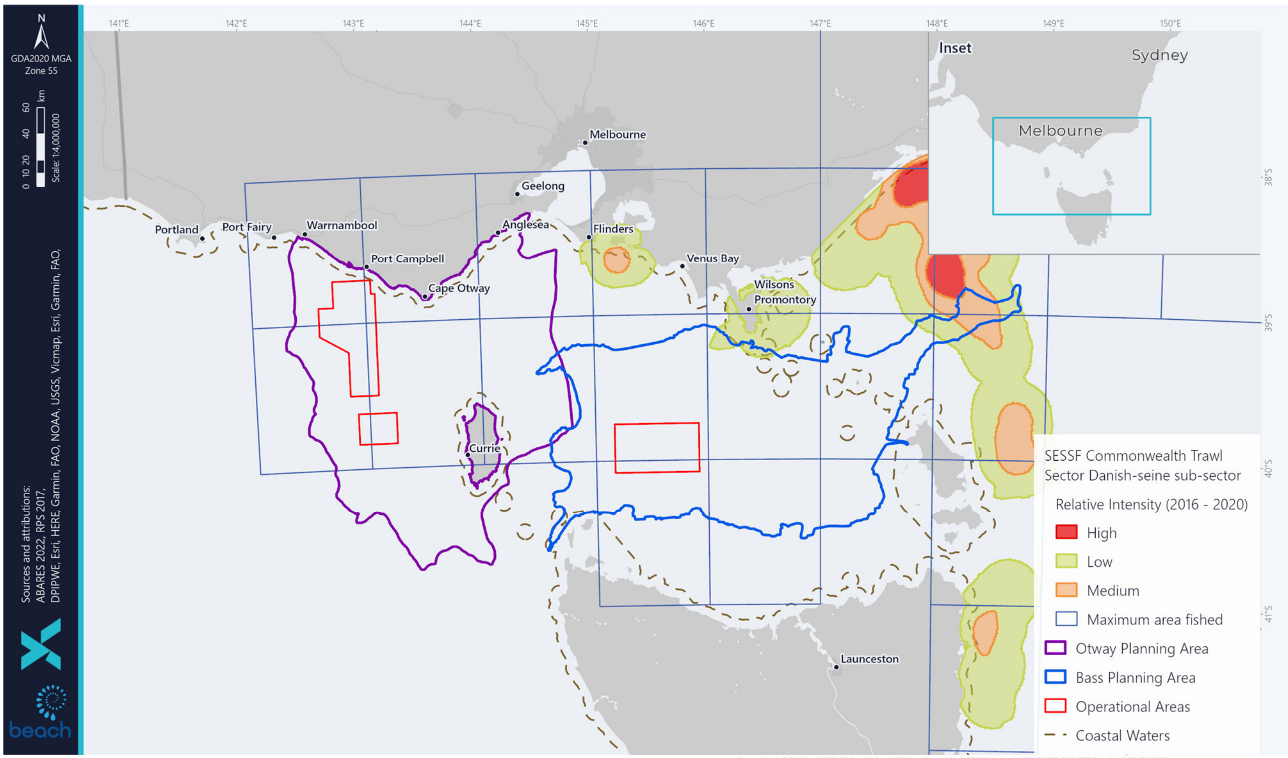


Figure 7-62: Southern and Eastern Scalefish and Shark Fishery (Commonwealth Trawl Sector) Danish-seine Fishing Intensity (effort, net length, m/km^2) and Maximum Area Fished

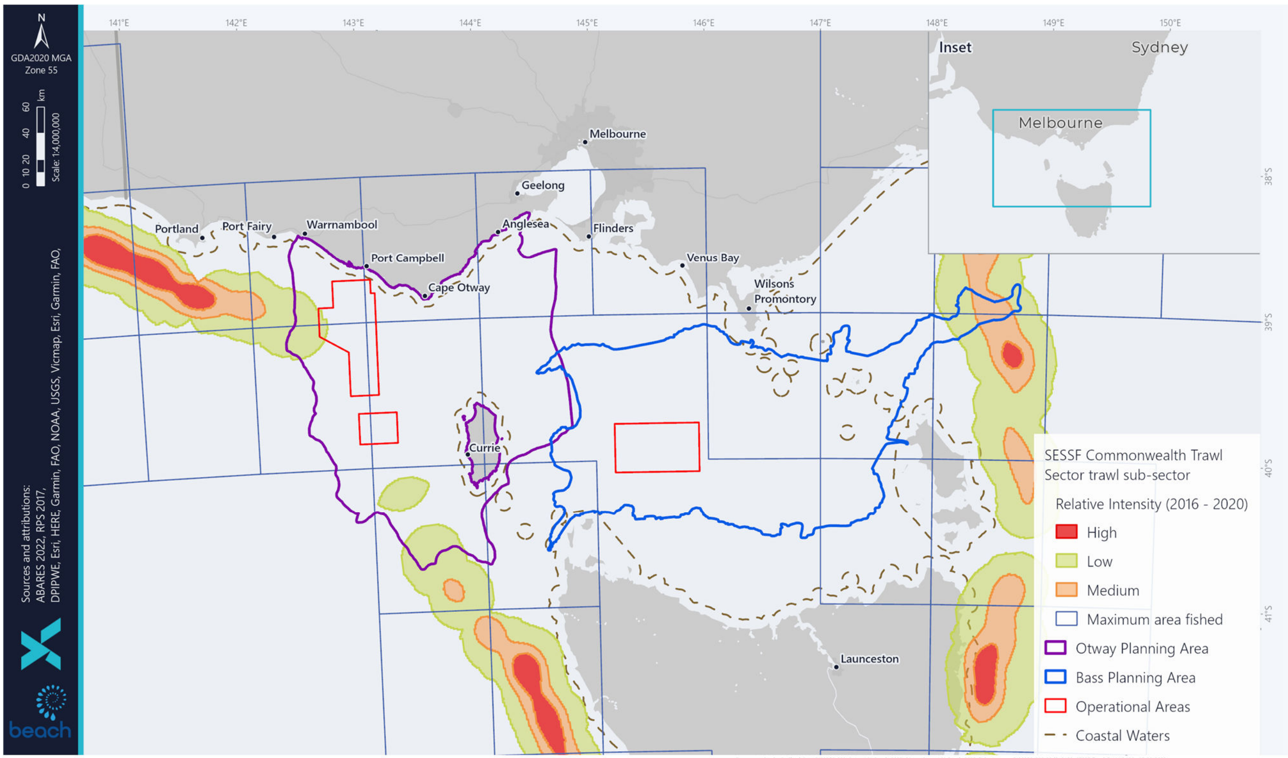


Figure 7-63: Southern and Eastern Scalefish and Shark Fishery (Commonwealth Trawl Sector) Otter Board Trawl Fishing Intensity (effort, net length, m/km^2) and Maximum Area Fished

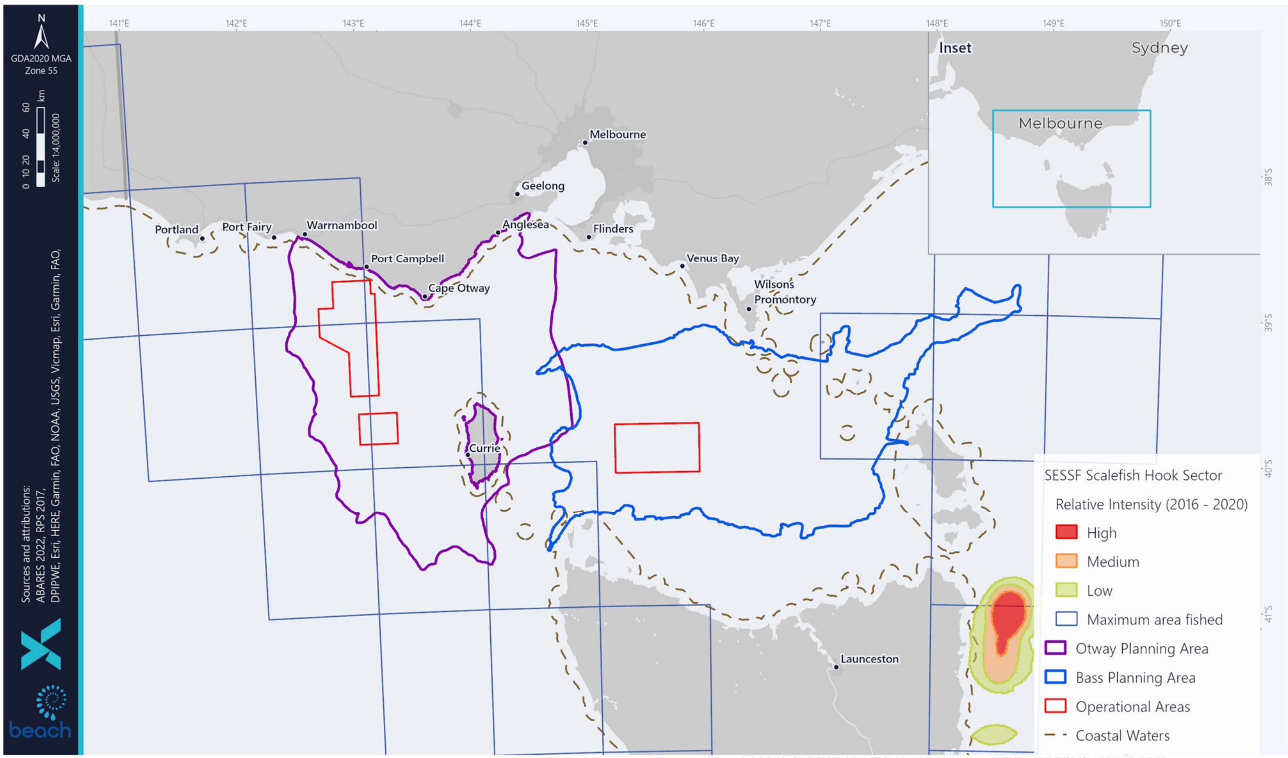


Figure 7-64: Southern and Eastern Scalefish and Shark Fishery (Scalefish Hook Sector) Fishing Intensity (effort, net length, m/km^2) and Maximum Area Fished

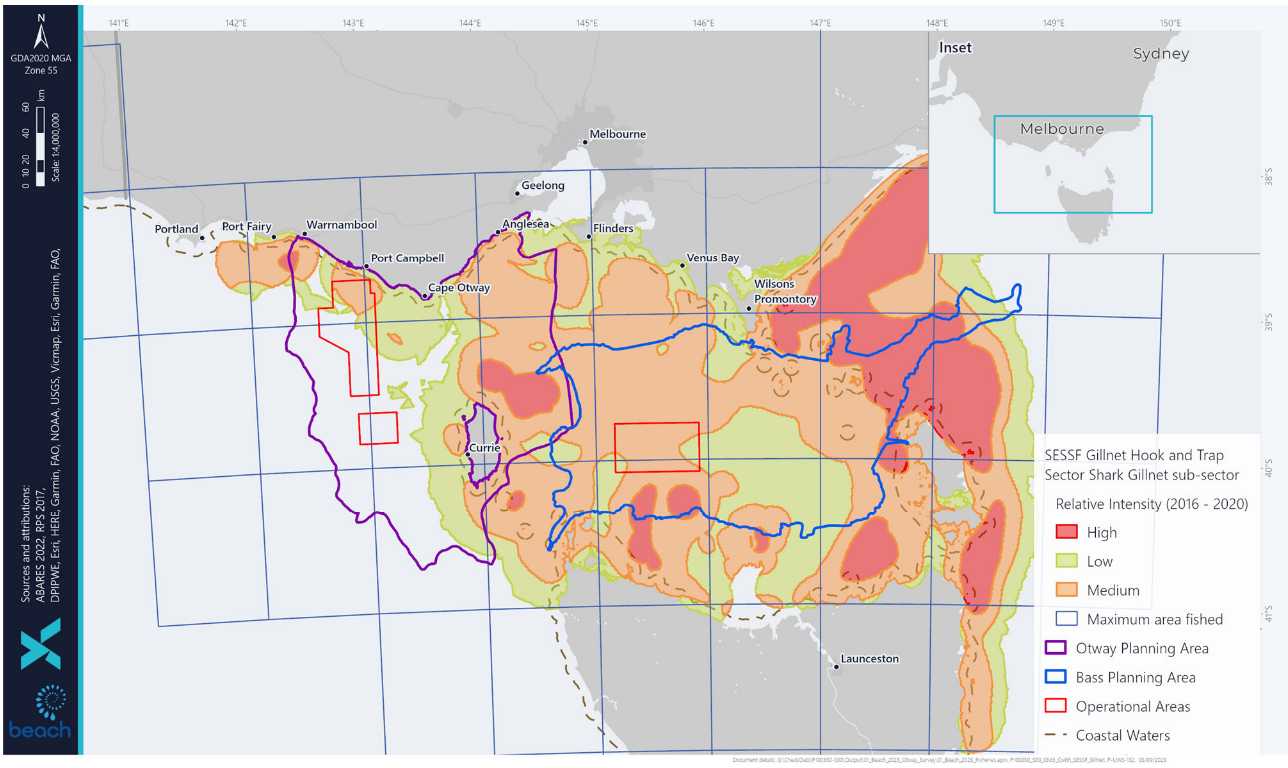


Figure 7-65: Southern and Eastern Scalefish and Shark Fishery (Gillnet Hook and Trap Sector) Shark Gillnet Fishing Intensity (effort, net length, m/km^2) and Maximum Area Fished

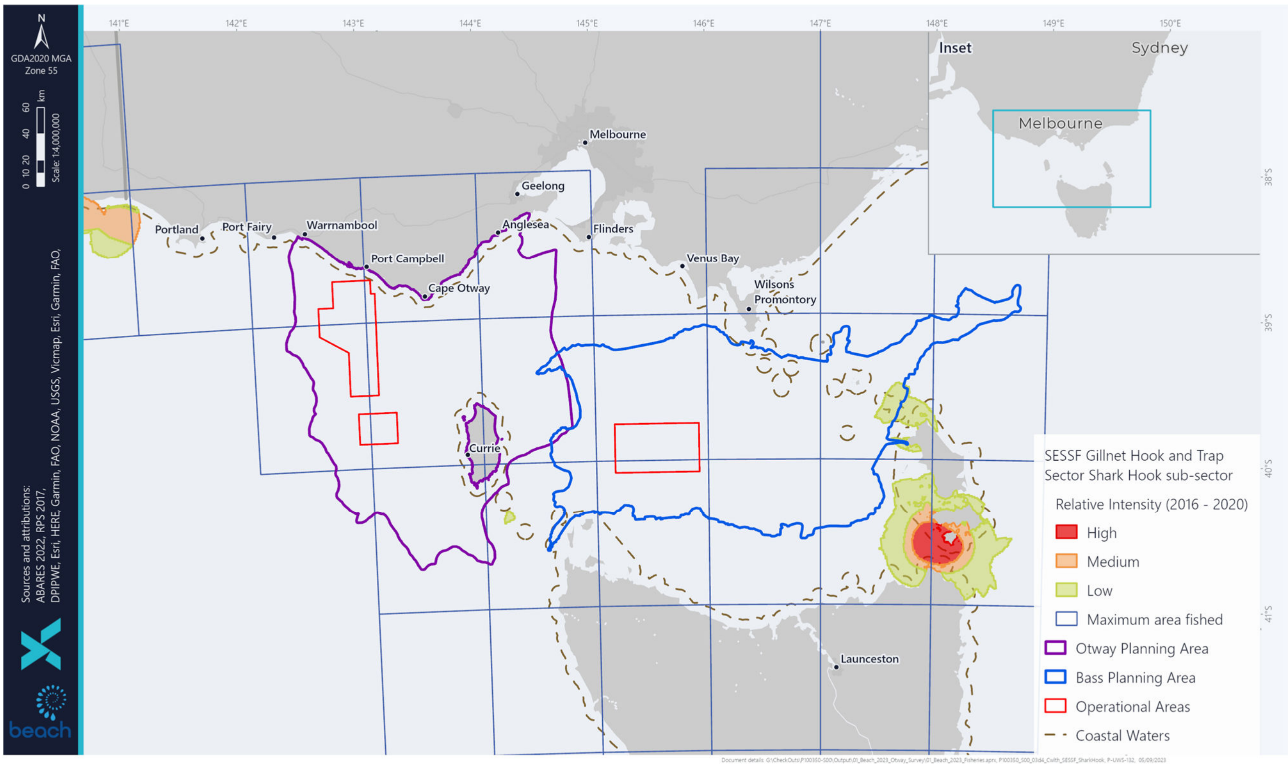


Figure 7-66: Southern and Eastern Scalefish and Shark Fishery (Gillnet Hook and Trap Sector) Shark Hook Fishing Intensity (effort, net length, m/km^2) and Maximum Area Fished

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Figure 7-67: Commonwealth Southern Squid Jig Fishery Fishing Intensity (effort, net length, m/km^2) and Maximum Area Fished

7.5.10 Victorian Managed Fisheries

Victorian fisheries are managed by the Victorian Fisheries Authority (VFA) under the *Fisheries Act 1995* (Cth). VFA has regulatory responsibility for the management of fisheries in Victorian State Waters out to 3 nm and Commonwealth waters where the VFA manage fisheries on behalf of the Commonwealth under the Offshore Constitutional Settlement (OCS) arrangements. OCS arrangements are joint management arrangements of particular marine living resources that are found in waters subject to both Commonwealth and State control. Such arrangements allow for the management of the resources by State authorities, even in waters outside the State 3 nm territorial sea boundary. In Victoria, such arrangements are in place out to 20 nm for key species such as scallop and rock lobster.

There are six Victorian state-managed fisheries that overlap the Operational and/or Planning Areas:

- Abalone Fishery
- Giant Crab Fishery
- Multi-species Ocean Fisheries
- Octopus Fishery
- Rock Lobster Fishery
- Wrasse (Ocean) Fishery

Information relating to the target species, fishing locations, landed catch, value and other relevant aspects of each fishery is provided in Table 7-17. Maps are also provided showing where the number of vessels reported in a VFA grid between 2011–2021 in relation to the Operational and/or Planning Areas. 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 2023) unless indicated.

Table 7-17: Victorian Managed Fisheries within the Operational and/or Planning Areas

Fishery	Target species	Description	Fishing Effort Operational Area		Fishing Effort Planning Area	
			Bass	**Otway**	**Bass**	**Otway**
Abalone Fishery (western zone)	Blacklip abalone Greenlip abalone	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 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 294.5 and 34.5 tonnes, respectively). There are 14 licences in the western zone and 34 licences in the central zone. The water depths where abalone are fished are close to shore within the Planning Areas. No fishing effort was identified in the Operational Areas.	No	No	Yes	Yes
Giant Crab Fishery	Giant crab	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 continental shelf edge (~200 m deep). 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 September to 15 November) and female (1 June to 15 November) giant crabs. Total landed catch in 2015-16 was 10 tonnes. Data for 2020/21 is not available due to insufficient data to report because there are less than five licence holders (policy requirement to protect commercial confidentiality of data. Figure 7-68 shows overlap of giant crab fished areas with the Otway Operational and Planning Areas. The Otway Operational Area contain areas with up to 15 vessels fishing. Catch effort data is considered confidential if there are less than five vessels present.	No	Yes	No	Yes
Multispecies Ocean Fisheries – Inshore Trawl	Eastern king prawn School prawn Shovelnose lobster/Balmain bug Minor bycatch of school whiting	The fishery operates along the entire Victorian coastline, excluding marine reserves, bays and inlets. Most operators are based at Lakes Entrance. Otter-board trawls with no more than a maximum head- line length of 33 m, or single mesh nets are used. As of June 2019, there were 54 fishery access licences, with only about 15 active to various degrees. Figure 7-69 shows the Otway Planning Area overlaps areas with up to 10 vessels fishing.	No	No	No	Yes
Multispecies Ocean Fisheries – Ocean General Fishery	Gummy shark School shark Australian salmon Snapper Small flathead bycatch	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. Snapper are caught using lines, nets and haul seine. Over 90% of the catch is from Port Phillip Bay, and around 5% from coastal waters. In 2020/21, 45 tonnes were landed but a 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 7-70 shows both Bass and Otway Planning Areas overlap areas fished. The Otway Planning Area contains areas with up to 88 vessels fishing. The Bass Planning Area overlaps only areas with less than five active vessels operating which are therefore confidential. No fishing effort was reported within the Operational Areas.	No	No	Yes	Yes
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 7-71 shows that octopus fishing effort overlaps both Bass and Otway Planning Areas. Fishing intensity for the overlapping areas is confidential due to there being less than five active vessels.	No	No	Yes	Yes
Rock Lobster Fishery (western and eastern zones)	Southern rock lobster	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 September to 15 November) and female (1 June to 15 November) lobsters. Southern rock lobsters are found to depths of 150 m, with most of the catch coming from inshore waters less than 100 m deep. Figure 7-72 shows the Otway Operational Areas and both Bass and Otway Planning Areas overlap the southern rock lobster fished areas. The Otway Operational Area overlap areas with up to 20 vessels fishing while the Otway Planning Area contains areas with as many as 98 vessels fishing. The Bass Planning Area overlaps only small areas with less than five vessels fishing.	No	Yes	Yes	Yes
Wrasse (Ocean) Fishery	Bluethroat wrasse Purple wrasse Small catches of rosy wrasse, senator wrasse and southern Maori wrasse	Extends the length of the Victorian coastline from high tide mark to 20 nm offshore. Fishers mostly use hook and line. Limited entry fishery with 22 current licences. Total annual catch in 2019/20 was 21.5 tonnes. Figure 7-73 shows overlap of fished areas with the Otway Planning Area. Fishing intensity for areas with less than five active vessels is considered confidential.	No	No	No	Yes

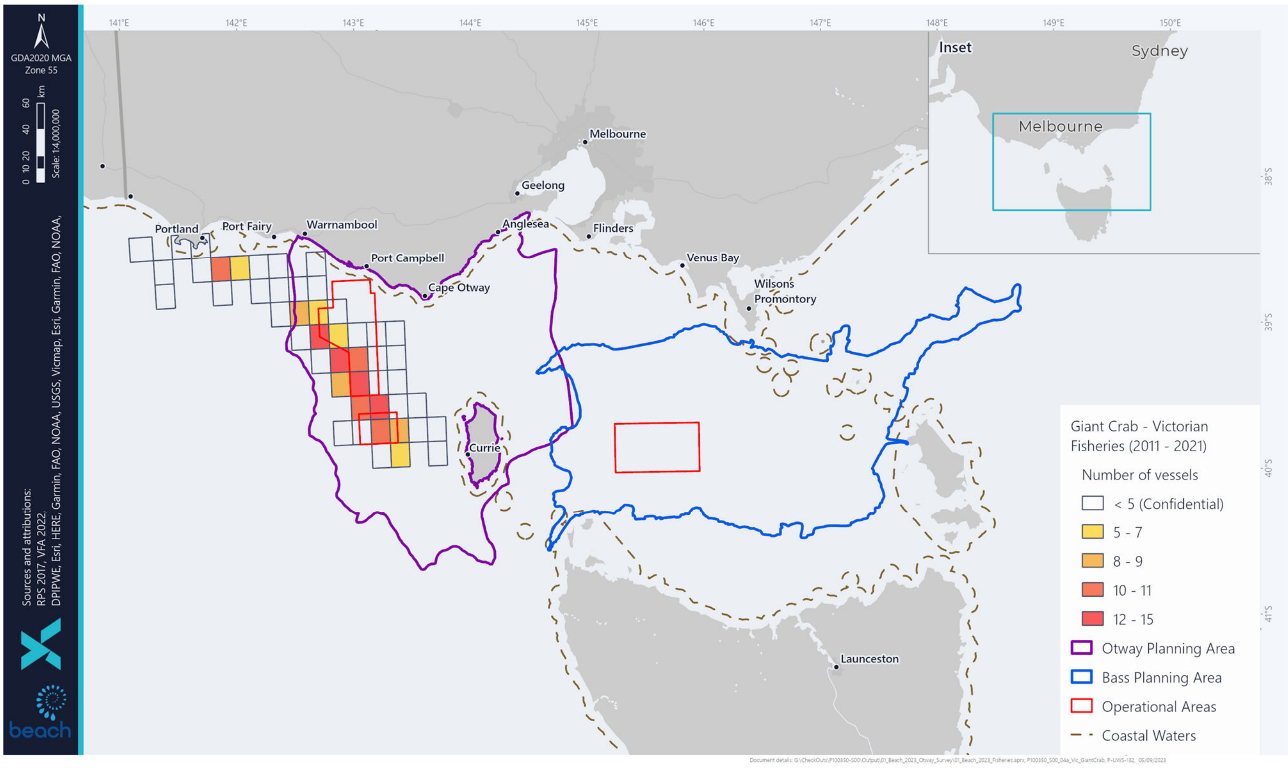

Figure 7-68: Giant Crab Fishery Number of Vessels from 2021-2021. Data obtained from VFA 2022.

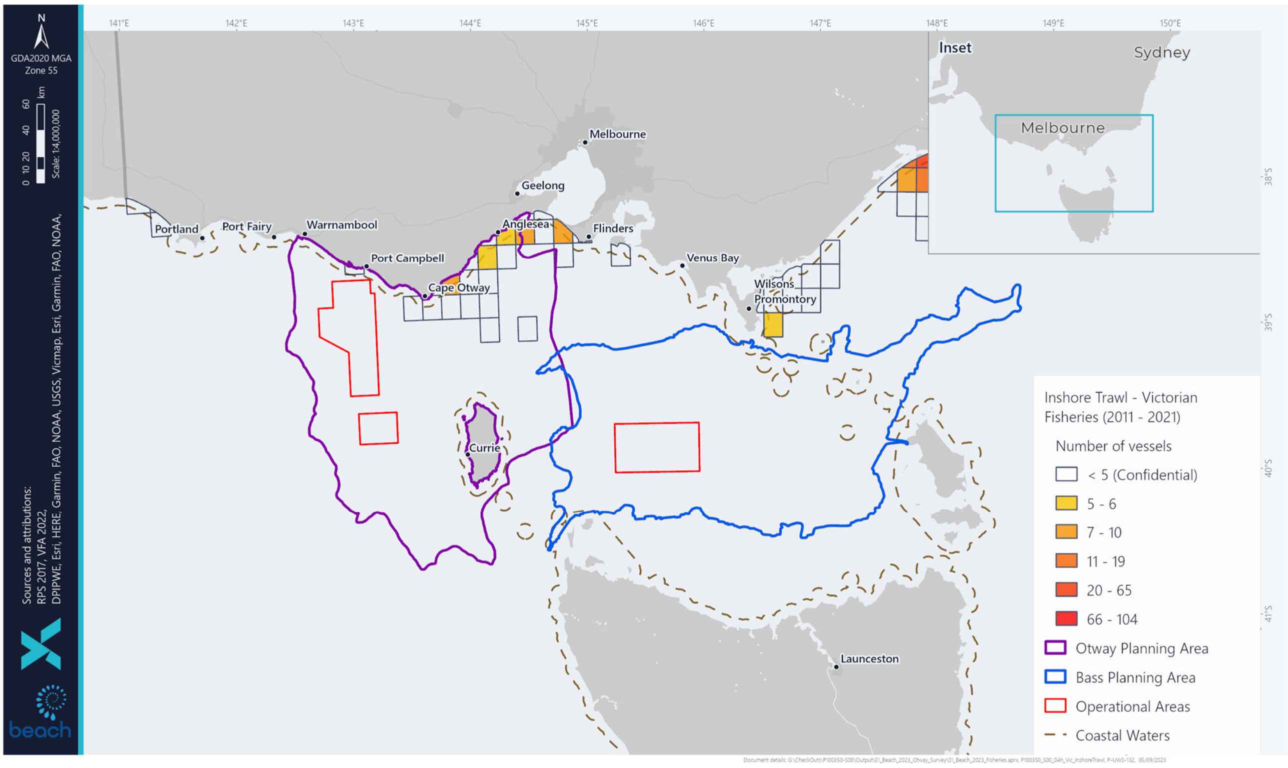

Figure 7-69: Multispecies Ocean Fisheries – Inshore Trawl Fishery Number of Vessels from 2011-2021. Data obtained from VFA 2022.

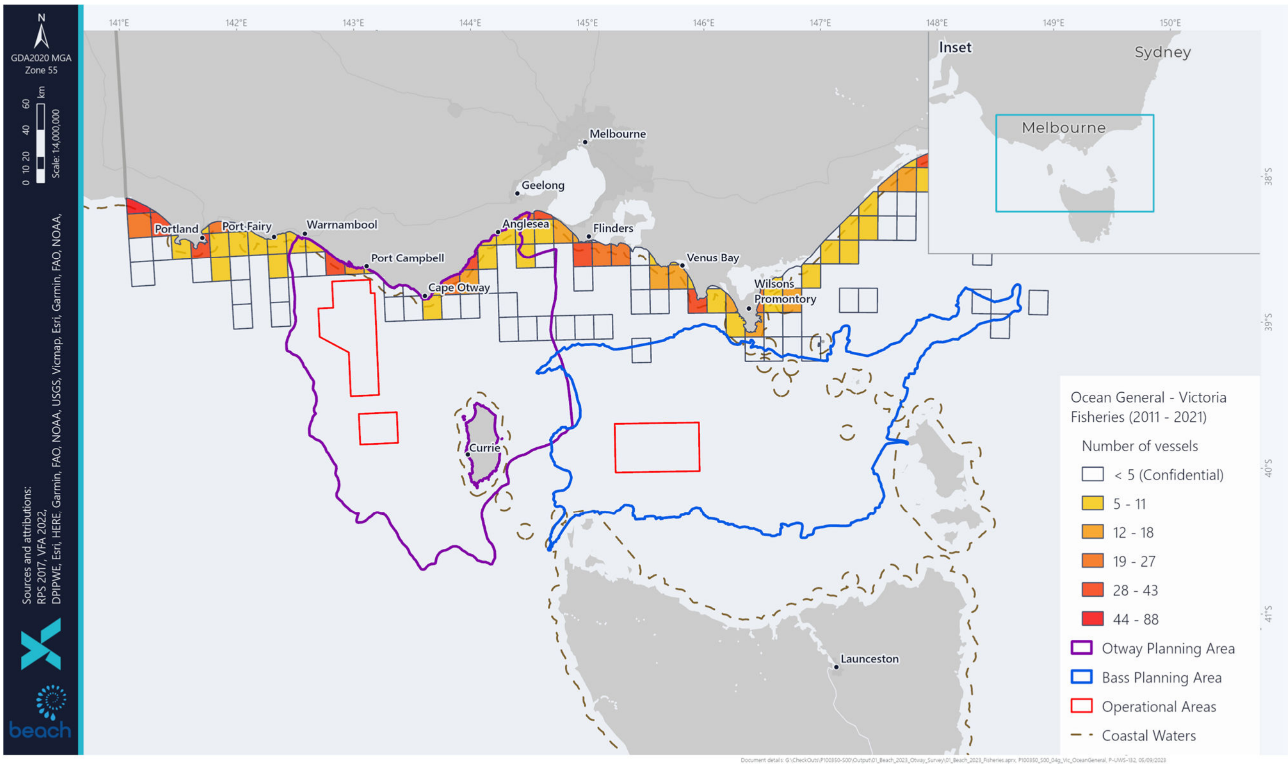

Figure 7-70: Multispecies Ocean Fisheries – Ocean General Fishery Number of Vessels from 2011-2021. Data obtained from VFA 2022.

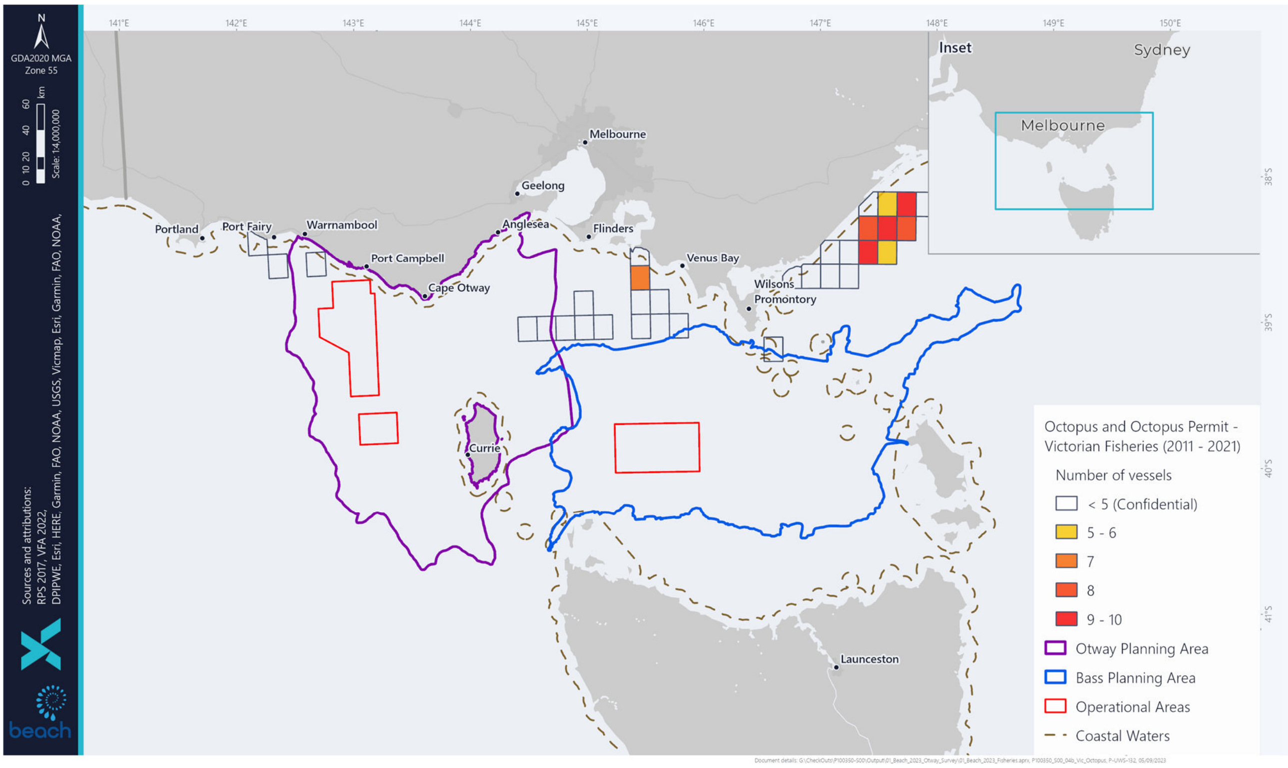

Figure 7-71: Octopus and Octopus Permit Fishery Number of Vessels from 2011-2021. Data obtained from VFA 2022.

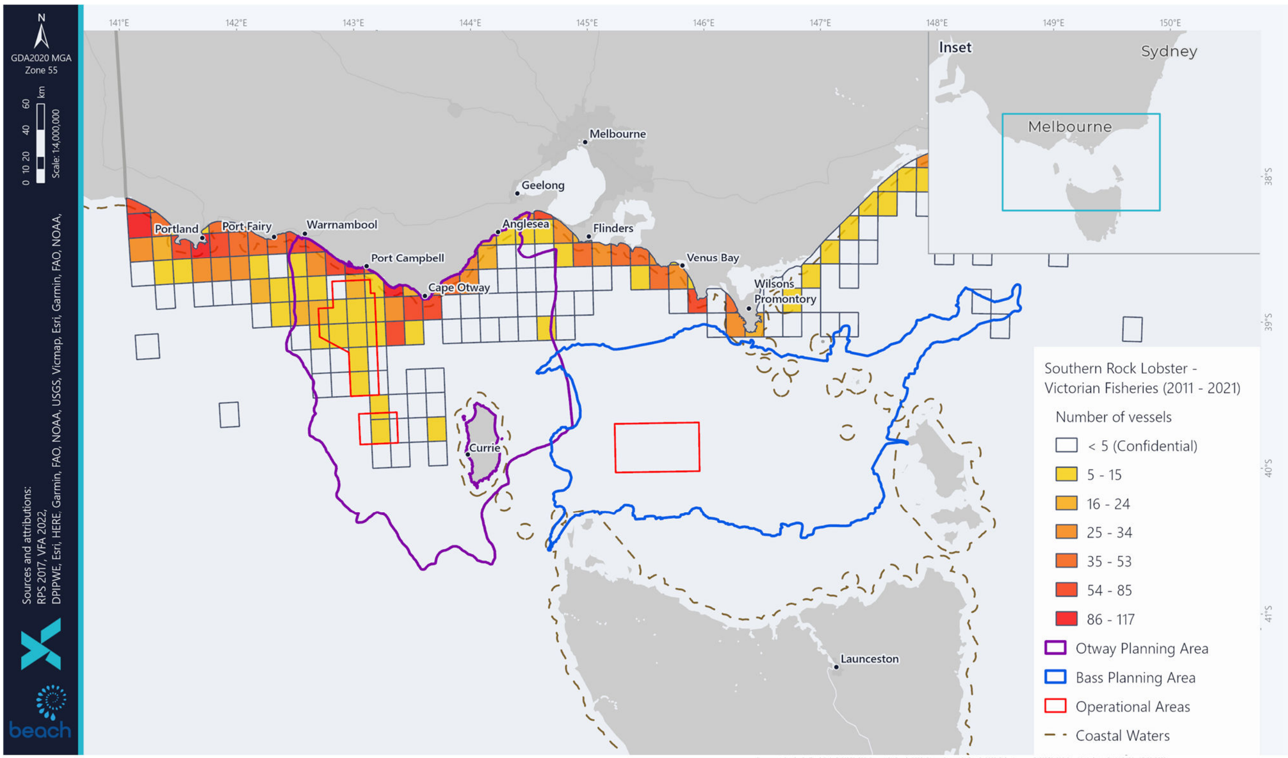

Figure 7-72: Southern Rock Lobster Fishery Number of Vessels from 2011-2021. Data obtained from VFA 2022.

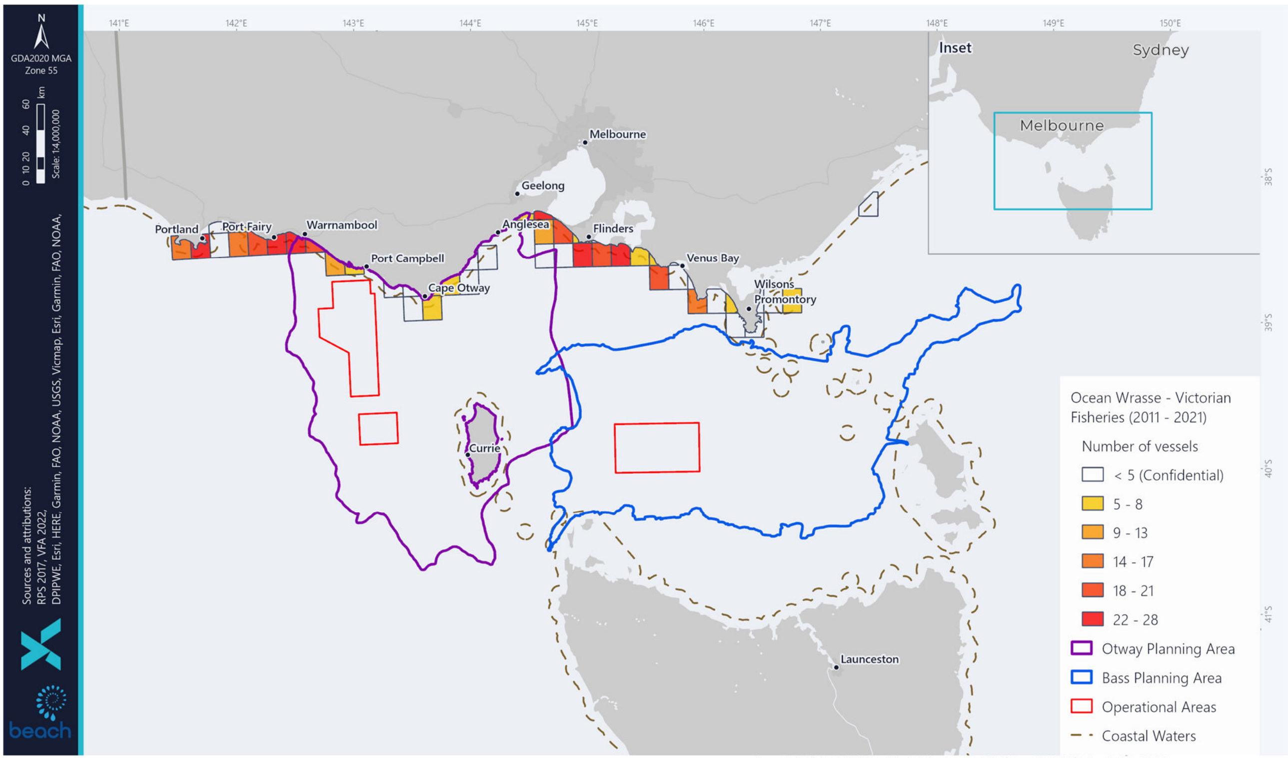

Figure 7-73: Wrasse (Ocean) Fishery Number of Vessels from 2011-2021. Data obtained from VFA 2022.

7.5.11 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.

No Tasmanian fisheries occur within the Operational Areas.

There are eight Tasmanian state managed commercial fisheries that potentially occur within the Planning Areas:

- Abalone Fishery
- Commercial Dive Fishery
- Giant Crab Fishery
- Marine Plant Fishery
- Rock Lobster Fishery
- Scalefish Fishery
- Scallop Fishery
- Shellfish Fishery

Information relating to the target species, fishing locations, landed catch, value and other relevant aspects of each fishery is detailed in Table 7-18. Data and information sources are Department of Natural Resources and Environment Tasmania (DNRET 2022), Department of Primary Industries, Water and Environment (DPIPWE 2021), 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 and/or Planning Areas. Fishing effort data is confidential if a grid has 5 or less active vessels. No data on the Abalone Fishery locations was available from Fishing Tasmania due to the confidential nature of the data.

Historic catch assessments indicate that Scallop and Shellfish Fishery activities are unlikely to occur in the Planning Areas, with fishing effort located in other areas of these fisheries. The Rock Lobster and Abalone Fisheries, which are by far the most productive and economically important Tasmanian fisheries accounting for 95% of the total value, are both expected to be active within the Planning Areas. Commercial Dive, Giant Crab, Scalefish, Scallop and Seaweed Fisheries are also likely to be active within the Planning Areas to varying degrees.

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Table 7-18: Tasmanian Managed Fisheries in the Operational and Planning Areas

Fishery	Target species	Description	Fishing Effort Operational Area		Fishing Effort Planning Area	
			Bass	Otway	Bass	Otway
Abalone Fishery (Northern and Bass Strait Zones)	Black lip (*Haliotis rubra*) and greenlip abalone (*H. laevigata*)	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 main focus 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 $50 million from a total catch of approximately 1,000 tonnes. The jurisdictional area of the Abalone Fishery is Tasmanian State waters. The Bass and Otway Planning Areas intersect the Northern Zone (waters around King Island) and Bass Strait Zone (waters in the Northern Bass Strait Region) of the Abalone Fishery (Figure 7-74).	No	No	Yes	Yes
Commercial Dive Fishery (Northern Zone)	Shortspined sea urchin (*Heliocidaris erythrogramma*) Wavy periwinkles (*Lunella undulata*) Longspined sea urchin (*Centrostephanus rodgersii*)	Dive 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 accounting 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 Bass and Otway Planning Areas intersect the Northern Zone of the Commercial Dive Fishery at King Island and in the northern Bass Strait (Figure 7-74). The Northern Zone of the fishery is defined as the area of Tasmanian State waters on the east coast bounded by the line of latitude 42°20'40"S in the south and extending north to the line of latitude 41°00'26"S (from the southern point of Cape Sonnerat to Red Rocks).	No	No	Yes	Yes

Fishery	Target species	Description	Fishing Effort Operational Area		Fishing Effort Planning Area	
			Bass	Otway	Bass	Otway
Giant Crab Fishery	Giant crab (*Pseudocarcinus gigas*)	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 $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. Figure 7-75 shows the Bass and Otway Planning Areas overlap where giant crabs are fished, particularly along the continental slope. The level of fishing in the Bass Planning Area is very low compared to the Otway Planning Area. As detailed in Figure 7-75 there is one grid with < 5 fishers within the Otway Operational area which is an error as it is outside the area of the fishery.	No	No	Yes	Yes
Marine Plant Fishery	Bull kelp (*Durvillea pototorum*) Japanese kelp (*Undaria pinnatifida*)	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 3000 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 $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 Otway Planning Area overlaps the area where bull kelp is potentially collected from King Island.	No	No	No	Yes

Fishery	Target species	Description	Fishing Effort Operational Area		Fishing Effort Planning Area	
			Bass	Otway	Bass	Otway
Rock Lobster Fishery	Southern rock lobster (*Jasus edwardsii*)	Southern rock lobster are the other major wild-caught Tasmanian fishery. For 2022-23 the Total Allowable Catch remains at 1050.7 t. Southern rock lobsters are found to depths of 150 m with most of the catch coming from inshore waters less than 100 m deep throughout state waters. The fishery is a limited entry with 312 licences. The Bass and Otway Operational Areas and Planning Areas overlap fishing effort for the Rock Lobster Fishery (Figure 7-76).	Yes	Yes	Yes	Yes
Scalefish Fishery (northwest coast)	Multi-species and multi-gear fishery	Complex multi-species fishery harvesting a range of scalefish, shark and cephalopod species. Fourteen different fishing methods are used. 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 Total Allowable Catch for the 2021/22 season has increased to 30 kg quota unit. The Planning Areas overlap the Scalefish Fishery management area (Figure 7-77).	No	No	Yes	Yes
Shellfish Fishery	Katelysia cockles (*Katelysia scalarina*) Venerupis clam (*Venerupis largillierti*) Native oyster (*Ostrea angasi*) Pacific oyster (*Crassostrea gigas*)	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 $345,538. The Planning Areas could potentially overlap areas where Pacific oysters are collected. Data for this fishery is confidential.	No	No	Yes	Yes

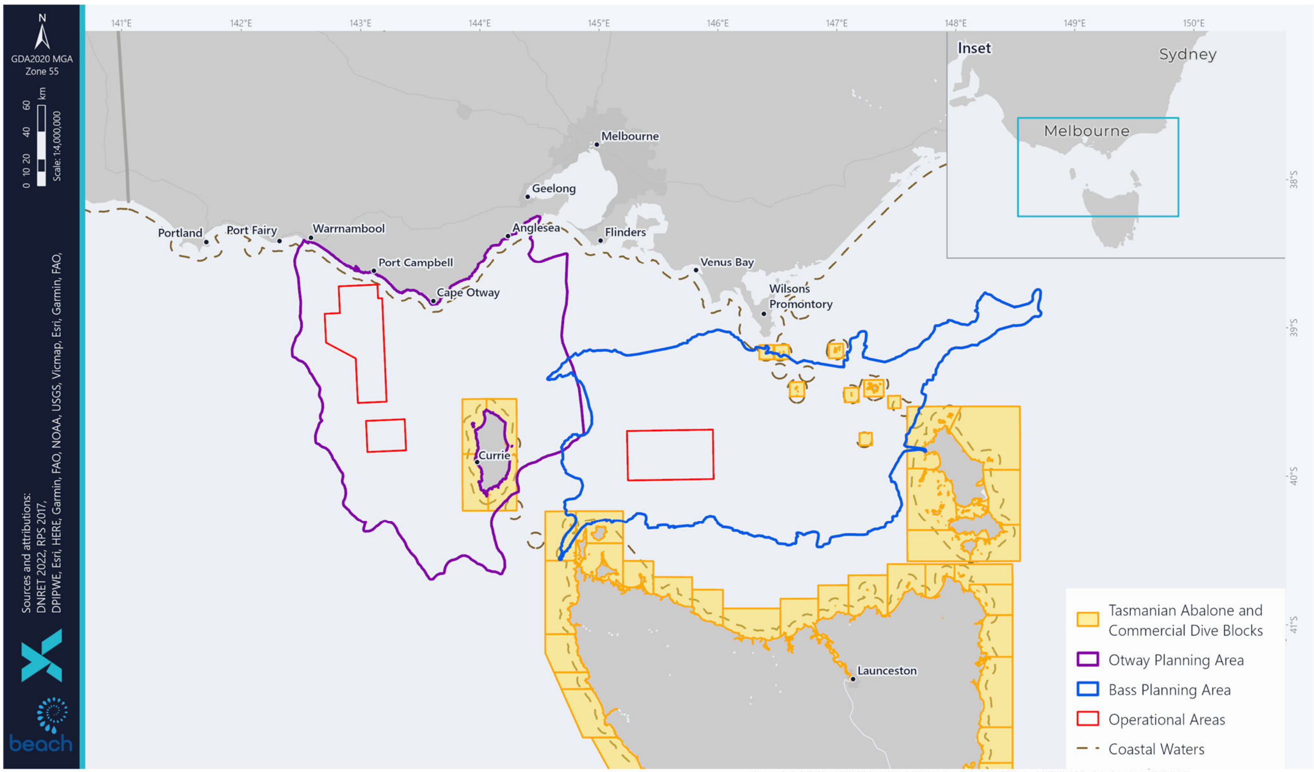


Figure 7-74: Tasmanian Abalone and Commercial Dive Blocks. Data obtained from DNRET 2022.

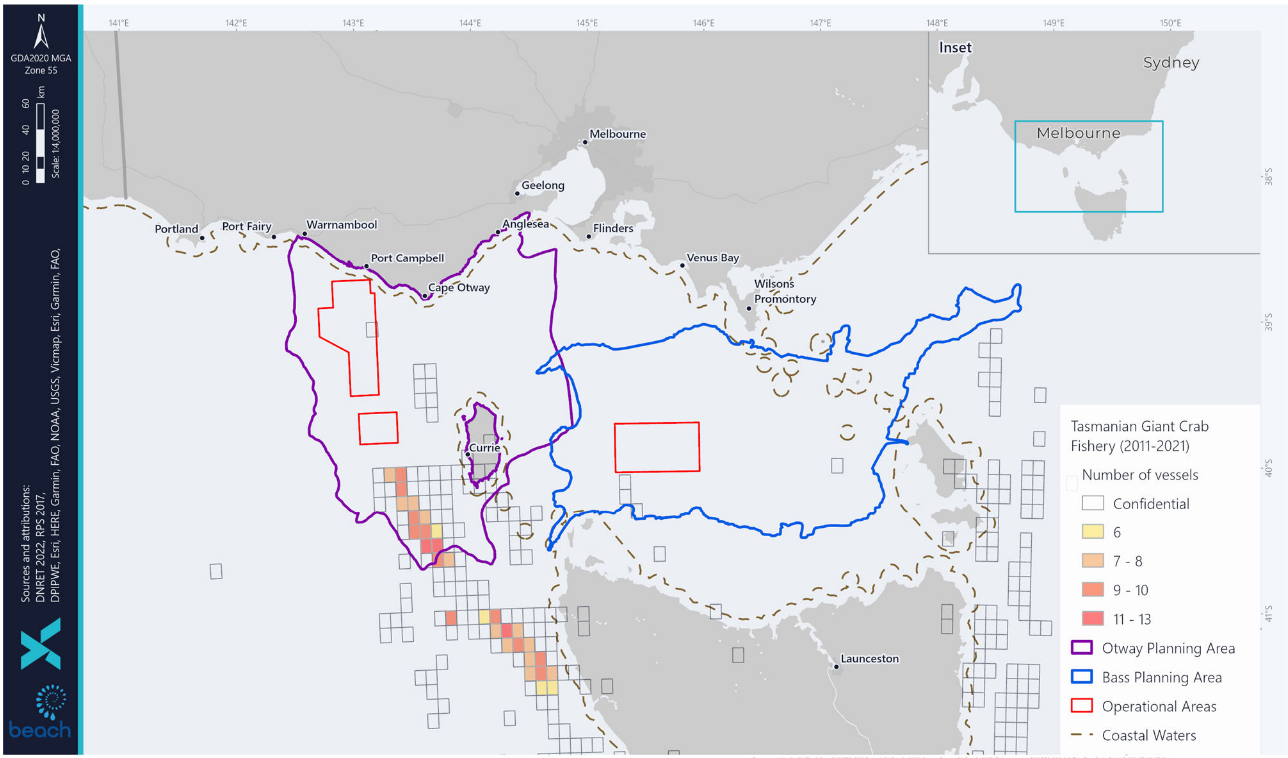


Figure 7-75: Tasmanian Giant Crab Fishery Number of Vessels from 2011 to 2021. Data obtained from DNRET 2022.

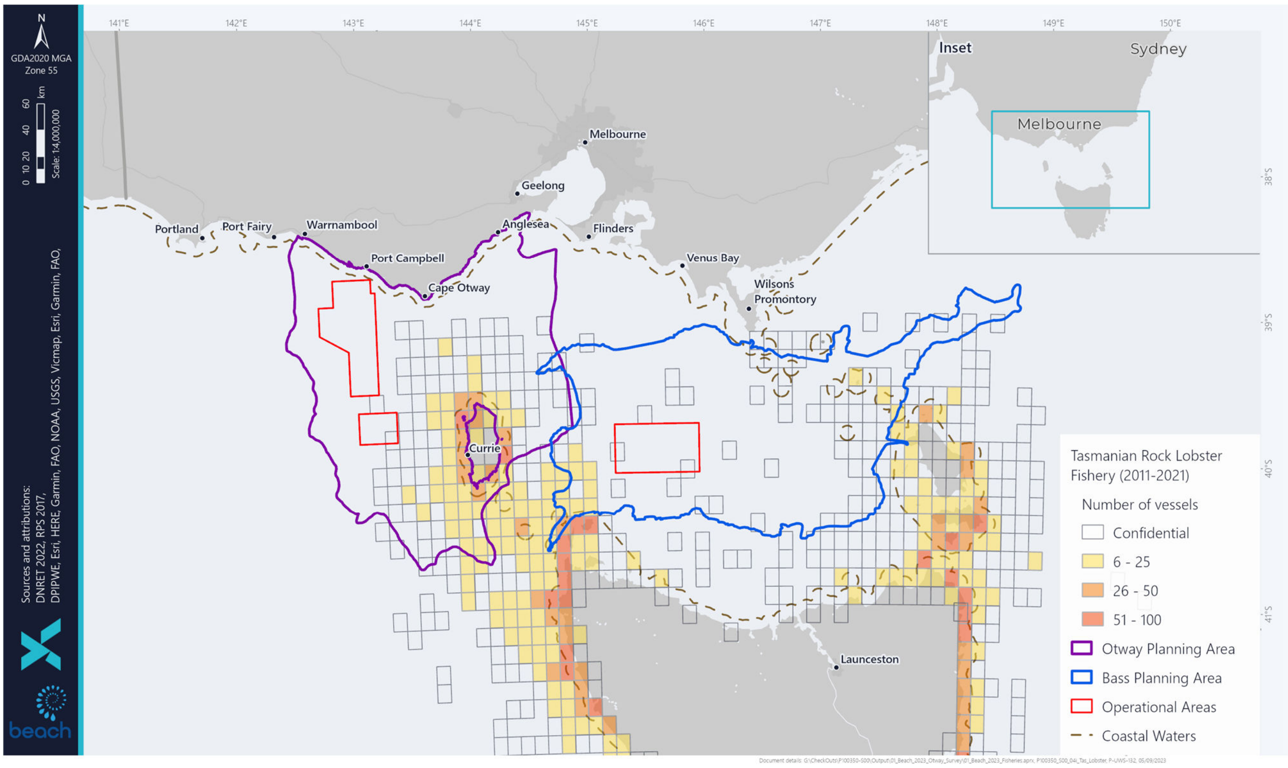


Figure 7-76: Tasmanian Rock Lobster Fishery Number of Vessels from 2011 to 2021. Data obtained from DNRET 2022

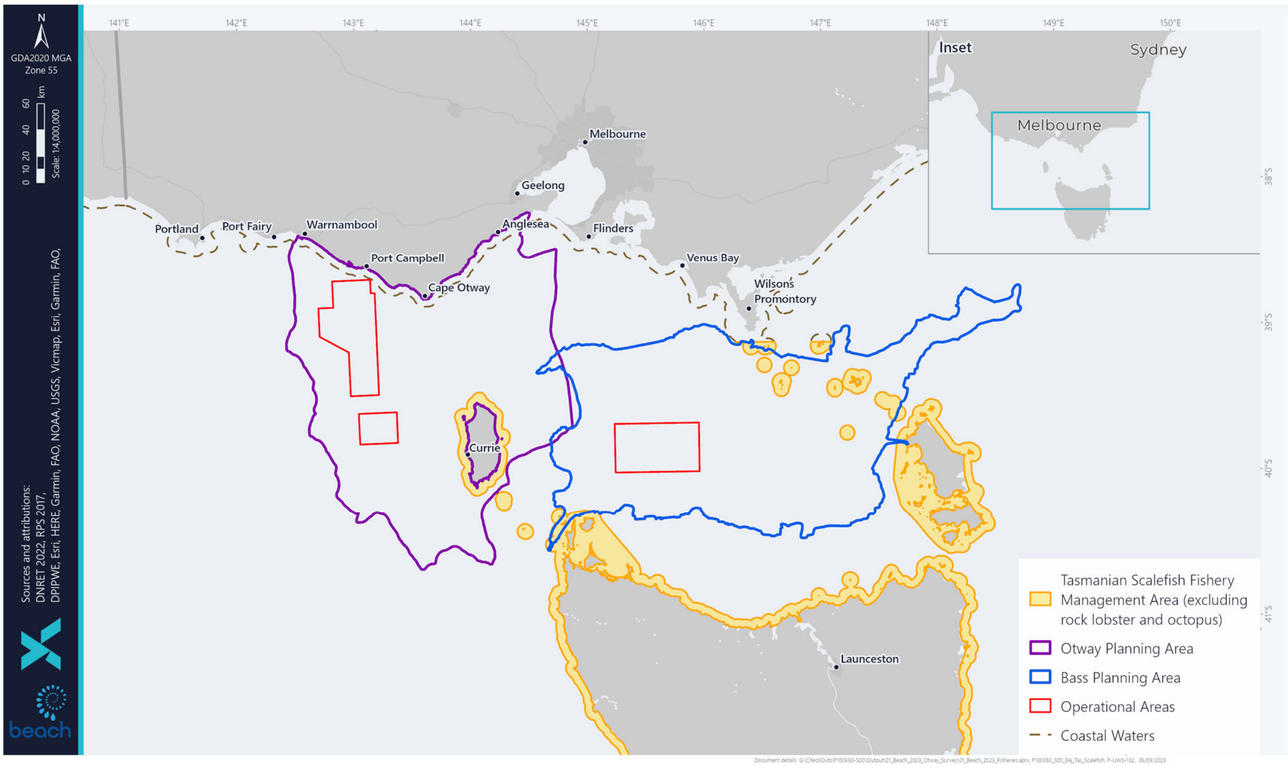


Figure 7-77: Tasmanian Scalefish Fishery Management Area (excluding rock lobster and octopus). Data obtained from DNRET 2022.

7.5.12 Seaweed Industry

The Australian seaweed industry is small: currently valued at an estimated gross value of product (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 pototorum*) 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 (s. 112(2) Fisheries Act 1995) and licences enabling seaweed aquaculture are not currently available in Victoria (VFA 2023a).

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.

7.6 First Nations

7.6.1 Cultural Landscapes and Sea Country

Country is a cultural landscape, it includes the tangible (cultural heritage) and intangible (song, creation stories and cultural practices). 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.

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 and Planning Areas.

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. Connection to Sea Country is accompanied by a complexity of cultural rights and responsibilities. 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, contains evidence of the ancient Dreamtime events by which all geographic features, animals, plants, and people were created. Sea country contains sacred sites, often 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.

7.6.2 Sea Country within the South East Australian Marine Region

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 2002b). Figure 7-79 shows the Victorian Traditional Owners within the Operational and Planning areas. Tasmanian Traditional Owners are not shown as there is no formally recognised Native Title.

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 (Smyth 1993). The Otway Planning Area is located in the Sea Country of the Eastern Maar Aboriginal peoples and Wadawurrung peoples.

The land adjacent the Otway Operational and Planning area is the traditional land of the Eastern Maar peoples legally represented by the Eastern Maar Aboriginal Corporation (EMAC). EMAC is both a Registered Aboriginal Party and a Recognised Native Title Prescribed Body Corporate Eastern Maar land extends as far north as Ararat and encompasses Warrnambool, Port Fairy, and other areas along the Great Ocean Road, it also stretches 100 m out to sea from low tide and therefore includes the iconic Twelve Apostles (EMAC 2022). 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. Through consultation with Beach, Eastern Maar advised us that eel, or "*Kooyang",* harvesting is incredibly important to the Eastern Maar today, and is a cultural practice handed down from their ancestors.

The land adjacent the Otway Planning Area is 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). 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. Through consultation with Beach Wadawurrung advised that eel, or *Beniyak,* have cultural significance to the Wadawurrung peoples.

The Bass Planning Area does not reach the Victorian shoreline however, the Traditional Owners of closest northern Sea Country are the Bunurong First Nations Peoples, represented by the Bunurong Land Council Aboriginal Corporation (BLCAC). Bunurong Country extends from the Weribee river to Wilsons promontory, and 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 Otway and Bass Planning Areas reach the shoreline of King Island, one location at Flinders Island and some small islands north-west of mainland Tasmania. The *palawa* (Tasmanian Aboriginal) 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.

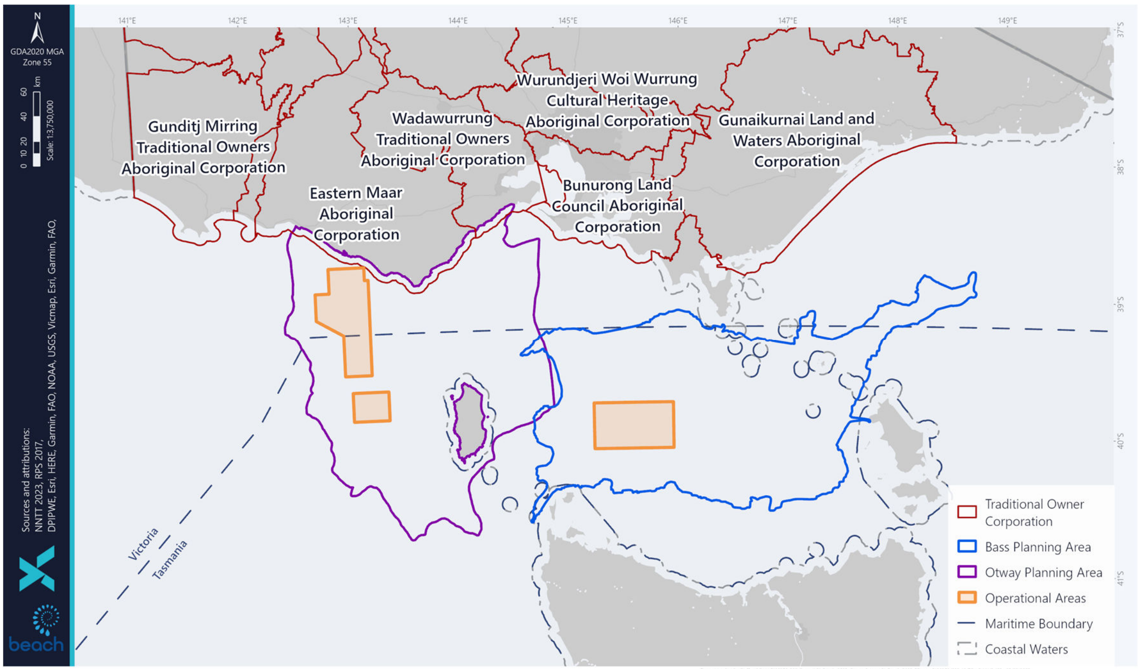


Figure 7-78: Victorian Traditional Owners within the Operational and Planning Areas

7.6.3 Songlines

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 Aboriginal 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 Neey*n (midwives), explaining why Gunditjmara is a Matrilineal Nation. (DCCEEW 2022a). Gunditjmara Country is not adjacent to the Operational or Planning areas, however Beach understands the interconnectedness of Sea Country from one Traditional Owner Nation to another.

Information regarding the cultural significance of whales, where available, is detailed in Section 7.4.12.6.

7.6.4 Native Title

A search of the National Native Title Tribunal (NNTT) database identified one native title claim determination over coastal areas within the Otway Planning Area (Figure 7-79). The claim is by the Eastern Maar people (VC2012/001), registered in 2013 and determined on 28th March 2023 and extends seaward 100 m from the mean low-water mark of the coastline (NNTT 2016). This determination is active on the National Native Title Register.

The following native titles claims and determinations exist outside but adjacent to the Planning Areas (Figure 7-79):

- VCD2007/001 - Gunditjmara - Part A. Gunditj Mirring Traditional Owners Aboriginal Corporation Registered Native Title Body Corporate.
- VCD2011/001 - Gunditjmara Area C. Gunditj Mirring Traditional Owners Aboriginal Corporation Registered Native Title Body Corporate, Eastern Maar Aboriginal Corporation Registered Native Title Body Corporate.
- VCD2010/001 - Gunai/Kurnai People. Gunaikurnai Land and Waters Aboriginal Corporation Registered Native Title Body Corporate.
- VC2022/002- Wadawurrung

There are no registered claims in Tasmania.

7.6.5 Indigenous Protected Areas

No Indigenous Protected Area were identified in the Operational or Planning Areas (Figure 7-79).

7.6.6 Indigenous Land Use Agreements

No registered Indigenous Land Use Agreements were identified within the Operational or Planning Areas (Figure 7-79).

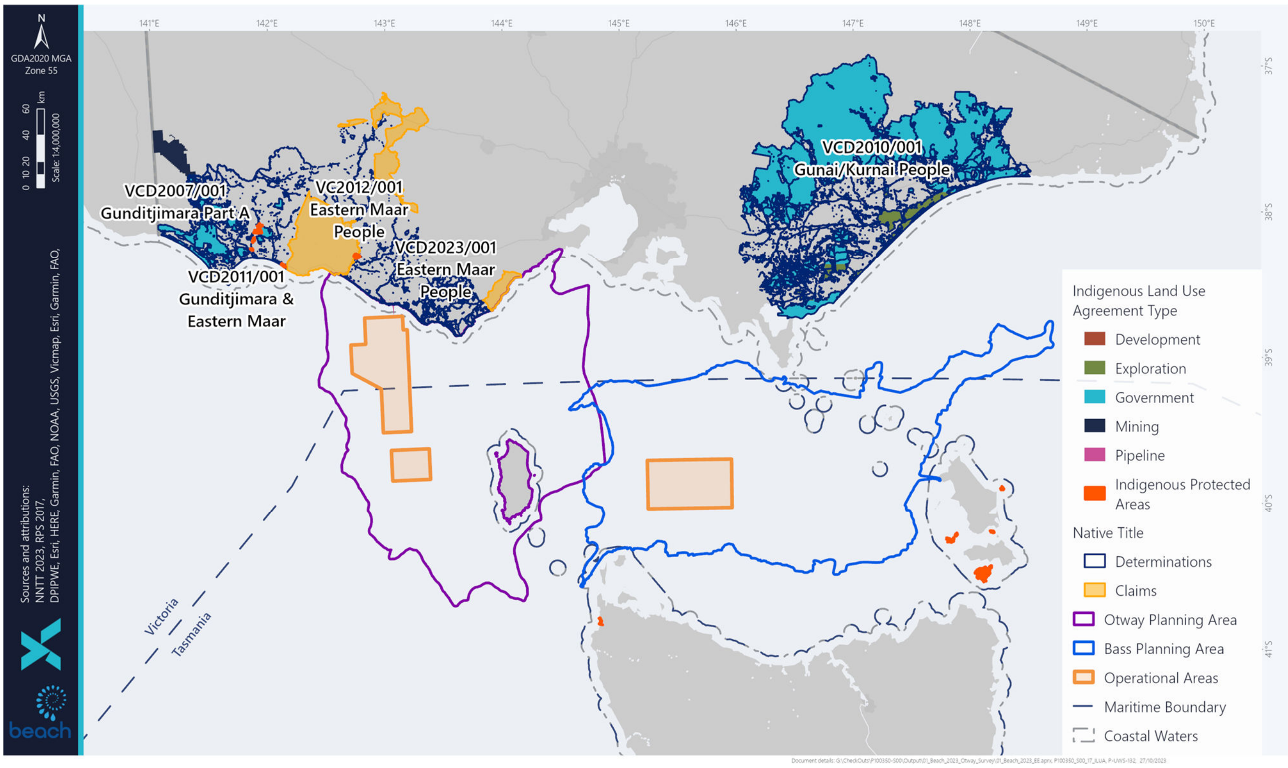


Figure 7-79: Native Title, Indigenous Protected Areas and Indigenous Land Use Agreements within Operational and Planning Areas

8 Environmental Impact and Risk Assessment

8.1 Overview

In accordance with the OPGGS(E)R, this section presents the impact and risk assessment for the environmental hazards identified for the seabed survey activities using the methodology described in Section 3. Potential impacts (planned) and risks (unplanned) associated with the environmental aspects of activity are identified in Table 8-1.

The impact and risk assessment is appropriate to the nature and scale of each impact and risk and details the control measures that are used to reduce the risks to ALARP and an acceptable level.

Environmental Performance Outcomes (EPO), Environmental Performance Standards (EPS), and Measurement Criteria have been developed, described, and summarised in Section 8.12.

Table 8-1: Activity and Aspect Relationship

	Planned						**Unplanned**				
	Seabed disturbance	**Underwater acoustic emissions**	**Atmospheric emissions**	**Light**	**Planned marine discharges**	**Physical presence**	**Invasive marine species**	**Unplanned release - Waste**	**Fauna interaction**	**Minor spill**	**Loss of diesel – vessel collision**
Geotechnical operations	X						X				
Geophysical operations		X					X				
Vessel operations		X	X	X	X	X	X	X	X	X	X
Spill response		X	X	X	X	X	X	X	X	X	

8.2 Impact and Risk Scoping

The context of the impact and risk assessment has been set via the description of the activity (Section 4) and identification of potential environmental receptors within the area that may be affected (Section 7). Impacts and risk to receptors which could potentially occur from the activity have been identified by considering the interactions between environmental aspects and the activity (Table 8-1).

Within this section, impacts and risks are framed as either Lower Order or Higher Order. A preliminary evaluation of impacts and risks was undertaken based on previous experience conducting seabed surveys using the criteria below to identify the level of assessment required for each aspect. If one or more of the following criteria was triggered the aspect was assessed as a High Order:

- Uncertainty in the impact or risk assessment which requires further analysis, for example where modelling is required to understand the nature and scale of an impact or risk.
- ALARP decision context B and above (refer to Section 3.8.2).
- Residual Risk Severity Moderate and above (refer to Section 2.2.3).
- Relevant person consultation raised objection or claim.

Higher order impacts and risks require a higher order of evaluation, as described in the NOPSEMA Environment Plan Decision Making Guideline (NOPSEMA 2022).

The higher and lower order impacts and risks are colour coded for each aspect-activity interaction in Table 8-1. The assessments of impacts and risks are provided in the following sections:

- Section 8.3 - Lower Order Impacts and Risks.
- Sections 8.4 to 8.10 - Higher order Impacts and Risks.

8.3 Low Order Impact and Risk Assessment

Activity	Aspect	Potential Impact or Risk	Receptor	Evaluation of Impact or Risk	Consequence Rating	ALARP Decision Context	Good Practice Control Measure	Additional Control Measures	Likelihood of Occurrence	Residual Risk	Acceptability Assessment	Acceptability Outcome
Vessel Operations	Atmospheric Emissions	Change in air quality	Air Climate	Minor emissions are predicted from the vessel from the use of diesel combustion engine. Vessel emissions would not be significant enough to impact on climate change. The extent of the area of impact is predicted to be localised to the emission point as offshore winds will rapidly disperse atmospheric emission to background levels close to the source while the site survey is undertaken. The severity is assessed as minor based on emissions will rapidly disperse to background levels close to the emission source and impacts to climate change are not predicted. Due to the rapid dispersion of any air emissions impacts to fauna such as birds or coastal communities are not predicted.	Minor (1)	A	CM#1: MO 97: Marine Pollution Prevention – Air Pollution CM#6: Preventative Maintenance System	None identified	N/A	**Low**	• Atmospheric emissions are assessed as having a minor consequence which is not considered as having the potential to result in serious or irreversible environmental damage. Consequently, no further evaluation against the principles of ESD is required. • The proposed management of the impact is aligned with the Beach Environment Policy. • Activities will be undertaken in accordance with the Implementation Strategy. • No stakeholder objections or claims have been raised in relation to vessel atmospheric emissions. • The impact is being managed in accordance with legislative requirements. • Good practice controls have been defined. • The predicted level of impact will not result in a substantial change in air quality which may adversely impact on biodiversity, ecological integrity; social amenity or human health. • Monitoring and reporting requirements are detailed in Section 9.12.8.	Acceptable
Vessel Operations	Planned marine discharges	Change in water quality Toxic effects to marine fauna	Water Marine fauna	Vessel planned marine discharges consist of bilge, brine, cooling water, deck drainage, putrescible waste, sewage, and greywater. These discharges can result in localised impacts to water quality from increased temperature, salinity, nutrients, chemicals, and hydrocarbons which can lead to toxic effects to marine fauna. Vessel planned marine discharges will be of low volume during the seabed surveys and of an intermittent nature. Open marine waters are typically influenced by regional wind and large-scale current patterns resulting in the rapid	Minor (1)	A	CM#2: Protection of the Sea (Prevention of Pollution from Ships) Act 1983 CM#3: MO 96: Marine Pollution Prevention – Sewage	None identified	N/A	**Low**	• Planned marine discharges is assessed as having a minor consequence which is not considered as having the potential to result in serious or irreversible environmental damage. Consequently, no further evaluation against the principles of ESD is required. • The proposed management of the impact is aligned with the Beach Environment Policy.	Acceptable

Activity	Aspect	Potential Impact or Risk	Receptor	Evaluation of Impact or Risk	Consequence Rating	ALARP Decision Context	Good Practice Control Measure	Additional Control Measures	Likelihood of Occurrence	Residual Risk	Acceptability Assessment	Acceptability Outcome
				mixing of surface and near surface waters thus it is expected that any discharges would disperse quickly over a small area. Discharges with the potential to contain toxic components such as bilge and sewage will be treated prior to discharge. The extent of the impact is predicted to be within the operational areas for the duration of the survey. The severity is assessed as minor based on: • Marine discharges will be of low toxicity with controls such as treatment and chemical assessment in place. • Marine discharges are not predicted to have lasting effects on the biological or physical environment in the area of open water of the Operational Areas. • Discharges will be intermittent and of a low volume and rapidly disperse in the marine environment. • As the discharges are discharged into an open oceanic environment they are predicted to mix rapidly with the surrounding waters and impacts to sediments and benthic biota including invertebrates is not predicted. • Given the anticipated rapid dilution of low concentration of hydrocarbons and chemicals within the water column, there is no identified potential for decreases in water quality that may impact on marine fauna that may be present in the operational area while a survey is being undertaken. • Food waste discharges are sporadic and for a short duration thus would not result in fauna habituating to this food source.			CM#4: Spill Containment CM#5: Offshore Environmental Chemical Assessment Process CM#6: Preventative Maintenance System			🟩	• Activities will be undertaken in accordance with the Implementation Strategy. • No stakeholder objections or claims have been raised in relation to vessel planned marine discharges. • The impact is being managed in accordance with legislative requirements. • Good practice controls have been defined. • The predicted level of impact will not result in a substantial change in water quality which may adversely impact on biodiversity, ecological integrity; social amenity or human health. • Monitoring and reporting requirements are detailed in Section 9.12.8.	
Vessel operations	Physical Presence	Changes to the functions, interests or activities of other users	Offshore Petroleum Industry Defence Activities Shipping	An exclusion zone is not required for the seabed surveys thus other marine users traversing (shipping) through the area will be required to apply normal navigation requirements and will not be inconvenienced any more than dealing with any other slow moving or stationary vessels.	Minor (1)	A	CM#7: Ongoing consultation CM#8: Beach Fair Ocean Access Procedure	None identified	N/A	🟩	• Physical presence is assessed as having a minor consequence which is not considered as having the potential to result in serious or irreversible environmental damage. Consequently, no further evaluation against the principles of ESD is required.	Acceptable

Activity	Aspect	Potential Impact or Risk	Receptor	Evaluation of Impact or Risk	Consequence Rating	ALARP Decision Context	Good Practice Control Measure	Additional Control Measures	Likelihood of Occurrence	Residual Risk	Acceptability Assessment	Acceptability Outcome
			Recreational diving, fishing and tourism Commercial fisheries	The Otway Operational Area overlaps with the proposed Regia Marine Seismic Survey Activity Planning Area, TGS Marine Seismic Survey Operational Area and potential 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. Cumulative impacts associated with the seabed surveys and other activities in the Operational Areas are detailed in Section 8.11. Consultation with Department of Defence identified that the Operational Areas are located within restricted airspace, but no other defence areas were identified. As there will be no helicopter activities impacts are not predicted and not controls are required. Recreational diving and tourism have not been identified as occurring within the Operational Areas, mainly due to the distance offshore and no diving or tourism features being present. Recreational fishing from vessels occurs within the Operational Areas as vessels have been seen from both the Thylacine and Yolla platforms though numbers are typically low. Commercial fishing has been identified to occur at low to high levels depending on the fishery and location within the Operational Areas. The extent of the impact to recreational and commercial fishers and other marine users that may transit through the area is predicted to be directly around the vessel within the operational areas for the duration of the survey. The severity is assessed as minor based on: • No exclusion zones are required.			CM#9: MO 30: Prevention of collisions CM#10: MO 27: Safety of navigation and radio equipment			🟩	• The proposed management of the impact is aligned with the Beach Environment Policy. • Activities will be undertaken in accordance with the Implementation Strategy. • No stakeholder objections or claims have been raised in relation to physical presence of the survey vessel. • The impact is being managed in accordance with legislative requirements. • Good practice controls have been defined.	

Activity	Aspect	Potential Impact or Risk	Receptor	Evaluation of Impact or Risk	Consequence Rating	ALARP Decision Context	Good Practice Control Measure	Additional Control Measures	Likelihood of Occurrence	Residual Risk	Acceptability Assessment	Acceptability Outcome
				• The area a fisher or vessel would need to avoid (around a vessel) is no different from any other slow moving or stationary vessels. • The fisheries cover a large area, and the area of displacement is very small and will only be in one place at a time over a number of hours. • Other marine users have not raised any issues in relation to displacement from the seabed surveys. Stakeholder engagement will be ongoing, and any displacement impacts can be managed by: • Provision of pre-survey information 4 weeks including Notice to Mariners, prior to a survey commencing and daily look-ahead information during the survey to allow marine users and Beach to plan the survey areas in a manner that minimises potential impact to each party. • Implementation of Beach's Commercial Fisher Operating Protocol to potentially impacted fishers where displacement cannot be avoided and there is a financial loss to the fisher.								
Vessel operations	Physical presence: collision with marine fauna	Injury/ mortality to fauna	Marine turtles Marine mammals	Marine fauna species most susceptible to vessel strike are typically characterised by one or more of the following characteristics: • Commonly dwells at or near surface waters • Often slow moving or large • Frequents areas with a high levels of vessel traffic • Fauna population is small, threatened, or geographically concentrated in areas that also correspond with high levels of vessel traffic. The National Strategy for Mitigating Vessel Strike of Marine Mega-fauna (CoA 2017a) identifies cetaceans and marine turtles as being vulnerable to vessel collisions. Three marine turtle species (or species habitat) may occur within the Operational Areas though no BIAs or critical habitat to the	Moderate (2)	A	CM#11: EPBC Regulations 2000 – Part 8 Division 8.1 interacting with cetaceans CM#12: Vessel speed restrictions	None identified	Highly Unlikely (2)	Low	• The risk of collision with marine fauna is assessed as low and the consequence was assessed as moderate which is not considered as having the potential to result in serious or irreversible environmental damage. Consequently, no further evaluation against the principles of ESD is required. • The proposed management of the impact is aligned with the Beach Environment Policy. • Activities will be undertaken in accordance with the Implementation Strategy. • No stakeholder objections or claims have been raised in relation to collision with marine fauna.	Acceptable

Activity	Aspect	Potential Impact or Risk	Receptor	Evaluation of Impact or Risk	Consequence Rating	ALARP Decision Context	Good Practice Control Measure	Additional Control Measures	Likelihood of Occurrence	Residual Risk	Acceptability Assessment	Acceptability Outcome
				survival of the species were identified. The Recovery Plan for Marine Turtles in Australia (CoA 2017b) identified vessel strike as a threat. 22 whale species (or species habitat) may occur within the Operational Areas. Foraging behaviours were identified for some species (blue, fin, pygmy right and sei whales); no other biologically important behaviours were identified. The operational areas intersects a foraging BIA for the pygmy blue whale and is within the species range and current core coastal range for the southern right whale. Six dolphin species may occur within the Operational Areas. No important behaviours or BIAs have been identified. The Conservation Management Plan for the blue whale and southern right whale and Conservation Advice for the fin whale, humpback whale and sei whale identify vessel strike as a threat. The National Strategy for Reducing Vessel Strike on Cetaceans and other Marine Megafauna 2017 (CoA 2017a) identifies that speed is a concern when considering collision risk and that slower moving vessels provide greater opportunity for fauna and vessels to avoid collision. The National Strategy for Reducing Vessel Strike on Cetaceans and other Marine Megafauna 2017 (CoA 2017a) does not make any recommendations in relation to a maximum vessel speed, but case studies within the strategy have implemented a 10 knot speed limit in sensitive areas. Based on this information vessel speeds within the Operational Areas will be restricted to 10 knots. The extent of the area where the risk of a vessel collision with fauna may occur is within the Operational Area and the risk could occur while seabed surveys are undertaken. It less likely to occur during the geotechnical survey as the vessel will be stationary while undertaking sampling. The severity is assessed as moderate and likelihood as highly unlikely based on: • Within the Operational Areas the survey vessel will be slow moving to stationary.						🟩	• The risk is being managed in accordance with legislative requirements. • Good practice controls have been defined. • The predicted level of impact and risk will not lead to a long-term decrease in the size of a threatened or migratory listed turtle, whale or dolphin population or have a substantial adverse effect on a population of turtle, whale or dolphin including its life cycle (for example, breeding, feeding, migration behaviour, life expectancy) and spatial distribution. • Vessel collision with marine fauna if it occurred will not: o Impact on the recovery of marine turtles as per the Recovery Plan for Marine Turtles in Australia (CoA 2017b). o Impact the recovery of the blue whale as per the Conservation Management Plan for the Blue Whale (DoE 2015a). o Impact the recovery of the southern right whale as per the Conservation Management Plan for the Southern Right Whale (DSEWPaC 2012a) and draft National Recovery Plan for the Southern Right Whale (DCCEEW 2022a). o Impact the recovery of sei, fin or humpback whales covered by conservation advice. • Actions from the Conservation Management Plan for the Blue Whale (DoE 2015a) applicable to the activity to minimise vessel collisions have been addressed as per: o Ensure all vessel strike incidents are reported in the National Ship Strike Database. Vessel	

Activity	Aspect	Potential Impact or Risk	Receptor	Evaluation of Impact or Risk	Consequence Rating	ALARP Decision Context	Good Practice Control Measure	Additional Control Measures	Likelihood of Occurrence	Residual Risk	Acceptability Assessment	Acceptability Outcome
				• The occurrence of vessel strikes is very low with no incidents occurring to date associated with Beach’s activities in the Otway or Bass Strait region. • If an incident occurred, it would be restricted to individual fauna and unlikely to impede the recovery of a protected species.						🟩	collision with protected marine fauna are required to be reported as detailed in Section 9.10 o 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. This EP details the impact assessment and mitigation measures (controls) to be implemented to ensure impacts are of an acceptable level and ALARP. • Actions from the draft National Recovery Plan for the Southern Right Whale (DCCEEW 2022a) applicable to the activity to minimise vessel collisions have been addressed as per: o Assess risk of vessel strike to southern right whales in BIAs. The operational areas where the risk of vessel collision could occur does not overlap with a southern right whale BIA. The risk of vessel strike to southern right whales in the core coastal area has been assessed in this section. o Ensure environmental impact assessments and associated plans consider and quantify the risk of vessel strike and associated potential cumulative risks in BIAs. The operational areas where the risk of vessel collision could occur does not overlap with a southern right whale BIA. The risk of vessel strike to southern right whales in the core coastal area has been assessed in this section. o Ensure all vessel strike incidents are reported in the National Ship Strike Database. Vessel collision with protected marine fauna are required to be	

Activity	Aspect	Potential Impact or Risk	Receptor	Evaluation of Impact or Risk	Consequence Rating	ALARP Decision Context	Good Practice Control Measure	Additional Control Measures	Likelihood of Occurrence	Residual Risk	Acceptability Assessment	Acceptability Outcome
											reported as detailed in Section 9.10. • Reporting requirements are detailed in Section 9.10	
Vessel operations	Unplanned release: waste	Injury/ mortality to fauna	Seabirds Marine turtles Pinnipeds Cetaceans (whales, dolphins)	Transfer of waste will only occur in port. Waste accidently released to the marine environment may lead to injury or death to individual marine fauna through ingestion or entanglement. 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. The Operational Areas overlaps foraging BIAs for several albatross, common diving-petrel, short-tailed shearwater and white-faced storm-petrel. No habitat critical to the survival of birds occur within the Operational Areas. Marine debris is identified as a threat in the National Recovery Plan for Albatrosses and Petrels (CoA 2022a). Three marine turtle species may occur within the operational area though no BIAs or critical habitat to the survival of the species were identified. The Recovery Plan for Marine Turtles in Australia (CoA 2017b) identifies marine debris as a threat. Two species of pinniped may occur within the Operational Areas: the New Zealand fur-seal and the Australian fur-seal. No BIAs or habitat critical to the survival of the species were identified for pinnipeds. 22 whale species (or species habitat) may occur within the Operational Areas. Foraging behaviours were identified for some species (blue, fin, pygmy right and sei whales); no	Minor (1)	A	CM#13: MO 95: Marine Pollution Prevention - Garbage	None identified	Remote (1)	Low	• The risk of an unplanned release of waste is assessed as low, and the consequence assessed as minor which is not considered as having the potential to result in serious or irreversible environmental damage. Consequently, no further evaluation against the principles of ESD is required. • The proposed management of the impact is aligned with the Beach Environment Policy. • Activities will be undertaken in accordance with the Implementation Strategy. • No stakeholder objections or claims have been raised in relation to vessel unplanned release of waste. • The risk is being managed in accordance with legislative requirements. • No actions in relation to unplanned release of waste from vessels were identified in the Conservation Management Plan for the Blue Whale (DoE 2015a) or draft National Recovery Plan for the Southern Right Whale (DCCEEW 2022a). • Good practice controls have been defined.	Acceptable

Activity	Aspect	Potential Impact or Risk	Receptor	Evaluation of Impact or Risk	Consequence Rating	ALARP Decision Context	Good Practice Control Measure	Additional Control Measures	Likelihood of Occurrence	Residual Risk	Acceptability Assessment	Acceptability Outcome
				other biologically important behaviours were identified. The Operational Areas intersects a foraging BIA for the pygmy blue whale and is within the species range and current core coastal range for the southern right whale. Six dolphin species may occur within the Operational Areas. No important behaviours or BIAs have been identified. The Conservation Management Plan for the blue whale and for the southern right whale identify marine debris as a threat while the Conservation Advice for the fin and sei whale doesn't. The extent of the area of where the risk of unplanned waste being discharged to the marine environment is within the Operational Areas and the risk could occur during a survey. An unplanned release of waste is assessed as minor and remote as unplanned release of waste is uncommon; if waste was lost overboard impacts would be restricted in exposure and quantity and would be limited to individual fauna.								
Vessel operations	Minor spill	Change in water quality	Water quality Marine fauna	Minor spills < 200 L may occur from the vessel equipment, bulk storage, or package chemical leak (deck spill). Given the small volumes of hydrocarbons and chemicals that could be discharged, minor spills are expected to rapidly dissipate and dilute in the high energy environment of the Bass Strait region. The extent of the area of where the risk of minor spills to the marine environment is within the Operational Areas and the risk could occur during a seabed survey. An unplanned minor spill that reached the marine environment is assessed as unlikely and of minor consequence based on: • Impacts to water quality are expected to be temporary and localised. • Minor spills will rapidly disperse in the marine environment. • Receptor exposure would be short term.	Minor (1)	A	CM#14: Spill containment CM#15: SMPEP or SOPEP (appropriate to class)	None identified	Unlikely (3)	**Low**	• The risk of a minor spill to the marine environment is assessed as low, and the consequence assessed as minor which is not considered as having the potential to result in serious or irreversible environmental damage. Consequently, no further evaluation against the principles of ESD is required. • The proposed management of the impact is aligned with the Beach Environment Policy. • Activities will be undertaken in accordance with the Implementation Strategy. • No stakeholder objections or claims have been raised in relation to vessel minor spills. • The risk is being managed in accordance with legislative requirements.	Acceptable

Activity	Aspect	Potential Impact or Risk	Receptor	Evaluation of Impact or Risk	Consequence Rating	ALARP Decision Context	Good Practice Control Measure	Additional Control Measures	Likelihood of Occurrence	Residual Risk	Acceptability Assessment	Acceptability Outcome
										🟩	• Good practice controls have been defined.	

8.4 Seabed Disturbance

8.4.1 Hazards

The survey vessel will hold station using DP or propellers as water depths are too deep for anchoring.

Seabed disturbance will not occur from the geophysical activities.

Seabed disturbance will occur from the physical footprint of taking a CPT, core, or sediment sample.

8.4.2 Potential Environmental Impacts

Potential impacts of seabed disturbance from the geophysical samples to receptors are:

- Disturbance or loss of benthic habitat
- Damage to subsea cables
- Damage to unexploded ordnances
- Disturbance to underwater cultural heritage
- Disturbance to First Nation's underwater cultural heritage

Damage to Beach infrastructure is not predicted as the location of the infrastructure is known to Beach and no geotechnical samples are required within 250 m of Beach infrastructure as detailed in CM#16: OGV Seabed Survey Scope of Work.

8.4.3 EMBA

Predicted impacts from the geophysical samples to the seabed will be limited to the Operational Areas.

8.4.4 Consequence Evaluation

Seabed disturbance will occur from the physical footprint of taking a CPT, core, or sediment sample. The estimated total area of seabed disturbance is 5,400 m^2 (0.0054 km^2). As detailed in Table 4-1 this is comprised of:

- Otway Operational Area A: 3,120 m^2
- Otway Operational Area B: 630 m^2
- Bass Operational Area: 1,650 m^2

8.4.4.1 Benthic Habitat

Surveys of the seabed near the Yolla-A platform showed that the seabed is flat and featureless with sparsely scattered clumps of solitary sponges, sea cucumbers, sea squirts and predatory snails (whelk) (Thales GeoSolutions 2001). As the Bass Operational Area is in a similar area and water depths it is likely that the seabed is of a similar nature to that at the Yolla platform. There are no KEFs located within the Bass Operational Area.

Surveys of the seabed within the Otway Operational Area A (Ramboll 2020) identified:

- Seabed topography is dominated by exposed rock on the seabed.

- Small patches of very thin transgressive coarse sand are present across the survey area.
- Seabed showed a scattered sessile biota on a sandy seafloor.
- No rocky reefs or outcrops were identified.
- Sandy substrates described for Thylacine and Artisan gas fields are consistent with the reported description for the broader Otway Development area of unconsolidated seabed sediments made up of carbonate sands.
- 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.
- 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.
- 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 species or ecological communities listed as threatened under the EPBC Act were observed.

Otway Operational Area B is within the deep shelf and upper slope of the Otway Shelf which consists of nutrient-rich upwelling currents supporting solitary coral communities and bioturbated muds with the presence of solitary azooxanthellate corals, respectively.

The northern part of the Otway Operational Area A and Otway Operational Area B overlap the West Tasmanian Canyons KEF in water depths between 200 to 1500 m. Geotechnical samples for three wells outside of the KEF maybe required within or near the KEF. Sampling is required to validate the seabed within the T/30P title for any potential future drilling in this title. Geotechnical data is required to ensure safe drilling and anchoring of the drill rig. The presence of these canyons influences depth-related patterns in benthic fauna, which peaks at 200-300 m water depth and then decreases with depths greater than 400 m.

The northern part of the Otway Operational Area B also overlap the Zeehan Australian Marine Park (AMP). Up to four geotechnical samples may be taken within the AMP. Each geotechnical sample disturbs ~ 30 m^2 of seabed with potentially up to 4 samples required within the AMP totalling 120 m^2 or 0.00012 km^2. Sampling is required to validate the seabed within the T/30P title for any potential future drilling in this title. Geotechnical data is required to ensure safe drilling and anchoring of the drill rig.

The extent of the area of benthic habitat impact is predicted to be 5,400 m^2 (0.0054 km^2) for a duration of up to months to years while the disturbed areas recolonise. The severity is assessed as minor based on:

- The nature of the benthic habitat within the Bass Operational Area is likely to consist of a flat and featureless seabed with sparse clumps of solitary sponges, sea cucumbers, sea squirts and predatory snails.
- The nature of the benthic habitat within the Otway Operational Area A is likely to consist of relatively low abundance and diversity of benthic faun as expected for coarse sand substrates.
- The nature of the benthic habitat within the Otway Operational Area B is likely to consist of solitary coral communities and bioturbated muds with the presence of solitary azooxanthellate corals.

- No threatened ecological communities, critical habitats, sensitive or protected benthic habitat or species, have been identified in the operational areas.

- The maximum extent of potential seabed disturbance for the West Tasmanian Canyons KEF is 0.000005% (0.00062 km^2/13,550 km^2). Any disturbance would not impact on the productivity of the KEF.

- The maximum extent of potential seabed disturbance for the Zeehan AMP is 0.0000006% (0.00012 km^2/19,897 km^2). Any disturbance would not impact on the productivity of the KEF.

- Any geotechnical sampling within the West Tasmanian Canyons KEF or Zeehan AMP will adopt a precautionary approach and only be undertaken following thorough and extensive geophysical data interpretation. Sample locations will be sited to avoid any seabed areas which exhibit the potential to be irrevocably disturbed by sampling activities. Areas completely precluded from sampling would be, for example, zones of high gradient or sediment build up that indicate the potential to slip if destabilised, or seabed sediments exhibiting local variations possibly linked to novel seabed benthos such as algal mats or seeps. Notwithstanding the adoption of a precautionary approach to seabed interaction, geotechnical samples will only be acquired if deemed completely necessary. The use of existing seabed data and confident extrapolation of the known characteristics as proxy depositionary environments will be used as much as possible. If sampling is unavoidable, such that the results are essential to ensure safe drilling activities, sample will be taken in such a way as to maximise the scientific value of the data with minimal seabed disturbance.

- The activity is consistent with the South-east Commonwealth Marine Reserves Network Management Plan 2013-23 as:

  - The geotechnical sampling overlaps a small part (0.0000006%) of the Zeehan AMP Multiple Use Zone (IUCN VI) and Special Purpose Zone (IUCN VI) for which an allowable activity is mining as long as the activity is conducted as per the accepted environment plan and demonstration that environmental impacts will be consistent with the relevant management plan.

    - The geotechnical sampling will be undertaken as per the accepted environment plan.

    - The mitigated impacts from geotechnical sampling are consistent with the IUCN VI management approach for:

      - Multiple Use Zone—provides for general sustainable use by allowing activities that do not significantly impact on benthic habitats. No significant impact to the Zeehan AMP benthic habitats from geotechnical sampling are predicted as impacts are predicted to be localised, short term and recoverable.

      - Special Purpose Zone—provides for limited natural resource use by limiting access to mining and low level extractive activities. Beach is proposing to take up to 4 seabed samples within the Zeehan AMP.

- Due to the small area of disturbance and that the benthic habitat and associated biota is not unique to the operational areas the benthic disturbance will not modify, destroy, fragment, isolate or disturb a substantial area of habitat such that an adverse impact on marine ecosystem functioning or integrity in a Commonwealth marine area results.

- There is no impediment to the disturbed areas recolonising as the benthic habitat and associated biota is not unique within the operating areas.

- Results of previous surveys of seabed disturbances from oil and gas activities indicating that recovery of benthic fauna in soft sediment substrates occurs within six to 12 months of cessation of the activity (URS 2001).
- Re colonisation and recovery will occur from the undisturbed surrounding area (Ingole et al. 2005 and Bluhm 2001).

8.4.4.2 Subsea Cables

As detailed in Section 7.5.3 there are three subsea telecommunication cables that are present within the Operational Areas. These cables could be disturbed or damaged is geotechnical sampling was to occur over them. Consultation with the cable operators has been undertaken to identify the location of the cables and a 1 km exclusion zone on either side of the cable location will be implemented. In addition, the geophysical survey will be undertaken first to help identify the location of any subsea cables prior to any geotechnical sampling.

With the implementation of the above controls (see CM#1: Seabed Assessment Scope of Work) impacts to subsea cables are not predicted.

8.4.4.3 Unexploded Ordnance

As detailed in Section 7.5.4 the Otway Operational Areas are located within an unexploded ordnance (UXO) Zone 1052 King Island where history of military activities may have resulted in numerous residual hazardous munitions, components, or constituents, but where confirmed UXO affected areas cannot be defined (DoD 2022b).

Otway Operational Area B overlaps UXO Zone SDG087 which has been used for dumping at sea of ordnance and other items, namely ammunition including cartridges, projectiles, and fuses (DoD 2022b).

No UXO zones have been identified within the Bass Operational Area.

Beach undertook seabed surveys ahead of the Otway Drilling Campaign, confirming the absence of UXO within the Otway Operational Area A. Prior to any geotechnical sampling the geophysical survey will be undertaken first to identify the location of any UXO that will need to be report and avoided.

As the aim of the geophysical survey is to identify seabed hazards including UXOs, impacts to UXO are not predicted.

8.4.4.4 Underwater Cultural Heritage

Section 7.2.5 details that the Otway and Bass Operational Areas each contain one shipwreck, the S.S. Selje and Albert, respectively. One additional shipwreck, the Alfred, is located 3 km to the north of the Otway Operational Area. These wrecks are not within a protected zone. Impacts to these wrecks and other unidentified underwater cultural heritage could occur if their location is not known and avoided.

No impacts to known underwater cultural heritage sites are predicted as geotechnical samples will not be taken within these areas. Prior to any geotechnical sampling the geophysical survey will be undertaken first to identify the location of any underwater cultural heritage that will need to be report and avoided. The guidance Underwater Cultural Heritage Guidance for Offshore Developments (DoEE 2019) recommends using remote sensing techniques such as magnetometer, side scan sonar, sub-bottom profiling and multi-beam sonar surveys to identified underwater cultural heritage. These techniques will be used for the geophysical survey.

As the aim of the geophysical survey is to identify seabed hazards including underwater cultural heritage, impacts to underwater cultural heritage are not predicted.

8.4.4.5 First Nation's Underwater Cultural Heritage

As detailed in Section 7.6 no First Nations underwater cultural heritage has been identified in the Operational Areas from a review of available online information. 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 the geophysical survey and geotechnical sampling to identify First Nations underwater cultural heritage.

As the aim of the geophysical survey and geotechnical sampling is to help identify First Nations underwater cultural heritage, impacts to First Nations underwater cultural heritage are not predicted.

8.4.5 Control Measures, ALARP and Acceptability Assessment

Control, ALARP and Acceptability Assessment: Physical Presence	
ALARP decision context and justification	ALARP Decision Context: Type B Impacts from seabed disturbance are well understood but there has been new requirements in relation to underwater cultural heritage and First Nations underwater cultural heritage. Via stakeholder consultation additional controls have been identified to avoid impacts to benthic habitats, telecommunication cables, UXO, underwater cultural heritage and First Nations underwater cultural heritage.
Adopted Control Measures	**Source of good industry practice control measures**
CM#16: OGV Seabed Survey Scope of Work	To avoid impacts to benthic habitats, telecommunication cables, UXO underwater cultural heritage and First Nations underwater cultural heritage the OGV Seabed Survey Scope of Work will include the following: • Known locations of telecommunication cables, UXO, underwater cultural heritage and First Nations underwater cultural heritage where geotechnical samples will not be taken. • Geotechnical samples will not be taken within 1 km of a telecommunication cables. • Geotechnical samples will not be taken within of 250 m of Beach infrastructure. • Geotechnical sample locations will be finalised after the geophysical survey data is obtained and interpretated. Geotechnical samples will only be taken within the West Tasmanian Canyons KEF or Zeehan AMP if it is deemed essential to ensure safe drilling activities. • Geophysical data will be obtained in a manner that can be utilised to obtain information on First Nations underwater cultural heritage. This will be determined in consultation with the appropriate First Nations groups, where engagement can be obtained, and cultural heritage researchers or consultants.

Additional Controls Assessed		
Control	**Cost/Benefit Analysis**	**Control Implemented?**
No geotechnical samples within the West Tasmanian Canyons KEF or Zeehan AMP	Geotechnical sample locations will be finalised after the geophysical survey data is obtained and interpretated. Geotechnical samples will only be taken within the West Tasmanian Canyons KEF or Zeehan AMP if it is deemed essential to ensure safe drilling activities. The maximum extent of potential seabed disturbance for the West Tasmanian Canyons KEF is 0.000005% and any disturbance would not impact on the productivity of the KEF. The geotechnical sampling overlaps 0.0000006% of the Zeehan AMP Multiple Use Zone (IUCN VI) and Special Purpose Zone (IUCN VI) for which an allowable activity is mining as long as the activity is conducted as per the accepted environment plan and demonstration that environmental impacts will be consistent with	No

	the relevant management plan. The impact assessments and acceptability assessment has shown that both these requirements are met.
Consequence rating	Minor (1)
Likelihood of occurrence	NA
Residual risk	Low
Acceptability assessment	
To meet the principles of ESD	Seabed disturbance was assessed as having a minor consequence which is not considered as having the potential to result in serious or irreversible environmental damage. Consequently, no further evaluation against the principles of ESD is required.
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 9).
External context	The merits of claims or objections raised by a relevant stakeholder have been adequately assessed and additional controls adopted where appropriate, as detailed in Section 5 Consultation. Information has been provided to the DNP as per the Petroleum Activities and Australian Marine Parks – A guidance note to support environmental protection and effective consultation (Stakeholder ID 4898). No objections or claims were raised. Telstra (Stakeholder ID 1019) was consulted and agreed that a 1 km buffer either side of the cables where no geotechnical samples would be taken was appropriate. This has been implemented as part of CM#16: OGV Seabed Survey Scope of Work. Department of Defence (Stakeholder ID 1521) raised that UXO maybe present in the area. This has been assessed in this Section and the control and the control CM#16: OGV Seabed Survey Scope of Work will be implemented where: • Geotechnical samples will not be taken within known locations of UXO. • Geotechnical sample locations will be finalised after the geophysical survey data is obtained and interpretated to identify any UXO. A meeting was held with First Peoples - State Relations (Victoria) (Stakeholder ID 1458) and Heritage Victoria (Stakeholder ID 1561) to obtain advice to inform the seabed survey acquisition to be able to identify underwater cultural heritage artifacts and features. Based on information from this meeting Wessex Archaeology (Stakeholder ID 293601290) who specialise in cultural mapping of landscapes including songlines, and submerged archaeology, are being engaged by Beach to provide expertise in relation to identifying underwater cultural heritage as part of the seabed surveys and interpretation of results. This information will feed into future drilling an installation activities for the OGV Project which is out of scope of this EP.
Other requirements	The environmental impacts from taking four geotechnical samples within the Zeehan AMP Multiple Use Zone (IUCN VI) and Special Purpose Zone (IUCN VI) will be consistent with the South-East Commonwealth Marine Reserves Network Management Plan 2013-2023 as: the activity is an allowable activity as long as it is conducted as per the accepted environment plan and the environmental impacts will be consistent with the relevant management plan. • The geotechnical sampling will be undertaken as per the accepted environment plan. • The mitigated impacts from geotechnical sampling are consistent with the IUCN VI management approach for: ❍ Multiple Use Zone—provides for general sustainable use by allowing activities that do not significantly impact on benthic habitats. No significant impact to the Zeehan AMP benthic habitats from geotechnical sampling are predicted as impacts are predicted to be localised, short term and recoverable. ❍ Special Purpose Zone—provides for limited natural resource use by limiting access to mining and low level extractive activities. Beach is proposing to take up to 4 seabed samples within the Zeehan AMP.

	Information has been provided to the DNP as per the Petroleum Activities and Australian Marine Parks – A guidance note to support environmental protection and effective consultation (Stakeholder ID 4898). No objections or claims were raised. The requirements of the Underwater Cultural Heritage Guidance for Offshore Developments (DoEE 2019) and Draft Guidelines for working in the near and offshore environment to protect Underwater Cultural Heritage (DCCEEW 2023b) have been meet by: • A review of the Underwater Cultural Heritage database has been undertaken to identify known underwater cultural heritage as detailed in Section 7.2.5. • Consultation has been undertaken with relevant government departments (see Stakeholder Records X) and First Nations groups (see Stakeholder Records X). • Magnetometer, side scan sonar, sub-bottom profiling and multi-beam sonar surveys to identified underwater cultural heritage. • Suitable experts will be engaged to interpret the results of a survey once completed. • Reporting of any underwater cultural heritage items is detailed in Section 9.10.
Monitoring and reporting	If any UXO or cultural heritage that is not known is identified, it will be reported as per the reporting requirements in Section 9.10. Seabed survey data applicable to the West Tasmanian Canyons KEF and Zeehan AMP will be provided to the Director of National Parks if they want the data, as detailed in consultation with the DNP (Stakeholder ID 4898).
Acceptability outcome	**Acceptable**

8.6 Underwater Acoustic Emissions

8.6.1 Hazards

Underwater acoustic emissions from the seabed assessment may impact biological receptors such as:

- Marine invertebrates, including commercially important species.
- Fish (with and without swim bladders) including commercial species such as sharks.
- Marine reptiles.
- Marine mammals.

8.6.2 Potential Environmental Impacts

Potential impacts of underwater acoustic from the geophysical survey, geotechnical survey and vessel to receptors are:

- Behavioural changes
- Auditory impairment, permanent threshold shift (PTS) and temporary threshold shift (TTS).

8.6.3 Sound Metric Terminology

Sound travels as a wave with the amplitude of the wave related to the amount of acoustic energy it carries, or how loud the sound will appear to be. Figure 8-1 shows a representative sound wave and the sound measures used in this assessment. Table 8-2 provides definitions of the sound measures and other sound related terms used in this assessment.

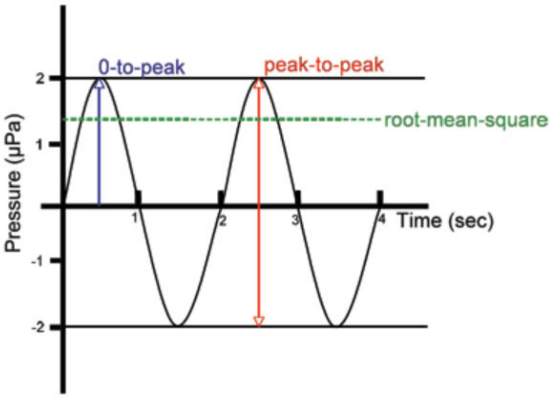


Figure 8-1: Representative Sound Wave and Sound Measures

Table 8-2: Sound Terminology

Term	Definition
0-to-peak or Peak sound pressure level (PK)	The peak pressure, also called the 0-to-peak pressure, is the range in pressure between zero and the greatest pressure of the signal. It is represented by PK and the unit dB re 1 µPa and summarised as dB PK.
Peak-to-peak sound pressure level (PK-PK)	The peak-to-peak pressure is the range in pressure between the most negative pressure and the most positive pressure of the signal. It is represented by PK-PK and the unit dB re 1 µPa or dB re 1 μPa^2m^2 and summarised as dB PK-PK.
Permanent threshold shift (PTS)	Permanent loss of hearing sensitivity caused by excessive noise exposure.
Received sound levels	The sound level measured at a receiver.
Root mean square sound pressure level	The root-mean-square pressure is the square root of the average of the square of the pressure of the sound signal over a given duration. It is represented by sound pressure level (SPL) and the unit dB re 1 µPa and summarised as dB SPL.
Sound exposure level (SEL)	A measure of the sound energy that considers both received level and duration of exposure. SEL is specified in terms of either single pulse (SEL) or a defined accumulation period (SEL_{cum}). For this assessment 24hrs has been used for the accumulation period and is shown as SEL_{24h}. Units are dB re 1 $\mu Pa^2 \cdot s$ or dB re 1 μPa^2m^2s.
Source sound level	The sound pressure level or sound exposure level measured 1 metre from a theoretical point source that radiates the same total sound power as the actual source.
Temporary threshold shift (TTS)	Temporary loss of hearing sensitivity caused by excessive noise exposure.

8.6.4 Consequence Evaluation – Geophysical Survey

Underwater acoustic emissions associated with the geophysical survey will be impulsive.

To assess potential impacts to receptors from underwater acoustic emissions associated with the geophysical survey, acoustic modelling was used to predict received underwater sound levels. The modelled received sound levels where then compared to defined noise effect criteria, as determined by scientific research and academic papers, for the identified receptors.

8.6.4.1 Acoustic Modelling

Beach commissioned JASCO Applied Sciences (JASCO) to undertake acoustic modelling to assist in understanding the potential acoustic impact on key regional receptors including fish, marine mammals, turtles, benthic invertebrates, and corals (McPherson and Wood 2017 Appendix B, Wood and McPherson 2019 Appendix C).

Based on a review of the geophysical equipment to be used for the seabed survey it was identified that the boomer and SBP were most relevant to the assessment of potential impacts to receptors, due to their operating frequencies and source sound levels. The modelling approach accounted for the acoustic emission characteristics of a representative boomer (AP3000) and SBP (Edgetech X-star system) both towed at 3 m depth.

The modelling study undertaken by JASCO (McPherson and Wood 2017 Appendix B) assessed six locations within the Otway Basin as detailed in Figure 8-2. Table 8-3 details the relevant seabed survey locations for the modelled sites. Further modelling was undertaken at four sites (Site 1, 2, 3 and 4) to obtain maximum ranges to updated impact thresholds for cetaceans and pinnipeds (Wood and McPherson 2019 Appendix C).

Though modelling was not undertaken within the Otway Operational Area B. Modelling at Site 2 in 129.5 m water depth would be applicable as it is representative of the shallower areas of the area and the sound fields would diminish as the water depth increases.

Modelling was not undertaken for the Bass Operational Area and instead a doubling of ranges has been applied based on the following information from JASCO.

The seabed within the Bass seabed assessment area consists of very soft to soft alternating layers of silty carbonate clay and silty sands. Three profiles for the seabed were considered within the Otway seabed assessment area:

1. Well-cemented carbonate caprock over increasingly cemented calcarenite (Sites 1 and 2 in > 100m water).

2. Thin layer of coarse carbonate sand over increasingly cemented calcarenite (Sites 3, 4, 6 in 70-85m water).

3. 20 m layer of coarse carbonate sand over increasingly cemented calcarenite (Site 5 in 72 m water).

From an acoustic perspective, the third profile is considered more like that within the Bass seabed assessment area than the other two. This profile will result in higher transmission loss for lower frequencies below approximately 100 Hz, increasing with range from the source. Higher frequency components of the signal will still experience transmission loss, but this will be proportionally significantly less than that experienced by lower frequency components (Duncan et al. 2009).

The differences between the third profile from the Otway seabed assessment area is that the Bass seabed assessment area will result in signals experiencing higher transmission loss at close range, as the seafloor within the Bass seabed assessment area is less reflective for steeper grazing angles – which occur close to the source. At longer range, the seafloor is more reflective for shallower grazing angles, and as such the levels could be slightly higher.

If the comparison was being with the geology from the first listed profile from the Otway, the ranges would be quite different, however as the third profile shares more similarities, the differences will be lower. It is approximated that at longer ranges, the sound levels experienced could be 3-10 dB higher for an equivalent distance beyond one water depth horizontally from the source, considering the frequencies of relevance and differences in seabed and the examples provided in (Duncan et al. 2009).

As the ranges to noise effect criteria for any fauna group occur within one water depth, they will likely be either uninfluenced, or comparatively shorter at the Bass seabed assessment area then they were predicted to be for the Otway sites. The distance at which marine mammal or turtle behaviour effects could occur could increase. The difference in ranges to the marine mammal behavioural threshold of 160 dB re 1 µPa between modelling sites in McPherson and Wood (2017) associated with the first and third geological profiles could be as much as a factor of two (75 vs 136 m). Therefore, considering this, and the similarities and differences between the third listed profile in McPherson and Wood (2017) and the Bass seabed assessment area, it is anticipated that the ranges would be in the order of twice as much again.

Table 8-3: Acoustic Modelling Locations Applicable to the Seabed Survey Locations

Modelled Location	Water Depth (m)	Seabed Survey Location
Site 1: THY MID PT	100.5	Otway Operational Area A
Site 2: MURCH DDIP	129.5	Otway Operational Area B
Site 3: G3	85	Otway Operational Area A
Site 4: ARTISAN	71.6	Otway Operational Area A
Site 5: VICP69 NTH	72.8	N/A

Modelled Location	Water Depth (m)	Seabed Survey Location
Site 6: VICP69 MEEKI	79.1	N/A

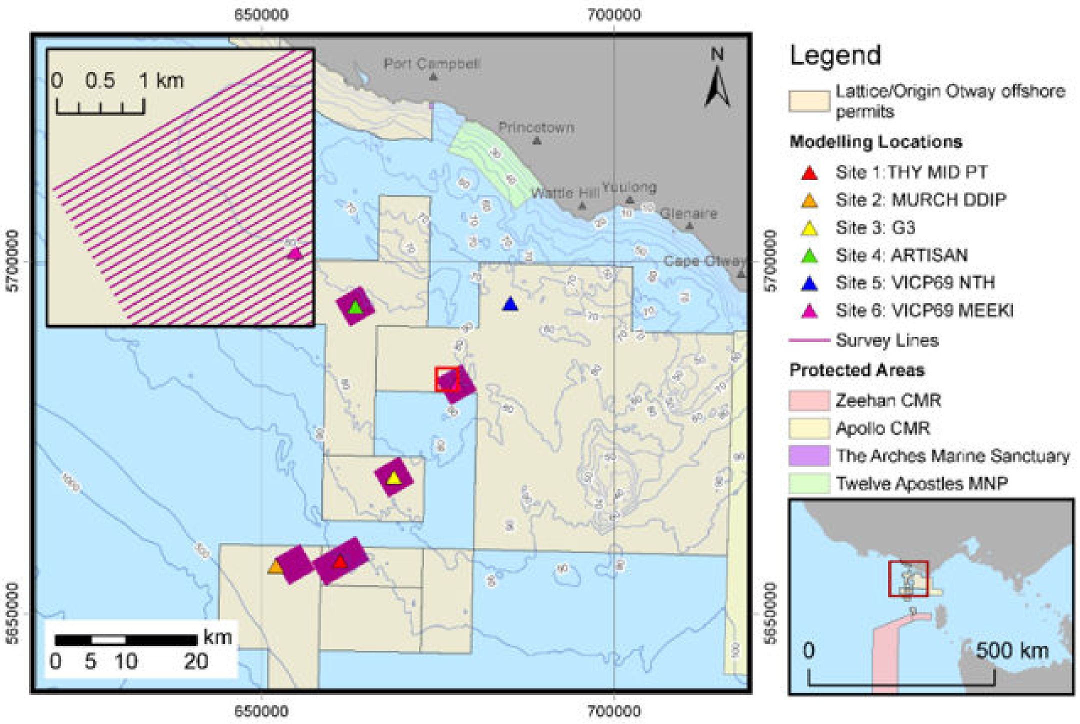


Figure 8-2: Noise Modelling Locations

8.6.4.2 Noise Effect Criteria

To assess whether an impact may occur modelled received sound levels were compared to receptor noise effect criteria. These criteria are based on published scientific research and papers as detailed in Table 8-4 and within the relevant receptor section. In lieu of any noise criteria specific to geophysical surveys, criteria that is applied to seismic surveys have been used.

Table 8-4: Effect Criteria and Applicable Results for Representative Single Pulse Sites and for Accumulated SEL Scenarios

Receptor	Noise Effect Criteria	Boomer Maximum R_{max} Distance (m)	SBP Maximum R_{max} Distance (m)	Noise Effect Criteria Reference
Plankton: mortality/potential mortal injury	>207 dB PK or 210 dB SELcum[1]	1.6 Not reached	0.3 Not reached	Popper et al. 2014
Invertebrates: effect at the seafloor	186–190 dB SEL 192–199 dB SEL_{24h} 209–212 dB PK-PK	Not reached Not reached Not reached	Not reached Not reached Not reached	Day et al. 2016
Invertebrates: no effect at the seafloor	202 dB PK-PK	Not reached	Not reached	Payne et al. 2008
Lobster: no effect at the seafloor	183 dB SEL	Not reached	Not reached	McCauley and Duncan 2016
Squid: behavioural	166 dB SPL	36	Not reached	McCauley et al. 2000
Fish (swim bladder): mortality/potential mortal injury	>207 dB PK or 207 dB SELcum[1]	1.6 Not reached	0.3 Not reached	Popper et al. 2014
Fish (swim bladder): recoverable injury	>213 dB PK or >216 dB SELcum[1]	0.6 Not reached	0.1 Not reached	Popper et al. 2014
Fish (no swim bladder): mortality/ potential mortal injury	>213 dB PK or >219 dB SELcum[1]	0.6 Not reached	0.1 Not reached	Popper et al. 2014
Fish (no swim bladder): recoverable injury	>213 dB PK or >216 dB SELcum[1]	0.6 Not reached	0.1 Not reached	Popper et al. 2014
Fish (swim bladder or no swim bladder): TTS	>186 dB SELcum[1]	Not reached	Not reached	Popper et al. 2014
Turtle: behavioural	166 dB SPL	36	Not reached	NSF 2011
Turtle: mortality/potential mortal injury	>207 dB PK or 210 dB SELcum[1]	1.6 Not reached	0.3 Not reached	Popper et al. 2014
Marine mammals: behavioural	160 dB SPL	145	2	NOAA 2019
Low-frequency cetaceans: PTS (humpback and pygmy blue whales)	219 dB PK 183 dB SEL_{24h}	Not reached Not reached	Not reached Not reached	Southall et al. 2019
Low-frequency cetaceans: TTS (humpback and pygmy blue whales)	213 dB PK 168 dB SEL_{24h}	Not reached 10	Not reached 10	Southall et al. 2019
High-frequency cetaceans: PTS (dolphins, beaked whales, sperm whales)	230 dB PK 185 dB SEL_{24h}	Not reached Not reached	Not reached Not reached	Southall et al. 2019
High-frequency cetaceans: TTS (dolphins, beaked whales, sperm whales)	224 dB PK 170 dB SEL_{24h}	Not reached Not reached	Not reached Not reached	Southall et al. 2019
Very-high-frequency cetaceans: PTS (pygmy and dwarf sperm whales)	202 dB PK 155 dB SEL_{24h}	4.5 Not reached	0.6 Not reached	Southall et al. 2019

Receptor	Noise Effect Criteria	Boomer Maximum R_{max} Distance (m)	SBP Maximum R_{max} Distance (m)	Noise Effect Criteria Reference
Very-high-frequency cetaceans: TTS (pygmy and dwarf sperm whales)	196 dB PK 140 dB SEL_{24h}	8.9 Not reached	1.2 Not reached	Southall et al. 2019
Pinnipeds: PTS (sea lions and seals)	232 dB PK 203 dB SEL_{24h}	Not reached Not reached	Not reached Not reached	Southall et al. 2019
Pinnipeds: TTS (sea lions and seals)	226 dB PK 188 dB SEL_{24h}	Not reached Not reached	Not reached Not reached	Southall et al. 2019

Note 1: Popper et al. 2014 do not defined an accumulation period. For this assessment 24 hrs was used based on the independent, expert peer review by Popper (Santos 2018) that concluded that a 24-hour period to assess SELcum and any associated effects is likely to be conservative for assessing the potential effects to fish.

8.6.4.3 Plankton

There is no data or studies that indicate geophysical survey equipment such as boomers and sub-bottom profilers acoustic emissions impact plankton. In lieu of any data the noise effect criteria from the American National Standards Institute (ANSI) accredited report of sound exposure guidelines for fishes and sea turtles (Popper et al. 2014) is used.

Table 8-4 details the noise effect criteria from Popper et al. (2014) and the distances at which modelling estimated they could be reaced for plankton. In summary:

- The noise effect criteria for injury to plankton for the boomer is predicted at a maximum distance of 1.6 m and 0.3 m for the SBP for the peak sound pressure level (PK) while the noise effect criteria based on the sound exposure level (SEL) is not reached.

- Note that for the Bass Operational Area these distances are estimated to be double (see Section 8.6.4.1) so will be 3.2 m for the boomer and 0.6 m for the SBP.

Based on these distances the predicted level of impact to plankton is assessed as minor based on:

- Mortality or mortal injury impacts to plankton (including fish eggs and larvae) will be well below natural mortality rates, which are very high, as report by Tang et al. (2014) of daily mortality rates of 11.6% (average minimum) to 59.8% (average maximum). In a review of mortality estimates (Houde and Zastrow 1993) the mean mortality rate for marine fish larvae was equivalent to a loss of 21.3% per day. In the experiment undertaken by McCauley et al. (2017) zooplankton mortality rate background levels were 19%.
- Richardson et al (2017) notes that zooplankton communities can begin to recover in number during a seismic survey, such that a continuous decline in zooplankton throughout the seismic survey is unlikely and parts of the survey area would be replenished with zooplankton as the survey progresses. This would also apply to geophysical surveys. Impacts to phytoplankton, the food source for zooplankton, are not predicted and such they are still available for zooplankton to graze on.

- Predicted impacts to plankton do not remove them from the food web and as such the nutrients and energy they contain are retained within the ecosystem. Even after plankton die, their carcasses remain in the water column for several days where they are scavenged before any remaining carcasses sink to the seafloor to be consumed by opportunistic benthic organisms (Kirillin et al. 2012, Tang et al. 2014, Dubovskaya et al. 2015). Thus, impacts to primary production and ecosystem function are not predicted.

- The area of predicted impact overlaps the pygmy blue whale high density, known and possible foraging BIAs. Foraging is associated with the timing of the Bonney Coast Upwelling and the presence of the krill. Mortality or mortal injury effects to krill does not impact on pygmy blue whales being able to feed on them as the krill will still be available within the water column. In addition, any impacts to krill are likely to be within natural mortalities rates thus not effecting the availability of krill available for foraging.

- Impacts to the Bonney Coast Upwelling and its role it plays in ecosystem function and productivity is not predicted as:
    - Impacts to phytoplankton are not predicted.
    - Mortality or mortal injury effects to zooplankton are within natural mortality rates and zooplankton communities can begin to recover during the geophysical survey such that a continuous decline in zooplankton throughout the duration of the survey is not anticipated and parts of the survey area would be replenished as the survey progressed.
    - Mortality or mortal injury effects to zooplankton, including krill, does not impact on marine fauna being able to feed on them as they will still be available within the water column.

8.6.4.4 Marine Invertebrates

There has been a number of comprehensive reviews of seismic noise impacts to invertebrates such as Carroll et al. (2017) and Edmonds et al. (2016). Available literature suggests particle motion, rather than sound pressure, is a more important factor for crustacean and bivalve hearing. There are currently no defined noise effect criteria for invertebrates and hence the results from the Day et al. (2016) study on acoustic impacts from seismic exposure on southern rock lobsters (*Jasus edwardsii*) are typically used. The study found that sub-lethal effects, relating to impairment of reflexes, damage to the statocysts and reduction in numbers of haemocytes (possibly indicative of decreased immune response function), were observed after exposure to measured received sound levels of:

- Single-pulse SEL: 186–190 dB re 1 µPa^2.s
- Accumulated SEL: 192–199 dB re 1 µPa^2.s
- Peak-peak pressure: 209–212 dB re 1 µPa.

Payne et al (2007) found no effects to the American lobster (*Homarus americanus*) in righting time or haemolymph biochemistry but a possible reduction in calcium after exposure to received noise levels of 202 dB re 1 µPa (PK-PK). Thus, the Payne et al (2007) level is applied as a no effect criteria. This assessment also used the no effect level proposed by McCauley and Duncan (2016) for rock lobsters of accumulated SEL 183 dB re 1 µPa^2.s.

Table 8-4 details that the sound levels from the representative boomer and SBP do not reach any of the effect or no effect criteria for invertebrates at the seafloor.

McCauley et al. (2000) assessed the effects of air gun noise on caged squid (*Sepioteuthis australis*). No sub-lethal injury or mortality as a result of exposures in this study was observed. Several squid showed alarm responses to the start-up of an airgun by firing their ink sacs and/or jetting away from the source, but this was not observed for similar or greater levels if the signal was ramped up. General habituation was observed with a decrease in alarm responses with subsequent exposures. During the trial the squid showed avoidance to the airgun by keeping close to the water surface at the end of the cage furthest from the airgun (within the sound shadow). McCauley suggests a threshold of 166 SPL would give an indication of the extent of disruption of a seismic survey by significant alteration in swimming patterns. Table 8-4 details that the noise effect criteria at which an alteration of swimming patterns may occur is predicted within 36 m of the boomer and not reached for the SBP.

Based on the modelling no mortality or injury effects to invertebrates including commercial squid, rock lobster and giant crab species are predicted.

8.6.4.5 Fish

Noise effect criteria for fish are based on the presence of a swim bladder. Typically, site-attached, and demersal fish including eels have a swim bladder, whereas pelagic fish do not. As noise effect criteria for sharks does not currently exist, they are assessed as fish without swim bladders. Noise effect criteria used in this assessment for fish are from the American National Standards Institute (ANSI) accredited report of sound exposure guidelines for fishes and sea turtles (Popper et al. 2014). These guidelines defined quantitative effect criteria for three types of immediate effects:

- Mortality, including injury leading to death.
- Recoverable injury, including injuries unlikely to result in mortality, such as hair cell damage and minor haematoma.
- TTS.

Table 8-4 details the noise effect criteria from Popper et al. (2014) and the distances at which modelling estimated they could be reaced for fish with and without a swim bladder. In summary:

- The noise effect criteria for mortality/potential mortal injury is predicted for fish with a swim bladder at a maximum distance of 1.6 m and for fish without a swim bladder at 0.6 m.
- The noise effect criteria for recoverable injury is predicted for fish with a swim bladder and without a swim bladder at a maximum distance of 0.6 m.
- The noise effect criteria for TTS for fish with and without a swim bladder was not reached.
- Note that for the Bass Operational Area these distances are estimated to be double (see Section 8.6.4.1) so will be a maximum of 3.2 m.

Studies to date have not shown mortality in relation to potential impact to fish from impulsive noise, though prolonged or extreme exposure to high-intensity, low-frequency sound, may lead to physical damage such as threshold shifts in hearing or barotraumatic ruptures (Carroll et al. 2017). Based on the modelling and that the geophysical surveys will not result in prolonged or extreme exposure to fish injury impacts to fish are not predictedr.

The white shark is known to occur within the Operational Areas but there are no BIAs or critical habitats. The Recovery Plan for the White Shark (DSEWPaC 2013a) does not identify underwater acoustic emissions as a threat.

The Operational Areas do not overlap any areas where site-attached fish species are likely to be present, thus it would be expected that any impacts to fish, including eels and sharks, would be limited to behavioural impacts such as startle response or avoidance behaviour as the vessel moves through an area. Thus, behavioural impacts to fish would be temporary and unlikely to have a significant impact on individuals or at a population level.

8.6.4.6 Marine Turtles

Noise effect criteria used in this assessment for injury to turtles are from the ANSI accredited report of sound exposure guidelines for fishes and sea turtles (Popper et al. 2014). Table 8-4 details the noise effect criteria from Popper et al. 2014 and the distances at which modelling estimated they could be reached. In summary:

- The noise effect criteria for injury to turtles were not reached for the SBP.
- The noise effect criteria for injury to turtles for the boomer is predicted at a maximum distance of 1.6 m for the peak sound pressure level (PK) while the noise effect criteria based on the sound exposure level (SEL) is not reached.

- Note that for the Bass Operational Area these distances are estimated to be double (see Section 8.6.4.1) so will be a maximum of 3.2 m.

Finneran et al. (2017) presented revised thresholds for turtle injury and hearing impairment from impulsive noise, considering both PK and frequency weighted SEL, suggesting that PTS may occur in response to 204 dB re 1 uPa^2·s (SEL24h) or 232 dB re 1 µPa (PK) and TTS may occur in response to 189 dB re 1 uPa^2·s (SEL24h) or 226 dB re 1 µPa (PK). These thresholds were not modelled but based on the modelling distances are likely to be < 2.4m for the PTS and TTS PK for the boomer and 0.3 m for the PTS and TTS PK for the SBP. For the Bass Operational Area these distances are estimated to be double (see Section 8.6.4.1) so will be a maximum of < 4.8 m.

The SEL24h threshold was not modelled but unlikely to be an issue for turtles as there are no BIAs or habitat critical to the survival of the species occur within the Operational Areas.

Based on limited data regarding noise levels that illicit a behavioural response in turtles, the United States National Marine Fisheries Service criterion of 166 dB re 1 µPa (SPL) is typically applied (NFS 2011) and is detailed in the Recovery Plan for Marine Turtles in Australia (CoA 2017b). For the boomer this noise effect criteria is predicted at a maximum distance of 36 m but was not reached for the SBP. For the Bass Operational Area these distances are estimated to be double (see Section 8.6.4.1) so will be a maximum of 72 m.

Three marine turtle species may occur within the Operational Areas. No BIAs or habitat critical to the survival of the species occur within the Operational Areas. Impacts to turtles are likely to be restricted to avoidance behaviour as the vessel moves through an area and unlikely to result in any injury due to the very small distance within which noise levels reach the noise effect criteria for injury. Thus, behavioural impacts to turtles would be temporary and unlikely to have a significant impact on individuals or at a population level.

8.6.4.7 Marine Mammals

Noise effect criteria used in this assessment for impacts to marine mammals are from:

- The National Oceanic and Atmospheric Administration (NOAA 2019) acoustic threshold for behavioural effects in marine mammals of 160 dB re 1 µPa (SPL). Whilst the newly published 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.

- Southall et al. (2019) for the onset of PTS and TTS. These criteria, as details in Table 8-4, are based on dual acoustic criteria for impulsive sounds that included peak pressure level thresholds and SEL24h thresholds, where the subscripted 24h refers to the accumulation period for calculating SEL.

Table 8-4 details the noise effect criteria and the distances at which modelling estimated they could be reached. In summary:

- The acoustic threshold for behavioural effects in marine mammals is predicted at a maximum of 2 m for the SBP and 145 m for the boomer.

- The thresholds for the onset of PTS were predicted to be reached only for very-high-frequency cetaceans at a maximum distance of 0.6 m for the SBP and 4.5 m for the boomer for the peak sound pressure level (PK). The threshold based on the sound exposure level (SEL) metric is not reached.

- The thresholds for the onset of TTS were predicted to be reached only for very-high-frequency cetaceans at a maximum distance of 1.2 m for the SBP and 8.9 m for the boomer for the peak sound pressure level. The threshold based on the sound exposure level (SEL) metric is predicted to be reached only for low-frequency cetaceans at a maximum distance of 10 m for both the SBP and boomer.

- For pinnipeds, such as fur-seals, the noise effect criteria for TTS and PTS where not reached.
- For the Bass Operational Area these distances are estimated to be double (see Section 8.6.4.1) so will be a maximum of 290 m for behavioural effects.

Low-frequency cetaceans

As detailed in Section 7.4.12.6 several low frequency cetacean may occur within the Operational Areas. Foraging behaviours were identified for the blue, fin, pygmy right and sei whales; no other important behaviours were identified. The Operational Areas intersect the migration BIA for the southern right whale and foraging BIAs for the pygmy blue whale. The reproduction BIA for the southern right whale does not overlap the Operational Areas.

For low-frequency cetaceans the noise effect criteria for PTS is not reached and for TTS is only reached at 10 m for the Otway Operational Area and 20 m for the Bass Operational Area for the 24-hour cumulative SEL. Thus, it is not feasible that a low-frequency cetacean, even if foraging, resting, or migrating would be within 20 m of a moving vessel for 24 hours. Predicted impacts would, therefore, be limited to behavioural response such as avoidance of the area while the geophysical survey is undertaken.

The severity of impact to low-frequency cetaceans is assessed as moderate based on:

- Geophysical surveys can be managed to ensure that they will not be inconsistent with the Conservation Management Plan for the Blue Whale (DoE 2015a) that 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 as:
    - The noise effect criteria for PTS is not reached and for TTS is only reached at 10 m for the Otway Operational Area and 20 m for the Bass Operational Area for the 24-hour cumulative SEL. Thus, it is not feasible that a low-frequency cetacean, even if foraging, resting, or migrating would be within 20 m of a moving vessel for 24 hours.
    - The distance to the noise effect criteria for behavioural response is 145 m for the Otway Operational Area and 290 m for the Bass Operational Area and as this distance is small the control measures detailed in Section 8.6.5.4 can be implemented to reduce the risk of displacement occurring as per the Guidance on Key Terms within the Conservation Management Plan for the Blue Whale (DCCEEW 2023c) that details 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.
- The fin and sei whale's conservation advice (TSSC 2015e, TSSC 2015f) has a consequence rating for anthropogenic noise and acoustic disturbance as minor with the extent over which the threat may operate as moderate-large.
- The pygmy right whale Species Profile and Threats Database (DotEE 2020a) in lieu of no conservation advice, does not identify anthropogenic noise and acoustic disturbance as a threat.
- The Conservation Management Plan for the Southern Right Whale (DSEWPaC 2012a) identifies acute industrial noise, of which geophysical surveys would be classed, as a threat that is classified as a minor consequence which is defined as individuals are affected but no affect at a population level. Geophysical surveys can be managed to ensure that they will not be inconsistent with the draft National Recovery Plan for the Southern Right Whale (DCCEEW 2022a) that details that actions within and adjacent to southern right whale BIAs and habitat critical to the survival of the species, should demonstrate that it does not prevent any southern right whale from utilising the area or cause injury (TTS and PTS) and/or disturbance, as:
    - The noise effect criteria thresholds are not reached at the southern right whale reproduction BIA, which at its closest is ~4 km from the Otway Operational Area.

  - The seabed survey is not being undertaken within the coastlines areas of south-west Victoria in Gunditjmara Sea Country where southern right whale feed and birth or the Whale Birthing Dreaming Sites in coastal bay areas from Port Campbell to Portland, including Warrnambool (DCCEEW 2022a). Noise impacts to southern right whales in these sites are not predicted.

  - The noise effect criteria for PTS is not reached and for TTS is only reached at 10 m for the Otway Operational Area and 20 m for the Bass Operational Area for the 24-hour cumulative SEL. Thus, it is not feasible that a low-frequency cetacean, even if foraging, resting, or migrating would be within 20 m of a moving vessel for 24 hours.

  - The distance to the noise effect criteria for behavioural response is 145 m for the Otway Operational Area and 290 m for the Bass Operational Area and as this distance is small the control measures detailed in Section 8.6.6 can be implemented to reduce the risk of preventing southern right whales from utilising the area or cause injury (TTS and PTS) and/or disturbance.

High-frequency cetaceans

High-frequency cetaceans such as dolphins, sperm whales and beaked whales may occur in the Operational Areas, but no BIAs or biologically important behaviours were identified. The noise effect criteria for TTS and PTS for these species was not reached, thus predicted impacts would be limited to behavioural response such as avoidance of the area while the geophysical survey is undertaken.

The extent of the area of where mid frequency cetaceans may be impacted by noise is predicted to be 145 m for the Otway Operational Area and 290 m for the Bass Operational Area. The severity of impact to high-frequency cetaceans is assessed as Minor (1) based on:

- Impacts to high-frequency cetaceans are likely to be limited to avoidance behavioural where they may move away from the vessel as it is undertaking the geophysical survey.

- The area of impact is small, as the maximum distance to the noise effect criteria at which impacts could occur is 290 m.

- The area of impact is not within a BIA or habitat critical to the survival of a high-frequency cetacean species and thus impacts are unlikely to have a significant impact on individuals or at a population level.

Very-high-frequency cetaceans

Very-high-frequency cetaceans, such as pygmy and dwarf sperm whales, may occur in the Operational Areas, but no BIAs or biologically important behaviours were identified. The maximum distance for the PTS noise effect criteria is 4.5 m for the Otway Operational Area and 9 m for the Bass Operational Area. For TTS the maximum distance is 8.9 m for the Otway Operational Area and 17.8 m for the Bass Operational Area. Thus, predicted impacts would be limited to behavioural response such as avoidance of the area while the geophysical survey is undertaken.

The extent of the area of where very-high-frequency cetaceans may be impacted by noise is predicted to be 8.9 m for the Otway Operational Area and 17.8 m for the Bass Operational Area. The severity of impact to seals is assessed as Minor (1) based on:

- Impacts to very-high-frequency cetaceans are likely to be limited to avoidance behavioural where they may move away from the vessel as it is undertaking the geophysical survey.

- The area of impact is small, as the maximum distance to the noise effect criteria at which impacts could occur is 17.8 m.

- The area of impact is not within a BIA or habitat critical to the survival of a very-high-frequency cetaceans species and thus impacts are unlikely to have a significant impact on individuals or at a population level.

Pinnipeds

The Australian and New Zealand fur-seals may occur in the Operational Areas but no BIAs or haul out areas were identified. The noise effect criteria for TTS and PTS for these species was not reached, thus predicted impacts would be limited to behavioural response such as avoidance of area while the geophysical survey is undertaken.

The extent of the area of where seals may be impacted by noise is predicted to be 145 m for the Otway Operational Area and 290 m for the Bass Operational Area. The severity of impact to seals is assessed as Minor based on:

- Impacts to seals are likely to be limited to avoidance behaviour where they may move away from the vessel as it is undertaking the geophysical survey.
- The area of impact is small, as the distance to the noise effect criteria at which impacts could occur is 290 m.
- The area of impact is not within a BIA or habitat critical to the survival of a seal species and thus impacts are unlikely to have a significant impact on individuals or at a population level.

8.6.5 Consequence Evaluation – Geotechnical Survey

Underwater acoustic emissions associated with the geotechnical survey will be continuous.

The marine fauna considered was based on a review of receptors that may be impacted by continuous sound, these were marine mammals, turtles, and fish.

To assess potential impacts to receptors from underwater acoustic emissions associated with the survey vessel acoustic modelling was used to predict received underwater sound levels. The modelled received sound levels where then compared to defined noise effect criteria, as determined by scientific research and academic papers, for the identified receptors.

8.6.5.1 Acoustic Modelling

JASCO Applied Sciences (JASCO) performed a modelling study of underwater sound levels associated with the Beach Energy Otway Development (Koessler and McPherson 2021 Appendix D). The modelling included a stationary vessel on dynamic positioning which would be equivalent or larger than the type of vessel that would be used to take the geotechnical samples.

JASCO (Stroot et al. 2022) performed a modelling study of underwater sound levels associated with the Yolla Drilling Program. The modelling included a stationary vessel on dynamic positioning while undertaking resupply activities to a platform. The modelled vessel is equivalent or larger than the type of vessel that would be used to take the geotechnical samples. The results used in this assessment is for Scenario 4 from Stroot et al. (2022) which includes underwater sound levels associated with the vessel on DP and the platform so is likely to be an slight overestimate of a standalone vessel on DP taking a seabed sample.

8.6.5.2 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 SPL criteria for fish with a swim bladder involved in hearing. Table 8-5 details the criteria and modelled distances to them (Koessler and McPherson 2021. Appendix D, Stroot et al. 2022 Appendix E).

The 48 hr recoverable injury threshold was not reached for the modelling for the Otway Operational Areas and was reached within 30 m for the Bass Operational Area. As there are no habitats likely to support site-attached fish in the Operational Area, it is unlikely that fish species would be present for a period of 48 hours.

The 12 hr TTS criteria was reached within 30 m for the Otway Operational Areas and 110 m for the Bass Operational Area. As there are no habitats likely to support site-attached fish in the Operational Area, it is unlikely that fish species would be present for a period of 12 hours. Thus, TTS impacts are not predicted.

Behavioural impacts are more likely such as moving away from the vessel. There are no habitats or features within the Operational Area that would restrict fish and sharks from moving away from the vessel.

The severity of impact to fish is assessed as minor based on:

- The white shark is known to occur within the Operational Areas but there are no BIAs or critical habitats. The Recovery Plan for the White Shark (DSEWPaC 2013a) does not identify underwater acoustic emissions as a threat.
- Injury, PTS and TTS impacts are not predicted.
- Impacts to fish, including sharks, would be limited to behavioural impacts such as startle response or avoidance behaviour near the vessel. Thus, behavioural impacts to fish would be temporary and unlikely to have a significant impact on individuals or at a population level.
- Temporary avoidance behaviour may occur near the vessel for commercial fish species; however, recovery would occur once the vessel had moved away. Based on the small area of impact and that displaced fish would still be available to be caught outside of the Operational Areas, impacts to commercial fishing are not predicted.

Table 8-5: SPL Criteria for Fish with a Swim Bladder involved in Hearing and Modelled Distances

Fish: Swim bladder involved in hearing	SPL (Lp; dB re 1 µPa)	DP vessel at Otway	DP vessel at Bass
Recoverable injury	170 dB SPL for 48 h	Not reached	30 m
TTS	158 dB SPL for 12 h	30 m	110 m

8.6.5.3 Marine Turtles

The Recovery Plan for Marine Turtles in Australia (CoA 2017b) 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.

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 insufficient data available to propose a quantitative exposure guideline or criteria for marine turtles for continuous sound such as those generated by vessels 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 (10s 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. Based on this information avoidance behaviour may occur within the Operational Areas.

Finneran et al. (2017) presented revised thresholds for turtle PTS and TTS for continuous sound. Table 8-6 details the criteria and modelled distances to them (Koessler and McPherson 2021. Appendix D). For the Otway Operational Areas the 24hr PTS criteria was not reached and the 24 hr TTS criteria was reached within 30 m. For the Bass Operational Area the 24hr PTS criteria was reached within 10 m and the 24 hr TTS criteria was reached within 110 m

Three marine turtle species may occur within the Operational Areas though no BIAs or habitat critical to the survival of the species were identified.

The severity of impact to marine turtles is assessed as minor based on:

- The Recovery Plan for Marine Turtles in Australia (CoA 2017b) 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.
- Thresholds for turtle PTS and TTS over 24 hrs were predicted to occur with a maximum distance of 110 m within the Operational Area where no marine turtle important habits are located.
- Avoidance behaviour may occur within the Operational Areas where no marine turtle important habits are located.
- Low numbers of marine turtles are predicted in the Operational Areas and therefore impacts would be limited to a small number of individuals.

Table 8-6: Finneran Turtle SEL_{24h} Thresholds and Modelled Distances

Marine Turtles	SEL_{24h} threshold	DP vessel at Otway	DP vessel at Bass
PTS	220 dB re 1 µPa^2·s	Not reached	10 m
TTS	200 dB re 1 µPa^2·s	30 m	110 m

8.6.5.4 Marine Mammals

Noise effect criteria used in this assessment for impacts to marine mammals are from:

- NOAA (2019) acoustic threshold for behavioural effects in marine mammals of 120 dB re 1 µPa (SPL). Whilst the newly published 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.
- NMFS (2018) exposure criterion for the onset of temporary hearing 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. The NMFS (2018) exposure criteria are based on a cumulative SELs over a period of 24 hours.

Table 8-7 details the furthest modelled distance to the criteria.

Table 8-7: Cetacean PTS, TTS and Behaviour Sound Criteria and Predicted Distances and Areas

Hearing group	SEL_{24h} threshold ($L_{E,24h}$; dB re 1 µPa^2·s)	DP Vessel at Otway (km)	DP Vessel at Bass (km)
	PTS		
Low-frequency cetaceans	199	0.06	0.11
High-frequency cetaceans	198	0.02	0.11
Very-high-frequency cetaceans	173	0.09	0.12
Otariid seals	219	–	-
	TTS		
Low-frequency cetaceans	179	0.60	0.35
High-frequency cetaceans	178	0.07	0.12
Very-high-frequency cetaceans	153	0.84	0.47
Otariid seals	199	0.02	0.11
	Behaviour		
Marine mammals	120 SPL	2.71	5.94

Low-frequency cetaceans

As detailed in Section 7.4.12.6 several low frequency cetacean may occur within the Operational Areas. Foraging behaviours were identified for the blue, fin, pygmy right and sei whales; no other important behaviours were identified. The Operational Areas intersect the migration BIA for the southern right whale and foraging BIAs for the pygmy blue whale.

For low-frequency cetaceans the noise effect criteria for:

- Otway Operational Areas is reached at 60 m for PTS and 600 m for TTS. The distance to the behavioural threshold is 2.71 km.
- Bass Otway Operational Area is reached at 110 m for PTS and 350 m for TTS. The distance to the behavioural threshold is 5.94 km.

The severity of impact to low-frequency cetaceans is assessed as moderate based on:

- Geotechnical sampling can be managed to ensure that it will not be inconsistent with the Conservation Management Plan for the Blue Whale (DoE 2015a) that 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 as:
  - The noise effect criteria for PTS is reached at a maximum of 110 m and for 600 m for TTS for the 24-hour cumulative SEL. It is unlikely that a foraging blue whale would be within 110 to 600 m of a stationary vessel for up to 24 hours. Especially as a geotechnical sample takes only a couple of hours to take before moving to the next sample location.
  - The distance to the noise effect criteria for behavioural response is between 2.71 km and 5.94 km and control measures detailed in Section 8.6.5.4 can be implemented to reduce the risk of displacement occurring as per the Guidance on Key Terms within the Conservation Management Plan for the Blue Whale (DCCEEW 2023c) that

details 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.

- The fin and sei whale's conservation advice (TSSC 2015e, TSSC 2015f) has a consequence rating for anthropogenic noise and acoustic disturbance as minor with the extent over which the threat may operate as moderate-large.
- The pygmy right whale Species Profile and Threats Database (DotEE 2020a) in lieu of no conservation advice, does not identify anthropogenic noise and acoustic disturbance as a threat.
- The Conservation Management Plan for the Southern Right Whale (DSEWPaC 2012a) identifies acute industrial noise, of which the geotechnical vessel would be classed, as a threat that is classified as a minor consequence which is defined as individuals are affected but no affect at a population level.
- Geotechnical sampling can be managed to ensure that it will not be inconsistent with the draft National Recovery Plan for the Southern Right Whale (DCCEEW 2022a) that details that actions within and adjacent to southern right whale BIAs and habitat critical to the survival of the species, should demonstrate that it does not prevent any southern right whale from utilising the area or cause injury (TTS and PTS) and/or disturbance, as:
    - The Operational Areas do not overlap the southern right whale reproduction BIA (Figure 7-49). The Otway Operational Area is ~4 km from the reproduction BIA and the further distance to a noise effect criteria is 2.71 km for behaviour. The Bass Operational Area is ~35 km from the reproduction BIA and the further distance to a noise effect criteria is 5.94 for behaviour.
    - The seabed survey is not being undertaken within the coastlines areas of south-west Victoria in Gunditjmara Sea Country where southern right whale feed and birth or the Whale Birthing Dreaming Sites in coastal bay areas from Port Campbell to Portland, including Warrnambool (DCCEEW 2022a). Noise impacts to southern right whales in these sites are not predicted.
    - The Bass and Otway Operational Areas overlap the southern right whale migration BIA (Figure 7-49). The control measures detailed in Section 8.6.5.4 will be implemented to reduce the risk of preventing southern right whales from utilising the area or cause injury (TTS and PTS) and/or disturbance.
    - PTS and TTS impacts are not predicted to southern right whales, by themselves or with calf, that may be moving through migration BIA based on mean recorded swims speeds for southern right whales are between 3 – 3.3 km/hr (Mate et al. 2011; Mackay et al. 2015 cited in Charlton 2017). As the furthest distance to the noise effect criteria for PTS is reached at 110 m and for TTS is reached at 600 m for the 24-hour cumulative SEL, southern right whales, by themselves or with calf, would move out of the ensonified area before PTS or TTS could occur.
- The fin, pygmy right and sei whales do not have conservation management plans. The fin and sei whales have conservation advice (TSSC 2015e, TSSC 2016f) which both identify anthropogenic noise as a threat. The fin and sei whale's conservation advice 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 and the Species Profile and Threats Database (DotEE 2020a) does not identify anthropogenic noise and acoustic disturbance as a threat.

High-frequency cetaceans

High-frequency cetaceans such as dolphins, sperm whales and beaked whales may occur in the Operational Areas, but no BIAs or biologically important behaviours were identified.

For high-frequency cetaceans the noise effect criteria for:

- Otway Operational Areas is reached at 20 m for PTS and 70 m for TTS. The distance to the behavioural threshold is 2.71 km.
- Bass Otway Operational Area is reached at 110 m for PTS and 120 m for TTS. The distance to the behavioural threshold is 5.94 km.

The severity of impact to high-frequency cetaceans is assessed as minor based on:

- No BIAs or biologically important behaviours were identified for high-frequency cetaceans.
- It is not feasible that a high-frequency cetacean would be within 20 m to 12 m of a vessel for 24 hours, thus PTS and TTS impacts are not predicted.
- Predicted impacts would be limited to behavioural response such as avoidance of the area while the geotechnical sampling is being undertaken.

Very-high-frequency cetaceans

Very-high-frequency cetaceans, such as pygmy and dwarf sperm whales, may occur in the Operational Areas, but no BIAs or biologically important behaviours were identified.

For high-frequency cetaceans the noise effect criteria for:

- Otway Operational Areas is reached at 90 m for PTS and 840 m for TTS. The distance to the behavioural threshold is 2.71 km.
- Bass Otway Operational Area is reached at 120 m for PTS and 470 m for TTS. The distance to the behavioural threshold is 5.94 km.

The severity of impact to very-high-frequency cetaceans is assessed as minor based on:

- No BIAs or biologically important behaviours were identified for very-high-frequency cetaceans.
- It is not feasible that a very-high-frequency cetacean would be within 90 m to 840 m of a vessel for 24 hours, thus PTS and TTS impacts are not predicted.
- Predicted impacts would be limited to behavioural response such as avoidance of the area while the geotechnical sampling is being undertaken.

Otariid seals

Otariid seals, such as the Australian sea lion and Australian and New Zealand fur seals may occur within the Operational Areas.

For Otariid seals the noise effect criteria for:

- Otway Operational Areas is not reached for PTS and is 20 m for TTS. The distance to the behavioural threshold is 2.71 km.
- Bass Otway Operational Area is not reached for PTS and is 110 m for TTS. The distance to the behavioural threshold is 5.94 km.

The consequence is assessed as Minor based on:

- No biologically important behaviours or biologically important areas were identified within the Operational Areas thus predicted impacts would be limited to behavioural response such as avoidance of area while geotechnical sampling is undertaken.
- The area of impact is not within a BIA or habitat critical to the survival of a seal species and thus impacts are unlikely to have a significant impact on individuals or at a population level.

8.6.6 Control Measures, ALARP and Acceptability Assessment

Control, ALARP and Acceptability Assessment: Underwater Acoustic Emissions	
ALARP Decision Context and Justification	**ALARP Decision Context: Type B** Impacts from geophysical impulsive sound emissions are well understood though there is the potential for uncertainty in relation to the level of impact. Geophysical activities are well practised, and there are no conflicts with company values, no partner interests and no significant media interests.
Control Measures	**Source of good practice control measures**
CM#11: EPBC Regulations 2000 – Part 8 Division 8.1 interacting with cetaceans	EPBC Regulations 2000 – Part 8 Division 8.1 interacting with cetaceans describes strategies to ensure whales and dolphins are not harmed during offshore interactions with vessels and helicopters. Vessels will adhere to EPBC Regulations 2000 – Part 8 Division 8.1 interacting with cetaceans in relation to distances to cetaceans. These regulations stipulate a safe operating distance of 300 m. This distance covers the furthest noise effect distance of 145 m for geophysical surveys within the Otway Operational Area and the furthest noise effect distance of 290 m for geophysical surveys within the Bass Operational Area. As the geophysical survey vessel is manoeuvrable, even when the geophysical equipment is in the water this requirement, the 300 m distance can be applied. Maintaining a 300 m distance to all whales will ensure that impacts will be managed such that they can continue to utilise the area without injury and will not be displaced from biologically important behaviours such as foraging, migrating, or resting.
CM#17: Geophysical Whale Management Procedure	For geophysical surveys using SBP (boomer or sparker) a prestart visual observation period of 30 mins will be applied to 300 m prior to the start of the SBP (boomer or sparker) this is to ensure that no whales are within 300 m prior to starting the equipment. A 300 m distance covers the furthest noise effect distance of 145 m for geophysical surveys within the Otway Operational Area and the furthest noise effect distance of 290 m for geophysical surveys within the Bass Operational Area. If during the prestart visual observation period, a whale is sighted within 300 m of the vessel the SBP equipment activation will be delayed until the whale has moved outside of the 300 m zone or 30 minutes has lapsed since the last whale sighting within 300 m. 30 minutes is sufficient time for the vessel and/or whale to have moved 300 m away and to account for blue whales that are capable of diving for periods upwards of 20 minutes as detailed in Section 7.4.12.6. Once the survey has commenced CM#11 applies where the vessel is required to maintain a 300 m distance to all whales. SBP equipment will not be started at night if there have been three or more delays to the start-up of the equipment due to whales in the previous 24 hours. Applying a 300 m distance will ensure that impacts to whales will be managed such that they can continue to utilise the area without injury and are not displaced from biologically important behaviours such as foraging, migrating, or resting. These controls will be applied to all seasons as a conservative measure to cover not only the peak foraging periods in the area (January to April) but the broader period when pygmy blue whales, and other whales such as the fin, pygmy right and sei may be in the area and when southern right whales are within nearshore BIAs or moving through the area in May/June and Oct/Nov.

Control, ALARP and Acceptability Assessment: Underwater Acoustic Emissions	
	If whales numbers are greater than expected such that pre-start observations are delayed three times in a 24 hour period or the vessel has to move away from a whale or a pod of whales in a 24 hr period, a review of the controls currently in place will be undertaken by the Activity Offshore Representative, Activity Project Manager and Environment Advisor. The review will be documented and will be undertaken against the Implementation of the EPBC Act Policy 2.1 Part A requirements to identify if further controls need to be applied to ensure that impacts and risks are ALARP and within the defined acceptable level.
CM#18: Geotechnical Whale Management Procedure	The Geotechnical Whale Management Procedure details the controls to prevent possible PTS, TTS and displacement impacts to foraging blue whale and southern right whales that maybe present in migration or reproduction BIAs. The procedure assumes that once a vessel is on DP to take a geotechnical sample foraging whales that enter the Activity Action Zone are not displaced as foraging behaviour has not been disrupted as the whale has commenced or continued foraging and thus aligns with the Conservation Management Plan for the Blue Whale (DoE 2015a) and DAWE (2021a) definitions. In this situation only PTS and TTS need to be managed to ensure the activity is not inconsistent with the Conservation Management Plan for the Blue Whale (DoE 2015a). Prior to commencing geotechnical sampling at a well location a pre-sampling survey will be undertaken of the following Activity Action Zones: • Otway – 3 km • Bass – 6 km The Activity Action Zones are based on the distance to the furthest modelled PTS, TTS or behaviour criteria for low-frequency cetaceans as detailed in Table 8-7, and have been rounded up to take into account accuracy of estimation of distance at sea. On advice from the Blue Whale Study, a conservative approach will be adopted whereby it is assumed that all whales are conducting biologically important behaviours (e.g., foraging or reproduction). Surveys will be undertaken for 30 min prior to the sampling commencing. If a whale is sighted within the Activity Action Zone, sampling will not commence until: • No whales are observed for 30 min within the Activity Action Zone; or • Whales are observed leaving the Activity Action Zone. The period of 30 min is deemed as sufficient time to observed deep diving whales such as blue whales based on blue whale foraging behaviour and dive duration detailed in the blue whale section in Section 7.4.12.6. Once sampling has commenced observations will be undertaken as far as can be seen covering the Activity Action Zone. If a whale is sighted within the Activity Action Zone, the following will occur: • If the vessel can do so it will move away from the whale and maintain a minimum separation distance equal to the Activity Action Zone. • If the vessel cannot move away from the whale, the vessel will reduce thrusters if safe to do so. The sampling will cease as soon as it is safe, and the vessel will move out of the Activity Action Zone. The activity can recommence once: • No whales are observed for 30 min within the Activity Action Zone; or • Whales are observed leaving the Activity Action Zone. Sampling can commence at night or in low visibility conditions (i.e., when observations cannot be undertaken) if no more than three whales have been seen in the Activity Action Zone in the preceding daylight hours. The no more than three whales criterion is acceptable for blue whales because it indicates the krill stock at the location has been diminished. More than three whales within the previous daylight hours may indicate a large krill supply and more whales could be expected. The daylight hours is justified because it is the longest possible continuous observation period (i.e., one full day of observations). Three southern right whales would be an indication that there is an increased likelihood of a southern right whale within the Activity Action Zone during the period that observations cannot be undertaken.

Control, ALARP and Acceptability Assessment: Underwater Acoustic Emissions		
	If the MFO cannot observe out to the Activity Action Zone from the vessel at a static location, an observation survey will be undertaken of the Activity Action Zone prior to commencing sampling. The survey will consist of a number of lines in Activity Action Zone with the distance between lines and vessel speed determined by the MFO based on the distance they can be confident in identifying whales based on the sea state and weather visibility conditions. If visibility is poor, closer survey lines and a slower vessel speed will be required compared to if visibility is high.	
CM#19: Marine Fauna Observer	A dedicated MFO will be present on the vessel to undertake pre-sampling survey, visual observations and implement controls. The MFO will have proven experience in whale observation, distance estimation and reporting. In addition, at least one crew member onboard the vessel will have proven experience in whale observation, distance estimation and reporting to provide coverage when the MFO is required to break.	
Additional Controls Assessed		
Control	**Cost/Benefit Analysis**	**Control Implemented?**
Seasonal timing	Blue whales are potentially in the foraging BIA within the Operational Areas from November through to June. Southern right whales may travel through the Operational Areas to and from coastal aggregation and migration areas during May-June and September-November and be present in the coastal aggregation and migration areas, between June to October. Thus, there is no period when there is not a whale undertaking a biologically important behaviour within the Operational Areas. The implementation of additional controls above the legislative requirements of the EPBC Regulations 2000 – Part 8 Division 8.1 interacting with cetaceans will be implemented to manage potential impacts to whales undertaking biologically important behaviour.	No
Implementation of the EPBC Act Policy 2.1 Shutdown Zones	Geophysical equipment operates at significantly lower source levels than a commercial seismic array, and thus the resulting sound levels are proportionally lower at comparable distances. EPBC Act Policy 2.1 was developed for seismic surveys with the aim of the policy to provide: • Practical standards to minimise the risk of acoustic injury to whales in the vicinity of seismic survey operations. • A framework that minimises the risk of biological consequences from acoustic disturbance from seismic survey sources to whales in biologically important habitat areas or during critical behaviours. • Provide guidance to both proponents of seismic surveys and operators conducting seismic surveys about their legal responsibilities under the EPBC Act. Modelling has shown that received noise levels and distances to noise effect criteria for the geophysical survey are significantly lower than those for seismic surveys with the largest distance predicted to be 290 m for the behavioural noise effect criteria for marine mammals. The distances proposed in the policy to minimise the risk of acoustic injury to whales and risk of biological consequences from acoustic disturbance from seismic survey sources to whales in biologically important habitat areas or during critical behaviours of 1 km, for the low power zone, and 500 m, for the shut-down zone, are significantly larger than the predicted distance of 290 m for the noise effect criteria for behavioural disturbance and 20 m for the noise effect criteria for TTS. As the vessel is continuously moving, the distance from the vessel to any marine mammal will exceed the small distances within which noise levels reach the noise effect criteria within seconds. Displacement due to behavioural impacts could occur up to 290 m from the source, and with a moving vessel the distances to the threshold criteria will occur quickly	No

Control, ALARP and Acceptability Assessment: Underwater Acoustic Emissions		
	(within 3 minutes for a vessel travelling at approx. 8 km/hr). By the time a whale is sighted, and equipment shut down, it is likely the distance would have been covered and the whale has passed, therefore affording no benefit. As such, based on the small distances within which the noise effect criteria for marine mammals are reached, that impacts are not predicted to injure individuals or displace pygmy blue whales from the foraging BIA, the implementation of shut-down zones does not afford any further benefit.	
Implementation of the EPBC Act Policy 2.1 Soft start	Soft starts are applied to seismic surveys to slowly ramp up the seismic source allowing fauna to move away from the source. No seismic source will be used for the activity and the geophysical equipment being used for the survey cannot be slowly ramped up.	No
Passive acoustic monitoring (PAM)	PAM is most useful in the detection of odontocetes such as sperm whales, dolphins and porpoise known to emit regular distinctive clicks and high frequency calls during long dives. PAM has limited utility in detecting lower frequency calls of baleen whales (such as blue whales, southern right whales) especially when in the presence of constant background low frequency sound such as that generated by the vessel towing the PAM system. Given the very low utility and associated unreliability of using PAM to inform mitigation decision making, any additional cost is considered disproportionate to the benefit gained.	No
Dedicated monitoring vessel	An additional dedicated vessel is not required as monitoring activities can be effectively conducted from the geophysical vessel. Cost is disproportionate to marginal environmental benefit.	No
Aerial surveillance	Aerial surveillance from aircraft or drones is not required as monitoring activities can be effectively conducted from the geophysical vessel. Cost is disproportionate to marginal environmental benefit.	No

Consequence rating	Moderate (2)
Likelihood of occurrence	NA
Residual risk	Low
Acceptability Assessment	
To meet the principles of ESD	Underwater acoustic emissions were assessed as having a moderate consequence which is not considered as having the potential to result in serious or irreversible environmental damage. Consequently, no further evaluation against the principles of ESD is required.
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 9).
External context	There have been no stakeholder objections or claims regarding underwater acoustic emissions.
Other requirements	Underwater acoustic emissions will be managed in accordance with legislative requirements. underwater acoustic emissions will: • Not impact on the recovery of marine turtles as per the Recovery Plan for Marine Turtles in Australia (CoA 2017b). • Be managed such that any blue whale continues to utilise the area without injury and is not displaced from a foraging area (DoE 2015a, DCCEEW 2023c). • Not impact the recovery of the blue whale as per the Conservation Management Plan for the Blue Whale (DoE 2015a). • Not impact the recovery of the southern right whale as per the Conservation Management Plan for the Southern Right Whale (DSEWPaC 2012a) or draft National Recovery Plan for the Southern Right Whale (DCCEEW 2022a). • Not impact the recovery of the white shark as per the Recovery Plan for the White Shark (DSEWPaC 2013a).

Control, ALARP and Acceptability Assessment: Underwater Acoustic Emissions	
	Actions from the Conservation Management Plan for the Blue Whale (DoE 2015a, DCCEEW 2023c) applicable to the activity in relation to assessing and addressing anthropogenic noise have been addressed as per: • Assessing the effect of anthropogenic noise on blue whale behaviour. Section 8.6.4.7 assesses the effects of anthropogenic noise from the activity 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 8.6.4.7 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 draft National Recovery Plan for the Southern Right Whale (DCCEEW 2022a) 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 it does not prevent any southern right whale from utilising the area or cause injury (TTS and PTS) and/or disturbance. • 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. Section 8.6.4.7 assesses the effects of anthropogenic noise from the activity on southern right whales and Section 8.6.5.4 includes consideration of national policy and guidelines relevant to geophysical surveys. • Quantify risks of anthropogenic underwater noise to Southern Right Whales, including behavioural disturbance, changes to vocalisations, and physiological effects to whales. Section 8.6.4.7 assesses the effects of anthropogenic noise from geophysical surveys on southern right whales.
Monitoring and reporting	Cetacean sightings will be recorded using the DCCEEW sighting sheets as detailed in Section 9.12.9.
Acceptability outcome	**Acceptable**

8.7 Light Emissions

8.7.1 Hazards

Vessel activities may be undertaken 24 hours a day. Therefore, lighting is required at night for navigation and to ensure safe operations when working on vessels.

8.7.2 Potential Environmental Impacts

The predicted environmental impacts from light emissions are:

- Changes in ambient light leading to changes in fauna behaviour, through attraction of light-sensitive species

8.7.3 EMBA

The EMBA for light emissions is based on the National Light Pollution Guidelines for Wildlife (CoA 2023). The guidelines recommend undertaking a light impact assessment where important habitat for list 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 (CoA 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. Subsequently, the 20 km light EMBA adopted here is considered to be highly conservative.

The guidelines identify marine turtles, seabirds and migratory shorebirds, fish, invertebrates, and zooplankton as potentially being impacted by artificial light to a level significant enough to require assessment. 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. For this assessment a distance of 20 km from the operational areas was used to identify any areas where turtles, shorebirds and seabirds may be foraging, breeding, roosting, or migrating. This area (20 km around the Operational Areas) is called the light EMBA. The EPBC Protected Matters Report for the light EMBA is in Appendix A.5.

Table 8-8 details the shorebirds and seabirds that may be foraging, breeding, roosting, or migrating within the light EMBA. These were identified from the light EMBA PMST Report (Appendix A.5) and BIAs from the National Conservation Values Atlas.

Artificial light can disrupt turtle nesting and hatching behaviours. Artificial light is listed as a key threat in the Recovery Plan for Marine Turtles in Australia (CoA 2017b). Listed turtle species may occur within the light EMBA, however, no biologically important behaviours, 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 is not predicted.

The closest distance to shore is from the Otway Operational Area A at ~ 10 km. If the survey vessel is visible at this distance light levels would be equivalent to other vessel traffic in the area, and therefore impacts on coastal settlements are not considered further.

Therefore, the light-sensitive receptors that may occur within the light EMBA are:

- Seabirds and migratory shorebirds.
- Zooplankton, invertebrates, and fish.

Table 8-8: Light Sensitive Receptors within the Light EMBA

Receptor	Biologically Important Behaviour	Otway	Bass
Albatross			
Antipodean albatross	Foraging, feeding or related behaviour likely to occur within area	X	X
	Foraging BIA	X	
Black-browed albatross	Foraging, feeding or related behaviour likely to occur within area	X	X
	Foraging BIA	X	X
Buller's albatross	Foraging, feeding or related behaviour likely to occur within area	X	
	Foraging BIA	X	X
Campbell albatross	Foraging, feeding or related behaviour likely to occur within area	X	X
	Foraging BIA	X	X
Gibson's Albatross	Foraging, feeding or related behaviour likely to occur within area		X
Indian yellow-nosed albatross	Foraging BIA	X	X
Northern Buller's albatross	Foraging, feeding or related behaviour likely to occur within area	X	
Northern royal albatross	Foraging, feeding or related behaviour likely to occur within area	X	
Salvin's albatross	Foraging, feeding or related behaviour likely to occur within area	X	X
Shy albatross	Foraging, feeding or related behaviour likely to occur within area	X	X
	Foraging BIA	X	X
Southern royal albatross	Foraging, feeding or related behaviour likely to occur within area	X	X
Wandering albatross	Foraging, feeding or related behaviour likely to occur within area	X	X
	Foraging BIA	X	X
White-capped albatross	Foraging, feeding or related behaviour likely to occur within area	X	X
Seabird			
Black-faced cormorant	Breeding known to occur within area	X	
Common diving-petrel	Foraging BIA	X	
Flesh-footed shearwater	Foraging, feeding or related behaviour likely to occur within area	X	X
Little Penguin	Breeding known to occur within area	X	
Northern Giant Petrel	Foraging, feeding or related behaviour likely to occur within area	X	X
Short-tailed shearwater	Breeding known to occur within area	X	
	Foraging BIA	X	
Southern giant-petrel	Foraging, feeding or related behaviour likely to occur within area	X	X
Wedge-tailed shearwater	Foraging BIA	X	
	Breeding BIA	X	
White-bellied sea-eagle	Breeding known to occur within area	X	
White-faced storm-petrel	Foraging BIA		X
Shorebird			
Australian fairy tern	Foraging, feeding or related behaviour likely to occur within area		X
Little curlew	Roosting likely to occur within area	X	

Receptor	Biologically Important Behaviour	Otway	Bass
Pin-tailed snipe	Roosting likely to occur within area	X	
Swinhoe's snipe	Roosting likely to occur within area	X	
White-fronted tern	Foraging, feeding or related behaviour likely to occur within area	X	X
Other			
Orange-bellied parrot	Migration route likely to occur within area	X	X

8.7.4 Consequence Evaluation

For the light impact assessment, the process outlined in the guidelines is used. The aim of the guidelines is that artificial light will be managed so wildlife is:

1. Not disrupted within, nor displaced from, important habitat.
2. Able to undertake critical behaviours such as foraging, reproduction and dispersal.

Identification of light-sensitive receptors was undertaken through definition of a 20 km light EMBA. The actual predicted area of impact at any one time will be significantly less than 20 km around the survey vessel operating within the operational areas.

Survey activities could occur up to 10 km from the shoreline, therefore, impacts to seabird and migratory shorebird coastal habitats (such as roosting sites) could occur, with the PMST Report identifying the little curlew, pin-tailed swipe and Swinhoe’s snipe likely to roost and the Australian fairy tern and white-fronted tern likely to forage or feed within the area of the light EMBA. These species are migratory wetland species and are covered by the Wildlife Conservation Plan for Migratory Shorebirds (DoE 2015b) which does not identify vessel lighting as a threat.

The light EMBA PMST Report (Appendix A.5) identified likely foraging behaviour for a number of albatrosses in the light EMBA. Some of these species have foraging BIAs that the light EMBA overlaps (Table 8-8). Light emissions are identified as a threat in National Recovery Plan for Albatrosses and Petrels (CoA 2022a) however, no actions are identified. 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). Thus, impacts within the small area of overlap with albatross foraging BIAs are not predicted based on these species forage most actively during daylight.

The black-faced cormorant was identified as breeding known to occur within the area in the light EMBA PMST Report (Appendix A.5). No BIA is present in light EMBA, and a breeding area could not be identified. This species is listed as marine and does not have a recovery plan or conservation advice but is covered by the Wildlife Conservation Plan for Seabirds (CoA 2020b). It is found along the coast of Tasmania and Victoria and breeding usually occurs on rocky islands, but also on stacks, slopes, and sea cliffs in colonies of up to 2,500 individuals (CoA 2020b). The Wildlife Conservation Plan for Seabirds (CoA 2020b) identifies light pollution as a threat to seabirds including vessels.

The common diving-petrel was not identified in the light EMBA PMST Report (Appendix A.5). This species is listed as marine and does not have a recovery plan or conservation advice but is covered by the Wildlife Conservation Plan for Seabirds (CoA 2020b). Brooke (2004) cited on Animal Diversity Web (2020) 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 some studies suggest seasonal movements (Brooke, 2004 cited on Animal Diversity Web, 2020). Based on this information, common diving-petrels may forage at night within the light EMBA.

The flesh-footed shearwater was identified in the light EMBA PMST Report as foraging likely within the light EMBA. No BIAs were identified. The flesh-footed shearwater feeds on small fish, cephalopod molluscs, crustaceans, other soft-bodied invertebrates and offal. 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, momentarily submerging onto prey beneath the surface or diving and pursuing prey beneath the surface by swimming (DOE 2023a).

The little penguin was identified in the light EMBA PMST Report as breeding known to occur within the light EMBA. However, as shown in Figure 7-31 the little penguin foraging and breeding BIAs are greater than 20 km from the Operational Areas and thus lighting is not predicted to impact foraging or breeding penguins.

The northern giant petrel was identified in the light EMBA PMST Report as foraging likely within the light EMBA. It is listed as vulnerable, marine, and migratory and is covered by the National Recovery Plan for Albatrosses and Petrels (CoA 2022a). It is thought to be a predominantly diurnal forager, but it feeds its chicks during both the day and at night (DoE 2023q). The northern giant petrel breeds in the sub-Antarctic, and visits areas off the Australian mainland mainly during the winter months (May-October) (DoE 2023q). There are marked differences in foraging behaviour between the sexes of the as females obtain most of their prey from the sea, while males will also scavenge from the carcasses of penguins and seals (DoE 2023q).

The southern giant petrel was identified in the light EMBA PMST Report as foraging likely within the light EMBA. It is listed as endangered, marine, and migratory and is covered by the National Recovery Plan for Albatrosses and Petrels (CoA 2022a). The southern giant petrel is marine bird that occurs in Antarctic to subtropical waters and is common in Australian waters (DoE 2023p). The southern giant petrel is an opportunist scavenger and predator. At sea, it forages largely by surface-seizing. It also scavenges on land and regularly follows ships. It apparently locates food by smell, and feeds its chicks both day and night (DoE 2023p).

The white-faced storm-petrel was not identified in the light EMBA PMST Report (Appendix A.5) though the light EMBA overlaps a foraging BIA. The foraging BIA is a 120 km buffer around the northern side of Tasmania. Crustaceans and fish represent a high proportion of the white-faced storm petrels' diets with coastal krill (*Nyctiphanes australis*) being the most abundant prey item (Underwood 2012). The white-faced storm petrels are present at the breeding colony during the austral summer from late August until March and nests in long shallow burrows with adults returning to the colony after dark (Underwood 2012). Thus, impacts to foraging white-faced storm-petrel from light emissions are not predicted.

Light emissions are identified as a threat in National Recovery Plan for Albatrosses and Petrels (CoA 2022a) however, no actions are identified.

The short-tailed shearwater was identified in the light EMBA PMST Report as breeding known to occur within the light EMBA. The light EMBA overlaps a foraging BIA (Figure 7-32). This species is listed as marine and migratory and does not have a recovery plan or conservation advice but is covered by the Wildlife Conservation Plan for Seabirds (CoA 2020b). No BIAs or habitat critical for the survival of the species occur within the light EMBA. Impacts to this species from light emissions are not predicted as the short-tailed shearwater returns to the colonies at dark after feeding at sea during the day (AAD 2020).

The wedge-tailed shearwater was not identified in the light EMBA PMST Report (Appendix A.5). The light EMBA overlaps a foraging BIA and breeding BIA. The foraging and breeding BIAs intersected by the light EMBA are a buffer around Muttonbird Island, Victoria (Figure 7-32). This species is listed as marine and migratory and does not have a recovery plan or conservation advice but is covered by the Wildlife Conservation Plan for Seabirds (CoA 2020b). 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 (DoE 2023b). The DCCEEW SPRAT profile does not show any locations for the wedge-tailed shearwater in Victoria, and Beaver (2018) 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. However, impacts to this species from light emissions are not predicted as Warham, (1996) cited in Beaver (2018) details that the wedge-tailed shearwater forms 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.

The white-bellied sea-eagle was identified in the light EMBA PMST Report as breeding known to occur within the light EMBA associated with the Otway Operational Area. The white-bellied sea-eagle is listed as marine and is common along the Victorian coastal areas with home ranges up to 100 km^2 (DoE 2023m). Lighting is not identified as a threat (DoE 2023m).

The light EMBA PMST Report (Appendix A.5) identified migration route likely for the orange-bellied parrot. No BIA or habitat critical to the survival of the species where identified. The orange-bellied parrot is a ground feeding parrot which breeds in south-west Tasmania between November and March and then overwinters on the coast of south-east mainland Australia between April and October (DELWP 2016). The orange-bellied parrot is classed as critically endangered and there are about 50 remaining in the wild (DELWP 2016). The orange-bellied parrot recovery plan identifies illuminated structures and illuminated boats as a potential barrier to migration and movement (DELWP 2016). IMR activities may overlap the period when orange-bellied parrots migrate between Tasmania and Victoria between late February to early April (Australian Museum 2020). The light EMBA overlaps the likely distribution and probably migration route for the orange-bellied parrot (Figure 7-33).

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 2022).

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.

The predicted level of impact from the survey vessel lighting is assessed as minor as it is will be short-term and temporary based on:

- The presence of birds within the light EMBA is expected to be representative of their wide distribution in southern Australian waters.
- As the light EMBA overlaps a number of 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, survey vessels will have a Lighting Management Procedure (CM#20) 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.

8.7.5 Control Measures, ALARP and Acceptability Assessment

Control, ALARP and acceptability assessment: Light emissions	
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	**Source of good practice control measures**
CM#20: Light Management Procedure	The National Light Pollution Guidelines for Wildlife (CoA 2023) provide management options for mitigating the effect of light to fauna. A review of the management options relevant to the activity is provided in the additional controls section with the following to be adopted: Vessels will have and implement a Light Management Procedure as per the National Light Pollution Guidelines for Wildlife (CoA 2023). The Light Management Procedure will detail mitigations to manage light based on the information in the Seabird Light Mitigation Toolbox and Beach Energy's Vessel Light Management Procedure Guidance (CDN/ID 19012450). At a minimum the Vessel Light Management Procedure will cover: • keeping lights off when not needed. • directing lighting onto work areas. • screening interior lights with curtains and blinds. • developing a program for handling grounded birds. • reporting requirements.

Additional controls assessed

Control	Cost/Benefit Analysis	Control Implemented?
Seasonal timing	Avoiding periods when birds may be present within the light EMBA would have a disproportionate cost without a significant environmental benefit. Avoiding periods when birds may be present within the light EMBA can result in seabed surveys being undertaken in multiple phases over a longer duration. This increase in time results in increased environmental impacts and risks, and an increase in costs without a significant reduction in the potential consequence level (minor) as the implementation of a Vessel Lighting Procedure (CM#20) will ensure that impacts from vessel lighting is managed so the fauna can continue to undertake biologically important behaviours.	No

Consequence rating	Minor (1)
Likelihood of occurrence	NA
Residual risk	Low
Acceptability assessment	
To meet the principles of ESD	Light emissions were assessed as having a minor consequence which is not considered as having the potential to result in serious or irreversible environmental damage. Consequently, no further evaluation against the principles of ESD is required.
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 9).
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 (CoA 2023). Light pollution is identified as a threat in the Wildlife Conservation Plan for Seabirds (CoA 2020b) and details that the National Light Pollution Guidelines for Wildlife (CoA 2023) provide a framework for assessing and managing these impacts around susceptible listed wildlife. Light emissions will be managed in accordance with the National Light Pollution Guidelines for Wildlife (CoA 2023). Artificial light is identified as a threat in the National Recovery Plan for Albatrosses and Petrels (CoA 2022a). No actions specific to light are identified. The Approved Conservation Advice for *Sternula nereis nereis* (Australian fairy tern) (DSEWPaC 2011c) does not identify light as a threat. The National Recovery Plan for the *Neophema chrysogaster* (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. Manage threat if the risk rating warrants action. This requirement is met by this impact assessment and the implementation of CM#20 Vessel Lighting Procedure. There are no other recovery plans, conservation advice or listing advice for birds within the light EMBA.
Monitoring and reporting	Impacts associated with light emissions are for a short duration during a seabed survey, over a small area and not predicted to have long term impacts to fauna in the area. Therefore, the monitoring of light emissions is not proposed. Reporting of injury to or death of EPBC Act-listed species will be undertaken as detailed in Table 9-4.
Acceptability outcome	**Acceptable**

8.8 Establishment of Invasive Marine Species

8.8.1 Hazards

The introduction of invasive marine species (IMS) could occur during vessel operations as a result of:

- Discharge of ballast water containing foreign species.
- Translocation of species through biofouling of the vessel hull anchors and/or niches (e.g. sea chests, bilges and strainers) or in-water survey equipment.

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., project 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.

8.8.2 Potential Environmental Impacts

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 are stationary for an extended period.

If the risk of establishment of IMS is realised, the following environmental impacts may occur:

- Change in ecosystem dynamics.
- Changes to the functions, interests, or activities of other users.

Change in ecosystem dynamics may include 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 area.

8.8.3 EMBA

Predicted impacts from the risk of establishment of IMS will be limited to the Operational Areas. Receptors potentially affected include marine invertebrates and benthic habitats, and commercial fisheries.

8.8.4 Consequence Evaluation

IMS may become established where conditions are suitable, and these species may have impacts on local ecological and economic values. Establishment of IMS is most likely to occur in shallow waters in areas where large numbers of vessels are present and are stationary for an extended period.

IMS are likely to have little or no natural competition or predators, thus potentially outcompeting native species for food or space, preying on native species, or changing the nature of the environment. It is estimated that Australia has more than 250 established marine pests, and that approximately one in six introduced marine species becomes a pest (DoE 2015). Once established, some pests can be difficult to eradicate (Hewitt et al. 2002) and therefore there is the potential for a long-term or persistent change in habitat structure. 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).

In the event of an IMS being introduced to the marine environment, successful colonisation is dependent upon suitable substrate availability. The Operational Areas do not present a location conducive to marine pest survival because they are mostly in water depths greater than 50 m and in an open-water environment.

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 Areas do not present a benthic habitat that is typically favourable to IMP survival. The Bass Operational Area is ~ 24 nm from the nearest land whilst at the closest point the Otway Operational Area is 3 nm from the Victorian coast.

The introduction of IMS has the potential to result in changes to the functions, interest, or activities of other users, including commercial fisheries. 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.

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, the consequences have been evaluated as Serious. However, it is considered such an event is Remote due to the unfavourable conditions within the operational area required for colonisation and to date no IMS have been introduced to the Operational Areas from Beach’s ongoing activities in the area.

8.8.5 Control Measures, ALARP and Acceptability Assessment

Control, ALARP and acceptability assessment: Establishment of invasive marine pests	
ALARP decision context and justification	ALARP Decision Context: Type B On the basis of the impact assessment completed, Beach considers the control measures described are appropriate to manage the impacts associated with the risk of introduction and establishment of IMS. The Victorian DJPR (now DEECA) have previously expressed interest in the management of IMS in Victorian State waters for other Beach activities.
Adopted Control Measures	**Source of good practice control measures**
CM#21: Beach Domestic IMS Biofouling Risk Assessment Process	All vessels mobilised from domestic waters to undertake seabed surveys within the Operational Areas 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 Areas. 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 Areas. • Identifies the potential IMS risk profile of vessels and submersible equipment prior to deployment within the Operational Areas. • Identifies potentially deficiency of IMS controls prior to entering the Operational Areas. • 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 Areas).	
Additional controls assessed			
Control	**Control Type**	**Cost/Benefit Analysis**	**Control Implemented?**
Only use vessels that are based in Victoria to reduce the potential for introducing IMS.	Equipment	Specialised vessels are likely required to undertake the seabed surveys. Using 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 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.	Not selected
Consequence rating	Serious (3)		
Likelihood of occurrence	Remote (1)		
Residual risk	Low		
Acceptability assessment			
To meet the principles of ESD	The risk of the establishment of IMS was assessed as low and the consequence was assessed as serious 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. • No impacts to MNES are predicted. • The implementation of controls make it a remote 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.		
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 9).		
External context	There have been no stakeholder objections or claims regarding the introduction or establishment of invasive marine pests 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 2023) • National Biofouling Management Guidance for the Petroleum Production and Exploration Industry (MPSC 2018) • Australian Ballast Water Management Requirements (CoA 2020a) and Australian Biofouling Management Requirements (DAWE 2022a) 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 2013-23 (DNP 2013) identifies IMS, and diseases translocated by shipping, fishing vessels and other vessels as a threat to the AMP network. The implementation of the controls make it unlikely that IMS will be introduced from the activity and spread to AMPs.		

Monitoring and reporting	Impacts as a result of the introduction of marine invasive species will be monitored and reported in accordance with the Section 9.10..
Acceptability outcome	**Acceptable**

8.9 Loss of Marine Diesel from Vessel Collision

8.9.1 Hazards

Marine diesel oil is used in offshore vessels. A collision between a Beach contracted vessel and third-party vessel has the potential to result in a spill of fuel.

8.9.2 Potential Environmental Impacts

The potential environmental impacts of a diesel 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 functions, interests, or activities of other users.

8.9.3 Quantitative Hydrocarbon Spill Modelling

Beach commissioned RPS to conduct quantitative spill modelling for a credible, yet hypothetical, worst-case hydrocarbon release scenario of 200 m^3 surface release of marine diesel over six hours. This scenario represents a loss of inventory from the largest outside fuel tank for vessel that would be used to undertake the seabed surveys. The calculation of discharge volume and timing aligns with the methodology recommended in the AMSA Technical guidelines for preparing contingency plans for marine and coastal facilities (Commonwealth of Australia, January 2015).

For the Bass Operational area the spill modelling was undertaken at the Yolla Platform (RPS 2023b) which would be representative of the Bass Operational Area as the Operational Area would have similar metocean conditions and distances to onshore areas. For details of the spill modelling see Appendix F.

For the Otway Operational Areas the spill modelling was undertaken at the Thylacine Platform (RPS 2022). As the seabed surveys could be undertaken within the Operational Area closer to the Victorian or Tasmanian coast, the area of exposure at the low thresholds (Table 8-11) was applied to the southern, northern and Thylacine platform locations to obtain the Otway Planning Area (Figure 7-1). For details of the spill modelling see Appendix G

8.9.3.1 Characteristics of Diesel Oils

Diesel oils are generally considered to be low viscosity, non-persistent oils, which are readily degraded by naturally occurring microbes. Diesel oils are considered to have a higher aquatic toxicity in comparison to many other crude oils due to the types of hydrocarbon present and their bioavailability. They also have a high potential to bio-accumulate in organisms.

Marine diesel is a medium-grade oil (classified as a Group II oil) used in the maritime industry. It has a low density, a low pour point and a low dynamic viscosity (Table 8-9), indicating that this oil will spread quickly when spilled at sea and thin out to low thicknesses, increasing the rate of evaporation.

Due to its chemical composition, approximately 40% will generally evaporate within the first day, with the remaining volatiles evaporating over 3-4 days depending upon the prevailing conditions. Diesel shows a strong tendency to entrain

into the upper water column in the presence of moderate winds and breaking waves (> 12 knots) but floats to the surface when conditions are calm, which delays the evaporation process.
Table 8-10 shows the boiling point ranges for the diesel used in the spill modelling.

Table 8-9: Physical characteristics of marine diesel oil

Parameter	**Characteristics**
Density (kg/m^3)	829 at 15ºC
API	37.6
Dynamic viscosity (cP)	4.0 at 25ºC
Pour point (°C)	-14
Oil category	Group II
Oil persistence classification	Light-persistent oil

Table 8-10: Boiling point ranges of marine diesel oil

Characteristic	**Volatiles (%)**	**Semi-volatiles (%)**	**Low volatiles (%)**	**Residual (%)**
Boiling point (°C)	< 180	180 – 265	265 – 380	> 380
Marine diesel oil	6.0	34.6	54.4	5
	Non-Persistent			Persistent

8.9.3.2 Hydrocarbon Exposure Thresholds

In the event of a diesel spill incident, the environment may be affected in several ways, depending on the concentration and duration of exposure of the environment to hydrocarbons. 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 8-11.

These thresholds have been used to:

- Predict potential hydrocarbon exposure at conservative (low exposure) concentrations to inform the description of the environment (Section 4).
- Inform the oil spill impact and risk evaluation (this Section).
- Inform oil spill response planning (Section 8.10 and OPEP) based on the actionable thresholds of:
    - Surface moderate exposure (10 g/m^2). As detailed in the OPEP Beach use the more conservative moderate exposure for oil response planning.
    - Shoreline moderate exposure (100 g/m^2).
- Inform oil spill monitoring planning (Section 9.9.2.3 and OSMP) based on the low exposure thresholds.

Table 8-11: 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.
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
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.

* In-water (entrained and dissolved) hydrocarbon thresholds are based upon an instantaneous (1 hr) hydrocarbon exposure

8.9.3.3 Potential Extent of Hydrocarbon Exposure

The extent of hydrocarbon exposure from the hydrocarbon spill modelling is summarised below.

Shorelines

Bass
No shoreline oil was predicted from the modelling.

Otway
The modelling at the Thylacine Platform has a probability of accumulation to any shoreline at, or above, the low level (10 g/m^2) threshold was 0% during summer conditions and 2% during winter conditions. During the winter conditions, King Island was the only shoreline receptor that was predicted to have shoreline accumulation above the low threshold (10 g/m^2) with a probability of low accumulation of 2%. The minimum time before shoreline accumulation at King Island during winter conditions was 8.13 days, whilst the maximum shoreline accumulation volume was 2.7 m^3 and the maximum length of shoreline accumulation at the low threshold was 5 km. No shoreline accumulation was predicted for the moderate (100 g/m^2) or high (1,000 g/m^2) threshold.

As the modelled location is further offshore than the Northern part of the Otway Operational Area A there is also the probability of shoreline oil being present on the Victorian coastline within the Otway Planning Area.

Surface Waters

Bass

The Bass modelling detailed that 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) exposure levels was 23 km (south in summer), 14.5 km (east in winter) and 2.3 km (southeast in winter), respectively.

Based on a 300m^3 spill (RPS 2023b, Appendix F) surface oil will dissipate within 26 hrs.

Victorian and Tasmanian waters were not predicted to be exposed to surface oil.

No conservation values or sensitivities (Section 7.2) were identified to be exposed to surface oil at the low threshold or above.

Otway

The modelling at the Thylacine Platform detailed that the maximum distance travelled by floating oil on the sea surface from the release location to the low (1–10 g/m^2), moderate (10–50 g/m^2) and high (> 50 g/m^2) exposure zones was 36.5 km (east-southeast) during summer conditions, 9.4 km (southeast) during winter conditions and 0.5 km (southwest) during winter conditions, respectively.

Thus, if a diesel spill occurred within the northern part of the Otway Operational Area A there is the potential for surface oil above the moderate threshold to enter Victorian waters.

Dissolved

Bass

The Bass modelling detailed that the maximum distance from the release location to dissolved hydrocarbon exposure in the 0-10 m depth layer at the low (10-50 ppb) and moderate (50-400 ppb) thresholds levels was predicted as 68.5 km (east in winter) and 5.2 km (east-southeast in winter), respectively. No high exposure to dissolved hydrocarbons was observed.

Victorian and Tasmanian waters were not predicted to be exposed to dissolved oil.

No conservation values or sensitivities (Section 7.2) were identified to be exposed to dissolved oil at the low threshold or above.

Otway

The modelling at the Thylacine Platform detailed that the maximum distance from the release location to dissolved hydrocarbon exposure in the 0-10 m depth layer at the low threshold for any receptor during either summer and winter was 43%. During the summer and winter conditions the maximum dissolved aromatic concentrations at any given receptor(s) was predicted to be 45 ppb and 43 ppb, respectively, which occurred within receptors containing the release location.

No moderate or high exposure to dissolved hydrocarbons was observed.

Victorian and Tasmanian waters were not predicted to be exposed to dissolved oil.

Due to dissolved oil only being present in the 0-10 m depth layer at the low threshold if a diesel spill occurred within the northern part of the Otway Operational Area A it is unlikely to impact Victorian State waters above the low threshold.

Entrained

Bass

The Bass modelling detailed that the maximum distance and direction from the release location to entrained hydrocarbons in the 0-10 m depth layer at the low (10-100 ppb) and high (≥ 100 ppb) exposure levels from the release location was 275.7 km (east-northeast in winter) and 109.3 km (east in winter), respectively.

Victorian and Tasmanian waters (King Island) were predicted to be exposed to low levels of entrained oil.

Otway

The modelling at the Thylacine Platform detailed that the maximum distance and direction from the release location to entrained hydrocarbons in the 0-10 m depth layer at the low (10-100 ppb) and high (≥ 100 ppb) exposure levels from the release location was ~110 km (east in summer) and ~165 km (east in winter), respectively.

Victorian and Tasmanian waters (King Island) were predicted to be exposed to low levels of entrained oil.

There is the potential that if a diesel spill occurred within the northern part of the Otway Operational Area A entrained oil may impact Victorian State waters above the low threshold.

8.9.4 Consequence Evaluation

Circumstances resulting in a loss of containment of marine diesel such as a vessel collision and subsequent fuel tank rupture are low probability events in open ocean areas without restricted navigation. Though shipping activity is relatively high within the operational area (Section 7.5.5), modern navigational aids assist in reducing the likelihood of a collision event. Higher commercial and recreational vessel traffic occurs in and around ports and harbours, which is therefore where the greatest risk of collision occurs. While undertaking the seabed surveys the vessels will often be stationary or moving slowly, further reducing the risk of collision with third-party vessels.

Identification of receptors predicted to be exposed to surface, shoreline, dissolved or entrained oil, based on the oil spill modelling are detailed and assessed in the following sections.

8.9.4.1 Australian Marine Parks

Potential Impacts	Change in values	**Predicted Oil Exposure Otway**				**Predicted Oil Exposure Bass**			
		Shoreline	**Surface**	**Dissolved**	**Entrained**	**Shoreline**	**Surface**	**Dissolved**	**Entrained**
Receptor	Apollo Marine Park	×	×	✓	✓	–	–	–	–
	Beagle Marine Park	–	–	–	–	×	×	×	✓
	Boag Marine Park	–	–	–	–	×	×	×	✓
	Zeehan Marine Park	×	✓	✓	✓	–	–	–	–

Predicted Exposure

Apollo AMP may be exposed to dissolved hydrocarbons above the low threshold and entrained hydrocarbons at the high threshold (3% probability) within the upper 0 -10 m of the water column.

Beagle AMP and Boag AMP may be exposed (5% probability) to dissolved hydrocarbons at the low threshold within the upper 0 -10 m of the water column.

Zeehan AMP may be exposed to surface at the moderate threshold, dissolved hydrocarbons above the low threshold and entrained hydrocarbons at the high threshold within the upper 0 -10 m of the water column.

Consequence Evaluation

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 Geraci (1988) found little evidence of cetacean mortality from hydrocarbon spills; however, some behaviour disturbance (including avoidance of the area) may occur. While this reduces the potential for physiological impacts from contact with hydrocarbons, active avoidance of an area may displace individuals from important habitat, such as foraging or migrating.

The Apollo AMP is an important foraging area for black-browed and shy albatross, Australasian gannet, short-tailed shearwater, and crested tern. 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 experiencing sub-lethal or toxic impacts as a result of consuming hydrocarbon-tainted fish.

The Beagle AMP is located in waters 50 m to 70 m deep and thus conservation values such as ecosystems, habitats and communities associated with the Southeast Shelf Transition and associated with the seafloor features and the wreck of the steamship SS Cambridge and the wreck of the ketch Eliza Davies are not predicted to be impacted., The Beagle AMP is also an important migration and resting areas for southern right whales and provides important foraging habitat for the Australian fur-seal, killer whale, great white shark, shy albatross, Australasian gannet, short-tailed shearwater, Pacific and silver gulls, crested tern, common diving petrel, fairy prion, black-faced cormorant and little penguin. These species are not precited to be impacted at the low thresholds for dissolved hydrocarbons.

The Boag AMP is located in waters 40 m to 80 m deep and thus conservation values such as ecosystems, habitats and communities associated with the Bass Strait Shelf Province and associated with the seafloor are not predicted to be impacted.,

The Beagle AMP is also an important foraging habitat for the shy albatross, Australasian gannet, short-tailed shearwater, fairy prion, back-faced cormorant, common diving-petrel and little penguin. These species are not precited to be impacted at the low thresholds for dissolved hydrocarbons.

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 Geraci (1988) found little evidence of cetacean mortality from hydrocarbon spills; however, some behaviour disturbance (including avoidance of the area) may occur. While this reduces the potential for physiological impacts from contact with hydrocarbons, active avoidance of an area may displace individuals from important habitat, such as foraging.

The Zeehan AMP is also an important foraging habitat for black-browed, wandering and shy albatrosses, and great-winged and cape petrels. 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 to these AMPs are considered to be Moderate, as they could be expected to result in localised minor short-term impacts to an area of recognised conservation value.

8.9.4.2 National Heritage Places

Potential Impacts	Change in values	**Predicted Oil Exposure Otway**				**Predicted Oil Exposure Bass**			
		Shoreline	**Surface**	**Dissolved**	**Entrained**	**Shoreline**	**Surface**	**Dissolved**	**Entrained**
Receptor	Great Ocean Road and Scenic Environs	✓	×	×	×	–	–	–	–
Predicted Exposure									
There is the potential of shoreline oil exposure at Great Ocean Road and Scenic Environs if a spill occurred while the seabed survey was being undertaken in the northern part of the Otway Operational Area.									
Consequence Evaluation									
Visible shoreline hydrocarbons has the potential to reduce the visual amenity of the area for tourism. Due to the low volume, light nature of marine diesel and substantial wave action with the Otway area, impacts are likely to be short term and not require intrusive clean-up response. The relatively short duration of exposure and low volume of oil likely to reach the shoreline means there may be short-term and localised consequences to an area of recognised conservation value, which is ranked as Moderate.									

8.9.4.3 Wetlands of International Importance and Nationally Important Wetlands

Potential Impacts	Change in values Changes to the functions, interests or activities of other users	**Predicted Oil Exposure Otway**				**Predicted Oil Exposure Bass**			
		Shoreline	**Surface**	**Dissolved**	**Entrained**	**Shoreline**	**Surface**	**Dissolved**	**Entrained**
Receptor	Aire River/Lower Aire River Wetlands	✓	×	×	×	–	–	–	–
	Lavinia	✓	×	×	×	–	–	–	–
	Princetown	✓	×	×	×	–	–	–	–

Predicted Exposure

There is the potential of shoreline oil exposure at Aire River, Lavinia, and Princetown wetlands if a spill occurred while the seabed survey was being undertaken in the northern part of the Otway Operational Area.

Consequence Evaluation

Visible shoreline hydrocarbons has the potential to reduce the visual amenity of the area for tourism and discourage recreational activities within protected areas. Due to the low volume, light nature of marine diesel and substantial wave action with the Otway area, impacts are likely to be short term and not require intrusive clean-up response.

Depending on where the shoreline contact occurs there is a potential for shoreline oil to move into the estuary and wetlands at low concentrations which are not predicted to impact the aesthetic and ecological value of the wetlands.

The relatively short duration of exposure and low volume of oil likely to reach the shoreline means there may be short-term and localised consequences to an area of recognised conservation value, which is ranked as Moderate.

8.9.4.4 Marine Protected Areas

Potential Impacts	Change in values Changes to the functions, interests or activities of other users	**Predicted Oil Exposure Otway**				**Predicted Oil Exposure Bass**			
		Shoreline	**Surface**	**Dissolved**	**Entrained**	**Shoreline**	**Surface**	**Dissolved**	**Entrained**
Receptor	Eagle Rock Marine Sanctuary	×	×	✓	✓	–	–	–	–
	Kent Group National Park	–	–	–	–	×	×	×	✓
	Marengo Reefs Marine Sanctuary	×	×	✓	✓	–	–	–	–
	Merri Marine Sanctuary	×	×	✓	✓	–	–	–	–
	Point Addis Marine National Park	×	×	✓	✓	–	–	–	–
	Point Danger Marine Sanctuary	×	×	✓	✓	–	–	–	–
	The Arches Marine Sanctuary	–	✓	✓	✓	–	–	–	–
	Twelve Apostles Marine National Park	✓	✓	✓	✓	–	–	–	–

Predicted Exposure

There is the potential of oil exposure at Victorian coastal marine protected area (except Wilsons Promontory Marine Nature Park) if a spill occurred while the seabed survey was being undertaken in the northern part of the Otway Operational Area.

The Kent Group National Park has a 1 – 4 % of exposure of above the low threshold for entrained hydrocarbons within the upper 0 -10 m of the water column.

Consequence Evaluation

Due to the distance from the Otway Planning Area only low levels of oil are predicted at the Eagle Rock Marine Sanctuary, Marengo Reefs Marine Sanctuary, Merri (Marine Sanctuary), Point Addis Marine National Park and Point Danger (Marine Sanctuary). Visible hydrocarbons has the potential to reduce the visual amenity of the area for tourism and discourage recreational activities within protected areas. Due to the low volume, light nature of marine diesel and substantial wave action with the Otway area, impacts are likely to be short term and not require intrusive clean-up response. Low levels of hydrocarbons are not predicted to impact on the values of these marine protected areas such as subtidal rocky reefs, rhodolith beds and intertidal reefs, rock stacks of geological significance, underwater scenery for snorkelling and scuba diving, vessel wrecks, Australian fur seal haul out areas and bird nesting and roosting areas and indigenous cultural values.

Due to their proximity to the Otway Operational area, if a diesel spill occurred while the seabed survey was being undertaken in the northern part of the Otway Operational Area, there is the potential for oil exposure above the low threshold to occur at The Arches Marine Sanctuary and Twelve Apostles Marine National Park. Visible shoreline hydrocarbons has the potential to reduce the visual amenity of the area for tourism and discourage recreational activities within protected areas. Due to the low volume, light nature of marine diesel and substantial wave action with the Otway area, impacts are likely to be short term and not require intrusive clean-up response.

The Arches Marine Sanctuary is located in 20 m water thus the features of the sanctuary such as limestone formations, rocky arches and canyons that support habitats such as kelp forests and a diverse range of invertebrates are not predicted to be impacted.

Twelve Apostles Marine National Park covers shoreline as well as extending 5.5 km offshore. Features in water depths > 10 m such as the wreck of the Loch Ard and underwater limestone formations of arches and canyons. The Twelve Apostles limestone formations and sub-tidal areas that support a diverse range of encrusting invertebrates are unlikely to be significantly impacted by exposure to hydrocarbons due to the low volume, light nature of marine diesel and substantial wave action with the Otway area.

The Kent Group National Park islands and islets, seabirds and Australian fur-seals are not predicted to be impacted by low level entrained hydrocarbons.

The relatively short duration of exposure and low volume of oil likely to reach marine protected area means there may be short-term and localised consequences to an area of recognised conservation value. which is ranked as Moderate.

8.9.4.5 State Terrestrial Protected Area

Potential Impacts	Change in values Changes to the functions, interests or activities of other users	**Predicted Oil Exposure Otway**				**Predicted Oil Exposure Bass**			
		Shoreline	**Surface**	**Dissolved**	**Entrained**	**Shoreline**	**Surface**	**Dissolved**	**Entrained**
Receptor	Aire River Heritage River	×	×	×	×	–	–	–	–
	Bay of Islands Coastal Park	×	×	×	×	–	–	–	–
	Cape Liptrap Coastal Park	×	×	×	×	–	–	–	–
	Cape Wickham Conservation Area and State Reserve (King Island)	✓	×	×	×	–	–	–	–
	Cataraqui Point Conservation Area (King Island)	✓	×	×	×	–	–	–	–
	Great Otway National Park	✓	×	×	×	–	–	–	–
	Phillip Island Nature Park	×	×	×	×	–	–	–	–
	Port Campbell National Park	×	×	×	×	–	–	–	–
	Seal Rocks State Reserve (King Island)	✓	×	×	×	–	–	–	–

Predicted Exposure

Modelling predicted shoreline accumulation above the low threshold (10 g/m^2) with a probability of low accumulation of 2% on King Island. The minimum time before shoreline accumulation at King Island during winter conditions was 8.13 days, whilst the maximum shoreline accumulation volume was 2.7 m^3. Within the area where shoreline accumulation could occur three State Protected Areas were identified.

There is the potential of shoreline oil exposure for the following Victorian Terrestrial Protected Areas if a spill occurred while the seabed survey was being undertaken in the northern part of the Otway Operational Area:

- Aire River Heritage River/Natural Features Reserve
- Bay of Islands Coastal Park
- Great Otway National Park
- Port Campbell National Park

Consequence Evaluation
Visible shoreline hydrocarbons has the potential to reduce the visual amenity of the area for tourism and discourage recreational activities within protected areas. Due to the low volume, light nature of marine diesel and substantial wave action with the Otway area and off King Island, impacts are likely to be short term and not require intrusive clean-up response. Impacts from shoreline oil are not predicted to the Cape Wickham Conservation Area lighthouse and the gravesites of the crew of Loch Leven due to their distance from the shore. No information could be obtained on the values of the Cataraqui Point Conservation Area. Seal Rocks on King Island is also a New Zealand fur-seal breeding colony. However, impacts to fur-seals at the low threshold is not predicted to result impact to this species. The relatively short duration of exposure and low volume of oil likely to reach the shoreline means there may be short-term and localised consequences to an area of recognised conservation value, which is ranked as Moderate.

8.9.4.6 Key Ecological Features

Potential Impacts	Change in ecosystem dynamics	**Predicted Oil Exposure Otway**				**Predicted Oil Exposure Bass**			
		Shoreline	**Surface**	**Dissolved**	**Entrained**	**Shoreline**	**Surface**	**Dissolved**	**Entrained**
Receptor	West Tasmanian Marine Canyons	×	✓	✓	✓	–	–	–	–
Predicted Exposure									
The West Tasmanian Marine Canyons KEF could be exposure to surface, dissolved and entrained oils.									
Consequence Evaluation									
The West Tasmanian Marine Canyons KEF are in water depths greater than 100 m thus impacts from surface, dissolved and entrained oils are not predicted to there ecological function.									

8.9.4.7 Threatened Ecological Communities – Saltmarshes

Potential Impacts	Change in ecosystem dynamics	**Predicted Oil Exposure Otway**				**Predicted Oil Exposure Bass**			
		Shoreline	**Surface**	**Dissolved**	**Entrained**	**Shoreline**	**Surface**	**Dissolved**	**Entrained**
Receptor	Assemblages of species associated with open-coast salt-wedge estuaries of western and central Victoria ecological community	✓	×	×	✓	–	–	–	–
	Subtropical and Temperate Coastal Saltmarsh	✓	×	×	✓	–	–	–	–

Predicted Exposure

Assemblages of species associated with open-coast salt-wedge estuaries of western and central Victoria ecological community and Subtropical and Temperate Coastal Saltmarsh may be exposure to shoreline oil if a spill occurred while the seabed survey was being undertaken in the northern part of the Otway Operational Area.

Consequence Evaluation

Depending on where the shoreline contact occurs there is a potential for shoreline oil to move into these coastal communities at low concentrations which are not predicted to impact their ecological value.

The relatively short duration of exposure and low volume of oil likely to reach the shoreline means there may be short-term and localised consequences to an area of recognised conservation value, which is ranked as Moderate.

8.9.4.8 Threatened Ecological Communities – Giant Kelp Marine Forests of South East Australia

Potential Impacts	Change in ecosystem dynamics	**Predicted Oil Exposure Otway**				**Predicted Oil Exposure Bass**			
		Shoreline	**Surface**	**Dissolved**	**Entrained**	**Shoreline**	**Surface**	**Dissolved**	**Entrained**
Receptor	Giant Kelp Marine Forests of South East Australia	×	×	×	✓	×			

Predicted Exposure

Modelling predicted a 1 – 4% probability of low entrained oil in areas where Giant Kelp Marine Forests of South East Australia occur. In addition, they may be exposed to entrained and dissolved oil if a spill occurred while the seabed survey was being undertaken in the northern part of the Otway Operational Area.

Consequence Evaluation

Smothering, fouling, and asphyxiation are some of the physical effects that have 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'Brian and Dixon 1976). The effect of hydrocarbons, however, is largely dependent on the degree of direct exposure and how much of the hydrocarbon adheres to algae, which will vary depending on the oils physical state and relative 'stickiness'.

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.

Though marine diesel is less likely to adhere to kelp it may impact tissues, though the study by Antrim et al (1995) did not detail if the kelp recovered from the diesel exposure. The low volume of oil and low exposure levels are more likely to result in recoverable impacts to kelp, but if non-recoverable impacts occurred these are likely to be localised and not impact the ecological function of the KEF. Thus, impacts are ranked as Moderate.

8.9.4.9 Benthic Habitats and Species Assemblages

Potential Impacts	Change in ecosystem dynamics	**Predicted Oil Exposure Otway**				**Predicted Oil Exposure Bass**			
		Shoreline	**Surface**	**Dissolved**	**Entrained**	**Shoreline**	**Surface**	**Dissolved**	**Entrained**
Receptor	Algae Coral Seagrass	–	✓	✓	✓	–	×	×	✓

Predicted Exposure

Modelling predicted a 1 – 6% probability of low entrained oil within the upper 0 -10 m of the water column in Tasmanian waters where algae, coral and seagrass may be present. No surface, shoreline or dissolved is predicted in Tasmanian waters.

There is the potential of oil exposure in Victorian waters where algae, coral and seagrass may be present, if a spill occurred while the seabed survey was being undertaken in the northern part of the Otway Operational Area.

Consequence Evaluation

Impacts to algae, coral, and seagrass within Tasmanian waters from entrained oil at low thresholds are not predicted.

Corals do not occur as a dominant habitat type within Victorian coast. Reef development by hard corals does not occur further south than Queensland (Tzioumis and Keable, 2007). Soft corals are typically present in deeper waters throughout the continental shelf, slope and off-slope regions, to well below the limit of light penetration (BBG 2003, Boreen et al. 1993). Gorgonian corals (soft corals) were identified during seabed surveys of the Beach Otway Development area within the Otway Planning Area (Ramboll 2020).

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.

As detailed in Section 7.4.4 bull kelp has a long history of use by First Nations in Australia and is known to be present in area along the Victorian coast that may be exposed to oil.

Studies undertaken after the Montara oil spill included diver surveys to assess the status of Ashmore, Cartier and Seringapatam coral reefs. These found that other than a region-wide coral bleaching event caused by thermal stress (i.e. caused by sea water exceeding 32°C), the condition of the reefs was consistent with previous surveys, suggesting that any effects of oil reaching these reefs was minor, transitory, or sub-lethal and not detectable (Heyward et al. 2010). This is despite AMSA observations of surface slicks or sheen nears these shallow reefs during the spill (Heyward et al. 2010). Surveys in 2011 indicated that the corals exhibiting bleaching in 2010 had largely survived and recovered (Heyward et al. 2012), indicating that potential exposure to hydrocarbons while in an already stressed state did not have any impact on the healthy recovery of the coral.

Smothering, fouling, and asphyxiation are some of the physical effects that have 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'Brian and Dixon 1976). The effect of hydrocarbons, however, is largely dependent on the degree of direct exposure and how much of the hydrocarbon adheres to algae, which will vary depending on the oils physical state and relative 'stickiness'.

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. Though marine diesel is less likely to adhere to kelp it may impact tissues, though the study by Antrim et al (1995) did not detail if the kelp recovered from the diesel exposure.

The low volume of oil and low exposure levels are more likely to result in recoverable impacts to alga, corals and seagrasses, but if non-recoverable impacts occurred these are likely to be localised and not impact the ecological function of the benthic assemblage. Thus, impacts are ranked as Minor.

8.9.4.10 Mangroves

Potential Impacts	Change in ecosystem dynamics	**Predicted Oil Exposure Otway**				**Predicted Oil Exposure Bass**			
		Shoreline	**Surface**	**Dissolved**	**Entrained**	**Shoreline**	**Surface**	**Dissolved**	**Entrained**
Receptor	Mangrove ecosystem	✓	×	×	×	–	–	–	–

Predicted Exposure
No mangroves are identified within the EMBA for Tasmania. There is the potential for low levels of shoreline oil exposure to mangroves along the coast towards Anglesea.
Consequence Evaluation
Due to the distance to known areas of coast where mangrove area present from the Otway Operational Area, if oil exposure did occur it would be at low levels that are unlikely to impact mangroves. Thus, impacts are not predicted.

8.9.4.11 Plankton

Potential Impacts	Injury/Mortality to fauna Change in fauna behaviour	**Predicted Oil Exposure Otway**				**Predicted Oil Exposure Bass**			
		Shoreline	**Surface**	**Dissolved**	**Entrained**	**Shoreline**	**Surface**	**Dissolved**	**Entrained**
Receptor	Plankton	–	✓	✓	✓	–	✓	✓	✓

Predicted Exposure

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.

Consequence Evaluation

Relatively low concentrations of hydrocarbon are toxic to both plankton including zooplankton and ichthyoplankton (fish eggs and larvae). Plankton risk exposure through ingestion, inhalation, and dermal contact. Impacts would predominantly result from exposure to dissolved fractions, as larval fish and plankton are pelagic, and are moved by seawater currents. Potential impacts would largely be restricted to planktonic communities, which would be expected to recover rapidly following a hydrocarbon spill.

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 exposure to moderate or higher levels of in-water hydrocarbons, the potential consequence to plankton are considered to be Minor, as they could be expected to result in localised low-level short-term and recoverable impacts.

8.9.4.12 Invertebrates

Potential Impacts	Injury/Mortality to fauna Change in fauna behaviour	**Predicted Oil Exposure Otway**				**Predicted Oil Exposure Bass**			
		Shoreline	**Surface**	**Dissolved**	**Entrained**	**Shoreline**	**Surface**	**Dissolved**	**Entrained**
Receptor	Invertebrates	✓	×	✓	✓	×	×	×	✓

Predicted Exposure

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.

Consequence Evaluation

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 of entrained in-water hydrocarbons.

Acute or chronic exposure through contact and/or ingestion can result in toxicological risks. However, the presence of an exoskeleton (e.g. crustaceans) reduces the impact of hydrocarbon absorption through the surface membrane. Invertebrates with no exoskeleton and larval forms may be more prone to impacts. 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 the low level of exposure, 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, as they could be expected to result in localised short-term impacts to species of value.

8.9.4.13 Fish

Potential Impacts	Injury/Mortality to fauna Change in fauna behaviour	**Predicted Oil Exposure Otway**				**Predicted Oil Exposure Bass**			
		Shoreline	**Surface**	**Dissolved**	**Entrained**	**Shoreline**	**Surface**	**Dissolved**	**Entrained**
Receptor	Fish	–	–	✓	✓	–	–	✓	✓

Predicted Exposure

Fish 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.

Consequence Evaluation

Several fish communities in the areas likely to be exposure to oil 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.

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 2011a). 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.

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 fish eggs and larvae entrained in the upper water column are not expected to be significant given the temporary nature of the resulting change in water quality. As egg/larvae dispersal is widely distributed in the upper layers of the water column it is expected that current induced drift will rapidly replace any oil affected populations.

Consequently, the potential consequence to eggs/larva are considered to be Minor, as they could be expected to result in localised low-level short-term impacts.

8.9.4.14 Seabirds and Shorebirds

Potential Impacts	Injury/Mortality to fauna Change in fauna behaviour	**Predicted Oil Exposure Otway**				**Predicted Oil Exposure Bass**			
		Shoreline	**Surface**	**Dissolved**	**Entrained**	**Shoreline**	**Surface**	**Dissolved**	**Entrained**
Receptor	Seabirds	✓	✓	✓	✓	–	✓	✓	✓
	Shorebirds	✓	–	–	–	–	–	–	–

Predicted Exposure

The modelling predicts shoreline exposure at the low threshold on the west side of King Island. There is the potential of shoreline oil exposure above low thresholds inshore from the northern part of the Otway Operational Area if a spill occurred while the seabed survey was being undertaken in that area. In addition, surface oil above the low threshold is predicted to occur within a maximum distance of 14.5 km from the spill source.

Consequence Evaluation

Several listed threatened, migratory and/or listed marine seabird species have the potential to be rafting, resting, diving and feeding within the area where oil exposure could be above the low thresholds.

Foraging BIAs for several albatross species, black-face cormorant, common diving-petrel, short-tailed shearwater and wedge-tailed shearwater are present in the area that could be exposed to oil above moderate levels of surface hydrocarbons (Figure 7-29 to Figure 7-32).

A foraging and breeding BIA for little penguins is within the shoreline exposure at the low threshold on the west side of King Island. Impacts to penguins at low levels of hydrocarbons are not predicted.

Little penguins are known to occur along parts of Port Campbell Bay area; therefore, it is possible that little penguins may be present in the area exposed to surface hydrocarbons above the low thresholds.

When first released, diesel 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 14.5 km from the release location) may be impacted; however, it is unlikely that many birds will be affected as volatile surface hydrocarbons are expected to evaporate over 3-4 days.

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 a diesel spill because of the limited period of exposure as sea surface oil is only predicted for the first 26 hrs limiting the period when oiling may occur. Therefore, potential impact would likely be limited to individuals, however, impacts to aggregations may occur.

Consequently, the potential consequence to seabirds is considered to be Moderate, as they could be expected to result in localised minor short-term impacts to species of recognised conservation value.

Several listed threatened, migratory and/or listed shorebirds were identified within the coastal area of the Victorian coast that may be exposed to oil above low thresholds. No BIAs for shorebirds were identified.

Shorebirds are likely to be exposed to oil when it directly impacts the intertidal zone due to their feeding habitats. Shorebird species foraging for invertebrates on 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). Breeding seabirds may be directly exposed to oil via a number of potential pathways. Any direct impact of oil on terrestrial habitats has the potential to contaminate birds 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).

Impacts to shorebirds are not predicted due to the low threshold of oil that would be present on King Island.

Depending on the location of a spill event in the northern part of the Otway Operational Area there could be oil exposure above the low threshold for areas of the Victorian coast within close proximity to the spill location.

Consequently, the potential consequence to shorebirds is considered to be Moderate, as they could be expected to result in localised minor short-term impacts to species of recognised conservation value.

8.9.4.15 Marine Reptiles

Potential Impacts	Injury/Mortality to fauna Change in fauna behaviour	**Predicted Oil Exposure Otway**				**Predicted Oil Exposure Bass**			
		Shoreline	**Surface**	**Dissolved**	**Entrained**	**Shoreline**	**Surface**	**Dissolved**	**Entrained**
Receptor	Turtles	✓	✓	✓	✓	✗	✓	✓	✓

Predicted Exposure

The modelling predicts shoreline exposure at the low threshold on the west side of King Island. There is the potential of shoreline oil exposure above low thresholds inshore from the northern part of the Otway Operational Area if a spill occurred while the seabed survey was being undertaken in that area. In addition, surface oil above the low threshold is predicted to occur within a maximum distance of 14.5 km from the spill source.

Consequence Evaluation

Marine turtles may be present in the area predicted to be exposed to surface oil above low thresholds. However, there are no BIAs or habitat critical to the survival of the species within this area.

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.

The number of marine turtles that may be exposed to surface diesel is expected to be low as there are no BIAs or habitat critical to the survival of the species present; however, turtles may be transient within the area of exposure. Sea surface oil is only predicted for the first 26 hrs limiting the period when oiling may occur. Therefore, potential impact would likely be limited to individuals, with population impacts not anticipated.

Consequently, the potential consequence to marine turtles are considered to be Moderate, as they could be expected to result in localised minor short-term impacts to species of recognised conservation value

8.9.4.16 Pinnipeds – Seals and Sea Lions

Potential Impacts	Injury/Mortality to fauna Change in fauna behaviour	**Predicted Oil Exposure Otway**				**Predicted Oil Exposure Bass**			
		Shoreline	**Surface**	**Dissolved**	**Entrained**	**Shoreline**	**Surface**	**Dissolved**	**Entrained**
Receptor	Pinnipeds	✓	✓	✓	✓	✗	✓	✓	✓

Predicted Exposure

The modelling predicts potential shoreline exposure at the low threshold at Seal Rocks on King Island which is a New Zealand fur-seal breeding colony.

Surface oil above the low threshold is predicted to occur within a maximum distance of 14.5 km from the spill source.

Consequence Evaluation

Breeding colonies (used to birth and nurse until pups are weaned) are particularly sensitive to hydrocarbon spills (Higgins and Gass 1993). Pinnipeds are further at risk because of their tendency to stay near established colonies and haul-out areas and consequently are unlikely to practice oil avoidance behaviours. ITOPF (2011a) report that species that rely on fur to regulate their body temperature (such as fur-seals) are the most vulnerable to oil as the animals may die from hypothermia or overheating, depending on the season, if the fur becomes matted with oil. However, impacts to fur-seals are unlikely at the low thresholds that are predicted for shoreline oil at Seal Rocks.

Seals are vulnerable to sea surface exposures given they spend much of their time on or near the surface of the water, as they need to surface every few minutes to breathe. 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.

The number of seals or sea lions that may be exposed to surface diesel above low thresholds is expected to be low as there are no BIAs or habitat critical to the survival of the species present within these areas, however, seals or sea lions may be transient in low numbers within these. Sea surface oil is only predicted for the first 26 hrs limiting the period when oiling may occur. Therefore, potential impact would be limited to individuals, with population impacts not anticipated.

Given that pinnipeds forage for prey within the water column, exposure to hydrocarbons (either via ingestion of contaminated prey or direct contact with oil droplets) may occur, The area of in-water hydrocarbons above the low threshold is small in comparison to the wider area available to pinnipeds for foraging and their known range of occupation. Due to the temporary and localised nature of the spill, and rapid loss of the volatile components of diesel in choppy and windy seas within the spill area there is a low probability that pinnipeds would be feeding exclusively on prey found in these areas of higher hydrocarbon exposure for long periods of time.

Consequently, the potential consequence to pinnipeds are considered to be Moderate, as they could be expected to result in localised minor short-term impacts to species of recognised conservation value.

8.9.4.17 Cetaceans

Potential Impacts	Injury/Mortality to fauna Change in fauna behaviour	**Predicted Oil Exposure Otway**				**Predicted Oil Exposure Bass**			
		Shoreline	**Surface**	**Dissolved**	**Entrained**	**Shoreline**	**Surface**	**Dissolved**	**Entrained**
Receptor	Cetaceans	×	✓	✓	✓	×	✓	✓	✓

Predicted Exposure

Surface oil above the low threshold is predicted to occur within a maximum distance of 14.5 km from the spill source.

Consequence Evaluation

Several threatened, migratory and/or listed cetacean species have the potential to be within the area predicted to be exposed to surface oil above low thresholds. BIAs for foraging for pygmy blue whales and southern right whales migration and reproduction are within the area predicted to be exposed to surface hydrocarbons above low thresholds.

Geraci (1988) found little evidence of cetacean mortality from hydrocarbon spills; however, some behaviour disturbance (including avoidance of the area) may occur. While this reduces the potential for physiological impacts from contact with hydrocarbons, active avoidance of an area may displace individuals from important habitat, such as foraging.

If whales are foraging at the time of a spill, a greater number of individuals may be present in the area where sea surface oil is present, however sea surface oil is only predicted for the first 26 hrs limiting the period when oiling may occur. Also, the area exposed at thresholds above low (14.5 km from the release location) is relatively small compared to the overall distribution area of cetaceans. Given this is a relatively small area of the total foraging BIA for pygmy blue whales and southern right whales migration and reproduction BIAs, the risk of displacement to whales is considered low.

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. Direct surface hydrocarbon contact may pose little problem to dolphins due to their extraordinarily thick epidermal layer which is highly effective as a barrier to the toxic, penetrating substances found in hydrocarbons. The number of dolphins exposed is expected to be low.

Cetacean exposure to entrained hydrocarbons can result in physical coating as well as ingestion (Geraci and St Aubin 1988). Such impacts are associated with 'fresh' hydrocarbon with the risk of impact declining rapidly as the diesel 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 events 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.

A proportion of the foraging or distributed population of whales could be affected in the relatively localised area and water depth of the total foraging BIA for pygmy blue whales and migration BIA for southern right whales.

Consequently, the potential consequence to cetaceans are considered to be Moderate, as they could be expected to result in localised short-term impacts to species of recognised conservation value.

8.9.4.18 Coastal Settlements

Potential Impacts	Change in aesthetic value Changes to the functions, interests or activities of other users	**Predicted Oil Exposure Otway**				**Predicted Oil Exposure Bass**			
		Shoreline	**Surface**	**Dissolved**	**Entrained**	**Shoreline**	**Surface**	**Dissolved**	**Entrained**
Receptor	Coastal settlements	✓	×	×	×	–	–	–	–

Predicted Exposure
Marine pollution can result in reduced visual aesthetic. The modelling predicts shoreline exposure at the low threshold on the west side of King Island. The low threshold of 10 g/m^2 equates to ~2 teaspoons of hydrocarbon per square metre and would appear as a stain/film. There may also be oil exposure to shorelines along the Victorian coast within the Planning Area if a spill occurred while the seabed survey was being undertaken in the northern part of the Otway Operational Area.

Consequence Evaluation
Shoreline oil at the low threshold had a 2% probability of exposure on the west side of King Island with the minimum time for low threshold shoreline accumulation of 8.13 days. Depending on the location of a spill event in the northern part of the Otway Operational Area there could be oil exposure above the low threshold for areas of the Victorian coast within close proximity to the spill location. Visible shoreline hydrocarbons has the potential to reduce the visual amenity of the area for tourism and discourage recreational activities. Both Cape Otway and the west side of King Island are exposed to substantial wave action that would breakdown any shoreline hydrocarbons. The relatively short duration of exposure and low volume of oil likely to reach the shoreline means there may be short-term and localised consequences, which are ranked as Minor.

8.9.4.19 Other Marine Users

Potential Impacts	Changes to the functions, interests or activities of other users	**Predicted Oil Exposure Otway**				**Predicted Oil Exposure Bass**			
		Shoreline	**Surface**	**Dissolved**	**Entrained**	**Shoreline**	**Surface**	**Dissolved**	**Entrained**
Receptor	Petroleum exploration and development	×	✓	×	×	–	–	–	–
	Other infrastructure	–	–	–	–	–	–	–	–
	Defence	–	–	–	–	–	–	–	–
	Shipping	×	✓	×	×	×	✓	×	×

Predicted Exposure

Other marine uses may be affected by surface hydrocarbons at a moderate threshold that could foul vessels or restrict water intake. Surface hydrocarbons at the moderate threshold are predicted to occur at a maximum of 14.5 km from the spill source.

Consequence Evaluation

Sea surface oil is only predicted for the first 26 hrs limiting the period when other marine users may need to avoid the area. As this would be no greater than 14.5 km the area of deviation is small and temporary.

Oiling may occur of offshore infrastructure which in the area of exposure would be the Thylacine and Yolla platforms both operated by Beach.

The very short duration of exposure and small are of deviation means there may be short-term and localised consequences, which are ranked as Minor.

8.9.4.20 Recreation and Tourism including Recreational Fishing and Diving

Potential Impacts	Change in aesthetic value Changes to the functions, interests or activities of other users	**Predicted Oil Exposure Otway**				**Predicted Oil Exposure Bass**			
		Shoreline	**Surface**	**Dissolved**	**Entrained**	**Shoreline**	**Surface**	**Dissolved**	**Entrained**
Receptor	Tourism	✓	✓	×	×	×	×	×	×
	Recreational diving	×	✓	×	✓	×	×	×	×
	Recreational fishing	✓	✓	×	✓	×	×	×	×

Predicted Exposure

The modelling predicts shoreline exposure at the low threshold on the west side of King Island. The low threshold of 10 g/m^2 equates to ~2 teaspoons of hydrocarbon per square metre and would appear as a stain/film.

There may also be oil exposure to shorelines along the Victorian coast within the Planning Area if a spill occurred while the seabed survey was being undertaken in the northern part of the Otway Operational Area.

Surface oil at a low threshold may be visible as a rainbow sheen and could travel up to 36.5 km from the from the spill source. However, sea surface oil is only predicted for the first 26 hrs limiting the period when a visible sheen may be present.

Consequence Evaluation

Shoreline oil at the low threshold had a 2% probability of exposure on the west side of King Island with the minimum time for low threshold shoreline accumulation of 8.13 days.

Depending on the location of a spill event in the northern part of the Otway Operational Area there could be oil exposure above the low threshold for areas of the Victorian coast within close proximity to the spill location.

Visible shoreline hydrocarbons has the potential to reduce the visual amenity of the area for tourism and discourage recreational activities. Both Cape Otway and the west side of King Island are exposed to substantial wave action that would breakdown any shoreline hydrocarbons.

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. However, this is only predicted for up to 26 hrs and thus unlikely to have a significant impact on visual amenity or discourage recreational activities.

The relatively short duration of exposure and low volume of oil likely to reach the shoreline means there may be short-term and localised consequences, which are ranked as Minor.

8.9.4.21 Commercial Fisheries

Potential Impacts	Changes to the functions, interests or activities of other users	**Predicted Oil Exposure Otway**				**Predicted Oil Exposure Bass**			
		Shoreline	**Surface**	**Dissolved**	**Entrained**	**Shoreline**	**Surface**	**Dissolved**	**Entrained**
Receptor	Commercial fisheries	×	✓	✓	✓	×	✓	✓	✓

Predicted Exposure

Commercial fisheries may be affected by surface hydrocarbons at a moderate threshold that could foul vessels or fishing gear. Surface hydrocarbons at the moderate threshold are predicted to occur at a maximum of 14.5 km from the spill source.

Commercial fish and invertebrate species may 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.

Consequence Evaluation

Several commercial fisheries operate in the Planning Area and overlap the spatial extent of the surface and water column hydrocarbon predictions.

Sea surface oil is only predicted for the first 26 hrs limiting the period when Commercial fisheries may need to avoid the area. As this would be no greater than 14.5 km the area of deviation is small and temporary. Buoys or ropes on the sea surface may come into contact with oil.

In-water exposure to hydrocarbons may result in a reduction in commercially targeted marine species, resulting in impacts to commercial fishing and aquaculture.

Actual or potential contamination of seafood can affect commercial and recreational fishing and can impact seafood markets long after any actual risk to seafood from a spill has subsided (NOAA 2002) which can have economic impacts to the industry.

Any acute impacts are expected to be limited to small numbers of juvenile fish, larvae, and planktonic organisms, which are not expected to affect population viability or recruitment. Impacts from entrained exposure are unlikely to manifest at a fish population viability level.

Consequently, the potential consequence to commercial fisheries are considered to be Moderate, as they could be expected to result in localised, low-level, short-term impacts to a commercial operation.

8.9.4.22 Seaweed Industry

Potential Impacts	Changes to the functions, interests or activities of other users	**Predicted Oil Exposure Otway**				**Predicted Oil Exposure Bass**			
		Shoreline	**Surface**	**Dissolved**	**Entrained**	**Shoreline**	**Surface**	**Dissolved**	**Entrained**
Receptor	Seaweed industry	✓	×	×	✓	–	–	–	–

Predicted Exposure

The modelling predicts potential shoreline and entrained oil exposure at the low threshold in areas along the west side of King Island where bull kelp is collected.

Surface and dissolved oil exposure is not predicted in coastal waters of King Island.

Consequence Evaluation

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.

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 and entrained oil predicted it is unlikely to be a significant impact on seaweed collection and associated income.

The relatively short duration and low volume means there may be short-term and localised consequences to a commercial operation, which is ranked as Moderate.

8.9.4.23 First Nations

Potential Impacts	Change in aesthetic value Changes to the functions, interests or activities of other users	**Predicted Oil Exposure Otway**				**Predicted Oil Exposure Bass**			
		Shoreline	**Surface**	**Dissolved**	**Entrained**	**Shoreline**	**Surface**	**Dissolved**	**Entrained**
Receptor	Sea Country	✓	✓	✓	✓	×	✓	✓	✓
	Native title	✓	×	×	×	–	–	–	–
	Indigenous Protected Areas	–	–	–	–	–	–	–	–
	Indigenous Land Use Agreements	–	–	–	–	–	–	–	–

Predicted Exposure

The modelling predicts shoreline exposure at the low threshold on the west side of King Island. The low threshold of 10 g/m^2 equates to ~2 teaspoons of hydrocarbon per square metre and would appear as a stain/film.

There may also be oil exposure to shorelines along the Victorian coast within the Planning Area if a spill occurred while the seabed survey was being undertaken in the northern part of the Otway Operational Area.

Surface oil at a low threshold may be visible as a rainbow sheen and could travel up to 36.5 km from the from the spill source. However, sea surface oil is only predicted for the first 26 hrs limiting the period when a visible sheen may be present.

Dissolved and entrained oil will occur with concentrations reducing further from the spill source.

Consequence Evaluation

Visible shoreline hydrocarbons has the potential to reduce the visual amenity of Sea Country. Shoreline oil at the low threshold had a 2% probability of exposure on the west side of King Island with the minimum time for low threshold shoreline accumulation of 8.13 days. Depending on the location of a spill event in the northern part of the Otway Operational Area there could be oil exposure above the low threshold for areas of the Victorian coast within close proximity to the spill location.

Though surface oil may be visible as a rainbow sheen is only predicted for the first 26 hrs limiting the period when a visible sheen may be present.

Dissolved and entrained oil 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. Impacts to any unknown underwater submerged cultural landscapes are not predicted from oil.

The relatively short duration and low volume means there may be short-term and localised consequences to cultural values, which is ranked as Moderate.

8.9.5 Control Measures, ALARP and Acceptability Assessment

Control, ALARP and Acceptability Assessment: Loss of Marine Diesel from Vessel Collision	
ALARP Decision Context and Justification	**ALARP Decision Context: Type B** Vessel have been used for activities within the Otway and Bass development for many years with no incident. Vessel activities are well regulated with associated control measures, well understood, and are implemented across the offshore industry. During stakeholder engagement, no concerns were raised regarding the acceptability of impacts from these events. However, if a diesel spill occurred from a vessel collision this could attract public and media interest. Consequently, Beach believes that ALARP Decision Context B should be applied.
Control Measures	**Source of good practice control measures**
CM#7: Ongoing consultation	Under the *Navigation Act 2012*, the Australian Hydrographic Service (AHS) 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. Relevant details in relation to the vessel activity will be provided to the AHS and AMSA and to relevant stakeholders to ensure the presence of the vessel is known in the area. See Section 5.16 Ongoing Consultation.
	Under the *OPGGS Act 2006* there is provision for ensuring that petroleum activities are carried out in a manner that doesn't interfere with other marine users to a greater extent than is necessary or the reasonable exercise of the rights and performance of the duties of the titleholder. Beach ensures this is achieved by conducting suitable consultation with relevant stakeholders. Consultation with potentially affected fisheries ensures the risk of interaction with these users is limited.
CM#15: SMPEP or SOPEP (appropriate to class)	In accordance with MARPOL Annex I and AMSA MO 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. Specifically, the SMPEP/SOPEP contains procedures to stop or reduce the flow of hydrocarbons to be considered in the event of tank rupture.
CM#22: MO 21: Safety and emergency arrangements	AMSA MO 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.
CM#9: MO 30: Prevention of collisions	AMSA MO 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.
CM#23: MO 31: SOLAS and non-SOLAS certification	All vessels contracted to Beach will have in date certification in accordance with AMSA MO 31: SOLAS and non-SOLAS certification.
CM#10: MO 27: Safety of navigation and radio equipment	AMSA MO 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.
CM#24: Vessel fuel type	Vessels contracted to conduct activities under this EP will only carry marine diesel.

Control, ALARP and Acceptability Assessment: Loss of Marine Diesel from Vessel Collision			
Additional Controls Assessed			
Control	**Control Type**	**Cost/Benefit Analysis**	**Control Implemented?**
Eliminate or substitute the use of diesel.	Good Practice	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
Exclusion zone established around the vessel during seabed surveys.	Good Practice	The duration of the seabed surveys at specific locations will be short in duration and the vessel transient. The exclusion of vessels from this area would cause greater impact on socio-economic receptors, such as fisheries and shipping.	No
Smaller vessel used for the seabed survey.	Engineering Risk Assessment	The vessels proposed for the seabed survey and their vessel tank sizes are considerably smaller than vessels used for other petroleum activities, such as seismic surveys and support vessels.	No
Consequence Rating	Moderate (2)		
Likelihood of Occurrence	Highly Unlikely (2)		
Residual Risk	Low		
Acceptability Assessment			
To meet the principles of ESD	The risk of a loss of containment resulting in a diesel spill was assessed as medium and the highest consequence assessed as moderate which is not considered as having the potential to result in serious or irreversible environmental damage. Consequently, no further evaluation against the principles of ESD is required.		
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 9).		
External context	No objections or claims have been raised during stakeholder consultation regarding the potential for diesel spills.		
Other Requirements	• Survey vessels will adhere to relevant legislative requirements as detailed in the controls section. • The South-east Commonwealth Marine Reserves Network Management Plan 2013-23 (DNP 2013) identifies oil pollution associated with shipping, other vessels and offshore mining operations as a pressure or source of pressure on the conservation values of the South-east Marine Reserves Network. In the event of a loss of diesel there is the potential for hydrocarbons to be present in the Apollo, Beagle, Boag and Zeehan AMP depending on the spill trajectory. Impacts to AMP values from a diesel spill are predicted to be localised, minor and short term based on: ◦ Sea surface oil > 10 g/m^2 (moderate threshold is only predicted for the first 36 hrs limiting the period when oiling may occur. ◦ Dissolved and entrained hydrocarbons will only occur within the top 10 m of the water column and thus impacts to benthic habitats, invertebrates and shipwrecks are not predicted. • The activity is consistent with the South-east Commonwealth Marine Reserves Network Management Plan 2013-23 as a diesel spill may impact the Apollo, Beagle and Boag AMPs Multiple Use Zone (IUCN VI) and the Zeehan AMP		

Control, ALARP and Acceptability Assessment: Loss of Marine Diesel from Vessel Collision	
	Multiple Use Zone (IUCN VI) and Special Purpose Zone (IUCN VI). The mitigated impacts are consistent with the IUCN VI management approach for: ◦ Multiple Use Zone—provides for general sustainable use by allowing activities that do not significantly impact on benthic habitats. No impacts are predicted to the benthic habitats from a marine diesel spill in the AMPs. ◦ Special Purpose Zone—provides for limited natural resource use by limiting access to mining and low level extractive activities. No impacts to this zoning are predicted. ◦ Impacts to AMP conservation values are assessed as short-term and recoverable. • The following Conservation Advices / Recovery Plans identify pollution as a key threat: ◦ Recovery Plan for Marine Turtles in Australia (CoA 2017b), identified as acute chemical discharge (oil pollution). ◦ Approved Conservation Advice for *Sternula nereis nereis* (Australian fairy tern) (DSEWPaC 2011c). ◦ National Recovery Plan for the Australian Painted Snipe (CoA 2022b) 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 *Numenius madagascariensis* (eastern curlew) (DoE 2015e) identified as habitat degradation/ modification (oil pollution). ◦ Conservation Advice for *Charadrius leschenaultia* (greater sand plover) (TSSC 2016b) identified as habitat degradation/ modification (oil pollution). ◦ Approved Conservation Advice for *Calidris canutus* (red knot) (TSSC 2016c). ◦ National Recovery Plan for Albatrosses and Petrels (CoA 2022a). ◦ Wildlife Conservation Plan for Migratory Shorebirds (DoE 2015b) ◦ Wildlife Conservation Plan for Seabirds (CoA 2020b) • These Conservation Advices and Recovery Plan 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 Area. 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 diesel spill is required to be reported as per Section 9.10. Impacts as a result of a loss of containment resulting in a diesel spill will be monitored and reported in accordance with the OSMP.
Acceptability outcome	**Acceptable**

8.10 Oil Spill Response

This section presents the risk assessment for oil spill response options as required by the OPGGS(E)R.

8.10.1 Response Option Selection

Not all response options and tactics are appropriate for every oil spill. Different oil types, spill locations, and volumes require different response options and tactics, or a combination of response options and tactics, to form an effective response strategy.

Table 8-12 provides an assessment of the available oil spill response options, their suitability to the potential spill scenarios and their recommended adoption for a 200m^3 marine diesel spill.

The suitable response strategies are:

- Source Control
- Monitor and Evaluate
- Onshore Protection and Deflection
- Shoreline Clean-up
- Oiled Wildlife Response

8.10.2 Hazards

The following activities have been identified as hazards for responding to a vessel collision oil spill event:

- Mobilisation and demobilisation of spill response personnel, plant, and equipment.
- Handling, treatment and/or relocation of affected fauna (oiled wildlife response).

Table 8-12: Suitability of Response Options for a Vessel Collision Resulting in a Diesel Spill

Response Option	Response Description	Feasibility, Effectiveness and ALARP Analysis	Net Environmental Benefit	Capability Needs Analysis (See OPEP and OSMP for details)	Capability Assessment
Source Control	Limit flow of hydrocarbons to environment.	Effective – primary response strategy for all spills in accordance with vessel SMPEP/SOPEP. For marine diesel spill from a vessel in Commonwealth waters, AMSA is the Control Agency and has access to National Plan resources.	Yes	Contract vessels	Vessel contract in place Capability available at request of AMSA as Control Agency
Monitor and Evaluate	Visual – aerial and vessel	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 marine diesel spill response and identify if oil has contacted shoreline or wildlife. Vessel surveillance limited in effectiveness in determining spread of oil. Visible oil on the sea surface may only be present for 26 hrs as diesel will rapidly decay based on the oil spill modelling (RPS 2023).	Yes	Actionable on-water hydrocarbon thresholds limited to immediate vicinity of well site. Potential for shoreline oil on west coast of King Island and coastal areas adjacent to Otway Operational Area. 1 x plane and observer required Remote oil spill trajectory modelling (OSTM)	As detailed in OPEP: • fixed wing contract in place • aerial observers available via AMOSC • OSTM contract in place and available via AMOSC Implement response as per OPEP and under direction of the Control Agency.

Response Option	**Response Description**	**Feasibility, Effectiveness and ALARP Analysis**	**Net Environmental Benefit**	**Capability Needs Analysis** **(See OPEP and OSMP for details)**	**Capability Assessment**
Offshore Containment and Recovery	Booms and skimmers	Not feasible. Marine diesel spreads rapidly to less than 10 g/m^2 and suitable thicknesses for recovery are only present for the first 26 hour for a diesel spill < 300 m^3 (RPS 2023), and there is insufficient mobilisation time to capture residues.	N/A	N/A	N/A
Onshore Protection and Deflection	Booms and skimmer	Potentially feasible. No actionable shoreline oil (> 100 g/m^2) is predicted to occur on shorelines. MDO spreads rapidly to less than 10 µm and suitable thicknesses for recovery are only present for the first ~ 26 hours. If operational monitoring indicates river mouths and inlets 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 oil within these inland water ways. 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 and skimmers Waste facilities	As detailed in OPEP: • Core responders and equipment available via AMOSC. • National Response Team (NRT) and National Response Support Team (NRST) available via Control Agency request under the Nation Plan. • Environmental monitoring providers accessible. • Waste contracts in place. Tactical Response Plans developed for: • Aire River • Curdies Inlet • King Island • Port Campbell Bay • Princetown Implement response as per OPEP and under direction of the State Control Agency.

Response Option	Response Description	Feasibility, Effectiveness and ALARP Analysis	Net Environmental Benefit	Capability Needs Analysis (See OPEP and OSMP for details)	Capability Assessment
Shoreline Clean-up	The active removal and/or treatment of oiled sand and debris	Feasible. May be effective at reducing shoreline loading where access to the shoreline is possible. 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 Net Environmental Benefit Analysis (NEBA) – unlikely to present net benefit	Based on a waste generation (bulking) factor of 10:1 and a clean-up rate of 1 m^3 per day per person, a single clean-up team (10 persons) could clean 10 m^3 / day. Shoreline accumulation on King Island is predicted to be 2.7 m^3 and would more likely use a smaller team over 2 – 3 days. Potential volumes on the Victorian coast will depend on how close the spill location is to shore but could result in larger clean-up volumes requirement a one to two teams of 10 person over a couple of weeks.	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: • Aire River • Curdies Inlet • King Island • Port Campbell Bay • Princetown Implement response as per OPEP and under direction of the State Control Agency.

Response Option	Response Description	Feasibility, Effectiveness and ALARP Analysis	Net Environmental Benefit	Capability Needs Analysis (See OPEP and OSMP for details)	Capability Assessment
Oiled Wildlife Response (OWR)	Capture, cleaning, and rehabilitation of oiled wildlife.	Feasible. Effective. Potential that individual birds could become oiled onshore and in the offshore environment.	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. DEECA is the State agency responsible for responding to wildlife affected by a marine pollution emergency in Victorian waters. DEECA's response to oiled wildlife is undertaken in accordance with the Victorian Wildlife Response Plan for Marine Pollution Emergencies. The Tasmanian Oiled Wildlife Response Plan (WildPlan) is administered by the Resource Management and Conservation Division of the DNRET. If an incident occurs in Commonwealth waters which affects wildlife, AMSA may request support from DEECA or DNRET to assess and lead a response if required. Both DEECA and DNRET have a number of first strike kits as well as access to AMOSC oiled wildlife equipment. Capability in place and sufficient to implement timely response

Response Option	Response Description	Feasibility, Effectiveness and ALARP Analysis	Net Environmental Benefit	Capability Needs Analysis (See OPEP and OSMP for details)	Capability Assessment
Chemical Dispersant Application	Application of chemical dispersants either surface or subsea	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 (ITOPF 2011b). Dispersant use will have a net negative effect on the environment. Dispersants push the marine diesel into the water column, creating longer lasting impacts in the water column than allowing the marine diesel to weather naturally from the sea surface.	No	N/A	N/A

8.10.3 Potential Environmental Impacts

Potential impacts from oil spill response activities are

- Change in fauna behaviour
- Injury/Mortality of fauna
- Change in habitat
- Changes to the functions, interests, or activities of other users

8.10.4 Consequence Evaluation

8.10.4.1 Source Control

No additional impacts that have not been assessed in the previous impacts and risk assessment sections were identified for source control.

8.10.4.2 Monitor and Evaluate

Aircraft, typically helicopters are used for aerial surveillance to detect and monitor an oil spill.

The presence of the helicopter and its associated sound field will be highly transient. Sound pressure from a helicopter 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 and reproduction BIAs and fin or sei whales which may also be foraging) and other marine fauna such as shorebirds is assessed as Minor (1).

8.10.4.3 Onshore Protection and Deflection and Shoreline Clean-up

Damage or removal of habitat (such as sand from beaches) from onshore protection and deflection, and clean-up strategies may expose shorelines to erosion processes or decrease in fauna and flora. Damage 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 movement of spill response personnel, vehicles, and equipment through coastal areas to undertake onshore protection and deflection, and shoreline clean-up has the potential to disturb or damage vegetation, habitats, artefacts or sites of cultural heritage significance. Though no artefacts or sites of cultural heritage significance have been identified on coastal areas within the area which may be exposed to shoreline oil. Any onshore disturbance or implementation of exclusion zones will be considered as part of the operational Net Environmental Benefit Assessment (NEBA) under the direction of the State Combat Agency.

Shorelines are not predicted to be exposure to hydrocarbons at loads that will result in significant stretches of coastline being affected and requiring prolonged clean-up, estimates are a couple of weeks at most. Thus, prolonged effects on local communities or tourism sites as not predicted.

As onshore protection and deflection, and clean-up strategies will only be undertaken under the direction of the State Combat Agency impacts to habitats and changes to the functions, interests or activities of other users are predicted to be Minor (1).

8.10.4.4 Oiled Wildlife Response

Oiled wildlife response may include pre-emptive techniques such as hazing, capturing and relocating of un-oiled fauna as well as post-oiling techniques such cleaning and rehabilitation. Deliberate disturbance of wildlife from known areas of ecological significance (e.g. resting, feeding, breeding, or nesting areas) to limit contact of individuals with hydrocarbons may result in inhibiting these species from accessing preferred habitats or food sources. This approach may also result in additional disturbance/handling stress to the affected species with little benefit as many species tend to display site fidelity and return to the location from which they have been moved.

The incorrect handling of oiled fauna has also the potential to result in increased stress levels which has may result in increased fauna mortality. 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.

As oiled wildlife response will only be undertaken under the direction of the State Combat Agency with the use of trained oil wildlife responders impacts to fauna are predicted to be Minor (1).

8.10.5 Control Measures, ALARP and Acceptability Assessment

Control, ALARP and acceptability assessment: Oil spill response	
ALARP Decision Context and Justification	**ALARP Decision Context: A** The purpose of implementing spill response activities is to reduce the severity of impacts from an oil spill to the environment. However, if the strategies do more harm than good (i.e. they are not having a net environmental benefit) then the spill response is not ALARP.
Control Measures	**Source of good practice control measures**
CM#11: EPBC Regulations 2000 – Part 8 Division 8.1 interacting with cetaceans	Helicopters adhere to the distances and management practices of EPBC Regulations (Part 8).
CM#25: Beach Victorian Oil Pollution Emergency Plan	Oil spill response strategies will be implemented as per the Beach Victorian Oil Pollution Emergency Plan (OPEP).
CM#26: Beach Offshore Victoria Operational and Scientific Monitoring Plan	Oil spill monitoring will be implemented as per the Beach Victorian Offshore Victoria Operational and Scientific Monitoring Plan (OSMP).

Additional Controls Assessed

Control	**Control Type**	**Cost/Benefit Analysis**	**Control Implemented?**
Monitor and evaluate: Satellite tracking buoys.	Good Practice	The surface life for a 200 m^3 vessel diesel spill is estimated to be less than 26 hours, thus tracking buoys are not required for such a short-lived spill.	No
Monitor and evaluate: Utilise additional vessels for spill observations during initial response stages.	Engineering Risk Assessment	Beach has existing contracts in place to support its maritime requirements. However, as the surface life for a 200 m^3 vessel diesel spill is estimated to be less than 26 hours aerial surveillance is more effective and can cover a broader area to identify any oil shorelines of wildlife.	No

Control, ALARP and acceptability assessment: Oil spill response			
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 aerial surveillance during daylight hours will provide operational awareness as the surface spill will only be visible for ~26 hours.	No
OWR: Pre-positioning of oiled wildlife response resources.	Precautionary approach	Oiled wildlife response equipment containers for first strike activities are positioned in Geelong. Positioning the equipment any closer to the potential spill area is not considered to provide a considerable environmental benefit considering that oiled wildlife is unlikely based on the rapid dispersion of a diesel spill.	No
Consequence Rating	Minor (1)		
Likelihood of Occurrence	NA		
Residual Risk	Low		
Acceptability Assessment			
To meet the principles of ESD	Response strategies were evaluated as having the potential to result in a Minor (1) consequence thus is not considered as having the potential to result in serious or irreversible environmental damage. Consequently, no further evaluation against the principles of ESD is required.		
Internal context	The proposed management of the impact is aligned with the Beach Environment Policy. Response strategies will be undertaken in accordance with the Beach Victorian OPEP and Beach Offshore Victoria OSMP.		
External context	No stakeholder concerns have been raised with regards to impacts of the spill response strategies.		
Other requirements	Response has been developed in accordance with: • *Offshore Petroleum and Greenhouse Gas Storage Act 2006* • AMSA Technical Guideline for the Preparation of Marine Pollution Contingency Plans for Marine and Coastal Facilities (AMSA 2015) • NOPSEMA. Oil Pollution Risk Management Guidance Note (NOPSEMA 2021) • South-east Commonwealth Marine Reserves Network Management Plan 2013-23 (DNP 2013). Oil spill response strategies 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	Reporting will be undertaken as per the Beach Victorian OPEP. Monitoring will be undertaken as per the Beach Offshore Victoria OSMP.		
Acceptability outcome	**Acceptable**		

8.11 Cumulative Impact Assessment

In the context of offshore petroleum activities, cumulative environmental impacts are successive, additive or synergistic impacts of collectively significant activities or projects with material impacts on the environment that have the potential to accumulate over temporal and spatial scales (NOPSEMA 2022).

The cumulative environmental impact assessment focuses on planned aspects as impacts from unplanned aspects are not expected to occur and repeated unplanned aspects would be highly unlikely.

The Otway Operational Area overlaps with the existing Beach Otway Development and the proposed Regia Marine Seismic Survey Activity Planning Area, TGS Marine Seismic Survey Operational Area and ConocoPhillips Drilling Operational Area. The Bass Operational Area overlaps with the existing Beach Yolla Development.

Table 8-13 details the review undertaken to identify which planned aspects have the potential for cumulative impacts from the seabed surveys with other existing or proposed activities. From this screening vessels noise from when the survey vessels is on dynamic positioning to take a geotechnical sample was the only planned aspect identified.

Table 8-13: Cumulative Impact Assessment

Aspect	**Consequence Rating**	**Assessment**	**Potential for Cumulative Impacts**	**Cumulative Impact Consequence Rating**	**Additional Controls Required**
Seabed disturbance	Minor	The estimated total area of seabed disturbance is 0.004350 km^2 from the geotechnical samples. With the exception of the West Tasmanian Canyons KEF and Zeehan AMP no sensitive seabed areas are predicted to be impacted by the activity. No other activities were identified that would disturb the seabed within the West Tasmanian Canyons KEF or Zeehan AMP. Thus, cumulative impacts from seabed disturbance to these areas are not predicted. Cumulative impacts are not predicted with other activities that may also impact the seabed within the Otway and Basin Basins such as drilling or infrastructure installation due to the small area of seabed disturbance from the geotechnical samples.	No	NA	NA
Underwater acoustic emissions	Moderate	Acoustic emission from the geophysical survey to the furthest sound threshold (marine mammal behaviour) is 145 m for Otway and 290 m for Bass. Based on the small area of impact for the geophysical survey and the proposed controls (Section 8.5.6) cumulative impacts with drilling or seismic activities are not predicted based on: Additive acoustic emissions leading to an increase in predicted noise levels will not occur as the geophysical survey vessel will be further than 290 m from any seismic or drilling activities in the area. Impacts to fauna from the geophysical survey at a level that could result in cumulative impacts with other activities are not predicted based on: • Impacts to plankton are not predicted as the area of potential impact is a maximum of 3.2 m from the source, thus if impacts did occur it would be to an extremely small proportion of the plankton population that would be within natural mortality rates and recovery would be within days. • Impacts to invertebrates are not predicted as sound levels do not reach any of the effect or no effect criteria for invertebrates at the seafloor	No	NA	NA

Aspect	Consequence Rating	Assessment	Potential for Cumulative Impacts	Cumulative Impact Consequence Rating	Additional Controls Required
		and behavioural impacts to squid are with 36 m of the source which would be indistinguishable from normal behaviour patterns. • Impacts to fish are not predicted as the area of potential impact is a maximum of 3.2 m from the source and may result in minor behavioural impacts which would be indistinguishable from normal behaviour patterns. • Impacts to turtles are not predicted as the area of potential impact is a maximum of 72 m from the source and may result in minor behavioural impacts which would be indistinguishable from normal behaviour patterns. • The furthest distance to the noise effect criteria for whales is 290 m and the control measures detailed in Section 8.5.6 can be implemented to reduce the risk of preventing blue whales or southern right whales from utilising the area or cause injury (TTS and PTS) and/or disturbance. There is the potential that drilling or seismic activities may be undertaken within the Otway Basin at the same time as the geophysical survey, however, as the area of potential impact is very small a significant increase in impact that would prevent blue whales or southern right whales from undertaking biologically important behaviours that are necessary for their recovery are not predicted.			
		Acoustic emission from the geotechnical survey are based on the survey vessel being on DP while taking the sample. Impacts to fish and turtles from vessel noise at a level that could result in cumulative impacts with other activities are not predicted based on impacts to fish and turtles are not predicted as the area of potential impact is a maximum of 110 m from the vessel and may result in minor behavioural impacts which would be indistinguishable from normal behaviour patterns.: For marine mammals the furthest distance to the noise effect criteria is for behavioural response and is 2.71 km for the Otway Operational Areas and 5.94 km for the Bass Operational Area. Impacts to the southern right whale reproduction BIA are not predicted as the Otway Operational Area is ~4 km and the Bass Operational Area is ~35 km from the reproduction BIA.	Yes	Moderate	The following will be added to CM#16: OGV Seabed Survey Scope of Work: • Geotechnical sampling will not occur within 6 km of the Yolla Platform or 3 km of the Otway Platform while resupply is being undertaken.

Aspect	Consequence Rating	Assessment	Potential for Cumulative Impacts	Cumulative Impact Consequence Rating	Additional Controls Required
		Cumulative impacts could occur to marine mammals from an additive increase in noise levels from other vessels, drill rigs or seismic surveys within these distances. For the Bass Operational Area an additive increase in noise levels could only occur if resupply at the Yolla platform was undertaken while geotechnical sampling was occurring within 5.94 km of the platform. To manage this potential increase CM#16 will be implemented. No cumulative impacts from the installation of Marinus Link cable are predicted as it is 14 km from the Bass Operational Area. As shown in Figure 7-58: Vessel Traffic within the Operational and Planning AreasFigure 7-58, a shipping lane passes through the Bass Operational Area for vessels traversing from Melbourne to Tasmania. Any increase in noise levels in the Bass Operational Area from vessels traversing through the area while a geotechnical sample is being taken would be slight and temporary as the transiting vessel passes by. For the Otway Operational Areas an additive increase in noise levels could occur if resupply at the Otway platform was undertaken while geotechnical sampling was occurring within 2.71 km of the platform. To manage this potential increase CM#16 will be implemented. TGS Marine Seismic Survey have committed to no acquisition will occur within the pygmy blue whale foraging BIA or the associated buffer (16 km) during the ‘peak feeding season’ from January to June (inclusive) with the exception to this is the acquisition of the 2D tie line which will be subject to additional operational restrictions and will take ~12 hours to acquire (TGS 2023). Thus, cumulative impacts to foraging blue whales from the TGS survey and geotechnical sampling would only occur for up to 12 hours. This can be managed via the implementation of the proposed control measures detailed in Section 8.5.6 to reduce the risk of preventing blue whales from utilising the area or cause injury (TTS and PTS) and/or disturbance. As the area of potential impact from the geotechnical sampling is small (3 km) and the temporal overlap with the TGS survey is only 12 hrs, a significant increase in impact that would prevent blue whales from undertaking biologically important behaviours that are necessary for their recovery are not predicted.			

Aspect	Consequence Rating	Assessment	Potential for Cumulative Impacts	Cumulative Impact Consequence Rating	Additional Controls Required
		Proposed drilling by Beach and ConocoPhillips and potentially other titleholders in the Otway Basin will be undertaken by one drill rig, thus limiting potential cumulative impacts. However, the cumulative impacts to foraging blue whales and migrating southern right whales from the geotechnical sampling being undertaken whilst drilling activities are occurring can be managed via the implementation of the proposed control measures detailed in Section 8.5.6 to reduce the risk of preventing them from utilising the area or cause injury (TTS and PTS) and/or disturbance. As the area of potential impact from the geotechnical sampling is small (3 km), a significant increase in impact that would prevent blue whales or southern right whales from undertaking biologically important behaviours that are necessary for their recovery are not predicted.			
Atmospheric emissions	Minor	As air emissions will rapidly disperse to background levels close to the emission source and impacts to climate change are not predicted, cumulative impacts with other activities that may occur within the Otway and Bass Basins are not predicted.	No	NA	NA
Light	Minor	As vessels undertaking the seabed surveys will have a Lighting Management Procedure, light is not predicted to have a significant impact on light sensitive species in the Otway and Basin Basins. Thus, cumulative impacts with other activities that may occur within the Otway and Bass Basins are not predicted.	No	NA	NA
Planned marine discharges	Minor	Marine discharges are not predicted to have lasting effects on biological or physical receptors as discharges will be intermittent and of a low volume and rapidly disperse in the marine environment. Thus, cumulative impacts with other activities that may occur within the Otway and Bass Basins are not predicted.	No	NA	NA
Physical Presence	Minor	As an exclusion zone is not required for the seabed surveys other marine users will be required to apply normal navigation requirements and thus cumulative impacts are not predicted. For commercial fishers there is the potential for cumulative impacts from successive impacts from one activity after another and from additive impacts from activities occurring at the same time. However, the cumulative	No	NA	NA

Aspect	Consequence Rating	Assessment	Potential for Cumulative Impacts	Cumulative Impact Consequence Rating	Additional Controls Required
		impact of the seabed survey would not be significant due to the short duration (hours) in an area, small area to be navigated around and that Beach has undertaken activities, including seabed surveys, in the Otway and Bass Operational Areas since 2008 and 2006, respectively without significant impact to commercial fishers.			

8.12 Environmental Performance Outcomes, Environmental Performance Standards and Measurement Criteria

This section provides the EPOs, EPSs and measurement criteria for the control measures identified.

Table 8-14: Seabed Survey Control Measures, EPOs, EPSs and Measurement Criteria

Environmental Performance Outcome	Control Measure #	Environmental Performance Standard	Measurement Criteria	Responsible Person
EPO1: No substantial reduction of air quality within local airshed caused by atmospheric emissions produced during the activity. EPO2: No impact to water quality at a distance > 500 m from the vessel from planned marine discharges.	CM#1: MO 97: Marine Pollution Prevention – Air Pollution	Use of very low sulphur fuel oil (VLSFO) (e.g. maximum 0.50% S VLSFO-DM, maximum 0.50% S VLSFO-RM). Vessels with diesel engines>130 kW must be certified to emission standards (e.g. International Air Pollution Prevention [IAPP]). Vessels shall implement their Ship Energy Efficiency Management Plan to monitor and reduce air emissions (as appropriate to vessel class).	Bunker receipts Ship Energy Efficiency Management Plan (SEEMP) records Certification documentation Vessel inspection	Vessel Master
	CM#2: Protection of the Sea (Prevention of Pollution from Ships) Act 1983	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 MARPOL certification Vessel inspection	Vessel Master
	CM#3: MO 96: Marine Pollution Prevention – Sewage	Sewage discharged at sea shall be treated via a MARPOL (or equivalent) approved sewage treatment system. Food waste only discharged when macerated to ≤25 mm and at distance greater than 3 nm from land.	Garbage record book MARPOL certification Vessel inspection	Vessel Master
	CM#4: Spill Containment	Materials and equipment that have the potential to spill onto the deck or marine environment shall be stored within a contained area.	Vessel inspection.	Vessel Master
	CM#5: Offshore Environmental Chemical Assessment Process	Vessel will have a chemical assessment process to ensure any chemicals used in waste wate discharges are of the lowest toxicity for the required use.	Vessel inspection.	Vessel Master
	CM#6: Preventative Maintenance System	Power generation and propulsion systems on vessels will be operated in accordance with maintenance management system to ensure efficient operation. Equipment used to treat planned discharges shall be maintained in accordance with manufacturer's specification as detailed within the preventative maintenance system.	Maintenance Management System (MMS) records Vessel inspection	Vessel Master
EPO3: 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.	CM#7: Ongoing Consultation	Seabed survey notifications and ongoing consultations will be undertaken as per Section 5.16 (Ongoing Consultation).	Notification records Consultation records	Activity Project Manager
	CM#8: Beach Fair Ocean Access Procedure	The Beach Fair Ocean Access Procedure (Appendix H.1 for overview) shall be implemented with fishers who have identified they fish in the area and have a commercial loss due to Beach's activities.	Consultation records	Community Relations Manager

Environmental Performance Outcome	Control Measure #	Environmental Performance Standard	Measurement Criteria	Responsible Person
EPO4: Seabed and associated biota disturbance will be within the Operational Areas.	CM#16: OGV Seabed Survey Scope of Work	To avoid impacts to benthic habitats, telecommunication cables, UXO underwater cultural heritage and First Nations underwater cultural heritage the OGV Seabed Survey Scope of Work will include the following: • Geotechnical samples will not be taken within known locations of telecommunication cables, UXO, underwater cultural heritage and First Nations underwater cultural heritage sites. • Geotechnical samples will not be taken within 1 km of a telecommunication cables. • Geotechnical samples will not be taken within of 250 m of Beach infrastructure. • Geotechnical sample locations will be finalised after the geophysical survey data is obtained and interpretated to identify any telecommunication cables, UXO, underwater cultural heritage and First Nations underwater cultural heritage sites. • Geotechnical samples will only be taken within the West Tasmanian Canyons KEF or Zeehan AMP if it is deemed essential to ensure safe drilling activities. Geophysical data will be obtained in a manner that can be utilised to obtain information on First Nations underwater cultural heritage. This will be determined in consultation with the appropriate First Nations groups, where engagement can be obtained, and cultural heritage researchers or consultants. To avoid cumulative underwater acoustic emission impacts the OGV Seabed Survey Scope of Work will include the following: • Geotechnical sampling will not occur within 6 km of the Yolla Platform or 3 km of the Otway Platform while resupply is being undertaken.	OGV Seabed Survey Scope of Work Consultation records Underwater Cultural Heritage Report	Activity Project Manager
• EPO5: No death or injury to fauna, including listed threatened or migratory species, from the activity. • EPO6: Sound emissions in BIAs will be managed such that any whale, including blue whales, continue to utilise the area without injury, and is not displaced from a foraging area. • EPO7: Biologically important behaviours within a BIA or outside a BIA can continue while the activity is being undertaken.	CM#11: EPBC Regulations 2000 – Part 8 Division 8.1 Interacting with Cetaceans	Vessel operators shall adhere to the distances and vessel management practices of EPBC Regulations (Part 8) and report vessel interactions with dolphins specifically: i. Do not approach a dolphin. ii. Maintain a distance of 150 m from a dolphin. iii. If a dolphin approaches the vessel try to maintain the separation distances without changing direction or moving into the path of the animal. Vessel operators shall adhere to the distances and vessel management practices of EPBC Regulations (Part 8) and report vessel interactions with whales, specifically: i. Do not approach a whale. ii. Maintain a distance of 300 m from a whale. If a whale approaches the vessel it will try to maintain the separation distances without changing direction or moving into the path of the animal. Helicopters will not fly lower than 1650 ft when within 500 m horizontal distance of a cetacean except when landing or taking off and will not approach a cetacean from head on.	Project induction DCCEEW cetacean sighting sheets	Vessel Master

Environmental Performance Outcome	Control Measure #	Environmental Performance Standard	Measurement Criteria	Responsible Person
	CM#12: Vessel Speed Restrictions	Vessel speeds when undertaken a survey will be restricted to 10 knots.	Project induction Vessel log	Vessel Master
	CM#17: Geophysical Whale Management Procedure	For geophysical surveys using SBP (boomer or sparker) a prestart visual observation period of 30 mins will be applied to 300 m prior to the start of the SBP (boomer or sparker). If during the prestart visual observation period, a whale is sighted within 300 m of the vessel the SBP equipment activation will be delayed until the whale has moved outside of the 300 m zone or 30 minutes has lapsed since the last whale sighting within 300 m. SBP equipment will not be started at night if there have been three or more delays to the start-up of the equipment due to whales in the previous 24 hours.	Daily report details pre-start observation period, any sightings and any actions required.	MFO
		If whales numbers are greater than expected such that pre-start observations are delayed three times in a 24 hour period or the vessel has to move away from a whale or a pod of whales in a 24 hr period, a review of the controls currently in place will be undertaken by the Activity Offshore Representative, Activity Project Manager and Environment Advisor. The review will be documented and will be undertaken against the Implementation of the EPBC Act Policy 2.1 Part A requirements to identify if further controls need to be applied to ensure that impacts and risks are ALARP and within the defined acceptable level.		

Environmental Performance Outcome	Control Measure #	Environmental Performance Standard	Measurement Criteria	Responsible Person
	CM#18: Geotechnical Whale Management Procedure	Prior to commencing geotechnical sampling at a well location a pre-sampling survey will be undertaken to of the Activity Action Zone: • Otway – 3 km • Bass – 6 km Surveys will be undertaken for 30 min prior to the sampling commencing. If a whale is sighted within the Activity Action Zone, sampling will not commence until: • No whales are observed for 30 min within the Activity Action Zone ; or • Whales are observed leaving the Activity Action Zone. Once the sampling has commenced observations will be undertaken as far as can be seen covering the Activity Action Zone. If a whale is sighted within the Activity Action Zone, the following will occur: • If the vessel can do so it will move away from the whale and maintain a minimum separation distance equal to the Activity Action Zone. • If the vessel cannot move away from the whale, the vessel will reduce thrusters if safe to do so. The sampling will cease as soon as it is safe, and the vessel will move out of the Activity Action Zone. The activity can recommence once: • No whales are observed for 30 min within the Activity Action Zone; or • Whales are observed leaving the Activity Action Zone.	Daily report details review, attendees and any actions required.	MFO
		If the MFO cannot observe out to the Activity Action Zone from the vessel at a static location, an observation survey will be undertaken of the Activity Action Zone prior to commencing sampling. The survey will consist of a number of lines in the Activity Action Zone with the distance between lines and vessel speed determined by the MFO based on the distance they can be confident in identifying whales based on the sea state and weather visibility conditions. If visibility is poor, closer survey lines and a slower vessel speed will be required compared to if visibility is high.		
		Sampling can commence at night or in low visibility conditions (i.e., when observations cannot be undertaken) if no more than three whales have been seen in the Activity Action Zone in the preceding daylight hours.		

Environmental Performance Outcome	Control Measure #	Environmental Performance Standard	Measurement Criteria	Responsible Person
	CM#19: Marine Fauna Observer	A dedicated MFO will be present on the vessel to undertake pre-sampling surveys, visual observations and implement controls. The MFO will have proven experience in whale observation, distance estimation and reporting. In addition, at least one crew member onboard the vessel will have proven experience in whale observation, distance estimation and reporting to provide coverage when the MFO is required to break.	MFO resume. Daily report details pre-start observation period, any sightings and any actions required.	Activity Project Manager
	CM#20: Vessel Light Management Procedure	Vessels will have a Lighting Management Procedure (or equivalent) to minimise light spill by: ◦ keeping lights off when not needed. ◦ directing lighting onto work areas. ◦ screening interior lights with curtains and blinds. ◦ developing a program for handling grounded birds. ◦ reporting requirements. The Vessel Lighting Management Procedure (or equivalent) will meet the requirements detailed in Beach Energy's Vessel Light Management Procedure Guidance (CDN/ID 19012450).	Lighting Management Procedure (or equivalent) Beach Energy's Vessel Light Management Procedure Guidance Vessel inspection	Vessel Master
EPO9: No unplanned discharge of waste to the marine environment.	CM#13: MO 95: Marine Pollution Prevention - Garbage	Waste with potential to be windblown shall be stored in covered containers.	Vessel inspection Garbage record book Incident report	Vessel Master
EPO10: No introduction of a known or potential invasive marine species	CM#21: Beach Domestic IMS Biofouling Risk Assessment Process	Prior to the initial mobilisation into the Operational Areas of any vessel or submersible equipment, Beach shall undertake a domestic IMS biofouling risk assessment as per Section 9.11.2 of this EP to: • Validate compliance with regulatory requirements (Commonwealth and State) in relation to biosecurity prior to engaging in petroleum activities within the Operational Areas. • Identify the potential IMS risk profile of vessels and submersible equipment prior to deployment within the Operational Areas. • Identify potentially deficiency of IMS controls prior to entering the Operational Areas. • 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 Areas).	Domestic IMS Biofouling Risk Assessment records	Activity Project Manager
EPO11: No spills of chemicals or hydrocarbons to the marine environment.	CM#9: MO 30: Prevention of collisions	Vessels shall meet the navigation equipment, watchkeeping, radar and lighting requirements of AMSA MO 30.	Vessel inspection	Vessel Master
	CM#10: MO 27: Safety of navigation and radio equipment	Vessels shall meet the safety of navigation and radio equipment requirements of AMSA MO 27. Vessels shall ensure their navigation status is set correctly in the ship's AIS unit.	Vessel inspection	Vessel Master

Environmental Performance Outcome	Control Measure #	Environmental Performance Standard	Measurement Criteria	Responsible Person
	CM#14: Spill containment	Materials and equipment that have the potential to spill onto the deck or marine environment shall be stored within a contained area.	Vessel inspection.	Vessel Master
	CM#15: SMPEP or SOPEP (appropriate to class)	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 shall be available and routinely checked to ensure adequate stock is maintained.	Vessel SMPEP Vessel inspection Vessel exercise schedule	Vessel Master
	CM#22: MO 21: Safety and emergency arrangements	Vessels shall meet the safety measures and emergency procedures of the AMSA MO 21.	Vessel inspection	Vessel Master
	CM#23: MO 31: SOLAS and non-SOLAS certification	Support vessels will meet survey, maintenance and certification of regulated Australian vessels as per AMSA MO 31.	Vessel certification	Vessel Master
	CM#24: Vessel fuel type	Vessels contracted to conduct activities under this EP will only carry marine diesel.	Vessel inspection	Operations Manager Project Manager
	CM#25: Beach Victorian Oil Pollution Emergency Plan	Emergency spill response capability is maintained in accordance with the OPEP	Outcomes of internal audits and tests demonstrate preparedness	Senior Crisis, Emergency & Security Advisor
		Implement spill response in accordance with relevant EPOs and EPSs in the accepted OPEP.	EMT log	Beach EMT
	CM#26: Beach Offshore Victoria Operational and Scientific Monitoring Plan	Operational and scientific monitoring capability is maintained in accordance with the OSMP.	Outcomes of internal audits and tests demonstrate preparedness	Senior Crisis, Emergency & Security Advisor

9 Implementation Strategy

The OPGGS(E)R requires that the EP must contain an implementation strategy for the activity.

The Beach Operations Excellence Management System (OEMS) will be used to govern the activity. The OEMS provides guidance on how Beach will meet the requirements of its Environmental Policy (Figure 9-2). The Beach OEMS has been developed considering Australian/New Zealand Standard ISO 14001:2016 Environmental Management Systems. The OEMS is an integrated management system and includes all HSE management elements and procedures.

The Implementation Strategy described in this section provides a summary of the OEMS elements and how they will be applied to effectively implement the control measures detailed in this EP. Specifically, it describes:

- The OEMS.
- Environment-specific roles and responsibilities.
- Arrangements for monitoring, review and reporting of environmental performance.
- Preparedness for emergencies.
- Arrangements for ongoing consultation.

9.1 Operations Excellence Management System

The OEMS documents the Environmental Policy, the 11 OEMS Elements and 30 OEMS Standards. It provides a management framework for achieving the requirements in a systematic way but allows flexibility to achieve this in a manner that best suits the business. The OEMS is aligned with the requirements of recognised international and national standards including:

- ISO 14001 (Environmental Management)
- OHSAS 18001 (Occupational Health and Safety)
- ISO 31000 (Risk Management)
- AS 4801 (Occupational Health and Safety Management Systems)

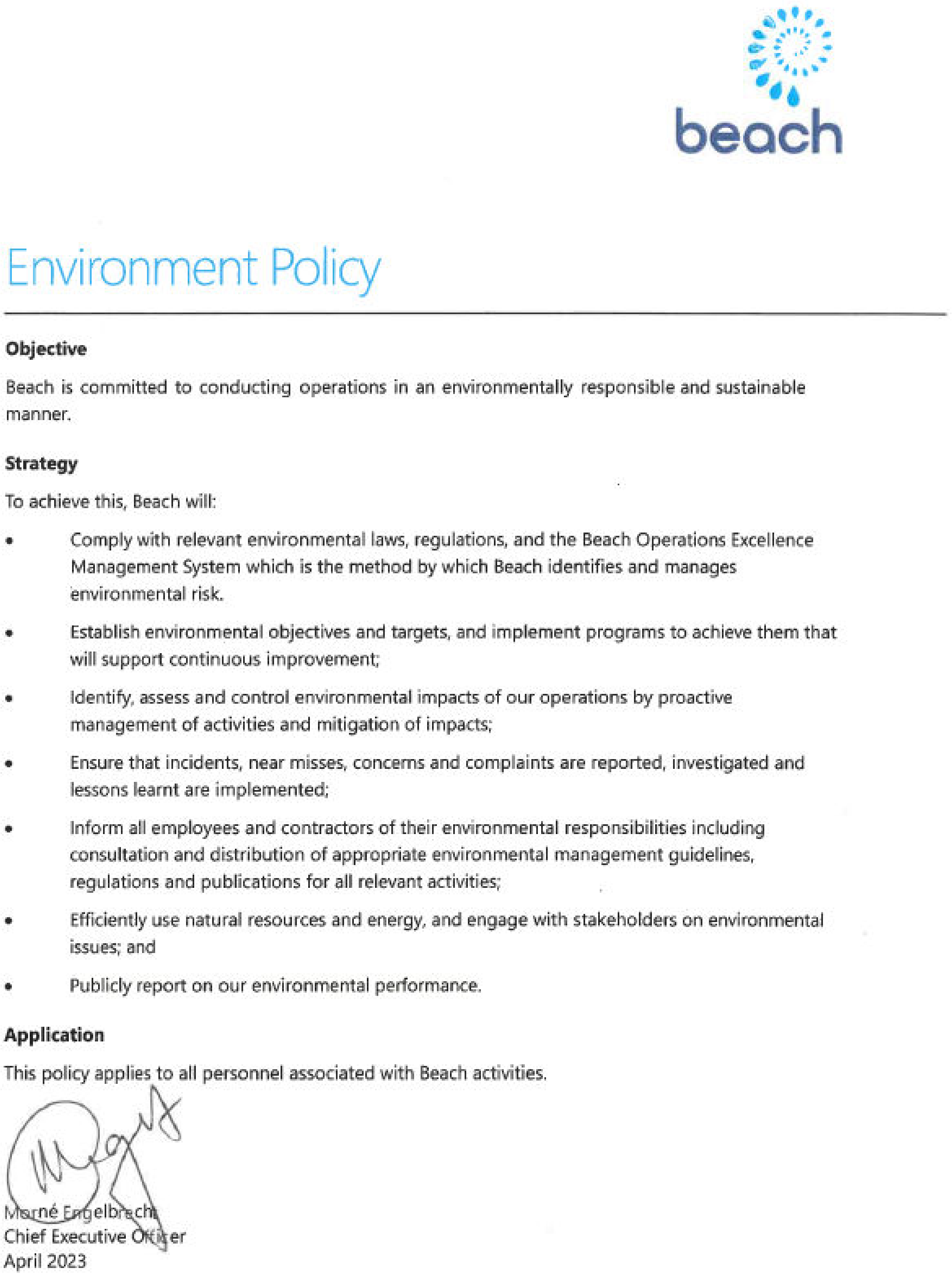
At the core of the OEMS are 11 elements and associated standards that detail specific performance requirements that incorporate all the requirements for the implementation of the Environmental Policy (Figure 9-2) and management of potential HSE impacts and risks (Figure 9-1, Table 9-1). The Elements, via the nominated expectations, sponsor 30 Beach OEMS Standards, which provide more granular minimum compliance rule sets under which the company operates. At the business level, the system is complemented by asset and site procedures and plans such as this EP.

Whilst Beach is the titleholder for the activity, the vessel contractor maintains operational control as per the requirements of their management system. The application of OEMS Elements and Standards relevant to the activity are described in the following sections.

Figure 9-1: Beach OEMS

Table 9-1: OEMS Performance Standards

Element		Standard
1	Partners, Leadership and Authority	Leadership Standard
		Technical Authority Standard
		Joint Venture Management Standard
2	Financial Management and Business Planning	Integrated Planning Standard
		Phase Gate Standard
		Hydrocarbon Resource Estimation and Reporting Standard
		Financial Management Standard
3	Information Management and Legal Requirements	Regulatory Compliance Standard
		Document Management Standard
		Information Management Standard
4	People, Capability and Health	Training and Competency Standard
		Health Management Standard
5	Contracts and Procurement	Contracts and Procurement Standard
		Transport and Logistics Standard
6	Asset Management	Asset Management Standard
		Maintenance Management Standard
		Well Integrity Management Standard
		Well Construction Management Standard
		Project Management Standard
7	Operational Control	Operational Integrity Standard
		Process Safety Standard
		Management of Change Standard
8	Risk Management and Hazard Control	Risk Management Standard
		Safe Systems of Work
		Emergency and Security Management Standard
9	Incident Management	Incident Management Standard
10	Environment and Community	Environment Management Standard
		Community Engagement Standard
11	Assurance and Reporting	Sustainability Standard
		Assurance Standard



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.

Morné Engelbrecht
Chief Executive Officer
April 2023

Figure 9-2: Beach’s Environmental Policy

9.2 Element 1 – Partners, Leadership and Authority

Element 1 focuses on ensuring 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.

The Beach Energy CEO has the ultimate responsibility for ensuring that Beach Energy has the appropriate organisation in place to meet the commitments within this EP. However, the Activity Project Manager 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 9-2.

Roles and responsibilities for an oil pollution emergency response are described in the OPEP.

Table 9-2: Roles and Responsibilities for Key Roles for the EP Implementation

Role	Responsibilities
Managing Director	• Responsible for HSE performance of all Beach activities. • Ensures policies and systems are in place to guide the company's environmental performance.
Chief Operating Officer	• Responsible for HSE performance of all Beach operational assets and their activities. • 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.
Activity Project Manager	Ensure: • Compliance with the Environment Policy, regulatory and other requirements, and this EP. • Records associated with the activity are maintained as per Section 9.4.2. • 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. • Assurance Processes as detailed in Section 9.12 are undertaken to confirm that control measures detailed in the EP are effective in reducing the environmental risks of the activity to ALARP and acceptable levels, and the EPOs and EPSs are continually met. • Environmental impacts and risks associated with the activity have been identified and any new or increased impacts or risks are managed via the Management of Change process detailed in Section 9.8.1. • Incidents are managed and reported as per Section 9.10. • EP Performance Report is submitted to NOPSEMA as per Section 9.12.7. • 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 Management of Change process detailed in Section 9.8.1. • Oil spill response arrangements are tested as per the OPEP. • Audits and inspections are undertaken in accordance with Section 9.12.4.
Head of Environment	• Ensures this EP is revised as required. • Reviews EP audits. • Leads the investigation and reporting of any environmental incidents. • Reviews and approves reportable incident reports to the regulators. • Reviews changes to operations for their environmental and regulatory implications.
Environment Advisor	• Maintains ongoing communications with the Activity Project Manager regarding regulatory requirements and environmental management in general.

Role	Responsibilities
	• Prepares environmental inductions and training packages. • Monitors environmental performance against this EP. • Undertakes Assurance Processes as detailed in Section 9.12 to confirm that control measures detailed in the EP are effective in reducing the environmental risks of the activity to ALARP and acceptable levels, and the EPOs and EPSs are continually met. • Prepares and submits monthly recordable incident reports to the regulators. • Prepares reportable incident reports for submission to the regulators. • Supports the Management of Change (MoC) process with regard to environmental issues impacting on operations. • Supports the investigation and reporting of any environmental incidents. • Prepares and submits reportable incident reports to the regulators. • Reviews changes to operations with the Head of Environment.
Community Relations Manager	• Ensures that relevant persons (as defined in Section 5) are consulted about operations issues that may impact their functions or interests. • Maintains a record of stakeholder communications. • Reports stakeholder concerns to the PIC and Senior Environment Advisor for resolution. • Keeps relevant persons informed of emergency events that may impact their functions or interests.
Activity Offshore Representative	Ensure: • Activity is carried out in accordance with regulatory requirements and this EP. • Vessel personnel complete the environmental component of the activity induction. • Vessel distances and vessel management practices for marine mammals as per the control measures and environmental performance standards detailed in Table 8-14 are communicated to Vessel Master and crew. • 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. • Environmental incidents are managed and reported as per Section 9.10.1. • Emissions and discharges identified in Section 9.12.8 are recorded and provided to the Activity Project Manager. • Activity Project Manager 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 9.8.1. • Weekly vessel inspections are undertaken to ensure ongoing compliance with the EP as per Section 9.12.4.
Vessel Master	Ensure: • Vessel operations are carried out in accordance with regulatory requirements and this EP. • Vessel adheres to the distances and vessel management practices for marine mammals as per the control measures and environmental performance standards detailed in Table 8-14. • Environmental incidents are reported to the Activity Offshore Representative within required timeframes as per Section 9.10. • Oil spill response arrangements are in place and tested as per the vessel's SMPEP or equivalent.
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.

9.3 Element 2 – Financial Management and Business Planning

Element 2 seeks to ensure robust and achievable business plans are developed and supported by a consistent and realistic understanding of facility constraints. It drives robust analysis and accountable decision-making to deliver assets that maximise lifecycle value, providing clear cost control throughout the life of an asset.

There are four standards (Table 9-1) and ten outcomes to be delivered under this element.

This EP does not cover the risks involved in financial management and impact on the activity. The relevant impacts of financial and business planning risks are managed under the other OEMS elements described in this chapter.

9.4 Element 3 – Information Management and Legal

Element 3 describes the measures Beach must take to ensure ongoing compliance with regulatory and legal obligations in order to protect the Company's value and reputation, and to maintain Beach's licences to operate. Beach's ability to safely perform its duties in line with its legal obligations relies on robust management of documents and information.

There are three standards (Table 9-1) and seven outcomes to be delivered under this element. The standards relevant to the implementation of this EP are described below.

9.4.1 Standard 3.1 – Regulatory Compliance Standard

Standard 3.1 describes the responsibilities of each stakeholder and the processes for identifying, maintaining, managing and reporting Beach's regulatory compliance obligations. The Standard details the minimum requirements of a system to ensure effective Regulator engagement can be maintained across all its activities including permissions, project execution, operating and reporting.

Section 6 of this EP details the key environmental requirements applicable to the activity. The acceptability discussion for each aspect is assessed in Chapter 8 and specifically details the environmental requirements pertaining to each aspect.

9.4.2 Standard 3.2 – Document Management Standard

Standard 3.2 specifies the minimum requirements to ensure that all Beach documents and records are managed in alignment with legal, regulatory and stakeholder requirements. It requires documents to be classified, developed, authorised, published, stored, accessed, reviewed and disposed consistently and in a manner that complies with company and statutory obligations. The document management system will clearly support the safe and efficient operations of the Company.

Documents and records relevant to the implementation of this EP are stored and maintained in the Beach document control system ('BoardWalk') for a minimum of five years. These records will be made available to regulators in electronic or printed form upon request.

9.4.3 Standard 3.3 – Information Management Standard

Standard 3.3 ensures that Beach implements appropriate Information Management practices to ensure information is managed as a corporate asset, enabling it to be exploited to support corporate objectives as well as satisfying Beach's legal and stakeholder requirements.

9.5 Element 4 – People, Capability and Health

Element 4 focuses on ensuring the people within the business are fully equipped with the competencies required to perform their assigned duties and are physically and mentally prepared. This element is important in protecting workers' health and is closely aligned with Standard 8.1 (Risk Management) and Standard 8.2 (Safe Systems of Work).

There are two standards (Table 9-1) and four outcomes to be delivered under this element. Standard 4.1 is discussed below, noting that the health management standard is not relevant to the EP.

9.5.1 Standard 4.1 – Training and Competency Standard

Standard 4.1 describes the minimum company requirements to ensure peoples training requirements are identified and meet the tasks they are required to perform, and that verification of competency is carried out where necessary. The Standard defines the responsibilities for ensuring suitable training programmes are available and for ensuring peoples levels of capability are maintained at the required level.

Each employee or contractor with responsibilities pertaining to the implementation of this EP shall have the appropriate competencies to fulfil their designated role.

To ensure that personnel are aware of the EP requirements for the activity all offshore personnel will complete an induction, as a minimum. Records of completion of the induction will be recorded and maintained as per Section 9.4.2. The induction will at a minimum cover:

- Description of the environmental sensitivities and conservation values of the operational areas and surrounding waters.
- Controls to be implemented to ensure impacts and risks are of an acceptable level and ALARP.
- 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.
- Location of known Cultural Heritage Sites and the process to follow if a Cultural Heritage Site is identified.
- Fauna sighting, including whale identification, fauna reporting and vessel interaction procedures.
- 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.

9.5.2 Communications

The Activity Project Manager 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 meeting.

The meetings are used to identify and communicate:

- 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.

9.6 Element 5 – Contracts and Procurement

Element 5 addresses the acquiring of external services and materials, and the transportation of those materials. It ensures Beach's business interests are met while maintaining compliance with all legal obligations and retaining HSE performance as the top priority. Element 5 also documents requirements for management of land transport risks.

There are two standards (Table 9-1) and four outcomes to be delivered under this element.

Beach undertakes a pre-qualification of all contractors in which their HSE systems are reviewed to ensure that the contractor's 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 HSEMS implementation.

Training and competency of contractor personal engaged to work on the activity shall be managed in accordance with the contractor's HSEMS (or equivalent).

9.12.4 details how the contractors will be assessed to ensure they have the capabilities and competencies to implement the control measures identified in Section 8.

9.7 Element 6 – Asset Management

The focus of Element 6 is the design, build and operation of assets. The underpinning standards reflect the importance of inherent safety in design, recognising that hazards and risk are to be reduced to ALARP in the design phase of an asset. The standards define the minimum requirement for the monitoring and assurance processes that support the ongoing safe and reliable management of an asset throughout its lifecycle. Element 6 draws heavily on the principles of process safety and is closely aligned with Elements 7 (Operational Control) and Element 8 (Risk Management).

There are five standards (Table 9-1) and eight outcomes to be delivered under this element.

Equipment that have been identified as a control measure for the purpose of managing potential environmental impacts and risks from the activity have an associated EPS that details the performance required as detailed in Section 8.

9.8 Element 7 – Operational Control

Element 7 focuses on the definition of parameters, practices and procedures required to ensure adequate controls and safe execution of work at operating assets. It deals with the ongoing management of barrier integrity throughout asset lifecycle, ensuring good process safety practices are consistently deployed, and that facility changes manage holistic risk.

There are three standards (Table 9-1) and ten outcomes to be delivered under this element. The standard of relevance to this EP Management of Change is discussed below.

9.8.1 Standard 7.3 – Management of Change Standard

Standard 7.3 defines the minimum planning and implementation requirements for technical and organisational change at Beach. It details the requirement for holistic assessment of the change, the requirement for consultation with stakeholder's dependent upon the nature of the change, and the need for clear accountability for the change. Risk associated with change is mitigated by ensuring change is appropriately approved, effectively implemented, formally assured and closed out upon completion. Any changes must be classified as either temporary or permanent.

The intent of the Management of Change (MoC) Standard is 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.

Changes to equipment, systems and documentation are managed in accordance with the MoC Standard to ensure that all proposed changes are adequately defined, implemented, reviewed and documented by suitably competent persons. This process is managed using an electronic tracking database (called 'Stature'), which provides assurance that all engineering and regulatory requirements have both been considered and met before any change is operational. The MoC process includes not just plant and equipment changes, but also documented procedures where there is an HSE impact, regulatory documents and organisational changes that impact personnel in safety critical roles.

Not all changes require a 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.

Where risk and hazard review processes nominated in Section 9.9 identify a change in impacts, risks or controls (compared to those described and assessed in Chapter 8), and triggers a regulatory requirement to revise this EP, as per Section 9.12.6, the revision shall be defined, endorsed, completed and communicated in accordance with the MoC Standard.

9.9 Element 8 – Risk Management and Hazard Control

The identification, assessment and treatment of risk is central to maintaining control of assets. Element 8 defines the means by which Beach manages all types of risk to the business. This element includes general risk management, the Safe Systems of Work by which site activities are controlled and executed, and the emergency and security arrangements in place to protect the Company from unplanned events or the attempts of others to do harm to the business.

There are three standards (Table 9-1) and seven outcomes to be delivered under this element. The standards of relevance to this EP are discussed below.

9.9.1 Standard 8.1 – Risk Management Standard

Standard 8.1 defines Beach's requirements to mitigate and manage risk at all levels within the business. It defines the Risk Management Framework for identifying, understanding, managing and reporting risks. The framework defines the documents, training, tools and templates to be used, and the accountabilities to be applied in support of effective risk management. Risks to people, the environment, Beach's reputation, financial position and any legal risks are assessed through the framework. The Standard defines the purpose and use of risk assessments and risk registers. The environmental risk management framework applied to the activity is described in Chapter 3 and applied to all the aspects assessed in Chapter 8 of this EP.

As described in Section 9.12.5, Beach will undertake a review of this EP if required in order to ensure that any changes to the activity, controls, regulatory requirements and information from research, stakeholders, industry bodies or any other sources to inform the EP are assessed using the risk management tools nominated. The review will ensure that the environmental impacts and risks of the activity continue to be of an acceptable level and reduced to ALARP.

If revision of this EP is trigged though a change in risk or controls, the revision process shall be managed in accordance with the MoC process outlined in Section 9.8.1.

Additional, or increased, impacts or risks, are identified, outside of the management of change process by the assurance process detailed in Table 9-5.

9.9.2 Standard 8.3 – Emergency and Security Management Standard

Standard 8.3 defines the minimum performance requirements to effectively manage credible emergency and security events, and to enable an efficient recovery to normal operations following such an event. The Standard 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 to be applied to the activity is outlined below.

9.9.2.1 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 9-3. This framework is described in the Beach Emergency Management Plan (EMP) (CDN/ID 128025990).

The responsibilities of the Emergency Response Team (ERT), Emergency Management Team (EMT) and Crisis Management Team (CMT) are outlined in Table 9-3.

The key emergency response arrangements for the activity are outlined herein.

Beach Emergency Management Plan

The Beach EMP provides the standard mechanism for the 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 Emergency Response Duty Roster and Contact Lists. These documents constitute a suite of emergency response documents that form the basis for Beach’s response to an emergency situation.

Activity Emergency Response Plan

For the survey activities Beach will prepare a bridging emergency response plan (ERP) that bridges to the emergency response measures in the vessel contractor’s vessel-specific ERP to ensure that all emergency management functions are accounted for. The Bridging ERP will be supported by the Beach EMP.

The Bridging ERP will describe the emergency roles and responsibilities for those on the vessel and outline the actions to be taken for potential activity-specific scenarios (e.g., loss of containment, vessel collision, fire, man overboard, fatality, etc). The Bridging ERP will define the communication requirements to notify both the company and external bodies of the incident so as to obtain assistance where needed and to fulfil reporting obligations.

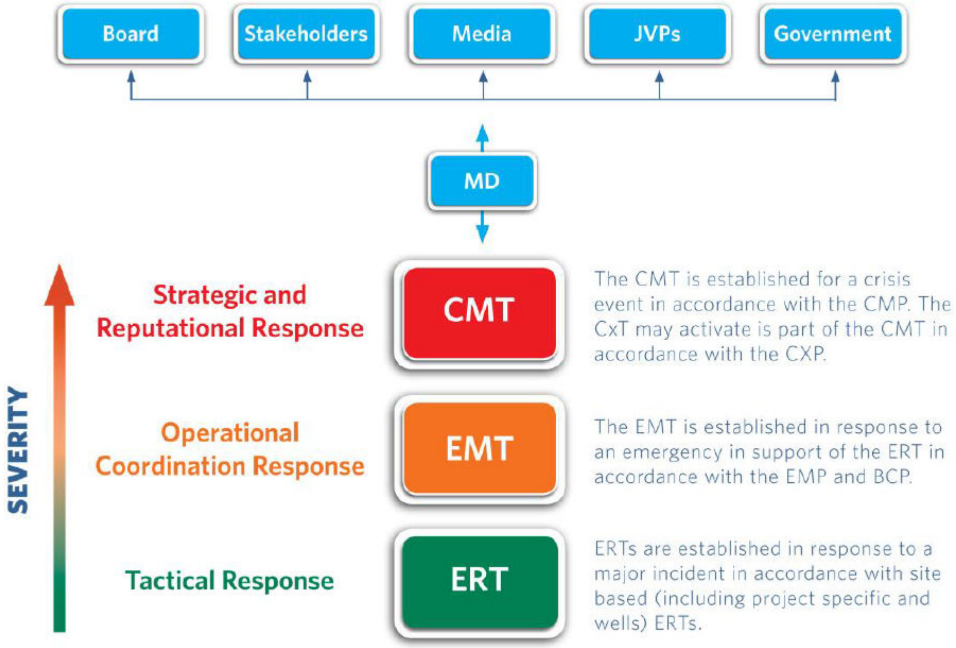


Figure 9-3: Beach Crisis and Emergency Management Framework

Table 9-3: 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 Vessel	• Respond to the emergency in accordance with the site-specific ERP.

9.9.2.2 Oil Pollution Emergency Plan

Oil spill response arrangements associated with Otway Offshore Operations are detailed in the Beach Victorian Offshore Oil Pollution Emergency Plan (OPEP) (CDN/ID 18986979/VIC 1000 SAF PLN).

Section 9.12.4 Audits and Inspections and the OPEP Section 10 On-Going Response Preparedness and Exercises detail the processes that Beach will undertake to ensure that oil response requirements can be met during survey activities.

Vessels used to undertake the surveys will have a Shipboard Marine Pollution Emergency Plan (SMPEP) or equivalent.

9.9.2.3 Operational and Scientific Monitoring Plan

Operational and scientific monitoring arrangement associated with Otway Offshore Operations are detailed within the Offshore Victoria Operational and Scientific Monitoring Plan (OSMP) (CDN/ID S4100AH717908) and Otway Offshore Operations OSMP Addendum (CDN/ID 18987652).

The Planning Areas are based on low exposure shoreline, surface, and in-water threshold for a diesel spill. The particular values and sensitivities that may require monitoring in the event of a diesel spill are detailed in the following Sections:

- Conservation Values and Sensitivities – Section 7.2
- Ecological Environment – Section 7.4
- Biologically Important Areas - Section 7.4.12.2
- Socio-economic Environment – Section 7.5
- First Nations – Section 7.6

9.9.2.4 Testing of Spill Response Arrangements

The OPEP details the oil spill response testing arrangements.

9.10 Element 9 - Incident Reporting

Element 9 defines how Beach classifies, investigates, reports, and learns from incidents. An incident is any unplanned event or change that results in potential or actual adverse effects or consequences to people, the environment, assets, reputation, or the community.

There is one standard (Table 9-1) and five outcomes to be delivered under this element, with the standard discussed below.

9.10.1 Standard 9.1 – Incident Management Standard

Standard 9.1 defines the requirement for incident notification, reporting and subsequent investigation requirements. It ensures that incident classification is applied consistently across the company, and that the appropriate level of investigation and approval authority is implemented. The standard describes the requirement for identifying and assigning remedial actions, and for communicating key learnings throughout the business. As such, the standard also defines the requirement for adequate training for those persons involved in performing investigations.

The incident management standard requires that all HSE incidents, including near misses, are reported, investigated and analysed to ensure that preventive actions are taken, and learnings are shared throughout the organisation.

Incident reports and corrective actions are 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 processes detailed in Table 9-5.

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 Management of Change process detailed in Section 9.8.1.

Notification and reporting requirements for environmental incidents to external agencies are provided in Table 9-4.

Table 9-4: 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 recordable incident.			
As a minimum, the written monthly recordable report must include a description of: • 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.	Before the 15th day of the following calendar month	• NOPSEMA – submissions@nopsema.gov.au	Activity Project Manager
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: • Vessel collision resulting in a loss of containment or otherwise. • Introduction of marine pests to the operational area			
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, a written record of the notification must be given to:	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	Activity Project Manager

Requirement	Timing	Contact	Responsible Person
• 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)			
Written notification Verbal 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	Activity Project Manager
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	Activity Project Manager
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
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 and include:	EMT Lead (or delegate)

Requirement	Timing	Contact	Responsible Person
		• 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.	
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 / Environment Advisor
Injury to or death of EPBC Act-listed species	Within seven days	• DCCEEW – 1800 803 772 • EPBC.Permits@environment.gov.au	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	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 Implementation and Heritage Department via email.	Activity Project Manager

Requirement	Timing	Contact	Responsible Person
		• Notification to the Tasmanian Parks and Wildlife Service, via email.	
Identification of any unexploded ordnance	Written notification within 1 week	• Written notification via email to offshore.petroleum@defence.gov.au	Activity Project Manager

9.11 Element 10 – Environment and Community

Element 10 focuses on the measures the organisation must take to ensure that it upholds its reputation as a responsible and ethical company and continues its open and transparent engagements with its communities and stakeholders. Beach operates in environmentally sensitive areas, 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 mitigated where there is an economic loss to a stakeholder directly impacted by Beach activities.

There are two standards (Table 9-1) and three outcomes to be delivered under this element, with the standards discussed below.

9.11.1 Standard 10.1 – Environment Management Standard

Standard 10.1 ensures that Beach implements appropriate plans and procedures to conduct its operations in an environmentally responsible and sustainable manner. The standard defines the requirement to assess environmental impacts and risks that may result from the company's operations and for site-specific management plans to protect the environment from harm. The standard covers land disturbance, reinstatement and rehabilitation activities, and defines obligations for management of biodiversity, water systems, air quality, noise and vibration, amenities and waste.

This EP provides the key means of satisfying this OEMS standard. The Beach Energy Domestic IMS Biofouling Risk Assessment Process identified as control in Section 8 is described below.

9.11.2 Beach Energy Domestic IMS Biofouling Risk Assessment Process

Scope

All MODUs, vessels and submersible equipment mobilised from domestic waters to undertake offshore petroleum activities within the operational area must 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.

This domestic IMS biofouling risk assessment process does not include an evaluation of potential risks associated with ballast water exchange given all MODU and vessel operators contracted to Beach must comply with the most recent version of the Australian Ballast Water Management Requirements.

Purpose

- Validate compliance with regulatory requirements (Commonwealth and State) in relation to biosecurity prior to engaging in petroleum activities within the operational / project area.

- Identify the potential IMS risk profile of MODUs, vessels and submersible equipment prior to deployment within the operational / project 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 / project area).

Screening Assessment

Prior to the initial mobilisation of the MODU, vessels or submersible equipment to the operational / project area, a screening assessment must be undertaken considering:

- All relevant IMO and regulatory requirements under the Australian Biosecurity Act 2015 and/or relevant Australian State or Territory legislation must be met.
- If mobilising from a high or uncertain risk area, the MODU / vessel / submersible equipment must have been within that area for fewer than 7 consecutive days or inspected and deemed low-risk by an independent IMS expert, within 7 days of departure from the area.
- Vessels must have valid antifouling coatings based upon manufacturers specifications.
- Vessels must have a biofouling control treatment system in use for key internal seawater systems.
- MODUs and vessels must have a Biofouling Management Plan and record book consistent with the International Maritime Organization (IMO) 2011 Guidelines for the control and management of ships' biofouling to minimize the transfer of invasive aquatic species (IMO Biofouling Guidelines).

Where relevant criteria have been met, no further management measures are required, and the MODU / vessel / submersible equipment may be deployed into the operational / project area.

Where relevant criteria have not been met, or there is uncertainty if these criteria have been met, Beach must engage an independent IMS expert to undertake a detailed biosecurity risk assessment, and the MODU / vessel / submersible equipment must be deemed low-risk prior to mobilisation into the operational / project area.

Basis of Detailed IMS Biofouling Risk Assessment

The basis by which an independent IMS expert evaluates the risk profile of a MODU / vessel / submersible equipment includes:

- The age, type and condition of the MODU / vessel / submersible equipment.
- Previous cleaning and inspection undertaken and the outcomes of previous inspections.
- Assessment of internal niches with potential to harbour IMS.
- The MODU / vessel / equipment history since previous inspection.
- The origin of the MODU / vessel / submersible equipment including potential for exposure to IMS.

- Translocation risk based upon source location in relation to activity location – both in relation to the water depth / proximity to land at the point of origin and the potential survivorship of IMS from the point of origin to the operational / project area.
- The mobilisation method – whether dry or in-water (including duration of low-speed transit through high or uncertain risk areas).
- For vessels, the application, age and condition of antifouling coatings.
- presence and condition of internal seawater treatment systems.
- Assessment of Biofouling Management Plan and record book against IMO Biofouling Guidelines.

Where appropriate, undertake in-water inspections.

9.11.3 Standard 10.2 – Community Engagement Standard

Standard 10.2 defines the minimum requirements for the conduct of Beach and its staff within the community, and the commitments to plan and execute effective community engagement in the course of its business. Beach staff will conduct themselves as ambassadors for the company and engage positively and respectfully with the community.

The standard describes the obligation of the company to proactively engage with the community at the outset of any activity that may have an impact on that community, and to develop a stakeholder engagement plan to manage that engagement.

Stakeholder consultation specific to the activity is discussed in Section 5 of this EP.

9.12 Element 11 – Assurance and Reporting

Element 11 establishes that the company must apply the requirements of relevant policies, and the commitments detailed in the OEMS standards throughout its activities. An assurance process therefore exists to systematically quantify compliance with those commitments, and with the underlying procedures and systems. This Element also documents Beach's approach to sustainability and reporting company performance using established sustainability performance metrics.

There are two standards (Table 9-1) and four outcomes to be delivered under this element, with the standards relevant to the activity discussed below.

9.12.1 Standard 11.1 – Sustainability Standard

The purpose of this standard is to operationalise the requirements established by the Company's Sustainability Policy and other associated Beach policies. The standard details how Beach incorporate environmental, social and government requirements into the Board, sustainability reporting, performance monitoring and evaluation, company and project risk assessments and emissions reduction assessments and activities.

9.12.2 Standard 11.2 – Assurance Management Standard

Standard 11.2 describes the "Three Lines of Defence" assurance model employed by Beach to govern its activities and ensure compliance with its commitments and standards. The standard defines Beach's requirements for the establishment and management of risk-based assurance activities at all levels within the company. The assurance process establishes the adequacy and effectiveness of Beach's risk controls and quantifies the status of compliance against our obligations. It ensures the organisation proactively closes any gaps in performance so it can address those issues before harm is manifested. As such, the assurance programme identifies improvement opportunities in business processes and risk controls.

The Standard describes the need to have assurance plans across the business, and for the assurance activities to take place on multiple levels of the organisation. This approach collectively ensures the operational activities Beach perform are compliant with its procedures, standards and ultimately with governing policies and legislative obligations. The holistic results of the assurance programme are reportable to the Board and Committees.

9.12.3 EP Assurance

Table 9-5 provides a summary of the processes (*specific measures*) undertaken by Beach to ensure that for the duration of the activity:

- 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 9-5 and the following sections are communicated to the Activity Project Manager 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 Management of Change process detailed in Section 9.8.1.

Where an assurance processes identifies a breach of an EPO or EPS in the EP this will be reported as a recordable incident as per Table 9-4.

Table 9-5: Geophysical and Geotechnical Survey EP Assurance Processes

Process	Frequency	Responsible
EP Assurance Checks covering: • EPOs, EPS and implementation strategy requirements. See Section 9.12.4.	Prior to commencement of survey	Environment Advisor
Incident reviews and investigations covering: • Review of all incidents to identify any recordable incidents and reportable incidents and any additional, or increased, environmental impacts or risks.	Weekly	Environment Advisor
• Reporting and investigation of incidents to identify recordable and reportable incidents and any additional, or increased, environmental impacts or risks. See Section 9.10.	As required	Activity Project Manager with support from Environment Advisor
Activity impact and risk review to ensure impacts and risks can be manage to ALARP and an acceptable level and any additional, or increased, environmental impacts or risks identified.	As required	Activity Project Manager
EP Performance Report covering: • Review of EPOs and EPs.	Annually	Environment Advisor

Process	Frequency	Responsible
See Section 9.12.7		
Activity emissions and discharge records See Section 9.12.8.	As detailed in Table 9-7	Activity Project Manager

9.12.4 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 at least two weeks prior to commencement of a survey. The assurance check consists of reviewing this EPs EPOs, EPSs implementation strategy requirements applicable to the vessel activity.

In addition, the following will be undertaken:

- Vessel weekly offshore inspection throughout the activity 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 relevant to the vessel activity are maintained.

Non-compliances and opportunities for improvements identified via assurance checks or any other means are communicated to the Activity Project Manager to report and action in a timely manner. Any additional, or increased, impacts or risks identified are managed as per the Management of Change process detailed in Section 9.8.1.

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 Table 9-4.

The assurance checks inform the annual performance report submitted to the relevant regulator as per Section 9.12.7.

9.12.5 Environment Plan Review

Beach may determine that a review of the EP is required when one or more of the following occurs:

- Changes to impacts and risks and/or controls identified during the activity.

- Annual environmental performance reporting identifies issues in the EP that require review and/or updating.
- Implementation of corrective actions to address internal audits findings or external inspection recommendations.
- An environmental incident and subsequent investigation identify 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 to risk and controls identified through the Risk Management Processes as per Section 9.9.
- New information or changes in information from stakeholders, research and studies, protected species, legal and other requirements. This shall be achieved by:
    - Subscription to regulator and relevant industry distribution lists (such as APPEA and IOGP).
    - Subscription to the NOPSEMA website to identify any new petroleum activities within the Otway Basin that may overlap with the Otway Operations locations and timings.
    - Annual review of the EP inclusive of relevant regulatory requirements (when in force for longer than 12 months).
    - Ongoing Stakeholder communications.
    - Where the EP is revised it will be logged in Section 10 (Document Information and History).

Any revisions to the EP are to be assessed against the criteria for submission of a revised EP to NOPSEMA as detailed in Table 9-6 and Management of Change as per Section 9.8.1 shall be evaluated.

9.12.6 Environment Plan Revision

In accordance with Regulation 17 of the OPGGS(E)R, a revision of this EP shall be submitted to NOPSEMA as per the regulatory requirements in Table 9-6.

Table 9-6: Regulatory Requirements for Submission of a Revised EP

OPGGS(E)R	EP Revision Submission Requirements
17(1)	With the regulator’s approval before the commencement of a new activity.
17(5)	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.
17(6)	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.
17(7)	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 8.

Increased impact or risk – one with greater extent, severity, duration, or uncertainty than is detailed in Section 8.

Significant change –

- The change to the activity design deviates from the EP to the degree that it results in new activities that are not intrinsic to the existing Activity Description in Section 4.
- The change affects the ability to achieve ALARP or acceptability for the existing impacts and risks described in Section 8.
- The change affects the ability to achieve the EPO and EPS contained in Section 8.

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 8.
- 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 (N04750-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 Table 8.9.
- 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.

9.12.7 Annual Performance Report

In accordance with OPGGS(E)R, Beach will submit a report on the environmental performance of the activity to NOPSEMA. Performance will be measured against the EPOs and EPSs described in this EP. The report will be submitted not more than three months after a survey has been completed or in the event that more than one survey is undertaken in a year the report will be submitted not more than three months after the anniversary date of the EP acceptance by NOPSEMA for that year. The interval between reports will not be more than one year.

9.12.8 Emissions and Discharge Records

In accordance with OPGGS(E)R, emissions and discharges shall be recorded for the duration of the activity. Table 9-7 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 Act (NGER) 2007 reporting and National Pollution Inventory (NPI) reporting.

Table 9-7: Emissions and Discharges Monitoring Requirements

Emission / Discharge	Monitoring parameter	Recording method	Reporting frequency	Responsibility
Fuel	Volume used	Daily report	Monthly	Vessel Operator
Bilge	Volume discharged	Oil record Book	As required	Vessel Operator
Sewage	Volume discharged	Garbage record book	As required	Vessel Operator
Putrescible food	Volume discharged	Garbage record book	As required	Vessel Operator

9.12.9 Marine Mammal Sighting Reports

Marine mammal sightings will be recorded and submitted to DCCEEW via the National Marine Mammal Data Portal. Sightings will be reported within two months of the end of a survey.

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Appendix A Protected Matters Search Tool Report

Appendix A.1 Otway Operational Area

Australian Government

Department of Climate Change, Energy, the Environment and Water

EPBC Act Protected Matters Report

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

Report created: 05-Sep-2023

Summary

Matters of National Environment Significance

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

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance (Ramsar	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	2
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	39
Listed Migratory Species:	40

Other Matters Protected by the EPBC Act

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

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

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

Commonwealth Lands:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	62
Whales and Other Cetaceans:	28
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	2
Habitat Critical to the Survival of Marine Turtles:	None

Extra Information

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

State and Territory Reserves:	None
Regional Forest Agreements:	None
Nationally Important Wetlands:	None
EPBC Act Referrals:	34
Key Ecological Features (Marine):	1
Biologically Important Areas:	18
Bioregional Assessments:	None
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

Commonwealth Marine Area [Resource Information]

Approval is required for a proposed activity that is located within the Commonwealth Marine Area which has, will have, or is likely to have a significant impact on the environment. Approval may be required for a proposed action taken outside a Commonwealth Marine Area but which has, may have or is likely to have a significant impact on the environment in the Commonwealth Marine Area.

Feature Name
Commonwealth Marine Areas (EPBC Act)
Commonwealth Marine Areas (EPBC Act)

Listed Threatened Species [Resource Information]

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act.
Number is the current name ID.

Scientific Name	Threatened Category	Presence Text
BIRD		
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area

Scientific Name	Threatened Category	Presence Text
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Halobaena caerulea Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Neophema chrysogaster Orange-bellied Parrot [747]	Critically Endangered	Migration route likely to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pachyptila turtur subantarctica Fairy Prion (southern) [64445]	Vulnerable	Species or species habitat may occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat likely to occur within area
Pterodroma leucoptera leucoptera Gould's Petrel, Australian Gould's Petrel [26033]	Endangered	Species or species habitat may occur within area
Pterodroma mollis Soft-plumaged Petrel [1036]	Vulnerable	Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche bulleri platei Northern Buller's Albatross, Pacific Albatross [82273]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche cauta Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Thalassarche chrysostoma Grey-headed Albatross [66491]	Endangered	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour known to occur within area

Scientific Name	Threatened Category	Presence Text
FISH		
Hoplostethus atlanticus		
Orange Roughy, Deep-sea Perch, Red Roughy [68455]	Conservation Dependent	Species or species habitat likely to occur within area
Prototroctes maraena		
Australian Grayling [26179]	Vulnerable	Species or species habitat may occur within area
Seriolella brama		
Blue Warehou [69374]	Conservation Dependent	Species or species habitat known to occur within area
Thunnus maccoyii		
Southern Bluefin Tuna [69402]	Conservation Dependent	Species or species habitat likely to occur within area
MAMMAL		
Balaenoptera borealis		
Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Balaenoptera musculus		
Blue Whale [36]	Endangered	Foraging, feeding or related behaviour known to occur within area
Balaenoptera physalus		
Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Eubalaena australis		
Southern Right Whale [40]	Endangered	Species or species habitat known to occur within area
REPTILE		
Caretta caretta		
Loggerhead Turtle [1763]	Endangered	Species or species habitat likely to occur within area
Chelonia mydas		
Green Turtle [1765]	Vulnerable	Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Dermochelys coriacea		
Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat likely to occur within area
SHARK		
Carcharodon carcharias		
White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
Centrophorus uyato listed as Centrophorus zeehaani		
Little Gulper Shark [68446]	Conservation Dependent	Species or species habitat likely to occur within area
Galeorhinus galeus		
School Shark, Eastern School Shark, Snapper Shark, Tope, Soupfin Shark [68453]	Conservation Dependent	Species or species habitat may occur within area

Listed Migratory Species [Resource Information]

Scientific Name	Threatened Category	Presence Text
Migratory Marine Birds		
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardenna carneipes		
Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Foraging, feeding or related behaviour likely to occur within area
Ardenna grisea		
Sooty Shearwater [82651]		Species or species habitat may occur within area
Diomedea antipodensis		
Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea epomophora		
Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area

Scientific Name	Threatened Category	Presence Text
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche cauta Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Thalassarche chrysostoma Grey-headed Albatross [66491]	Endangered	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area

Scientific Name	Threatened Category	Presence Text
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Migratory Marine Species		
Balaenoptera bonaerensis Antarctic Minke Whale, Dark-shoulder Minke Whale [67812]		Species or species habitat likely to occur within area
Balaenoptera borealis Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Foraging, feeding or related behaviour known to occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Caperea marginata Pygmy Right Whale [39]		Foraging, feeding or related behaviour may occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat likely to occur within area

Scientific Name	Threatened Category	Presence Text
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat may occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat likely to occur within area
Eubalaena australis as Balaena glacialis australis Southern Right Whale [40]	Endangered	Species or species habitat known to occur within area
Isurus oxyrinchus Shortfin Mako, Mako Shark [79073]		Species or species habitat likely to occur within area
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat likely to occur within area
Lamna nasus Porbeagle, Mackerel Shark [83288]		Species or species habitat likely to occur within area
Megaptera novaeangliae Humpback Whale [38]		Species or species habitat likely to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat likely to occur within area
Physeter macrocephalus Sperm Whale [59]		Species or species habitat may occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species [Resource Information]

Scientific Name	Threatened Category	Presence Text
Bird		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area overfly marine area
Ardenna carneipes as Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Foraging, feeding or related behaviour likely to occur within area
Ardenna grisea as Puffinus griseus Sooty Shearwater [82651]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area overfly marine area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area overfly marine area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area overfly marine area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Halobaena caerulea Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Foraging, feeding or related behaviour likely to occur within area

Scientific Name	Threatened Category	Presence Text
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Neophema chrysogaster Orange-bellied Parrot [747]	Critically Endangered	Migration route likely to occur within area overfly marine area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pachyptila turtur Fairy Prion [1066]		Species or species habitat may occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat likely to occur within area
Pterodroma mollis Soft-plumaged Petrel [1036]	Vulnerable	Species or species habitat may occur within area
Stercorarius antarcticus as Catharacta skua Brown Skua [85039]		Species or species habitat may occur within area
Sterna striata White-fronted Tern [799]		Foraging, feeding or related behaviour likely to occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche bulleri platei as Thalassarche sp. nov. Northern Buller's Albatross, Pacific Albatross [82273]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area

Scientific Name	Threatened Category	Presence Text
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche cauta Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Thalassarche chrysostoma Grey-headed Albatross [66491]	Endangered	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Fish		
Heraldia nocturna Upside-down Pipefish, Eastern Upside-down Pipefish, Eastern Upside-down Pipefish [66227]		Species or species habitat may occur within area
Hippocampus abdominalis Big-belly Seahorse, Eastern Potbelly Seahorse, New Zealand Potbelly Seahorse [66233]		Species or species habitat may occur within area
Hippocampus breviceps Short-head Seahorse, Short-snouted Seahorse [66235]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Histiogamphelus briggsii Crested Pipefish, Briggs' Crested Pipefish, Briggs' Pipefish [66242]		Species or species habitat may occur within area
Histiogamphelus cristatus Rhino Pipefish, Macleay's Crested Pipefish, Ring-back Pipefish [66243]		Species or species habitat may occur within area
Hypselognathus rostratus Knifesnout Pipefish, Knife-snouted Pipefish [66245]		Species or species habitat may occur within area
Kaupus costatus Deepbody Pipefish, Deep-bodied Pipefish [66246]		Species or species habitat may occur within area
Leptoichthys fistularius Brushtail Pipefish [66248]		Species or species habitat may occur within area
Lissocampus caudalis Australian Smooth Pipefish, Smooth Pipefish [66249]		Species or species habitat may occur within area
Lissocampus runa Javelin Pipefish [66251]		Species or species habitat may occur within area
Maroubra perserrata Sawtooth Pipefish [66252]		Species or species habitat may occur within area
Mitotichthys semistriatus Halfbanded Pipefish [66261]		Species or species habitat may occur within area
Mitotichthys tuckeri Tucker's Pipefish [66262]		Species or species habitat may occur within area
Notiocampus ruber Red Pipefish [66265]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Phycodurus eques Leafy Seadragon [66267]		Species or species habitat may occur within area
Phyllopteryx taeniolatus Common Seadragon, Weedy Seadragon [66268]		Species or species habitat may occur within area
Pugnaso curtirostris Pugnose Pipefish, Pug-nosed Pipefish [66269]		Species or species habitat may occur within area
Solegnathus robustus Robust Pipehorse, Robust Spiny Pipehorse [66274]		Species or species habitat may occur within area
Solegnathus spinosissimus Spiny Pipehorse, Australian Spiny Pipehorse [66275]		Species or species habitat may occur within area
Stigmatopora argus Spotted Pipefish, Gulf Pipefish, Peacock Pipefish [66276]		Species or species habitat may occur within area
Stigmatopora nigra Widebody Pipefish, Wide-bodied Pipefish, Black Pipefish [66277]		Species or species habitat may occur within area
Stipecampus cristatus Ringback Pipefish, Ring-backed Pipefish [66278]		Species or species habitat may occur within area
Urocampus carinirostris Hairy Pipefish [66282]		Species or species habitat may occur within area
Vanacampus margaritifer Mother-of-pearl Pipefish [66283]		Species or species habitat may occur within area
Vanacampus phillipi Port Phillip Pipefish [66284]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Vanacampus poecilolaemus		
Longsnout Pipefish, Australian Long-snout Pipefish, Long-snouted Pipefish [66285]		Species or species habitat may occur within area
Mammal		
Arctocephalus forsteri		
Long-nosed Fur-seal, New Zealand Fur-seal [20]		Species or species habitat may occur within area
Arctocephalus pusillus		
Australian Fur-seal, Australo-African Fur-seal [21]		Species or species habitat may occur within area
Reptile		
Caretta caretta		
Loggerhead Turtle [1763]	Endangered	Species or species habitat likely to occur within area
Chelonia mydas		
Green Turtle [1765]	Vulnerable	Species or species habitat may occur within area
Dermochelys coriacea		
Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat likely to occur within area

Whales and Other Cetaceans [Resource Information]

Current Scientific Name	Status	Type of Presence
Mammal		
Balaenoptera acutorostrata		
Minke Whale [33]		Species or species habitat may occur within area
Balaenoptera bonaerensis		
Antarctic Minke Whale, Dark-shoulder Minke Whale [67812]		Species or species habitat likely to occur within area
Balaenoptera borealis		
Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Balaenoptera musculus		
Blue Whale [36]	Endangered	Foraging, feeding or related behaviour known to occur within area

Current Scientific Name	Status	Type of Presence
Balaenoptera physalus Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Berardius arnuxii Arnoux's Beaked Whale [70]		Species or species habitat may occur within area
Caperea marginata Pygmy Right Whale [39]		Foraging, feeding or related behaviour may occur within area
Delphinus delphis Common Dolphin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat known to occur within area
Globicephala macrorhynchus Short-finned Pilot Whale [62]		Species or species habitat may occur within area
Globicephala melas Long-finned Pilot Whale [59282]		Species or species habitat may occur within area
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
Kogia breviceps Pygmy Sperm Whale [57]		Species or species habitat may occur within area
Kogia sima Dwarf Sperm Whale [85043]		Species or species habitat may occur within area
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat likely to occur within area

Current Scientific Name	Status	Type of Presence
Lissodelphis peronii Southern Right Whale Dolphin [44]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]		Species or species habitat likely to occur within area
Mesoplodon bowdoini Andrew's Beaked Whale [73]		Species or species habitat may occur within area
Mesoplodon densirostris Blainville's Beaked Whale, Dense-beaked Whale [74]		Species or species habitat may occur within area
Mesoplodon hectori Hector's Beaked Whale [76]		Species or species habitat may occur within area
Mesoplodon layardii Strap-toothed Beaked Whale, Strap-toothed Whale, Layard's Beaked Whale [25556]		Species or species habitat may occur within area
Mesoplodon mirus True's Beaked Whale [54]		Species or species habitat may occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat likely to occur within area
Physeter macrocephalus Sperm Whale [59]		Species or species habitat may occur within area
Pseudorca crassidens False Killer Whale [48]		Species or species habitat likely to occur within area
Tursiops aduncus Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area

Current Scientific Name	Status	Type of Presence
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area
Ziphius cavirostris Cuvier's Beaked Whale, Goose-beaked Whale [56]		Species or species habitat may occur within area

Australian Marine Parks

[Resource Information]

Park Name	Zone & IUCN Categories
Zeehan	Multiple Use Zone (IUCN VI)
Zeehan	Special Purpose Zone (IUCN VI)

Extra Information

EPBC Act Referrals

[Resource Information]

Title of referral	Reference	Referral Outcome	Assessment Status
Otway Astrolabe 3D Marine Seismic Survey, Otway Basin	2012/6421		Completed
Controlled action			
Casino Gas Field Development	2003/1295	Controlled Action	Post-Approval
Otway Development	2002/621	Controlled Action	Post-Approval
Schomberg 3D Marine Seismic Survey	2007/3754	Controlled Action	Completed
VICP61 2D Marine Seismic Survey	2008/4075	Controlled Action	Completed
Not controlled action			
Exploration drilling for liquid/gaseous hydrocarbons	2004/1681	Not Controlled Action	Completed
Gas Field Development	2006/2635	Not Controlled Action	Completed
Henry-1 Exploration Well, Petroleum Permit Area VIC/P44	2005/2147	Not Controlled Action	Completed
INDIGO Central Submarine Telecommunications Cable	2017/8127	Not Controlled Action	Completed

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action			
VIC-P44 Stage 2 Gas Field Development	2007/3767	Not Controlled Action	Completed
Not controlled action (particular manner)			
'Moonlight Head' 3D seismic survey, VIC/P38(V), VIC/P43 and VIC/RL8	2005/2236	Not Controlled Action (Particular Manner)	Post-Approval
2D Marine Seismic Survey	2005/2295	Not Controlled Action (Particular Manner)	Post-Approval
2D Seismic Survey	2003/1214	Not Controlled Action (Particular Manner)	Post-Approval
3D marine seismic survey near King Island	2004/1461	Not Controlled Action (Particular Manner)	Post-Approval
3D seismic program VIC/P38(v), VIC/P43 and VIC/RL8	2003/1137	Not Controlled Action (Particular Manner)	Post-Approval
Astrolabe 3D Marine Seismic Survey	2011/6048	Not Controlled Action (Particular Manner)	Post-Approval
BHPBilliton Otway 3D Seismic Survey	2007/3443	Not Controlled Action (Particular Manner)	Post-Approval
Deepwater Sorell Basin 2001 Non-Exclusive 2D Seismic Survey	2001/156	Not Controlled Action (Particular Manner)	Post-Approval
Drill and Profile Exploration Well Somerset 1, License Area T34P	2009/5037	Not Controlled Action (Particular Manner)	Post-Approval
Geographe-A gas exploration well	2000/82	Not Controlled Action (Particular Manner)	Post-Approval
INDIGO Marine Cable Route Survey (INDIGO)	2017/7996	Not Controlled Action (Particular Manner)	Post-Approval

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action (particular manner)			
La Bella 3D Marine Seismic Survey, Otway Basin, VIC	2012/6683	Not Controlled Action (Particular Manner)	Post-Approval
Otway Basin Exploration Drilling Campaign, Vic	2011/6125	Not Controlled Action (Particular Manner)	Post-Approval
Santos Otway 3d Seismic VIC/P44	2007/3367	Not Controlled Action (Particular Manner)	Post-Approval
Schomberg 3D Marine Seismic survey	2007/3868	Not Controlled Action (Particular Manner)	Post-Approval
Southern Margins T/35P and T/36P 3D Seismic Surveys	2007/3817	Not Controlled Action (Particular Manner)	Post-Approval
Strike Oil NL Seismic Surveys	2000/107	Not Controlled Action (Particular Manner)	Post-Approval
Surface Geochemical Exploration Program, TAS	2010/5780	Not Controlled Action (Particular Manner)	Post-Approval
Thylacine-A Exploration Well	2000/81	Not Controlled Action (Particular Manner)	Post-Approval
Undertake a three dimensional marine seismic survey	2010/5700	Not Controlled Action (Particular Manner)	Post-Approval
Vic/P37(v) and Vic/P44 3D marine seismic survey	2003/1102	Not Controlled Action (Particular Manner)	Post-Approval
VIC P44 Gas Exploration Wells	2002/662	Not Controlled Action (Particular Manner)	Post-Approval
Vic-P51 and Vic-P52 2D seismic survey	2002/811	Not Controlled Action (Particular	Post-Approval

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action (particular manner)			
		Manner)	
Referral decision			
VICP61 2D Marine Seismic Survey	2008/3975	Referral Decision	Completed

Key Ecological Features

[Resource Information]

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

Name	Region
West Tasmania Canyons	South-east

Biologically Important Areas

Scientific Name	Behaviour	Presence
Seabirds		
Ardenna pacifica Wedge-tailed Shearwater [84292]	Foraging	Likely to occur
Ardenna tenuirostris Short-tailed Shearwater [82652]	Foraging	Known to occur
Diomedea exulans (sensu lato) Wandering Albatross [1073]	Foraging	Known to occur
Diomedea exulans antipodensis Antipodean Albatross [82269]	Foraging	Known to occur
Pelecanoides urinatrix Common Diving-petrel [1018]	Foraging	Known to occur
Thalassarche bulleri Bullers Albatross [64460]	Foraging	Known to occur
Thalassarche cauta cauta Shy Albatross [82345]	Foraging likely	Likely to occur
Thalassarche chlororhynchos bassi Indian Yellow-nosed Albatross [85249]	Foraging	Known to occur
Thalassarche melanophris Black-browed Albatross [66472]	Foraging	Known to occur

Scientific Name	Behaviour	Presence
Thalassarche melanophris impavida Campbell Albatross [82449]	Foraging	Known to occur
Sharks		
Carcharodon carcharias White Shark [64470]	Distribution	Likely to occur
Carcharodon carcharias White Shark [64470]	Distribution	Known to occur
Carcharodon carcharias White Shark [64470]	Distribution (low density)	Likely to occur
Carcharodon carcharias White Shark [64470]	Known distribution	Known to occur
Whales		
Balaenoptera musculus brevicauda Pygmy Blue Whale [81317]	Distribution	Known to occur
Balaenoptera musculus brevicauda Pygmy Blue Whale [81317]	Foraging	Likely to be present
Balaenoptera musculus brevicauda Pygmy Blue Whale [81317]	Foraging (annual high use area)	Known to occur
Balaenoptera musculus brevicauda Pygmy Blue Whale [81317]	Known Foraging Area	Known to occur

Caveat

1 PURPOSE

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

The report contains the mapped locations of:

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

2 DISCLAIMER

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

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

3 DATA SOURCES

Threatened ecological communities

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

Threatened, migratory and marine species

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

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

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

4 LIMITATIONS

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

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

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

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

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

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

Acknowledgements

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

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

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

Please feel free to provide feedback via the Contact us page.

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Appendix A.2 Bass Operational Area

Australian Government

Department of Climate Change, Energy, the Environment and Water

EPBC Act Protected Matters Report

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

Report created: 06-Sep-2023

Summary

Matters of National Environment Significance

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

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance (Ramsar	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	1
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	38
Listed Migratory Species:	37

Other Matters Protected by the EPBC Act

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

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

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

Commonwealth Lands:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	47
Whales and Other Cetaceans:	14
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None
Habitat Critical to the Survival of Marine Turtles:	None

Extra Information

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

State and Territory Reserves:	None
Regional Forest Agreements:	None
Nationally Important Wetlands:	None
EPBC Act Referrals:	10
Key Ecological Features (Marine):	None
Biologically Important Areas:	14
Bioregional Assessments:	None
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

Commonwealth Marine Area [Resource Information]

Approval is required for a proposed activity that is located within the Commonwealth Marine Area which has, will have, or is likely to have a significant impact on the environment. Approval may be required for a proposed action taken outside a Commonwealth Marine Area but which has, may have or is likely to have a significant impact on the environment in the Commonwealth Marine Area.

Feature Name
Commonwealth Marine Areas (EPBC Act)

Listed Threatened Species [Resource Information]

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act.
Number is the current name ID.

Scientific Name	Threatened Category	Presence Text
BIRD		
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea antipodensis gibsoni Gibson's Albatross [82270]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area

Scientific Name	Threatened Category	Presence Text
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Fregetta grallaria grallaria White-bellied Storm-Petrel (Tasman Sea), White-bellied Storm-Petrel (Australasian) [64438]	Vulnerable	Species or species habitat likely to occur within area
Halobaena caerulea Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Neophema chrysogaster Orange-bellied Parrot [747]	Critically Endangered	Migration route likely to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pachyptila turtur subantarctica Fairy Prion (southern) [64445]	Vulnerable	Species or species habitat may occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat likely to occur within area

Scientific Name	Threatened Category	Presence Text
Pterodroma leucoptera leucoptera Gould's Petrel, Australian Gould's Petrel [26033]	Endangered	Species or species habitat may occur within area
Pterodroma mollis Soft-plumaged Petrel [1036]	Vulnerable	Species or species habitat may occur within area
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area
Thalassarche bulleri platei Northern Buller's Albatross, Pacific Albatross [82273]	Vulnerable	Species or species habitat may occur within area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche cauta Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Thalassarche chrysostoma Grey-headed Albatross [66491]	Endangered	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area

Scientific Name	Threatened Category	Presence Text
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
FISH		
Seriolella brama Blue Warehou [69374]	Conservation Dependent	Species or species habitat known to occur within area
Thunnus maccoyii Southern Bluefin Tuna [69402]	Conservation Dependent	Species or species habitat likely to occur within area
MAMMAL		
Balaenoptera borealis Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat known to occur within area
REPTILE		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat likely to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Dermochelys coriacea		
Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat likely to occur within area
SHARK		
Carcharodon carcharias		
White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
Galeorhinus galeus		
School Shark, Eastern School Shark, Snapper Shark, Tope, Soupfin Shark [68453]	Conservation Dependent	Species or species habitat may occur within area

Listed Migratory Species

[Resource Information]

Scientific Name	Threatened Category	Presence Text
Migratory Marine Birds		
Ardenna carneipes		
Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Foraging, feeding or related behaviour likely to occur within area
Ardenna grisea		
Sooty Shearwater [82651]		Species or species habitat may occur within area
Diomedea antipodensis		
Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea epomophora		
Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans		
Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi		
Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area

Scientific Name	Threatened Category	Presence Text
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche cauta Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Thalassarche chrysostoma Grey-headed Albatross [66491]	Endangered	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area

Scientific Name	Threatened Category	Presence Text
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Migratory Marine Species		
Balaenoptera borealis Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Caperea marginata Pygmy Right Whale [39]		Foraging, feeding or related behaviour may occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat likely to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat may occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat likely to occur within area
Eubalaena australis as Balaena glacialis australis Southern Right Whale [40]	Endangered	Species or species habitat known to occur within area

Scientific Name	Threatened Category	Presence Text
Isurus oxyrinchus Shortfin Mako, Mako Shark [79073]		Species or species habitat likely to occur within area
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat may occur within area
Lamna nasus Porbeagle, Mackerel Shark [83288]		Species or species habitat likely to occur within area
Megaptera novaeangliae Humpback Whale [38]		Species or species habitat known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat likely to occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species [Resource Information]

Scientific Name	Threatened Category	Presence Text
Bird		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Ardenna carneipes as Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Foraging, feeding or related behaviour likely to occur within area
Ardenna grisea as Puffinus griseus Sooty Shearwater [82651]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area overfly marine area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area overfly marine area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area overfly marine area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea antipodensis gibsoni as Diomedea gibsoni Gibson's Albatross [82270]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area

Scientific Name	Threatened Category	Presence Text
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Halobaena caerulea Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Neophema chrysogaster Orange-bellied Parrot [747]	Critically Endangered	Migration route likely to occur within area overfly marine area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pachyptila turtur Fairy Prion [1066]		Species or species habitat may occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat likely to occur within area

Scientific Name	Threatened Category	Presence Text
Pterodroma mollis Soft-plumaged Petrel [1036]	Vulnerable	Species or species habitat may occur within area
Stercorarius antarcticus as Catharacta skua Brown Skua [85039]		Species or species habitat may occur within area
Sterna striata White-fronted Tern [799]		Foraging, feeding or related behaviour likely to occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area
Thalassarche bulleri platei as Thalassarche sp. nov. Northern Buller's Albatross, Pacific Albatross [82273]	Vulnerable	Species or species habitat may occur within area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche cauta Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Thalassarche chrysostoma Grey-headed Albatross [66491]	Endangered	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area

Scientific Name	Threatened Category	Presence Text
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Fish		
Heraldia nocturna Upside-down Pipefish, Eastern Upside-down Pipefish, Eastern Upside-down Pipefish [66227]		Species or species habitat may occur within area
Hippocampus abdominalis Big-belly Seahorse, Eastern Potbelly Seahorse, New Zealand Potbelly Seahorse [66233]		Species or species habitat may occur within area
Hippocampus minotaur Bullneck Seahorse [66705]		Species or species habitat may occur within area
Kimblaeus bassensis Trawl Pipefish, Bass Strait Pipefish [66247]		Species or species habitat may occur within area
Maroubra perserrata Sawtooth Pipefish [66252]		Species or species habitat may occur within area
Notiocampus ruber Red Pipefish [66265]		Species or species habitat may occur within area
Phycodurus eques Leafy Seadragon [66267]		Species or species habitat may occur within area
Phyllopteryx taeniolatus Common Seadragon, Weedy Seadragon [66268]		Species or species habitat may occur within area
Solegnathus robustus Robust Pipehorse, Robust Spiny Pipehorse [66274]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Solegnathus spinosissimus Spiny Pipehorse, Australian Spiny Pipehorse [66275]		Species or species habitat may occur within area
Vanacampus phillipi Port Phillip Pipefish [66284]		Species or species habitat may occur within area
Mammal		
Arctocephalus forsteri Long-nosed Fur-seal, New Zealand Fur-seal [20]		Species or species habitat may occur within area
Arctocephalus pusillus Australian Fur-seal, Australo-African Fur-seal [21]		Species or species habitat may occur within area
Reptile		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat likely to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat may occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat likely to occur within area

Whales and Other Cetaceans [Resource Information]

Current Scientific Name	Status	Type of Presence
Mammal		
Balaenoptera acutorostrata Minke Whale [33]		Species or species habitat may occur within area
Balaenoptera borealis Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area

Current Scientific Name	Status	Type of Presence
Balaenoptera physalus Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Caperea marginata Pygmy Right Whale [39]		Foraging, feeding or related behaviour may occur within area
Delphinus delphis Common Dolphin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat known to occur within area
Globicephala macrorhynchus Short-finned Pilot Whale [62]		Species or species habitat may occur within area
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]		Species or species habitat known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat likely to occur within area
Pseudorca crassidens False Killer Whale [48]		Species or species habitat likely to occur within area
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area

Extra Information

EPBC Act Referrals			[Resource Information]
Title of referral	Reference	Referral Outcome	Assessment Status
Controlled action			
Yolla Gas Field (TRL1) Development	2001/321	Controlled Action	Post-Approval
Not controlled action			
Exploration Drilling Well Trefoil-1	2003/1058	Not Controlled Action	Completed
Installation of optic fibre cable from Inverloch, Victoria to Stanley, Tasmania	2002/906	Not Controlled Action	Completed
Not controlled action (particular manner)			
Aroo Chappell 3D seismic survey	2010/5701	Not Controlled Action (Particular Manner)	Post-Approval
Bass Basin 2D and 3D seismic surveys (T/38P & T/37P)	2007/3650	Not Controlled Action (Particular Manner)	Post-Approval
Origin Energy Silvereye-1 Exploration Drilling Programme	2010/5702	Not Controlled Action (Particular Manner)	Post-Approval
Rockhopper-1 and Trefoil-2 Exploration Drilling in Permit Area T/18P	2009/4776	Not Controlled Action (Particular Manner)	Post-Approval
Shearwater 2D and 3D marine seismic survey	2005/2180	Not Controlled Action (Particular Manner)	Post-Approval
Silvereye 3D Seismic Survey	2007/3551	Not Controlled Action	Post-Approval

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action (particular manner)			
		(Particular Manner)	
Tap Oil Ltd Molson 2D Seismic Survey T47P	2008/3967	Not Controlled Action (Particular Manner)	Post-Approval

Biologically Important Areas

Scientific Name	Behaviour	Presence
Seabirds		
Ardenna tenuirostris Short-tailed Shearwater [82652]	Foraging	Known to occur
Diomedea exulans (sensu lato) Wandering Albatross [1073]	Foraging	Known to occur
Pelagodroma marina White-faced Storm-petrel [1016]	Foraging	Known to occur
Pelecanoides urinatrix Common Diving-petrel [1018]	Foraging	Known to occur
Thalassarche bulleri Bullers Albatross [64460]	Foraging	Known to occur
Thalassarche cauta cauta Shy Albatross [82345]	Foraging likely	Likely to occur
Thalassarche chlororhynchos bassi Indian Yellow-nosed Albatross [85249]	Foraging	Known to occur
Thalassarche melanophris Black-browed Albatross [66472]	Foraging	Known to occur
Thalassarche melanophris impavida Campbell Albatross [82449]	Foraging	Known to occur
Sharks		
Carcharodon carcharias White Shark [64470]	Distribution	Known to occur

Scientific Name	Behaviour	Presence
Carcharodon carcharias White Shark [64470]	Distribution (low density)	Likely to occur
Carcharodon carcharias White Shark [64470]	Known distribution	Known to occur
Whales		
Balaenoptera musculus brevicauda Pygmy Blue Whale [81317]	Distribution	Known to occur
Balaenoptera musculus brevicauda Pygmy Blue Whale [81317]	Foraging	Likely to be present

Caveat

1 PURPOSE

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

The report contains the mapped locations of:

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

2 DISCLAIMER

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

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

3 DATA SOURCES

Threatened ecological communities

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

Threatened, migratory and marine species

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

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

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

4 LIMITATIONS

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

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

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

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

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

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

Acknowledgements

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

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

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

Please feel free to provide feedback via the Contact us page.

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Appendix A.3 Otway Planning Area

Australian Government

Department of Climate Change, Energy, the Environment and Water

EPBC Act Protected Matters Report

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

Report created: 06-Sep-2023

Summary

Matters of National Environment Significance

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

World Heritage Properties:	None
National Heritage Places:	1
Wetlands of International Importance (Ramsar	2
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	2
Listed Threatened Ecological Communities:	10
Listed Threatened Species:	110
Listed Migratory Species:	70

Other Matters Protected by the EPBC Act

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

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

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

Commonwealth Lands:	8
Commonwealth Heritage Places:	1
Listed Marine Species:	111
Whales and Other Cetaceans:	29
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	4
Habitat Critical to the Survival of Marine Turtles:	None

Extra Information

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

State and Territory Reserves:	57
Regional Forest Agreements:	2
Nationally Important Wetlands:	12
EPBC Act Referrals:	90
Key Ecological Features (Marine):	1
Biologically Important Areas:	28
Bioregional Assessments:	None
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

National Heritage Places

[Resource Information]

Name	State	Legal Status
Historic		
Great Ocean Road and Scenic Environs	VIC	Listed place

Wetlands of International Importance (Ramsar Wetlands)

[Resource Information]

Ramsar Site Name	Proximity
Lavinia	Within Ramsar site
Port phillip bay (western shoreline) and bellarine peninsula	Within Ramsar site

Commonwealth Marine Area

[Resource Information]

Approval is required for a proposed activity that is located within the Commonwealth Marine Area which has, will have, or is likely to have a significant impact on the environment. Approval may be required for a proposed action taken outside a Commonwealth Marine Area but which has, may have or is likely to have a significant impact on the environment in the Commonwealth Marine Area.

Feature Name
Commonwealth Marine Areas (EPBC Act)
Commonwealth Marine Areas (EPBC Act)

Listed Threatened Ecological Communities

[Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.
Status of Vulnerable, Disallowed and Ineligible are not MNES under the EPBC Act.

Community Name	Threatened Category	Presence Text
Assemblages of species associated with open-coast salt-wedge estuaries of western and central Victoria ecological community	Endangered	Community likely to occur within area
Giant Kelp Marine Forests of South East Australia	Endangered	Community may occur within area
Grassy Eucalypt Woodland of the Victorian Volcanic Plain	Critically Endangered	Community known to occur within area
Natural Damp Grassland of the Victorian Coastal Plains	Critically Endangered	Community likely to occur within area
Natural Temperate Grassland of the Victorian Volcanic Plain	Critically Endangered	Community likely to occur within area

Community Name	Threatened Category	Presence Text
Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains	Critically Endangered	Community likely to occur within area
Subtropical and Temperate Coastal Saltmarsh	Vulnerable	Community likely to occur within area
Tasmanian Forests and Woodlands dominated by black gum or Brookers gum (Eucalyptus ovata / E. brookeriana)	Critically Endangered	Community likely to occur within area
Tasmanian white gum (Eucalyptus viminalis) wet forest	Critically Endangered	Community may occur within area
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Critically Endangered	Community likely to occur within area

Listed Threatened Species

[Resource Information]

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act.
Number is the current name ID.

Scientific Name	Threatened Category	Presence Text
BIRD		
Acanthiza pusilla magnirostris listed as Acanthiza pusilla archibaldi		
King Island Brown Thornbill, Brown Thornbill (King Island) [91709]	Endangered	Species or species habitat known to occur within area
Acanthornis magna greeniana		
King Island Scrubtit, Scrubtit (King Island) [82329]	Critically Endangered	Species or species habitat known to occur within area
Anthochaera phrygia		
Regent Honeyeater [82338]	Critically Endangered	Foraging, feeding or related behaviour likely to occur within area
Aphelocephala leucopsis		
Southern Whiteface [529]	Vulnerable	Species or species habitat may occur within area
Aquila audax fleayi		
Tasmanian Wedge-tailed Eagle, Wedge-tailed Eagle (Tasmanian) [64435]	Endangered	Species or species habitat may occur within area
Botaurus poiciloptilus		
Australasian Bittern [1001]	Endangered	Species or species habitat known to occur within area

Scientific Name	Threatened Category	Presence Text
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Roosting known to occur within area
Callocephalon fimbriatum Gang-gang Cockatoo [768]	Endangered	Species or species habitat known to occur within area
Ceyx azureus diemenensis Tasmanian Azure Kingfisher [25977]	Endangered	Species or species habitat known to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat likely to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Roosting known to occur within area
Climacteris picumnus victoriae Brown Treecreeper (south-eastern) [67062]	Vulnerable	Species or species habitat may occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area

Scientific Name	Threatened Category	Presence Text
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat likely to occur within area
Fregetta grallaria grallaria White-bellied Storm-Petrel (Tasman Sea), White-bellied Storm-Petrel (Australasian) [64438]	Vulnerable	Species or species habitat likely to occur within area
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat known to occur within area
Halobaena caerulea Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat known to occur within area
Limosa lapponica baueri Nunivak Bar-tailed Godwit, Western Alaskan Bar-tailed Godwit [86380]	Vulnerable	Species or species habitat known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Melanodryas cucullata cucullata South-eastern Hooded Robin, Hooded Robin (south-eastern) [67093]	Endangered	Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Neophema chrysogaster Orange-bellied Parrot [747]	Critically Endangered	Migration route known to occur within area
Neophema chrysostoma Blue-winged Parrot [726]	Vulnerable	Species or species habitat known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Pachyptila turtur subantarctica Fairy Prion (southern) [64445]	Vulnerable	Species or species habitat known to occur within area
Pedionomus torquatus Plains-wanderer [906]	Critically Endangered	Species or species habitat may occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat likely to occur within area
Platycercus caledonicus brownii Green Rosella (King Island) [67041]	Vulnerable	Species or species habitat known to occur within area
Pterodroma leucoptera leucoptera Gould's Petrel, Australian Gould's Petrel [26033]	Endangered	Species or species habitat may occur within area
Pterodroma mollis Soft-plumaged Petrel [1036]	Vulnerable	Species or species habitat may occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat known to occur within area
Stagonopleura guttata Diamond Firetail [59398]	Vulnerable	Species or species habitat known to occur within area

Scientific Name	Threatened Category	Presence Text
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Species or species habitat known to occur within area
Strepera fuliginosa colei Black Currawong (King Island) [67113]	Vulnerable	Breeding likely to occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche bulleri platei Northern Buller's Albatross, Pacific Albatross [82273]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche cauta Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Thalassarche chrysostoma Grey-headed Albatross [66491]	Endangered	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area

Scientific Name	Threatened Category	Presence Text
Thalassarche steadi		
White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Thinornis cucullatus cucullatus		
Eastern Hooded Plover, Eastern Hooded Plover [90381]	Vulnerable	Species or species habitat known to occur within area
FISH		
Galaxiella pusilla		
Eastern Dwarf Galaxias, Dwarf Galaxias [56790]	Vulnerable	Species or species habitat likely to occur within area
Hoplostethus atlanticus		
Orange Roughy, Deep-sea Perch, Red Roughy [68455]	Conservation Dependent	Species or species habitat likely to occur within area
Nannoperca obscura		
Yarra Pygmy Perch [26177]	Vulnerable	Species or species habitat known to occur within area
Prototroctes maraena		
Australian Grayling [26179]	Vulnerable	Species or species habitat known to occur within area
Rexea solandri (eastern Australian population)		
Eastern Gemfish [76339]	Conservation Dependent	Species or species habitat may occur within area
Seriolella brama		
Blue Warehou [69374]	Conservation Dependent	Species or species habitat known to occur within area
Thunnus maccoyii		
Southern Bluefin Tuna [69402]	Conservation Dependent	Species or species habitat likely to occur within area
FROG		
Litoria raniformis		
Growling Grass Frog, Southern Bell Frog, Green and Golden Frog, Warty Swamp Frog, Golden Bell Frog [1828]	Vulnerable	Species or species habitat known to occur within area
INSECT		

Scientific Name	Threatened Category	Presence Text
Synemon plana Golden Sun Moth [25234]	Vulnerable	Species or species habitat may occur within area
MAMMAL		
Antechinus minimus maritimus Swamp Antechinus (mainland) [83086]	Vulnerable	Species or species habitat known to occur within area
Balaenoptera borealis Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Foraging, feeding or related behaviour known to occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Dasyurus maculatus maculatus (SE mainland population) Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat known to occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Breeding known to occur within area
Isoodon obesulus obesulus Southern Brown Bandicoot (eastern), Southern Brown Bandicoot (south-eastern) [68050]	Endangered	Species or species habitat known to occur within area
Mastacomys fuscus mordicus Broad-toothed Rat (mainland), Tooarrana [87617]	Vulnerable	Species or species habitat known to occur within area
Miniopterus orianae bassanii Southern Bent-wing Bat [87645]	Critically Endangered	Breeding known to occur within area
Neophoca cinerea Australian Sea-lion, Australian Sea Lion [22]	Endangered	Species or species habitat known to occur within area

Scientific Name	Threatened Category	Presence Text
Petauroides volans Greater Glider (southern and central) [254]	Endangered	Species or species habitat may occur within area
Petaurus australis australis Yellow-bellied Glider (south-eastern) [87600]	Vulnerable	Species or species habitat known to occur within area
Potorous tridactylus trisulcatus Long-nosed Potoroo (southern mainland) [86367]	Vulnerable	Species or species habitat known to occur within area
Pseudomys fumeus Smoky Mouse, Konoom [88]	Endangered	Species or species habitat may occur within area
Pseudomys novaehollandiae New Holland Mouse, Pookila [96]	Vulnerable	Species or species habitat likely to occur within area
Pteropus poliocephalus Grey-headed Flying-fox [186]	Vulnerable	Roosting known to occur within area
PLANT		
Amphibromus fluitans River Swamp Wallaby-grass, Floating Swamp Wallaby-grass [19215]	Vulnerable	Species or species habitat likely to occur within area
Astelia australiana Tall Astelia [10851]	Vulnerable	Species or species habitat may occur within area
Dodonaea procumbens Trailing Hop-bush [12149]	Vulnerable	Species or species habitat may occur within area
Eucalyptus strzeleckii Strzelecki Gum [55400]	Vulnerable	Species or species habitat known to occur within area
Glycine latrobeana Clover Glycine, Purple Clover [13910]	Vulnerable	Species or species habitat known to occur within area

Scientific Name	Threatened Category	Presence Text
Grevillea infecunda Anglesea Grevillea [22026]	Vulnerable	Species or species habitat known to occur within area
Haloragis exalata subsp. exalata Wingless Raspwort, Square Raspwort [24636]	Vulnerable	Species or species habitat known to occur within area
Hiya distans listed as Hypolepis distans Scrambling Ground-fern [92548]	Endangered	Species or species habitat known to occur within area
Lachnagrostis adamsonii Adamson's Blown-grass, Adamson's Blowngrass [76211]	Endangered	Species or species habitat may occur within area
Leiocarpa gatesii Wrinkled Buttons [76212]	Vulnerable	Species or species habitat likely to occur within area
Lepidium aschersonii Spiny Peppercress [10976]	Vulnerable	Species or species habitat known to occur within area
Lepidium hyssopifolium Basalt Pepper-cress, Peppercress, Rubble Pepper-cress, Pepperweed [16542]	Endangered	Species or species habitat likely to occur within area
Leucochrysum albicans subsp. tricolor Hoary Sunray, Grassland Paper-daisy [89104]	Endangered	Species or species habitat may occur within area
Pimelea spinescens subsp. spinescens Plains Rice-flower, Spiny Rice-flower, Prickly Pimelea [21980]	Critically Endangered	Species or species habitat likely to occur within area
Prasophyllum spicatum Dense Leek-orchid [55146]	Vulnerable	Species or species habitat known to occur within area
Pterostylis chlorogramma Green-striped Greenhood [56510]	Vulnerable	Species or species habitat known to occur within area

Scientific Name	Threatened Category	Presence Text
Pterostylis cucullata Leafy Greenhood [15459]	Vulnerable	Species or species habitat known to occur within area
Pterostylis tenuissima Swamp Greenhood, Dainty Swamp Orchid [13139]	Vulnerable	Species or species habitat known to occur within area
Pterostylis ziegeleri Grassland Greenhood, Cape Portland Greenhood [64971]	Vulnerable	Species or species habitat may occur within area
Rutidosis leptorhynchoides Button Wrinklewort [67251]	Endangered	Species or species habitat may occur within area
Senecio macrocarpus Large-fruit Fireweed, Large-fruit Groundsel [16333]	Vulnerable	Species or species habitat likely to occur within area
Senecio psilocarpus Swamp Fireweed, Smooth-fruited Groundsel [64976]	Vulnerable	Species or species habitat known to occur within area
Thelymitra epipactoides Metallic Sun-orchid [11896]	Endangered	Species or species habitat known to occur within area
Thelymitra matthewsii Spiral Sun-orchid [4168]	Vulnerable	Species or species habitat known to occur within area
Xerochrysum palustre Swamp Everlasting, Swamp Paper Daisy [76215]	Vulnerable	Species or species habitat likely to occur within area
REPTILE		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Delma impar		
Striped Legless Lizard, Striped Snake-lizard [1649]	Vulnerable	Species or species habitat may occur within area
Dermochelys coriacea		
Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area
Lissolepis coventryi		
Swamp Skink, Eastern Mourning Skink [84053]	Endangered	Species or species habitat known to occur within area
Tympanocryptis pinguicolla		
Victorian Grassland Earless Dragon [66727]	Critically Endangered	Species or species habitat likely to occur within area
SHARK		
Carcharodon carcharias		
White Shark, Great White Shark [64470]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Centrophorus uyato listed as Centrophorus zeehaani		
Little Gulper Shark [68446]	Conservation Dependent	Species or species habitat likely to occur within area
Galeorhinus galeus		
School Shark, Eastern School Shark, Snapper Shark, Tope, Soupfin Shark [68453]	Conservation Dependent	Species or species habitat likely to occur within area

Listed Migratory Species

[Resource Information]

Scientific Name	Threatened Category	Presence Text
Migratory Marine Birds		
Anous stolidus		
Common Noddy [825]		Species or species habitat likely to occur within area
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardenna carneipes		
Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Foraging, feeding or related behaviour likely to occur within area

Scientific Name	Threatened Category	Presence Text
Ardenna grisea Sooty Shearwater [82651]		Species or species habitat may occur within area
Ardenna tenuirostris Short-tailed Shearwater [82652]		Breeding known to occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat likely to occur within area
Sternula albifrons Little Tern [82849]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche cauta Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Thalassarche chrysostoma Grey-headed Albatross [66491]	Endangered	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Migratory Marine Species		
Balaenoptera bonaerensis Antarctic Minke Whale, Dark-shoulder Minke Whale [67812]		Species or species habitat likely to occur within area
Balaenoptera borealis Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area

Scientific Name	Threatened Category	Presence Text
Balaenoptera musculus Blue Whale [36]	Endangered	Foraging, feeding or related behaviour known to occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Caperea marginata Pygmy Right Whale [39]		Foraging, feeding or related behaviour may occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat may occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area
Eubalaena australis as Balaena glacialis australis Southern Right Whale [40]	Endangered	Breeding known to occur within area
Isurus oxyrinchus Shortfin Mako, Mako Shark [79073]		Species or species habitat likely to occur within area
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat likely to occur within area

Scientific Name	Threatened Category	Presence Text
Lamna nasus Porbeagle, Mackerel Shark [83288]		Species or species habitat likely to occur within area
Megaptera novaeangliae Humpback Whale [38]		Species or species habitat known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat likely to occur within area
Physeter macrocephalus Sperm Whale [59]		Species or species habitat may occur within area
Migratory Terrestrial Species		
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Breeding known to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Arenaria interpres Ruddy Turnstone [872]		Roosting known to occur within area

Scientific Name	Threatened Category	Presence Text
Calidris acuminata Sharp-tailed Sandpiper [874]		Roosting known to occur within area
Calidris alba Sanderling [875]		Roosting known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat known to occur within area
Calidris ruficollis Red-necked Stint [860]		Roosting known to occur within area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Roosting known to occur within area
Charadrius bicinctus Double-banded Plover [895]		Roosting known to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat likely to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Roosting known to occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat known to occur within area
Gallinago megala Swinhoe's Snipe [864]		Roosting likely to occur within area
Gallinago stenura Pin-tailed Snipe [841]		Roosting likely to occur within area

Scientific Name	Threatened Category	Presence Text
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Limosa limosa Black-tailed Godwit [845]		Roosting known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Numenius minutus Little Curlew, Little Whimbrel [848]		Roosting likely to occur within area
Numenius phaeopus Whimbrel [849]		Roosting known to occur within area
Pandion haliaetus Osprey [952]		Species or species habitat known to occur within area
Phalaropus lobatus Red-necked Phalarope [838]		Roosting known to occur within area
Pluvialis fulva Pacific Golden Plover [25545]		Roosting known to occur within area
Pluvialis squatarola Grey Plover [865]		Roosting known to occur within area
Tringa brevipes Grey-tailed Tattler [851]		Roosting known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Roosting known to occur within area
Xenus cinereus Terek Sandpiper [59300]		Roosting known to occur within area

Other Matters Protected by the EPBC Act

Commonwealth Lands [Resource Information]

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

Commonwealth Land Name	State
Defence	
Defence - WARRNAMBOOL TRAINING DEPOT [21111]	VIC
Unknown	
Commonwealth Land - [60112]	TAS
Commonwealth Land - [60113]	TAS
Commonwealth Land - [60111]	TAS
Commonwealth Land - [60115]	TAS
Commonwealth Land - [21583]	VIC
Commonwealth Land - [21492]	VIC
Commonwealth Land - [60114]	TAS

Commonwealth Heritage Places [Resource Information]

Name	State	Status
Historic		
Cape Wickham Lighthouse	TAS	Listed place

Listed Marine Species [Resource Information]

Scientific Name	Threatened Category	Presence Text
Bird		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Anous stolidus Common Noddy [825]		Species or species habitat likely to occur within area
Anseranas semipalmata Magpie Goose [978]		Species or species habitat may occur within area overfly marine area

Scientific Name	Threatened Category	Presence Text
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area overfly marine area
Ardenna carneipes as Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Foraging, feeding or related behaviour likely to occur within area
Ardenna grisea as Puffinus griseus Sooty Shearwater [82651]		Species or species habitat may occur within area
Ardenna tenuirostris as Puffinus tenuirostris Short-tailed Shearwater [82652]		Breeding known to occur within area
Arenaria interpres Ruddy Turnstone [872]		Roosting known to occur within area
Bubulcus ibis as Ardea ibis Cattle Egret [66521]		Species or species habitat may occur within area overfly marine area
Calidris acuminata Sharp-tailed Sandpiper [874]		Roosting known to occur within area
Calidris alba Sanderling [875]		Roosting known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area overfly marine area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area overfly marine area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat known to occur within area overfly marine area

Scientific Name	Threatened Category	Presence Text
Calidris ruficollis Red-necked Stint [860]		Roosting known to occur within area overfly marine area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Roosting known to occur within area overfly marine area
Chalcites osculans as Chrysococcyx osculans Black-eared Cuckoo [83425]		Species or species habitat likely to occur within area overfly marine area
Charadrius bicinctus Double-banded Plover [895]		Roosting known to occur within area overfly marine area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat likely to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Roosting known to occur within area
Charadrius ruficapillus Red-capped Plover [881]		Roosting known to occur within area overfly marine area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area

Scientific Name	Threatened Category	Presence Text
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Eudyptula minor Little Penguin [1085]		Breeding known to occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat known to occur within area overfly marine area
Gallinago megala Swinhoe's Snipe [864]		Roosting likely to occur within area overfly marine area
Gallinago stenura Pin-tailed Snipe [841]		Roosting likely to occur within area overfly marine area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Breeding known to occur within area
Halobaena caerulea Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area
Himantopus himantopus Pied Stilt, Black-winged Stilt [870]		Roosting known to occur within area overfly marine area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area overfly marine area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat known to occur within area overfly marine area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area

Scientific Name	Threatened Category	Presence Text
Limosa limosa Black-tailed Godwit [845]		Roosting known to occur within area overfly marine area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area overfly marine area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area overfly marine area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area overfly marine area
Myiagra cyanoleuca Satin Flycatcher [612]		Breeding known to occur within area overfly marine area
Neophema chrysogaster Orange-bellied Parrot [747]	Critically Endangered	Migration route known to occur within area overfly marine area
Neophema chrysostoma Blue-winged Parrot [726]	Vulnerable	Species or species habitat known to occur within area overfly marine area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area

Scientific Name	Threatened Category	Presence Text
Numenius minutus Little Curlew, Little Whimbrel [848]		Roosting likely to occur within area overfly marine area
Numenius phaeopus Whimbrel [849]		Roosting known to occur within area
Pachyptila turtur Fairy Prion [1066]		Species or species habitat known to occur within area
Pandion haliaetus Osprey [952]		Species or species habitat known to occur within area
Phalacrocorax fuscescens Black-faced Cormorant [59660]		Breeding known to occur within area
Phalaropus lobatus Red-necked Phalarope [838]		Roosting known to occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat likely to occur within area
Pluvialis fulva Pacific Golden Plover [25545]		Roosting known to occur within area
Pluvialis squatarola Grey Plover [865]		Roosting known to occur within area overfly marine area
Pterodroma mollis Soft-plumaged Petrel [1036]	Vulnerable	Species or species habitat may occur within area
Recurvirostra novaehollandiae Red-necked Avocet [871]		Roosting known to occur within area overfly marine area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area overfly marine area

Scientific Name	Threatened Category	Presence Text
Rostratula australis as Rostratula benghalensis (sensu lato) Australian Painted Snipe [77037]	Endangered	Species or species habitat known to occur within area overfly marine area
Stercorarius antarcticus as Catharacta skua Brown Skua [85039]		Species or species habitat may occur within area
Sterna striata White-fronted Tern [799]		Foraging, feeding or related behaviour likely to occur within area
Sternula albifrons as Sterna albifrons Little Tern [82849]		Species or species habitat may occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche bulleri platei as Thalassarche sp. nov. Northern Buller's Albatross, Pacific Albatross [82273]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche cauta Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Thalassarche chrysostoma Grey-headed Albatross [66491]	Endangered	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area

Scientific Name	Threatened Category	Presence Text
Thalassarche melanophris		
Black-browed Albatross [66472]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche salvini		
Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche steadi		
White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Thinornis cucullatus as Thinornis rubricollis		
Hooded Plover, Hooded Dotterel [87735]		Species or species habitat known to occur within area overfly marine area
Thinornis cucullatus cucullatus as Thinornis rubricollis rubricollis		
Eastern Hooded Plover, Eastern Hooded Plover [90381]	Vulnerable	Species or species habitat known to occur within area overfly marine area
Tringa brevipes as Heteroscelus brevipes		
Grey-tailed Tattler [851]		Roosting known to occur within area
Tringa nebularia		
Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area overfly marine area
Tringa stagnatilis		
Marsh Sandpiper, Little Greenshank [833]		Roosting known to occur within area overfly marine area
Xenus cinereus		
Terek Sandpiper [59300]		Roosting known to occur within area overfly marine area
Fish		
Heraldia nocturna		
Upside-down Pipefish, Eastern Upside-down Pipefish, Eastern Upside-down Pipefish [66227]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Hippocampus abdominalis Big-belly Seahorse, Eastern Potbelly Seahorse, New Zealand Potbelly Seahorse [66233]		Species or species habitat may occur within area
Hippocampus breviceps Short-head Seahorse, Short-snouted Seahorse [66235]		Species or species habitat may occur within area
Hippocampus minotaur Bullneck Seahorse [66705]		Species or species habitat may occur within area
Histiogamphelus briggsii Crested Pipefish, Briggs' Crested Pipefish, Briggs' Pipefish [66242]		Species or species habitat may occur within area
Histiogamphelus cristatus Rhino Pipefish, Macleay's Crested Pipefish, Ring-back Pipefish [66243]		Species or species habitat may occur within area
Hypselognathus rostratus Knifesnout Pipefish, Knife-snouted Pipefish [66245]		Species or species habitat may occur within area
Kaupus costatus Deepbody Pipefish, Deep-bodied Pipefish [66246]		Species or species habitat may occur within area
Kimblaeus bassensis Trawl Pipefish, Bass Strait Pipefish [66247]		Species or species habitat may occur within area
Leptoichthys fistularius Brushtail Pipefish [66248]		Species or species habitat may occur within area
Lissocampus caudalis Australian Smooth Pipefish, Smooth Pipefish [66249]		Species or species habitat may occur within area
Lissocampus runa Javelin Pipefish [66251]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Maroubra perserrata Sawtooth Pipefish [66252]		Species or species habitat may occur within area
Mitotichthys mollisoni Mollison's Pipefish [66260]		Species or species habitat may occur within area
Mitotichthys semistriatus Halfbanded Pipefish [66261]		Species or species habitat may occur within area
Mitotichthys tuckeri Tucker's Pipefish [66262]		Species or species habitat may occur within area
Notiocampus ruber Red Pipefish [66265]		Species or species habitat may occur within area
Phycodurus eques Leafy Seadragon [66267]		Species or species habitat may occur within area
Phyllopteryx taeniolatus Common Seadragon, Weedy Seadragon [66268]		Species or species habitat may occur within area
Pugnaso curtirostris Pugnose Pipefish, Pug-nosed Pipefish [66269]		Species or species habitat may occur within area
Solegnathus robustus Robust Pipehorse, Robust Spiny Pipehorse [66274]		Species or species habitat may occur within area
Solegnathus spinosissimus Spiny Pipehorse, Australian Spiny Pipehorse [66275]		Species or species habitat may occur within area
Stigmatopora argus Spotted Pipefish, Gulf Pipefish, Peacock Pipefish [66276]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Stigmatopora nigra Widebody Pipefish, Wide-bodied Pipefish, Black Pipefish [66277]		Species or species habitat may occur within area
Stipecampus cristatus Ringback Pipefish, Ring-backed Pipefish [66278]		Species or species habitat may occur within area
Urocampus carinirostris Hairy Pipefish [66282]		Species or species habitat may occur within area
Vanacampus margaritifer Mother-of-pearl Pipefish [66283]		Species or species habitat may occur within area
Vanacampus phillipi Port Phillip Pipefish [66284]		Species or species habitat may occur within area
Vanacampus poecilolaemus Longsnout Pipefish, Australian Long-snout Pipefish, Long-snouted Pipefish [66285]		Species or species habitat may occur within area
Mammal		
Arctocephalus forsteri Long-nosed Fur-seal, New Zealand Fur-seal [20]		Species or species habitat may occur within area
Arctocephalus pusillus Australian Fur-seal, Australo-African Fur-seal [21]		Species or species habitat likely to occur within area
Neophoca cinerea Australian Sea-lion, Australian Sea Lion [22]	Endangered	Species or species habitat known to occur within area
Reptile		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area

Whales and Other Cetaceans [Resource Information]

Current Scientific Name	Status	Type of Presence
Mammal		
Balaenoptera acutorostrata Minke Whale [33]		Species or species habitat may occur within area
Balaenoptera bonaerensis Antarctic Minke Whale, Dark-shoulder Minke Whale [67812]		Species or species habitat likely to occur within area
Balaenoptera borealis Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Foraging, feeding or related behaviour known to occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Berardius arnuxii Arnoux's Beaked Whale [70]		Species or species habitat may occur within area
Caperea marginata Pygmy Right Whale [39]		Foraging, feeding or related behaviour may occur within area
Delphinus delphis Common Dolphin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Breeding known to occur within area

Current Scientific Name	Status	Type of Presence
Globicephala macrorhynchus Short-finned Pilot Whale [62]		Species or species habitat may occur within area
Globicephala melas Long-finned Pilot Whale [59282]		Species or species habitat may occur within area
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
Kogia breviceps Pygmy Sperm Whale [57]		Species or species habitat may occur within area
Kogia sima Dwarf Sperm Whale [85043]		Species or species habitat may occur within area
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat likely to occur within area
Lissodelphis peronii Southern Right Whale Dolphin [44]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]		Species or species habitat known to occur within area
Mesoplodon bowdoini Andrew's Beaked Whale [73]		Species or species habitat may occur within area
Mesoplodon densirostris Blainville's Beaked Whale, Dense-beaked Whale [74]		Species or species habitat may occur within area
Mesoplodon grayi Gray's Beaked Whale, Scamperdown Whale [75]		Species or species habitat may occur within area

Current Scientific Name	Status	Type of Presence
Mesoplodon hectori Hector's Beaked Whale [76]		Species or species habitat may occur within area
Mesoplodon layardii Strap-toothed Beaked Whale, Strap-toothed Whale, Layard's Beaked Whale [25556]		Species or species habitat may occur within area
Mesoplodon mirus True's Beaked Whale [54]		Species or species habitat may occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat likely to occur within area
Physeter macrocephalus Sperm Whale [59]		Species or species habitat may occur within area
Pseudorca crassidens False Killer Whale [48]		Species or species habitat likely to occur within area
Tursiops aduncus Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area
Ziphius cavirostris Cuvier's Beaked Whale, Goose-beaked Whale [56]		Species or species habitat may occur within area

Australian Marine Parks [Resource Information]

Park Name	Zone & IUCN Categories
Apollo	Multiple Use Zone (IUCN VI)
Franklin	Multiple Use Zone (IUCN VI)
Zeehan	Multiple Use Zone (IUCN VI)

Park Name	Zone & IUCN Categories
Zeehan	Special Purpose Zone (IUCN VI)

Extra Information

State and Territory Reserves

[Resource Information]

Protected Area Name	Reserve Type	State
Aire River	Heritage River	VIC
Aire River W.R.	Natural Features Reserve	VIC
Aireys Inlet B.R.	Natural Features Reserve	VIC
Anglesea B.R.	Natural Features Reserve	VIC
Badger Box Creek	Nature Reserve	TAS
Barham Paradise S.R.	Natural Features Reserve	VIC
Bay of Islands Coastal Park	Conservation Park	VIC
Breamlea F.F.R.	Nature Conservation Reserve	VIC
Cape Wickham	State Reserve	TAS
Cape Wickham	Conservation Area	TAS
Cataraqui Point	Conservation Area	TAS
Christmas Island	Nature Reserve	TAS
City of Melbourne Bay	Conservation Area	TAS
Colliers Forest Reserve	Conservation Covenant	TAS
Colliers Swamp	Conservation Area	TAS
Councillor Island	Nature Reserve	TAS
Counsel Hill	Conservation Area	TAS
Currie Lightkeepers Residence	Historic Site	TAS

Protected Area Name	Reserve Type	State
Disappointment Bay	State Reserve	TAS
Eagle Rock	Marine Sanctuary	VIC
Edna Bowman N.C.R.	Natural Features Reserve	VIC
Eldorado	Conservation Area	TAS
Gentle Annie	Conservation Area	TAS
Great Otway	National Park	VIC
Johanna Falls S.R.	Natural Features Reserve	VIC
Lake Connewarre W.R	Natural Features Reserve	VIC
Lake Gillear W.R	Natural Features Reserve	VIC
Latrobe B.R.	Natural Features Reserve	VIC
Lavinia	State Reserve	TAS
Lily Pond B.R.	Natural Features Reserve	VIC
Marengo N.C.R.	Nature Conservation Reserve	VIC
Marengo Reefs	Marine Sanctuary	VIC
Merri	Marine Sanctuary	VIC
Muddy Lagoon	Nature Reserve	TAS
New Year Island	Game Reserve	TAS
Painkalac Creek	Reference Area	VIC
Point Addis	Marine National Park	VIC
Point Danger	Marine Sanctuary	VIC
Porky Beach	Conservation Area	TAS
Port Campbell	National Park	VIC
Princetown W.R	Natural Features Reserve	VIC
Red Hut Point	Conservation Area	TAS

Protected Area Name	Reserve Type	State
Red Hut Road #1	Conservation Covenant	TAS
Red Hut Road #2	Conservation Covenant	TAS
Sea Elephant	Conservation Area	TAS
Sea Elephant River	Conservation Covenant	TAS
Seal Rocks	State Reserve	TAS
Seal Rocks	Conservation Area	TAS
South Rd Nugara	Conservation Covenant	TAS
Stokes Point	Conservation Area	TAS
Stony Creek (Otways)	Reference Area	VIC
The Arches	Marine Sanctuary	VIC
Twelve Apostles	Marine National Park	VIC
Unnamed P0176	Private Nature Reserve	VIC
Wild Dog B.R.	Natural Features Reserve	VIC
Wild Dog Creek SS.R.	Natural Features Reserve	VIC
Yambacoona	Conservation Covenant	TAS

Regional Forest Agreements [Resource Information]

Note that all areas with completed RFAs have been included. Please see the associated resource information for specific caveats and use limitations associated with RFA boundary information.

RFA Name	State
Tasmania RFA	Tasmania
West Victoria RFA	Victoria

Nationally Important Wetlands [Resource Information]

Wetland Name	State
Aire River	VIC
Bungaree Lagoon	TAS
Lake Connewarre State Wildlife Reserve	VIC
Lake Flannigan	TAS

Wetland Name	State
Lavinia Nature Reserve	TAS
Lower Aire River Wetlands	VIC
Lower Merri River Wetlands	VIC
Pearshape Lagoon 1	TAS
Pearshape Lagoon 2	TAS
Pearshape Lagoon 3	TAS
Pearshape Lagoon 4	TAS
Princetown Wetlands	VIC

EPBC Act Referrals

[Resource Information]

Title of referral	Reference	Referral Outcome	Assessment Status
Apollo Bay to Skenes Creek Coastal Trail	2022/09274		Assessment
Otway Astrolabe 3D Marine Seismic Survey, Otway Basin	2012/6421		Completed
Controlled action			
Alston-1 petroleum exploration well, permit VIC/P44	2003/1315	Controlled Action	Post-Approval
Casino Gas Field Development	2003/1295	Controlled Action	Post-Approval
City Of Greater Geelong Mosquito Control Program 2021-2030, Vic	2020/8782	Controlled Action	Further Information Request
Establishment of plantation for use of effluent water	2003/1063	Controlled Action	Completed
Lorne Golf Course redevelopment	2004/1513	Controlled Action	Post-Approval
Mosquito Control	2005/2132	Controlled Action	Post-Approval
Otway Development	2002/621	Controlled Action	Post-Approval
Schomberg 3D Marine Seismic Survey	2007/3754	Controlled Action	Completed
Strike Oil Gas Exploration Well, Otway Basin (VIC/P44)	2000/97	Controlled Action	Completed
Twelve Apostles Saddle Lookout	2019/8571	Controlled Action	Post-Approval

Title of referral	Reference	Referral Outcome	Assessment Status
Controlled action			
VICP61 2D Marine Seismic Survey	2008/4075	Controlled Action	Completed
Not controlled action			
Airey Inlet water reclamation plant to Anglesea sewerage system	2006/2539	Not Controlled Action	Completed
Anglesea Mine South Wall Vegetation removal, Anglesea, Vic	2017/8060	Not Controlled Action	Completed
Apollo Bay Water Storage Basin, VIC	2012/6484	Not Controlled Action	Completed
CO2 geosequestration - Otway Basin Pilot Project	2006/2699	Not Controlled Action	Completed
Construction and operation of Barwon Water biosolids treatment facility	2008/4345	Not Controlled Action	Completed
Construction of Barwon Heads Bridge	2005/2375	Not Controlled Action	Completed
Construction of Infrastructure to Extract, Treat & Transfer Groundwater to Wurde	2008/4104	Not Controlled Action	Completed
Construction of Overtaking Lanes on Great Ocean Rd	2008/4044	Not Controlled Action	Completed
construction of pump station for pump diversion from the Barham River	2003/1242	Not Controlled Action	Completed
Construction of the Edgars Road Extension, from Childs Road, Lalor to Cooper Street, Epping	2003/1135	Not Controlled Action	Completed
Enterprise 1 Exploration Drilling Program, near Port Campbell, Vic	2019/8438	Not Controlled Action	Completed
Exploration drilling for liquid/gaseous hydrocarbons	2004/1681	Not Controlled Action	Completed
Gas Field Development	2006/2635	Not Controlled Action	Completed
Gas Fields Development	2011/5879	Not Controlled Action	Completed
Golflinks Road Residential Development & Water Storage Facility at Barwon Heads	2004/1793	Not Controlled Action	Completed
Grevillea infecunda tip cuttings and soil samples	2005/1979	Not Controlled Action	Completed

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action			
Halladale and Speculant Gas Pipeline Project, North of Port Campbell, Vic	2015/7551	Not Controlled Action	Completed
Henry-1 Exploration Well, Petroleum Permit Area VIC/P44	2005/2147	Not Controlled Action	Completed
Improving rabbit biocontrol: releasing another strain of RHDV, sthrn two thirds of Australia	2015/7522	Not Controlled Action	Completed
INDIGO Central Submarine Telecommunications Cable	2017/8127	Not Controlled Action	Completed
Installation of a 35 metre telecommunications facility at Jirrahlinga Animal San	2003/1151	Not Controlled Action	Completed
Kelly Swamp Boardwalk Construction	2010/5371	Not Controlled Action	Completed
Minerva Cut Back Project, Vic	2017/8036	Not Controlled Action	Completed
New Water Infrastructure Upgrade, Grassy Dam, King Island	2013/6882	Not Controlled Action	Completed
Nirranda South Wind Farm Pty Ltd	2002/763	Not Controlled Action	Completed
Offshore exploration drilling within permit area VIC/P 37(v)	2004/1466	Not Controlled Action	Completed
Port Campbell Headland Walking Trail Realignment	2012/6676	Not Controlled Action	Completed
Proposed replacement of existing road culvert	2013/7077	Not Controlled Action	Completed
Residential/Resort/Golf Course development	2002/907	Not Controlled Action	Completed
St Quentin Consulting Pty Ltd /Residential development/305 Great Ocean Road, Jan Juc/VIC/Development	2014/7184	Not Controlled Action	Completed
Torquay Sewerage Strategy - pipe replacement between Torquay and the Black Rock	2004/1704	Not Controlled Action	Completed
Track construction - Great Ocean Walk	2002/793	Not Controlled Action	Completed
VIC-P44 Stage 2 Gas Field Development	2007/3767	Not Controlled Action	Completed

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action			
Victorian Generator Project	2005/1984	Not Controlled Action	Completed
Wind Farm Construction and Operation	2001/471	Not Controlled Action	Completed
Not controlled action (particular manner)			
'Moonlight Head' 3D seismic survey, VIC/P38(V), VIC/P43 and VIC/RL8	2005/2236	Not Controlled Action (Particular Manner)	Post-Approval
2D Marine Seismic Survey	2005/2295	Not Controlled Action (Particular Manner)	Post-Approval
2D Marine Seismic Survey in Permit Areas T/32P and T/33P	2002/845	Not Controlled Action (Particular Manner)	Post-Approval
2D Seismic Survey	2003/1214	Not Controlled Action (Particular Manner)	Post-Approval
2D Seismic Survey	2008/3962	Not Controlled Action (Particular Manner)	Post-Approval
3D marine seismic survey near King Island	2004/1461	Not Controlled Action (Particular Manner)	Post-Approval
3D Marine Seismic Survey within Torquay Sub-basin off sthn Victoria	2012/6256	Not Controlled Action (Particular Manner)	Post-Approval
3D seismic program VIC/P38(v), VIC/P43 and VIC/RL8	2003/1137	Not Controlled Action (Particular Manner)	Post-Approval
Astrolabe 3D Marine Seismic Survey	2011/6048	Not Controlled Action (Particular Manner)	Post-Approval
BHPBilliton Otway 3D Seismic Survey	2007/3443	Not Controlled Action (Particular Manner)	Post-Approval

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action (particular manner)			
Construct private dwelling	2008/4234	Not Controlled Action (Particular Manner)	Post-Approval
Deepwater Sorell Basin 2001 Non-Exclusive 2D Seismic Survey	2001/156	Not Controlled Action (Particular Manner)	Post-Approval
Drill and Profile Exploration Well Somerset 1, License Area T34P	2009/5037	Not Controlled Action (Particular Manner)	Post-Approval
Enterprise Three-dimensional Transition Zone Seismic Survey, Victoria	2016/7800	Not Controlled Action (Particular Manner)	Post-Approval
Fuelbreak construction	2009/4915	Not Controlled Action (Particular Manner)	Post-Approval
Geelong Bypass Section 3	2005/2099	Not Controlled Action (Particular Manner)	Post-Approval
Geographe-A gas exploration well	2000/82	Not Controlled Action (Particular Manner)	Post-Approval
INDIGO Marine Cable Route Survey (INDIGO)	2017/7996	Not Controlled Action (Particular Manner)	Post-Approval
La Bella 3D Marine Seismic Survey, Otway Basin, VIC	2012/6683	Not Controlled Action (Particular Manner)	Post-Approval
OTE10 2D Marine Seismic Survey	2009/5223	Not Controlled Action (Particular Manner)	Post-Approval
Otway Basin Exploration Drilling Campaign, Vic	2011/6125	Not Controlled Action (Particular Manner)	Post-Approval
Santos Otway 3d Seismic VIC/P44	2007/3367	Not Controlled Action (Particular	Post-Approval

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action (particular manner)			
		Manner)	
Schomberg 3D Marine Seismic survey	2007/3868	Not Controlled Action (Particular Manner)	Post-Approval
SEA Gas Project transmission pipeline	2001/513	Not Controlled Action (Particular Manner)	Post-Approval
Shearwater 2D and 3D marine seismic survey	2005/2180	Not Controlled Action (Particular Manner)	Post-Approval
Southern Gas Pipeline Project	2002/619	Not Controlled Action (Particular Manner)	Post-Approval
Southern Margins T/35P and T/36P 3D Seismic Surveys	2007/3817	Not Controlled Action (Particular Manner)	Post-Approval
Speculant 3D Transition Zone Seismic Survey	2010/5558	Not Controlled Action (Particular Manner)	Post-Approval
Strike Oil NL Seismic Surveys	2000/107	Not Controlled Action (Particular Manner)	Post-Approval
Surface Geochemical Exploration Program, TAS	2010/5780	Not Controlled Action (Particular Manner)	Post-Approval
The Enterprise 3D Seismic Acquisition Survey, Otway Basin, Vic	2012/6565	Not Controlled Action (Particular Manner)	Post-Approval
Thylacine-A Exploration Well	2000/81	Not Controlled Action (Particular Manner)	Post-Approval
Torquay Sub-basin (VIC/P62) OTE12-3D Seismic Survey	2012/6655	Not Controlled Action (Particular Manner)	Post-Approval

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action (particular manner)			
Undertake a three dimensional marine seismic survey	2010/5700	Not Controlled Action (Particular Manner)	Post-Approval
Vic/P37(v) and Vic/P44 3D marine seismic survey	2003/1102	Not Controlled Action (Particular Manner)	Post-Approval
VIC P44 Gas Exploration Wells	2002/662	Not Controlled Action (Particular Manner)	Post-Approval
Vic-P51 and Vic-P52 2D seismic survey	2002/811	Not Controlled Action (Particular Manner)	Post-Approval
Wolseley 3D seismic acquisition survey	2010/5703	Not Controlled Action (Particular Manner)	Post-Approval
Referral decision			
3D Marine Seismic Survey	2011/6156	Referral Decision	Completed
The Enterprise 3D Seismic Acquisition Survey, Otway Basin, VIC	2012/6545	Referral Decision	Completed
VICP61 2D Marine Seismic Survey	2008/3975	Referral Decision	Completed
Wolseley 3D Seismic Acquisition Survey in Permit T/32P	2010/5291	Referral Decision	Completed

Key Ecological Features

[Resource Information]

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

Name	Region
West Tasmania Canyons	South-east

Biologically Important Areas

Scientific Name	Behaviour	Presence
Seabirds		
Ardenna pacifica Wedge-tailed Shearwater [84292]	Breeding	Known to occur

Scientific Name	Behaviour	Presence
Ardenna pacifica Wedge-tailed Shearwater [84292]	Foraging	Likely to occur
Ardenna tenuirostris Short-tailed Shearwater [82652]	Breeding	Known to occur
Ardenna tenuirostris Short-tailed Shearwater [82652]	Foraging	Known to occur
Diomedea exulans (sensu lato) Wandering Albatross [1073]	Foraging	Known to occur
Diomedea exulans antipodensis Antipodean Albatross [82269]	Foraging	Known to occur
Eudyptula minor Little Penguin [1085]	Breeding	Known to occur
Eudyptula minor Little Penguin [1085]	Foraging	Known to occur
Morus serrator Australasian Gannet [1020]	Foraging	Known to occur
Pelagodroma marina White-faced Storm-petrel [1016]	Foraging	Known to occur
Pelecanoides urinatrix Common Diving-petrel [1018]	Breeding	Known to occur
Pelecanoides urinatrix Common Diving-petrel [1018]	Foraging	Known to occur
Phalacrocorax fuscescens Black-faced Cormorant [59660]	Breeding	Known to occur
Phalacrocorax fuscescens Black-faced Cormorant [59660]	Foraging	Known to occur
Thalassarche bulleri Bullers Albatross [64460]	Foraging	Known to occur

Scientific Name	Behaviour	Presence
Thalassarche cauta cauta Shy Albatross [82345]	Foraging likely	Likely to occur
Thalassarche chlororhynchos bassi Indian Yellow-nosed Albatross [85249]	Foraging	Known to occur
Thalassarche melanophris Black-browed Albatross [66472]	Foraging	Known to occur
Thalassarche melanophris impavida Campbell Albatross [82449]	Foraging	Known to occur
Sharks		
Carcharodon carcharias White Shark [64470]	Distribution	Likely to occur
Carcharodon carcharias White Shark [64470]	Distribution	Known to occur
Carcharodon carcharias White Shark [64470]	Distribution (low density)	Likely to occur
Carcharodon carcharias White Shark [64470]	Foraging	Known to occur
Carcharodon carcharias White Shark [64470]	Known distribution	Known to occur
Whales		
Balaenoptera musculus brevicauda Pygmy Blue Whale [81317]	Distribution	Known to occur
Balaenoptera musculus brevicauda Pygmy Blue Whale [81317]	Foraging	Likely to be present
Balaenoptera musculus brevicauda Pygmy Blue Whale [81317]	Foraging (annual high use area)	Known to occur
Balaenoptera musculus brevicauda Pygmy Blue Whale [81317]	Known Foraging Area	Known to occur

Caveat

1 PURPOSE

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

The report contains the mapped locations of:

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

2 DISCLAIMER

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

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

3 DATA SOURCES

Threatened ecological communities

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

Threatened, migratory and marine species

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

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

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

4 LIMITATIONS

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

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

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

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

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

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

Acknowledgements

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

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

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

Please feel free to provide feedback via the Contact us page.

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Appendix A.4 Bass Planning Area

Australian Government

Department of Climate Change, Energy,
the Environment and Water

EPBC Act Protected Matters Report

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

Report created: 06-Sep-2023

Summary

Matters of National Environment Significance

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

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance (Ramsar	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	3
Listed Threatened Ecological Communities:	3
Listed Threatened Species:	68
Listed Migratory Species:	53

Other Matters Protected by the EPBC Act

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

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

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

Commonwealth Lands:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	90
Whales and Other Cetaceans:	29
Critical Habitats:	1
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	2
Habitat Critical to the Survival of Marine Turtles:	None

Extra Information

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

State and Territory Reserves:	19
Regional Forest Agreements:	1
Nationally Important Wetlands:	None
EPBC Act Referrals:	36
Key Ecological Features (Marine):	None
Biologically Important Areas:	27
Bioregional Assessments:	None
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

Commonwealth Marine Area [Resource Information]

Approval is required for a proposed activity that is located within the Commonwealth Marine Area which has, will have, or is likely to have a significant impact on the environment. Approval may be required for a proposed action taken outside a Commonwealth Marine Area but which has, may have or is likely to have a significant impact on the environment in the Commonwealth Marine Area.

Feature Name
Commonwealth Marine Areas (EPBC Act)
Commonwealth Marine Areas (EPBC Act)
Commonwealth Marine Areas (EPBC Act)

Listed Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.
Status of Vulnerable, Disallowed and Ineligible are not MNES under the EPBC Act.

Community Name	Threatened Category	Presence Text
Giant Kelp Marine Forests of South East Australia	Endangered	Community may occur within area
Tasmanian Forests and Woodlands dominated by black gum or Brookers gum (Eucalyptus ovata / E. brookeriana)	Critically Endangered	Community likely to occur within area
Tasmanian white gum (Eucalyptus viminalis) wet forest	Critically Endangered	Community likely to occur within area

Listed Threatened Species [Resource Information]

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act.
Number is the current name ID.

Scientific Name	Threatened Category	Presence Text
BIRD		
Aquila audax fleayi		
Tasmanian Wedge-tailed Eagle, Wedge-tailed Eagle (Tasmanian) [64435]	Endangered	Species or species habitat likely to occur within area
Botaurus poiciloptilus		
Australasian Bittern [1001]	Endangered	Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area
Ceyx azureus diemenensis Tasmanian Azure Kingfisher [25977]	Endangered	Species or species habitat may occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat may occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea antipodensis gibsoni Gibson's Albatross [82270]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Fregetta grallaria grallaria White-bellied Storm-Petrel (Tasman Sea), White-bellied Storm-Petrel (Australasian) [64438]	Vulnerable	Species or species habitat likely to occur within area

Scientific Name	Threatened Category	Presence Text
Halobaena caerulea Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat likely to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat likely to occur within area
Limosa lapponica baueri Nunivak Bar-tailed Godwit, Western Alaskan Bar-tailed Godwit [86380]	Vulnerable	Species or species habitat may occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Neophema chrysogaster Orange-bellied Parrot [747]	Critically Endangered	Migration route known to occur within area
Neophema chrysostoma Blue-winged Parrot [726]	Vulnerable	Species or species habitat likely to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pachyptila turtur subantarctica Fairy Prion (southern) [64445]	Vulnerable	Species or species habitat known to occur within area
Pardalotus quadragintus Forty-spotted Pardalote [418]	Endangered	Foraging, feeding or related behaviour may occur within area

Scientific Name	Threatened Category	Presence Text
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat likely to occur within area
Pterodroma leucoptera leucoptera Gould's Petrel, Australian Gould's Petrel [26033]	Endangered	Species or species habitat may occur within area
Pterodroma mollis Soft-plumaged Petrel [1036]	Vulnerable	Species or species habitat may occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area
Thalassarche bulleri platei Northern Buller's Albatross, Pacific Albatross [82273]	Vulnerable	Species or species habitat may occur within area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche cauta Shy Albatross [89224]	Endangered	Breeding known to occur within area
Thalassarche chrysostoma Grey-headed Albatross [66491]	Endangered	Species or species habitat may occur within area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Foraging, feeding or related behaviour may occur within area

Scientific Name	Threatened Category	Presence Text
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Thinornis cucullatus cucullatus Eastern Hooded Plover, Eastern Hooded Plover [90381]	Vulnerable	Species or species habitat known to occur within area
Tyto novaehollandiae castanops (Tasmanian population) Masked Owl (Tasmanian) [67051]	Vulnerable	Species or species habitat may occur within area
CRUSTACEAN		
Engaeus martigener Furneaux Burrowing Crayfish [67220]	Endangered	Species or species habitat may occur within area
FISH		
Galaxiella pusilla Eastern Dwarf Galaxias, Dwarf Galaxias [56790]	Vulnerable	Species or species habitat may occur within area
Hoplostethus atlanticus Orange Roughy, Deep-sea Perch, Red Roughy [68455]	Conservation Dependent	Species or species habitat likely to occur within area
Prototroctes maraena Australian Grayling [26179]	Vulnerable	Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Rexea solandri (eastern Australian population)		
Eastern Gemfish [76339]	Conservation Dependent	Species or species habitat likely to occur within area
Seriolella brama		
Blue Warehou [69374]	Conservation Dependent	Species or species habitat known to occur within area
Thunnus maccoyii		
Southern Bluefin Tuna [69402]	Conservation Dependent	Species or species habitat likely to occur within area
FROG		
Litoria raniformis		
Growling Grass Frog, Southern Bell Frog, Green and Golden Frog, Warty Swamp Frog, Golden Bell Frog [1828]	Vulnerable	Species or species habitat may occur within area
MAMMAL		
Balaenoptera borealis		
Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Balaenoptera musculus		
Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Balaenoptera physalus		
Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Eubalaena australis		
Southern Right Whale [40]	Endangered	Species or species habitat known to occur within area
Pseudomys novaehollandiae		
New Holland Mouse, Pookila [96]	Vulnerable	Species or species habitat likely to occur within area
PLANT		
Caladenia caudata		
Tailed Spider-orchid [17067]	Vulnerable	Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Glycine latrobeana Clover Glycine, Purple Clover [13910]	Vulnerable	Species or species habitat may occur within area
Hiya distans listed as Hypolepis distans Scrambling Ground-fern [92548]	Endangered	Species or species habitat may occur within area
Prasophyllum atratum Three Hummock Leek-orchid [82677]	Critically Endangered	Species or species habitat may occur within area
Prasophyllum secutum Northern Leek-orchid [64954]	Endangered	Species or species habitat likely to occur within area
Pterostylis cucullata Leafy Greenhood [15459]	Vulnerable	Species or species habitat likely to occur within area
Senecio psilocarpus Swamp Fireweed, Smooth-fruited Groundsel [64976]	Vulnerable	Species or species habitat likely to occur within area
REPTILE		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat may occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
SHARK		
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Centrophorus harrissoni Harrisson's Dogfish, Endeavour Dogfish, Dumb Gulper Shark, Harrison's Deepsea Dogfish [68444]	Conservation Dependent	Species or species habitat likely to occur within area

Scientific Name	Threatened Category	Presence Text
Centrophorus uyato listed as Centrophorus zeehaani		
Little Gulper Shark [68446]	Conservation Dependent	Species or species habitat likely to occur within area
Galeorhinus galeus		
School Shark, Eastern School Shark, Snapper Shark, Tope, Soupfin Shark [68453]	Conservation Dependent	Species or species habitat likely to occur within area
Rhincodon typus		
Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area

Listed Migratory Species [Resource Information]

Scientific Name	Threatened Category	Presence Text
Migratory Marine Birds		
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardenna carneipes		
Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Foraging, feeding or related behaviour likely to occur within area
Ardenna grisea		
Sooty Shearwater [82651]		Species or species habitat may occur within area
Ardenna tenuirostris		
Short-tailed Shearwater [82652]		Breeding known to occur within area
Diomedea antipodensis		
Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea epomophora		
Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans		
Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area

Scientific Name	Threatened Category	Presence Text
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat likely to occur within area
Sternula albifrons Little Tern [82849]		Species or species habitat may occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche cauta Shy Albatross [89224]	Endangered	Breeding known to occur within area
Thalassarche chrysostoma Grey-headed Albatross [66491]	Endangered	Species or species habitat may occur within area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Foraging, feeding or related behaviour may occur within area

Scientific Name	Threatened Category	Presence Text
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Migratory Marine Species		
Balaenoptera bonaerensis Antarctic Minke Whale, Dark-shoulder Minke Whale [67812]		Species or species habitat likely to occur within area
Balaenoptera borealis Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Caperea marginata Pygmy Right Whale [39]		Foraging, feeding or related behaviour may occur within area

Scientific Name	Threatened Category	Presence Text
Carcharhinus longimanus Oceanic Whitetip Shark [84108]		Species or species habitat may occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat may occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
Eubalaena australis as Balaena glacialis australis Southern Right Whale [40]	Endangered	Species or species habitat known to occur within area
Isurus oxyrinchus Shortfin Mako, Mako Shark [79073]		Species or species habitat likely to occur within area
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat likely to occur within area
Lamna nasus Porbeagle, Mackerel Shark [83288]		Species or species habitat likely to occur within area
Megaptera novaeangliae Humpback Whale [38]		Species or species habitat known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat likely to occur within area

Scientific Name	Threatened Category	Presence Text
Physeter macrocephalus Sperm Whale [59]		Species or species habitat may occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area
Migratory Terrestrial Species		
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat likely to occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris alba Sanderling [875]		Species or species habitat likely to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat may occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species [Resource Information]

Scientific Name	Threatened Category	Presence Text
Bird		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area overfly marine area
Ardenna carneipes as Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Foraging, feeding or related behaviour likely to occur within area
Ardenna grisea as Puffinus griseus Sooty Shearwater [82651]		Species or species habitat may occur within area
Ardenna tenuirostris as Puffinus tenuirostris Short-tailed Shearwater [82652]		Breeding known to occur within area

Scientific Name	Threatened Category	Presence Text
Bubulcus ibis as Ardea ibis Cattle Egret [66521]		Species or species habitat may occur within area overfly marine area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris alba Sanderling [875]		Species or species habitat likely to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area overfly marine area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area overfly marine area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area overfly marine area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat may occur within area
Chroicocephalus novaehollandiae as Larus novaehollandiae Silver Gull [82326]		Breeding known to occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea antipodensis gibsoni as Diomedea gibsoni Gibson's Albatross [82270]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area

Scientific Name	Threatened Category	Presence Text
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Eudyptula minor Little Penguin [1085]		Breeding known to occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area overfly marine area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Breeding known to occur within area
Halobaena caerulea Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat likely to occur within area overfly marine area
Larus pacificus Pacific Gull [811]		Breeding known to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat likely to occur within area overfly marine area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area overfly marine area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area overfly marine area
Neophema chrysogaster Orange-bellied Parrot [747]	Critically Endangered	Migration route known to occur within area overfly marine area
Neophema chrysostoma Blue-winged Parrot [726]	Vulnerable	Species or species habitat likely to occur within area overfly marine area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pachyptila turtur Fairy Prion [1066]		Species or species habitat known to occur within area
Pelagodroma marina White-faced Storm-Petrel [1016]		Breeding known to occur within area
Pelecanoides urinatrix Common Diving-Petrel [1018]		Breeding known to occur within area

Scientific Name	Threatened Category	Presence Text
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat likely to occur within area
Pterodroma cervicalis White-necked Petrel [59642]		Species or species habitat may occur within area
Pterodroma mollis Soft-plumaged Petrel [1036]	Vulnerable	Species or species habitat may occur within area
Rostratula australis as Rostratula benghalensis (sensu lato) Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area overfly marine area
Stercorarius antarcticus as Catharacta skua Brown Skua [85039]		Species or species habitat may occur within area
Sterna striata White-fronted Tern [799]		Foraging, feeding or related behaviour likely to occur within area
Sternula albifrons as Sterna albifrons Little Tern [82849]		Species or species habitat may occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area
Thalassarche bulleri platei as Thalassarche sp. nov. Northern Buller's Albatross, Pacific Albatross [82273]	Vulnerable	Species or species habitat may occur within area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche cauta Shy Albatross [89224]	Endangered	Breeding known to occur within area

Scientific Name	Threatened Category	Presence Text
Thalassarche chrysostoma Grey-headed Albatross [66491]	Endangered	Species or species habitat may occur within area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Foraging, feeding or related behaviour may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Thinornis cucullatus as Thinornis rubricollis Hooded Plover, Hooded Dotterel [87735]		Species or species habitat known to occur within area overfly marine area
Thinornis cucullatus cucullatus as Thinornis rubricollis rubricollis Eastern Hooded Plover, Eastern Hooded Plover [90381]	Vulnerable	Species or species habitat known to occur within area overfly marine area
Fish		
Heraldia nocturna Upside-down Pipefish, Eastern Upside-down Pipefish, Eastern Upside-down Pipefish [66227]		Species or species habitat may occur within area
Hippocampus abdominalis Big-belly Seahorse, Eastern Potbelly Seahorse, New Zealand Potbelly Seahorse [66233]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Hippocampus breviceps Short-head Seahorse, Short-snouted Seahorse [66235]		Species or species habitat may occur within area
Hippocampus minotaur Bullneck Seahorse [66705]		Species or species habitat may occur within area
Histiogamphelus briggsii Crested Pipefish, Briggs' Crested Pipefish, Briggs' Pipefish [66242]		Species or species habitat may occur within area
Histiogamphelus cristatus Rhino Pipefish, Macleay's Crested Pipefish, Ring-back Pipefish [66243]		Species or species habitat may occur within area
Hypselognathus rostratus Knifesnout Pipefish, Knife-snouted Pipefish [66245]		Species or species habitat may occur within area
Kaupus costatus Deepbody Pipefish, Deep-bodied Pipefish [66246]		Species or species habitat may occur within area
Kimblaeus bassensis Trawl Pipefish, Bass Strait Pipefish [66247]		Species or species habitat may occur within area
Leptoichthys fistularius Brushtail Pipefish [66248]		Species or species habitat may occur within area
Lissocampus caudalis Australian Smooth Pipefish, Smooth Pipefish [66249]		Species or species habitat may occur within area
Lissocampus runa Javelin Pipefish [66251]		Species or species habitat may occur within area
Maroubra perserrata Sawtooth Pipefish [66252]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Mitotichthys mollisoni Mollison's Pipefish [66260]		Species or species habitat may occur within area
Mitotichthys semistriatus Halfbanded Pipefish [66261]		Species or species habitat may occur within area
Mitotichthys tuckeri Tucker's Pipefish [66262]		Species or species habitat may occur within area
Notiocampus ruber Red Pipefish [66265]		Species or species habitat may occur within area
Phycodurus eques Leafy Seadragon [66267]		Species or species habitat may occur within area
Phyllopteryx taeniolatus Common Seadragon, Weedy Seadragon [66268]		Species or species habitat may occur within area
Pugnaso curtirostris Pugnose Pipefish, Pug-nosed Pipefish [66269]		Species or species habitat may occur within area
Solegnathus robustus Robust Pipehorse, Robust Spiny Pipehorse [66274]		Species or species habitat may occur within area
Solegnathus spinosissimus Spiny Pipehorse, Australian Spiny Pipehorse [66275]		Species or species habitat may occur within area
Stigmatopora argus Spotted Pipefish, Gulf Pipefish, Peacock Pipefish [66276]		Species or species habitat may occur within area
Stigmatopora nigra Widebody Pipefish, Wide-bodied Pipefish, Black Pipefish [66277]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Stipecampus cristatus Ringback Pipefish, Ring-backed Pipefish [66278]		Species or species habitat may occur within area
Syngnathoides biaculeatus Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area
Urocampus carinirostris Hairy Pipefish [66282]		Species or species habitat may occur within area
Vanacampus margaritifer Mother-of-pearl Pipefish [66283]		Species or species habitat may occur within area
Vanacampus phillipi Port Phillip Pipefish [66284]		Species or species habitat may occur within area
Vanacampus poecilolaemus Longsnout Pipefish, Australian Long-snout Pipefish, Long-snouted Pipefish [66285]		Species or species habitat may occur within area
Mammal		
Arctocephalus forsteri Long-nosed Fur-seal, New Zealand Fur-seal [20]		Species or species habitat may occur within area
Arctocephalus pusillus Australian Fur-seal, Australo-African Fur-seal [21]		Breeding known to occur within area
Reptile		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat may occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area

Whales and Other Cetaceans

[Resource Information]

Current Scientific Name	Status	Type of Presence
Mammal		
Balaenoptera acutorostrata Minke Whale [33]		Species or species habitat may occur within area
Balaenoptera bonaerensis Antarctic Minke Whale, Dark-shoulder Minke Whale [67812]		Species or species habitat likely to occur within area
Balaenoptera borealis Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Berardius arnuxii Arnoux's Beaked Whale [70]		Species or species habitat may occur within area
Caperea marginata Pygmy Right Whale [39]		Foraging, feeding or related behaviour may occur within area
Delphinus delphis Common Dolphin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat known to occur within area

Current Scientific Name	Status	Type of Presence
Globicephala macrorhynchus Short-finned Pilot Whale [62]		Species or species habitat may occur within area
Globicephala melas Long-finned Pilot Whale [59282]		Species or species habitat may occur within area
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
Kogia breviceps Pygmy Sperm Whale [57]		Species or species habitat may occur within area
Kogia sima Dwarf Sperm Whale [85043]		Species or species habitat may occur within area
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat likely to occur within area
Lissodelphis peronii Southern Right Whale Dolphin [44]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]		Species or species habitat known to occur within area
Mesoplodon bowdoini Andrew's Beaked Whale [73]		Species or species habitat may occur within area
Mesoplodon densirostris Blainville's Beaked Whale, Dense-beaked Whale [74]		Species or species habitat may occur within area
Mesoplodon hectori Hector's Beaked Whale [76]		Species or species habitat may occur within area

Current Scientific Name	Status	Type of Presence
Mesoplodon layardii Strap-toothed Beaked Whale, Strap-toothed Whale, Layard's Beaked Whale [25556]		Species or species habitat may occur within area
Mesoplodon mirus True's Beaked Whale [54]		Species or species habitat may occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat likely to occur within area
Physeter macrocephalus Sperm Whale [59]		Species or species habitat may occur within area
Pseudorca crassidens False Killer Whale [48]		Species or species habitat likely to occur within area
Tursiops aduncus Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area
Ziphius cavirostris Cuvier's Beaked Whale, Goose-beaked Whale [56]		Species or species habitat may occur within area

Critical Habitats [Resource Information]

Name	Type of Presence
Thalassarche cauta (Shy Albatross) - Albatross Island, The Mewstone, Pedra Branca	Listed Critical Habitat

Australian Marine Parks [Resource Information]

Park Name	Zone & IUCN Categories
Beagle	Multiple Use Zone (IUCN VI)
Boags	Multiple Use Zone (IUCN VI)

Extra Information

State and Territory Reserves

[Resource Information]

Protected Area Name	Reserve Type	State
Albatross Island	Nature Reserve	TAS
Bass Pyramid	Nature Reserve	TAS
Bun Beetons Point	Conservation Area	TAS
Cone Islet	Conservation Area	TAS
Craggy Island	Conservation Area	TAS
Curtis Island	Nature Reserve	TAS
Devils Tower	Nature Reserve	TAS
Egg Beach	Conservation Area	TAS
Hunter Island	Conservation Area	TAS
Kent Group	National Park	TAS
Mount Tanner	Nature Recreation Area	TAS
Pasco Group	Conservation Area	TAS
Rodondo Island	Nature Reserve	TAS
Roydon Island	Conservation Area	TAS
Sugarloaf Rock	Conservation Area	TAS
Three Hummock Island	State Reserve	TAS
West Moncoeur Island	Nature Reserve	TAS
Wilsons Promontory	Marine National Park	VIC
Wright Rock	Nature Reserve	TAS

Regional Forest Agreements

[Resource Information]

Note that all areas with completed RFAs have been included. Please see the associated resource information for specific caveats and use limitations associated with RFA boundary information.

RFA Name	State
Tasmania RFA	Tasmania

EPBC Act Referrals

[Resource Information]

Title of referral	Reference	Referral Outcome	Assessment Status
Controlled action			
Yolla Gas Field (TRL1) Development	2001/321	Controlled Action	Post-Approval
Not controlled action			
Bass Basin - Pee Jay-1 - Drilling Program	2007/3908	Not Controlled Action	Completed
Exploration Drilling Well Trefoil-1	2003/1058	Not Controlled Action	Completed
Improving rabbit biocontrol: releasing another strain of RHDV, sthrn two thirds of Australia	2015/7522	Not Controlled Action	Completed
INDIGO Central Submarine Telecommunications Cable	2017/8127	Not Controlled Action	Completed
Installation of optic fibre cable from Inverloch, Victoria to Stanley, Tasmania	2002/906	Not Controlled Action	Completed
Offshore Petroleum Exploration	2001/289	Not Controlled Action	Completed
Offshore Seismic Survey	2001/498	Not Controlled Action	Completed
Spikey Beach 1, West Triton Drilling Program, Bass Basin Permit T/38P	2007/3914	Not Controlled Action	Completed
Not controlled action (particular manner)			
2D & 3D seismic survey T/39P	2005/2237	Not Controlled Action (Particular Manner)	Post-Approval
2D Seismic Aquisition Survey	2008/4041	Not Controlled Action (Particular Manner)	Post-Approval
2D Seismic Survey	2008/4066	Not Controlled Action (Particular Manner)	Post-Approval
2D Seismic Survey	2008/4131	Not Controlled Action (Particular Manner)	Post-Approval
2D Seismic Survey	2008/3962	Not Controlled Action (Particular Manner)	Post-Approval

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action (particular manner)			
2D seismic survey Permit Area VIC/P49	2006/2943	Not Controlled Action (Particular Manner)	Post-Approval
3D Seismic Survey	2008/4528	Not Controlled Action (Particular Manner)	Post-Approval
Apache 3D seismic exploration survey	2006/3146	Not Controlled Action (Particular Manner)	Post-Approval
Aroo Chappell 3D seismic survey	2010/5701	Not Controlled Action (Particular Manner)	Post-Approval
Bass Basin 2D and 3D seismic surveys (T/38P & T/37P)	2007/3650	Not Controlled Action (Particular Manner)	Post-Approval
Dalrymple 3D Seismic Survey	2010/5680	Not Controlled Action (Particular Manner)	Post-Approval
Exploration drilling of the Craigow-1 and Tolpuddle-1 wells	2010/5725	Not Controlled Action (Particular Manner)	Post-Approval
Gippsland 2D Marine Seismic Survey - VIC/P-63, VIC/P-64 and T/46P	2009/5241	Not Controlled Action (Particular Manner)	Post-Approval
INDIGO Marine Cable Route Survey (INDIGO)	2017/7996	Not Controlled Action (Particular Manner)	Post-Approval
Labatt 3D Seismic Survey T/47P Bass Strait	2007/3759	Not Controlled Action (Particular Manner)	Post-Approval
Non-exclusive 3-D Marine Seismic Survey, Bass Strait	2002/775	Not Controlled Action (Particular Manner)	Post-Approval
Origin Energy Silvereye-1 Exploration Drilling Programme	2010/5702	Not Controlled Action (Particular	Post-Approval

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action (particular manner)			
		Manner)	
Rockhopper-1 and Trefoil-2 Exploration Drilling in Permit Area T/18P	2009/4776	Not Controlled Action (Particular Manner)	Post-Approval
Seismic Survey	2001/206	Not Controlled Action (Particular Manner)	Post-Approval
Seismic survey, Gippsland Basin	2001/525	Not Controlled Action (Particular Manner)	Post-Approval
Shearwater 2D and 3D marine seismic survey	2005/2180	Not Controlled Action (Particular Manner)	Post-Approval
Silvereye 3D Seismic Survey	2007/3551	Not Controlled Action (Particular Manner)	Post-Approval
Southern Flanks 2D Marine Seismic Survey	2010/5288	Not Controlled Action (Particular Manner)	Post-Approval
Tap Oil Ltd Molson 2D Seismic Survey T47P	2008/3967	Not Controlled Action (Particular Manner)	Post-Approval
Tuskfish 3D Seismic Survey, Bass Strait	2002/864	Not Controlled Action (Particular Manner)	Post-Approval
Referral decision			
Darymple 3D Seismic Survey, Petroleum Exploration Permit T/41P	2010/5322	Referral Decision	Completed
Holloman 2010 Vic/P60 3D Seismic Acquisition Survey Program	2009/5251	Referral Decision	Completed

Biologically Important Areas

Scientific Name	Behaviour	Presence
Seabirds		

Scientific Name	Behaviour	Presence
Ardenna pacifica Wedge-tailed Shearwater [84292]	Foraging	Likely to occur
Ardenna tenuirostris Short-tailed Shearwater [82652]	Breeding	Known to occur
Ardenna tenuirostris Short-tailed Shearwater [82652]	Foraging	Known to occur
Diomedea exulans (sensu lato) Wandering Albatross [1073]	Foraging	Known to occur
Diomedea exulans antipodensis Antipodean Albatross [82269]	Foraging	Known to occur
Eudyptula minor Little Penguin [1085]	Breeding	Known to occur
Eudyptula minor Little Penguin [1085]	Foraging	Known to occur
Morus serrator Australasian Gannet [1020]	Foraging	Known to occur
Pelagodroma marina White-faced Storm-petrel [1016]	Foraging	Known to occur
Pelecanoides urinatrix Common Diving-petrel [1018]	Breeding	Known to occur
Pelecanoides urinatrix Common Diving-petrel [1018]	Foraging	Known to occur
Phalacrocorax fuscescens Black-faced Cormorant [59660]	Breeding	Known to occur
Phalacrocorax fuscescens Black-faced Cormorant [59660]	Foraging	Known to occur
Thalassarche bulleri Bullers Albatross [64460]	Foraging	Known to occur

Scientific Name	Behaviour	Presence
Thalassarche cauta cauta Shy Albatross [82345]	Breeding	Known to occur
Thalassarche cauta cauta Shy Albatross [82345]	Foraging likely	Likely to occur
Thalassarche chlororhynchos bassi Indian Yellow-nosed Albatross [85249]	Foraging	Known to occur
Thalassarche melanophris Black-browed Albatross [66472]	Foraging	Known to occur
Thalassarche melanophris impavida Campbell Albatross [82449]	Foraging	Known to occur
Sharks		
Carcharodon carcharias White Shark [64470]	Distribution	Likely to occur
Carcharodon carcharias White Shark [64470]	Distribution	Known to occur
Carcharodon carcharias White Shark [64470]	Distribution (low density)	Likely to occur
Carcharodon carcharias White Shark [64470]	Foraging	Known to occur
Carcharodon carcharias White Shark [64470]	Known distribution	Known to occur
Whales		
Balaenoptera musculus brevicauda Pygmy Blue Whale [81317]	Distribution	Known to occur
Balaenoptera musculus brevicauda Pygmy Blue Whale [81317]	Foraging	Likely to be present
Balaenoptera musculus brevicauda Pygmy Blue Whale [81317]	Known Foraging Area	Known to occur

Caveat

1 PURPOSE

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

The report contains the mapped locations of:

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

2 DISCLAIMER

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

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

3 DATA SOURCES

Threatened ecological communities

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

Threatened, migratory and marine species

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

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

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

4 LIMITATIONS

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

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

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

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

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

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

Acknowledgements

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

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

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

Please feel free to provide feedback via the Contact us page.

Appendix A.5 Light EMBA

Australian Government

Department of Climate Change, Energy, the Environment and Water

EPBC Act Protected Matters Report

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

Report created: 02-Nov-2023

Summary

Matters of National Environment Significance

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

World Heritage Properties:	None
National Heritage Places:	1
Wetlands of International Importance (Ramsar	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	2
Listed Threatened Ecological Communities:	3
Listed Threatened Species:	86
Listed Migratory Species:	55

Other Matters Protected by the EPBC Act

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

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

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

Commonwealth Lands:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	92
Whales and Other Cetaceans:	29
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	3
Habitat Critical to the Survival of Marine Turtles:	None

Extra Information

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

State and Territory Reserves:	11
Regional Forest Agreements:	1
Nationally Important Wetlands:	1
EPBC Act Referrals:	71
Key Ecological Features (Marine):	1
Biologically Important Areas:	21
Bioregional Assessments:	None
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

National Heritage Places [Resource Information]

Name	State	Legal Status	Buffer Status
Historic			
Great Ocean Road and Scenic Environs	VIC	Listed place	In buffer area only

Commonwealth Marine Area [Resource Information]

Approval is required for a proposed activity that is located within the Commonwealth Marine Area which has, will have, or is likely to have a significant impact on the environment. Approval may be required for a proposed action taken outside a Commonwealth Marine Area but which has, may have or is likely to have a significant impact on the environment in the Commonwealth Marine Area.

Feature Name	Buffer Status
Commonwealth Marine Areas (EPBC Act)	In feature area
Commonwealth Marine Areas (EPBC Act)	In feature area

Listed Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.
Status of Vulnerable, Disallowed and Ineligible are not MNES under the EPBC Act.

Community Name	Threatened Category	Presence Text	Buffer Status
Assemblages of species associated with open-coast salt-wedge estuaries of western and central Victoria ecological community	Endangered	Community likely to occur within area	In buffer area only
Giant Kelp Marine Forests of South East Australia	Endangered	Community may occur within area	In buffer area only
Subtropical and Temperate Coastal Saltmarsh	Vulnerable	Community likely to occur within area	In buffer area only

Listed Threatened Species [Resource Information]

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act.
Number is the current name ID.

Scientific Name	Threatened Category	Presence Text	Buffer Status
BIRD			
Anthochaera phrygia			
Regent Honeyeater [82338]	Critically Endangered	Species or species habitat may occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat known to occur within area	In buffer area only
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Callocephalon fimbriatum Gang-gang Cockatoo [768]	Endangered	Species or species habitat known to occur within area	In buffer area only
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Climacteris picumnus victoriae Brown Treecreeper (south-eastern) [67062]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Diomedea antipodensis gibsoni Gibson's Albatross [82270]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area	In feature area
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Fregetta grallaria grallaria White-bellied Storm-Petrel (Tasman Sea), White-bellied Storm-Petrel (Australasian) [64438]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Halobaena caerulea Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area	In feature area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat likely to occur within area	In buffer area only
Limosa lapponica baueri Nunivak Bar-tailed Godwit, Western Alaskan Bar-tailed Godwit [86380]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Foraging, feeding or related behaviour likely to occur within area	In feature area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Neophema chrysogaster Orange-bellied Parrot [747]	Critically Endangered	Migration route likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Neophema chrysostoma Blue-winged Parrot [726]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Pachyptila turtur subantarctica Fairy Prion (southern) [64445]	Vulnerable	Species or species habitat known to occur within area	In feature area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Pterodroma leucoptera leucoptera Gould's Petrel, Australian Gould's Petrel [26033]	Endangered	Species or species habitat may occur within area	In feature area
Pterodroma mollis Soft-plumaged Petrel [1036]	Vulnerable	Species or species habitat may occur within area	In feature area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area	In buffer area only
Stagonopleura guttata Diamond Firetail [59398]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Species or species habitat known to occur within area	In feature area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Thalassarche bulleri platei Northern Buller's Albatross, Pacific Albatross [82273]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Thalassarche cauta Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area	In feature area
Thalassarche chrysostoma Grey-headed Albatross [66491]	Endangered	Species or species habitat may occur within area	In feature area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area
Thinornis cucullatus cucullatus Eastern Hooded Plover, Eastern Hooded Plover [90381]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
FISH			
Galaxiella pusilla Eastern Dwarf Galaxias, Dwarf Galaxias [56790]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Hoplostethus atlanticus Orange Roughy, Deep-sea Perch, Red Roughy [68455]	Conservation Dependent	Species or species habitat likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Nannoperca obscura Yarra Pygmy Perch [26177]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Prototroctes maraena Australian Grayling [26179]	Vulnerable	Species or species habitat known to occur within area	In feature area
Seriolella brama Blue Warehou [69374]	Conservation Dependent	Species or species habitat known to occur within area	In feature area
Thunnus maccoyii Southern Bluefin Tuna [69402]	Conservation Dependent	Species or species habitat likely to occur within area	In feature area
FROG			
Litoria raniformis Growling Grass Frog, Southern Bell Frog, Green and Golden Frog, Warty Swamp Frog, Golden Bell Frog [1828]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
MAMMAL			
Antechinus minimus maritimus Swamp Antechinus (mainland) [83086]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
Balaenoptera borealis Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Balaenoptera musculus Blue Whale [36]	Endangered	Foraging, feeding or related behaviour known to occur within area	In feature area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Dasyurus maculatus maculatus (SE mainland population) Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat likely to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Eubalaena australis			
Southern Right Whale [40]	Endangered	Breeding known to occur within area	In feature area
Isoodon obesulus obesulus			
Southern Brown Bandicoot (eastern), Southern Brown Bandicoot (south-eastern) [68050]	Endangered	Species or species habitat known to occur within area	In buffer area only
Mastacomys fuscus mordicus			
Broad-toothed Rat (mainland), Tooarrana [87617]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
Miniopterus orianae bassanii			
Southern Bent-wing Bat [87645]	Critically Endangered	Species or species habitat likely to occur within area	In buffer area only
Neophoca cinerea			
Australian Sea-lion, Australian Sea Lion [22]	Endangered	Species or species habitat may occur within area	In buffer area only
Petaurus australis australis			
Yellow-bellied Glider (south-eastern) [87600]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
Potorous tridactylus trisulcatus			
Long-nosed Potoroo (southern mainland) [86367]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
Pseudomys fumeus			
Smoky Mouse, Konoom [88]	Endangered	Species or species habitat may occur within area	In buffer area only
Pseudomys novaehollandiae			
New Holland Mouse, Pookila [96]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Pteropus poliocephalus			
Grey-headed Flying-fox [186]	Vulnerable	Roosting known to occur within area	In buffer area only
PLANT			
Amphibromus fluitans			
River Swamp Wallaby-grass, Floating Swamp Wallaby-grass [19215]	Vulnerable	Species or species habitat may occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Dianella amoena Matted Flax-lily [64886]	Endangered	Species or species habitat may occur within area	In buffer area only
Eucalyptus strzeleckii Strzelecki Gum [55400]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
Glycine latrobeana Clover Glycine, Purple Clover [13910]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
Haloragis exalata subsp. exalata Wingless Raspwort, Square Raspwort [24636]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
Lepidium aschersonii Spiny Peppercress [10976]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Lepidium hyssopifolium Basalt Pepper-cress, Peppercress, Rubble Pepper-cress, Pepperweed [16542]	Endangered	Species or species habitat may occur within area	In buffer area only
Prasophyllum spicatum Dense Leek-orchid [55146]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
Pterostylis chlorogramma Green-striped Greenhood [56510]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Pterostylis cucullata Leafy Greenhood [15459]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Pterostylis tenuissima Swamp Greenhood, Dainty Swamp Orchid [13139]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
Senecio psilocarpus Swamp Fireweed, Smooth-fruited Groundsel [64976]	Vulnerable	Species or species habitat known to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Thelymitra epipactoides Metallic Sun-orchid [11896]	Endangered	Species or species habitat known to occur within area	In buffer area only
Thelymitra matthewsii Spiral Sun-orchid [4168]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Thelymitra orientalis Hoary Sun-orchid [88011]	Critically Endangered	Species or species habitat may occur within area	In buffer area only
Xerochrysum palustre Swamp Everlasting, Swamp Paper Daisy [76215]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
REPTILE			
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area	In feature area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat may occur within area	In feature area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area	In feature area
Lissolepis coventryi Swamp Skink, Eastern Mourning Skink [84053]	Endangered	Species or species habitat known to occur within area	In buffer area only
SHARK			
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area
Centrophorus uyato Little Gulper Shark [68446]	Conservation Dependent	Species or species habitat likely to occur within area	In feature area
Galeorhinus galeus School Shark, Eastern School Shark, Snapper Shark, Tope, Soupfin Shark [68453]	Conservation Dependent	Species or species habitat likely to occur within area	In feature area

Listed Migratory Species

[Resource Information]

Scientific Name	Threatened Category	Presence Text	Buffer Status
Migratory Marine Birds			
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area	In feature area
Ardenna carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Foraging, feeding or related behaviour likely to occur within area	In feature area
Ardenna grisea Sooty Shearwater [82651]		Species or species habitat may occur within area	In feature area
Ardenna tenuirostris Short-tailed Shearwater [82652]		Breeding known to occur within area	In buffer area only
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area	In feature area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Foraging, feeding or related behaviour likely to occur within area	In feature area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Sternula albifrons Little Tern [82849]		Species or species habitat may occur within area	In buffer area only
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Thalassarche cauta Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area	In feature area
Thalassarche chrysostoma Grey-headed Albatross [66491]	Endangered	Species or species habitat may occur within area	In feature area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area

Migratory Marine Species

Scientific Name	Threatened Category	Presence Text	Buffer Status
Balaenoptera bonaerensis Antarctic Minke Whale, Dark-shoulder Minke Whale [67812]		Species or species habitat likely to occur within area	In feature area
Balaenoptera borealis Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Balaenoptera musculus Blue Whale [36]	Endangered	Foraging, feeding or related behaviour known to occur within area	In feature area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Caperea marginata Pygmy Right Whale [39]		Foraging, feeding or related behaviour may occur within area	In feature area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area	In feature area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat may occur within area	In feature area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area	In feature area
Eubalaena australis as Balaena glacialis australis Southern Right Whale [40]	Endangered	Breeding known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Isurus oxyrinchus Shortfin Mako, Mako Shark [79073]		Species or species habitat likely to occur within area	In feature area
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat likely to occur within area	In feature area
Lamna nasus Porbeagle, Mackerel Shark [83288]		Species or species habitat likely to occur within area	In feature area
Megaptera novaeangliae Humpback Whale [38]		Species or species habitat known to occur within area	In feature area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat likely to occur within area	In feature area
Physeter macrocephalus Sperm Whale [59]		Species or species habitat may occur within area	In feature area
Migratory Terrestrial Species			
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat may occur within area	In buffer area only
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area	In buffer area only
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area	In buffer area only
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area	In buffer area only
Migratory Wetlands Species			

Scientific Name	Threatened Category	Presence Text	Buffer Status
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area	In feature area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area	In feature area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat known to occur within area	In feature area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat known to occur within area	In buffer area only
Gallinago megala Swinhoe's Snipe [864]		Roosting likely to occur within area	In buffer area only
Gallinago stenura Pin-tailed Snipe [841]		Roosting likely to occur within area	In buffer area only
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area	In buffer area only
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Numenius minutus Little Curlew, Little Whimbrel [848]		Roosting likely to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Pandion haliaetus Osprey [952]		Species or species habitat likely to occur within area	In buffer area only
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area	In buffer area only

Other Matters Protected by the EPBC Act

Listed Marine Species

[Resource Information]

Scientific Name	Threatened Category	Presence Text	Buffer Status
Bird			
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area	In feature area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area overfly marine area	In feature area
Ardenna carneipes as Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Foraging, feeding or related behaviour likely to occur within area	In feature area
Ardenna grisea as Puffinus griseus Sooty Shearwater [82651]		Species or species habitat may occur within area	In feature area
Ardenna tenuirostris as Puffinus tenuirostris Short-tailed Shearwater [82652]		Breeding known to occur within area	In buffer area only
Bubulcus ibis as Ardea ibis Cattle Egret [66521]		Species or species habitat may occur within area overfly marine area	In buffer area only
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Calidris canutus			
Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area overfly marine area	In feature area
Calidris ferruginea			
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area overfly marine area	In feature area
Calidris melanotos			
Pectoral Sandpiper [858]		Species or species habitat known to occur within area overfly marine area	In feature area
Chalcites osculans as Chrysococcyx osculans			
Black-eared Cuckoo [83425]		Species or species habitat likely to occur within area overfly marine area	In buffer area only
Charadrius leschenaultii			
Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Diomedea antipodensis			
Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Diomedea antipodensis gibsoni as Diomedea gibsoni			
Gibson's Albatross [82270]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Diomedea epomophora			
Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Diomedea exulans			
Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area	In feature area
Eudyptula minor Little Penguin [1085]		Breeding known to occur within area	In buffer area only
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat known to occur within area overfly marine area	In buffer area only
Gallinago megala Swinhoe's Snipe [864]		Roosting likely to occur within area overfly marine area	In buffer area only
Gallinago stenura Pin-tailed Snipe [841]		Roosting likely to occur within area overfly marine area	In buffer area only
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Breeding known to occur within area	In buffer area only
Halobaena caerulea Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area	In feature area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area overfly marine area	In buffer area only
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat likely to occur within area overfly marine area	In buffer area only
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area	In buffer area only
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Foraging, feeding or related behaviour likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area overfly marine area	In buffer area only
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat may occur within area overfly marine area	In buffer area only
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area overfly marine area	In buffer area only
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area overfly marine area	In buffer area only
Neophema chrysogaster Orange-bellied Parrot [747]	Critically Endangered	Migration route likely to occur within area overfly marine area	In feature area
Neophema chrysostoma Blue-winged Parrot [726]	Vulnerable	Species or species habitat known to occur within area overfly marine area	In buffer area only
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Numenius minutus Little Curlew, Little Whimbrel [848]		Roosting likely to occur within area overfly marine area	In buffer area only
Pachyptila turtur Fairy Prion [1066]		Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Pandion haliaetus			
Osprey [952]		Species or species habitat likely to occur within area	In buffer area only
Phalacrocorax fuscescens			
Black-faced Cormorant [59660]		Breeding known to occur within area	In buffer area only
Phoebetria fusca			
Sooty Albatross [1075]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Pterodroma mollis			
Soft-plumaged Petrel [1036]	Vulnerable	Species or species habitat may occur within area	In feature area
Rhipidura rufifrons			
Rufous Fantail [592]		Species or species habitat known to occur within area overfly marine area	In buffer area only
Rostratula australis as Rostratula benghalensis (sensu lato)			
Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area overfly marine area	In buffer area only
Stercorarius antarcticus as Catharacta skua			
Brown Skua [85039]		Species or species habitat may occur within area	In feature area
Sterna striata			
White-fronted Tern [799]		Foraging, feeding or related behaviour likely to occur within area	In feature area
Sternula albifrons as Sterna albifrons			
Little Tern [82849]		Species or species habitat may occur within area	In buffer area only
Thalassarche bulleri			
Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Thalassarche bulleri platei as Thalassarche sp. nov.			
Northern Buller's Albatross, Pacific Albatross [82273]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Thalassarche carteri			
Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Thalassarche cauta			
Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area	In feature area
Thalassarche chrysostoma			
Grey-headed Albatross [66491]	Endangered	Species or species habitat may occur within area	In feature area
Thalassarche impavida			
Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Thalassarche melanophris			
Black-browed Albatross [66472]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Thalassarche salvini			
Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Thalassarche steadi			
White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area
Thinornis cucullatus as Thinornis rubricollis			
Hooded Plover, Hooded Dotterel [87735]		Species or species habitat known to occur within area overfly marine area	In buffer area only
Thinornis cucullatus cucullatus as Thinornis rubricollis rubricollis			
Eastern Hooded Plover, Eastern Hooded Plover [90381]	Vulnerable	Species or species habitat known to occur within area overfly marine area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area overfly marine area	In buffer area only
Fish			
Heraldia nocturna Upside-down Pipefish, Eastern Upside-down Pipefish, Eastern Upside-down Pipefish [66227]		Species or species habitat may occur within area	In feature area
Hippocampus abdominalis Big-belly Seahorse, Eastern Potbelly Seahorse, New Zealand Potbelly Seahorse [66233]		Species or species habitat may occur within area	In feature area
Hippocampus breviceps Short-head Seahorse, Short-snouted Seahorse [66235]		Species or species habitat may occur within area	In feature area
Hippocampus minotaur Bullneck Seahorse [66705]		Species or species habitat may occur within area	In feature area
Histiogamphelus briggsii Crested Pipefish, Briggs' Crested Pipefish, Briggs' Pipefish [66242]		Species or species habitat may occur within area	In feature area
Histiogamphelus cristatus Rhino Pipefish, Macleay's Crested Pipefish, Ring-back Pipefish [66243]		Species or species habitat may occur within area	In feature area
Hypselognathus rostratus Knifesnout Pipefish, Knife-snouted Pipefish [66245]		Species or species habitat may occur within area	In feature area
Kaupus costatus Deepbody Pipefish, Deep-bodied Pipefish [66246]		Species or species habitat may occur within area	In feature area
Kimblaeus bassensis Trawl Pipefish, Bass Strait Pipefish [66247]		Species or species habitat may occur within area	In feature area
Leptoichthys fistularius Brushtail Pipefish [66248]		Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Lissocampus caudalis Australian Smooth Pipefish, Smooth Pipefish [66249]		Species or species habitat may occur within area	In feature area
Lissocampus runa Javelin Pipefish [66251]		Species or species habitat may occur within area	In feature area
Maroubra perserrata Sawtooth Pipefish [66252]		Species or species habitat may occur within area	In feature area
Mitotichthys semistriatus Halfbanded Pipefish [66261]		Species or species habitat may occur within area	In feature area
Mitotichthys tuckeri Tucker's Pipefish [66262]		Species or species habitat may occur within area	In feature area
Notiocampus ruber Red Pipefish [66265]		Species or species habitat may occur within area	In feature area
Phycodurus eques Leafy Seadragon [66267]		Species or species habitat may occur within area	In feature area
Phyllopteryx taeniolatus Common Seadragon, Weedy Seadragon [66268]		Species or species habitat may occur within area	In feature area
Pugnaso curtirostris Pugnose Pipefish, Pug-nosed Pipefish [66269]		Species or species habitat may occur within area	In feature area
Solegnathus robustus Robust Pipehorse, Robust Spiny Pipehorse [66274]		Species or species habitat may occur within area	In feature area
Solegnathus spinosissimus Spiny Pipehorse, Australian Spiny Pipehorse [66275]		Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Stigmatopora argus Spotted Pipefish, Gulf Pipefish, Peacock Pipefish [66276]		Species or species habitat may occur within area	In feature area
Stigmatopora nigra Widebody Pipefish, Wide-bodied Pipefish, Black Pipefish [66277]		Species or species habitat may occur within area	In feature area
Stipecampus cristatus Ringback Pipefish, Ring-backed Pipefish [66278]		Species or species habitat may occur within area	In feature area
Urocampus carinirostris Hairy Pipefish [66282]		Species or species habitat may occur within area	In feature area
Vanacampus margaritifer Mother-of-pearl Pipefish [66283]		Species or species habitat may occur within area	In feature area
Vanacampus phillipi Port Phillip Pipefish [66284]		Species or species habitat may occur within area	In feature area
Vanacampus poecilolaemus Longsnout Pipefish, Australian Long-snout Pipefish, Long-snouted Pipefish [66285]		Species or species habitat may occur within area	In feature area
Mammal			
Arctocephalus forsteri Long-nosed Fur-seal, New Zealand Fur-seal [20]		Species or species habitat may occur within area	In feature area
Arctocephalus pusillus Australian Fur-seal, Australo-African Fur-seal [21]		Species or species habitat likely to occur within area	In feature area
Neophoca cinerea Australian Sea-lion, Australian Sea Lion [22]	Endangered	Species or species habitat may occur within area	In buffer area only
Reptile			
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat may occur within area	In feature area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area	In feature area

Whales and Other Cetaceans

[Resource Information]

Current Scientific Name	Status	Type of Presence	Buffer Status
Mammal			
Balaenoptera acutorostrata Minke Whale [33]		Species or species habitat may occur within area	In feature area
Balaenoptera bonaerensis Antarctic Minke Whale, Dark-shoulder Minke Whale [67812]		Species or species habitat likely to occur within area	In feature area
Balaenoptera borealis Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Balaenoptera musculus Blue Whale [36]	Endangered	Foraging, feeding or related behaviour known to occur within area	In feature area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Berardius arnuxii Arnoux's Beaked Whale [70]		Species or species habitat may occur within area	In feature area
Caperea marginata Pygmy Right Whale [39]		Foraging, feeding or related behaviour may occur within area	In feature area
Delphinus delphis Common Dolphin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area	In feature area

Current Scientific Name	Status	Type of Presence	Buffer Status
Eubalaena australis Southern Right Whale [40]	Endangered	Breeding known to occur within area	In feature area
Globicephala macrorhynchus Short-finned Pilot Whale [62]		Species or species habitat may occur within area	In feature area
Globicephala melas Long-finned Pilot Whale [59282]		Species or species habitat may occur within area	In feature area
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area	In feature area
Kogia breviceps Pygmy Sperm Whale [57]		Species or species habitat may occur within area	In feature area
Kogia sima Dwarf Sperm Whale [85043]		Species or species habitat may occur within area	In feature area
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat likely to occur within area	In feature area
Lissodelphis peronii Southern Right Whale Dolphin [44]		Species or species habitat may occur within area	In feature area
Megaptera novaeangliae Humpback Whale [38]		Species or species habitat known to occur within area	In feature area
Mesoplodon bowdoini Andrew's Beaked Whale [73]		Species or species habitat may occur within area	In feature area
Mesoplodon densirostris Blainville's Beaked Whale, Dense-beaked Whale [74]		Species or species habitat may occur within area	In feature area

Current Scientific Name	Status	Type of Presence	Buffer Status
Mesoplodon grayi Gray's Beaked Whale, Scamperdown Whale [75]		Species or species habitat may occur within area	In buffer area only
Mesoplodon hectori Hector's Beaked Whale [76]		Species or species habitat may occur within area	In feature area
Mesoplodon layardii Strap-toothed Beaked Whale, Strap-toothed Whale, Layard's Beaked Whale [25556]		Species or species habitat may occur within area	In feature area
Mesoplodon mirus True's Beaked Whale [54]		Species or species habitat may occur within area	In feature area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat likely to occur within area	In feature area
Physeter macrocephalus Sperm Whale [59]		Species or species habitat may occur within area	In feature area
Pseudorca crassidens False Killer Whale [48]		Species or species habitat likely to occur within area	In feature area
Tursiops aduncus Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area	In feature area
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area	In feature area
Ziphius cavirostris Cuvier's Beaked Whale, Goose-beaked Whale [56]		Species or species habitat may occur within area	In feature area

Australian Marine Parks

[Resource Information]

Park Name	Zone & IUCN Categories	Buffer Status
Boags	Multiple Use Zone (IUCN VI)	In buffer area only

Park Name	Zone & IUCN Categories	Buffer Status
Zeehan	Multiple Use Zone (IUCN VI)	In feature area
Zeehan	Special Purpose Zone (IUCN VI)	In feature area

Extra Information

State and Territory Reserves

[Resource Information]

Protected Area Name	Reserve Type	State	Buffer Status
Bay of Islands Coastal Park	Conservation Park	VIC	In buffer area only
Cooriemungle	Reference Area	VIC	In buffer area only
Cooriemungle Creek F.R	Nature Conservation Reserve	VIC	In buffer area only
Curdie Vale N.C.R.	Natural Features Reserve	VIC	In buffer area only
Great Otway	National Park	VIC	In buffer area only
Latrobe B.R.	Natural Features Reserve	VIC	In buffer area only
Port Campbell	National Park	VIC	In buffer area only
Princetown W.R	Natural Features Reserve	VIC	In buffer area only
The Arches	Marine Sanctuary	VIC	In buffer area only
Timboon I1 B.R	Natural Features Reserve	VIC	In buffer area only
Twelve Apostles	Marine National Park	VIC	In buffer area only

Regional Forest Agreements

[Resource Information]

Note that all areas with completed RFAs have been included. Please see the associated resource information for specific caveats and use limitations associated with RFA boundary information.

RFA Name	State	Buffer Status
West Victoria RFA	Victoria	In buffer area only

Nationally Important Wetlands

[Resource Information]

Wetland Name	State	Buffer Status
Princetown Wetlands	VIC	In buffer area only

EPBC Act Referrals [Resource Information]

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Otway Astrolabe 3D Marine Seismic Survey, Otway Basin	2012/6421		Completed	In feature area
Controlled action				
Alston-1 petroleum exploration well, permit VIC/P44	2003/1315	Controlled Action	Post-Approval	In buffer area only
Casino Gas Field Development	2003/1295	Controlled Action	Post-Approval	In feature area
Otway Development	2002/621	Controlled Action	Post-Approval	In feature area
Schomberg 3D Marine Seismic Survey	2007/3754	Controlled Action	Completed	In feature area
Strike Oil Gas Exploration Well, Otway Basin (VIC/P44)	2000/97	Controlled Action	Completed	In buffer area only
Twelve Apostles Saddle Lookout	2019/8571	Controlled Action	Post-Approval	In buffer area only
VICP61 2D Marine Seismic Survey	2008/4075	Controlled Action	Completed	In feature area
Yolla Gas Field (TRL1) Development	2001/321	Controlled Action	Post-Approval	In feature area
Not controlled action				
CO2 geosequestration - Otway Basin Pilot Project	2006/2699	Not Controlled Action	Completed	In buffer area only
Enterprise 1 Exploration Drilling Program, near Port Campbell, Vic	2019/8438	Not Controlled Action	Completed	In buffer area only
Exploration drilling for liquid/gaseous hydrocarbons	2004/1681	Not Controlled Action	Completed	In feature area
Exploration Drilling Well Trefoil-1	2003/1058	Not Controlled Action	Completed	In feature area
Gas Field Development	2006/2635	Not Controlled Action	Completed	In feature area
Gas Fields Development	2011/5879	Not Controlled Action	Completed	In buffer area only
Halladale and Speculant Gas Pipeline Project, North of Port Campbell, Vic	2015/7551	Not Controlled Action	Completed	In buffer area only
Henry-1 Exploration Well, Petroleum Permit Area VIC/P44	2005/2147	Not Controlled Action	Completed	In feature area
Improving rabbit biocontrol: releasing another strain of RHDV,	2015/7522	Not Controlled Action	Completed	In buffer area only

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Not controlled action				
sthrn two thirds of Australia				
INDIGO Central Submarine Telecommunications Cable	2017/8127	Not Controlled Action	Completed	In feature area
Installation of optic fibre cable from Inverloch, Victoria to Stanley, Tasmania	2002/906	Not Controlled Action	Completed	In feature area
Minerva Cut Back Project, Vic	2017/8036	Not Controlled Action	Completed	In buffer area only
Newfield wind farm	2007/3226	Not Controlled Action	Completed	In buffer area only
Nirranda South Wind Farm Pty Ltd	2002/763	Not Controlled Action	Completed	In buffer area only
Offshore exploration drilling within permit area VIC/P 37(v)	2004/1466	Not Controlled Action	Completed	In buffer area only
Port Campbell Headland Walking Trail Realignment	2012/6676	Not Controlled Action	Completed	In buffer area only
Track construction - Great Ocean Walk	2002/793	Not Controlled Action	Completed	In buffer area only
VIC-P44 Stage 2 Gas Field Development	2007/3767	Not Controlled Action	Completed	In feature area
Victorian Generator Project	2005/1984	Not Controlled Action	Completed	In buffer area only
Wind Farm Construction and Operation	2001/471	Not Controlled Action	Completed	In buffer area only
Not controlled action (particular manner)				
'Moonlight Head' 3D seismic survey, VIC/P38(V), VIC/P43 and VIC/RL8	2005/2236	Not Controlled Action (Particular Manner)	Post-Approval	In feature area
2D & 3D seismic survey T/39P	2005/2237	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only
2D Marine Seismic Survey	2005/2295	Not Controlled Action (Particular Manner)	Post-Approval	In feature area
2D Marine Seismic Survey in Permit Areas T/32P and T/33P	2002/845	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Not controlled action (particular manner)				
2D Seismic Survey	2003/1214	Not Controlled Action (Particular Manner)	Post-Approval	In feature area
3D marine seismic survey near King Island	2004/1461	Not Controlled Action (Particular Manner)	Post-Approval	In feature area
3D seismic program VIC/P38(v), VIC/P43 and VIC/RL8	2003/1137	Not Controlled Action (Particular Manner)	Post-Approval	In feature area
Aroo Chappell 3D seismic survey	2010/5701	Not Controlled Action (Particular Manner)	Post-Approval	In feature area
Astrolabe 3D Marine Seismic Survey	2011/6048	Not Controlled Action (Particular Manner)	Post-Approval	In feature area
Bass Basin 2D and 3D seismic surveys (T/38P & T/37P)	2007/3650	Not Controlled Action (Particular Manner)	Post-Approval	In feature area
BHPBilliton Otway 3D Seismic Survey	2007/3443	Not Controlled Action (Particular Manner)	Post-Approval	In feature area
Deepwater Sorell Basin 2001 Non-Exclusive 2D Seismic Survey	2001/156	Not Controlled Action (Particular Manner)	Post-Approval	In feature area
Drill and Profile Exploration Well Somerset 1, License Area T34P	2009/5037	Not Controlled Action (Particular Manner)	Post-Approval	In feature area
Enterprise Three-dimensional Transition Zone Seismic Survey, Victoria	2016/7800	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only
Exploration drilling of the Craigow-1 and Tolpuddle-1 wells	2010/5725	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only
Geographe-A gas exploration well	2000/82	Not Controlled Action (Particular	Post-Approval	In feature area

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Not controlled action (particular manner)				
		Manner)		
INDIGO Marine Cable Route Survey (INDIGO)	2017/7996	Not Controlled Action (Particular Manner)	Post-Approval	In feature area
Labatt 3D Seismic Survey T/47P Bass Strait	2007/3759	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only
La Bella 3D Marine Seismic Survey, Otway Basin, VIC	2012/6683	Not Controlled Action (Particular Manner)	Post-Approval	In feature area
Origin Energy Silvereye-1 Exploration Drilling Programme	2010/5702	Not Controlled Action (Particular Manner)	Post-Approval	In feature area
Otway Basin Exploration Drilling Campaign, Vic	2011/6125	Not Controlled Action (Particular Manner)	Post-Approval	In feature area
Rockhopper-1 and Trefoil-2 Exploration Drilling in Permit Area T/18P	2009/4776	Not Controlled Action (Particular Manner)	Post-Approval	In feature area
Santos Otway 3d Seismic VIC/P44	2007/3367	Not Controlled Action (Particular Manner)	Post-Approval	In feature area
Schomberg 3D Marine Seismic survey	2007/3868	Not Controlled Action (Particular Manner)	Post-Approval	In feature area
SEA Gas Project transmission pipeline	2001/513	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only
Shaw River Power Station construct gas pipeline and associated infrastructure	2009/5089	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only
Shearwater 2D and 3D marine seismic survey	2005/2180	Not Controlled Action (Particular Manner)	Post-Approval	In feature area

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Not controlled action (particular manner)				
Silvereye 3D Seismic Survey	2007/3551	Not Controlled Action (Particular Manner)	Post-Approval	In feature area
Southern Gas Pipeline Project	2002/619	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only
Southern Margins T/35P and T/36P 3D Seismic Surveys	2007/3817	Not Controlled Action (Particular Manner)	Post-Approval	In feature area
Speculant 3D Transition Zone Seismic Survey	2010/5558	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only
Strike Oil NL Seismic Surveys	2000/107	Not Controlled Action (Particular Manner)	Post-Approval	In feature area
Surface Geochemical Exploration Program, TAS	2010/5780	Not Controlled Action (Particular Manner)	Post-Approval	In feature area
Tap Oil Ltd Molson 2D Seismic Survey T47P	2008/3967	Not Controlled Action (Particular Manner)	Post-Approval	In feature area
The Enterprise 3D Seismic Acquisition Survey, Otway Basin, Vic	2012/6565	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only
Thylacine-A Exploration Well	2000/81	Not Controlled Action (Particular Manner)	Post-Approval	In feature area
Undertake a three dimensional marine seismic survey	2010/5700	Not Controlled Action (Particular Manner)	Post-Approval	In feature area
Vic/P37(v) and Vic/P44 3D marine seismic survey	2003/1102	Not Controlled Action (Particular Manner)	Post-Approval	In feature area
VIC P44 Gas Exploration Wells	2002/662	Not Controlled Action (Particular	Post-Approval	In feature area

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Not controlled action (particular manner)				
		Manner)		
Vic-P51 and Vic-P52 2D seismic survey	2002/811	Not Controlled Action (Particular Manner)	Post-Approval	In feature area
Referral decision				
The Enterprise 3D Seismic Acquisition Survey, Otway Basin, VIC	2012/6545	Referral Decision	Completed	In buffer area only
VICP61 2D Marine Seismic Survey	2008/3975	Referral Decision	Completed	In feature area

Key Ecological Features [Resource Information]

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

Name	Region	Buffer Status
West Tasmania Canyons	South-east	In feature area

Biologically Important Areas

Scientific Name	Behaviour	Presence	Buffer Status
Seabirds			
Ardenna pacifica Wedge-tailed Shearwater [84292]	Breeding	Known to occur	In buffer area only
Ardenna pacifica Wedge-tailed Shearwater [84292]	Foraging	Likely to occur	In feature area
Ardenna tenuirostris Short-tailed Shearwater [82652]	Foraging	Known to occur	In feature area
Diomedea exulans (sensu lato) Wandering Albatross [1073]	Foraging	Known to occur	In feature area
Diomedea exulans antipodensis Antipodean Albatross [82269]	Foraging	Known to occur	In feature area
Pelagodroma marina White-faced Storm-petrel [1016]	Foraging	Known to occur	In feature area
Pelecanoides urinatrix Common Diving-petrel [1018]	Foraging	Known to occur	In feature area

Scientific Name	Behaviour	Presence	Buffer Status
Thalassarche bulleri Bullers Albatross [64460]	Foraging	Known to occur	In feature area
Thalassarche cauta cauta Shy Albatross [82345]	Foraging likely	Likely to occur	In feature area
Thalassarche chlororhynchos bassi Indian Yellow-nosed Albatross [85249]	Foraging	Known to occur	In feature area
Thalassarche melanophris Black-browed Albatross [66472]	Foraging	Known to occur	In feature area
Thalassarche melanophris impavida Campbell Albatross [82449]	Foraging	Known to occur	In feature area
Sharks			
Carcharodon carcharias White Shark [64470]	Distribution	Known to occur	In feature area
Carcharodon carcharias White Shark [64470]	Distribution	Likely to occur	In feature area
Carcharodon carcharias White Shark [64470]	Distribution (low density)	Likely to occur	In feature area
Carcharodon carcharias White Shark [64470]	Foraging	Known to occur	In buffer area only
Carcharodon carcharias White Shark [64470]	Known distribution	Known to occur	In feature area
Whales			
Balaenoptera musculus brevicauda Pygmy Blue Whale [81317]	Distribution	Known to occur	In feature area
Balaenoptera musculus brevicauda Pygmy Blue Whale [81317]	Foraging	Likely to be present	In feature area
Balaenoptera musculus brevicauda Pygmy Blue Whale [81317]	Foraging (annual high use area)	Known to occur	In feature area
Balaenoptera musculus brevicauda Pygmy Blue Whale [81317]	Known Foraging Area	Known to occur	In feature area

Scientific Name	Behaviour	Presence	Buffer Status

Caveat

1 PURPOSE

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

The report contains the mapped locations of:

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

2 DISCLAIMER

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

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

3 DATA SOURCES

Threatened ecological communities

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

Threatened, migratory and marine species

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

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

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

4 LIMITATIONS

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

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

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

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

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

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

Acknowledgements

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

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

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

Please feel free to provide feedback via the Contact us page.

Appendix B JASCO Acoustic Modelling Report – Otway Geophysical Survey

Otway Basin Geophysical Operations Acoustic Modelling

Acoustic Modelling for Assessing Marine Fauna Sound Exposures

Submitted to:
Lattice Energy

Authors:
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Disclaimer:

The results presented herein are relevant within the specific context described in this report. They could be misinterpreted if not considered in the light of all the information contained in this report. Accordingly, if information from this report is used in documents released to the public or to regulatory bodies, such documents must clearly cite the original report, which shall be made readily available to the recipients in integral and unedited form.

Contents

Figures

Tables

Executive Summary

Sound models were used to assess underwater noise levels during the proposed Otway Basin Geophysical Survey by Lattice Energy. The modelling approach accounted for the acoustic emission characteristics of a representative boomer and sub-bottom profiler (SBP) both towed at 3 m depth, along with a 450 in^3 vertical seismic profiler (VSP) array operated at a centroid depth of 6 m. The boomer and SBP geophysical survey sources planned for use had not been decided at the time of the modelling study, therefore JASCO chose commonly-used representative systems for each source, with levels derived from previous JASCO field measurement campaigns of such sources. The modelled per-pulse in-beam SEL and SPL source levels of the boomer were 180.0 dB re 1 µPa^2·s @ 1 m and 200.5 dB re 1 µPa @ 1 m respectively, and for the sub-bottom profiler they were 171.4 dB re 1 µPa^2·s @ 1 m and 191.7 dB re 1 µPa @ 1 m. The modelling considered source directivity and the area's range-dependent environmental properties.

The modelling study assessed six sites for the representative boomer and sub-bottom profiler, and one site for the VSP operations, focusing on the metrics relevant to benthic invertebrates. Accumulated SEL was modelled for four full surveys of the boomer and SBP operating in tandem. The scenarios considered operational periods of either 51 or 40.2 hours, including turn times.

The analysis considered the maximum distances away from a given source or survey lines at which several effects criteria were reached. The results are summarised below for representative single pulse sites and for accumulated sound exposure level (SEL) scenarios.

Benthic Invertebrates and Fish

- Sound fields from the representative boomer and SBP do not reach any of the assessed thresholds for benthic crustaceans or fish at the seafloor for either single pulse or accumulated SEL scenarios. The sound level drops below the lowest relevant peak-to-peak pressure level (PK-PK) isopleth of 202 dB re 1 µPa at a vertical distance of 11 m below the source, and below the lowest relevant peak pressure level (PK) of 207 dB re 1 µPa within 1.6 m, while the maximum per-pulse SEL isopleth predicted to occur at the seafloor is 155 dB re 1 µPa^2·s at a maximum horizontal distance of 1 m from the source.
- The SBP is a higher-frequency, more directional, and lower energy source than the boomer; consequently, the ranges are consistently lower. The PK-PK isopleth of 202 dB re 1 µPa is predicted to occur at 1.4 m vertically below the source, while the maximum per-pulse SEL isopleth predicted to occur at the seafloor is 130 dB re 1 µPa^2·s at a maximum horizontal distance of 6 m.
- The maximum accumulated SEL from the combined operations of the boomer and SBP at the seafloor is not predicted to exceed 170 dB re 1 µPa^2·s for any single survey. This is below any of the relevant isopleths for benthic invertebrates, including the 183 dB re 1 µPa^2·s 'no effect' accumulated SEL (McCauley and Duncan 2016). It is also below the threshold for temporary hearing impairment (TTS) in fish. The predicted ranges for the four surveys modelled at similar, due to the identical sources, sound speed profiles, similar depths and geoacoustics.
- The VSP source was modelled with models capable of accounting for all environmental parameters and high propagation angles. The results show that the lowest PK-PK isopleths of interest derived from Day et al. (2016b), 209 dB re 1 µPa, is not reached at the seafloor; and the horizontal range along the seafloor to the 202 dB re 1 µPa PK-PK level from Payne et al. (2007) is 185 m. PK metrics relevant to the Popper et al. (2014) criteria for fish and turtles are also not reached at the seafloor. The maximum per-pulse SEL on the seafloor below the array is 181 dB re 1 µPa^2·s, below the lowest level from Day et al. (2016b) of 186 dB re 1 µPa^2·s.

Marine Mammals and Turtle Behaviour

- Considering the United States (US) National Marine Fisheries Service (NMFS; 2013) acoustic threshold for behavioural effects in marine mammals of 160 dB re 1 µPa (SPL), the boomer could potentially disturb marine mammals at horizontal distances of up to 145 m, and the SBP at 2 m.
- Considering the US NMFS criterion for behavioural effects in turtles of 166 dB re 1 µPa (SPL), the boomer could potentially disturb turtles are horizontal distances of up to 36 m, while this level is not reached for the SBP.

- For the VSP array, sounds exceeded the unweighted per-pulse SEL criterion for the 1 km low-power zone of 160 dB re 1 µPa^2·s (DEWHA 2008) within 1.03 km of the 450 in^3 array ($R_{95\%}$ distance). The maximum ranges to the marine mammal and turtle behavioural thresholds of 160 and 166 dB re 1 µPa SPL are 2.56 and 1.55 km respectively.

1. Introduction

JASCO Applied Sciences (JASCO) performed a numerical estimation study of underwater sound levels associated with the Otway Basin Geotechnical Operations proposed by Lattice Energy in the Otway Basin. The acoustic modelling evaluated the effects of sounds produced by three sources on marine fauna, with a specific focus on benthic invertebrates. The three sources considered in the modelling were a representative boomer and sub-bottom profiler (SBP) both towed at 3 m, along with a 450 in^3 vertical seismic profiler (VSP) array operated at a centroid depth of 6 m. The boomer and SBP geophysical survey sources planned for use had not been decided at the time of the modelling study, therefore JASCO proposed a commonly used representative for each source, with levels derived from a previous JASCO measurement campaign of such sources. The results are presented as sound pressure levels (SPL), zero-to-peak pressure levels (PK), peak-to-peak pressure levels (PK-PK) and either per-pulse (i.e., per-pulse) or accumulated sound exposure levels (SEL), as appropriate to each scenario.

Single pulse sound fields for each source were modelled at six representative locations (Table 1, Figure 1), although it is likely that the boomer and SBP will not operate at Site 5. The VSP will only be operated at Site 5. Accumulated SEL was modelled for four full surveys of the boomer and SBP operating in tandem, using the single pulse modelling results from Sites 1, 3, 4 and 6.

Table 1. Location details for modelled sites (UTM zone 54S).

Site #	Site Name	Site Name Acronym	Water depth (m)	Latitude	Longitude	Easting	Northing
1	Thylacine Midpoint	THY MID	100.5	-39.2168	142.8665	661137	5657503
2	Murchinson Downdip	MURCH DDIP	129.5	-39.2249	142.7614	652042	5656787
3	Geographe 3	G3	85	-39.1082	142.9517	668752	5669398
4	Artisan	ARTISAN	71.6	-38.8909	142.8829	663300	5693640
5	Block VICP69, North	VICP69 NTH	72.8	-38.8829	143.1359	685264	5694052
6	Block VICP69, Meeki	VICP69 MEEKI	79.1	-38.9881	143.051	677633	5682538

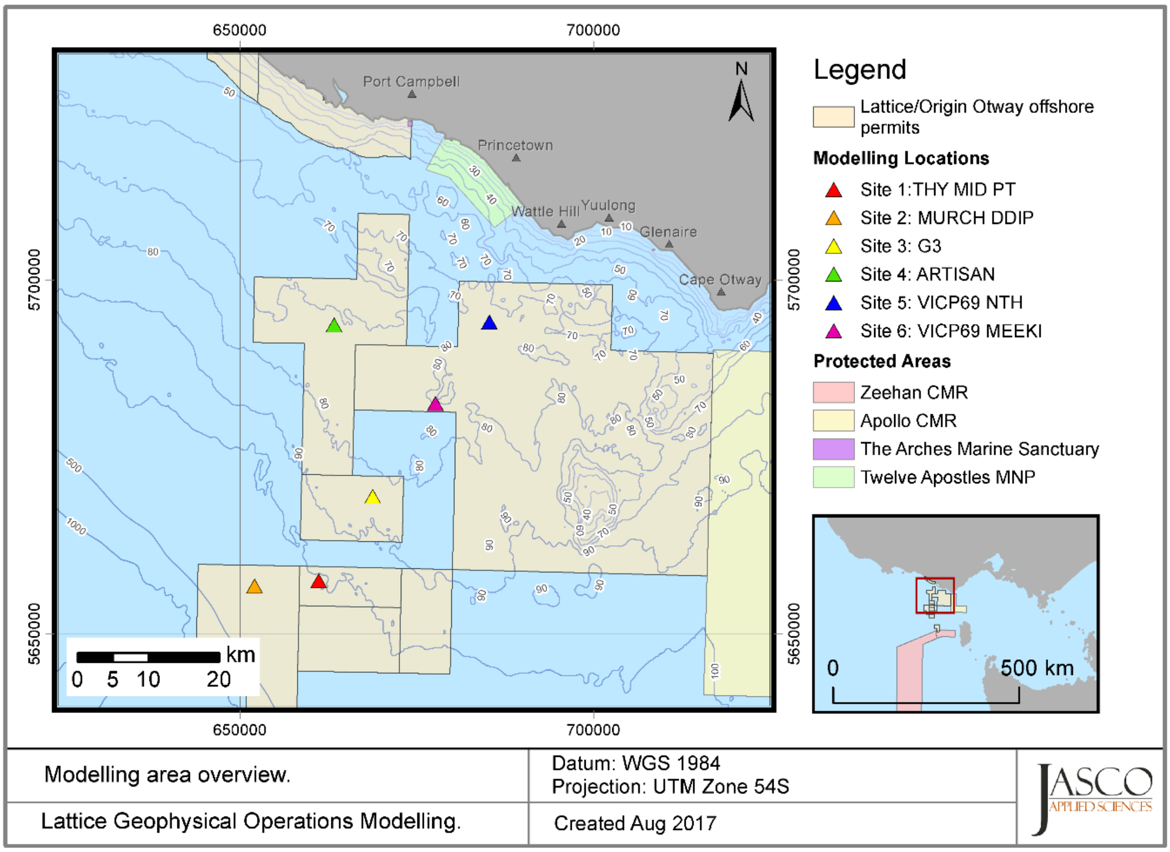


Figure 1. Single pulse modelling site locations and relevant features, including Commonwealth Marine Reserves (CMR), and Marine National Parks (MNP)

2. Noise Effects Criteria

The perceived loudness of sound, especially impulsive noise such as from seismic airguns, is not generally proportional to the instantaneous acoustic pressure. Rather, perceived loudness depends on the time over which the pulse rises, how long this occurs for, and its frequency content. Thus, several sound level metrics are commonly used to evaluate noise and its effects on marine life. The metrics applied in this report, including peak pressure level (PK), peak-peak pressure (PK-PK), sound pressure level (SPL), and sound exposure level (SEL), are defined in Appendix A. Appropriate subscripts indicate any applied frequency weighting; unweighted SEL is defined as required. The acoustic metrics in this report reflect the updated ANSI and ISO standards for acoustic terminology, ANSI-ASA S1.1 (R2013) and ISO/DIS 18405.2:2017 (2016).

Whether acoustic exposure levels might injure or disturb marine fauna is an active research topic. Since 2007, several expert groups have investigated an SEL-based assessment approach for injury in marine mammals, with a handful of key papers published on the topic. The number of studies that investigated the level of disturbance to marine animals by underwater noise has also increased substantially.

We chose the following noise criteria for this study because they include requested thresholds, standard thresholds, thresholds suggested by the best available science (Sections 2.1, 2.2 and 2.3):

1. For comparison to results in Payne et al. (2008), and Day et al. (2016a), the following metrics are reported for benthic crustaceans:
    - Seafloor per-pulse SEL: 186–190 dB re 1 µPa^2.s
    - Seafloor SEL$_{24h}$: 192–199 dB re 1 µPa^2.s
    - Peak-peak pressure: 202, 209–212 dB re 1 µPa
2. ‘No effect on lobster’ accumulated SEL for the Crowes Foot MSS of 183 dB re 1 µPa^2.s (McCauley and Duncan 2016).
3. Per-pulse threshold for cetaceans (unweighted per-pulse SEL of 160 dB re 1 µPa^2·s) outlined in the Australian Environment Protection and Biodiversity Conservation (EPBC) Act Policy Statement 2.1, Department of the Environment, Water, Heritage and the Arts (DEWHA) (2008).
4. Marine mammal behavioural threshold based on the current interim U.S. National Marine Fisheries Service (NMFS) criterion (NMFS 2013) for marine mammals of 160 dB re 1 µPa SPL for impulsive sound sources.
5. Sound exposure guidelines for fish, fish eggs and larvae, and turtles (Popper et al. 2014).
6. Threshold for turtle behavioural response 166 dB re 1 µPa (SPL) (NSF 2011), applied by the US NMFS.

2.1. Benthic Invertebrates (Crustaceans)

Research is ongoing into the relationship between sound and its effects on crustaceans, including the relevant metrics for both effect and impact. Available literature suggests particle motion, rather than sound pressure, is a more important factor for crustacean and bivalve hearing. Water depth and airgun array size are related to the particle motion levels at the seafloor, with larger arrays and shallower water being related to higher particle motion levels, more likely relevant to effects on bivalves. Although some impact assessments have estimated areas of potential impacts from seismic surveys based on the results in Day et al. (2016b), current literature does not clearly define an appropriate metric or identify relevant sound levels for an assessment. This includes the consideration of what particle motion levels lead to a behavioural response, or mortality.

At the seafloor interface bivalves are subject to particle motion stimuli from several acoustic or acoustically-induced waves. These include the particle motion associated with an impinging sound pressure wave in the water column (the incident, reflected, and transmitted portions), substrate acoustic waves, and interface waves of the Scholte type. However, it is unclear which aspect(s) of these waves is/are most relevant to the animals, either when they normally sense the environment or their physiological responses to loud sounds so there is not enough information to establish similar criteria and thresholds as done for marine mammals and fish. Therefore, at this stage, JASCO is not able to define thresholds to inform the impact assessment. Additionally, prediction of particle motion from sources such as low-energy geophysical sources including boomers and sub-bottom profilers is not possible currently due to the lack of source models.

Despite this, the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) has publicly stated that the seafloor levels, sound levels at the seafloor derived from Day et al. (2016b) should be used to assist in the assessment of impacts on scallops and lobster. Therefore, JASCO has used the following metrics in its evaluation:

- Per-pulse SEL: 186–190 dB re 1 µPa^2.s
- Accumulated SEL: 192–199 dB re 1 µPa^2.s
- Peak-peak pressure: 209–212 dB re 1 µPa

Additionally a PK-PK of 202 dB re 1 µPa from Payne et al. (2007) has been included along with an accumulated SEL of 183 dB re 1 µPa^2.s as specified by Lattice Energy based on McCauley and Duncan (2016).

2.2. Marine Mammals

The criteria applied in this study to assess possible effects of impulsive noise on marine mammals are summarised in Table 2 and detailed in Sections 2.2.1 and 2.2.2.

Table 2. The SPL and per-pulse SEL thresholds for acoustic effects on marine mammals.

Hearing group	**DEWHA (2008)**	**NMFS (2013)**
	Unweighted per-pulse SEL (dB re 1 µPa^2·s)	**Behaviour**
		SPL (dB re 1 µPa)
Low-frequency cetaceans	160	160
Mid-frequency cetaceans		
High-frequency cetaceans		
Phocid pinnipeds in water	Not Applicable	
Otariid pinnipeds in water	Not Applicable	

2.2.1. Injury and Hearing Sensitivity Changes

There are two categories of auditory threshold shifts representing reduced hearing ability: permanent threshold shift (PTS), considered a physical injury to an animal’s hearing organs, and temporary threshold shift (TTS), a temporary reduction in an animal’s hearing sensitivity, understood to be partly a result of receptor hair cells in the cochlea becoming fatigued.

For seismic surveys in Australian waters, the EPBC Act Policy Statement 2.1 determines suitable exclusion zones with an unweighted per-pulse SEL threshold of 160 dB re 1 µPa^2·s (DEWHA 2008). This threshold minimises the likelihood of TTS in mysticetes and large odontocetes. The Policy Statement does not apply to smaller dolphins and porpoises as DEWHA assessed these cetaceans as having relatively low hearing sensitivity to the low frequencies produced by seismic airgun arrays.

2.2.2. Behavioural Response

Southall et al. (2007) extensively reviewed marine mammal behavioural responses to sounds. Their review found that most marine mammals exhibited varying responses between 140 and

180 dB re 1 µPa SPL, but inconsistent results between studies makes choosing a single behavioural threshold difficult. Studies varied in their lack of control groups, imprecise measurements, inconsistent metrics, and that animal responses depended on study context, which included the animal's activity state. To create meaningful quantitative data from the collected information, Southall et al. (2007) proposed a severity scale that increased with increasing sound levels.

NMFS has historically used a relatively simple sound level criterion for potentially disturbing a marine mammal. For impulsive sounds, this threshold is 160 dB re 1 µPa SPL for pinnipeds and cetaceans (NMFS 2013).

2.3. Fish, Turtles, Fish Eggs, and Fish Larvae

In 2006, the Working Group on the Effects of Sound on Fish and Turtles was formed to continue developing noise exposure criteria for fish and turtles, work begun by a NOAA panel two years earlier. The resulting guidelines included specific thresholds for different levels of effects and for different groups of species (Popper et al. 2014). These guidelines defined quantitative thresholds for three types of immediate effects:

- Mortality, including injury leading to death.
- Recoverable injury, including injuries unlikely to result in mortality, such as hair cell damage and minor haematoma.
- TTS

Masking and behavioural effects can be assessed qualitatively, by assessing relative risk rather than by specific sound level thresholds. These effects are not assessed in this report. Because the presence or absence of a swim bladder has a role in hearing, fish's susceptibility to injury from noise exposure varies depending on the species and the presence and possible role of a swim bladder in hearing. Thus, different thresholds were proposed for fish without a swim bladder (also appropriate for sharks and applied to whale sharks in the absence of other information), fish with a swim bladder not used for hearing, and fish that use their swim bladders for hearing. Turtles, fish eggs, and fish larvae are considered separately.

Table 3 lists relevant effects thresholds from Popper et al. (2014). In general, any adverse effects of seismic sound on fish behaviour depends on the species, the state of the individuals exposed, and other factors. We note that, despite mortality being a possibility for fish exposed to airgun sounds, Popper et al. (2014) do not reference an actual occurrence of this effect. Since the publication of that work, newer studies have further examined the question of possible mortality. Popper et al. (2016) adds further information to the possible levels of impulsive seismic airgun sound to which adult fish can be exposed without immediate mortality. They found that the two fish species in their study, with body masses in the range 200–400 g, exposed to a per-pulse of a maximum received level of either 231 dB re 1 µPa (PK) or 205 dB re 1 µPa^2·s (SEL), remained alive for 7 days after exposure and that the probability of mortal injury did not differ between exposed and control fish.

The SEL metric integrates noise intensity over some period of exposure. Because the period of integration for regulatory assessments is not well defined for sounds that do not have a clear start or end time, or for very long-lasting exposures, it is required to define a time period. This is done for marine mammals in the Southall et al. (2007) criteria, where it is 24 h or the duration of the activity, whichever longer. Popper et al. (2014) recommend a standard period of time should be applied, where this is either defined as a justified fixed period or the duration of the activity, however also include caveats about how long the fish will be exposed because they can move (or remain in location) and so can the source. In the discussion of the criteria, Popper et al. (2014) discuss the complications in determining a relevant period of mobile seismic surveys, as the received levels at the fish change between impulses due to the mobile source, and that in reality a revised guideline based on the closest PK or the per-pulse SEL might be more useful than one based on accumulated SEL. This is because exposures at the closest point of approach are the primary exposures contributing to a receiver's accumulated level (Gedamke et al. 2011). Additionally, several important factors determine the likelihood and duration a receiver is expected to be in close proximity to a sound source (i.e., overlap in space and time between the source and receiver). For example, accumulation time for fast moving (relative to the receiver) mobile sources is driven primarily by the characteristics of source (i.e., speed, duty cycle) (NMFS 2016).

Popper et al. (2014) summaries that in all TTS studies considered, fish that showed TTS recovered to normal hearing levels within 18–24 hours. However in this study the full period of operations has been considered as the accumulation period for SEL.

Table 3. Criteria for seismic noise exposure for fish and turtles, adapted from Popper et al. (2014).

Type of animal	Mortality and potential mortal injury	Impairment			Behaviour
		Recoverable injury	TTS	Masking	
Fish: No swim bladder (particle motion detection)	> 219 dB SEL_{24h} or > 213 dB PK	> 216 dB SEL_{24h} or > 213 dB PK	>> 186 dB SEL_{24h}	(N) Low (I) Low (F) Low	(N) High (I) Moderate (F) Low
Fish: Swim bladder not involved in hearing (particle motion detection)	210 dB SEL_{24h} or > 207 dB PK	203 dB SEL_{24h} or > 207 dB PK	>> 186 dB SEL_{24h}	(N) Low (I) Low (F) Low	(N) High (I) Moderate (F) Low
Fish: Swim bladder involved in hearing (primarily pressure detection)	207 dB SEL_{24h} or > 207 dB PK	203 dB SEL_{24h} or > 207 dB PK	186 dB SEL_{24h}	(N) Low (I) Low (F) Moderate	(N) High (I) High (F) Moderate
Turtles	210 dB SEL_{24h} or > 207 dB PK	(N) High (I) Low (F) Low	(N) High (I) Low (F) Low	(N) Low (I) Low (F) Low	(N) High (I) Moderate (F) Low
Fish eggs and fish larvae	> 210 dB SEL_{24h} or > 207 dB PK	(N) Moderate (I) Low (F) Low	(N) Moderate (I) Low (F) Low	(N) Low (I) Low (F) Low	(N) Moderate (I) Low (F) Low

Notes: Peak sound pressure level dB re 1 µPa; SEL_{24h} dB re 1µPa^2·s. All criteria are presented as sound pressure even for fish without swim bladders since no data for particle motion exist. Relative risk (high, moderate, low) is given for animals at three distances from the source defined in relative terms as near (N), intermediate (I), and far (F).

2.3.1. Turtle Behavioural Response

There is a paucity of data regarding responses of turtles to acoustic exposure, and no studies of hearing loss due to exposure to loud sounds. McCauley et al. (2000) observed the behavioural response of caged turtles—green (*Chelonia mydas*) and loggerhead (*Caretta caretta*)—to an approaching seismic airgun. For received levels above 166 dB re 1 µPa (SPL), the turtles increased their swimming activity and above 175 dB re 1 µPa they began to behave erratically, which was interpreted as an agitated state. The 166 dB re 1 µPa level has been used as the threshold level for a behavioural disturbance response by NMFS and applied in the Arctic Programmatic Environment Impact Statement (PEIS) (NSF 2011). At that time, and in the absence of any data from which to determine the sound levels that could injure an animal, TTS or PTS onset were considered possible at an SPL of 180 dB re 1 µPa (NSF 2011). Some additional data suggest that behavioural responses occur closer to an SPL of 175 dB re 1 µPa, and TTS or PTS at even higher levels (Moein et al. 1995), but the received levels were unknown and the NSF (2011) PEIS maintained the earlier NMFS criteria levels of 166 and 180 dB re 1 µPa (SPL) for behavioural response and injury, respectively. Popper et al. (2014) suggested injury to turtles could occur for sound exposures above 207 dB re 1 µPa (PK) or above 210 dB re 1 µPa^2·s (SEL_{24h}) (Table 3). Sound levels defined by Popper et al. (2014) show that animals are very likely to exhibit a behavioural response when they are near an airgun (tens of metres), a moderate response if they encounter the source at intermediate ranges (hundreds of metres), and a low response if they are far (thousands of meters) from the airgun. Both the NMFS criteria for behavioural disturbance (SPL of 166 dB re 1 µPa) and the Popper et al. (2014) injury criteria were included in this analysis, although the analysis did not consider the ranges at which an animal could suffer impairment, as defined by Popper et al. (2014).

3. Methods

This section details the methodology for predicting source levels, modelling sound propagation, and assessing distances to the selected impact criteria.

The environmental parameters used in the propagation models are described in detail in Appendix D. A single sound speed profile that provided the greatest propagation across the year was applied, which occurs during the month of September.

3.1. Acoustic Sources

3.1.1. Boomer: AP3000 Dual-Plate Boomer

The representative boomer system for geophysical survey operations is the AP3000 triple-plate boomer (manufactured by Subsea Systems, Inc.). To estimate the sound field for the boomer source, the specifications of the Applied Acoustics AA202 boomer plate (Applied Acoustics Engineering 2013), a suitable approximation, were taken to represent a single plate, three of which comprise the full system. The boomer plate is 38 cm wide by 38 cm long with a circular baffle. Because the boomer source is a circular piston surrounded by a rigid baffle, it cannot be considered a point-like source (Verbeek and McGee 1995). The beam pattern of a boomer plate shows some directivity for frequencies above 1 kHz. Above this frequency, the acoustic wave's emitted length becomes comparable (of the same order of magnitude) with the baffle size (< 150 cm vs. 35 cm).

The input energy for the AP3000 system is up to 600 J per pulse per plate, or up to 1800 J per pulse from all three plates. The width of the pulse calculated based on the 90% SPL (T_{90}) is 8.1 ms.

JASCO performed a source verification study on an AP3000 system (Martin et al. 2012) with a double-plate configuration operating at maximum input energy of 1000 J. During the study, the acoustic data were collected as close as 8 m to the source and directly below it (Figure 2). By assuming a reduction in pressure in line with spherical spreading laws the data showed that the broadband source level for the system was 197.9 dB 1 µPa @ 1 m SPL and 177.4 dB re 1 µPa^{2}·s @ 1 m SEL.

The increase in the source level of an AP3000 boomer when in triple-plate configuration, instead of double-plate configuration, was estimated at 2.6 dB because a triple-plate configuration could be used with a higher energy input per pulse (up to 1800 J vs. up to 1000 J for double plate configuration). For modelling, the source level of the AP3000 triple-plated boomer operating at 1800 J per pulse energy was calculated to be 200.5 dB 1 µPa @ 1 m SPL and 180.0 dB re 1 µPa^{2}·s @ 1 m SEL (Table 4). The power spectrum of the boomer signal was determined directly from the measurement of the boomer signal having compensated the signal for geometric spreading and the change in energy (Figure 3). The 1/3-octave frequency boomer source spectra are shown in Figure 4.

The beamwidth of a boomer plate at each 1/3-octave frequency was calculated based on the standard formula for the beam pattern of a circular transducer (Equation 1). Figure 5 shows a vertical slice for the calculated beam pattern at (a) 1.25 and (b) 16.0 kHz. In order to simplify the acoustic propagation calculations, the beam pattern from the triple-plate system was considered to be equal to the beam pattern from a single plate.

Table 4. Specifications of the AP3000 triple-plate boomer system towed at a depth of 2 m used for the modelling

Specification	Specification	Source
Operating frequency (broad band):	200 Hz–16 kHz;	Estimated from field measurements; Martin et al. (2012)
Beam width	omnidirectional –8°	
Beams	1	

Specification	Specification	Source
Tilt angle (below horizontal plane)	90°	System specification document
Maximum energy input (per pulse):	1800 J	
Peak pressure source level	210.8 dB re 1 µPa @ 1 m	Estimated from field measurements; Martin et al. (2012).
Peak-Peak pressure source level	222.7 dB re 1 µPa @ 1 m	
SPL source level	200.5 dB re 1 µPa @ 1 m	
Pulse length (T_{90})	8.1 ms	
Per-pulse SEL source level	180.0 dB re 1 µPa²•s @ 1 m	

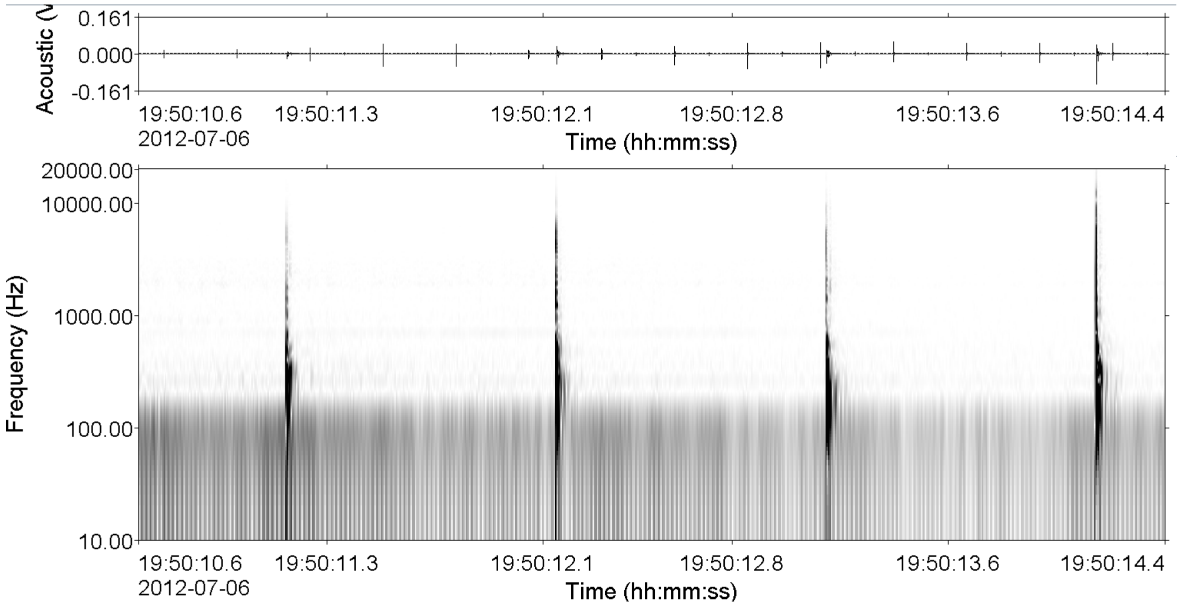


Figure 2. Spectrogram of dual-plate boomer (1000 J) pulses at the closest point of approach. Majority of energy is between 100 and 1000 Hz, with some energy at up to 10 kHz. (131,072 point FFT, 7000 data points, 3500 point overlap, Figure 15 in Martin et al. (2012)).

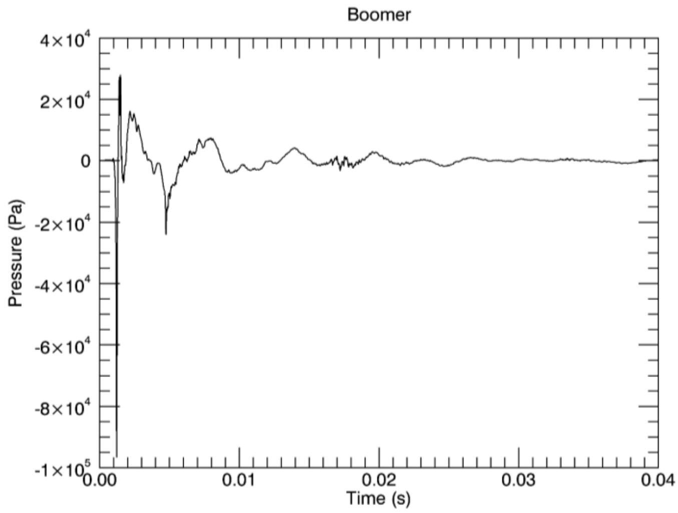


Figure 3. Back-propagated and scaled boomer source signature calculated from measurements (Martin et al. 2012).

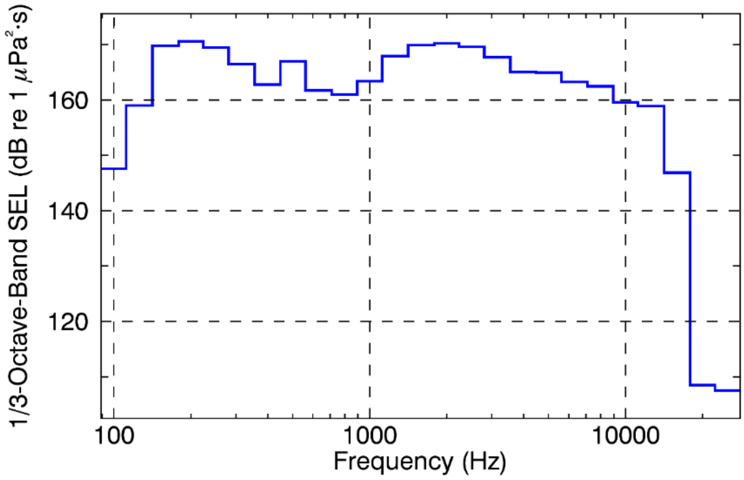


Figure 4. Boomer source spectra calculated from measurements (Martin et al. 2012).

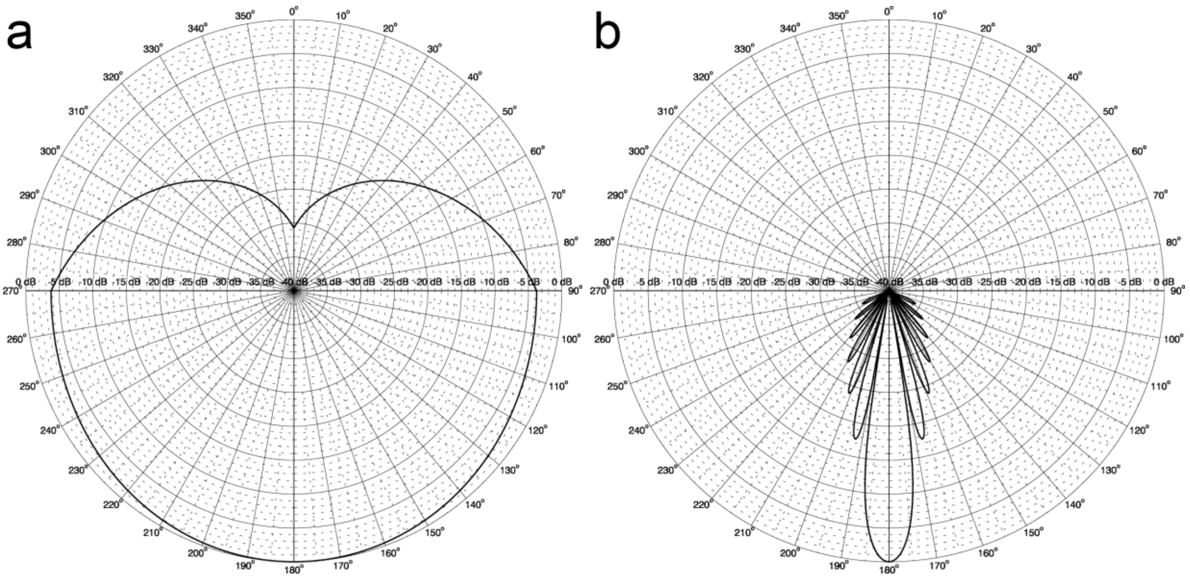


Figure 5. Calculated beam pattern vertical slice for the AA202 boomer plate at (a) 1.25 and (b) 16.0 kHz; across-track direction.

3.1.2. Sub-bottom Profiler: EdgeTech X-Star

The representative sub-bottom profiler system for geophysical survey operations is the EdgeTech X-Star (manufactured by EdgeTech). The system is equipped with a SBP-216 tow-fish. The transducer installed on the SBP-216 tow-fish transmits a chirp pulse that spans an operator-selectable frequency band. The lower and upper limits of the sonar's frequency band are 2 and 16 kHz, respectively. The system projects a single beam directed vertically down. The projected beamwidth depends on the operating frequency, and it can vary in range from 10° to 20°.

The source function was determined by using data obtained from the same measurement campaign as the boomer (Martin et al. (2012).To determine a source function usable for modelling the signal underwent a degree of post-processing. A clip from the recording measured at the closest point of approach was selected for processing (Figure 6). By assuming a point-like source and with no significant reflections or pulse dilation, the source level was determined by back-propagation methods assuming spherical spreading (Figure 7). The SEL band levels were determined from the back-propagated signal and are shown in Figure 8. The calculated source specifications are provided in Table 5. The width of the pulse encompassing 90% of the energy (T_{90}) was 8.1 ms, providing a SPL of 191.7 dB re 1 µPa @ 1 m.

For the purposes of modelling a source depth of 3 m was used, based on the assumed tow depth of a tow-fish. Since the echosounder's transducer projects a circular beam that is aimed vertically down, the source is effectively omnidirectional in the horizontal plane.

Table 5. Specifications of the Edgetech X-Star sub-bottom profiling system towed at a depth of 3 m used for the modelling

Specification	Specification	Source
Operating frequency:	2-16 kHz	System specification document
Beam width	10-20°	
Tilt angle (below horizontal plane)	90°	
Peak pressure source level	197.6 dB re 1 µPa @ 1 m	Estimated from field measurements; Martin et al. (2012).
Peak-Peak pressure source level	204.7 dB re 1 µPa @ 1 m	
SPL source level	191.7 dB re 1 µPa @ 1 m	
Pulse length (T_{90})	8.1 ms	
Per-pulse SEL source level	171.4 dB re 1 µPa^2·s @ 1 m	

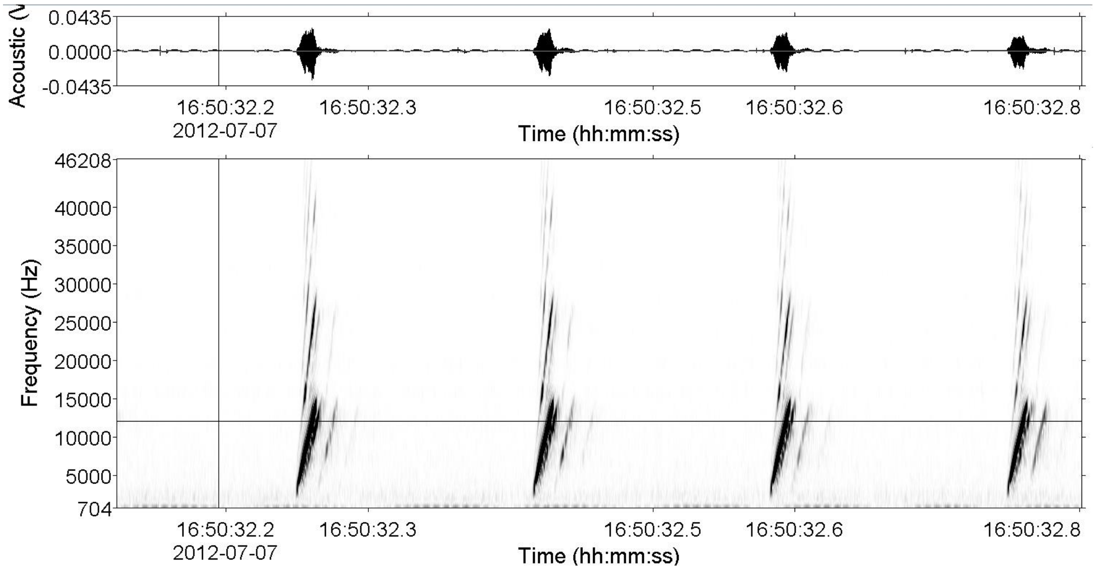


Figure 6. Spectrogram of X-Star SB-216S Sub-Bottom Profiler at closest-point of approach. The centroid frequency of the pulses was approximately 10 kHz, with 90% of the energy between 6 and 13 kHz. Aliased energy is visible above the main pulse. The bottom reflection is visible about 15 ms after the main pulse. (131,072 point FFT, 690 real data points, 345 point overlap.)

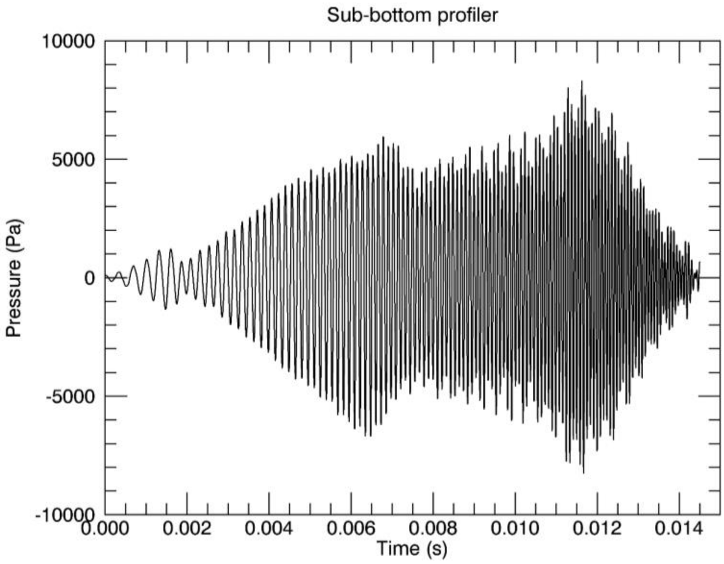


Figure 7. Back-propagated and scaled sub-bottom profiler source signature calculated from measurements (Martin et al. 2012).

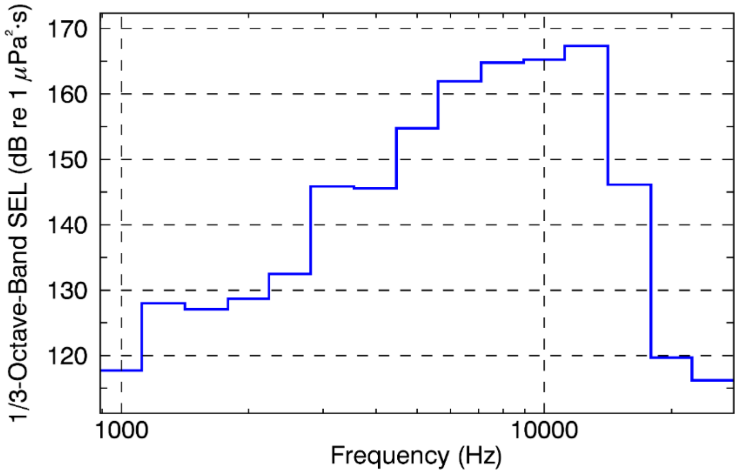


Figure 8. Sub-bottom profiler source spectra calculated from measurements (Martin et al. 2012).

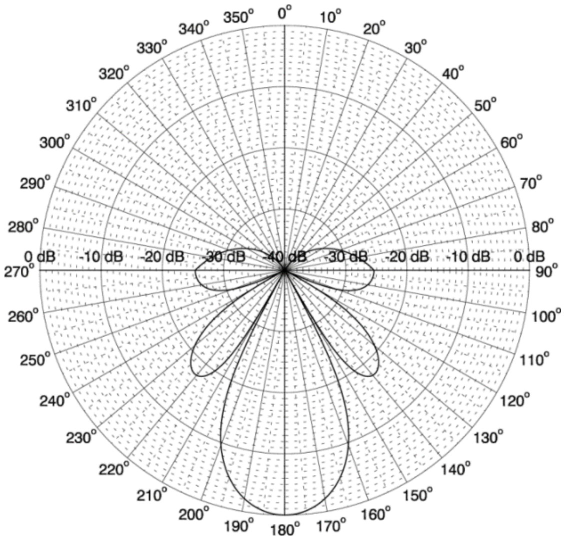


Figure 9. Calculated beam pattern vertical slice for the EdgeTech X-Star sub-bottom profiler at central frequency of 9 kHz.

3.1.3. VSP

The VSP airgun array under consideration is a 450 in^3 array consisting of 3 150 in^3 airguns operated at a centroid depth of 6 m, Figure 10 and Table 6.

The source levels and directivity of the airgun array were predicted with JASCO's Airgun Array Source Model (AASM), which accounts for:

- Array layout
- Volume, tow depth, and firing pressure of each airgun
- Interactions between different airguns in the array

The array was modelled over AASM's full frequency range, up to 25 kHz. Details of the model are described in Appendix B.

The model considered the following specifications:

- A 450 in^3 firing volume seismic airgun array for VSP.
- Airguns operated at a firing pressure of 2000 psi. The type was not specified, however Bolt 1900 LLX were used for the modelling.

- An array layout consisting of three 150 in³ airguns with a centroid depth of 6.0 m.

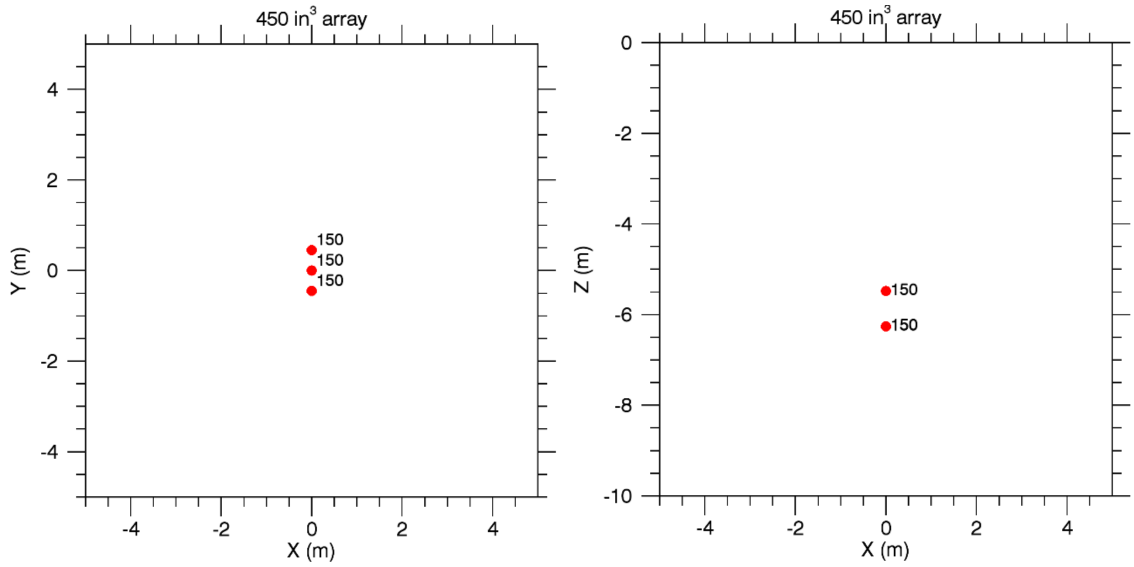


Figure 10. Layout of the modelled 450 in³ VSP array, plan view (left) and side view (right). Centroid operating depth is 6 m. The labels indicate the firing volume (in cubic inches) for each airgun. The convention is that the array is towed in the positive x direction. Also see Table 6.

Table 6. Layout of the modelled 450 in³ VSP array.Centroid operating depth is 6 m. Firing pressure for all guns is 2000 psi. The tow direction is assumed to be in the positive *x* direction.

Gun	*x* (m)	*y* (m)	*z* (m)	Volume (in³)
1	0.0	0	5.48	150
2	0.0	0.45	6.26	150
3	0.0	- 0.45	6.26	150

3.2. Sound Propagation Models

3.2.1. Boomer

The boomer source can be treated as an omnidirectional source for the frequencies of 1000 Hz and lower. For frequencies higher than 1000 Hz, the directionality of the boomer was taken into account. Due The acoustic field projected by the boomer source in 1/3-octave-bands was modelled using two propagation models: for frequencies of 1000 Hz and below MONM-RAM was used, while frequencies above 1000 Hz were modelled using MONM-BELLHOP. These were combined in post processing to determine the acoustic field across the entire frequency range. To determine the maximum range to PK, and PK-PK thresholds, spherical spreading laws were applied to the source level in the downward direction; these are usable due to the short ranges associated with the identified threshold levels within which no appreciable pulse dilation will occur nor reflections.

The acoustic propagation modelling was conducted in terms of PK, PK-PK and SEL units. The conversion to the SPL units was done based on Equation A-5 considering the T_{90} equal to 0.2 ms for the distances from the source less than 20 m, and 10 ms for the distances greater than 20 m from the source.

3.2.2. Sub-bottom Profiler

As the sub-bottom profiler was found only to have significant energy above 1 kHz it was assumed to be directional throughout its operational range. Consequently, MONM-BELLHOP was employed to model the entire frequency range of the SEL acoustic field in terms of 1/3-octave-bands. The ranges to PK and PK-PK levels were determined using spherical spreading laws.

The conversion to the SPL units was done based on Equation A-5 considering the T_{90} equal to 8 ms as determined by the measurement study.

3.2.3. VSP

Four sound propagation models (Appendix C) were used to predict the acoustic field around the VSP array for frequencies from 5 Hz to 25 kHz:

- Range-dependent parabolic equation model (Marine Operations Noise Model, MONM)
- Range-dependent ray tracing model (BELLHOP)
- Full Waveform Range-dependent Acoustic Model (FWRAM)
- Wavenumber integration model (VSTACK).

The models were used in combination to characterise the acoustic fields at short and long ranges in terms of SEL, SPL, PK, and PK-PK.

3.3. Accumulated SEL

3.3.1. Method overview

During a geophysical survey, a new portion of sound energy is introduced into the environment with each pulse from the survey equipment. An accurate assessment of the cumulative acoustic field depends not only on the parameters of each impulse, but also on the number of impulses delivered over a period and the relative position of the impulses. Consideration of the total acoustic energy marine fauna is subjected to over the survey operations is required for comparison to the relevant effect criteria (Section 2).

When there are many pulses, it becomes computationally prohibitive to perform sound propagation modelling for every single event. The offset between the consecutive pulses is small enough, however, that the environmental parameters that influence sound propagation are virtually the same for many impulse points. The acoustic fields can, therefore, be modelled for a subset of pulses and estimated at several adjacent ones. After sound fields from representative impulse locations are calculated, they are adjusted to account for the source position for nearby impulses.

Although estimating the cumulative sound field with the described approach is not as precise as modelling sound propagation at every impulse location, small-scale, site-specific sound propagation features tend to blur and become less relevant when sound fields from adjacent impulses are summed. Larger scale sound propagation features, primarily dependent on water depth, dominate the cumulative field. The accuracy of the present method acceptably reflects those large-scale features, thus providing a meaningful estimate of a wide area SEL field in a computationally feasible framework.

3.3.2. Scenario definition

Four regions were identified for the cumulative study, each requiring many thousands of individual impulses. In each region a representative single pulse noise field for the relevant source is shifted in space and noise fields summed to provide a composite field. For the Thylacine location, two possible surveys were combined into a single scenario, referred to as Thylacine Combined. This scenario included a total of 38 lines each being 7.025 km in length (total estimated time of 51 h including turns). The other three scenarios, Geographe 3 (G3), Artisan (ARTISAN) and VICP69 Meeki (MEEKI), each featured 41 lines, of 4.0 km length (total estimated time of 40.2 h. Along each line the operating sequence was to alternate between the sub-bottom profiler and the boomer with the vessel travelling at 4.5 knots and a turn time of 30 minutes during which no source would be operated. The proposed areas are shown in Figure 11.

To produce maps of cumulative received sound level distribution and calculate distances to specified sound level thresholds at the seafloor, the sound level was calculated at a subset of points within the modelled region. The radial grids of sound levels of the modelled sites at each point were then resampled (by linear triangulation) to produce a regular Cartesian grid. These grids were transposed geographically to each impulse location along the survey lines. The sound field grids from all impulses were summed, using Equation A-4, to produce the cumulative sound field grid. The produced grids had a cell size of 5 m. The contours and threshold ranges were calculated from these flat Cartesian projections of the modelled acoustic fields.

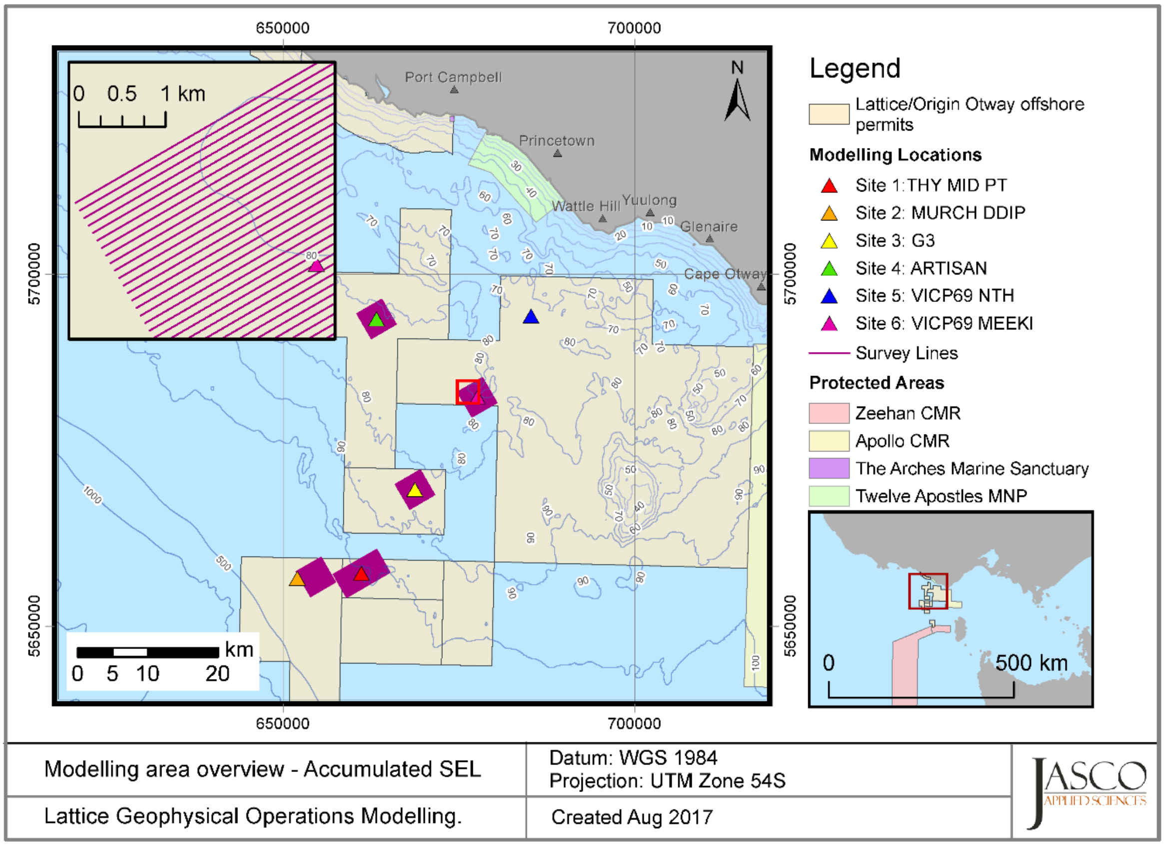


Figure 11. Overview of site surveys (and survey lines) under consideration. The site surveys are referred to by the name of the modelling location located at the same site.

3.4. Geometry and Modelled Regions

The modelled regions were defined based on the anticipated noise footprint of each of the sources. The VSP is significantly louder than either the boomer or the sub-bottom profiler, as well as having greater energy at lower frequencies that would typically propagate further than higher frequencies. The VSP, therefore was modelled in MONM in a series of radial slices with a maximum length of 56 km; the radial slices were 2.5° apart providing a total of 144 individual two-dimensional sound fields that were interpolated onto a regular three-dimensional grid to determine the output metrics. The range step in MONM was 10 m, used across the entire frequency range of 10 to 2000 Hz.

To determine the conversion factor from SEL to SPL, FWRAM was used with four transects modelled (cardinal directions). The Full Waveform Range-dependent Acoustic Model (FWRAM) employs a frequency dependent range step varying from 50 m at 10 Hz to 10 m at 1000 Hz. To calculate the near-field results the VSP was modelled in VSTACK, a wavenumber integration model; results were generated up to a frequency of 1 kHz up to 500 m away. Only a single range-independent transect was modelled using VSTACK.

The boomer and the sub-bottom profiler sources are more strongly directional than the VSP and operate at higher frequencies; consequently, the modelling was principally performed using BELLHOP, the beam-tracing model. The field was modelled in radial slices each 10° apart to provide 36 modelled transects, up to a maximum range of 3.5 km, with a range step of 1 m to provide high-resolution outputs. Where the boomer was omnidirectional (at 1 kHz), MONM was used to generate the contribution; otherwise, BELLHOP was used throughout. These modelling runs were performed separately for each of the six identified single pulse sites.

4. Results

This section presents the model results as distances to sound level thresholds and as sound field contour maps.

4.1. Acoustic Source Levels and Directivity

4.1.1. VSP Array

The pressure signatures of the individual airguns and the composite 1/3-octave-band point-source equivalent directional levels of the arrays were modelled with AASM (Section 3.1). Although AASM accounts for the effects of surface-reflected signals on bubble oscillations and inter-bubble interactions in the notional pressure signatures of each airgun, the signal reflected off the water surface (known as surface ghost) is not included in the far-field source signatures; however, the acoustic propagation models account for those surface reflections because they are a property of the propagating medium rather than the source.

The horizontal and vertical overpressure signatures, corresponding power spectrum levels, and the horizontal directivity plots for array is provided in Appendix B.4.

To help compare these results to the outputs of other airgun array source models, Table 7 presents the vertical source level that accounts for the surface ghost, and lists the broadband PK, and per-pulse SEL source levels of the array in the endfire, broadside, and vertical directions.

Table 7. Source level specifications in the horizontal plane for the 450 in^3 VSP array, for a 6 m centroid depth.

Direction	PK (dB re 1 µPa @ 1 m)	SEL (dB re 1 µPa^2·s @ 1 m)	
		10–2000 Hz	2000–25000 Hz
Broadside	237.6	213.6	167.7
Endfire	237.8	213.7	173.4
Vertical (no ghost)	237.6	213.6	171.1
Vertical (with ghost)	237.6	215.7	174.1

4.2. Single Pulse Sound Fields

4.2.1. Tabulated Results

4.2.1.1. Boomer

The single pulse sound fields for the representative boomer (an AP3000 triple plate boomer) are presented in terms of maximum-over depth SPL for marine mammal and turtle behavioural thresholds (Table 8), maximum-over-depth and seafloor per-pulse SEL (Tables 9 and 10), and water column PK-PK and PK (Tables 11 and 12). Water column PK-PK and PK are included as the levels referenced for benthic invertebrates in Section 2.1 are not reached at the seafloor.

Table 8. Maximum (R_{max}) and 95% ($R_{95\%}$) horizontal distances (in m) from the boomer to modelled maximum-over-depth marine mammal and turtle behavioural response thresholds.

	Site 1		Site 2		Site 3		Site 4		Site 5		Site 6	
	R_{max}	$R_{95\%}$	R_{max}	$R_{95\%}$	R_{max}	$R_{95\%}$	R_{max}	$R_{95\%}$	R_{max}	$R_{95\%}$	R_{max}	$R_{95\%}$
Marine mammal behaviour SPL: 160 dB re 1 µPa	142	139	75	72	140	136	138	134	136	132	145	134
Turtle behaviour, SPL: 166 dB re 1 µPa	36	35	36	35	36	35	36	35	36	35	36	35

Table 9. Maximum (R_{max}) and 95% ($R_{95\%}$) horizontal distances (in m) from the boomer to modelled maximum-over-depth per-pulse SEL isopleths.

Per-pulse SEL (dB re 1 µPa^2·s)	Site 1		Site 2		Site 3		Site 4		Site 5		Site 6	
	R_{max}	$R_{95\%}$	R_{max}	R_{max}	R_{max}	R_{max}	R_{max}	R_{max}	R_{max}	R_{max}	R_{max}	R_{max}
160	7	7	7	7	6	6	7	6	7	7	6	6
155	13	12	12	12	13	12	12	12	12	12	12	12
150	21	21	21	21	21	21	22	21	21	21	22	21
145	38	37	38	37	38	37	39	38	38	37	38	37
140	84	77	70	67	136	134	131	127	134	129	135	129
135	233	226	244	229	226	208	288	208	303	215	253	216
130	768	609	604	504	738	559	868	725	908	671	762	628
125	2070	1500	1810	1220	1900	1380	1740	1490	1810	1520	1880	1310
120	3260	2660	3250	2480	3210	2480	3000	2460	3070	2460	3100	2440

Table 10. Maximum (R_{max}) and 95% ($R_{95\%}$) horizontal distances (in m) from the boomer to modelled seafloor per-pulse SEL isopleths. A dash indicates the level is not reached.

Per-pulse SEL (dB re 1 µPa^2·s)	Site 1		Site 2		Site 3		Site 4		Site 5		Site 6	
	R_{max}	$R_{95\%}$	R_{max}	R_{max}	R_{max}	R_{max}	R_{max}	R_{max}	R_{max}	R_{max}	R_{max}	R_{max}
160	—	—	—	—	—	—	—	—	—	—	—	—
155	1	1	—	—	—	—	—	—	—	—	—	—

Per-pulse SEL (dB re 1 µPa²·s)	Site 1		Site 2		Site 3		Site 4		Site 5		Site 6	
	R_{max}	$R_{95\%}$	R_{max}	R_{max}	R_{max}	R_{max}	R_{max}	R_{max}	R_{max}	R_{max}	R_{max}	R_{max}
150	3	3	2	2	1	1	1	1	1	1	1	1
145	6	5	5	5	4	4	3	3	4	4	4	4
140	62	60	13	12	136	135	131	127	134	130	135	130
135	232	226	243	229	226	208	288	208	303	213	253	209
130	668	607	602	504	634	547	868	636	908	661	762	651
125	1960	1500	1810	1170	1690	1310	1740	1510	1810	1540	1880	1280
120	3240	2580	3230	2410	3060	2380	3000	2330	3070	2390	2920	2370

Table 11. Maximum (R_{max}) vertical distances down (in m) from the boomer to modelled PK-PK isopleths in the water column. The source is operated at 2 m depth, the results are site independent.

PK-PK (dB re 1 µPa)	Vertical Distance from source (m)
215	2.4
212	3.4
210	4.3
209	4.8
205	7.6
202	10.8

Table 12. Maximum (R_{max}) vertical distances down (in m) from the boomer to modelled PK isopleths in the water column. The source is operated at 2 m depth, the results are site independent.

PK (dB re 1 µPa)	Vertical Distance from source (m)
213	0.6
210	0.8
207	1.6

4.2.1.2. Sub-bottom Profiler

The single pulse sound fields for the representative sub-bottom profiler (an EdgeTech X-Star SBP-216) are presented in terms of maximum-over depth SPL for marine mammal and turtle behavioural thresholds (Table 13), maximum-over-depth and seafloor per-pulse SEL (Tables 14 and 15), and water column PK-PK and PK (Tables 16 and 17). Water column PK-PK and PK are included as the levels referenced for benthic invertebrates in Section 2.1 are not reached at the seafloor.

Table 13. Maximum (R_{max}) and 95% ($R_{95\%}$) horizontal distances (in m) from the sub-bottom profiler to modelled maximum-over-depth applied marine mammal and turtle behavioural response thresholds. A dash indicates the threshold is not reached.

Per-pulse SEL (dB re 1 µPa²·s)	Site 1		Site 2		Site 3		Site 4		Site 5		Site 6	
	R_{max}	$R_{95\%}$	R_{max}	$R_{95\%}$	R_{max}	$R_{95\%}$	R_{max}	$R_{95\%}$	R_{max}	$R_{95\%}$	R_{max}	$R_{95\%}$
Marine mammal behaviour SPL: 160 dB re 1 µPa	2	2	2	2	2	2	2	2	2	2	2	2
Turtle behaviour, SPL: 166 dB re 1 µPa	—	—	—	—	—	—	—	—	—	—	—	—

Table 14. Maximum (R_{max}) and 95% ($R_{95\%}$) horizontal distances (in m) from the sub-bottom profiler to modelled maximum-over-depth per-pulse SEL isopleths. A dash indicates the level is not reached.

Per-pulse SEL (dB re 1 µPa²·s)	Site 1		Site 2		Site 3		Site 4		Site 5		Site 6	
	R_{max}	$R_{95\%}$	R_{max}	$R_{95\%}$	R_{max}	$R_{95\%}$	R_{max}	$R_{95\%}$	R_{max}	$R_{95\%}$	R_{max}	$R_{95\%}$
145	—	—	—	—	—	—	—	—	—	—	—	—
140	1	1	1	1	1	1	1	1	1	1	1	1
135	4	4	4	4	4	4	4	4	4	4	4	4
130	8	8	8	7	7	7	7	7	7	7	7	7
125	13	12	13	13	11	11	10	10	10	10	11	10
120	16	16	19	18	14	13	13	12	13	13	13	13

Table 15. Maximum (R_{max}) and 95% ($R_{95\%}$) horizontal distances (in m) from the sub-bottom profiler to modelled seafloor per-pulse SEL isopleths. A dash indicates the level is not reached.

Per-pulse SEL (dB re 1 µPa²·s)	Site 1		Site 2		Site 3		Site 4		Site 5		Site 6	
	R_{max}	$R_{95\%}$	R_{max}	$R_{95\%}$	R_{max}	$R_{95\%}$	R_{max}	$R_{95\%}$	R_{max}	$R_{95\%}$	R_{max}	$R_{95\%}$
135	—	—	—	—	—	—	—	—	—	—	—	—
130	—	—	—	—	—	—	5	5	6	6	6	6
125	10	10	13	13	9	9	8	8	8	8	10	9
120	15	14	19	18	13	12	12	12	13	12	13	13

Table 16. Maximum (R_{max}) vertical distances down (in m) from the boomer to modelled PK-PK isopleths in the water column. The source is operated at 3 m depth, the results are site independent.

PK-PK (dB re 1 µPa)	Vertical Distance from source (m)
215	0.3
212	0.4
210	0.5
209	0.6
205	1.0

PK-PK (dB re 1 µPa)	Vertical Distance from source (m)
202	1.4

Table 17. Maximum ($R_{\max}$) vertical distances down (in m) from the boomer to modelled PK isopleths in the water column. The source is operated at 3 m depth, the results are site independent.

PK (dB re 1 µPa)	Vertical Distance from source (m)
213	0.1
210	0.2
207	0.3

4.2.1.3. VSP

The single pulse results for the 450 in^3 VSP array operating in 72 m of water at Site 5 are presented in terms of maximum-over-depth per-pulse SEL and SPL (Tables 18 and 19), and seafloor per-pulse SEL, PK-PK and PK (Tables 20–22).

Table 18. Maximum ($R_{\max}$) and 95% ($R_{95\%}$) horizontal distances (in km) from the 450 in^3 VSP array to modelled maximum-over-depth per-pulse SEL isopleths at Site 5. The 160 dB re 1 µPa²·s isopleth (bold values) is associated with the DEWHA (2008) criterion.

Per-pulse SEL (dB re 1 µPa²·s)	Distance (km)	
	$R_{\max}$	$R_{95\%}$
190	<0.02	<0.02
180	0.04	0.04
170	0.23	0.22
160	**1.06**	**1.03**
150	3.55	3.10
140	8.76	7.80
130	>23.0	>19.0

Table 19. Maximum ($R_{\max}$) and 95% ($R_{95\%}$) horizontal distances (in km) from the 450 in^3 VSP array to modelled maximum-over-depth SPL isopleths at Site 5 The 166 and 160 dB re 1 µPa isopleths (bold values) are associated with the turtle and marine mammal behavioural response thresholds.

SPL (dB re 1 µPa)	Distance (km)	
	$R_{\max}$	$R_{95\%}$
190	<0.04	<0.04
180	0.22	0.21
170	0.89	0.86
166	**1.55**	**1.45**
160	**2.56**	**2.44**
150	6.96	6.24

SPL (dB re 1 µPa)	Distance (km)	
	R_{max}	$R_{95\%}$
140	19.9	16.8
130	>48.0	>42.0

Table 20. Maximum (R_{max}) horizontal distances (in m) from the 450 in^3 VSP array to modelled seafloor per-pulse SEL isopleths at Site 5 using VSTACK. A dash indicates the level is not reached.

Per-pulse SEL (dB re 1 µPa²·s)	Distance (m)
185	-
180	35
178	65
176	105
174	145
172	180
170	210

Table 21. Maximum (R_{max}) horizontal distances (in m) from the VSP array at Site 5 to modelled seafloor PK-PK isopleths. A dash indicates the level is not reached.

PK-PK (dB re 1 µPa)	Distance (m)
212	–
210	–
209	–
208	30
207	55
206	75
205	100
202	185

Table 22. Maximum (R_{max}) horizontal distances (in m) from the VSP array at Site 5 to modelled seafloor PK isopleths. A dash indicates the level is not reached.

PK (dB re 1 µPa)	Distance (m)
213	–
207	–
204	20
202	60
200	110

PK (dB re 1 µPa)	Distance (m)
198	165

4.2.2. Maps and Graphs

4.2.2.1. Boomer

Maps of the per-pulse SEL at the seafloor along with vertical slices for the representative boomer are shown for two representative sites, Site 1 (Thylacine Midpoint: Figures 12 and 13) and Site 4 (Artisan: Figures 14 and 15). The shape of the footprint at all six modelled sites (Table 1) is almost identical.

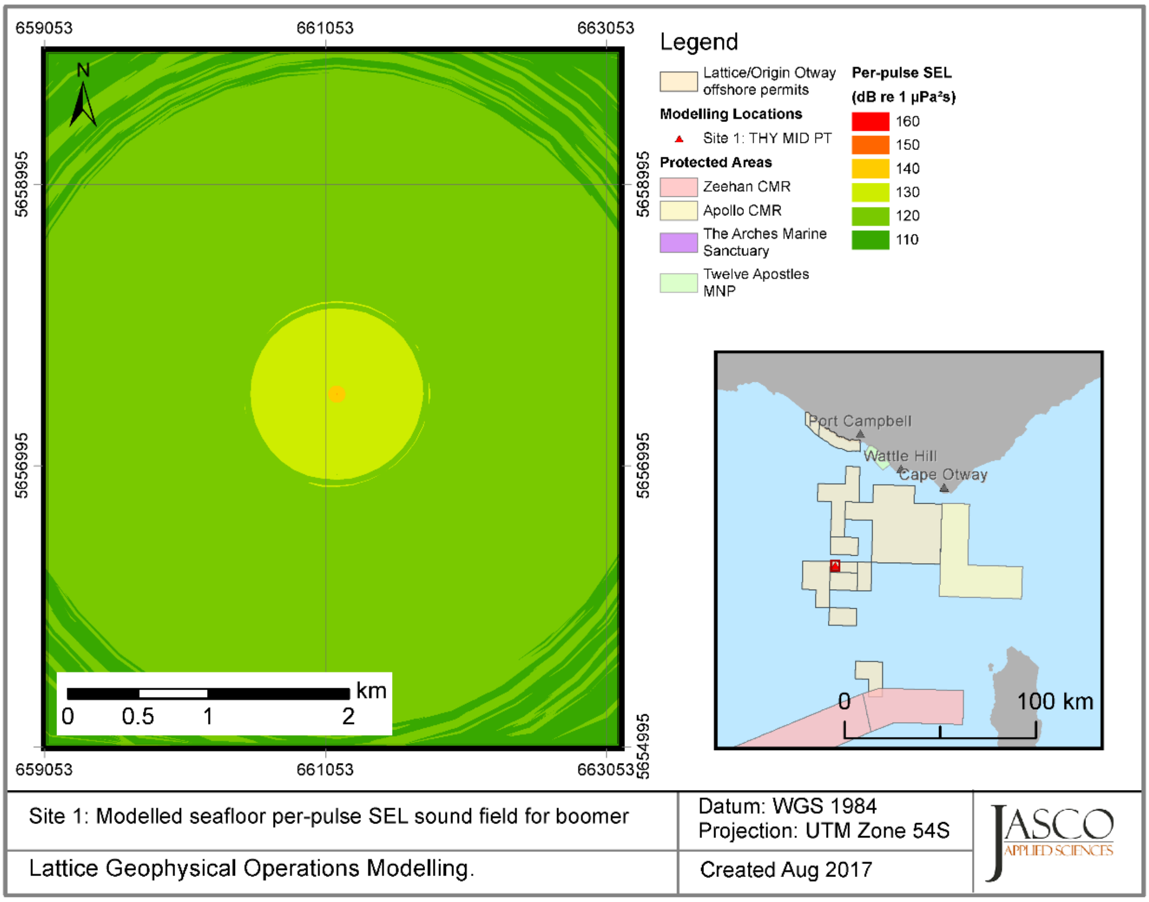


Figure 12. Boomer, Site 1: Sound level contour map showing unweighted seafloor per-pulse SEL results for the boomer towed at 2 m depth.

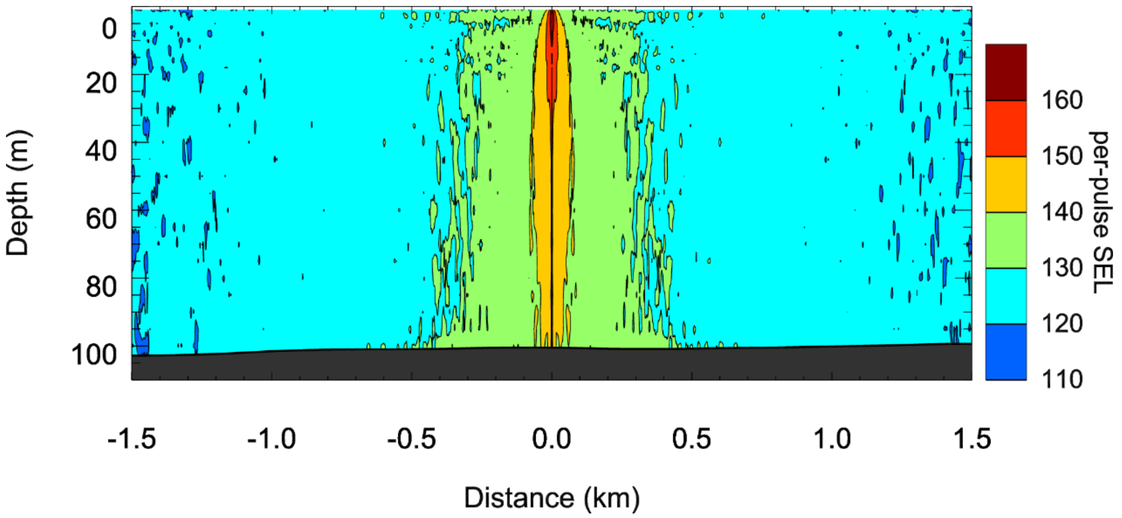


Figure 13. Boomer, Site 1: Predicted unweighted per-pulse SEL for the boomer towed at 2 m depth as vertical slices. Levels are shown from south to north.

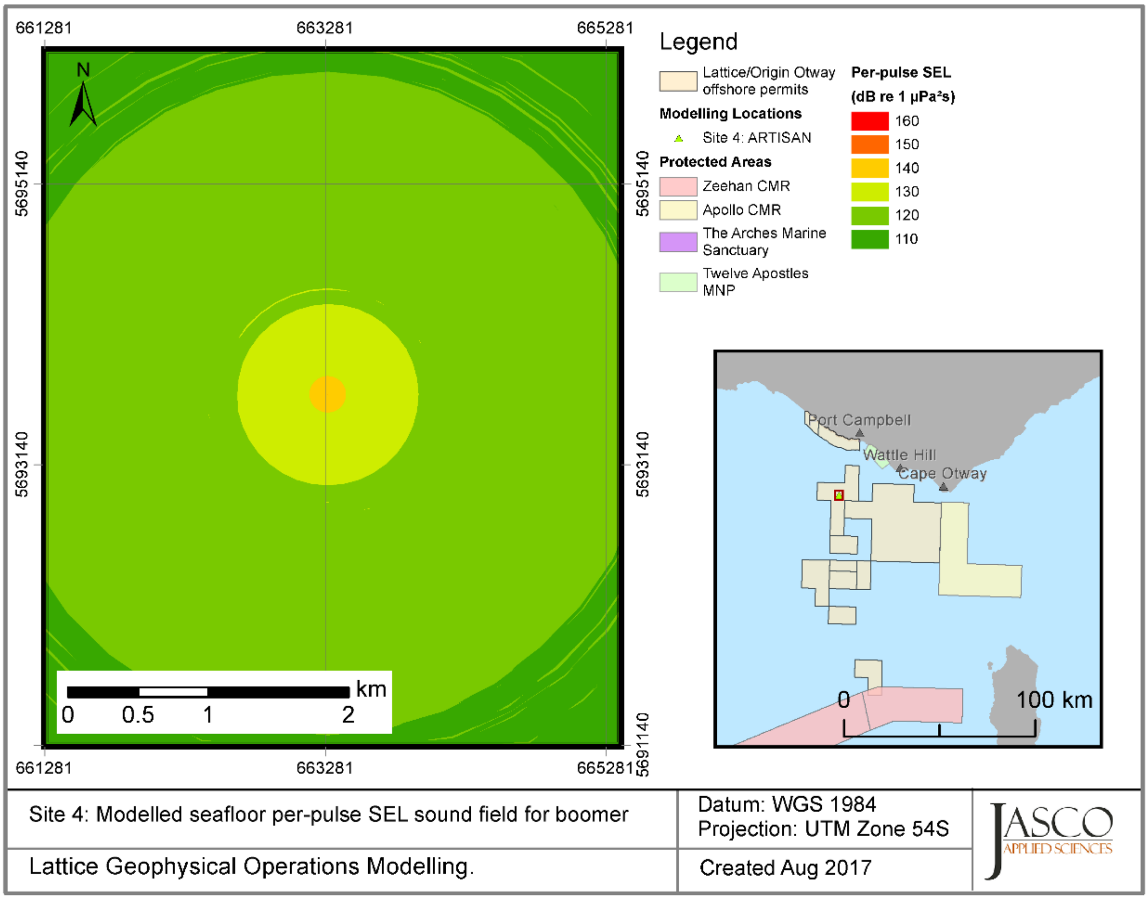


Figure 14. Boomer, Site 4: Sound level contour map showing unweighted seafloor per-pulse SEL results for the boomer towed at 2 m depth.

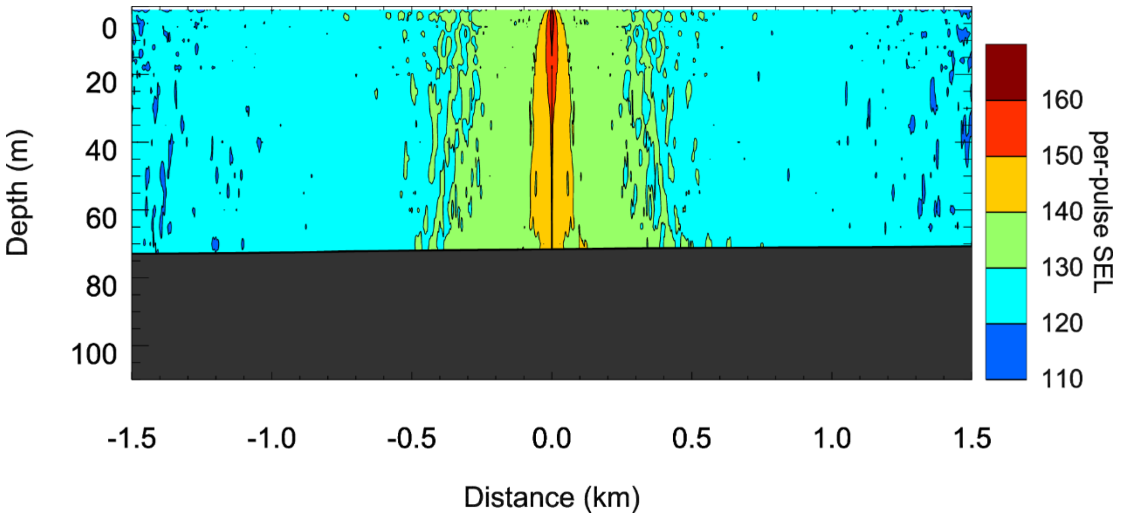


Figure 15. Boomer, Site 4: Predicted unweighted per-pulse SEL for the boomer towed at 2 m depth as vertical slices. Levels are shown from south to north.

4.2.2.2. Sub-bottom Profiler

Maps of the per-pulse SEL at the seafloor along with vertical slices for the representative SBP is shown for two representative sites, Site 1 (Thylacine Midpoint: Figures 16 and 17) and Site 4 (Artisan: Figures 18 and 19). The shape of the footprint at all six modelled sites (Table 1) is almost identical.

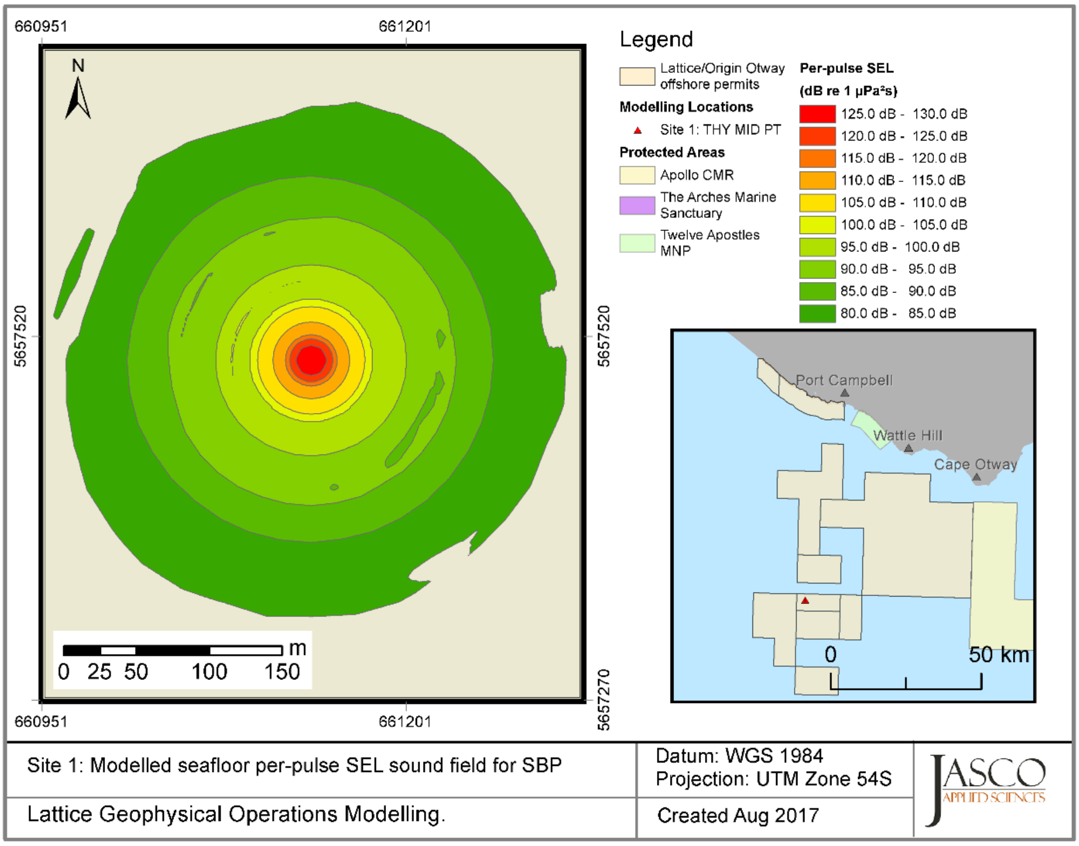


Figure 16. SBP, Site 1: Sound level contour map showing unweighted seafloor per-pulse SEL results for the SBP towed at 3 m depth.

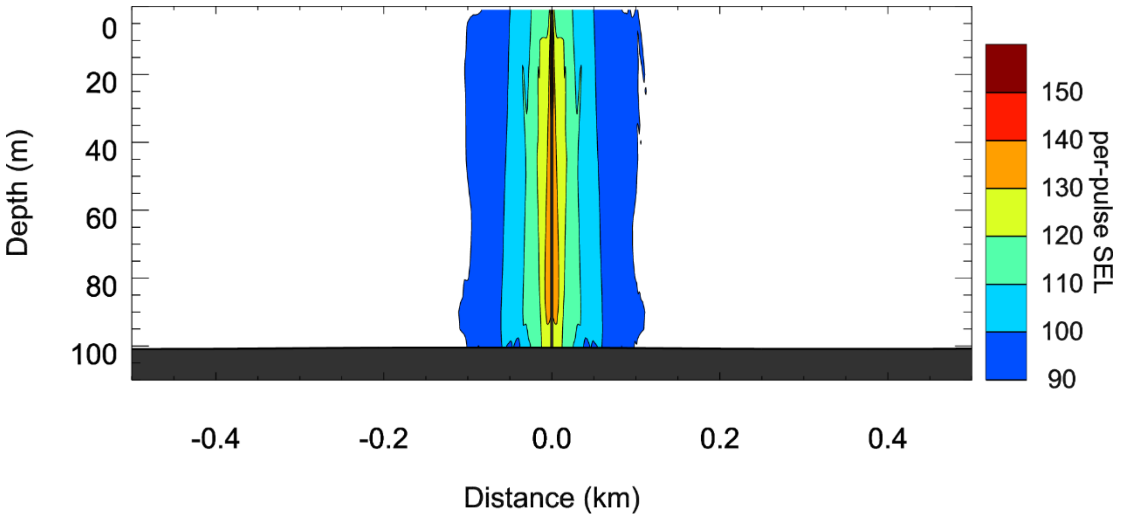


Figure 17. SBP, Site 1: Predicted unweighted per-pulse SEL for the SBP towed at 3 m depth as a vertical slice. Levels are shown from south to north.

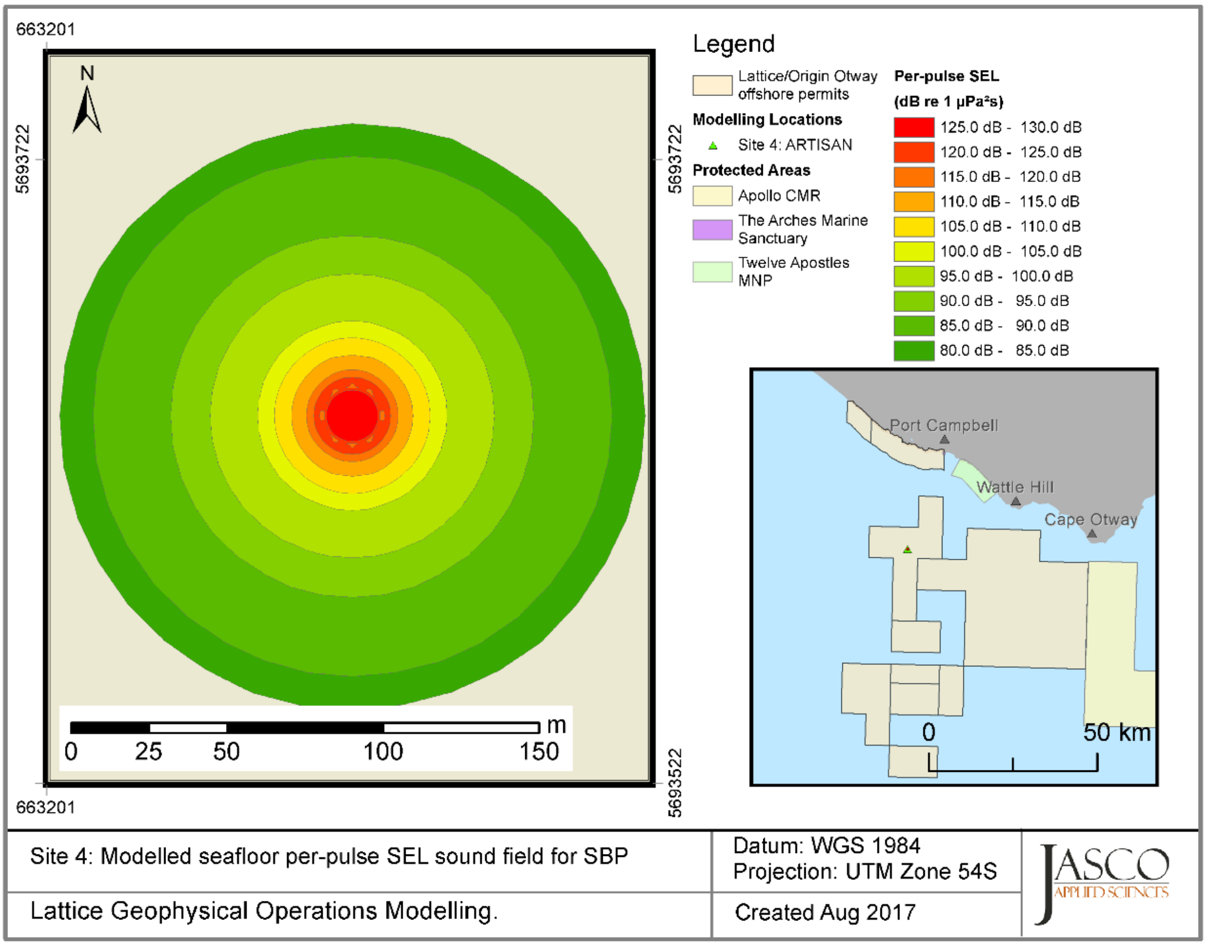


Figure 18. SBP, Site 4: Sound level contour map showing unweighted seafloor per-pulse SEL results for the SBP towed at 3 m depth.

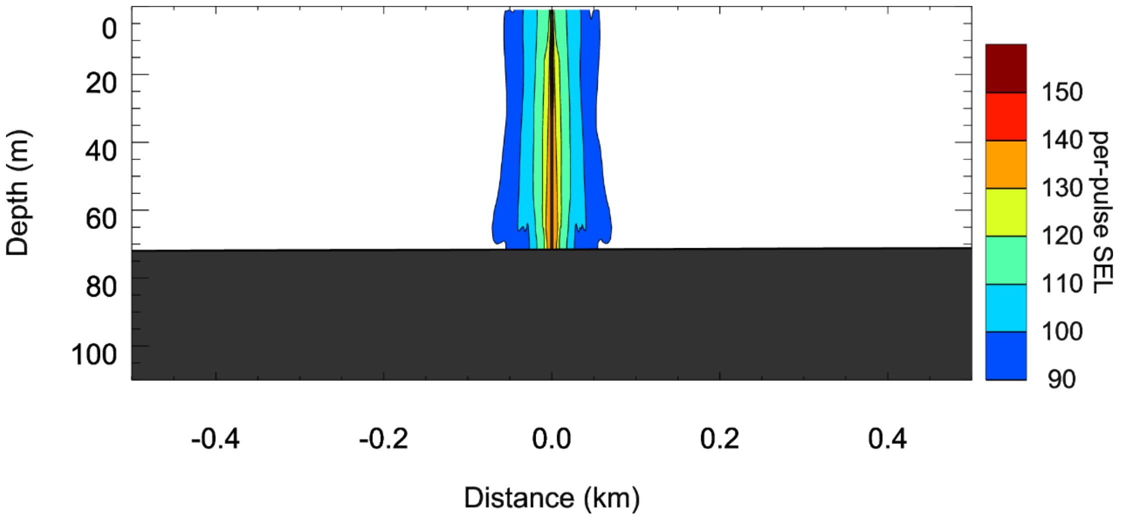


Figure 19. SBP, Site 4: Predicted unweighted per-pulse SEL for the SBP towed at 3 m depth as a vertical slice. Levels are shown from south to north.

4.2.2.3. VSP

Maps of the per-pulse SEL as maximum-over-depth along with vertical slices for the VSP is shown at Site 5, Block VICP69, North (Figures 20 and 21). Additionally, the PK and PK-PK at the seafloor out to 300 m is shown in Figure 22.

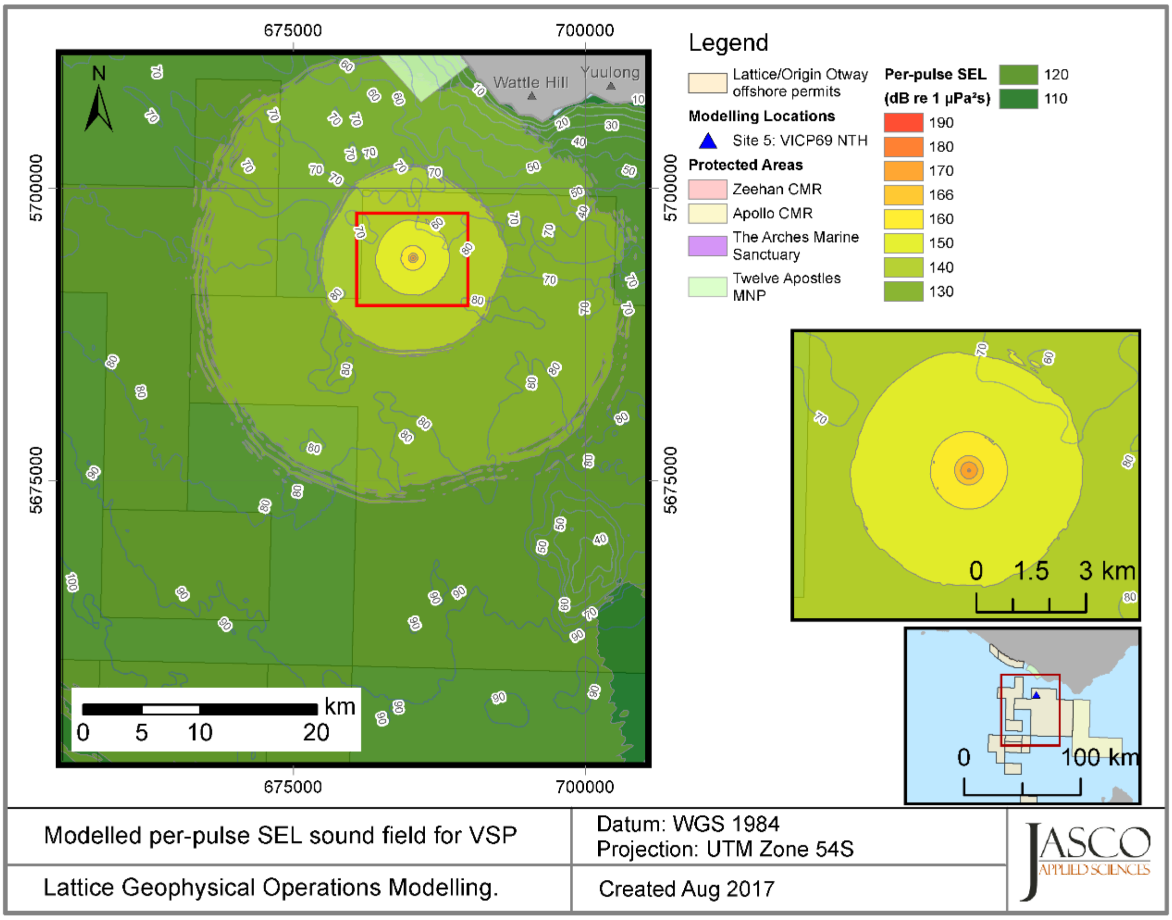


Figure 20. Sound level contour map showing unweighted maximum-over-depth per-pulse SEL results for the 450 in³ VSP array operated at 6 m depth at Site 5.

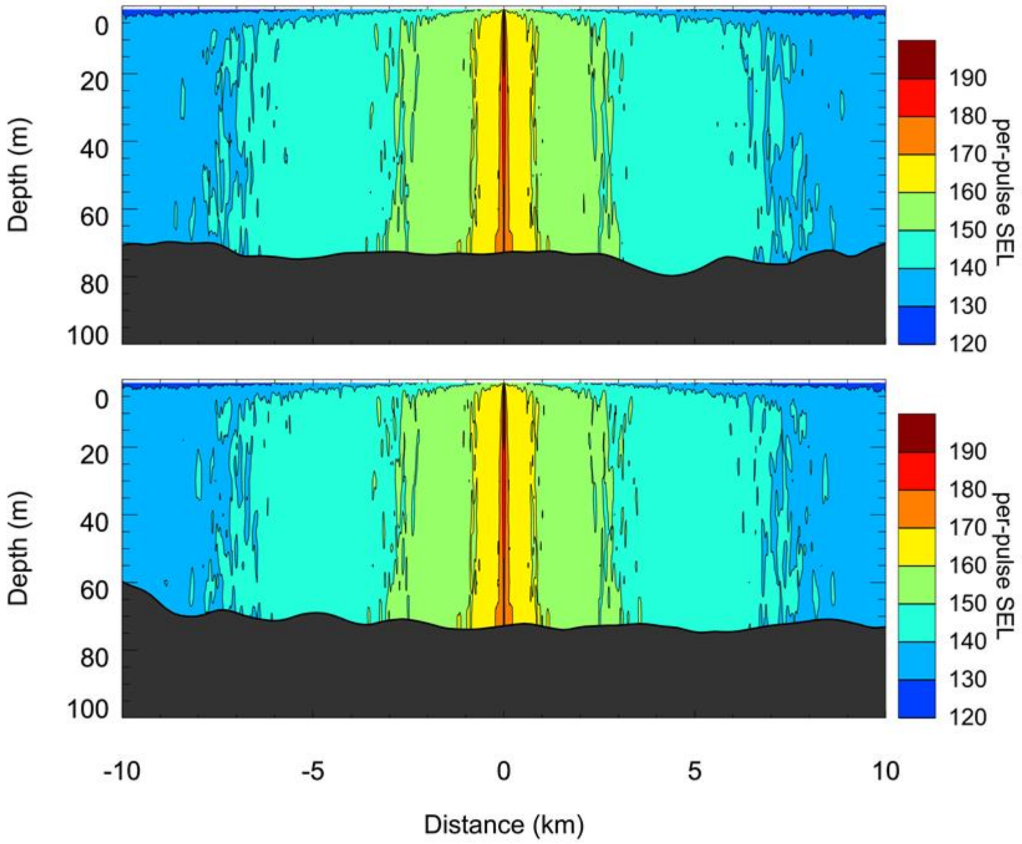


Figure 21. Predicted unweighted per-pulse SEL as vertical slices. Levels are shown in the broadside (top) and endfire directions (bottom). The source depth is 6 m.

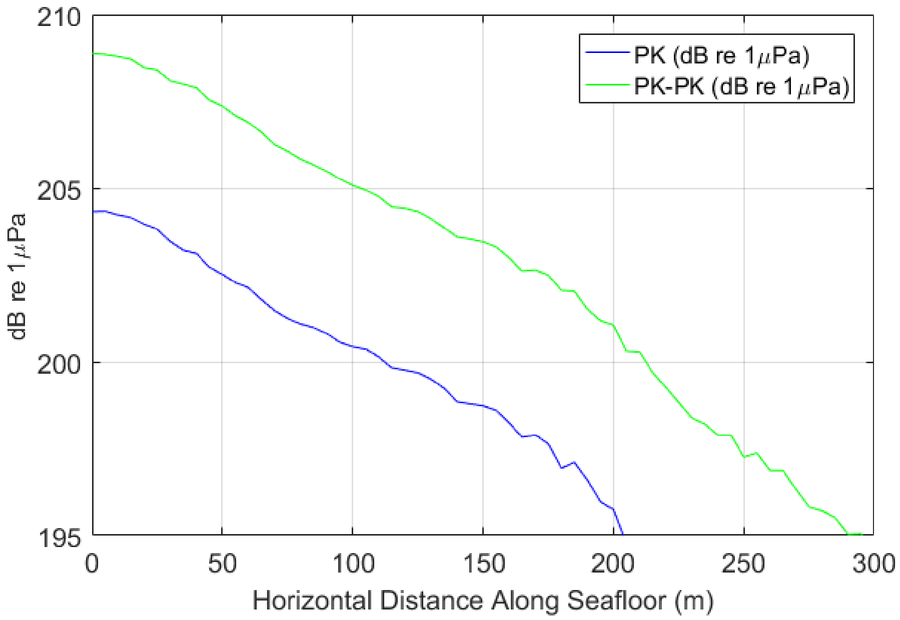


Figure 22. Predicted maximum PK and PK-PK in the endfire direction at the seafloor at Site 5, 72.8 m depth. The source depth is 6 m.

4.3. Accumulated Sound Exposure Levels

4.3.1. Tabulated Results

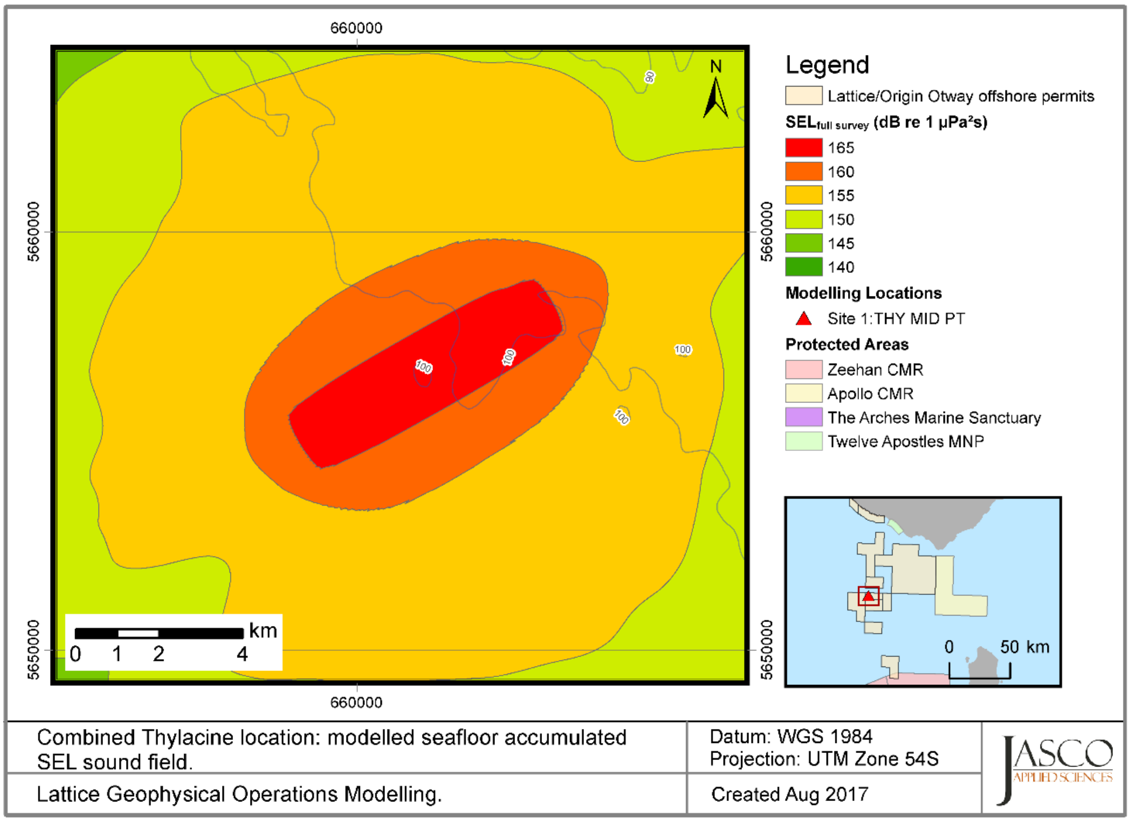
A cumulative noise study was performed for the four regions, Thylacine Combined, Geographe 3, Artisan, and Block VICP69 Meeki, as indicated in Figure 11. The study involved multiple survey lines with alternating pulses of the boomer and the sub-bottom profiler. Table 23 shows the distances to cumulative SEL thresholds at the seafloor where the accumulation period covers the entire survey.

Table 23. Maximum (R_max) and 95% ($R_{95\%}$) horizontal distances (in km) from the survey areas to modelled seafloor cumulative SEL isopleths, and the ensonified area to the specified threshold (in km^2). A dash indicates that the level was not exceeded at the seafloor.

SEL (dB re 1 μPa^2·s)	**Thylacine Combined**			**Geographe 3**			**Artisan**			**Block VICP69, Meeki**		
	R_max (km)	**$R_{95\%}$ (km)**	***Area* (km^2)**	**R_max (km)**	**R_max (km)**	***Area* (km^2)**	**R_max (km)**	**R_max (km)**	***Area* (km^2)**	**R_max (km)**	**R_max (km)**	***Area* (km^2)**
170	—	—	—	—	—	—	—	—	—	—	—	—
165	0.11	0.05	12.52	0.05	0.05	8.86	0.09	0.05	9.46	0.05	0.05	9.08
160	1.7	1.2	38.9	1.1	0.8	22.7	1.2	0.8	22.7	1.1	0.8	22.7
155	6.9	5.3	189	4.8	4.1	107	4.8	3.9	106	5.5	4.2	114
150	9.6	6.9	287	8.2	6.4	221	8.1	6.4	220	8.3	6.4	221
145	>10	>10	NA	>10	>10	NA	>10	>10	NA	>10	>10	NA

4.3.2. Sound Level Contour Maps

Maps of the accumulated SEL at the seafloor for the combined operations of the boomer and the SBP over the duration of the surveys (described in Section 3.3.2) are shown for the four considered surveys. These are at the Thylacine Combined (Figure 23), Geographe 3 (Figure 24), Artisan (Figure 25) and Block VICP69, Meeki (Figure 26) locations.



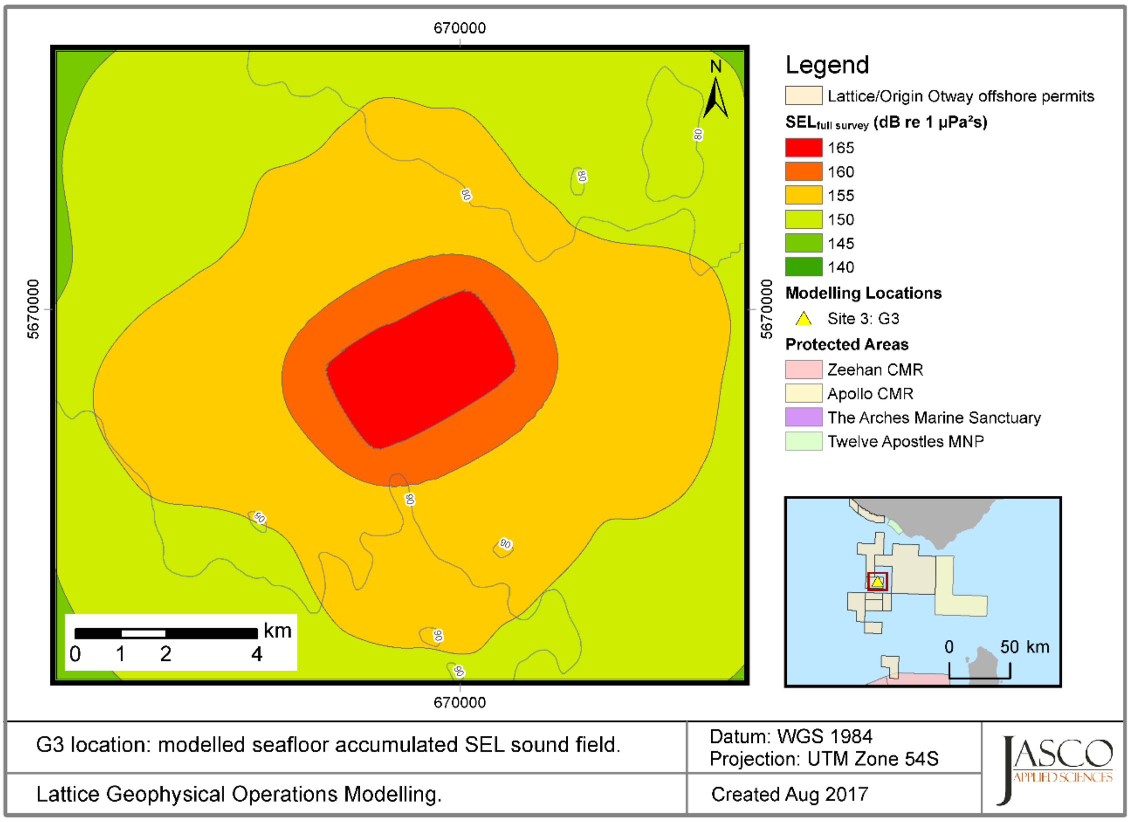
Combined Thylacine location: modelled seafloor accumulated SEL sound field.

Lattice Geophysical Operations Modelling.

Datum: WGS 1984
Projection: UTM Zone 54S

Created Aug 2017

Figure 23. Thylacine Combined location: Sound level contour map of seafloor accumulated SEL over the full survey for the boomer and SBP operations.



G3 location: modelled seafloor accumulated SEL sound field.

Lattice Geophysical Operations Modelling.

Datum: WGS 1984
Projection: UTM Zone 54S

Created Aug 2017

Figure 24. G3 location: Sound level contour map of seafloor accumulated SEL over the full survey for the boomer and SBP operations.

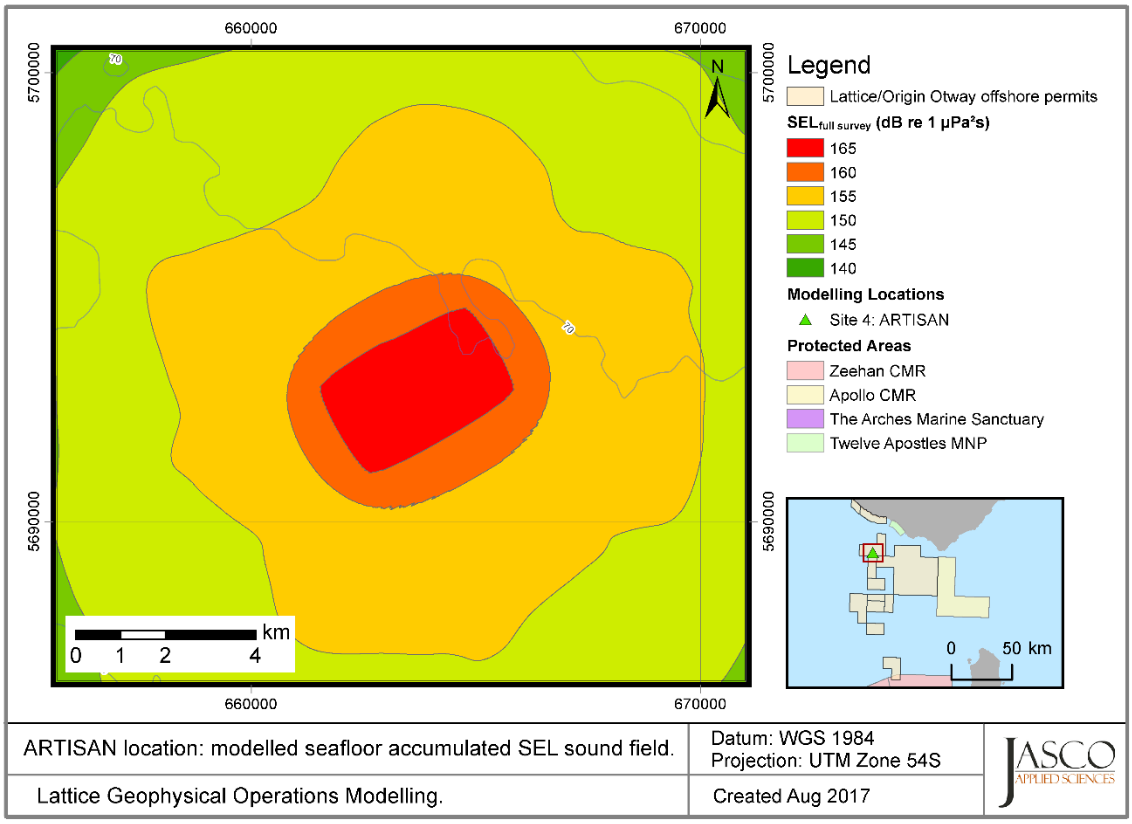


Figure 25. ARTISAN location: Sound level contour map of seafloor accumulated SEL over the full survey for the boomer and SBP operations.

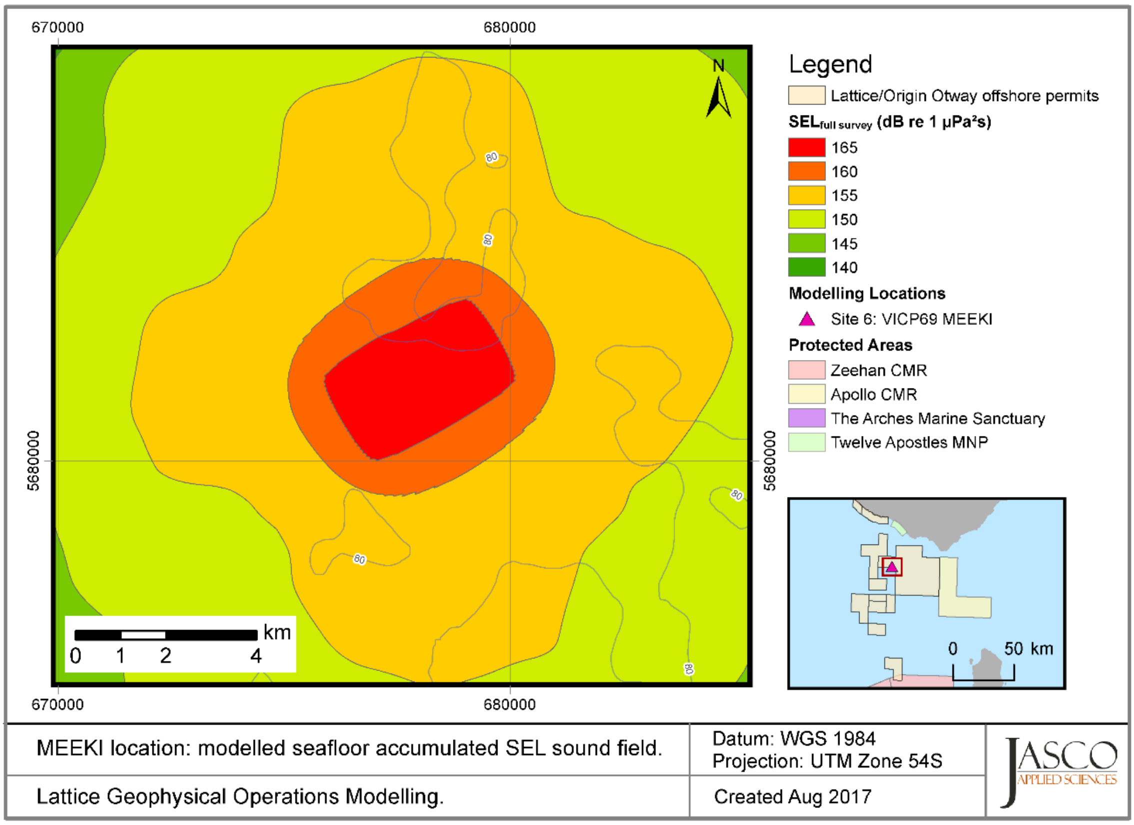


Figure 26. MEEKI location: Sound level contour map of seafloor accumulated SEL over the full survey for the boomer and SBP operations.

5. Discussion and Conclusion

5.1. Overview and source levels

This modelling study predicted underwater sound levels associated with the specified geophysical operations of the VSP, and surveys including boomer and sub-bottom profiler sources. Due to a lack of available literature on source functions for the high-frequency sources, the boomer and the sub-bottom profiler source inputs were determined from a previous JASCO measurement campaign (Sections 3.1.1 and 3.1.2). It was determined that the per-pulse SEL source level of the boomer was 180.0 dB re 1 µPa²·s @ 1 m, and for the sub-bottom profiler it was 171.4 dB re 1 µPa²·s @ 1 m; further metrics for the back propagated source levels are shown in Tables 4 and 5 respectively. The boomer was found to be a relatively broadband source with appreciable energy across the range of 160 Hz to 12.5 kHz (Figure 4). The sub-bottom profiler had the majority of energy at higher frequencies, between 5 kHz and 12.5 kHz.

The 450 in³ VSP was modelled using AASM at a centroid depth of 6 m (Section 3.1.3). The SEL source level of the VSP was 213.7 dB re 1 µPa²·s @ 1 m in the endfire direction, and 213.6 dB re 1 µPa²·s @ 1 m in the broadside direction; further source metrics are shown in Table 7. Most of the acoustic energy is output at lower frequencies, in the tens to hundreds of hertz. Due to the geometry of the array, the VSP is practically an omnidirectional source.

The modelling was performed using a typical September sound speed profile, as the setting most likely to achieve the greatest transmission, such that a precautionary estimation of distances can be made for the surveys (Section D.3.2). The lithography of the regions place Sites 1 & 2 in a region typified by a hard caprock, Sites 3, 4, and 6 in a region with a shallow sand layer over increasingly consolidated calcarenite, and Site 5 with a deeper sand layer over the calcarenite; this is detailed in Section D.3.3. The modelling also accounted for variations in site-specific bathymetry (Section D.3.1)

5.2. Single pulse sound fields

The results for the single pulse sound fields are presented in Section 4.2.

Across all sites, the maximum range for the boomer to exceed the marine mammal behavioural threshold (SPL of 160 dB re 1 µPa) is 145 m (Site 6), and to exceed the turtle behavioural threshold (SPL of 166 dB re 1 µPa) is 36 m, which is consistent across all sites (Table 8). The consistency for the turtle behavioural threshold is due to the levels being reached before influences from the site-dependent environment factors (bathymetry and geoacoustics). The range to the marine mammal behavioural threshold level at Site 2 is significantly shorter than at the other sites; this is due to the greater water depth and consequent lack of constructive noise fields within 150 m horizontally from the source.

The PK-PK ranges for the boomer are shown in Table 11. Due to the high threshold levels, the ranges were calculated assuming an acoustic field that is initially spherically spreading. This is valid where the source can be considered a point source, and there is no influence from reflecting surfaces. Due also to the directionality of the source, the ranges to the thresholds on-axis are going to be significantly greater than those off-axis and thus the vertical ranges from the sources are presented. It is shown that for the triple-plate boomer, the level drops below all relevant isopleths within 11 m of the source. Similar principles apply for PK levels in Table 12; the greatest range to a specified threshold is 1.6 m.

The SBP is a higher-frequency, more directional, and lower energy source than the boomer; consequently, the ranges are consistently lower. Using the generated source levels, the threshold for turtle behaviour is not reached at any horizontal distance from the source, and the marine mammal behavioural threshold is exceeded up to 2 m horizontally from the source (Table 13). Additionally, the ranges to thresholds at the seafloor are accordingly small (Table 15); here it is of note that the 115 and 120 dB re 1 µPa²·s SEL levels are at their greatest ranges at Site 2 due to the greater distance the conical beam may propagate, and thus widen, before reaching the interface.

For the SBP, the PK-PK and PK results were treated in the same way as for the boomer; results are shown for a spherically spreading noise field with the on-axis sound pressure analysed to determine ranges to thresholds. For the identified thresholds of interest for the SBP, the vertical distance does not exceed 1.4 m. In summary, sound fields from the boomer and the SBP do not reach any of the assessed thresholds for benthic crustaceans or fish (Section 2) at the seafloor.

The single pulse results for the VSP operated at Site 5 are shown in Section 4.2.1.3. The source has a significantly higher source level than either the boomer or the sub-bottom profiler. The maximum range to the DEWHA (2008) criterion of 160 dB re 1 µPa²·s SEL is 1.06 km, while the $R_{95\%}$ range is predicted to be 1.03 km. The maximum ranges to the marine mammal and turtle behavioural thresholds of 160 and 166 dB re 1 µPa SPL are 2.56 and 1.55 km respectively. The per-pulse SEL levels at the seafloor were modelled using VSTACK to allow for levels to be determined at high propagation angles. The maximum per-pulse SEL on the seafloor below the array is 181 dB re 1 µPa²·s, therefore the levels from Day et al. (2016b) of 190, 188 and 186 dB re 1 µPa²·s, are not reached at the seafloor.

In the case of the VSP source, PK thresholds of interest are reached at the seafloor and so it was modelled fully with all environmental parameters considered, rather than the spherical spreading approach used for the other two sources. The results show that the lowest isopleth of interest derived from Day et al. (2016b), 209 dB re 1 µPa, is not reached at the seafloor, and the horizontal range along the seafloor to the 202 dB re 1 µPa PK-PK level from Payne et al. (2007) is 185 m. PK metrics relevant to the Popper et al. (2014) criteria for fish are also not reached at the seafloor.

In this modelling study, both the boomer and sub-bottom profiler sources were directed straight down. Consequently, the sound channels constructed as a result of the sound speed profile are unlikely to influence the propagation of sound greatly. It is of note, that if either high-frequency source is directed toward the sea surface then the sound channels are likely to enhance the propagation of these sources. As the VSP is typically a low-frequency source, the fine details in the sound speed profile near the surface are unlikely to influence the propagation.

5.3. Multiple pulse sound fields

The study included modelling to assess the cumulative effect of noise generated for four separate survey areas. The surveys themselves comprise multiple lines along which the boomer and sub-bottom profiler sources are fired alternately. In total, more than 27000 pulses were included for the Thylacine Combined survey over the estimated 51 h of survey, and more than 21000 pulses for each of the other three surveys over the estimated 40.2 h. Sound levels were assessed only at the seafloor with results shown in Table 14. The modelling results show that the SEL at the seafloor did not exceed 170 dB re 1 µPa²·s for any single survey. This is below any of the relevant isopleths for benthic invertebrates, including the 183 dB re 1 µPa²·s 'no effect' accumulated SEL (McCauley and Duncan 2016). Due to the identical sources, and sound speed profiles, and similar depths and geoacoustics, the ranges between the surveys are similar. The greatest ranges are realised for the Thylacine Combined survey; here, the survey is in deeper water than the others as well as featuring the caprock layer that is likely to produce stronger reflections off the sediment layer.

Glossary

3-D
Three-dimensional

1/3-octave-band
Non-overlapping passbands that are one-third of an octave wide (where an octave is a doubling of frequency). Three adjacent 1/3-octave-bands comprise a one octave-band. One-third-octave-bands become wider with increasing frequency. Also see octave.

90% time window
The time interval over which the cumulative energy rises from 5% to 95% of the total pulse energy. This interval contains 90% of the total pulse energy. Symbol: T_{90}.

90% sound pressure level (SPL(T_{90}))
The root-mean-square sound pressure levels calculated over the 90%-energy time window of a pulse. Used only for pulsed sounds.

attenuation
The gradual loss of acoustic energy from absorption and scattering as sound propagates through a medium.

audiogram
A graph of hearing threshold level (sound pressure levels) as a function of frequency, which describes the hearing sensitivity of an animal over its hearing range.

azimuth
A horizontal angle relative to a reference direction, which is often magnetic north or the direction of travel. In navigation it is also called bearing.

bandwidth
The range of frequencies over which a sound occurs. Broadband refers to a source that produces sound over a broad range of frequencies (e.g., seismic airguns, vessels) whereas narrowband sources produce sounds over a narrow frequency range (e.g., sonar) (ANSI/ASA S1.13-2005 R2010).

BIA
Biologically Important Area (http://www.environment.gov.au/marine/marine-species/bias)

broadside direction
Perpendicular to the travel direction of a source. Compare to endfire direction.

cetacean
Any animal in the order Cetacea. These are aquatic, mostly marine mammals and include whales, dolphins, and porpoises.

decibel (dB)
One-tenth of a bel. Unit of level when the base of the logarithm is the tenth root of ten, and the quantities concerned are proportional to power (ANSI S1.1-1994 R2004).

endfire direction
Parallel to the travel direction of a source. Also see broadside direction.

ensonified area
The total area ensonified in conjunction with a specified isopleth.

frequency
The rate of oscillation of a periodic function measured in cycles-per-unit-time. The reciprocal of the period. Unit: hertz (Hz). Symbol: *f*. 1 Hz is equal to 1 cycle per second.

functional hearing group
Grouping of marine mammal species with similar estimated hearing ranges. Southall et al. (2007) proposed the following functional hearing groups: low-, mid-, and high-frequency cetaceans, pinnipeds in water, and pinnipeds in air.

geoacoustic
Relating to the acoustic properties of the seafloor.

hearing threshold
The sound pressure level that is barely audible for a given individual in the absence of significant background noise during a specific percentage of experimental trials.

hertz (Hz)
A unit of frequency defined as one cycle per second.

high-frequency cetacean
The functional hearing group that represents odontocetes specialised for using high frequencies.

impulsive sound
Sound that is typically brief and intermittent with rapid (within a few seconds) rise time and decay back to ambient levels (NOAA 2013, ANSI S12.7-1986 R2006). For example, seismic airguns and impact pile driving.

low-frequency cetacean
The functional hearing group that represents mysticetes (baleen whales).

maximum-over-depth (MOD)
The maximum value over all modelled depths above the sea floor.

mid-frequency cetacean
The functional hearing group that represents some odontocetes (dolphins, toothed whales, beaked whales, and bottlenose whales).

mysticete
Mysticeti, a suborder of cetaceans, use their baleen plates, rather than teeth, to filter food from water. They are not known to echolocate, but use sound for communication. Members of this group include rorquals (Balaenopteridae), right whales (Balaenidae), and the grey whale (*Eschrichtius robustus*).

non-impulsive sound
Sound that is broadband, narrowband or tonal, brief or prolonged, continuous or intermittent, and typically does not have a high peak pressure with rapid rise time (typically only small fluctuations in decibel level) that impulsive signals have (ANSI/ASA S3.20-1995 R2008). Marine vessels, aircraft, machinery, construction, and vibratory pile driving are examples.

octave
The interval between a sound and another sound with double or half the frequency. For example, one octave above 200 Hz is 400 Hz, and one octave below 200 Hz is 100 Hz.

odontocete
The presence of teeth, rather than baleen, characterises these whales. Members of the Odontoceti are a suborder of cetaceans, a group comprised of whales, dolphins, and porpoises. The toothed whales' skulls are mostly asymmetric, an adaptation for their echolocation. This group includes sperm whales, killer whales, belugas, narwhals, dolphins, and porpoises.

parabolic equation method
A computationally-efficient solution to the acoustic wave equation that is used to model transmission loss. The parabolic equation approximation omits effects of back-scattered sound, simplifying the computation of transmission loss. The effect of back-scattered sound is negligible for most ocean-acoustic propagation problems.

peak sound pressure level (PK)
The maximum instantaneous sound pressure level, in a stated frequency band, within a stated period. Also called zero-to-peak sound pressure level. Unit: dB re 1 µPa

permanent threshold shift (PTS)
A permanent loss of hearing sensitivity caused by excessive noise exposure. PTS is considered auditory injury.

pinniped
A common term used to describe all three groups that form the superfamily Pinnipedia: phocids (true seals or earless seals), otariids (eared seals or fur seals and sea lions), and walrus.

point source
A source that radiates sound as if from a single point (ANSI S1.1-1994 R2004).

power spectrum density
The acoustic signal power per unit frequency as measured at a single frequency. Unit: $\mu Pa^2/Hz$, or $\mu Pa^2 \cdot s$.

power spectrum density level
The decibel level ($10\log_{10}$) of the power spectrum density, usually presented in 1 Hz bins. Unit: dB re 1 $\mu Pa^2/Hz$.

pressure, acoustic
The deviation from the ambient hydrostatic pressure caused by a sound wave. Also called overpressure. Unit: pascal (Pa). Symbol: *p*.

pulsed sound
Discrete sounds with durations less than a few seconds. Sounds with longer durations are called continuous sounds.

received level
The sound level measured at a receiver.

signature
Pressure signal generated by a source.

sound
A time-varying pressure disturbance generated by mechanical vibration waves travelling through a fluid medium such as air or water.

sound exposure
Time integral of squared, instantaneous frequency-weighted sound pressure over a stated time interval or event. Unit: pascal-squared second ($Pa^2 \cdot s$) (ANSI S1.1-1994 R2004).

sound exposure level (SEL)
A measure related to the sound energy in one or more pulses. Unit: dB re 1 $\mu Pa^2 \cdot s$.

sound field
Region containing sound waves (ANSI S1.1-1994 R2004).

sound pressure level (SPL)
The decibel ratio of the time-mean-square sound pressure, in a stated frequency band, to the square of the reference sound pressure (ANSI S1.1-1994 R2004).

For sound in water, the reference sound pressure is one micropascal ($p_0 = 1$ µPa) and the unit for SPL is dB re 1 µPa:

$$\mathrm{SPL} = 10\log_{10}\left(p^2/p_0^2\right) = 20\log_{10}\left(p/p_0\right)$$

Unless otherwise stated, SPL refers to the root-mean-square sound pressure level Unit: dB re 1 µPa.

sound speed profile
The speed of sound in the water column as a function of depth below the water surface.

source level (SL)
The sound pressure level or sound exposure level measured 1 metre from a theoretical point source that radiates the same total sound power as the actual source. Unit: dB re 1 µPa @ 1 m or dB re 1 µPa^2·s.

spectrum
An acoustic signal represented in terms of its power (or energy) distribution versus frequency.

SBP
Sub-bottom profiler.

temporary threshold shift (TTS)
Temporary loss of hearing sensitivity caused by excessive noise exposure.

transmission loss (TL)
Also called propagation loss, this refers to the decibel reduction in sound level between two stated points that results from sound spreading away from an acoustic source subject to the influence of the surrounding environment.

VSP
Vertical Seismic Profiler.

wavelength
Distance over which a wave completes one oscillation cycle. Unit: meter (m). Symbol: λ.

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Appendix A. Acoustic Metrics

Underwater sound pressure amplitude is measured in decibels (dB) relative to a fixed reference pressure of $p_0 = 1$ µPa. Because the perceived loudness of sound, especially impulsive noise such as from seismic airguns, pile driving, and sonar, is not generally proportional to the instantaneous acoustic pressure, several sound level metrics are commonly used to evaluate noise and its effects on marine life. We provide specific definitions of relevant metrics used in the accompanying report. Where possible we follow the ANSI and ISO standard definitions and symbols for sound metrics, but these standards are not always consistent.

The zero-to-peak sound pressure level, or peak sound pressure level (PK; dB re 1 µPa), is the maximum instantaneous sound pressure level in a stated frequency band attained by an acoustic pressure signal, $p(t)$:

$$L_{p,pk} = 20 \log_{10}\left[\frac{\max\left(\left|p(t)\right|\right)}{p_0}\right] \tag{A-1}$$

$L_{p,pk}$ is often included as a criterion for assessing whether a sound is potentially injurious; however, because it does not account for the duration of a noise event, it is generally a poor indicator of perceived loudness.

The root-mean-square (rms) sound pressure level (SPL; dB re 1 µPa) is the rms pressure level in a stated frequency band over a specified time window (T, s) containing the acoustic event of interest. It is important to note that SPL always refers to an rms pressure level and, therefore, not instantaneous pressure:

$$L_p = 10 \log_{10}\left(\frac{1}{T}\int_T p^2(t)dt \Big/ p_0^2\right) \tag{A-2}$$

The SPL represents a nominal effective continuous sound over the duration of an acoustic event, such as the emission of one acoustic pulse, a marine mammal vocalisation, the passage of a vessel, or over a fixed duration. Because the window length, T, is the divisor, events with similar sound exposure level (SEL) but more spread out in time have a lower SPL. Throughout this study, a fixed time window of 125 ms is used as the integration period.

The sound exposure level (SEL, dB re 1 µPa^2·s) is a measure related to the acoustic energy contained in one or more acoustic events (N). The SEL for a single event is computed from the time-integral of the squared pressure over the full event duration (T):

$$L_E = 10 \log_{10}\left(\int_T p^2(t)dt \Big/ T_0 p_0^2\right) \tag{A-3}$$

where T_0 is a reference time interval of 1 s. The SEL continues to increase with time when non-zero pressure signals are present. It therefore can be construed as a dose-type measurement so the integration time used must be carefully considered in terms of relevance for impact to the exposed recipients.

SEL can be calculated over periods with multiple acoustic events or over a fixed duration. For a fixed duration, the square pressure is integrated over the duration of interest. For multiple events, the SEL can be computed by summing (in linear units) the SEL of the N individual events:

$$L_{E,N} = 10 \log_{10}\left(\sum_{i=1}^{N} 10^{\frac{L_{E,i}}{10}}\right) \tag{A-4}$$

If applied, the frequency weighting of an acoustic event should be specified, as in the case of M-weighted SEL (e.g., $\mathrm{SEL}_{\mathrm{LFC,24h}}$). The use of fast, slow, or impulse exponential-time-averaging, or other time-related characteristics should else be specified.

Because the SPL and SEL are both computed from the integral of square pressure, these metrics are related by a simple expression, which depends only on the duration of the 90% energy time window T_{90}:

$$L_E = L_{p90} + 10\log_{10}(T_{90}) + 0.458 \tag{A-5}$$

where the 0.458 dB factor accounts for the SPL containing 90% of the total energy from the per-pulse SEL.

Appendix B. Acoustic Source Modelling

B.1. Transducer Beam Theory

Mid- and high-frequency underwater acoustic sources for geophysical measurements create an oscillatory overpressure through rapid vibration of a surface, using either electromagnetic forces or the piezoelectric effect of materials. A vibratory source based on the piezoelectric effect is commonly referred to as a transducer, and may be capable of receiving as well as emitting signals. Transducers are usually designed to produce an acoustic wave of a specific frequency, often in a highly directive beam. The directional capability increases with increasing operating frequency. The main parameter characterizing directivity is the beamwidth, defined as the angle subtended by diametrically opposite “half power” (-3 dB) points of the main lobe (Massa 2003). For different transducers, the beamwidth varies from 180° (almost omnidirectional) to a few degrees.

Transducers are usually built with either circular or rectangular active surfaces. For circular transducers, the beam pattern in the horizontal plane (assuming a downward pointing main beam) is equal in all directions. The beam pattern of a rectangular transducer is variable with the azimuth in the horizontal plane.

The acoustic radiation pattern, or beam pattern, of a transducer is the relative measure of acoustic transmitting or receiving power as a function of spatial angle. Directionality is generally measured in decibels relative to the maximum radiation level along the central axis perpendicular to the transducer surface. The pattern is defined largely by the operating frequency of the device and the size and shape of the transducer. Beam patterns generally consist of a main lobe, extending along the central axis of the transducer, and multiple secondary lobes separated by nulls. The width of the main lobe depends on the size of the active surface relative to the sound wavelength in the medium. Larger transducers produce narrower beams. Figure B-1 shows a 3-dimensional (3-D) visualisation of a typical beam pattern for a circular transducer.

The true beam pattern of a transducer can be obtained only by in situ measurement of the emitted energy around the device. Such data, however, are not always available, and for propagation modelling it is often sufficient to estimate the beam pattern of the source based on transducer beam theory. An example of a measured beam pattern is shown in Figure B-2.

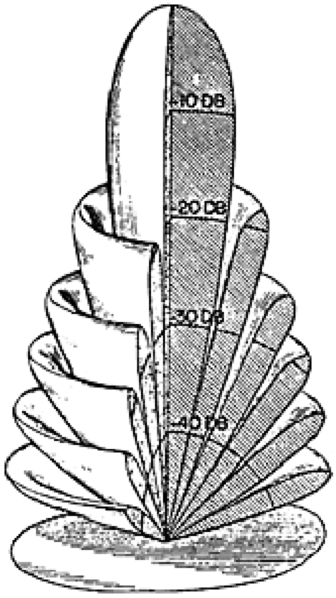


Figure B-1. Typical 3-D beam pattern for a circular transducer (Massa 2003).

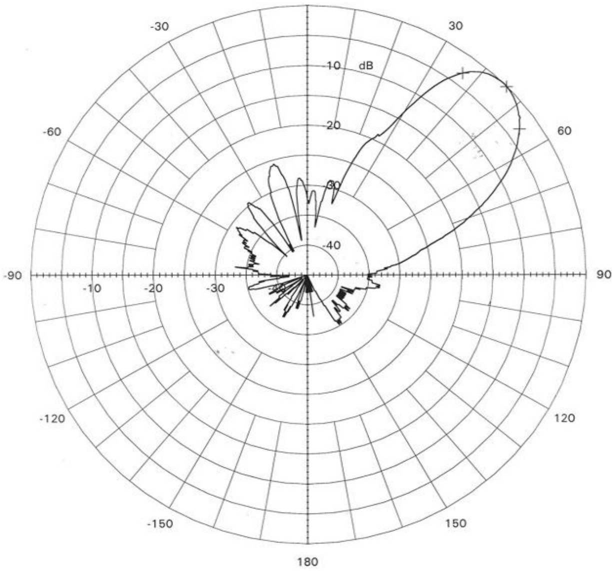


Figure B-2. Vertical cross section of a beam pattern measured in situ from a transducer used by Kongsberg (source: Zykov (2013)).

B.2. Circular Transducers

The beam of an ideal circular transducer is symmetrical about the main axis; the radiated level depends only on the depression angle. In this study, beam directivities were calculated from the standard formula for the beam pattern of a circular transducer (Kinsler et al. 1950, [ITC] International Transducer Corporation 1993). The directivity function of a conical beam relative to the on-axis pressure amplitude is:

$$R(\phi) = \frac{2 \cdot J_1\left(\pi\, D_\lambda \sin(\phi)\right)}{\pi\, D_\lambda \sin(\phi)} \text{ and } D_\lambda = \frac{60}{\theta_{bw}}, \tag{1}$$

where J_1 is the first-order Bessel function, D_λ is the transducer dimension in wavelengths of sound in the medium, θ_{bw} is the beamwidth in degrees, and ϕ is the beam angle from the transducer axis. The beam pattern of a circular transducer can be calculated from the transducer's specified beamwidth or from the diameter of the active surface and the operating frequency. The calculated beam pattern for a circular transducer with a beamwidth of 20° is shown in Figure B-3. The grayscale represents the source level (dB re 1 µPa @ 1 m) and the declination angle is relative to a central vector (0°, 0°) pointing down.

Although some acoustic energy is emitted at the back of the transducer, the theory accounts for the beam power in only the front half-space ($\phi < 90°$) and assumes no energy directed into the back half-space. The relative power at these rearward angles is significantly lower, generally by more than 30 dB, and consequently the emission in the back half-space can be estimated by applying a simple decay rate, in decibels per angular degree, which gives a beam power at $\phi = 90°$ of 30 dB less than that at $\phi = 0°$. This is a conservative estimate of the beam power in the back half-space.

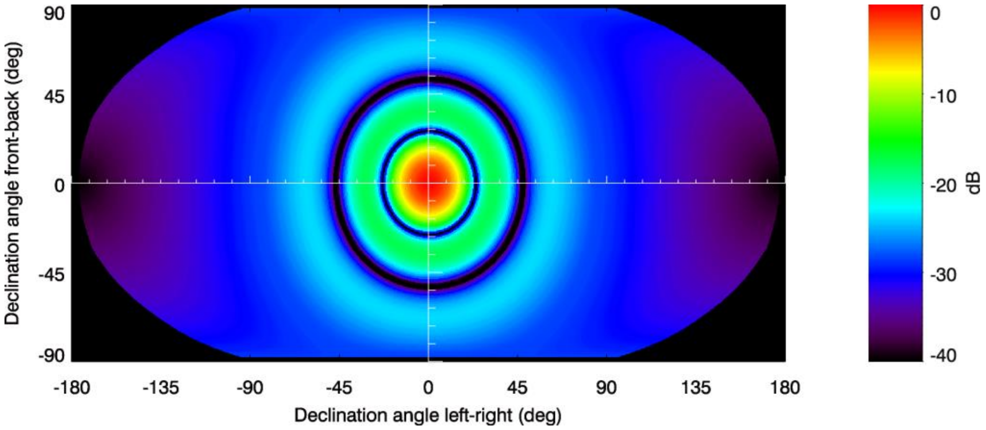


Figure B-3. Calculated beam pattern for a circular transducer with a beamwidth of 20°. The beam power function is shown relative to the on-axis level using the Robinson projection.

B.3. VSP Modelling

The source levels and directivity of the airgun array were predicted with JASCO's Airgun Array Source Model (AASM). AASM includes low- and high-frequency modules for predicting different components of the airgun array spectrum. The low-frequency module is based on the physics of oscillation and radiation of airgun bubbles, as originally described by Ziolkowski (1970), that solves the set of parallel differential equations that govern bubble oscillations. Physical effects accounted for in the simulation include pressure interactions between airguns, port throttling, bubble damping, and generator-injector (GI) gun behaviour discussed by Dragoset (1984), Laws et al. (1990), and Landro (1992). A global optimisation algorithm tunes free parameters in the model to a large library of airgun source signatures.

Whilst airgun signatures are highly repeatable at the low frequencies, which are used for seismic imaging, their sound emissions have a large random component at higher frequencies that cannot be predicted deterministically. Therefore, the high-frequency module of AASM uses a stochastic simulation to predict the sound emissions of individual airguns above 800 Hz, using a multivariate statistical model. The current version of AASM has been tuned to fit a large library of high quality seismic source signature data obtained from the Joint Industry Program (JIP) on Sound and Marine Life (Mattsson and Jenkerson 2008). The stochastic model uses a Monte-Carlo simulation of the random component of the high-frequency spectrum of each airgun in an array. The mean high-frequency spectra from the stochastic model augment the low-frequency signatures from the physical model, allowing AASM to predict airgun source levels at frequencies up to 25,000 Hz.

AASM produces a set of “notional” signatures for each array element based on:

- Array layout
- Volume, tow depth, and firing pressure of each airgun
- Interactions between different airguns in the array

These notional signatures are the pressure waveforms of the individual airguns at a standard reference distance of 1 m; they account for the interactions with the other airguns in the array. The signatures are summed with the appropriate phase delays to obtain the far-field source signature of the entire array in all directions. This far-field array signature is filtered into 1/3-octave-bands to compute the source levels of the array as a function of frequency band and azimuthal angle in the horizontal plane (at the source depth), after which it is considered to be a directional point source in the far field.

A seismic array consists of many sources and the point-source assumption is invalid in the near field where the array elements add incoherently. The maximum extent of the near field of an array (R_{nf}) is:

$$R_{\mathrm{nf}} < \frac{l^2}{4\lambda} \tag{B-2}$$

where λ is the sound wavelength and *l* is the longest dimension of the array (Lurton 2002, §5.2.4). For example, an airgun array length of *l* = 21 m yields a near-field range of 147 m at 2 kHz and 7 m at 100 Hz. Beyond this R_{nf} range, the array is assumed to radiate like a directional point source and is treated as such for propagation modelling.

The interactions between individual elements of the array create directionality in the overall acoustic emission. Generally, this directionality is prominent mainly at frequencies in the mid-range between tens of hertz to several hundred hertz. At lower frequencies, with acoustic wavelengths much larger than the inter-airgun separation distances, the directionality is small. At higher frequencies, the pattern of lobes is too finely spaced to be resolved and the effective directivity is less.

B.4. VSP Acoustic Source Levels and Directivity Results

Figure B-4 shows the broadside (perpendicular to the tow direction), endfire (parallel to the tow direction), and vertical overpressure signatures and corresponding power spectrum levels for the 3090 in^3 array. The signatures consist of a strong primary peak, related to the initial release of high-pressure air, followed by a series of pulses associated with bubble oscillations. Most energy is produced at frequencies below 200 Hz. Frequency-dependent peaks and nulls in the spectrum result from interference among airguns in the array, and correspond with the volumes and relative locations of the airguns to each other.

Horizontal 1/3-octave-band source levels are shown as a function of band centre frequency and azimuth (Figure B-5); directivity in the sound field is most noticeable at mid-frequencies as described in the model detail in Appendix B.3.

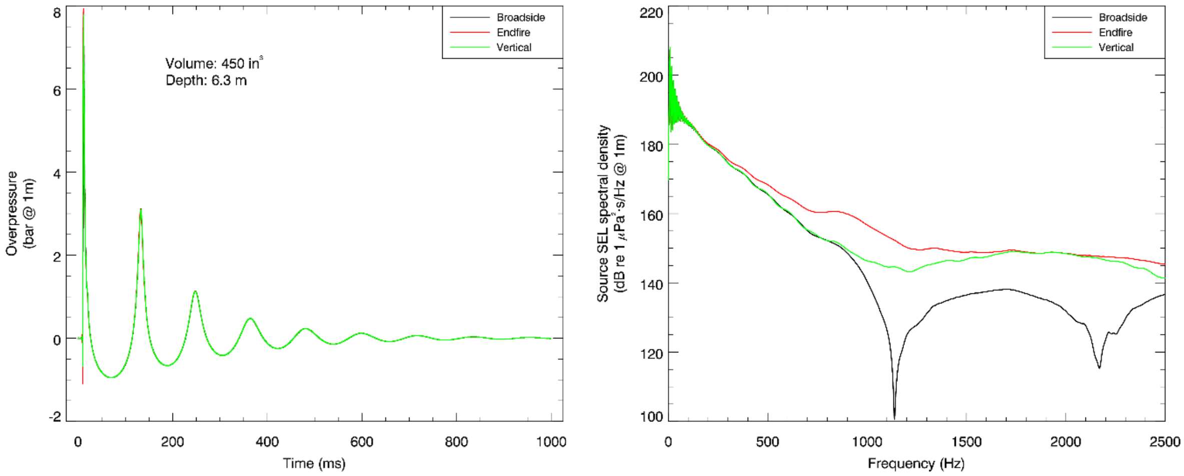


Figure B-4. Predicted source level details for the 450 in^3 VSP array operated at a centroid depth of 6 m. (Left) the overpressure signature and (right) the power spectrum for broadside (perpendicular to tow direction) and endfire (directly aft of the array) directions, and for vertically down.

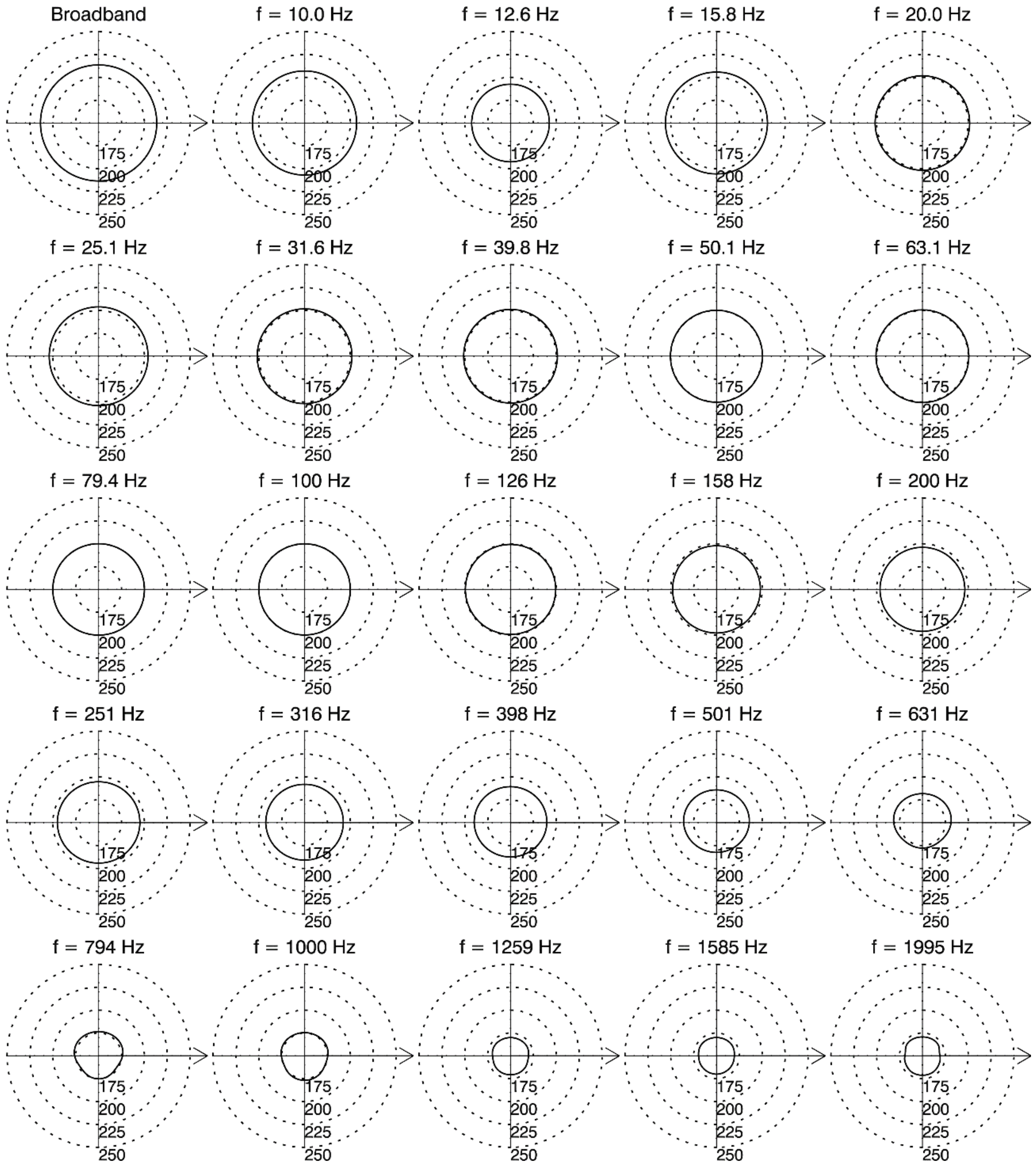


Figure B-5. Directionality of the predicted horizontal source levels for the 450 in^3 array, 5–2000 Hz. Source levels (in dB re 1 µPa^2·s) are shown as a function of azimuth for the centre frequencies of the 1/3-octave-bands modelled; frequencies are shown above the plots. Tow direction is to the right. Operating depth is 6 m (see Section 3.1.3).

Appendix C. Sound Propagation Models

C.1. MONM-BELLHOP

Underwater sound propagation (i.e., transmission loss) was predicted with JASCO's Marine Operations Noise Model (MONM). This model computes sound propagation at frequencies of 5 Hz to 1.25 kHz via a wide-angle parabolic equation solution to the acoustic wave equation (Collins 1993) based on a version of the U.S. Naval Research Laboratory's Range-dependent Acoustic Model (RAM), which has been modified to account for a solid seabed (Zhang and Tindle 1995). MONM computes sound propagation at frequencies > 1.25 kHz via the BELLHOP Gaussian beam acoustic ray-trace model (Porter and Liu 1994).

The parabolic equation method has been extensively benchmarked and is widely employed in the underwater acoustics community (Collins et al. 1996). MONM accounts for the additional reflection loss at the seabed, which results from partial conversion of incident compressional waves to shear waves at the seabed and sub-bottom interfaces, and it includes wave attenuations in all layers. MONM incorporates the following site-specific environmental properties: a bathymetric grid of the modelled area, underwater sound speed as a function of depth, and a geoacoustic profile based on the overall stratified composition of the seafloor.

This version of MONM accounts for sound attenuation due to energy absorption through ion relaxation and viscosity of water in addition to acoustic attenuation due to reflection at the medium boundaries and internal layers (Fisher and Simmons 1977). The former type of sound attenuation is significant for frequencies higher than 5 kHz and cannot be neglected without noticeably affecting the model results.

MONM computes acoustic fields in three dimensions by modelling transmission loss within two-dimensional (2-D) vertical planes aligned along radials covering a 360° swath from the source, an approach commonly referred to as N×2-D. These vertical radial planes are separated by an angular step size of $\Delta\theta$, yielding $N = 360°/\Delta\theta$ number of planes (Figure C-1).

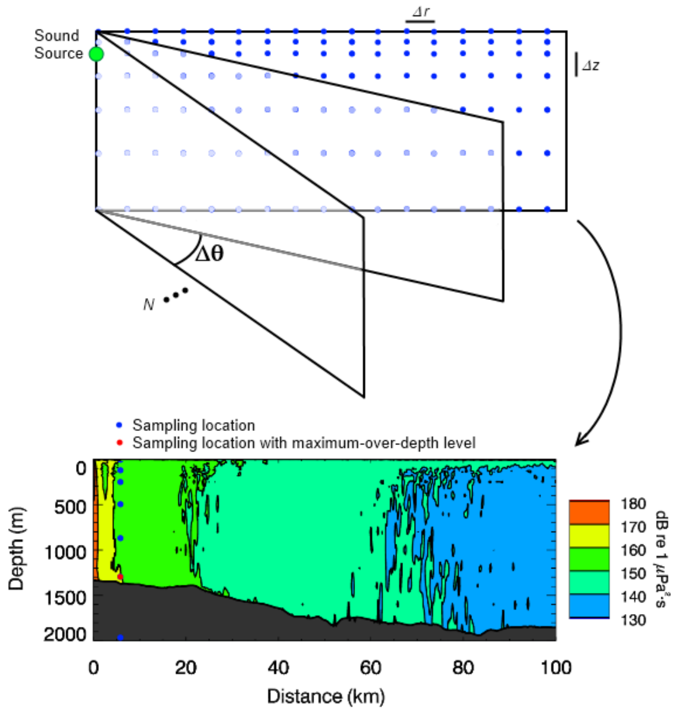


Figure C-1. The N×2-D and maximum-over-depth modelling approach used by MONM.

MONM treats frequency dependence by computing acoustic transmission loss at the centre frequencies of 1/3-octave-bands. Sufficiently many 1/3-octave-bands, starting at 10 Hz, are modelled to include most acoustic energy emitted by the source. At each centre frequency, the transmission loss is modelled within each of the N vertical planes as a function of depth and range from the source.

The 1/3-octave-band received per-pulse SELs are computed by subtracting the band transmission loss values from the directional source level in that frequency band. Composite broadband received SELs are then computed by summing the received 1/3-octave-band levels.

The received per-pulse SEL sound field within each vertical radial plane is sampled at various ranges from the source, generally with a fixed radial step size. At each sampling range along the surface, the sound field is sampled at various depths, with the step size between samples increasing with depth below the surface. The step sizes are chosen to provide increased coverage near the depth of the source and at depths of interest in terms of the sound speed profile. For areas with deep water, sampling is not performed at depths beyond those reachable by marine mammals. The received per-pulse SEL at a surface sampling receiver location is taken as the maximum value that occurs over all samples within the water column, i.e., the maximum-over-depth received per-pulse SEL. These maximum-over-depth per-pulse SELs are presented as colour contours around the source.

MONM’s predictions have been validated against experimental data from several underwater acoustic measurement programs conducted by JASCO (Hannay and Racca 2005, Aerts et al. 2008, Funk et al. 2008, Ireland et al. 2009, O'Neill et al. 2010, Warner et al. 2010, Racca et al. 2012a, Racca et al. 2012b, Martin et al. 2015).

C.2. FWRAM

For impulsive sounds from the seismic array, time-domain representations of the pressure waves generated in the water are required to calculate SPL and peak pressure level. Furthermore, the airgun array must be represented as a distributed source to accurately characterise vertical directivity effects in the near-field zone. For this study, synthetic pressure waveforms were computed using FWRAM, which is a time-domain acoustic model based on the same wide-angle parabolic equation (PE) algorithm as MONM. FWRAM computes synthetic pressure waveforms versus range and depth for range-varying marine acoustic environments, and it takes the same environmental inputs as MONM (bathymetry, water sound speed profile, and seafloor geoacoustic profile). Unlike MONM, FWRAM computes pressure waveforms via Fourier synthesis of the modelled acoustic transfer function in closely spaced frequency bands. FWRAM employs the array starter method to accurately model sound propagation from a spatially distributed source (MacGillivray and Chapman 2012).

Besides providing direct calculations of the peak pressure level and SPL, the synthetic waveforms from FWRAM can also be used to convert the SEL values from MONM to SPL.

C.3. Wavenumber Integration Model

Sound pressure levels near the airgun array were modelled using JASCO’s VSTACK wavenumber integration model. VSTACK computes synthetic pressure waveforms versus depth and range for arbitrarily layered, range-independent acoustic environments using the wavenumber integration approach to solving the exact (range-independent) acoustic wave equation. This model is valid over the full angular range of the wave equation and can fully account for the elasto-acoustic properties of the sub-bottom. Wavenumber integration methods are extensively used in the field of underwater acoustics and seismology where they are often referred to as reflectivity methods or discrete wavenumber methods. VSTACK computes sound propagation in arbitrarily stratified water and seabed layers by decomposing the outgoing field into a continuum of outward-propagating plane cylindrical waves. Seabed reflectivity in the model is dependent on the seabed layer properties: compressional and shear wave speeds, attenuation coefficients, and layer densities. The output of the model can be post-processed to yield estimates of the SEL, SPL, and PK.

VSTACK accurately predicts steep-angle propagation in the proximity of the source, but is computationally slow at predicting sound pressures at large distances due to the need for smaller wavenumber steps with increasing distance. Additionally, VSTACK assumes range-invariant bathymetry with a horizontally stratified medium (i.e., a range-independent environment) which is azimuthally symmetric about the source. VSTACK is thus best suited to modelling the sound field near the source.

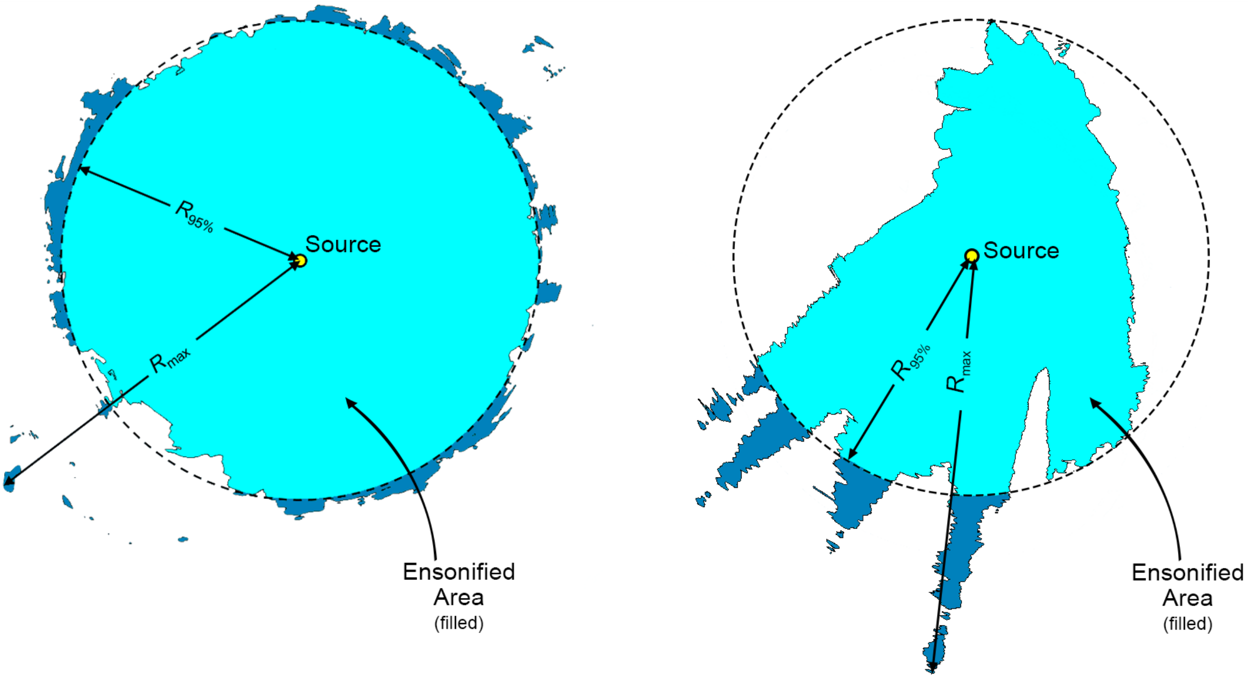
Appendix D. Methods and Parameters

This section describes the specifications of the airgun array source that was used at all sites and the environmental parameters used in the propagation models.

D.1. Estimating Range to Thresholds Levels

Sound level contours were calculated based on the underwater sound fields predicted by the propagation models, sampled by taking the maximum value over all modelled depths above the sea floor for each location in the modelled region. The predicted distances to specific levels were computed from these contours. Two distances relative to the source are reported for each sound level: 1) R_{max}, the maximum range to the given sound level over all azimuths, and 2) $R_{95\%}$, the range to the given sound level after the 5% farthest points were excluded (see examples in Figure D-1).

The $R_{95\%}$ is used because sound field footprints are often irregular in shape. In some cases, a sound level contour might have small protrusions or anomalous isolated fringes. This is demonstrated in the image in Figure D-1(a). In cases such as this, where relatively few points are excluded in any given direction, R_{max} can misrepresent the area of the region exposed to such effects, and $R_{95\%}$ is considered more representative. In strongly asymmetric cases such as shown in Figure D-1(b), on the other hand, $R_{95\%}$ neglects to account for significant protrusions in the footprint. In such cases R_{max} might better represent the region of effect in specific directions. Cases such as this are usually associated with bathymetric features affecting propagation. The difference between R_{max} and $R_{95\%}$ depends on the source directivity and the non-uniformity of the acoustic environment.



(a) (b)

Figure D-1. Sample areas ensonified to an arbitrary sound level with R_{max} and $R_{95\%}$ ranges shown for two different scenarios. (a) Largely symmetric sound level contour with small protrusions. (b) Strongly asymmetric sound level contour with long protrusions. Light blue indicates the ensonified areas bounded by $R_{95\%}$; darker blue indicates the areas outside this boundary which determine R_{max}.

D.2. Estimating SPL from Modelled SEL Results

The SEL of individual sound pulses is an energy-like metric related to the dose of sound received over the pulse's duration. The SPL on the other hand is related to the pulses intensity over a specified time interval (Appendix A). The time interval applied in this report is fixed at 125 ms.

Seismic pulses typically lengthen in duration as they propagate away from their source due to seafloor and surface reflections and other waveguide dispersion effects. The changes in pulse length affect the numeric relationship between SPL and SEL because the amount of pulse energy within the specified time interval changes. Full-waveform modelling is necessary to estimate SPL, but this type of modelling is computationally intensive and can be prohibitively time consuming when run at high spatial resolution over large areas.

The current study, modelled synthetic seismic pulses from 5–1024 Hz with FWRAM (Appendix C.2).

FWRAM uses Fourier synthesis to recreate the signal in the time domain so that both the SEL and SPL can be calculated from the propagated signal. SPL was calculated using a 125 ms fixed time window positioned to maximise the SPL over the pulse duration. The difference between the SEL and SPL was extracted for all ranges and depths corresponded to those generated in the high spatial-resolution MONM results. The resulting SEL-to-SPL offsets were then averaged in 0.5 km range bins. The final range-dependent conversion function for each site correspond to the 90th percentile curve derived from the SEL-to-SPL offsets along all radials at that site. These range-dependent conversion functions were applied to predicted per-pulse SEL results from MONM and BELLHOP to model SPLs. The range-dependent conversion function for the VSP at Site 5 is shown in Figure D-2.

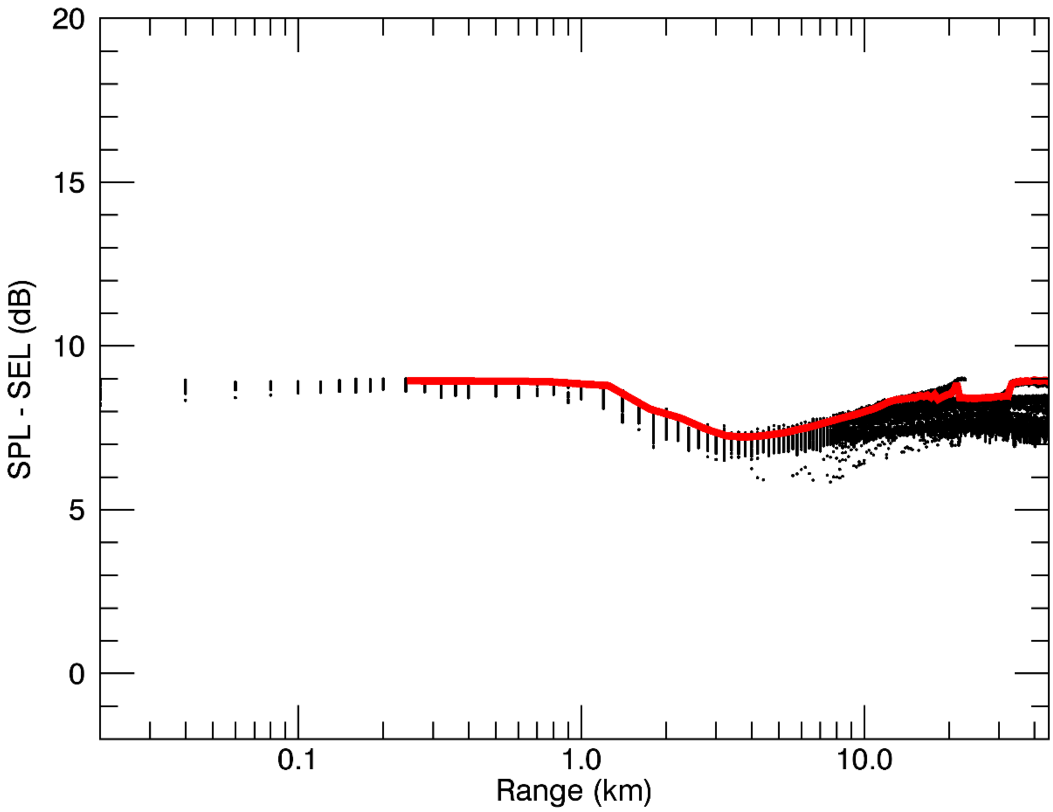


Figure D-2. Conversion Factor applied: Range-dependent conversion function for converting single-pulse SEL to SPL for the 450 in^3 VSP array.

D.3. Environmental Parameters

D.3.1. Bathymetry

Water depths throughout the modelled area were supplied by the client. The bathymetric data was re-gridded onto a Cartesian grid with a regular grid spacing of 50 × 50 m; this grid was used for all modelled sites in this study.

D.3.2. Sound speed profile

The sound speed profiles for the modelled sites were derived from temperature and salinity profiles from the U.S. Naval Oceanographic Office's *Generalized Digital Environmental Model V 3.0* (GDEM; Teague et al. 1990, Carnes 2009). GDEM provides an ocean climatology of temperature and salinity for the world's oceans on a latitude-longitude grid with 0.25° resolution, with a temporal resolution of one month, based on global historical observations from the U.S. Navy's Master Oceanographic Observational Data Set (MOODS). The temperature and salinity profiles were converted to sound speed profiles according to the equations of Coppens (1981).

The sound speed profiles across the year were calculated across the area encompassing all sites, with the median sound speed at each depth retained for comparison. It was found that the sound speed profile for September provided the greatest propagation and is consequently used for the modelling. Since the profiles did not extend to the maximum water depth in the modelling area, they were supplemented with a deeper nearby offshore profile.

The final profile features a sound channel at 70 m, as well as a surface duct that may allow for enhanced high frequency propagation. Due to the bathymetry of the modelling region, most propagation is within the top two-hundred metres. At greater depths, the profile is downwardly refracting until 1300 m depth. The sound speed profile used throughout the modelling is shown in Figure D-3.

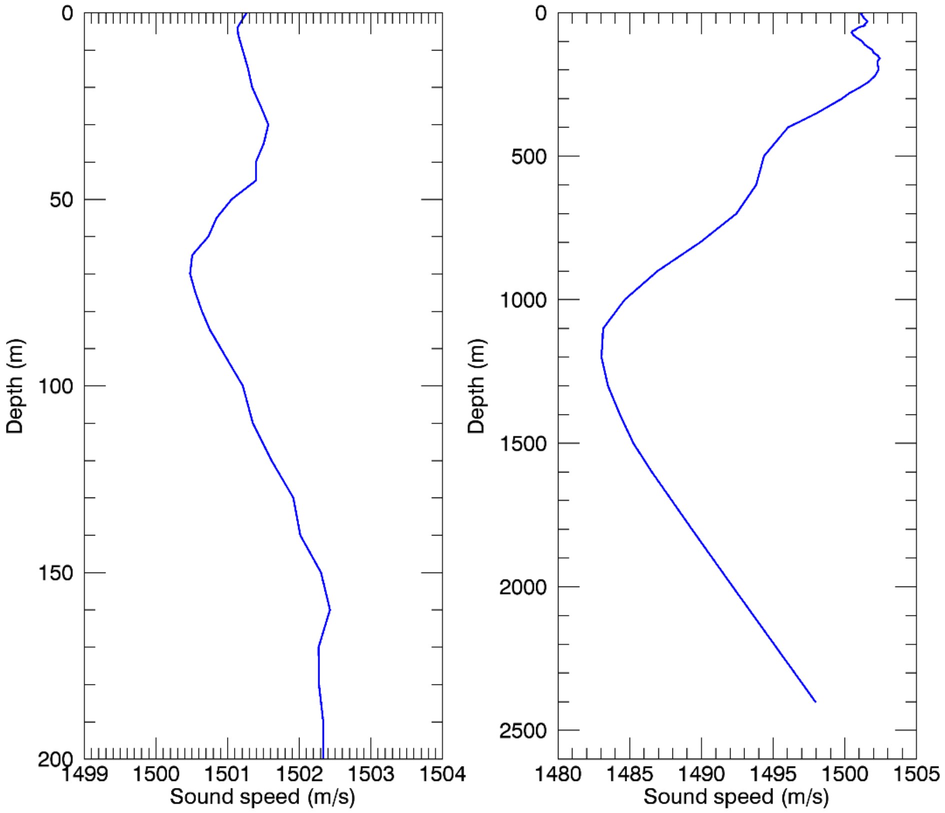


Figure D-3. The sound speed profile for September across the modelling region for the first 200 m (left), and over the entire range of depths (right). The profile was calculated from temperature and salinity profiles from GDEM V 3.0 (GDEM; Teague et al. 1990, Carnes 2009).

D.3.3. Geoacoustics

Each of the models used in this study utilise a single geoacoustic profile for each site. The geoacoustics determine how sound is reflected from the seabed, as well as how it is coupled into the sediment layers. The geoacoustic description for Site 5 are taken from a ground truthing report due to its proximity to the location (Duncan 2017). The geoacoustic profiles for the other sites were generated using lithographic descriptions from the geotechnical reports supplied by the client. Sites 1 and 2 located towards the south of the region were found typically to feature a well-cemented calcarenite caprock over a softer calcarenite layer. Sites 3, 4, and 6 typically exhibited a sand layer that sat above increasingly cemented calcarenite. In all cases, the calcarenite layer was found to extend to many hundreds of metres below the seafloor.

Geoacoustic values for Calcarenite have been taken from Duncan et al. 2013; where the calarenite is indicated to be increasingly consolidated with depth, the properties have been linearly interpolated. The geoacoustic parameters for sand are generated using models proposed by Hamilton (Hamilton 1980). The three final geoacoutics profiles used for the modelling are presented in Tables D-1 to D-3.

Table D-1. Geoacoustic profile used as the input to the models at Sites 1 & 2.

Depth below seafloor (m)	Material	Density (g/cm^3)	P-wave speed (m/s)	P-wave attenuation (dB/λ)	S-wave speed (m/s)	S-wave attenuation (dB/λ)
0-1	Well-cemented carbonate caprock	2.7	2600	0.5	1200	0.5
1-20	Increasingly cemented calcarenite	2.2	2000	0.3	900	0.27
20-40		2.3	2120	0.34	960	0.316
40-60		2.4	2240	0.38	1020	0.362
60-80		2.5	2360	0.42	1080	0.408
80-10		2.6	2480	0.46	1140	0.454
>100	Well-cemented calcarenite	2.7	2600	0.5	1200	0.5

Table D-2. Geoacoustic profile used as the input to the models at Sites 3, 4, & 6.

Depth below seafloor (m)	Material	Density (g/cm^3)	P-wave speed (m/s)	P-wave attenuation (dB/λ)	S-wave speed (m/s)	S-wave attenuation (dB/λ)
0-0.5	Coarse carbonate sand	2.03	1803.1	0.85	300	6.2
0.5-20	Increasingly cemented calcarenite	2.2	2000	0.3	900	0.27
20-40		2.3	2120	0.34	960	0.316
40-60		2.4	2240	0.38	1020	0.362
60-80		2.5	2360	0.42	1080	0.408
80-100		2.6	2480	0.46	1140	0.454
>100	Well-cemented calcarenite	2.7	2600	0.5	1200	0.5

Table D-3. Geoacoustic profile used as the input to the models at Site 5.

Depth below seafloor (m)	Material	Density (g/cm^3)	P-wave speed (m/s)	P-wave attenuation (dB/λ)	S-wave speed (m/s)	S-wave attenuation (dB/λ)
0	Coarse carbonate sand	2.03	1802.2	0.85	300	6.2
20		2.07	1836.27	0.84	320	6.5
20-36	Increasingly cemented calcarenite	2.2	2000	0.3	900	0.27
36-52		2.3	2120	0.34	960	0.316
52-68		2.4	2240	0.38	1020	0.362
68-84		2.5	2360	0.42	1080	0.408
84-100		2.6	2480	0.46	1140	0.454
>100	Well-cemented calcarenite	2.7	2600	0.5	1200	0.5

Appendix C JASCO Acoustic Modelling Report – Otway Geophysical Survey Technical Note

Technical Note

Supplemental modelling results for *Otway Basin Geophysical Operations Acoustic Modelling: Acoustic Modelling for Assessing Marine Fauna Sound Exposures*

From: Michael Wood and Craig McPherson
JASCO Applied Sciences (Australia) Pty Ltd

Date: 02 April 2019

Document: 01777

This technical note provides additional modelling results that supplement the original report: *Otway Basin Geophysical Operations Acoustic Modelling: Acoustic Modelling for Assessing Marine Fauna Sound Exposures* (McPherson and Wood 2017).

Tabulated ranges are provided to impact thresholds defined by NMFS (2018) for cetaceans and pinnipeds from operations involving the boomer and sub-bottom profiler (SBP) sound sources, and from the 450 in^3 vertical seismic profiling (VSP) array.

The sound exposure level (SEL) results for the different auditory classes of marine mammal are frequency-weighted in accordance with NMFS (2018); the weighting functions are described in Appendix A; peak pressure levels (PK) are unweighted.

Results are presented for the Boomer and SBP in Section 1, and for the VSP in Section 2, while Section 3 discusses potential alternative sources for the study.

1. Boomer and SBP

1.1. Impact ranges from PK for high-frequency cetaceans

The ranges to identified impact thresholds for high-frequency cetaceans from the PK levels of the Boomer and SBP are shown in Table 1. The threshold levels for the equivalent effect in low- and mid-frequency cetaceans are appreciably higher, and thus were not reached.

Table 1. Maximum ranges to identified impact thresholds due to PK levels defined by NMFS for high-frequency cetaceans from SBP and Boomer operations.

PK Threshold Level dB re 1 µPa	Effect	SBP Range (m)	Boomer AP3000 Range (m)
202	PTS	0.6	2.8
196	TTS	1.2	5.5

1.2. Maximum ranges to impact thresholds from SEL_{24h} for marine mammals

The ranges to recommended impact thresholds from the Boomer and SBP are presented in Table 2. In all cases, the frequency-weighted levels are not high enough to reach the impact thresholds except for TTS in low-frequency cetaceans; the maximum range in this case is 10 m from the acoustic centre of the source.

Table 2. Maximum ranges to identified impact thresholds due to frequency-weighted SEL_{24h} levels defined by NMFS from SBP and Boomer operations.

Auditory group	Effect	Frequency-weighted Threshold Level dB re 1 µPa²·s	Artisan Range (m)	G3 Range (m)	Meeki Range (m)	Thy Comb Range (m)
Low-frequency Cetaceans	PTS	183	—	—	—	—
	TTS	168	10	<10	<10	<10
Mid-frequency Cetaceans	PTS	185	—	—	—	—
	TTS	170	—	—	—	—
High-frequency Cetaceans	PTS	155	—	—	—	—
	TTS	140	—	—	—	—
Phocid pinnipeds	PTS	185	—	—	—	—
	TTS	170	—	—	—	—
Otariid pinnipeds	PTS	203	—	—	—	—
	TTS	188	—	—	—	—

2. VSP

The ranges to recommended impact thresholds resulting from the VSP are presented in Table 3. Results assume both stationary source and receivers. Results are frequency-weighted in accordance with NMFS (2018). Maximum ranges are shown for 1, 5, 10, 15, 25, 144, and 360 impulses within a 24-hour period. Ranges up to 2.5 km calculated using 1 m resolution modelling on 5 m resolution gridded sound fields; ranges greater 2.5 km calculated using 10 m resolution modelling on 25 m resolution gridded sound fields.

Table 3. Maximum ranges to identified impact thresholds due to frequency-weighted SEL_{24h} defined by NMFS from VSP operations assuming different numbers of impulses during a 24-hour period.

Auditory group	Effect	Frequency-weighted Threshold Level dB re 1 µPa²·s	Number of impulses						
			1 R_{max} (m)	5 R_{max} (m)	10 R_{max} (m)	15 R_{max} (m)	25 R_{max} (m)	144 R_{max} (m)	360 R_{max} (m)
Low-frequency Cetaceans	PTS	183	11	30	45	56	72	323	738
	TTS	168	81	335	625	924	1227	3051	4743
Mid-frequency Cetaceans	PTS	185	—	—	—	—	—	—	—
	TTS	170	—	—	—	—	—	<10	<10
High-frequency Cetaceans	PTS	155	—	—	—	<10	<10	18	32
	TTS	140	<10	21	29	36	51	149	256
Phocid pinnipeds	PTS	185	—	—	—	<10	<10	21	34
	TTS	170	<10	22	32	40	55	222	409
Otariid pinnipeds	PTS	203	—	—	—	—	—	—	—
	TTS	188	—	—	—	—	—	<10	14

3. Comparison of sources

Beach Energy solicited tenders for the geophysical survey, and received three responses which proposed alternative equipment to that considered in McPherson and Wood (2017). These three responses have been evaluated, with the findings summarised below.

The primary sources of concern are the boomer and sub-bottom profiler, with other the potential sources for this project such as multi-beam echo sounders and side-scan-sonars being high frequency devices only, with centre frequencies over 100 Hz. As no mid-frequency multi-beam sonars are being considered, the potential for overlap between marine fauna hearing ranges and multi-beam sonar signals of concern is extremely limited.

The proposed sub-bottom profiler is the Edgetech X-star system, which is the same source as considered in the modelling study. Alternative boomers suggested as potential sources instead of the AP3000 include the AA251, AA300 and AA301. The modelled AP3000 signature was based upon scaling the signature of an AA202 single boomer plate. The frequency spectrum components of these potential sources are very similar to the modelled AP3000, and they will also exhibit a similar beam pattern. The peak source pressure level of the alternative boomers is slightly higher than the AP3000, which has a peak source pressure level of 210.8 dB re 1 μPa^{2}m^2, with that for the AA251 being of 212 dB re 1 μPa^{2}m^2 and AA301's 215 dB re 1 μPa^{2}m^2. This results in slightly greater ranges to PK thresholds for high-frequency cetaceans (Table 4), however criteria for other mammal auditory groups are not reached. There is also an increase in distance to PK-PK sound levels of interest, however the resulting ranges are still small, with no PK-PK sound level applied in the impact assessment exceeded more than 18 m from the source (Table 5). However, as both the Boomer and SBP are both towed at 3 m, the maximum depth at which the sound level of 202 dB re 1 μPa will be reached will be 21 m. As the shallowest modelling site of interest (Artisan, Table 1 in McPherson and Wood (2017)) has a depth of 71 m, no PK-PK sound levels of interest for benthic invertebrates will be reached at the seafloor.

Despite the differences in peak source pressure level between the modelled and potential alternative boomers, there is estimated to be only a very minor change in the per-pulse source sound exposure level (SEL), partly due to the length of the impulse from these alternative sources. Due to minor changes expected in term of per-pulse SEL, the modelling results presented in McPherson and Wood (2017) for SEL$_{24h}$ are considered to be appropriate approximations of the potential sound fields and ranges to SEL$_{24h}$ impact criteria.

Table 4. Maximum ranges to identified impact thresholds due to PK levels defined by NMFS for high-frequency cetaceans for the modelled boomer (AP3000) and two potential alternative boomers.

PK Threshold level dB re 1 μPa	Effect	Boomer AP3000 Range (m)	Boomer AA251 Range (m)	Boomer AA301 Range (m)
202	PTS	2.8	3.2	4.5
196	TTS	5.5	6.3	8.9

Table 5. Maximum ranges to identified PK-PK sound levels for the modelled boomer (AP3000) and two potential alternative boomers.

PK-PK dB re 1 μPa	Boomer AP3000 Range (m)	Boomer AA251 Range (m)	Boomer AA301 Range (m)
215	2.4	2.8	3.9
212	3.4	3.9	5.5
210	4.3	4.9	7.0
209	4.8	5.5	7.8
205	7.6	8.7	12.4
202	10.8	12.4	17.5

References

[NMFS] National Marine Fisheries Service. 2018. *2018 Revision to: Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (Version 2.0): Underwater Thresholds for Onset of Permanent and Temporary Threshold Shifts*. U.S. Department of Commerce, NOAA. NOAA Technical Memorandum NMFS-OPR-59. 167 pp. https://www.fisheries.noaa.gov/webdam/download/75962998.

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Appendix A.

NMFS (2018) Frequency weighting functions

In 2015, a U.S. Navy technical report by Finneran (2015) recommended new auditory weighting functions. The auditory weighting functions for marine mammals are applied in a similar way as A-weighting for noise level assessments for humans. The new frequency-weighting functions are expressed as:

$$G(f) = K + 10\log_{10}\left\{\frac{(f/f_1)^{2a}}{[1+(f/f_1)^2]^a[1+(f/f_2)^2]^b}\right\} \tag{A-1}$$

Finneran (2015) proposed five functional hearing groups for marine mammals in water: low-, mid- and high-frequency cetaceans (LF, MF, and HF cetaceans, respectively), phocid pinnipeds, and otariid pinnipeds. The parameters for these frequency-weighting functions were further modified the following year (Finneran 2016) and were adopted in NOAA's technical guidance that assesses noise impacts on marine mammals (NMFS 2018). Table A-1 lists the frequency-weighting parameters for each hearing group. Figure A-1 shows the resulting frequency-weighting curves.

Table A-1. Parameters for the auditory weighting functions recommended by NMFS (2018).

Functional hearing group	***a***	***b***	**f_1 (Hz)**	**f_2 (Hz)**	**K (dB)**
Low-frequency cetaceans	1.0	2	200	19,000	0.13
Mid-frequency cetaceans	1.6	2	8,800	110,000	1.20
High-frequency cetaceans	1.8	2	12,000	140,000	1.36
Phocid pinnipeds in water	1.0	2	1,900	30,000	0.75
Otariid pinnipeds in water	2.0	2	940	25,000	0.64

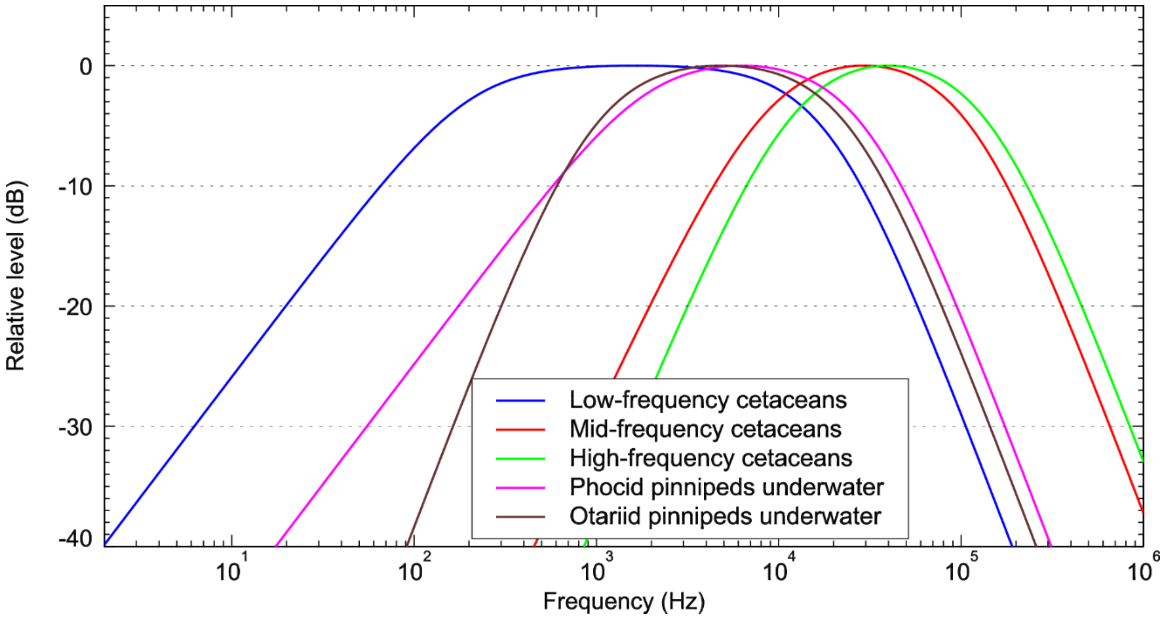

Figure A-1. Auditory weighting functions for the functional marine mammal hearing groups as recommended by NMFS (2018).

Appendix D JASCO Acoustic Modelling Report – Otway Development

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TECHNICAL ADDENDUM

DATE: 23 July 2021
FROM: Matthew Koessler, Craig McPherson (JASCO Applied Sciences (Australia) Pty Ltd)
TO: Phil Wemyss (Beach Energy)

SUBJECT: Beach Otway Project: Additional and Revised Modelling Study

1. Summary

JASCO Applied Sciences (JASCO) performed modelling study of underwater sound levels associated with the Beach Energy Otway Development, to supplement drilling and construction results previously presented in Koessler et al. (2020), Matthews et al. (2020) and Matthews et al. (2021).

The results have been revised due to better understanding of the propagation loss in the region gained through the validation monitoring of drilling operations at Artisan-1 McPherson et al. (2021). A significant finding of this study was lack of a thin layer of sand overlying the carbonate seabed structure near Artisan-1, which has a significant influence on propagation loss.

This monitoring project also characterised Monopole Source Levels (MSL) for project vessels (during transit and under dynamic positioning (DP)) and the *Ocean Onyx* Mobile Offshore Drilling Unit (MODU). These source levels are considered in the revised modelling.

Estimated underwater acoustic levels are presented as sound pressure levels (SPL, L_p), and as accumulated sound exposure levels (SEL, L_E) as appropriate for non-impulsive (continuous) noise sources. For the non-time dependent scenarios, the modelled maximum and 95th percentile distances to the marine mammal behavioural threshold based on the current interim NOAA (2019) criterion for marine mammals of 120 dB re 1 µPa (SPL; L_p) for non-impulsive sound sources are summarised in Table 1.

For the time-dependent scenarios, the modelled maximum distances to permanent threshold shift (PTS) and temporary threshold shift (TTS) criteria for low-frequency cetaceans (NMFS 2018), which are based on SEL accumulated over a period of time are summarised in Table 2.

Table 1. Maximum (R_{max}) and 95% ($R_{95\%}$) horizontal distances (in km) to sound pressure level (SPL) from the most appropriate location for considered sources per scenario. MCR: Maximum Continuous Rating, MODU: Mobile Offshore Drilling Unit, OSV: Offshore Supply Vessel, ROV: Remotely Operated Vehicle.

Scenario number	Well Area	Description	R_{max} (km)	$R_{95\%}$ (km)
A1	Thylacine North-1	MODU Drilling	1.24	1.12
A2		OSV under DP	7.1	6.5
A3		OSV Standby Transit	0.38	0.35
A4	Thylacine A	Platform Operations	0.20	0.19
A5	Thylacine North-1	MODU Drilling + OSV resupply	7.89	6.56
A7		MODU Drilling + OSV Standby Transit	1.32	1.19
1	Thylacine A	Platform Operations + OSV resupply	7.28	6.56
5		Platform Operations + OSV Standby	0.45	0.43
7	Thylacine North-1	Pipelay Vessel stationary (June), operating at 20% MCR	2.71	2.57
8		Pipelay Vessel stationary (November), operating at 20% MCR	2.70	2.55
11	Artisan-1	Pipelay Vessel stationary (June), operating at 20% MCR	2.27	2.09
12		Pipelay Vessel stationary (November), operating at 20% MCR	2.26	2.02
15	Thylacine North-1 + Geographe-4	Vessel stationary, operating at 20% MCR (Thylacine North-1) + Vessel stationary, operating at 20% MCR + ROV cutting tool (Geographe-4) (June)	2.98	2.76
16		Vessel stationary, operating at 20% MCR (Thylacine North-1) + Vessel stationary, operating at 20% MCR + ROV cutting tool (Geographe-4) (November)	2.97	2.73
17	Artisan-1 + Geographe-4	Vessel stationary, operating at 20% MCR (Artsian-1) + Vessel stationary, operating at 20% MCR + ROV cutting tool (Geographe-4) (June)	2.98	2.75
18		Vessel stationary, operating at 20% MCR (Artsian-1) + Vessel stationary, operating at 20% MCR + ROV cutting tool (Geographe-4) (November)	2.97	2.72
19	Thylacine North-1 + Thylacine A	MODU Drilling + Platform + OSV resupply	7.90	6.65
21		MODU Drilling + Platform + Skid installation	4.85	4.29

Table 2. Summary: Maximum (R_{max}) horizontal distances (in km) and ensonified area (km^2) for the frequency-weighted LF-cetacean SEL$_{24h}$ TTS thresholds based on NMFS (2018) from the most appropriate location for considered sources per scenario. MCR: Maximum Continuous Rating, MODU: Mobile Offshore Drilling Unit, OSV: Offshore Supply Vessel, ROV: Remotely Operated Vehicle.

Scenario number	Well Area	Description	R_{max} (km)	Area (km^2)
A1	Thylacine North-1	MODU Drilling	0.39	0.33
A2		OSV under DP	0.95	2.33
A3		OSV Standby Transit	–	–
A4	Thylacine A	Platform Operations	0.04	0.004
A5	Thylacine North-1	MODU Drilling + 4h OSV resupply	1.06	2.49
A6		MODU Drilling + 8h OSV resupply	1.31	4.39
A7		MODU Drilling + OSV Standby Transit	0.39	0.33
1	Thylacine A	Platform + 2h OSV resupply	0.75	1.31
2		Platform + 4h OSV resupply	0.95	2.30
3		Platform + 6h OSV resupply	1.11	3.15
4		Platform + 8h OSV resupply	1.25	4.01
5		Platform 8h + OSV Standby	0.04	0.004
6		Platform + 24h OSV Standby	0.04	0.004
7	Thylacine North-1	Pipelay Vessel stationary (June), operating at 20% MCR	0.60	1.04
8		Pipelay Vessel stationary (November), operating at 20% MCR	0.59	1.04
9		Pipelay Vessel laying pipe (June), operating at 20% MCR	1.18	13.62
10		Pipelay Vessel laying pipe (November), operating at 20% MCR	1.17	13.53
11	Artisan-1	Pipelay Vessel stationary (June), operating at 20% MCR	0.67	1.14
12		Pipelay Vessel stationary (November), operating at 20% MCR	0.67	1.12
13		Pipelay Vessel laying pipe (June), operating at 20% MCR	0.90	10.76
14		Pipelay Vessel laying pipe (November), operating at 20% MCR	0.90	10.69
15	Thylacine North-1 + Geographe-4	Vessel stationary, operating at 20% MCR (Thylacine North-1) + Vessel stationary, operating at 20% MCR + ROV cutting tool (Geographe-4) (June)	0.66	1.35
16		Vessel stationary, operating at 20% MCR (Thylacine North-1) + Vessel stationary, operating at 20% MCR + ROV cutting tool (Geographe-4) (November)	0.66	1.34
17	Artisan-1 + Geographe-4	Vessel stationary, operating at 20% MCR (Artsian-1) + Vessel stationary, operating at 20% MCR + ROV cutting tool (Geographe-4) (June)	0.67	1.35
18		Vessel stationary, operating at 20% MCR (Artsian-1) + Vessel stationary, operating at 20% MCR + ROV cutting tool (Geographe-4) (November)	0.67	1.33
19	Thylacine North-1 + Thylacine A	MODU Drilling + Platform + 4h OSV resupply	0.95	2.31
20		MODU Drilling + Platform + 8h OSV resupply	1.23	4.03
21		MODU Drilling + Platform + Skid installation	0.65	1.10

2. Introduction

JASCO Applied Sciences (JASCO) performed modelling study of underwater sound levels associated with the Beach Energy Otway Development, to supplement drilling and construction results previously presented in Koessler et al. (2020), Matthews et al. (2020) and Matthews et al. (2021).

The results have been revised due to better understanding of the propagation loss in the region gained through the validation monitoring of drilling operations at Artisan-1 McPherson et al. (2021) as described in Section 2.1. An overview of the modelling scenarios considered is provided in Section 2.2, with results presented in Section 4, and briefly discussed in Section 5.

For noise effect criteria and explanations on methodologies applied, refer to Koessler et al. (2020), Matthews et al. (2020), Matthews et al. (2021) and McPherson et al. (2021).

2.1. Validation Monitoring Study Summary

The monitoring study (McPherson et al. 2021) was completed in relation to the 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. Through this characterisation, validation of the modelling predictions used in Beach Energy Otway Environment Plans (EPs) for the development drilling activities was required.

The exploration well Artisan-1, drilled by the *Ocean Onyx*, was selected for the monitoring program because the predicted distances to thresholds for effects on marine mammals, including pygmy blue whales, were farthest at this location in the modelling study used for the EP (Koessler et al. 2020), as well as because it was the first well in the Otway drilling campaign.

Four JASCO Autonomous Multichannel Acoustic Recorders (AMARs) in C-lander moorings were deployed in February and retrieved in early April. Stations 1 through 4 were deployed at distances of 0.336, 1.13, 5.11, and 25 km from the *Ocean Onyx*. The AMARs recorded continuously at 24-bit resolution and 64 kHz sample rate for the entire deployment. The three stations closest to the *Ocean Onyx* were configured with a single hydrophone, whilst the station 25 km away was configured with three hydrophones to provide directional processing of received sounds.

To assist in the characterisation of *Ocean Onyx* and attendant support vessels, the vessels conducted specific activities under dynamic positioning and followed a nominated transit track between the *Ocean Onyx* and Geelong Supply Base. No specific operational requests were made of the *Ocean Onyx* and vessels during normal drilling activities due to the complexity of operationally meeting any requests. Over the course of the monitoring program, the MODU and support vessels engaged in different operational states with different uncontrollable contributors, such as variable drilling operations, resupply and support operations, weather conditions, and merchant shipping.

A summary of the findings of the monitoring study are described in the following sections.

Source Levels

The Monopole Source Levels determined through the measurement study differed from those either estimated for use in the modelling study or those determined using proxy sources. The key differences are as follows:

- The support vessels are quieter than estimated when they are under slow transit speeds, such as 7 knots.
- The support vessels are louder than estimated when they are travelling at faster transit speeds, with 9 knots used to represent these speeds and the associated MSL.
- The support vessels are louder than estimated when holding station or moving under dynamic positioning.
- The drilling operations of the *Ocean Onyx* are both louder at some frequencies and quieter at others than those for the proxy rig the *Polar Pioneer* (Austin et al. 2018), although the results presented for the *Polar*

Pioneer did not examine the changes in level with increased drilling depth (over time) as completed within this study.

Comparison of Results

The results from the measurement study could not be directly compared to the modelling presented in Koessler et al. (2020) due to the differences in actual events compared to the nominal representative scenarios developed and evaluated as part of the EP assessment process. Additionally, the measurements were obtained at a receiver located 1.2 m off the seafloor, which is not the maximum-over-depth results reported in the modelling study. The ranges obtained from the measurement study were reported in relation to the Artisan-1 well location, and thus the centre of the *Ocean Onyx*. The ranges in project related modelling studies are reported from a range of locations, including the centroids of multiple sources, thus it was not possible to report the measurement results in a similar fashion using the small number of recording locations used in this study.

Geological Environment Representation

Previous modelling studies for Beach Energy, Koessler et al. (2020), Matthews et al. (2020) and Matthews et al. (2021), used MONM with the assumption of a 1 m thick layer of sand overlaying the carbonate seabed structure at the Artisan-1 well location. This assumption was made due to the lack of available information, and is similar to other inshore work in the Otway Basin, such as (Duncan et al. 2012), who represented the shelf as two zones, an in-shore zone out to a water depth of about 70 m in which the sand layer has a thickness of between 4–10 m, and an off-shore zone of effectively bare calcarenite probably due to scouring by current and swell. The transition between these two zones is ill-defined due to a lack of datapoints, and lies close to the Artisan-1 location, and a balanced approach of assuming 1 m thick layer of sand overlaying the carbonate seabed structure was judged to be appropriate given available information.

The measurement study has increased the understanding of the geological environment in the region and indicates that the sand overlay is thinner (or non-existent) at shallower water depths. The different environment required the use of an alternate configuration of numerical models to represent the propagation loss.

Propagation Loss

The accuracy of the broadband calculated propagation loss for the Otway Basin continental shelf environment depends significantly upon the frequency content of the radiating sound source together with thickness of the sand layer on carbonate seabed (calcarenite) likely to occur within the region. In general, the thinner the sand layer, the greater the overall propagation loss.

When comparing SPL data fits for Stations 1–3 in McPherson et al. (2021), the loss rate is higher than what would have been expected in this environment, considering the higher monopole source levels for the support vessel on DP derived from trial measurements. The differences are likely attributable to the potential absence of a sand veneer.

Comparisons were conducted using JASCO’s Marine Operations Noise Model (MONM), a wide-angle parabolic equation model which applies the BELLHOP Gaussian beam acoustic ray-trace model at higher frequencies, and JASCO’s wavenumber integration model (VSTACK) which can fully account for the elasto-acoustic properties of the sub-bottom. The agreement between the models was excellent when only a comparatively thin (1 m thick) layer of sand overlies the carbonate seabed structure. In an environment such as this, MONM could have been used without correction. However, the comparisons indicate a much higher rates of loss, as would be expected if no (or only a very thin) sand layer were present.

A better understanding of the propagation loss environment, and the revision of the representation and treatment of it through the measurement study, enabled the modelling scenarios for the activities at Artisan-1 presented in Koessler et al. (2020) to be recalculated (Section 6.3 in McPherson et al. (2021)).

2.2. Scenario Details

The scenarios considered within this assessment are detailed below and in Table 3, with the associated modelling sites provided in Table 4. An overview of the scenarios is as follows:

1. Otway Offshore Project Development Drilling Campaign, Thylacine North-1 Operations:
    a. Mobile Offshore Drilling Unit (MODU) conducting normal drilling operations
    b. MODU with Offshore Supply Vessel (OSV) in attendance, standing by and conducting resupply operations under Dynamic Positioning (DP)
2. Otway Offshore Project Operations scenarios:
    1. Operations of the Thylacine platform (at Thylacine-A)
    2. OSV vessel resupply at Thylacine platform for periods of 2, 4, 6 and 8 hrs.
    3. OSV vessel on standby at Thylacine platform for periods of 8 and 24 hrs
4. Otway Offshore Project Construction scenarios: A single nominated pipelay/construction vessel, the Skandi Singapore, was considered for these scenarios. Each scenario was considered with a sound speed profiles for the ‘worst case over the year’ and for the period pygmy blue whales are present in the region, between November and January:
    a. Pipelay vessel (PLV) both stationary and laying pipe at Thylacine North-1 and Artisan-1 operating at 20% of its Maximum Continuous Rating (MCR).
    b. Pipelay vessel operating a Remotely Operated Vehicle (ROV) and cutting tool at Geographe-4. The vessel at Geographe-4 was also modelled operating at 20% of its Maximum Continuous Rating (MCR).
    c. Quantitively assess the combined sound levels of drilling activities and the construction vessel(s) at the emerging SRW aggregation area at Port Campbell. This scenario considered the drilling activities at Thylacine North-1 presented in Koessler et al. (2020) and the nominated construction vessel (Skandi Singapore) operating at Geographe-4.
5. Simultaneous assessment for drilling, operations and construction operations were considered for key scenarios:
    a. Drilling at Thylacine while doing Thylacine platform resupply
    b. Drilling at Thylacine while doing installation of Thylacine skid near Thylacine platform.

Table 3. Description of modelled scenarios. MCR: Maximum Continuous Rating, MODU: Mobile Offshore Drilling Unit, OSV: Offshore Supply Vessel, ROV: Remotely Operated Vehicle.

Scenario number	Well Name	Description	SSP Month	Modelled sites
A1	Thylacine North-1	MODU Drilling	June	1
A2		OSV under DP	June	2
A3		OSV Standby Transit	June	3
A4	Thylacine A	Platform Operations	June	4
A5	Thylacine North-1	MODU Drilling + 4h OSV resupply	June	1,2,3
A6		MODU Drilling + 8h OSV resupply	June	1,2,3
A7		MODU Drilling + OSV Standby Transit	June	1,3
1	Thylacine A	Platform + 2h OSV resupply	June	4,5
2		Platform + 4h OSV resupply	June	4,5
3		Platform + 6h OSV resupply	June	4,5
4		Platform + 8h OSV resupply	June	4,5
5		Platform 8h + OSV Standby	June	3,5
6		Platform + 24h OSV Standby	June	3,5
7	Thylacine North-1	Pipelay Vessel stationary, operating at 20% MCR	June	6
8		Pipelay Vessel stationary, operating at 20% MCR	November	6
9		Pipelay Vessel laying pipe, operating at 20% MCR	June	6
10		Pipelay Vessel laying pipe, operating at 20% MCR	November	6
11	Artisan-1	Pipelay Vessel stationary, operating at 20% MCR	June	7
12		Pipelay Vessel stationary, operating at 20% MCR	November	7
13		Pipelay Vessel laying pipe, operating at 20% MCR	June	7
14		Pipelay Vessel laying pipe, operating at 20% MCR	November	7
15	Thylacine North-1 + Geographe-4	Pipelay Vessel stationary, operating at 20% MCR (Thylacine North-1) + Vessel stationary, operating at 20% MCR + ROV cutting tool (Geographe-4)	June	6,8,9
16		Pipelay Vessel stationary, operating at 20% MCR (Thylacine North-1) + Vessel stationary, operating at 20% MCR + ROV cutting tool (Geographe-4)	November	6,8,9

Scenario number	Well Name	Description	SSP Month	Modelled sites
17	Artisan-1 + Geographe-4	Pipelay Vessel stationary, operating at 20% MCR (Artsian-1) + Vessel stationary, operating at 20% MCR + ROV cutting tool (Geographe-4)	June	7,8,9
18	Artisan-1 + Geographe-4	Vessel stationary, operating at 20% MCR (Pipelay Vessel -1) + Vessel stationary, operating at 20% MCR + ROV cutting tool (Geographe-4)	November	7,8,9
19	Thylacine North-1 + Thylacine A	MODU Drilling + Platform + 4h OSV resupply	June	1,4,5
20		MODU Drilling + Platform + 8h OSV resupply	June	1,4,5
21		MODU Drilling + Platform + Skid installation	June	1,4,6
22	Thylacine North-1 + Geographe-4	MODU Drilling + 8h OSV resupply (Thylacine North-1) + Vessel stationary, operating at 20% MCR + ROV cutting tool (Geographe-4)	June	1,2,3,8,9

Table 4. Location details for the modelled sites. MODU: Mobile Offshore Drilling Unit, OSV: Offshore Supply Vessel, PLV: Pipelay Vessel, ROV: Remotely Operated Vehicle, WHP: Well Head Platform

Well	Site	Source	Latitude (S)	Longitude (E)	MGA Zone 54 (GDA94)		Water depth (m)
					X (m)	*Y* (m)	
Thylacine North-1	1	MODU	39° 12.51001'	142° 52.49601'	661882	5658411	99.1
	2	OSV	39° 12.48903'	142° 53.88508'	663882	5658408	99.1
	3	OSV standby	39° 12.50986'	142° 52.54039'	661946	5658410	99.2
Thylacine A	4	WHP	39° 14.40200'	142° 54.60100'	664838	5654848	102.4
	5	OSV	39° 14.40059'	142° 54.64574'	664902	5654849	102.3
Thylacine North-1	6	PLV	39° 12.51001'	142° 52.49601'	661882	5658411	99.1
Artisan-1	7	PLV	38° 53.45684'	142° 52.97408'	663300	5693640	71.5
Geographe-4	8	PLV	39° 6.49400'	142° 57.06700'	668700	5669400	85.0
	9	*ROV Cutting Tool*	39° 6.49400'	142° 57.06700'	668700	5669400	85.0
Thylacine North-1	10	OSV	39° 14.40200'	142° 54.60100'	664838	5654848	102.4

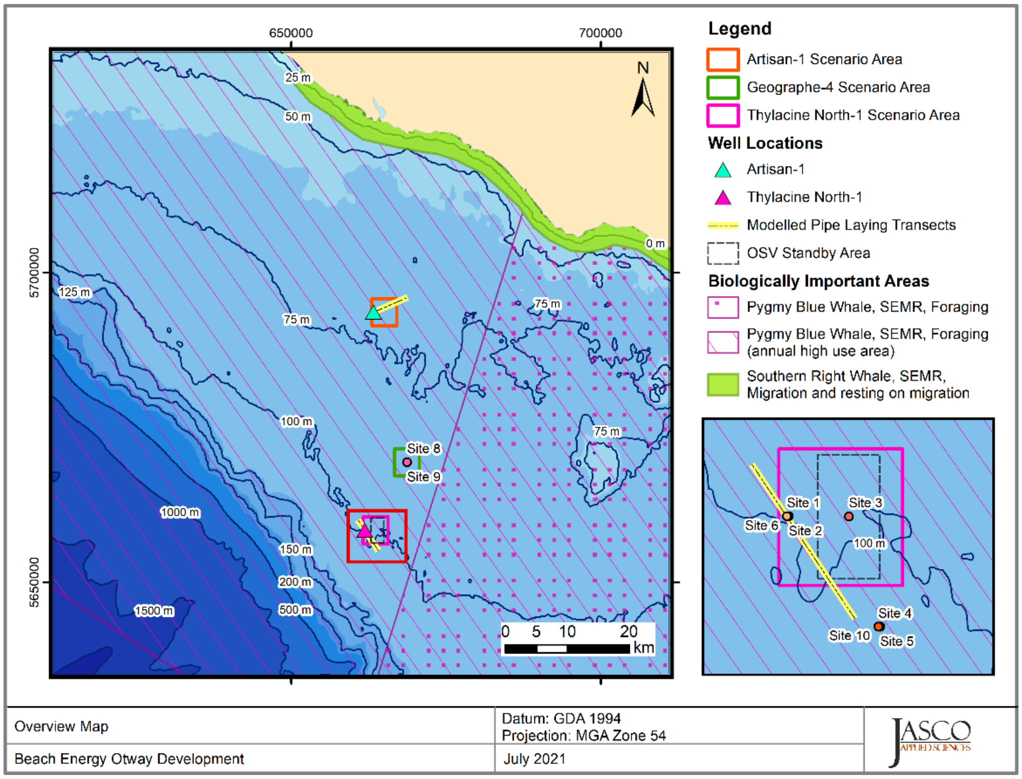


Figure 1. Overview of the modelled area (focus on Thylacine North-1 Scenario Area) and local features within the South East Marine Region (SEMR).

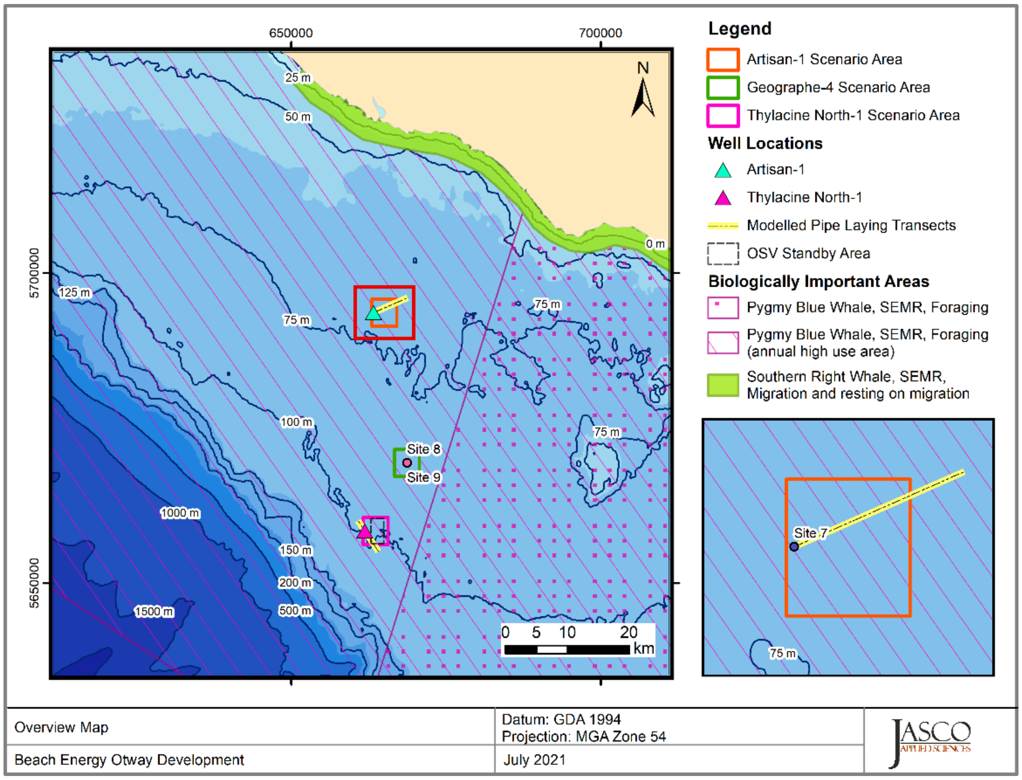


Figure 2. Overview of the modelled area (focus on Artisan-1 Scenario Area) and local features within the South East Marine Region (SEMR).

3. Methods and Parameters

A details description of the employed modelling method and input parameters can be found in refer to Koessler et al. (2020), Matthews et al. (2020), Matthews et al. (2021), Connell et al. (2021) and McPherson et al. (2021). A brief a summary of key elements used in this addendum are provided as follows.

The measured monopole source levels (MSLs) and spectra for the MODU and OSV were used here from McPherson et al. (2021):

- For the MODU drilling, mean levels from Section 5.5.1 in McPherson et al. (2021) were used.
- For scenarios where the OSV was under dynamic positioning (DP) the average spectrum from Section 5.5.2 in McPherson et al. (2021) was used.
- For scenarios where the OSV was transiting or standing by the average slow transit (7 knots) spectrum in McPherson et al. (2021) was used.

For the construction phase scenarios, estimates of the energy source levels (ESLs) for the pipelay/construction vessel were based on the specifications of the *Skandi Singapore* and a ESL derived from recordings of the TechnipFMC flexible lay and construction vessel *Deep Orient*. The specifications of proxy vessel and details on scaling can be found in Matthews et al. (2020), Matthews et al. (2021) and Connell et al. (2021).

Fixed structures such as the WHP have lower radiated sound levels than floating platforms (Spence et al. 2007). Equipment operating onboard floating platforms can contribute to marine environment sound however, airborne and structure-borne (vibration) pathways are considered more significant on these facilities, where equipment can be located below the water line. Underwater noise produced from platforms standing on metal jack-up legs is relatively low given the small surface areas available for sound transmission and also given the location of machinery above the waterline. It is therefore expected that the dominant pathway for sound generation is structure-borne (i.e., vibration from machinery passing through the legs) (Spence et al. 2007).

A study involving the Endeavour Jack-up Rig, operating in Cook Inlet, was conducted by Illingworth and Rodkin (2014) during drilling activities. The results from the sound source verification indicated that sound generated from drilling or generators were below ambient sound levels. The generators used on the Endeavour are mounted on pedestals specifically to reduce sound transfer through the infrastructure, and they are enclosed in an insulated engine room, which may have reduced further underwater sound transmission to levels below those generated by the Spartan 151. The sound source verification revealed that the submersed deep-well pumps that charge the fire-suppression system and cool the generators (in a closed water system) were the most likely dominant contributor the sound field. The measurements are reported as near-source levels recorded close to the bow leg pump system (at 10 m range) (Figure 3-5 in Illingworth and Rodkin Inc. (2014). These were backpropagated using spherical spreading to determine an energy source level (ESL) spectrum. Considering the similarities between a Jack-up Rig and a static WHP the decidecade band spectrum is shown in Figure 3 was used in modelling noise emissions from the Thylacine-A platform.

Furthermore, as discussed by (McPherson et al. 2021) and discussed above in Section 2.1, significant rates of propagation loss were found when analysing the data from the measurement study. As part of the model-measurement validation an adjustment factor was applied broadband received level predictions to account for the loss associated with a cemented limestone seabed (calcarenite) (Section 6.2 in McPherson et al. (2021)). A similar adjustment, which only differed by accounting for sources in different water depths, was applied to broadband level predictions in this addendum as a very similar type of seabed environment is expected at the Thylacine scenario area

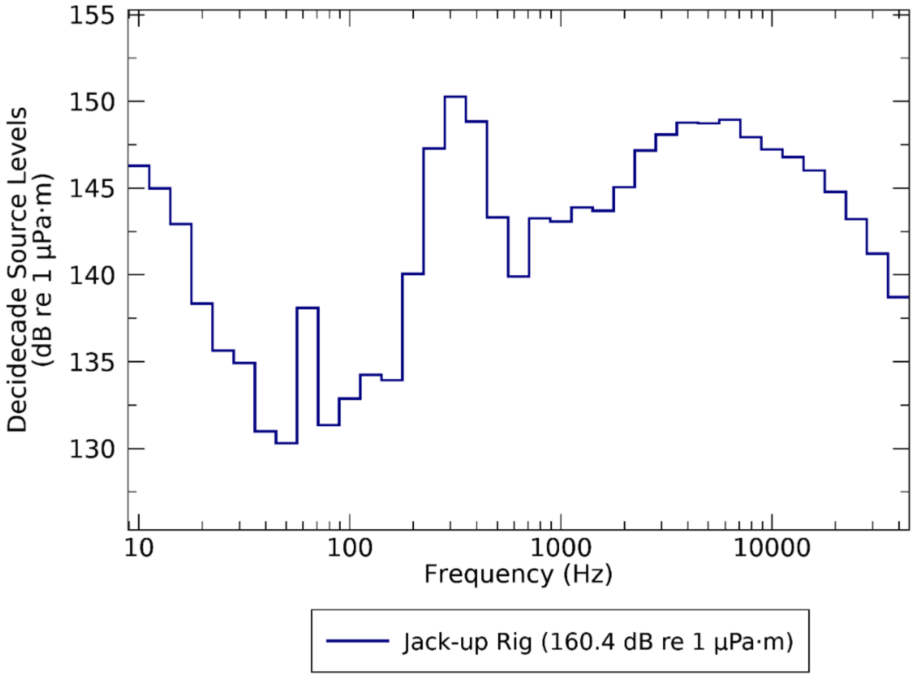


Figure 3. Energy source level (ESL) spectra (in decidecade frequency-band) for the Jack-up Rig considered as a proxy source for the Thylacine WHP.

4. Results

For the considered scenarios (described in Section 2.2), the maximum-over-depth sound fields for the modelled scenarios are presented below in two formats: as tables of distances to sound levels and, where the distances are long enough, as contour maps showing the directivity and distance to various sound levels. Distances to isopleths/thresholds were reported from either the centroid of several sources or from the most dominant single source. When an isopleth completely envelopes multiple sources the centroid was used. When several closed isopleths exist the most dominant source was used.

Tables 5–7 present the maximum and 95% distances (defined in Appendix B.1) to SPL isopleths. Since the SPL metric does not depend on the duration of the operation, these estimates are valid for both, stationary and non-stationary scenarios. Tables 9–14 present the distances to frequency-weighted SEL$_{24h}$ threshold, as well as the total ensonified area for all scenarios.

The maximum-over-depth sound fields for nine scenarios (described in Section were extracted at the emerging SRW aggregation area at Port Campbell, and can be compared to the 120 dB re 1 µPa threshold for marine mammal behavioural response to continuous noise (NOAA 2019).

4.1. Tabulated Results

Table 5. *Scenarios A1–A7:* Maximum (*R_{max}*) and 95% (*$R_{95\%}$*) horizontal distances (in km) to sound pressure level (SPL) from the most appropriate location for considered sources per scenarioA dash indicates the level was not reached within the limits of the modelling resolution (20 m). MODU: Mobile Offshore Drilling Unit, OSV: Offshore Supply Vessel, DP: Dynamic Positioning.

SPL (L_p; dB re 1 µPa)	**MODU Drilling (Scenario A1)**		**OSV under DP (Scenario A2)**		**OSV Standby Transit (Scenario A3)**		**Platform (Scenario A4)**		**MODU Drilling and OSV Resupply (Scenario A5)**		**MODU Drilling and OSV Standby (Scenario A7)**	
	R_{max} (km)	$R_{95\%}$ (km)	R_{max} (km)	$R_{95\%}$ (km)	R_{max} (km)	$R_{95\%}$ (km)	R_{max} (km)	$R_{95\%}$ (km)	R_{max} (km)	$R_{95\%}$ (km)	R_{max} (km)	$R_{95\%}$ (km)
180	–	–	–	–	–	–	–	–	0.05	0.05	–	–
170[A]	–	–	–	–	–	–	–	–	0.05	0.05	–	–
160	–	–	0.08	0.08	–	–	–	–	0.11	0.10	–	–
158[B]	–	–	0.13	0.12	–	–	–	–	0.15	0.15	–	–
150	–	–	0.32	0.31	–	–	–	–	0.36	0.31	–	–
140	0.09	0.09	0.87	0.81	–	–	–	–	0.88	0.82	0.09	0.09
130	0.38	0.35	2.3	2.15	0.17	0.16	–	–	2.51	2.18	0.38	0.35
120[C]	1.24	1.12	7.10	6.50	0.38	0.35	0.20	0.19	7.89	6.56	1.32	1.19
110	3.90	3.53	21.1	17.6	1.03	0.97	0.57	0.54	21.1	17.8	4.96	4.45

[A] 48 h threshold for recoverable injury for fish with a swim bladder involved in hearing (Popper et al. 2014).

[B] 12 h threshold for TTS for fish with a swim bladder involved in hearing (Popper et al. 2014).

[C] Threshold for marine mammal behavioural response to continuous noise (NOAA 2019).

Table 6. *Scenarios 1–11:* Maximum (R_{max}) and 95% ($R_{95\%}$) horizontal distances (in km) to sound pressure level (SPL) from the most appropriate location for considered sources per scenario. A dash indicates the level was not reached within the limits of the modelling resolution (20 m). OSV: Offshore Supply Vessel, PLV: Pipelay Vessel.

SPL (L_p; dB re 1 µPa)	**Platform and OSV resupply (Scenario 1)**		**Platform and OSV standby (Scenario 5)**		**PLV stationary, Thylacine**				**PLV stationary, Artisan**			
					June (Scenario 7)		**November (Scenario 8)**		**June (Scenario 11)**		**November (Scenario 12)**	
	R_{max} (km)	$R_{95\%}$ (km)	R_{max} (km)	$R_{95\%}$ (km)	R_{max} (km)	$R_{95\%}$ (km)	R_{max} (km)	$R_{95\%}$ (km)	R_{max} (km)	$R_{95\%}$ (km)	R_{max} (km)	$R_{95\%}$ (km)
180	–	–	–	–	–	–	–	–	–	–	–	–
170[A]	–	–	–	–	–	–	–	–	–	–	–	–
160	0.08	0.08	–	–	–	–	–	–	–	–	–	–
158[B]	0.14	0.09	–	–	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
150	0.28	0.27	–	–	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09
140	0.85	0.80	–	–	0.33	0.32	0.33	0.32	0.29	0.29	0.29	0.29
130	2.48	2.18	0.17	0.16	0.95	0.85	0.94	0.84	0.87	0.80	0.87	0.80
120[C]	7.31	6.56	0.45	0.43	2.71	2.57	2.70	2.55	2.27	2.09	2.26	2.02
110	21.2	17.6	1.02	0.98	8.29	6.72	8.29	6.55	4.95	4.67	4.91	4.65

[A] 48 h threshold for recoverable injury for fish with a swim bladder involved in hearing (Popper et al. 2014).
[B] 12 h threshold for TTS for fish with a swim bladder involved in hearing (Popper et al. 2014).
[C] Threshold for marine mammal behavioural response to continuous noise (NOAA 2019).

Table 7. *Scenarios 15–21:* Maximum (R_{max}) and 95% ($R_{95\%}$) horizontal distances (in km) to sound pressure level (SPL) from the most appropriate location for considered sources per scenario. A dash indicates the level was not reached within the limits of the modelling resolution (20 m). MODU: Mobile Offshore Drilling Unit, OSV: Offshore Supply Vessel, PLV: Pipelay Vessel, ROV: Remotely Operated Vehicle.

SPL (L_p; dB re 1 µPa)	**PLV stationary, at Thylacine and ROV Operations at Geographe-4**				**PLV stationary, at Artisan and ROV Operations at Geographe-4**				**MODU Drilling, Platform and OSV resupply**		**MODU Drilling, Platform and Skid Installation**	
	June (Scenario 15)		**November (Scenario 16)**		**June (Scenario 17)**		**November (Scenario 18)**		**(Scenario 19)**		**(Scenario 21)**	
	R_{max} (km)	$R_{95\%}$ (km)	R_{max} (km)	$R_{95\%}$ (km)	R_{max} (km)	$R_{95\%}$ (km)	R_{max} (km)	$R_{95\%}$ (km)	R_{max} (km)	$R_{95\%}$ (km)	R_{max} (km)	$R_{95\%}$ (km)
180	–	–	–	–	–	–	–	–	–	–	–	–
170[A]	–	–	–	–	–	–	–	–	–	–	–	–
160	–	–	–	–	–	–	–	–	0.08	0.08	–	–
158[B]	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.14	0.09	0.04	0.04
150	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.28	0.27	0.09	0.09
140	0.32	0.31	0.32	0.31	0.32	0.31	0.32	0.31	0.85	0.80	0.31	0.30
130	0.91	0.86	0.91	0.84	0.91	0.86	0.91	0.84	2.48	2.18	0.85	0.83
120[C]	2.98	2.76	2.97	2.73	2.98	2.75	2.97	2.72	7.90	6.65	4.85	4.29
110	11.3	8.64	11.3	8.70	7.14	6.14	7.11	6.01	21.2	17.7	9.42	7.80

[A] 48 h threshold for recoverable injury for fish with a swim bladder involved in hearing (Popper et al. 2014).

[B] 12 h threshold for TTS for fish with a swim bladder involved in hearing (Popper et al. 2014).

[C] Threshold for marine mammal behavioural response to continuous noise (NOAA 2019).

Table 8. Received SPL at the Port Campbell SRW receiver for relevant scenarios.

Scenario	**Description**	**Location(s)**	**SPL (Lp; dB re 1 µPa) at Port Campbell SRW Receiver**
22	MODU Drilling + 8h OSV resupply (Thylacine North-1) + Vessel stationary, operating at 20% MCR + ROV cutting tool (Geographe-4)	Thylacine North-1 + Geographe-4	93.8

Table 9. *Scenarios A1-A7:* Maximum (R_{max}) horizontal distances (in km) to frequency-weighted SEL_{24h} PTS and TTS thresholds based on NMFS (2018) and Finneran et al. (2017) from the most appropriate location for considered sources per scenario, and ensonified area (km^2). A dash indicates the level was not reached within the limits of the modelling resolution (20 m). MODU: Mobile Offshore Drilling Unit, OSV: Offshore Supply Vessel.

Hearing group	**SEL_{24h} threshold** ($L_{E,24h}$; dB re 1 µPa²·s)†	**MODU Drilling (Scenario A1)**		**OSV under DP (Scenario A2)**		**OSV Standby Transit (Scenario A3)**		**Platform (Scenario A4)**		**MODU Drilling and 4h OSV resupply (Scenario A5)**		**MODU Drilling and 8h OSV resupply (Scenario A6)**		**MODU Drilling and OSV Standby Transit (Scenario A7)**	
		R_{max} (km)	Area (km^2)	R_{max} (km)	Area (km^2)	R_{max} (km)	Area (km^2)	R_{max} (km)	Area (km^2)	R_{max} (km)	Area (km^2)	R_{max} (km)	Area (km^2)	R_{max} (km)	Area (km^2)
PTS															
LF cetaceans	199	0.03	0.004	0.09	0.03	–	–	0.02	0.001	0.12	0.03	0.18	0.08	0.06	0.004
MF cetaceans	198	0.02	0.001	0.02	0.001	–	–	0.02	0.001	0.05	0.002	0.05	0.002	0.04	0.001
HF cetaceans	173	0.23	0.16	0.06	0.01	–	–	0.03	0.004	0.26	0.16	0.26	0.17	0.26	0.16
Phocid seals	201	0.02	0.001	0.03	0.003	–	–	0.02	0.001	0.05	0.004	0.07	0.01	0.04	0.001
Otariid seals	219	–	–	–	–	–	–	–	–	0.03	0.001	0.05	0.001	–	–
Turtles	220	–	–	0.02	0.001	–	–	–	–	0.05	0.002	0.05	0.002	–	–
TTS															
LF cetaceans	179	0.39	0.33	0.95	2.33	–	–	0.04	0.004	1.06	2.49	1.31	4.39	0.39	0.33
MF cetaceans	178	0.13	0.06	0.06	0.01	–	–	0.03	0.003	0.16	0.06	0.16	0.07	0.13	0.06
HF cetaceans	153	1.12	3.22	0.47	0.69	–	–	0.30	0.28	1.16	3.71	1.16	3.99	1.12	3.22
Phocid seals	181	0.12	0.04	0.28	0.24	–	–	0.03	0.00	0.32	0.27	0.46	0.55	0.12	0.04
Otariid seals	199	0.02	0.001	0.04	0.01	–	–	0.02	0.001	0.07	0.01	0.09	0.01	0.02	0.001
Turtles	200	0.02	0.002	0.07	0.02	–	–	0.02	0.001	0.10	0.02	0.16	0.06	0.02	0.002

Table 10. *Scenarios 1–6:* Maximum (R_{max}) horizontal distances (in km) to frequency-weighted SEL$_{24h}$ PTS and TTS thresholds based on NMFS (2018) and Finneran et al. (2017) from the most appropriate location for considered sources per scenario, and ensonified area (km^2). A dash indicates the level was not reached within the limits of the modelling resolution (20 m), OSV: Offshore Supply Vessel.

Hearing group	**SEL$_{24h}$ threshold** ($L_{E,24h}$; dB re 1 µPa^2·s)†	**Platform and OSV resupply 2 h (Scenario 1)**		**Platform and OSV resupply 4 h (Scenario 2)**		**Platform and OSV resupply 6 h (Scenario 3)**		**Platform and OSV resupply 8 h (Scenario 4)**		**Platform and OSV 8h standby (Scenario 5)**		**Platform and OSV 24h standby (Scenario 6)**	
		R_{max} (km)	Area (km^2)	R_{max} (km)	Area (km^2)	R_{max} (km)	Area (km^2)	R_{max} (km)	Area (km^2)	R_{max} (km)	Area (km^2)	R_{max} (km)	Area (km^2)
PTS													
LF cetaceans	199	0.10	0.02	0.12	0.03	0.14	0.04	0.18	0.07	0.02	0.001	0.02	0.001
MF cetaceans	198	0.05	0.001	0.05	0.001	0.05	0.002	0.05	0.002	0.02	0.001	0.02	0.001
HF cetaceans	173	0.08	0.01	0.09	0.02	0.10	0.02	0.11	0.02	0.03	0.004	0.03	0.004
Phocid seals	201	0.05	0.002	0.06	0.004	0.06	0.01	0.08	0.01	0.02	0.001	0.02	0.001
Otariid seals	219	–	–	–	–	–	–	–	–	–	–	–	–
Turtles	220	–	–	–	–	0.04	0.001	0.04	0.001	–	–	–	–
TTS													
LF cetaceans	179	0.75	1.31	0.95	2.30	1.11	3.15	1.25	4.01	0.04	0.004	0.04	0.004
MF cetaceans	178	0.06	0.01	0.08	0.01	0.09	0.02	0.10	0.02	0.03	0.003	0.03	0.003
HF cetaceans	153	0.45	0.60	0.52	0.79	0.60	1.05	0.63	1.17	0.30	0.28	0.30	0.28
Phocid seals	181	0.23	0.12	0.30	0.24	0.37	0.36	0.43	0.46	0.03	0.00	0.03	0.00
Otariid seals	199	0.06	0.004	0.07	0.01	0.08	0.01	0.08	0.01	0.02	0.001	0.02	0.001
Turtles	200	0.08	0.01	0.10	0.02	0.11	0.02	0.17	0.04	0.02	0.001	0.02	0.001

Table 11. *Scenarios 7–10:* Maximum (R_{max}) horizontal distances (in km) to frequency-weighted SEL$_{24h}$ PTS and TTS thresholds based on NMFS (2018) and Finneran et al. (2017) from the most appropriate location for considered sources per scenario, and ensonified area (km^2). A dash indicates the level was not reached within the limits of the modelling resolution (20 m), PLV: Pipelay Vessel.

Hearing group	**SEL$_{24h}$ threshold** ($L_{E,24h}$; dB re 1 $\mu Pa^2 \cdot s$)†	**PLV stationary, at Thylacine**				**PLV laying pipe, at Thylacine**			
		June (Scenario 7)		**November (Scenario 8)**		**June (Scenario 9)**		**November (Scenario 10)**	
		R_{max} (km)	Area (km^2)	R_{max} (km)	Area (km^2)	R_{max} (km)	Area (km^2)	R_{max} (km)	Area (km^2)
PTS									
LF cetaceans	199	0.06	0.01	0.06	0.01	0.02	0.21	0.02	0.21
MF cetaceans	198	0.02	0.001	0.02	0.001	0.01	0.02	0.01	0.02
HF cetaceans	173	0.09	0.03	0.09	0.03	0.03	0.37	0.03	0.36
Phocid seals	201	0.02	0.001	0.02	0.001	0.01	0.14	0.01	0.14
Otariid seals	219	–	–	–	–	–	–	–	–
Turtles	220	0.02	0.001	0.02	0.001	–	–	–	–
TTS									
LF cetaceans	179	0.60	1.04	0.59	1.04	1.18	13.62	1.17	13.53
MF cetaceans	178	0.07	0.02	0.07	0.02	0.02	0.22	0.02	0.22
HF cetaceans	153	0.84	2.02	0.70	1.36	1.19	15.04	1.46	16.02
Phocid seals	181	0.19	0.12	0.19	0.12	0.13	1.54	0.13	1.54
Otariid seals	199	0.02	0.001	0.02	0.001	0.01	0.15	0.01	0.15
Turtles	200	0.08	0.02	0.08	0.02	0.02	0.27	0.02	0.27

Table 12. *Scenarios 11–14:* Maximum (R_{max}) horizontal distances (in km) to frequency-weighted SEL$_{24h}$ PTS and TTS thresholds based on NMFS (2018) and Finneran et al. (2017) from the most appropriate location for considered sources per scenario, and ensonified area (km^2). A dash indicates the level was not reached within the limits of the modelling resolution (20 m), PLV: Pipelay Vessel.

Hearing group	**SEL$_{24h}$ threshold** ($L_{E,24h}$; dB re 1 µPa²·s)†	**PLV stationary, at Artisan**				**PLV laying pipe, at Artisan**			
		June (Scenario 11)		**November (Scenario 12)**		**June (Scenario 13)**		**November (Scenario 14)**	
		R_{max} (km)	Area (km^2)	R_{max} (km)	Area (km^2)	R_{max} (km)	Area (km^2)	R_{max} (km)	Area (km^2)
PTS									
LF cetaceans	199	0.06	0.01	0.06	0.01	0.02	0.25	0.02	0.25
MF cetaceans	198	0.01	0.001	0.01	0.001	–	–	–	–
HF cetaceans	173	0.09	0.03	0.09	0.03	0.03	0.37	0.03	0.37
Phocid seals	201	0.02	0.001	0.02	0.001	0.02	0.13	0.02	0.13
Otariid seals	219	–	–	–	–	–	–	–	–
Turtles	220	0.01	0.001	0.01	0.001	–	–	–	–
TTS									
LF cetaceans	179	0.67	1.14	0.67	1.12	0.90	10.76	0.90	10.69
MF cetaceans	178	0.07	0.02	0.07	0.02	0.03	0.30	0.03	0.30
HF cetaceans	153	0.77	1.60	0.62	1.18	0.95	11.92	0.91	10.68
Phocid seals	181	0.19	0.11	0.19	0.11	0.12	1.36	0.12	1.36
Otariid seals	199	0.02	0.001	0.02	0.001	0.02	0.22	0.02	0.22
Turtles	200	0.07	0.02	0.07	0.02	0.03	0.29	0.03	0.29

Table 13. *Scenarios 15–18:* Maximum (R_{max}) horizontal distances (in km) to frequency-weighted SEL_{24h} PTS and TTS thresholds based on NMFS (2018) and Finneran et al. (2017) from the most appropriate location for considered sources per scenario, and ensonified area (km^2). A dash indicates the level was not reached within the limits of the modelling resolution (20 m), PLV: Pipelay Vessel, ROV: Remotely Operated Vehicle.

Hearing group	**SEL_{24h} threshold** ($L_{E,24h}$; dB re 1 µPa²·s)†	**PLV stationary, at Thylacine and ROV Operations at Geographe-4**				**PLV stationary, at Artisan and ROV Operations at Geographe-4**			
		June (Scenario 15)		**November (Scenario 16)**		**June (Scenario 17)**		**November (Scenario 18)**	
		R_{max} (km)	Area (km^2)	R_{max} (km)	Area (km^2)	R_{max} (km)	Area (km^2)	R_{max} (km)	Area (km^2)
PTS									
LF cetaceans	199	0.06	0.01	0.06	0.01	0.06	0.01	0.06	0.01
MF cetaceans	198	0.02	0.001	0.02	0.001	0.02	0.001	0.02	0.001
HF cetaceans	173	0.12	0.04	0.11	0.04	0.12	0.04	0.11	0.04
Phocid seals	201	0.02	0.001	0.02	0.001	0.02	0.001	0.02	0.001
Otariid seals	219	0.01	0.001	0.01	0.001	0.01	0.001	0.01	0.001
Turtles	220	0.02	0.001	0.02	0.001	0.01	0.001	0.01	0.001
TTS									
LF cetaceans	179	0.66	1.35	0.66	1.34	0.67	1.35	0.67	1.33
MF cetaceans	178	0.09	0.03	0.09	0.03	0.09	0.03	0.09	0.03
HF cetaceans	153	0.87	2.37	0.83	1.93	0.87	2.37	0.83	1.93
Phocid seals	181	0.19	0.12	0.19	0.12	0.19	0.11	0.19	0.11
Otariid seals	199	0.02	0.001	0.02	0.001	0.02	0.001	0.02	0.001
Turtles	200	0.08	0.02	0.08	0.02	0.08	0.02	0.08	0.02

Table 14. *Scenarios 19–21:* Maximum (R_{max}) horizontal distances (in km) to frequency-weighted SEL_{24h} PTS and TTS thresholds based on NMFS (2018) and Finneran et al. (2017) from the most appropriate location for considered sources per scenario, and ensonified area (km^2). A dash indicates the level was not reached within the limits of the modelling resolution (20 m). MODU: Mobile Offshore Drilling Unit, OSV: Offshore Supply Vessel.

Hearing group	**SEL_{24h} threshold** ($L_{E,24h}$; dB re 1 µPa²·s)†	**MODU Drilling, Platform and 4 h OSV resupply (Scenario 19)**		**MODU Drilling, Platform and 8 h OSV resupply (Scenario 20)**		**MODU Drilling, Platform and Skid Installation (Scenario 21)**	
		R_{max} (km)	Area (km^2)	R_{max} (km)	Area (km^2)	R_{max} (km)	Area (km^2)
PTS							
LF cetaceans	199	0.09	0.03	0.15	0.07	0.06	0.01
MF cetaceans	198	0.04	0.001	0.04	0.001	0.04	0.001
HF cetaceans	173	0.26	0.16	0.26	0.16	0.26	0.16
Phocid seals	201	0.04	0.004	0.05	0.008	0.04	0.001
Otariid seals	219	–	–	–	–	–	–
Turtles	220	–	–	0.03	0.001	0.03	0.001
TTS							
LF cetaceans	179	0.95	2.31	1.23	4.03	0.65	1.10
MF cetaceans	178	0.16	0.06	0.16	0.06	0.16	0.06
HF cetaceans	153	1.15	3.25	1.15	3.26	1.15	3.26
Phocid seals	181	0.28	0.24	0.41	0.46	0.18	0.09
Otariid seals	199	0.04	0.005	0.06	0.011	0.04	0.001
Turtles	200	0.08	0.02	0.15	0.04	0.08	0.02

4.2. Sound Field Maps

4.2.1. SPL Maps

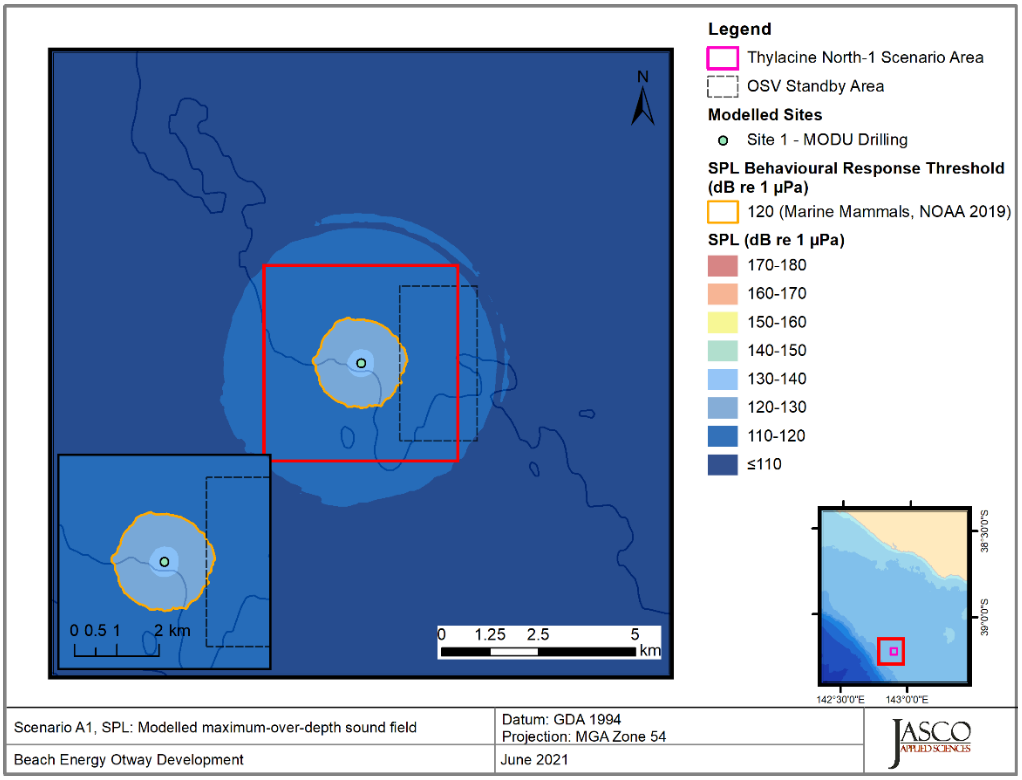


Figure 4. *Thylacine North-1, MODU Drilling (Scenario A1) SPL:* Sound level contour map, showing unweighted maximum over-depth SPL results. Isopleth for marine mammal (120 dB re 1 µPa) behavioural criteria is shown as an orange contour line.

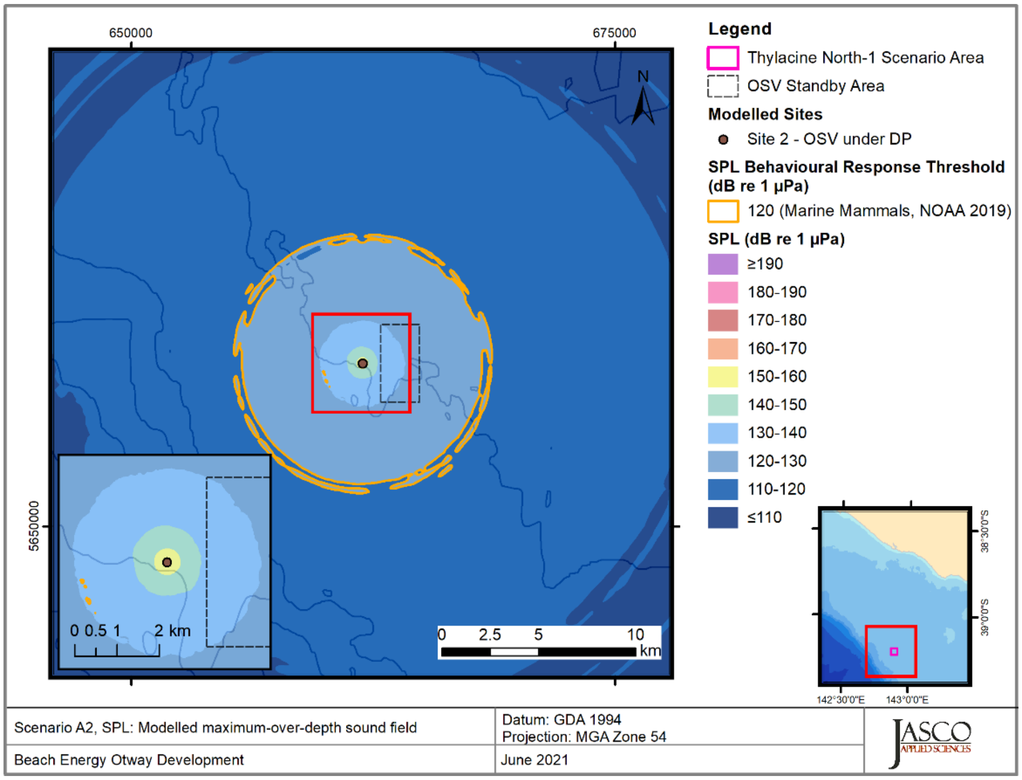


Figure 5. *Thylacine North-1, OSV on DP (Scenario A2) :* Sound level contour map, showing unweighted maximum over-depth SPL results. Isopleth for marine mammal (120 dB re 1 µPa) behavioural criteria is shown as an orange contour line.

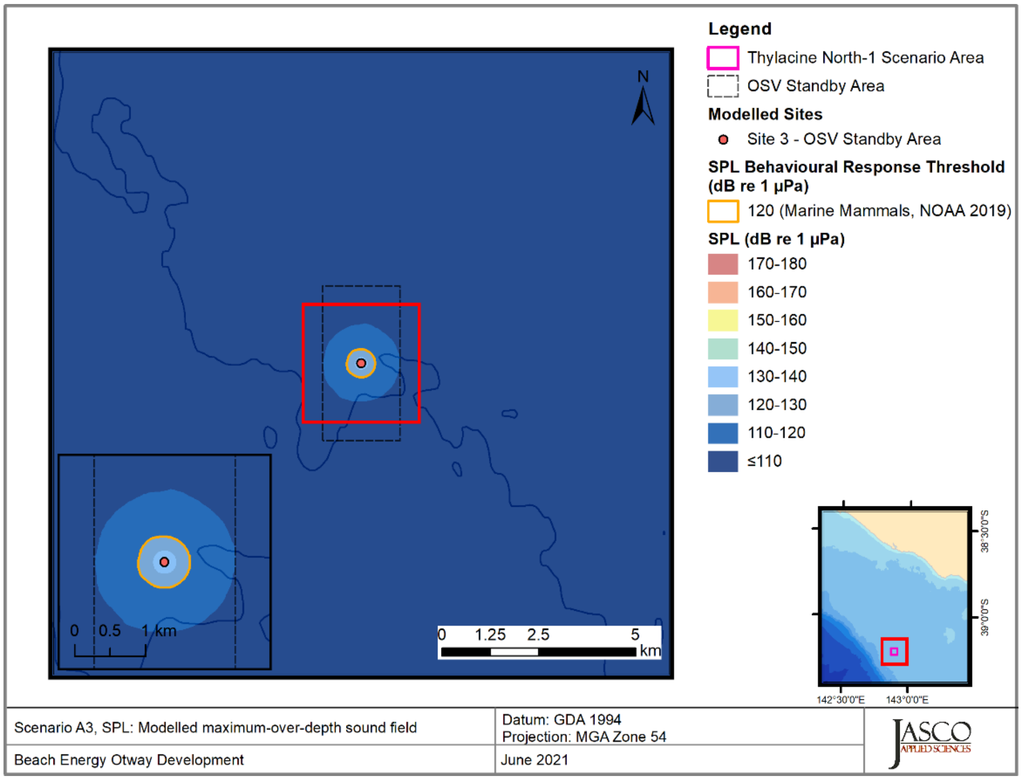


Figure 6. *Thylacine North-1, OSV Standby (Scenario A3) SPL:* Sound level contour map, showing unweighted maximum over-depth SPL results. Isopleth for marine mammal (120 dB re 1 µPa) behavioural criteria is shown as an orange contour line.

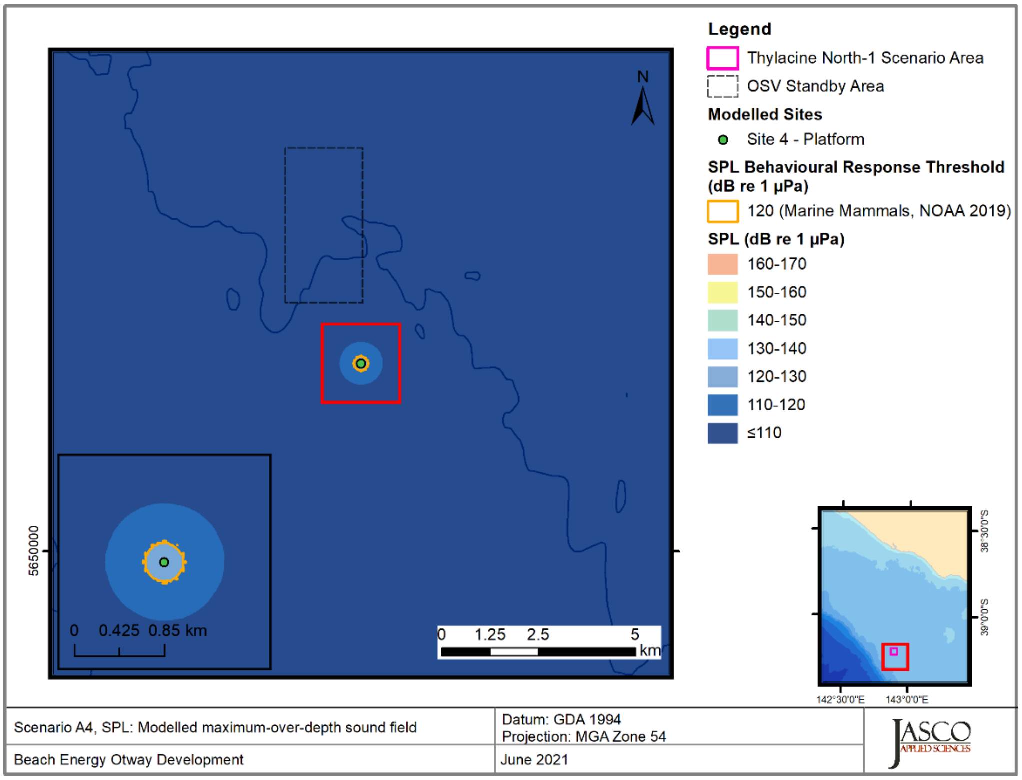


Figure 7. *Thylacine A, Platform Operations (Scenario A4) SPL:* Sound level contour map, showing unweighted maximum over-depth SPL results. Isopleth for marine mammal (120 dB re 1 µPa) behavioural criteria is shown as an orange contour line.

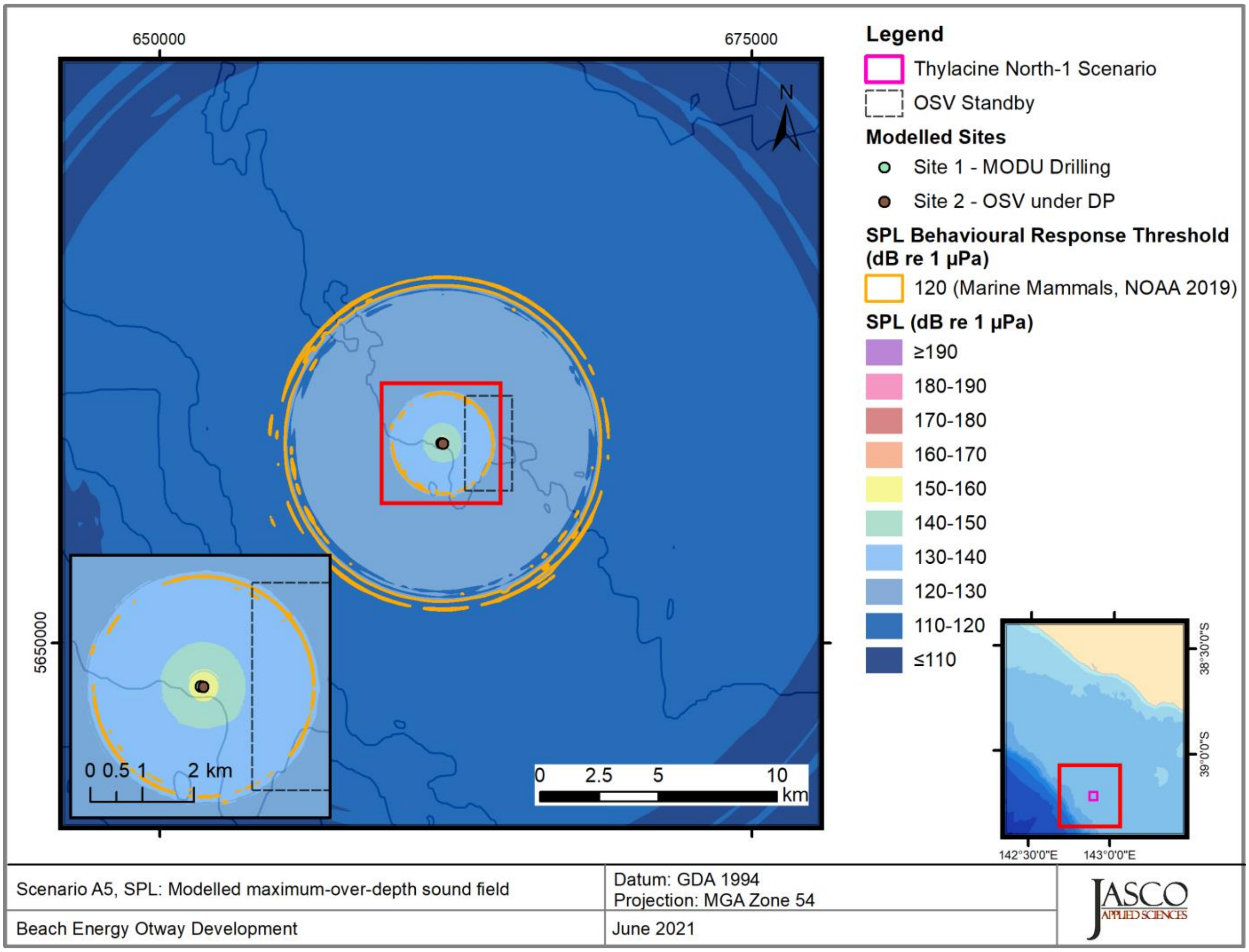
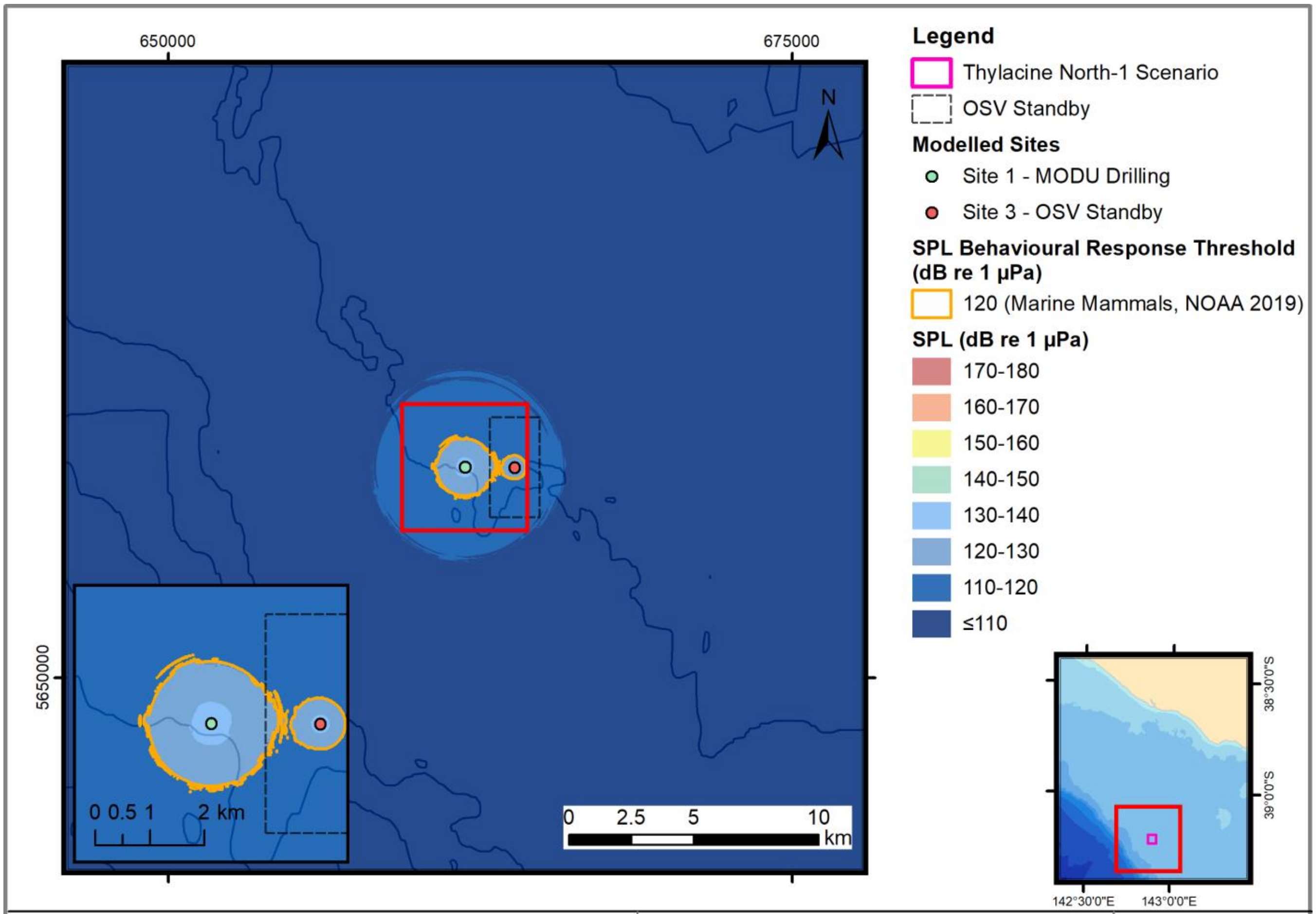


Figure 8. *Thylacine North-1, MODU Drilling and OSV Resupply (Scenario A5) SPL:* Sound level contour map, showing unweighted maximum over-depth SPL results. Isopleth for marine mammal (120 dB re 1 µPa) behavioural criteria is shown as an orange contour line.



Scenario A6, SPL: Modelled maximum-over-depth sound field	Datum: GDA 1994 Projection: MGA Zone 54
Beach Energy Otway Development	June 2021

Figure 9. *Thylacine North-1, MODU Drilling and OSV Standby (Scenario A7) SPL:* Sound level contour map, showing unweighted maximum over-depth SPL results. Isopleth for marine mammal (120 dB re 1 µPa) behavioural criteria is shown as an orange contour line.

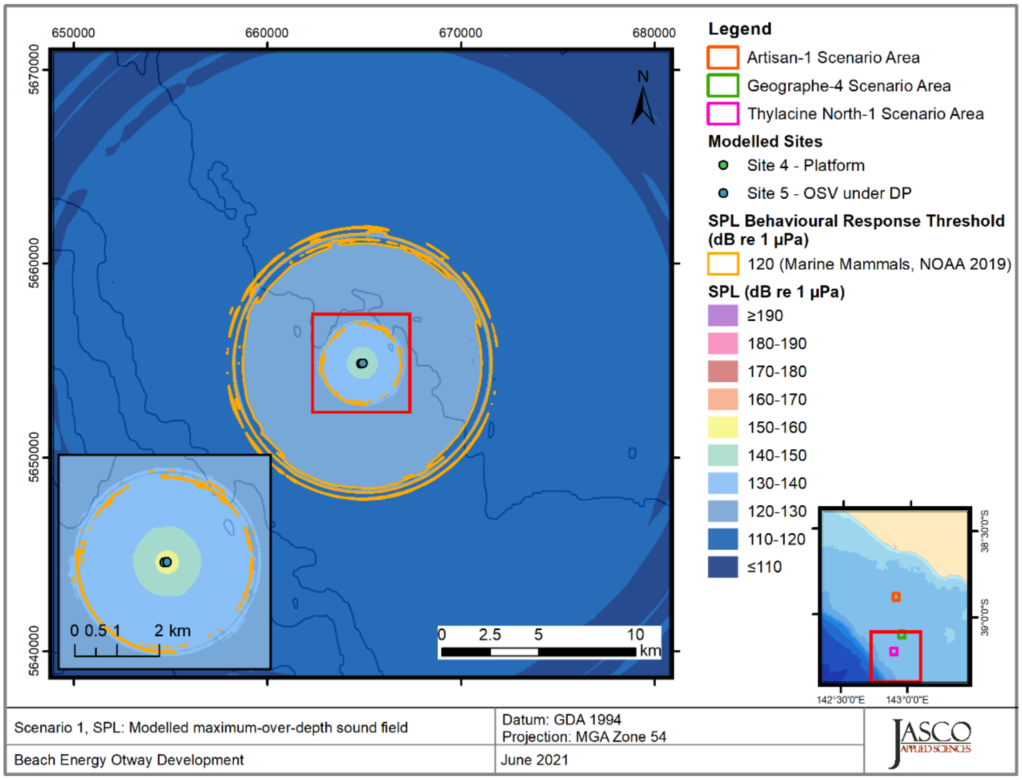


Figure 10. *Thylacine A Platform, Platform Resupply (Scenario1) SPL:* Sound level contour map, showing unweighted maximum over-depth SPL results. Isopleth for marine mammal (120 dB re 1 µPa) behavioural criteria is shown as an orange contour line.

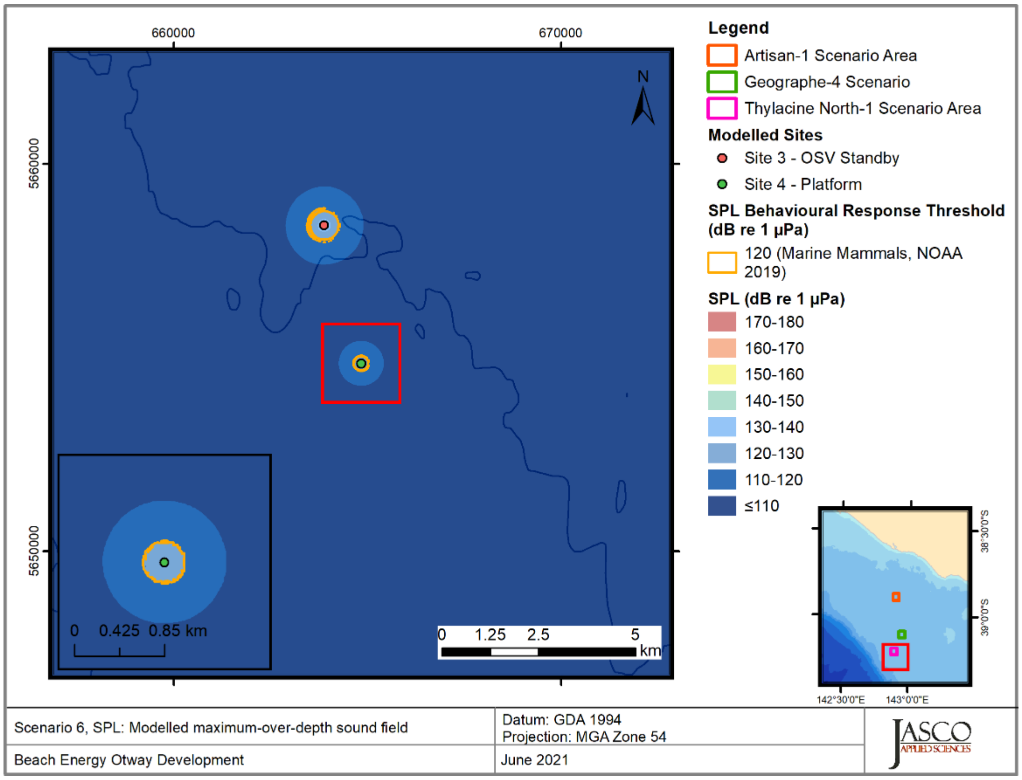


Figure 11. *Thylacine A Platform, OSV standby (Scenario 6) SPL :* Sound level contour map, showing unweighted maximum over-depth SPL results. Isopleth for marine mammal (120 dB re 1 µPa) behavioural criteria is shown as an orange contour line.

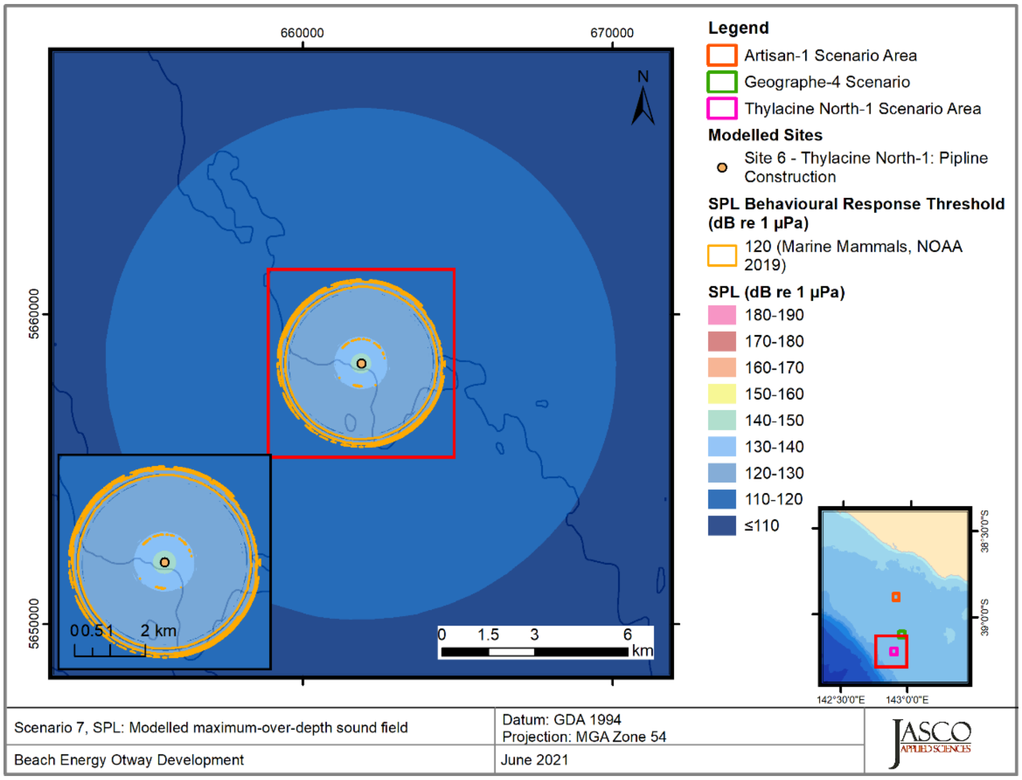


Figure 12. *Thylacine North-1, PLV stationary -June (Scenario 7) SPL:* Sound level contour map, showing unweighted maximum over-depth SPL results. Isopleth for marine mammal (120 dB re 1 µPa) behavioural criteria is shown as an orange contour line.

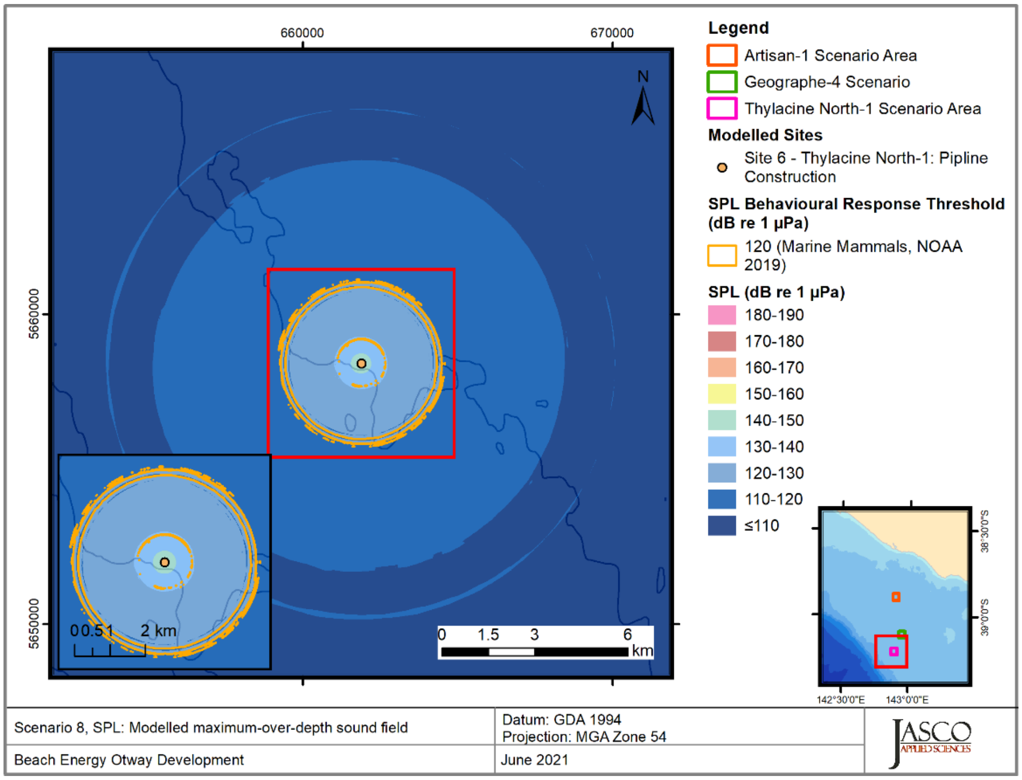


Figure 13. *Thylacine North-1, PLV stationary -November (Scenario 8) SPL:* Sound level contour map, showing unweighted maximum over-depth SPL results. Isopleth for marine mammal (120 dB re 1 µPa) behavioural criteria is shown as an orange contour line.

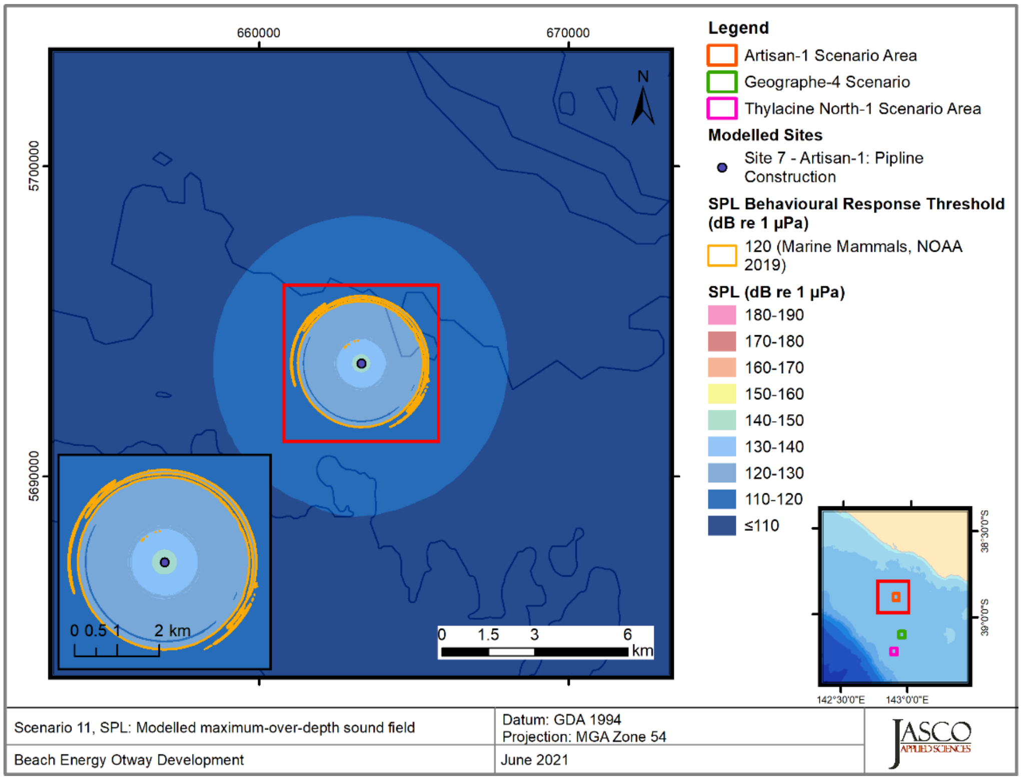


Figure 14. *Artisan-1, PLV stationary -June (Scenario 11) SPL:* Sound level contour map, showing unweighted maximum over-depth SPL results. Isopleth for marine mammal (120 dB re 1 µPa) behavioural criteria is shown as an orange contour line.

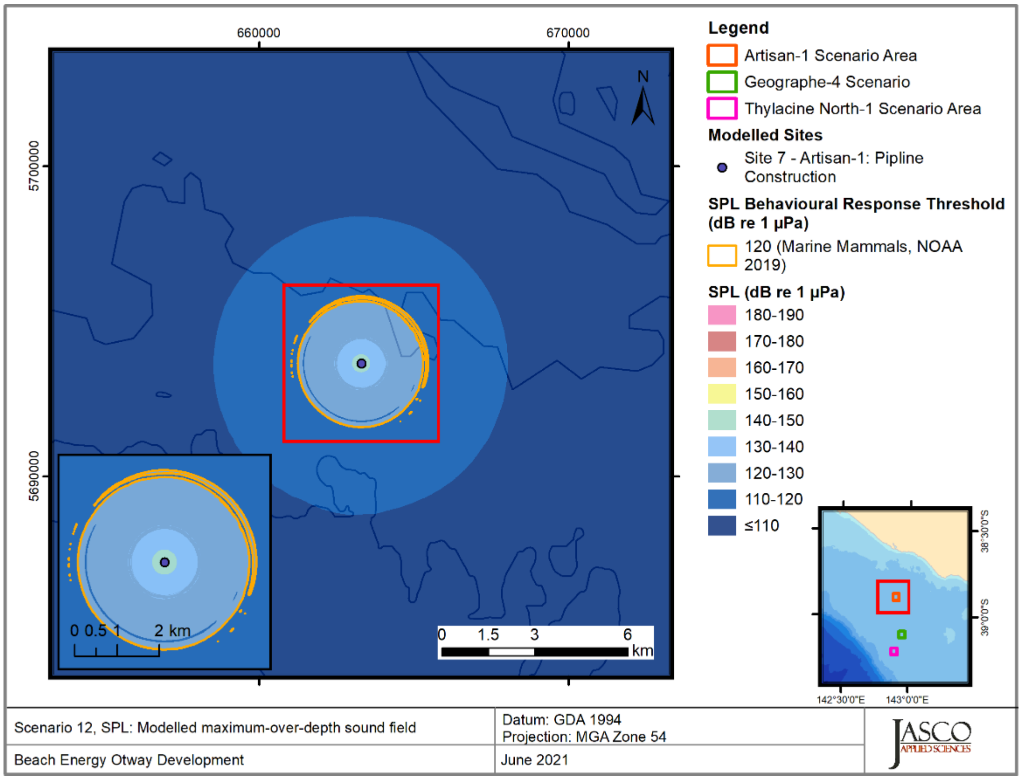


Figure 15. *Artisan-1, PLV stationary -November (Scenario 12) SPL:* S Sound level contour map, showing unweighted maximum over-depth SPL results. Isopleth for marine mammal (120 dB re 1 µPa) behavioural criteria is shown as an orange contour line.

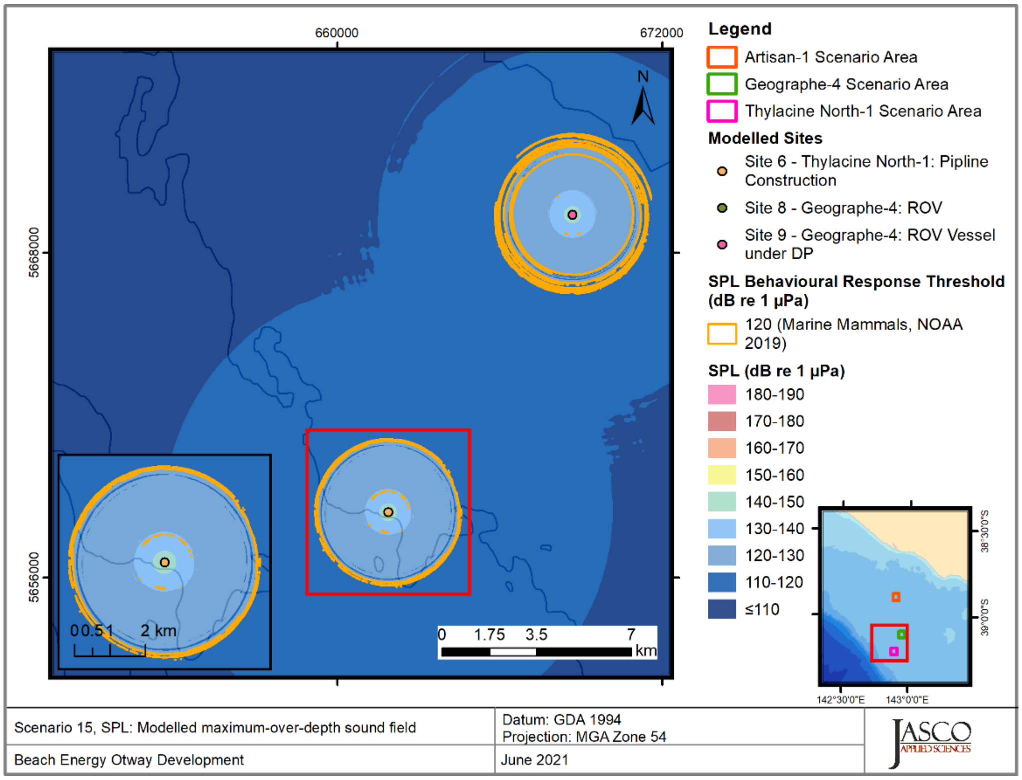


Figure 16. *Thylacine North-1, PLV stationary and ROV operations at Geographe-4 - June (Scenario 15) SPL:* Sound level contour map, showing unweighted maximum over-depth SPL results. Isopleth for marine mammal (120 dB re 1 µPa) behavioural criteria is shown as an orange contour line.

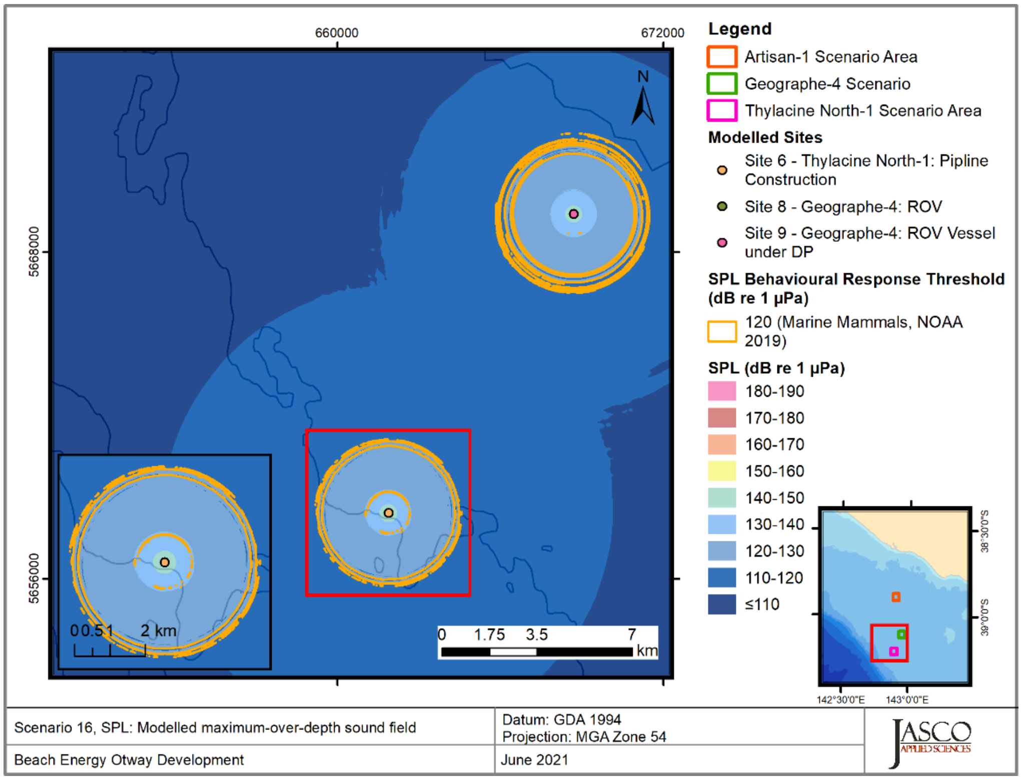


Figure 17. *Thylacine North-1, PLV stationary and ROV operations at Geographe-4 – November (Scenario 16) SPL:* Sound level contour map, showing unweighted maximum over-depth SPL results. Isopleth for marine mammal (120 dB re 1 µPa) behavioural criteria is shown as an orange contour line.

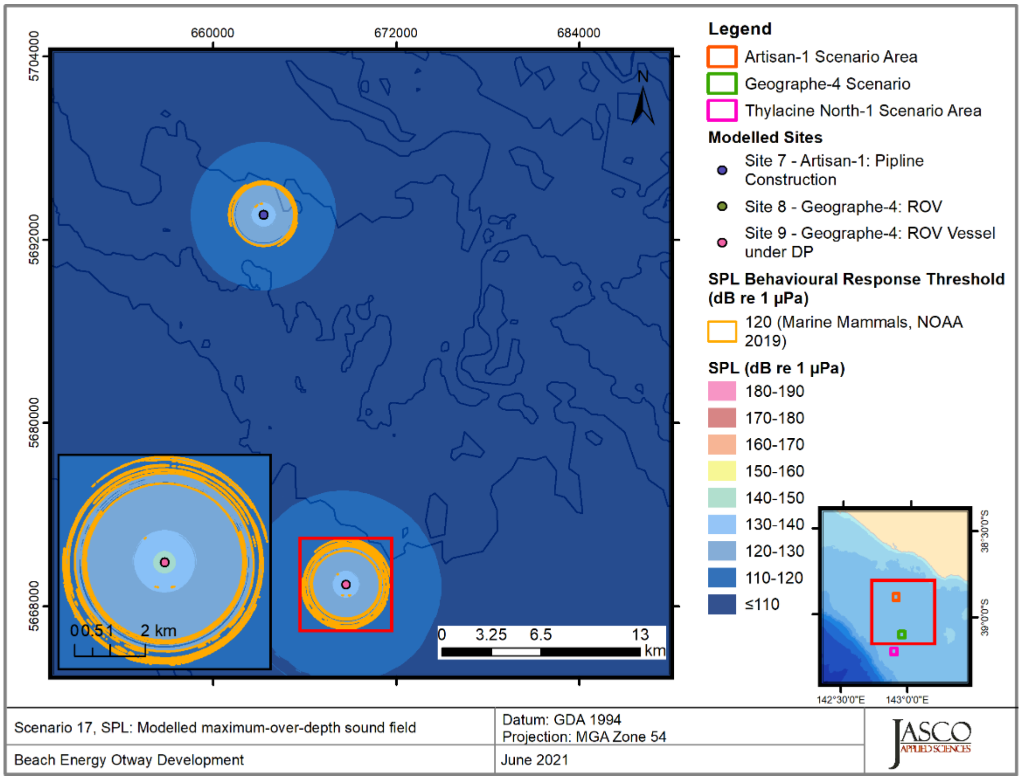


Figure 18. *Artisan-1, PLV stationary and ROV Operations at Geographe-4 – June (Scenario 17) SPL:* Sound level contour map, showing unweighted maximum over-depth SPL results. Isopleth for marine mammal (120 dB re 1 µPa) behavioural criteria is shown as an orange contour line.

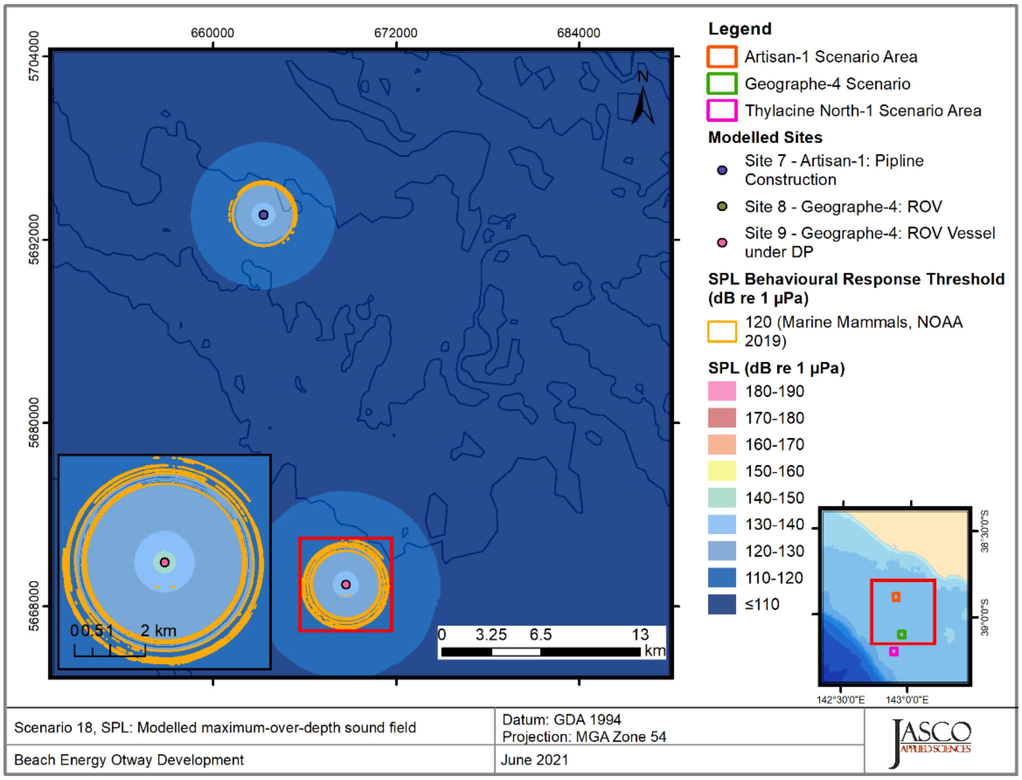


Figure 19. *Artisan-1, PLV stationary and ROV Operations at Geographe-4 – November (Scenario 18) SPL:* Sound level contour map, showing unweighted maximum over-depth SPL results. Isopleth for marine mammal (120 dB re 1 µPa) behavioural criteria is shown as an orange contour line.

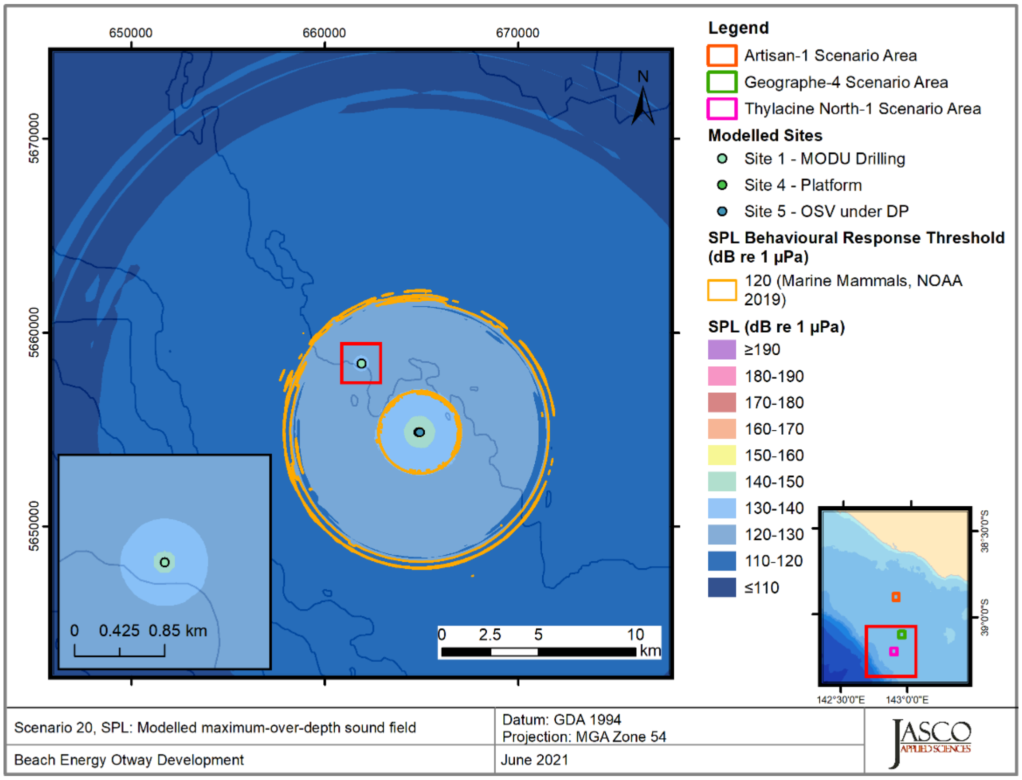


Figure 20. *Thylacine A Platform, Platform Resupply and MODU Drilling (Scenario 20) SPL:* Sound level contour map, showing unweighted maximum over-depth SPL results. Isopleth for marine mammal (120 dB re 1 µPa) behavioural criteria is shown as an orange contour line.

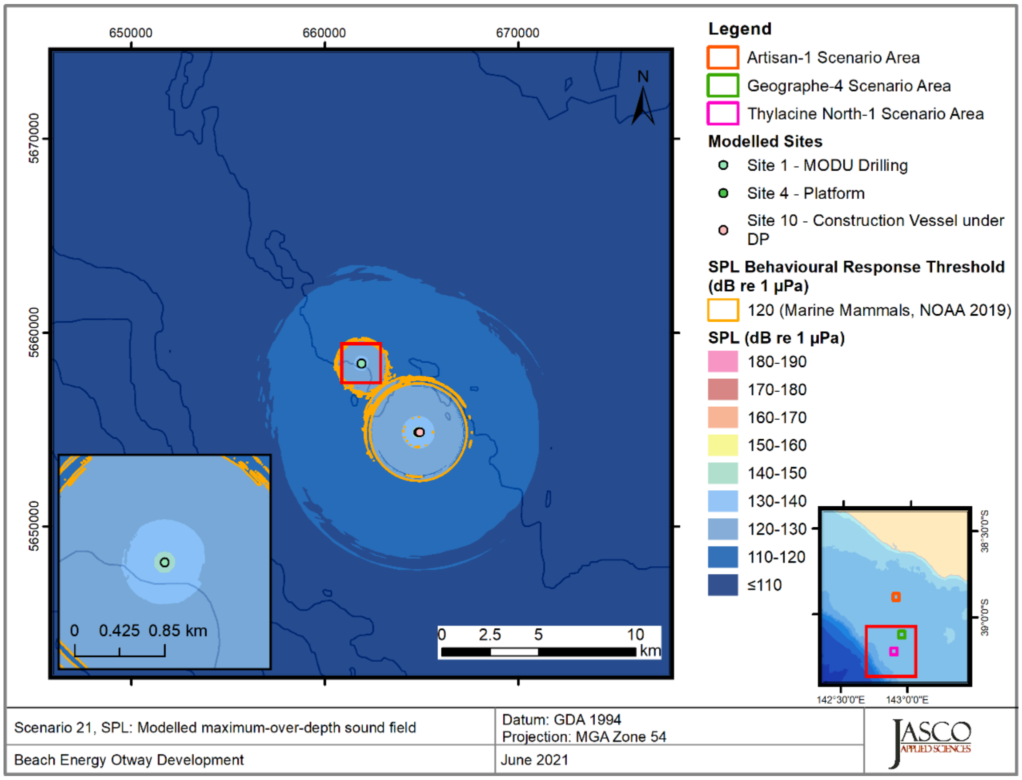


Figure 21. *Thylacine A Platform, Platform Resupply and skid installation (Scenario 20) SPL:* Sound level contour map, showing unweighted maximum over-depth SPL results. Isopleth for marine mammal (120 dB re 1 µPa) behavioural criteria is shown as an orange contour line.

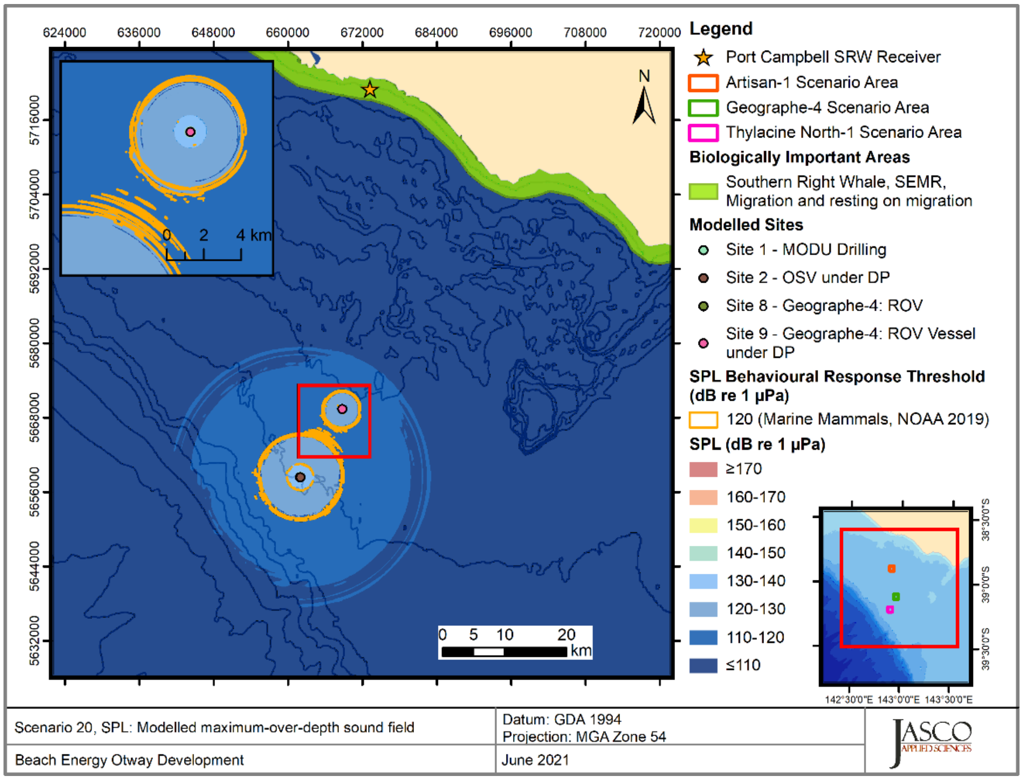


Figure 22. *Concurrent drilling operations at Thylacine North-1 and construction operations at Geographe-4 (Scenario 22) SPL:* Sound level contour map, showing unweighted maximum over-depth SPL results. Isopleth for marine mammal (120 dB re 1 µPa) behavioural criteria is shown as an orange contour line.

4.2.2. Accumulated SEL_{24h} Maps

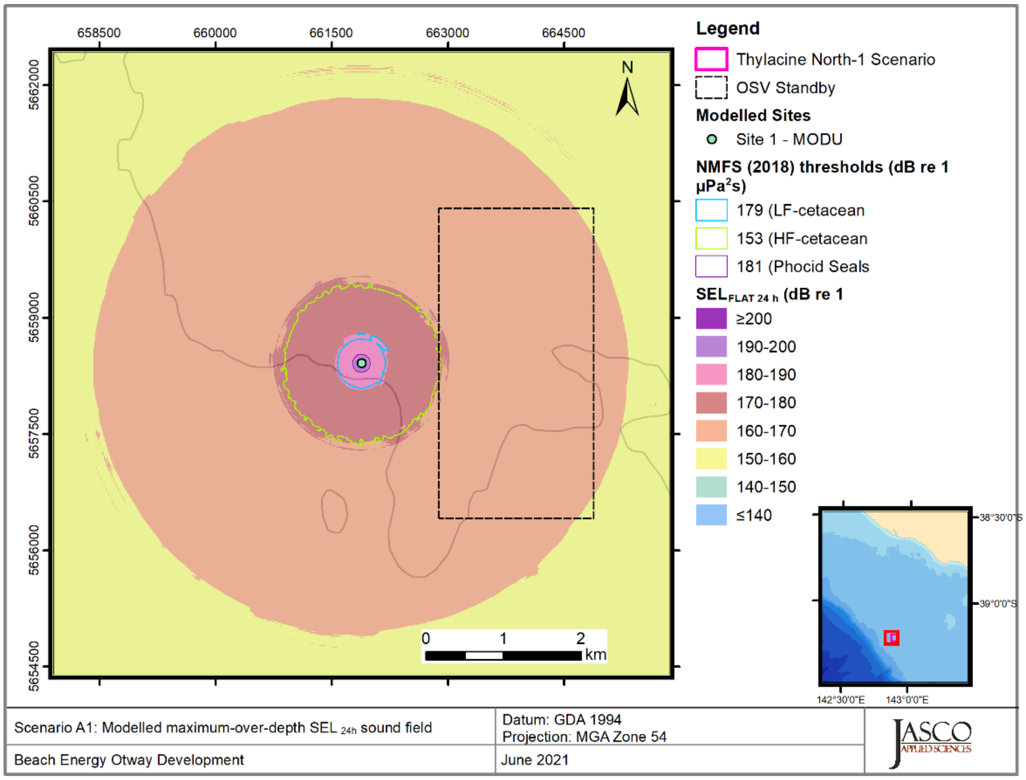


Figure 23. *Thylacine North-1, MODU Drilling (Scenario A1) SEL_{24h}:* Sound level contour map showing unweighted maximum-over-depth SEL_{24h} results, along with isopleths for TTS thresholds. Thresholds for PTS and some thresholds for TTS were either not reached or were small enough such that they could not be displayed on a map.

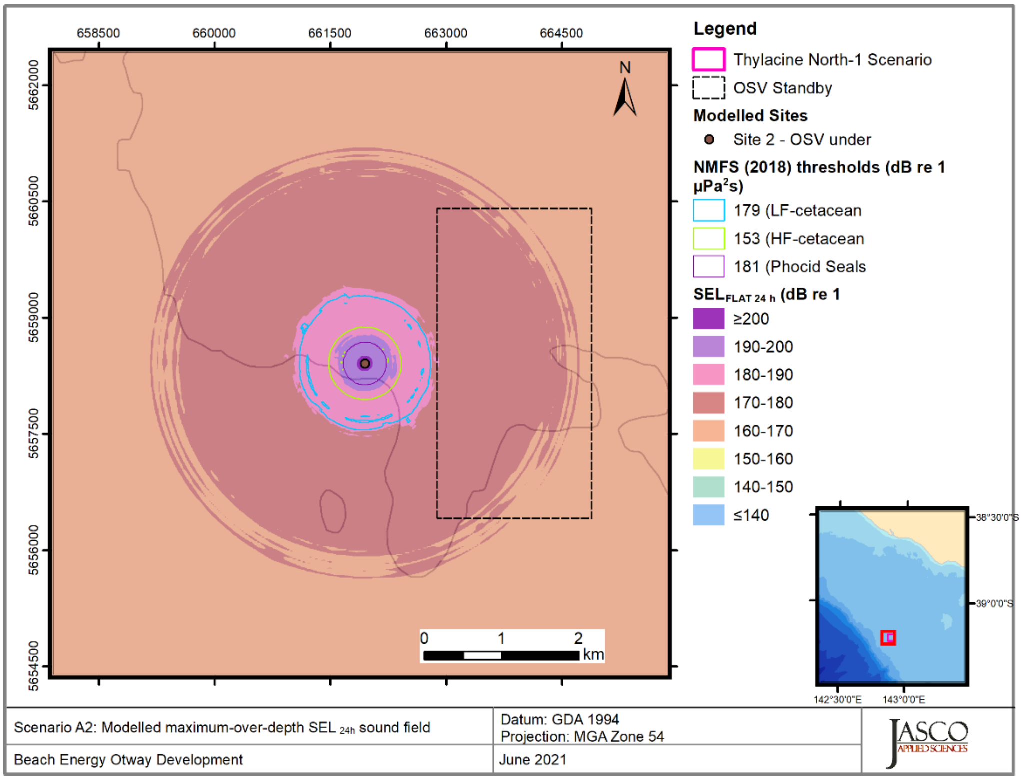


Figure 24. *Thylacine North-1, OSV on DP (4h) (Scenario A2) SEL$_{24h}$*: Sound level contour map showing unweighted maximum-over-depth SEL$_{24h}$ results, along with isopleths for TTS thresholds. Thresholds for PTS and some thresholds for TTS were either not reached or were small enough such that they could not be displayed on a map.

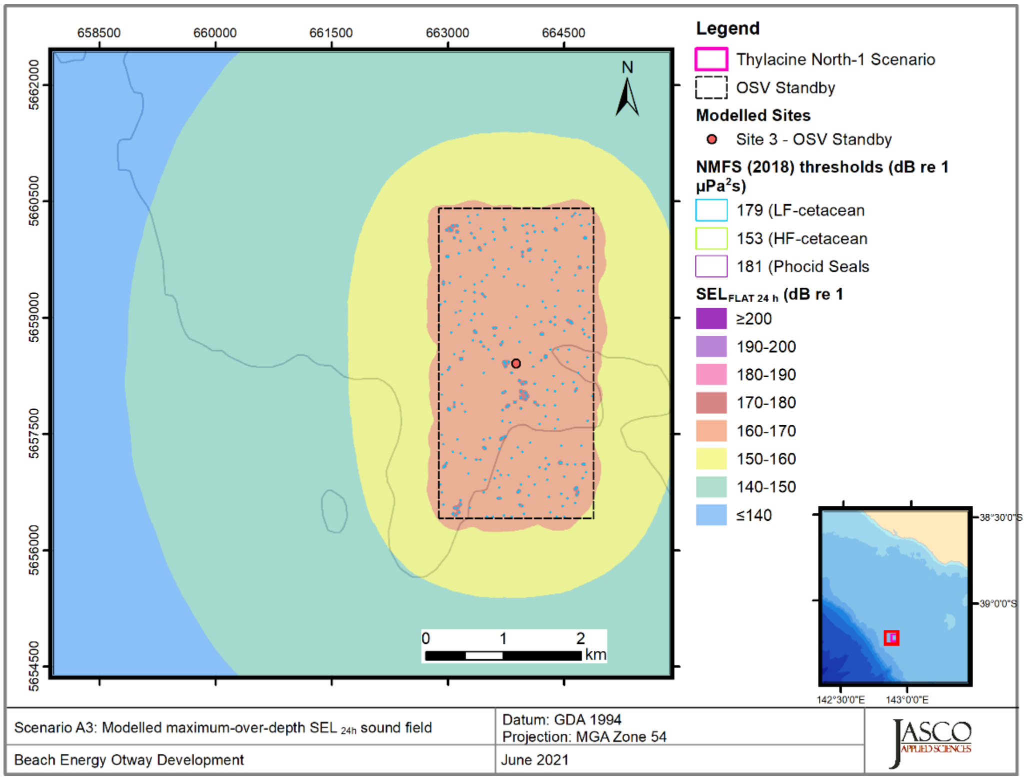


Figure 25. *Thylacine North-1, OSV Standby (Scenario A3) SEL$_{24h}$*: Sound level contour map showing unweighted maximum-over-depth SEL$_{24h}$ results, along with isopleths for TTS thresholds. Thresholds for PTS and some thresholds for TTS were either not reached or were small enough such that they could not be displayed on a map.

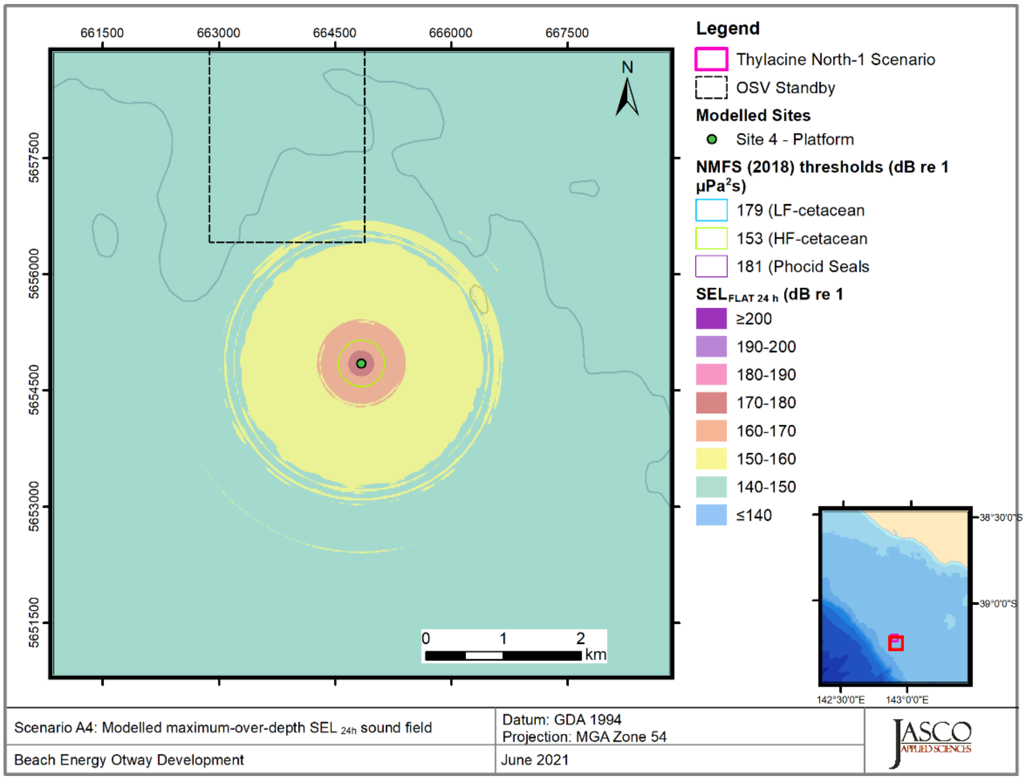


Figure 26. *Thylacine A, Platform Operations (Scenario A4) SEL*$_{24h}$: Sound level contour map showing unweighted maximum-over-depth SEL$_{24h}$ results, along with isopleths for TTS thresholds. Thresholds for PTS and some thresholds for TTS were either not reached or were small enough such that they could not be displayed on a map.

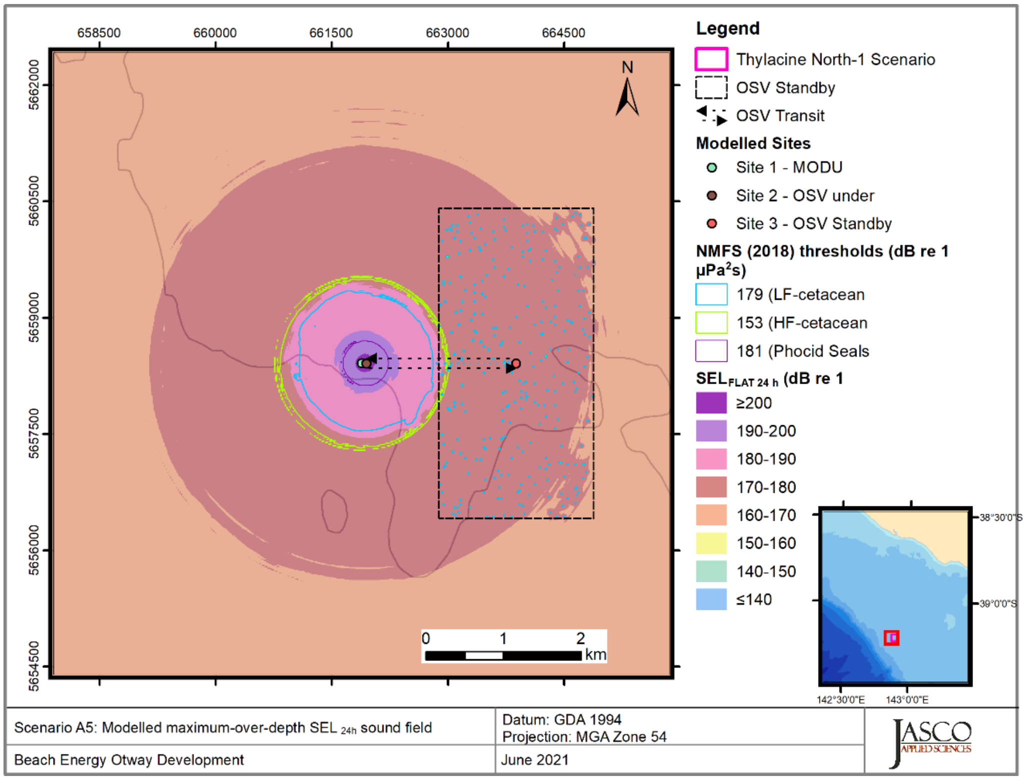


Figure 27. *Thylacine North-1, MODU 4h Resupply Operations (Scenario A5) SEL*$_{24h}$: Sound level contour map showing unweighted maximum-over-depth SEL$_{24h}$ results, along with isopleths for TTS thresholds. Thresholds for PTS and some thresholds for TTS were either not reached or were small enough such that they could not be displayed on a map.

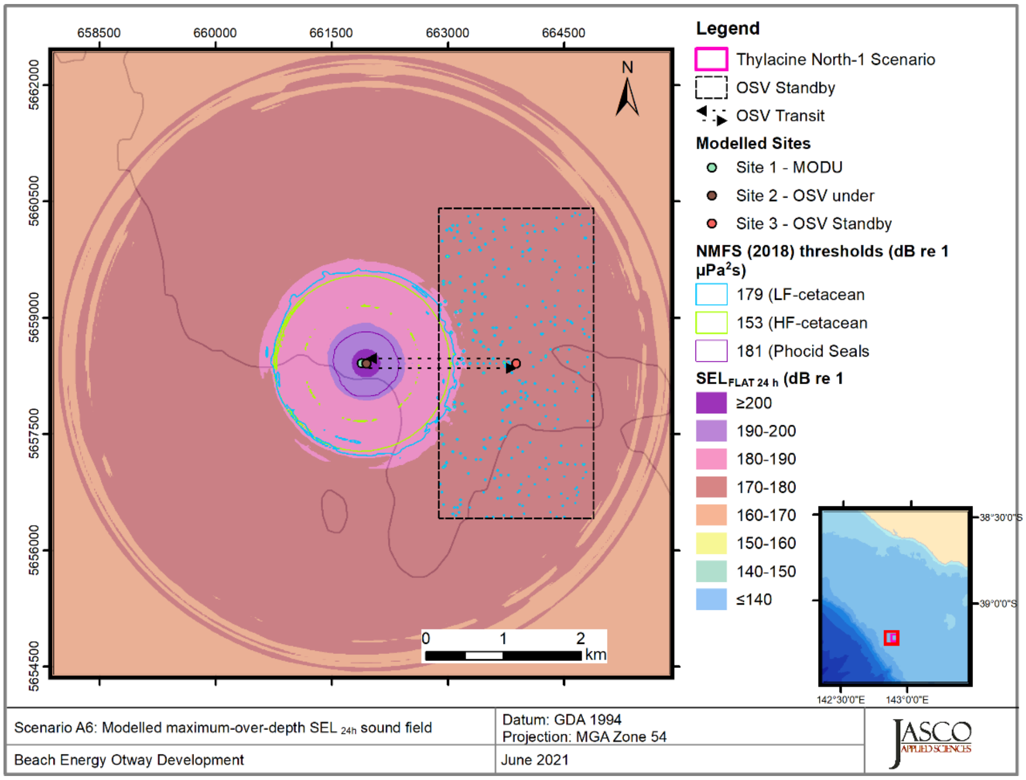


Figure 28. *Thylacine North-1, MODU 8h Resupply Operations (Scenario A6) SEL$_{24h}$*: Sound level contour map showing unweighted maximum-over-depth SEL$_{24h}$ results, along with isopleths for TTS thresholds. Thresholds for PTS and some thresholds for TTS were either not reached or were small enough such that they could not be displayed on a map.*SEL24h:*

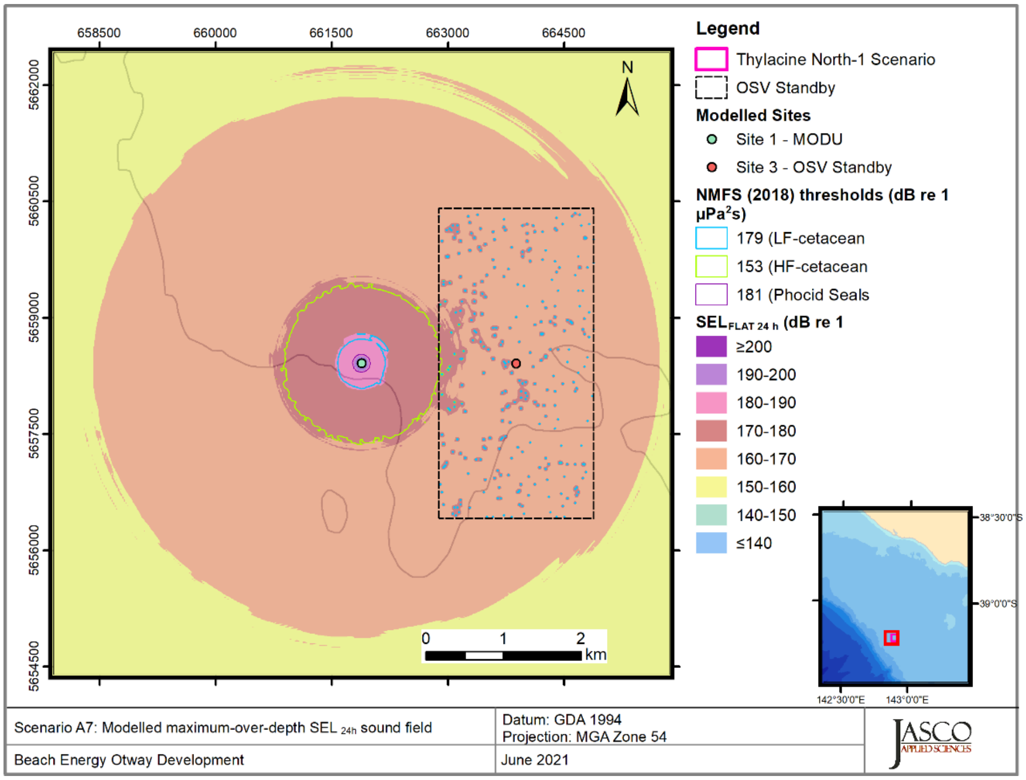


Figure 29. *Thylacine North-1, MODU Drilling and OSV standby (Scenario A7) SEL$_{24h}$*: Sound level contour map showing unweighted maximum-over-depth SEL$_{24h}$ results, along with isopleths for TTS thresholds. Thresholds for PTS and some thresholds for TTS were either not reached or were small enough such that they could not be displayed on a map.

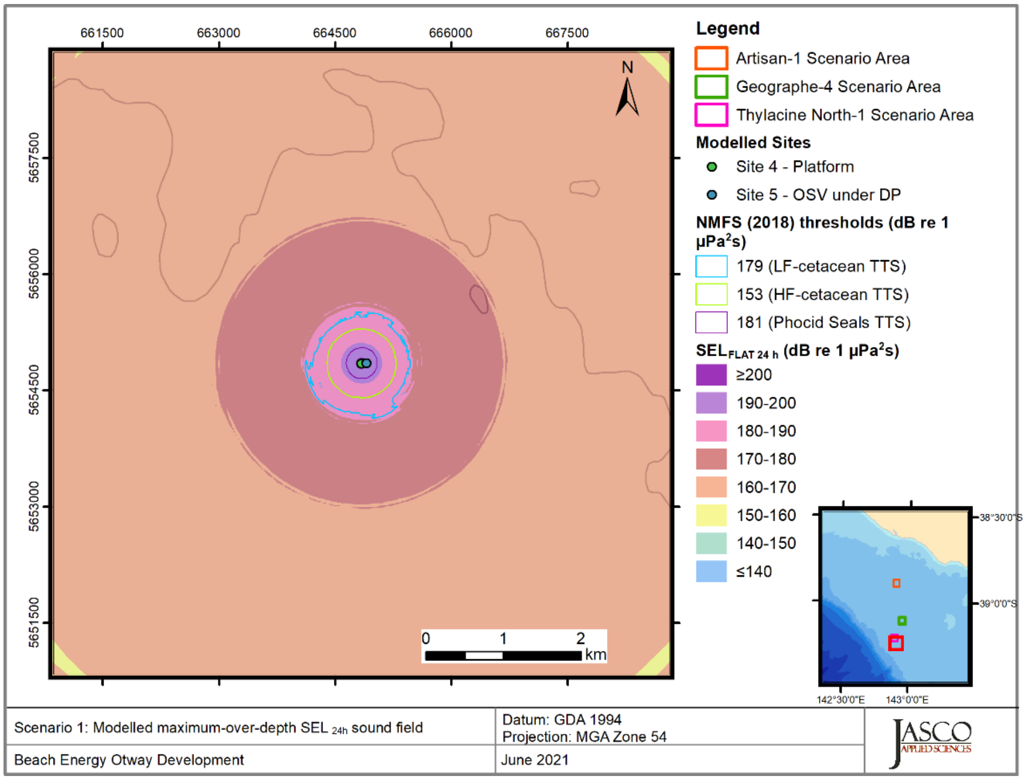


Figure 30. *Thylacine A Platform, 2 h Platform Resupply (Scenario 1) SEL$_{24h}$:* Sound level contour map showing unweighted maximum-over-depth SEL$_{24h}$ results, along with isopleths for TTS thresholds. Thresholds for PTS and some thresholds for TTS were either not reached or were small enough such that they could not be displayed on a map.

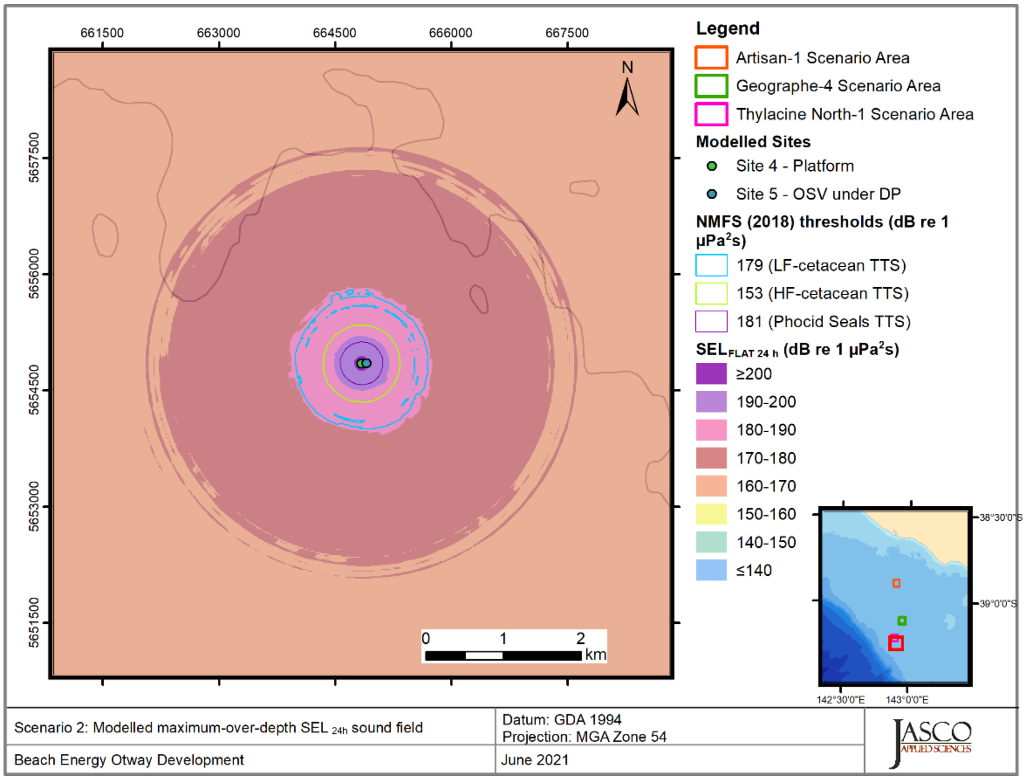


Figure 31. *Thylacine A Platform, 4 h Platform Resupply (Scenario 2) SEL$_{24h}$:* Sound level contour map showing unweighted maximum-over-depth SEL$_{24h}$ results, along with isopleths for TTS thresholds. Thresholds for PTS and some thresholds for TTS were either not reached or were small enough such that they could not be displayed on a map.

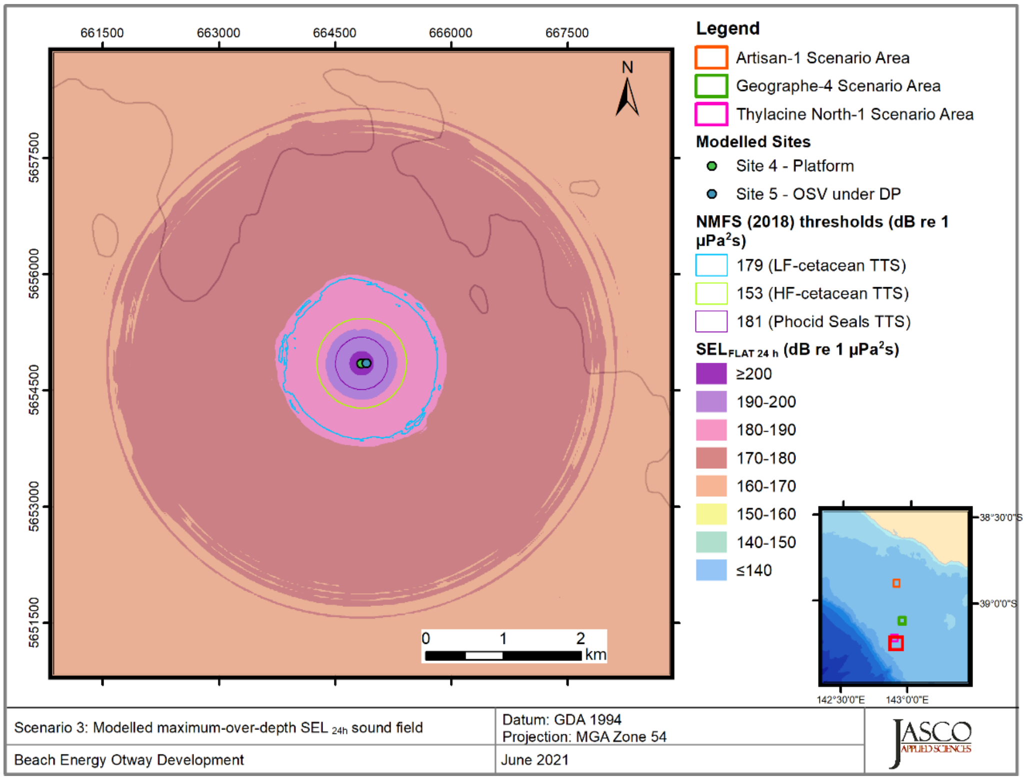


Figure 32. *Thylacine A Platform, 6 h Platform Resupply (Scenario 3) SEL_{24h}:* Sound level contour map showing unweighted maximum-over-depth SEL_{24h} results, along with isopleths for TTS thresholds. Thresholds for PTS and some thresholds for TTS were either not reached or were small enough such that they could not be displayed on a map.

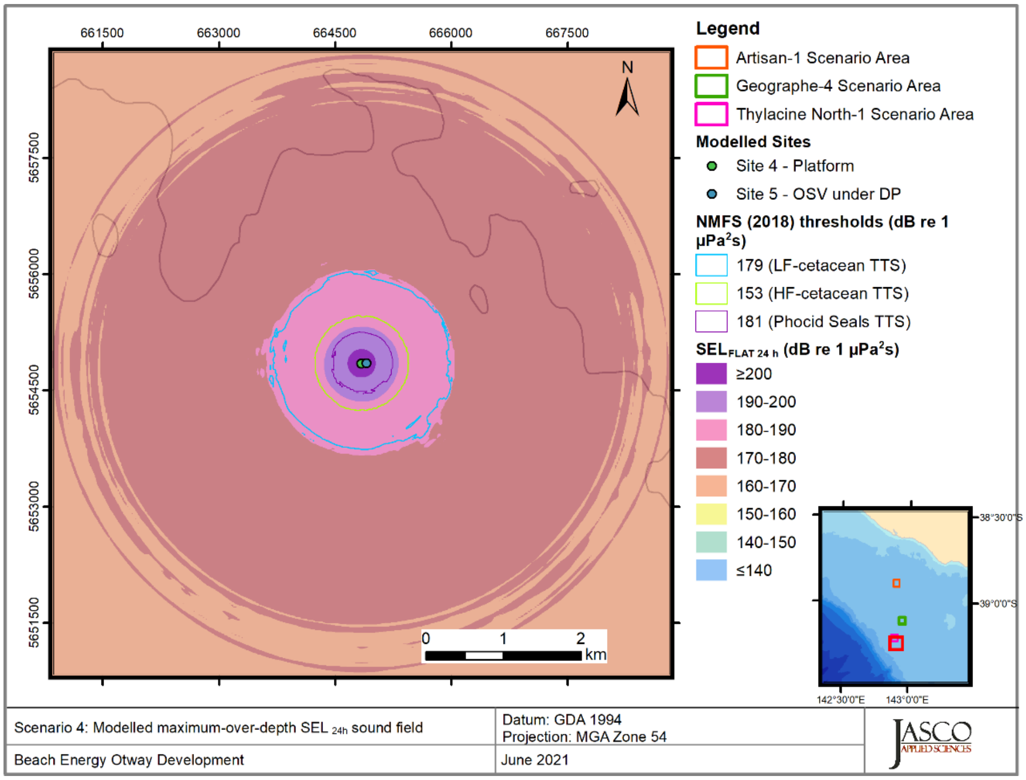


Figure 33. *Thylacine A Platform, 8 h Platform Resupply (Scenario 4) SEL_{24h}:* Sound level contour map showing unweighted maximum-over-depth SEL_{24h} results, along with isopleths for TTS thresholds. Thresholds for PTS and some thresholds for TTS were either not reached or were small enough such that they could not be displayed on a map.

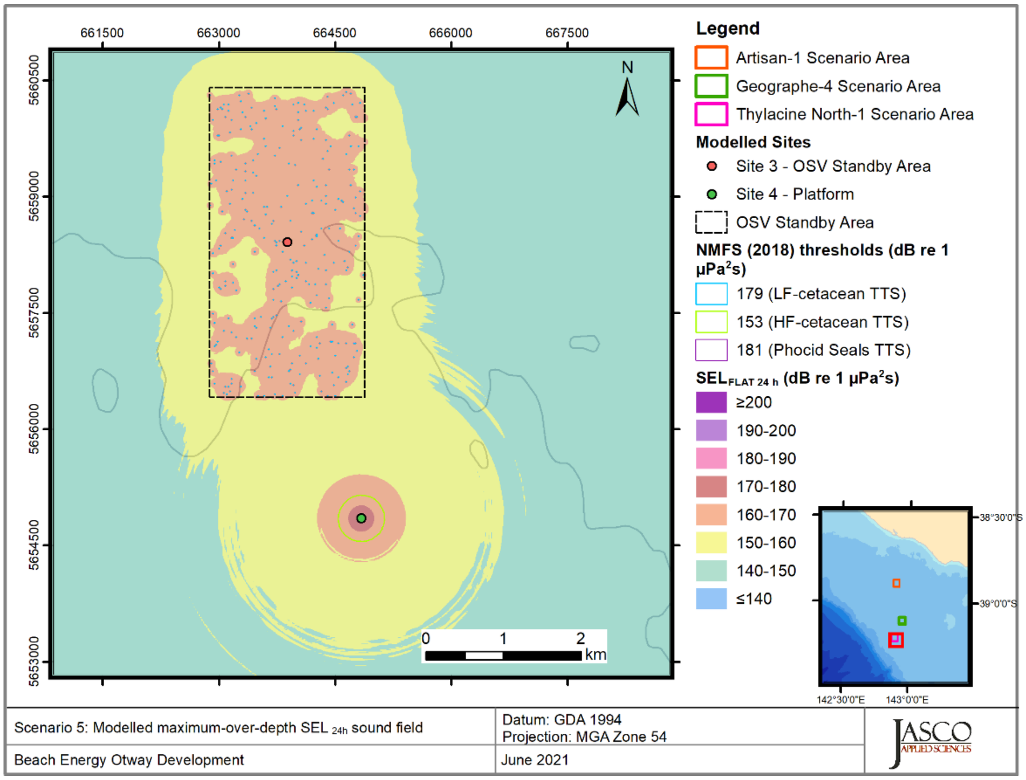


Figure 34. *Thylacine A Platform, 8h OSV standby (Scenario 5) SEL$_{24h}$*: Sound level contour map showing unweighted maximum-over-depth SEL$_{24h}$ results, along with isopleths for TTS thresholds. Thresholds for PTS and some thresholds for TTS were either not reached or were small enough such that they could not be displayed on a map.

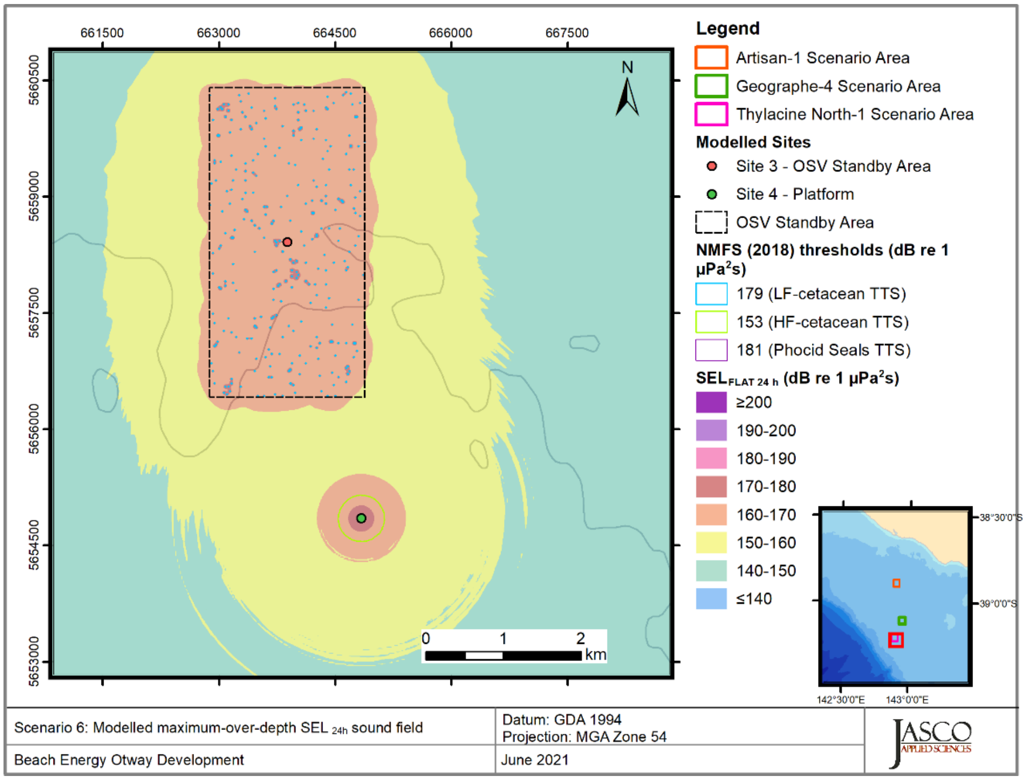


Figure 35. *Thylacine A Platform, 24h OSV standby (Scenario 6) SEL$_{24h}$*: Sound level contour map showing unweighted maximum-over-depth SEL$_{24h}$ results, along with isopleths for TTS thresholds. Thresholds for PTS and some thresholds for TTS were either not reached or were small enough such that they could not be displayed on a map.

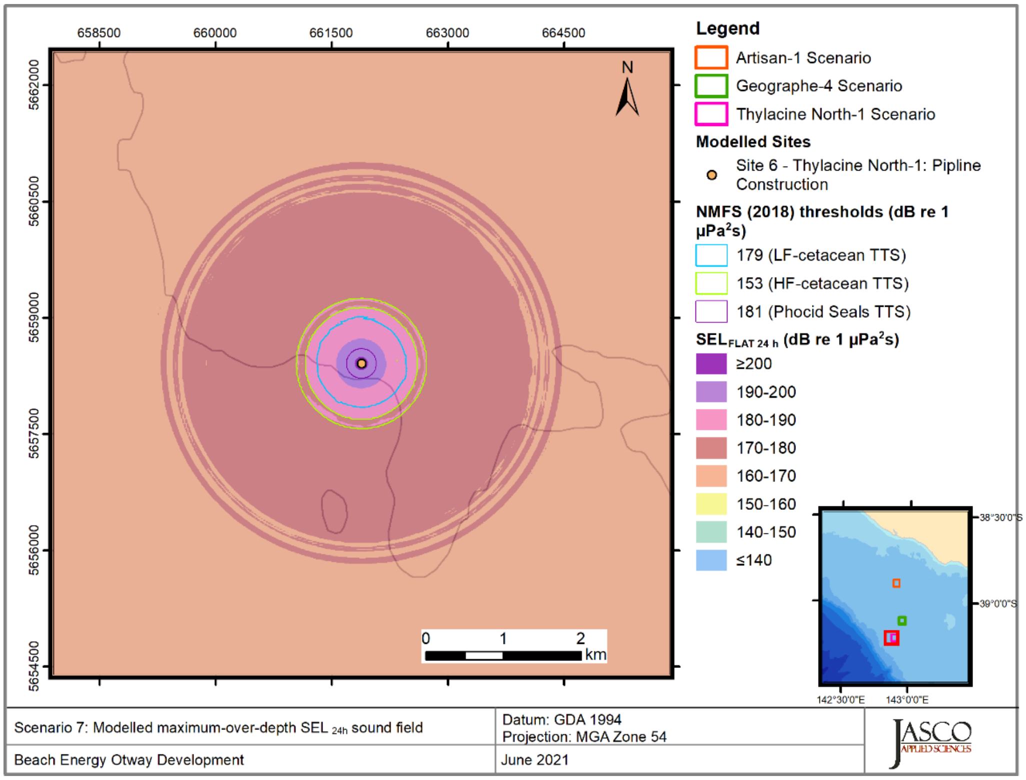


Figure 36. *Thylacine North-1, PLV stationary -June (Scenario 7) SEL$_{24h}$:* Sound level contour map showing unweighted maximum-over-depth SEL24h results, along with isopleths for TTS thresholds. Thresholds for PTS and some thresholds for TTS were either not reached or were small enough such that they could not be displayed on a map.

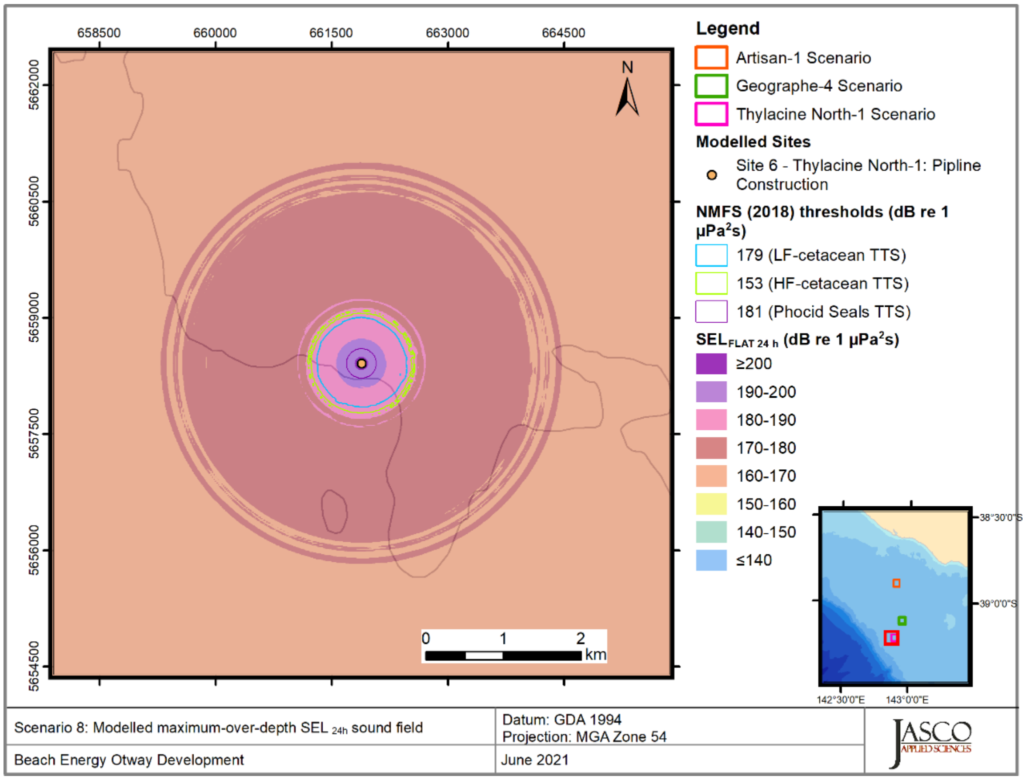


Figure 37. *Thylacine North-1, PLV stationary - November (Scenario 8) SEL$_{24h}$:* Sound level contour map showing unweighted maximum-over-depth SEL$_{24h}$ results, along with isopleths for TTS thresholds. Thresholds for PTS and some thresholds for TTS were either not reached or were small enough such that they could not be displayed on a map.

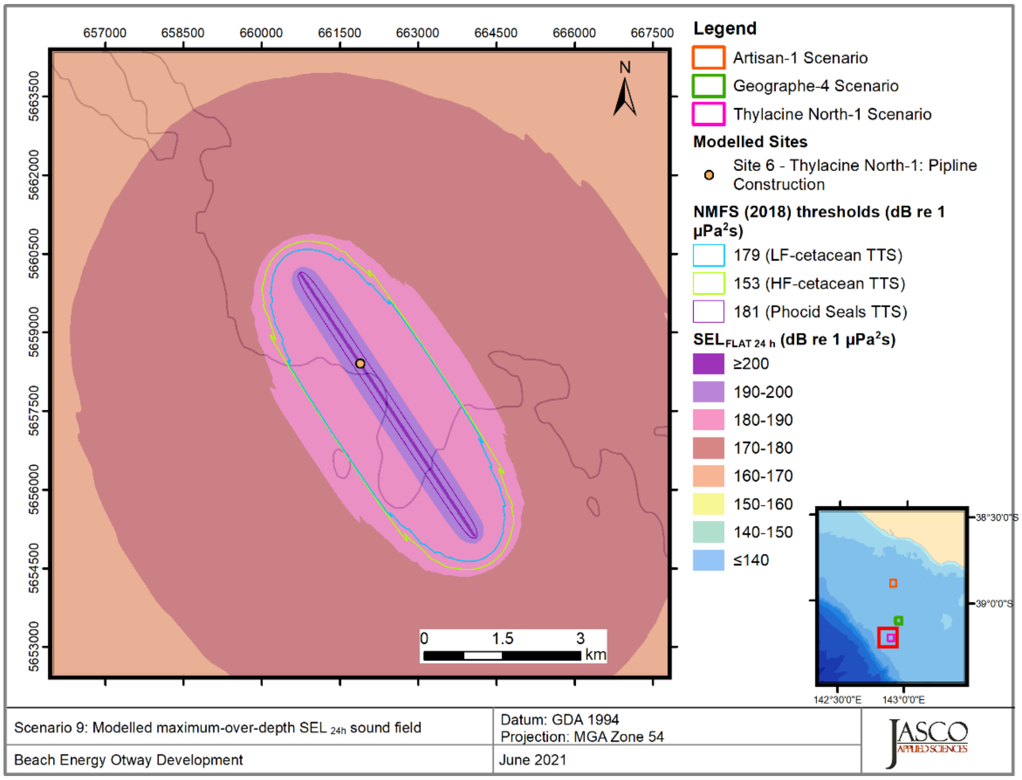


Figure 38. *Thylacine North-1, PLV pipe laying operations - June (Scenario 9) SEL24h:* Sound level contour map showing unweighted maximum-over-depth SEL24h results, along with isopleths for TTS thresholds. Thresholds for PTS and some thresholds for TTS were either not reached or were small enough such that they could not be displayed on a map.

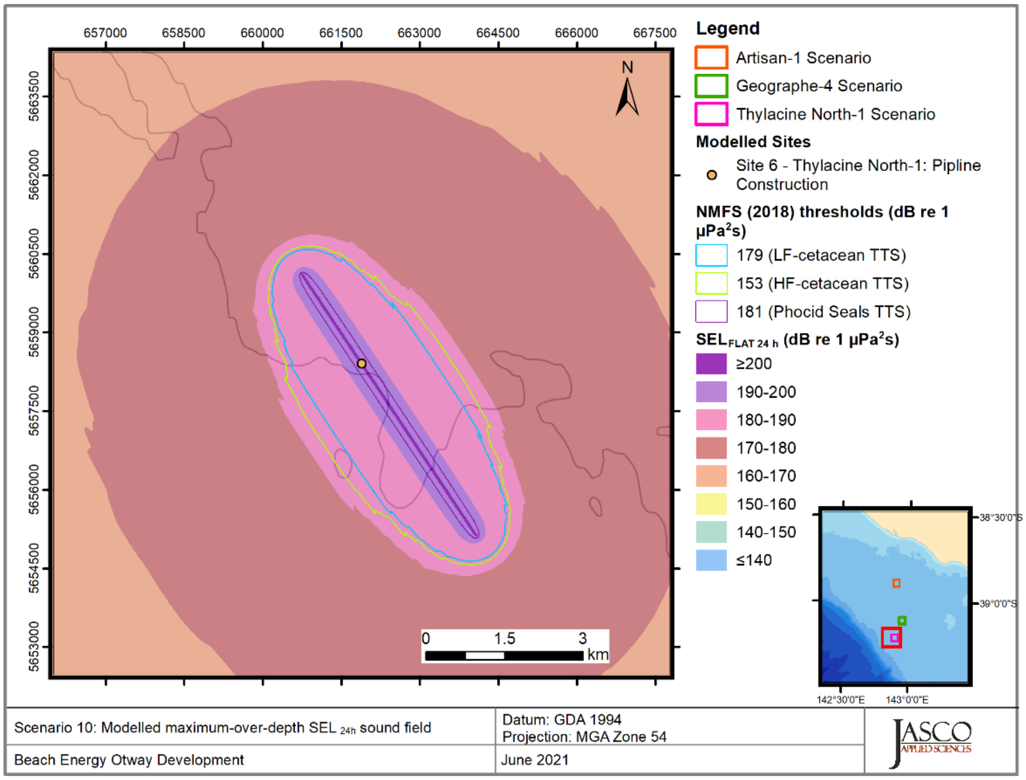


Figure 39. *Thylacine North-1, PLV pipe laying operations - November (Scenario 10) SEL24h:* Sound level contour map showing unweighted maximum-over-depth SEL24h results, along with isopleths for TTS thresholds. Thresholds for PTS and some thresholds for TTS were either not reached or were small enough such that they could not be displayed on a map.

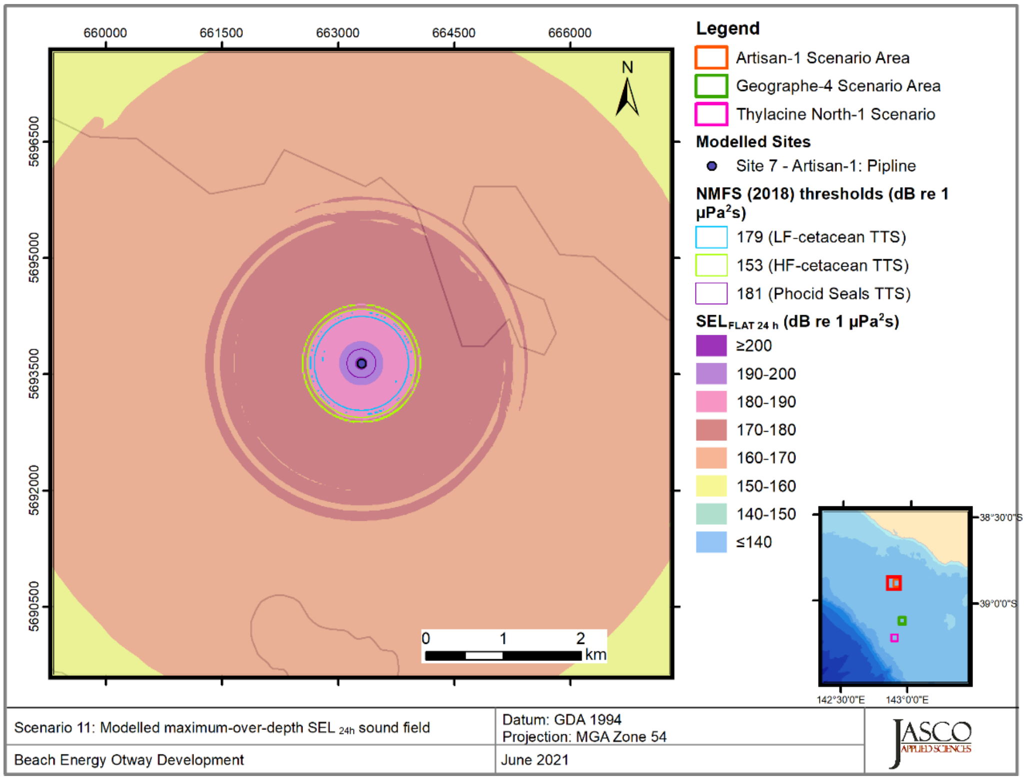


Figure 40. *Artisan-1, PLV stationary - June (Scenario 11) SEL_{24h}:* Sound level contour map showing unweighted maximum-over-depth SEL_{24h} results, along with isopleths for TTS thresholds. Thresholds for PTS and some thresholds for TTS were either not reached or were small enough such that they could not be displayed on a map.

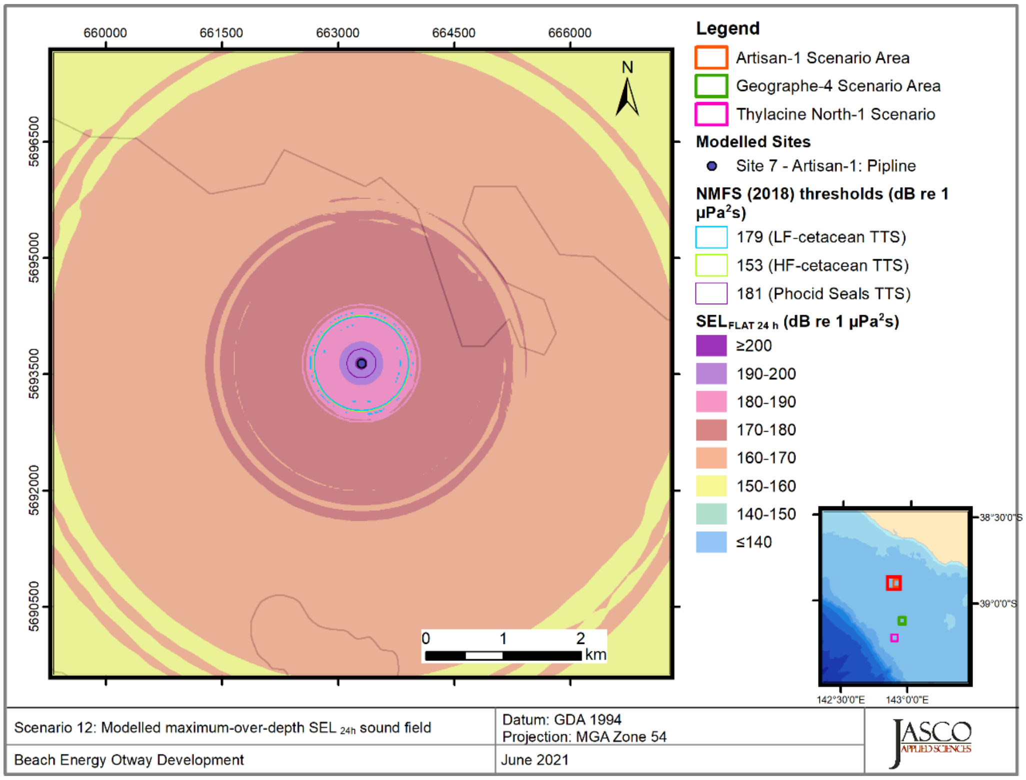


Figure 41. *Artisan-1, PLV stationary - November (Scenario 12) SEL_{24h}:* Sound level contour map showing unweighted maximum-over-depth SEL_{24h} results, along with isopleths for TTS thresholds. Thresholds for PTS and some thresholds for TTS were either not reached or were small enough such that they could not be displayed on a map.

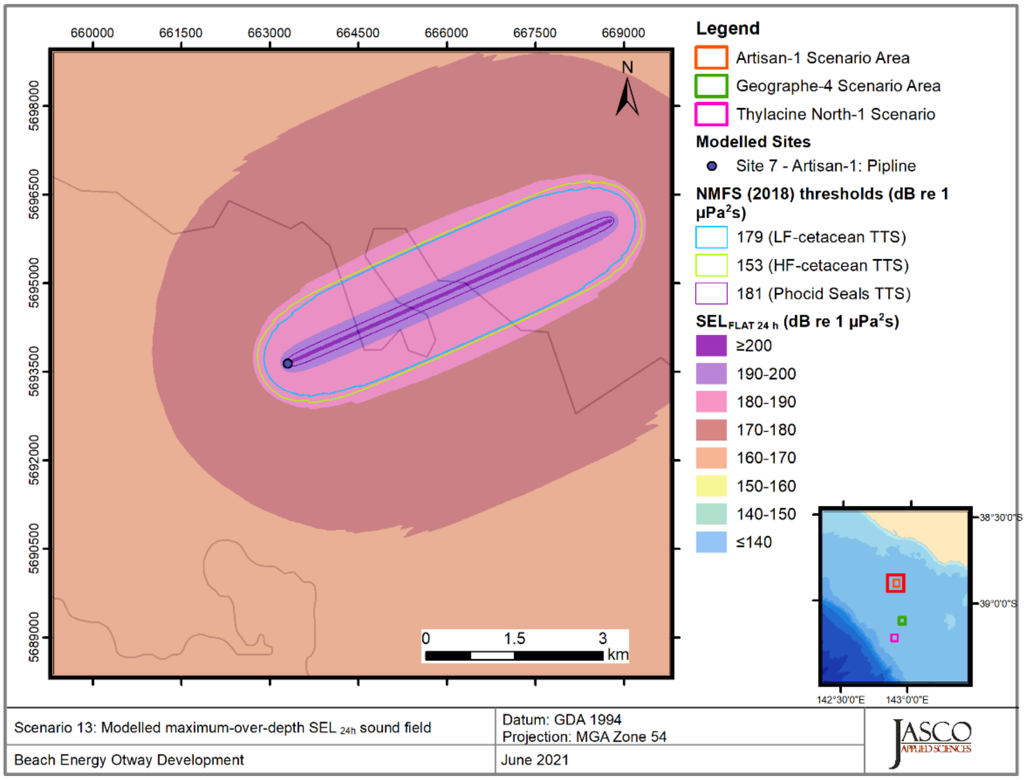


Figure 42. *Artisan-1, PLV pipe laying operations - June (Scenario 13) SEL$_{24h}$:* Sound level contour map showing unweighted maximum-over-depth SEL$_{24h}$ results, along with isopleths for TTS thresholds. Thresholds for PTS and some thresholds for TTS were either not reached or were small enough such that they could not be displayed on a map.

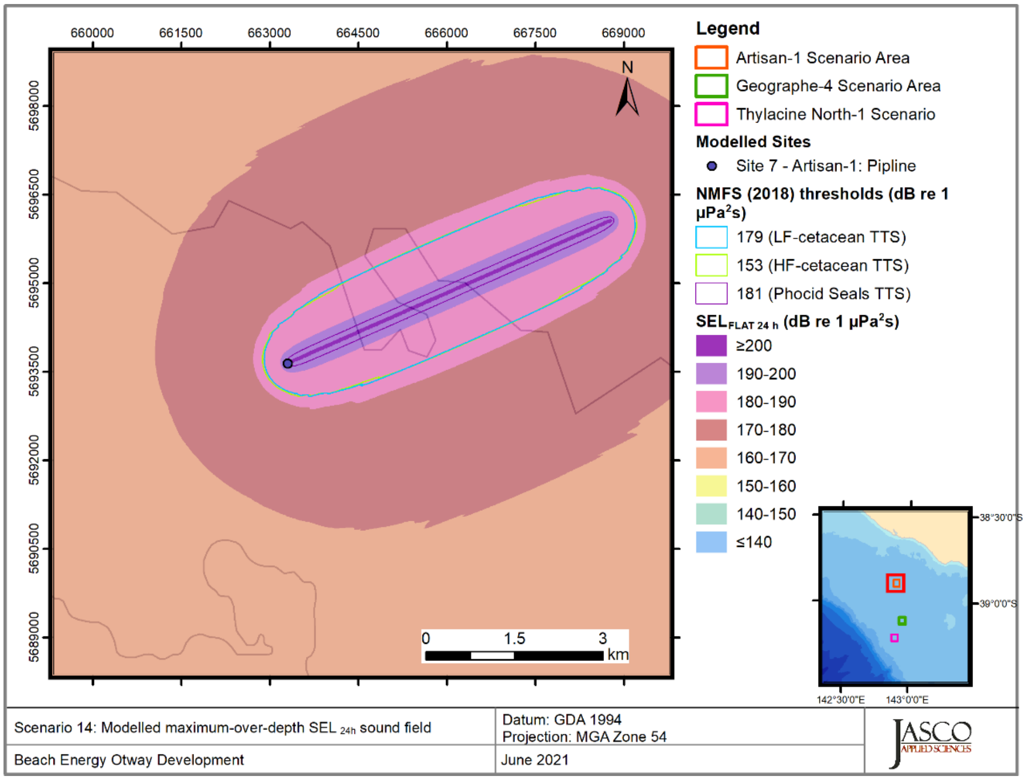


Figure 43. *Artisan-1, PLV pipe laying operations - November (Scenario 14) SEL$_{24h}$:* Sound level contour map showing unweighted maximum-over-depth SEL$_{24h}$ results, along with isopleths for TTS thresholds. Thresholds for PTS and some thresholds for TTS were either not reached or were small enough such that they could not be displayed on a map.

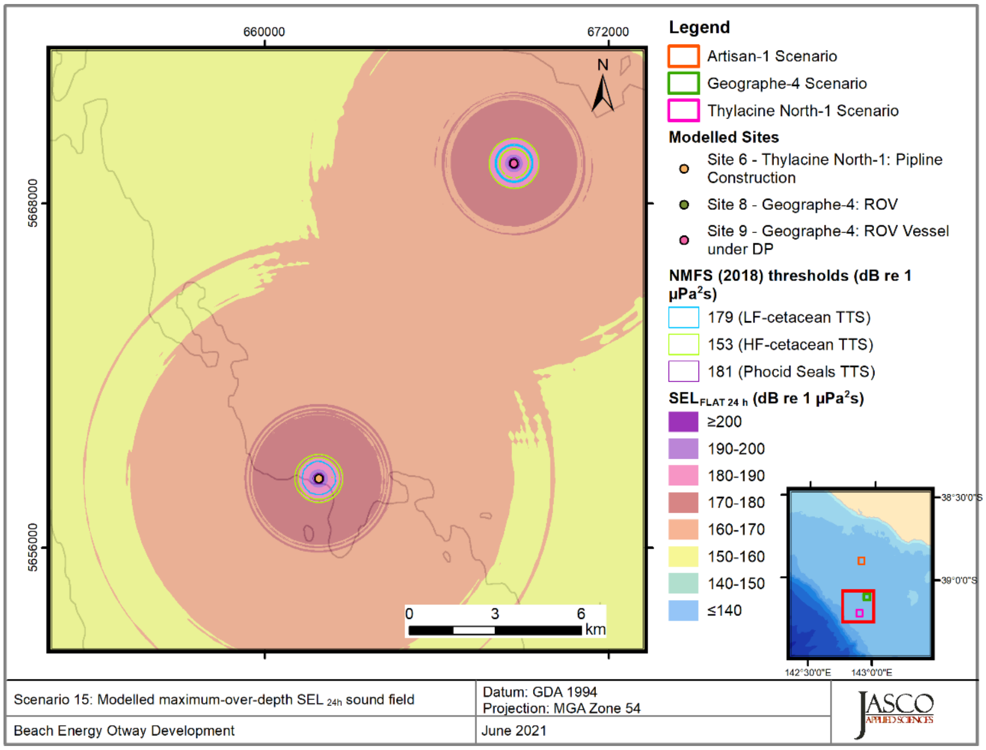


Figure 44. Thylacine North-1, PLV stationary and ROV Operations at Geographe-4 - June (Scenario 15) SEL$_{24h}$: Sound level contour map showing unweighted maximum-over-depth SEL24h results, along with isopleths for TTS thresholds. Thresholds for PTS and some thresholds for TTS were either not reached or were small enough such that they could not be displayed on a map.

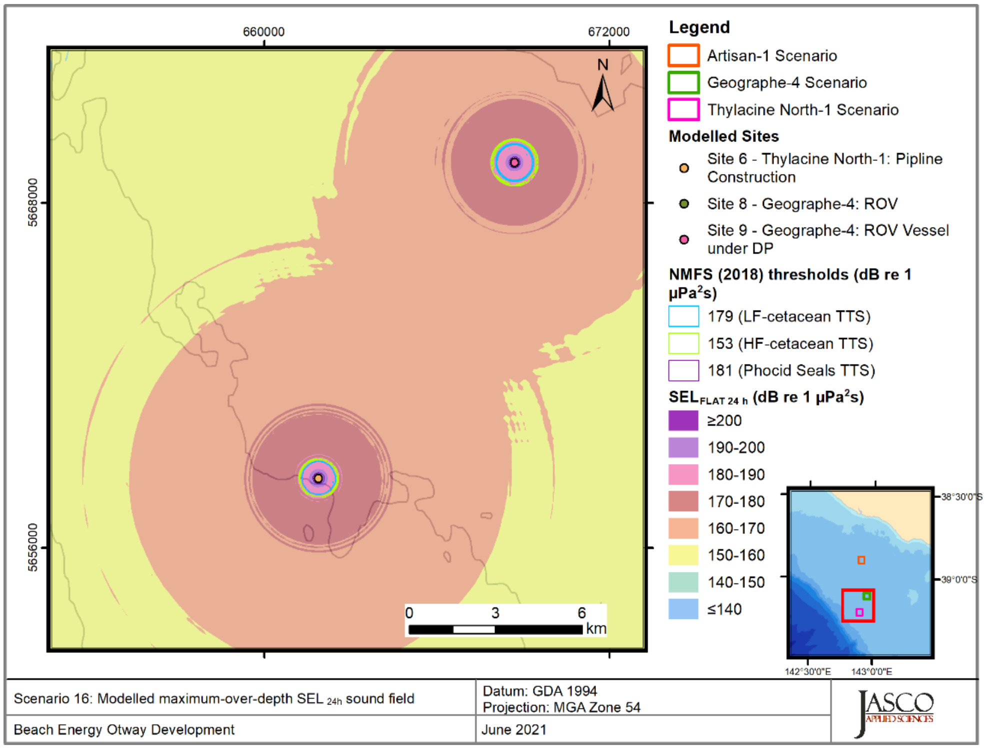


Figure 45. *Thylacine North-1, PLV stationary and ROV Operations at Geographe-4 - November (Scenario 16) SEL$_{24h}$*: Sound level contour map showing unweighted maximum-over-depth SEL$_{24h}$ results, along with isopleths for TTS thresholds. Thresholds for PTS and some thresholds for TTS were either not reached or were small enough such that they could not be displayed on a map.

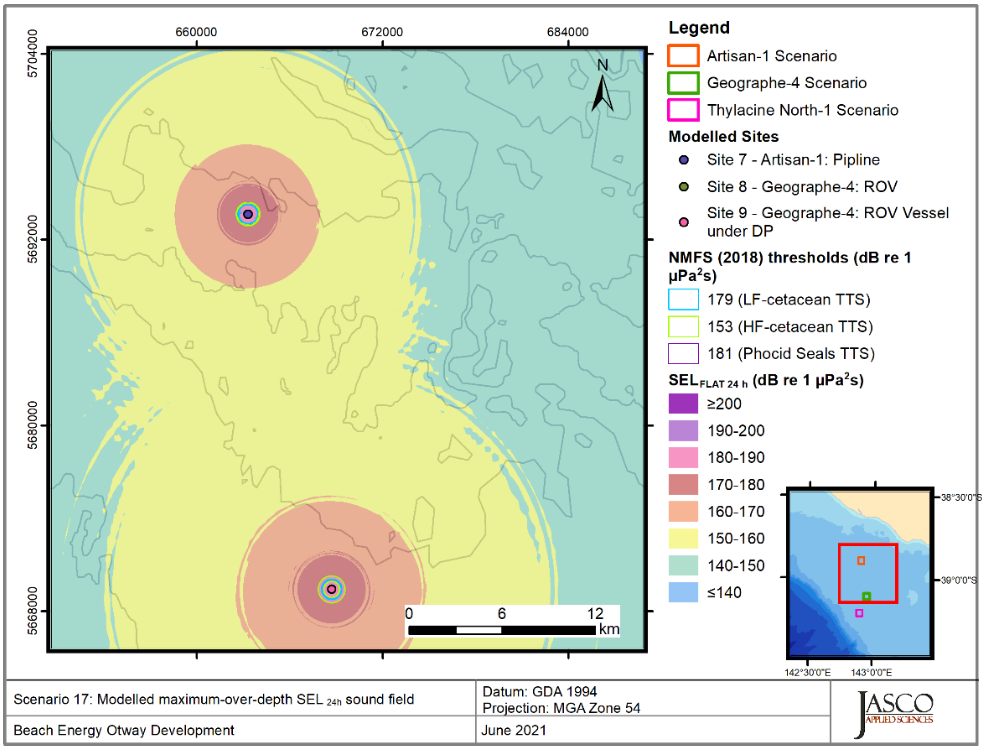


Figure 46. *Thylacine North-1, PLV stationary and ROV Operations at Geographe-4 - June (Scenario 17) SEL$_{24h}$*: Sound level contour map showing unweighted maximum-over-depth SEL$_{24h}$ results, along with isopleths for TTS thresholds. Thresholds for PTS and some thresholds for TTS were either not reached or were small enough such that they could not be displayed on a map.

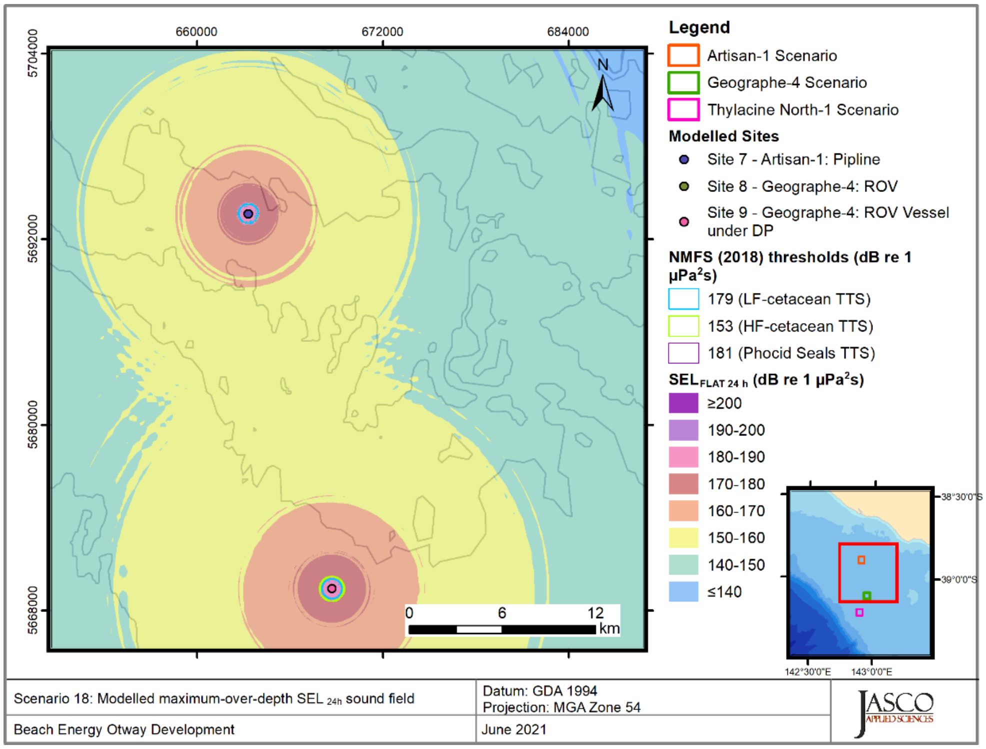


Figure 47. *Artisan-1, PLV stationary and ROV Operations at Geographe-4 - November (Scenario 18) SEL$_{24h}$*: Sound level contour map showing unweighted maximum-over-depth SEL$_{24h}$ results, along with isopleths for TTS thresholds. Thresholds for PTS and some thresholds for TTS were either not reached or were small enough such that they could not be displayed on a map.

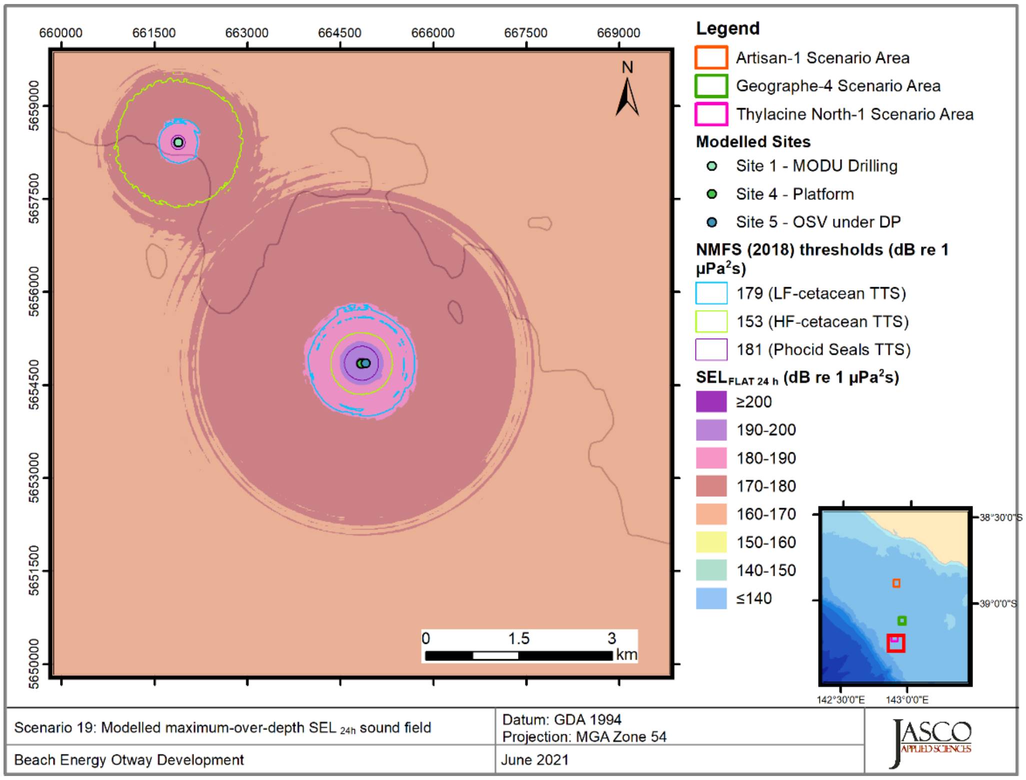


Figure 48. *Thylacine A Platform, 4h Platform Resupply and MODU Drilling (Scenario 19) SEL$_{24h}$*: Sound level contour map showing unweighted maximum-over-depth SEL$_{24h}$ results, along with isopleths for TTS thresholds. Thresholds for PTS and some thresholds for TTS were either not reached or were small enough such that they could not be displayed on a map.

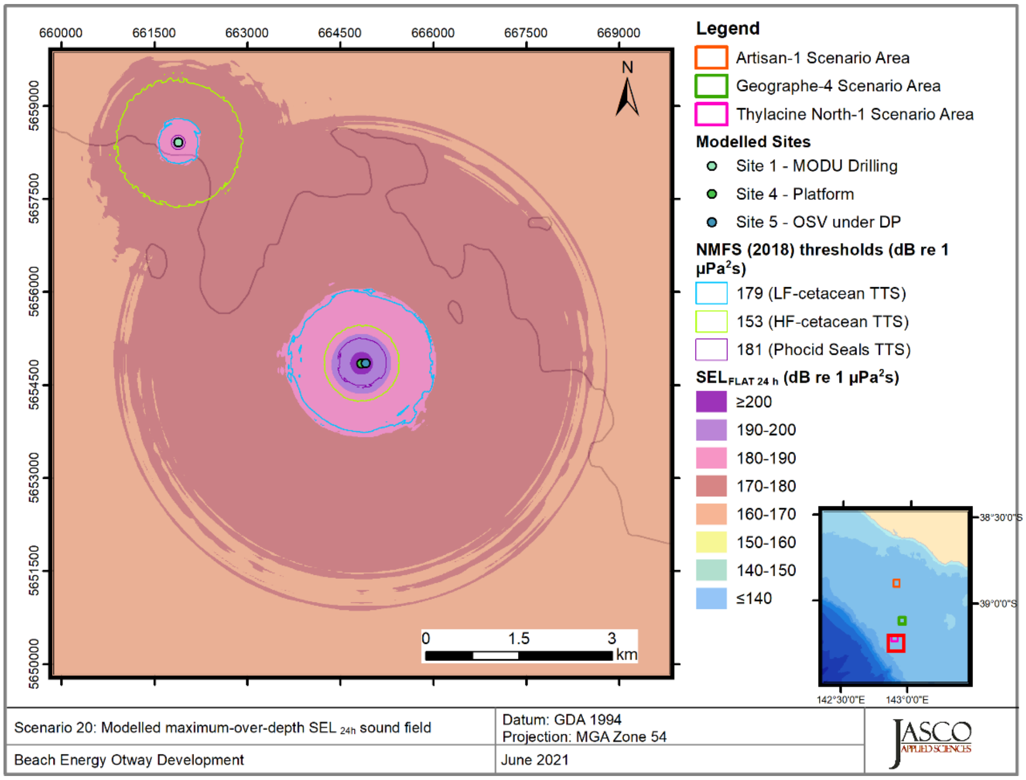


Figure 49. *Thylacine A Platform, 8h Platform Resupply and MODU Drilling (Scenario 20) SEL$_{24h}$*: Sound level contour map showing unweighted maximum-over-depth SEL$_{24h}$ results, along with isopleths for TTS thresholds. Thresholds for PTS and some thresholds for TTS were either not reached or were small enough such that they could not be displayed on a map.

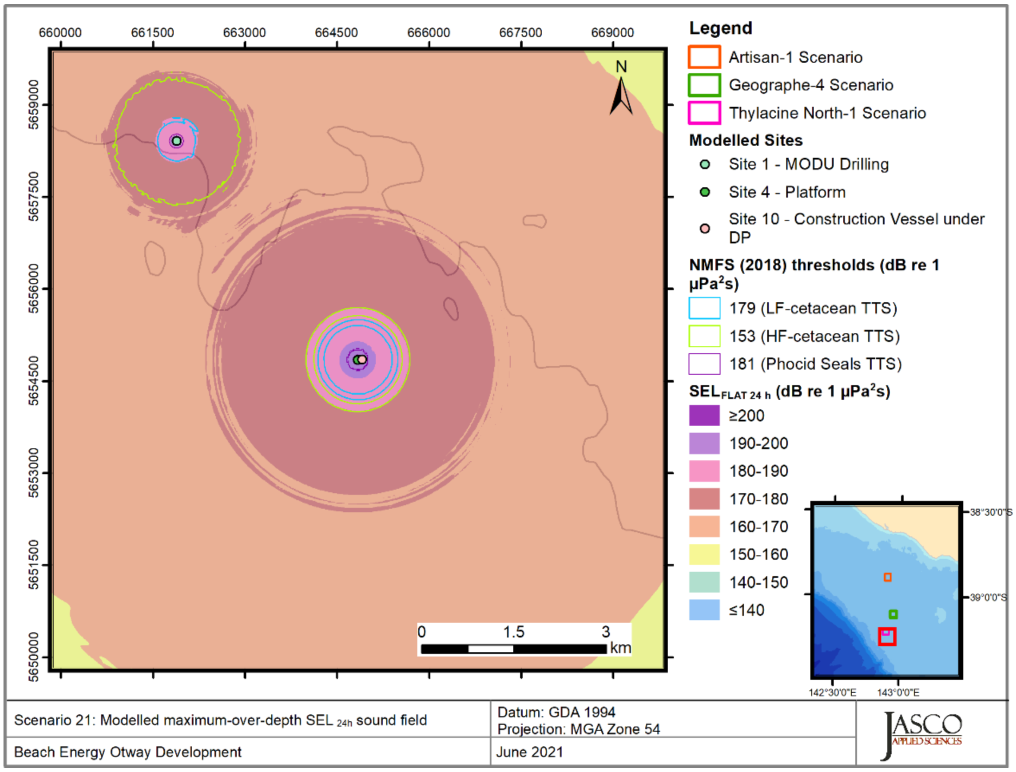


Figure 50. *Thylacine A Platform, Skid installation and MODU Drilling (Scenario 21) SEL$_{24h}$:* Sound level contour map showing unweighted maximum-over-depth SEL$_{24h}$ results, along with isopleths for TTS thresholds. Thresholds for PTS and some thresholds for TTS were either not reached or were small enough such that they could not be displayed on a map.

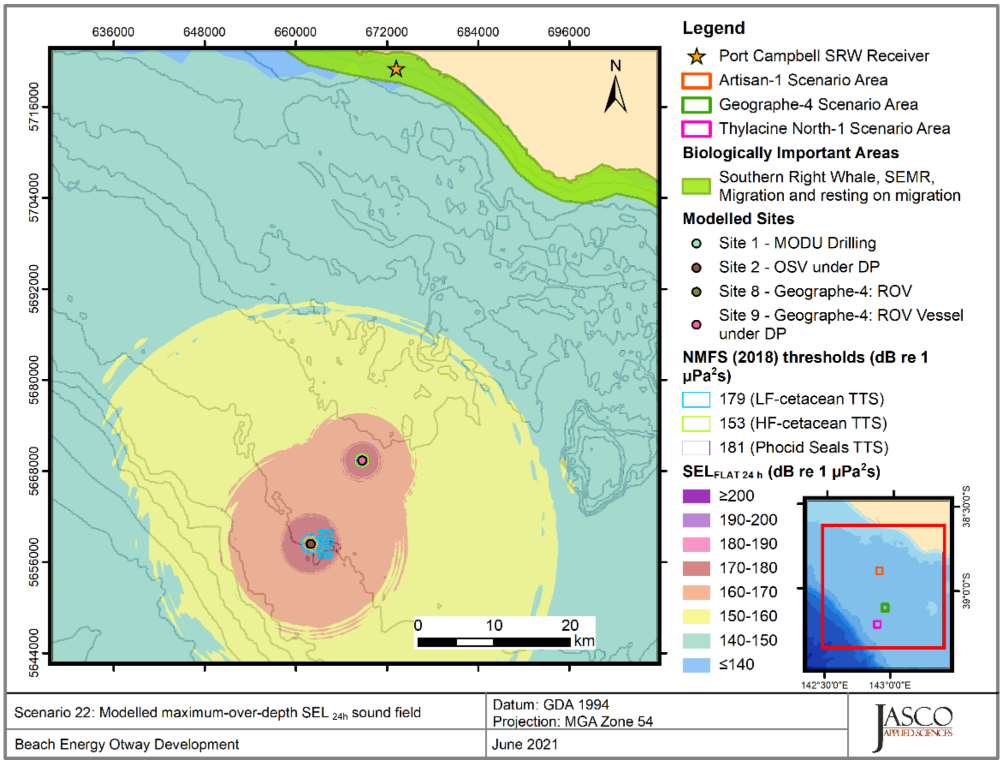


Figure 51 *Concurrent drilling operations at Thylacine North-1 and construction operations at Geographe-4 (Scenario 22) SEL$_{24h}$:* Sound level contour map showing unweighted maximum-over-depth SEL$_{24h}$ results, along with isopleths for TTS thresholds. Thresholds for PTS and some thresholds for TTS were either not reached or were small enough such that they could not be displayed on a map.

5. Discussion

The approach applied here to model the propagation loss was based is suitable for other locations within the continental shelf portion of the Otway Basin because it is supported by measurements of very similar operational activities (McPherson et al. 2021). However, the accuracy of the modelling propagation loss within this environment depends significantly upon the frequency content of the radiating sound source together with thickness of the sand layer on the calcarenite seabed within Otway region. In general, for these types of sources (i.e., vessels and other sources with a significant amount of energy above a few hundred Hertz) the thinner the sand layer, the greater the propagation loss. Having accurate source and site-specific information reduces the amount of uncertainty results due to model inputs uncertainty particularly when seemingly small changes in parametrisation can have reasonable significant changes in predicted results.

The distances to the effect thresholds based on modelling conducted here and supported by the results of the measurement study McPherson et al. (2021) are generally smaller when compared to those originally presented in Koessler et al. (2020). The understanding of the environment gained through the measurement study allowed for the geological environment to be represented in a site-specific fashion, and a more appropriate configuration of numerical models to represent the environmental propagation loss particularly with the layered calcarenite seabed. The application of the revised modelling approach to represent other Beach Energy activities on the continental shelf of the Otway Basin would be appropriate.

The effect of different seasonality on predicted distances to the effect thresholds was minor but present. Considering the modelled Otway Offshore Project Construction scenarios, each scenario was modelled with a sound speed profiles for the ‘worst case over the year’ and for a period pygmy blue whales are present in the region, between November and January. These sound speed profiles were respectively selected as June and November. The effect thresholds applied to pygmy blue was the low-frequency cetacean SEL_{24h} thresholds based on NMFS (2018). The sound speed profile of November generally produced small distances to the low-frequency cetacean PTS and TTS threshold for the same operational activities modelled with a June SSP, see Tables 11–13. The seasonal differences were at most a few hundred metres. The receiver SPL level at the Port Campbell receiver locations presented in Table 8 are therefore expected to be lower in in November.

The SEL_{24h} is a cumulative metric that reflects the dosimetric impact of noise levels within 24 hours based on the assumption that an animal is consistently exposed to such noise levels at a fixed position. The corresponding SEL_{24h} radii represent an unlikely worst-case scenario. More realistically, marine mammals (as well as fish and turtles) are unlikely to stay in the same location for 24 hours. Therefore, a reported radius for SEL_{24h} criteria does not mean that marine fauna travelling within this radius of the source will be injured, but rather that an animal could be exposed to the sound level associated with impairment (either PTS or TTS) if it remained in that location for 24 hours.

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Appendix A. Acoustic Metrics

A.1. Pressure Related Acoustic Metrics

Underwater sound pressure amplitude is measured in decibels (dB) relative to a fixed reference pressure of p_0 = 1 μPa. Because the perceived loudness of sound, especially impulsive noise such as from seismic airguns, pile driving, and sonar, is not generally proportional to the instantaneous acoustic pressure, several sound level metrics are commonly used to evaluate noise and its effects on marine life. We provide specific definitions of relevant metrics used in the accompanying report. Where possible we follow the ANSI and ISO standard definitions and symbols for sound metrics, but these standards are not always consistent.

The sound pressure level (SPL; L_p; dB re 1 μPa) is the rms pressure level in a stated frequency band over a specified time window (T, s) containing the acoustic event of interest. It is important to note that SPL always refers to a rms pressure level and therefore not instantaneous pressure:

$$L_p = 10\log_{10}\left(\frac{1}{T}\int_T p^2(t)dt \Big/ p_0^2\right) \tag{A-1}$$

The SPL represents a nominal effective continuous sound over the duration of an acoustic event, such as the emission of one acoustic pulse, a marine mammal vocalization, the passage of a vessel, or over a fixed duration. Because the window length, T, is the divisor, events with similar sound exposure level (SEL) but more spread out in time have a lower SPL.

The sound exposure level (SEL; L_E; $L_{E,p}$; dB re 1 μPa^2·s) is a measure related to the acoustic energy contained in one or more acoustic events (N). The SEL for a single event is computed from the time-integral of the squared pressure over the full event duration (T):

$$L_E = 10\log_{10}\left(\int_T p^2(t)dt \Big/ T_0 p_0^2\right) \tag{A-2}$$

where T_0 is a reference time interval of 1 s. The SEL continues to increase with time when non-zero pressure signals are present. It therefore can be construed as a dose-type measurement, so the integration time used must be carefully considered in terms of relevance for impact to the exposed recipients.

SEL can be calculated over periods with multiple acoustic events or over a fixed duration. For a fixed duration, the square pressure is integrated over the duration of interest. For multiple events, SEL can be computed by summing (in linear units) SEL of the N individual events:

$$L_{E,N} = 10\log_{10}\left(\sum_{i=1}^{N} 10^{\frac{L_{E,i}}{10}}\right) . \tag{A-3}$$

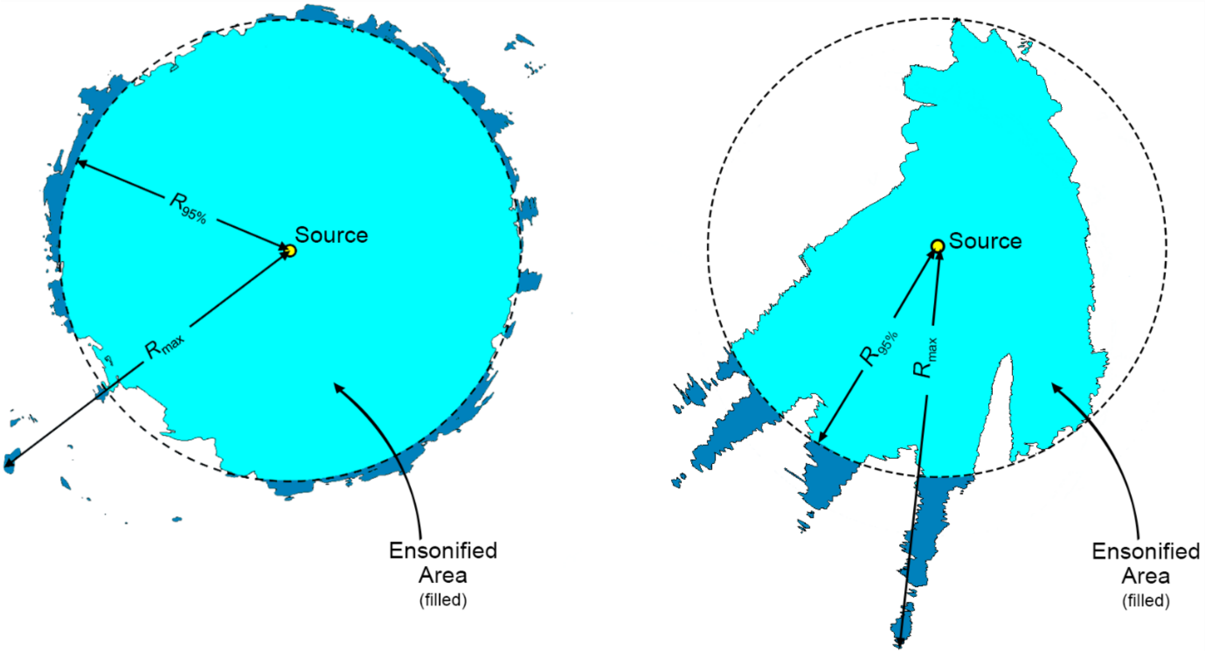
Appendix B. Methods and Parameters

This section describes the specifications of the seismic source that was used at all sites and the environmental parameters used in the propagation models.

B.1. Estimating Range to Thresholds Levels

Sound level contours were calculated based on the underwater sound fields predicted by the propagation models, sampled by taking the maximum value over all modelled depths above the sea floor for each location in the modelled region. The predicted distances to specific levels were computed from these contours. Two distances relative to the source are reported for each sound level: 1) $R_{\max}$, the maximum range to the given sound level over all azimuths, and 2) $R_{95\%}$, the range to the given sound level after the 5% farthest points were excluded (see examples in Figure B-1).

The $R_{95\%}$ is used because sound field footprints are often irregular in shape. In some cases, a sound level contour might have small protrusions or anomalous isolated fringes. This is demonstrated in the image in Figure B-1(a). In cases such as this, where relatively few points are excluded in any given direction, $R_{\max}$ can misrepresent the area of the region exposed to such effects, and $R_{95\%}$ is considered more representative. In strongly asymmetric cases such as shown in Figure B-1(b), on the other hand, $R_{95\%}$ neglects to account for significant protrusions in the footprint. In such cases $R_{\max}$ might better represent the region of effect in specific directions. Cases such as this are usually associated with bathymetric features affecting propagation. The difference between $R_{\max}$ and $R_{95\%}$ depends on the source directivity and the non-uniformity of the acoustic environment.



(a) (b)

Figure B-1. Sample areas ensonified to an arbitrary sound level with $R_{\max}$ and $R_{95\%}$ ranges shown for two different scenarios. (a) Largely symmetric sound level contour with small protrusions. (b) Strongly asymmetric sound level contour with long protrusions. Light blue indicates the ensonified areas bounded by $R_{95\%}$; darker blue indicates the areas outside this boundary which determine $R_{\max}$.

B.2. Environmental Parameters

B.2.1. Bathymetry

Water depths throughout the modelled areas were extracted from the Australian Bathymetry and Topography Grid, a 9 arc-second grid rendered for Australian waters (Whiteway 2009). Bathymetry data were re-gridded onto a Map Grid of Australia (MGA) coordinate projection (Zone 54) with a regular grid spacing of 100 × 100 m.

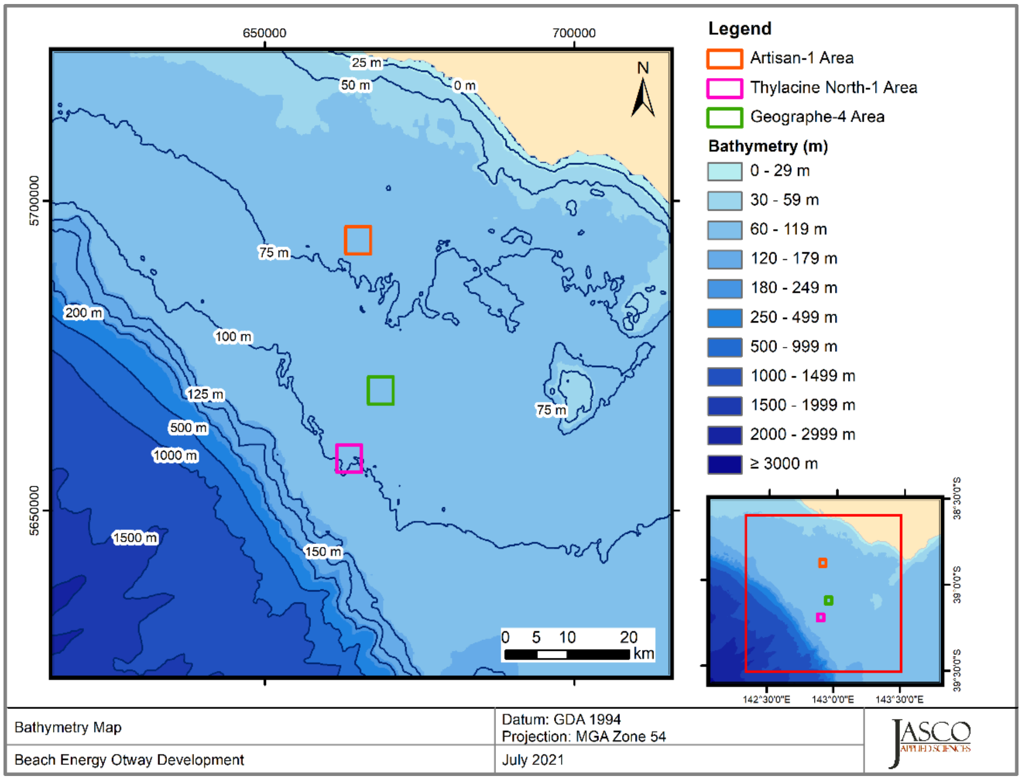


Figure B-2. Bathymetry in the modelled area.

B.2.2. Sound speed profile

The sound speed profile in the area was derived from temperature and salinity profiles from the U.S. Naval Oceanographic Office's *Generalized Digital Environmental Model V 3.0* (GDEM; Teague et al. 1990, Carnes 2009). GDEM provides an ocean climatology of temperature and salinity for the world's oceans on a latitude-longitude grid with 0.25° resolution, with a temporal resolution of one month, based on global historical observations from the U.S. Navy's Master Oceanographic Observational Data Set (MOODS). The climatology profiles include 78 fixed depth points to a maximum depth of 6800 m (where the ocean is that deep). The GDEM temperature-salinity profiles were converted to sound speed profiles according to Coppens (1981).

Mean monthly sound speed profiles were derived from the GDEM profiles at distances less than 7 km around the modelled site. The June sound speed profile is expected to be most favourable to longer-range sound propagation across the entire year. As such, June was selected for sound propagation modelling to ensure precautionary estimates of distances to received sound level thresholds. For the pygmy blue whale period between November and January November is expected to be most favourable to longer-range propagation in that period. Figure B-3 shows the resulting profiles, which were used as input to the sound propagation modelling.

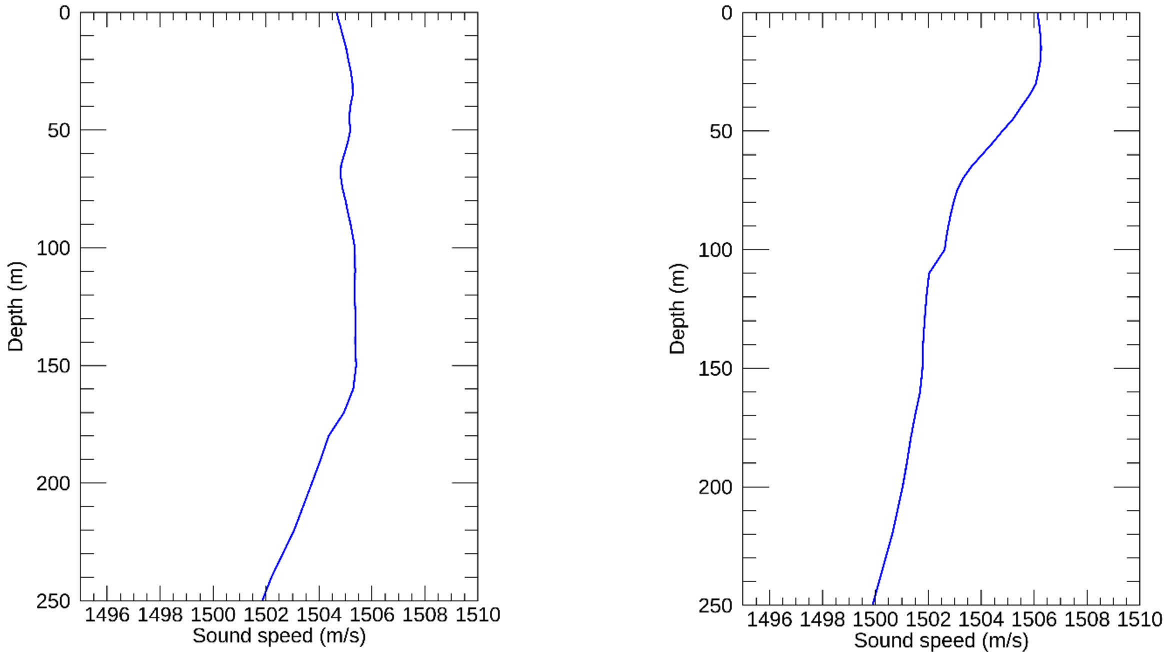


Figure B-3. The modelling sound speed profile corresponding to June (left) and November (right) Profiles are calculated from temperature and salinity profiles from *Generalized Digital Environmental Model* V 3.0 (GDEM; Teague et al. 1990, Carnes 2009).

B.2.3. Geoacoustics

The propagation model used in this study consider a single geoacoustic profile for each development area. These profiles determine how sound is reflected from the seabed, as well as how it is transmitted, reflected and absorbed into the sediment layers. As in previous acoustic studies in the area, the modelling area was divided into two seabed types (Wood and McPherson 2018). Both areas are located on the continental shelf, however the seabed in the Thylacine North-1 and were modelled as being characterised by well-cemented carbonate caprock (calcarenite), overlying semi-cemented carbonate rock (calcarenite). This contrast in seabed environment is consistent with larger scale geological data and interpretations of the Australian continental shelf environment (James and Bone 2010). Table B-1 present the geoacoustic profile used at the modelled sites in each respective development area.

Table B-1. *Thylacine North-1*: Geoacoustic profile. Each parameter varies linearly within the stated range.

Depth below seafloor (m)	**Predicted lithology**	**Density (g/cm^3)**	**Compressional wave**		**Shear wave**	
			Speed (m/s)	Attenuation (dB/λ)	Speed (m/s)	Attenuation (dB/λ)
0–0.5	Well-cemented carbonate caprock	2.7	2600	0.50	1200	0.5
0.5–20	Increasingly cemented calcarenite	2.2	2000	0.30	900	0.27
20-40		2.3	2120	0.34	960	0.32
40-60		2.4	2240	0.38	1020	0.41
60-80		2.5	2360	0.42	1080	0.45
80–100		2.6	2480	0.46	1140	0.5
>100	Well-cemented calcarenite	2.7	2600	0.5	1200	0.5

Appendix E JASCO Acoustic Modelling Report – Yolla Drilling Campaign

Beach Energy Yolla Drilling Campaign

Acoustic Modelling for Assessing Marine Fauna Sound Exposures

JASCO Applied Sciences (Australia) Pty Ltd

17 June 2022

Submitted to:

Phil Wemyss
Beach Energy
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Authors:

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Contents

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Executive Summary

JASCO Applied Sciences (JASCO) performed a modelling study of underwater sound levels associated with the Beach Energy Yolla Drilling Campaign. This study considers specific components of the program to take place at the Yolla well head platform (WHP), including the drilling of the Yolla-7 well.

In addition to the regular activities of the Yolla WHP, the modelling study considers the activities of a jack-up drill rig conducting drilling operations, and an associated Offshore Support Vessel (OSV) conducting re-supply operations under dynamic positioning (DP).

The study assessed distances from operations where underwater sound levels reached thresholds corresponding to various levels of potential impact to marine fauna. The animals considered here included marine mammals, turtles, and fish (including fish eggs and larvae). Due to the variety of species considered, there are several different thresholds for evaluating effects, including: mortality, injury, temporary reduction in hearing sensitivity, and behavioural disturbance. Of particular note, whilst the newly published 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.

The modelling methodology considered scenario specific source levels and range-dependent environmental properties. Estimated underwater acoustic levels for non-impulsive (continuous) noise sources presented as sound pressure levels (SPL, L_p), and as accumulated sound exposure levels (SEL, L_E). In this report, the duration of the SEL accumulation is defined as integrated over a 24 hour period.

The SEL_{24h} is a cumulative metric that reflects the dosimetric impact of noise levels within 24 hours based on the assumption that an animal is consistently exposed to such noise levels at a fixed position. The corresponding SEL_{24h} radii represent an unlikely worst-case scenario. More realistically, marine mammals (as well as fish and turtles) would not stay in the same location for 24 hours. Therefore, a reported radius for SEL_{24h} criteria does not mean that marine fauna travelling within this radius of the source will be injured, but rather that an animal could be exposed to the sound level associated with impairment if it remained in that location for 24 hours

Vessel and Drilling Noise

For the results below, the distances to isopleths/thresholds were reported from the most dominant source when a group of sources were present. Maps are provided in with the report to assist in with contextualising tabulated distances. The key results of this acoustic modelling study are summarised below. There are no thresholds for invertebrates for effects from non-impulsive noise, therefore no results are reported.

Marine mammals:

The maximum distances to the (NOAA) (2019) marine mammal behavioural response criterion of 120 dB re 1 µPa (SPL) are presented in Table 1. The results for the criteria from Southall et al. (2019) for marine mammal PTS and TTS for Jack-up rig and vessel operations are assessed for four scenarios. The maximum distances and total ensonified areas are presented in Table 2.

Table 1. Maximum (R_{max}) and 95% ($R_{95\%}$) horizontal distances (in km) to the marine mammal behavioural response criterion of 120 dB re 1 µPa (SPL) from the most appropriate location for considered sources per scenario. WHP: Well Head Platform, JU: Jack-Up Drill Rig, OSV: Offshore Support Vessel

Applicable Scenario number	Description	R_{max} (km)	$R_{95\%}$ (km)
1	Yolla WHP	0.16	0.16
2	Yolla WHP + JU	2.14	2.06
3	Yolla WHP + JU + OSV under DP	6.20	5.85
4	Yolla WHP + OSV under DP	5.94	5.55

Table 2. Summary: Maximum (R_{max}) horizontal distances (in km) and ensonified area (km^2) for the frequency-weighted LF-cetacean SEL$_{24h}$ TTS thresholds from the most appropriate location for the considered scenario. WHP: Well Head Platform, JU: Jack-Up Drill Rig, OSV: Offshore Supply Vessel

Scenario number	Description	R_{max} (km)	Area (km^2)
1	Yolla WHP	0.03	0.004
2	Yolla WHP + JU	0.17	0.08
3	Yolla WHP + JU + OSV under DP	0.49	0.58
4	Yolla WHP + OSV under DP	0.35	0.34

Fish:

Sound produced by the drilling activity operations at the Yolla WHP may reach the sound levels associated with physiological effects, recoverable injury, and TTS for some fish species in close proximity to the sound sources (within 30–110 m respectively), but in order for the thresholds to be exceeded, the fish must remain at those distances for either 12 or 48 h respectively.

1. Introduction

JASCO Applied Sciences (Australia) performed a modelling study of underwater acoustic noise emissions associated with the Beach Energy Yolla Drilling Campaign. This study considers specific components of the program to take place at the Yolla well head platform (WHP), including the drilling of the Yolla-7 well.

This study specifically assessed distances from the considered operations to where underwater sound levels reached thresholds corresponding to various levels of impact to marine fauna. The key fauna considered in this study included humpback whales, fish (including fish eggs and larvae) and benthic invertebrates; however, other marine mammals and sea turtles are also considered. Due to the variety of species considered, there are several different thresholds for evaluating effects, including: mortality, injury, temporary reduction in hearing sensitivity, and behavioural disturbance.

The modelling methodology considered source directivity and range-dependent environmental properties. Estimated underwater acoustic levels are presented as sound pressure levels (SPL, L_p), and accumulated sound exposure levels (SEL, L_E) as appropriate for different noise effect criteria for non-impulsive (vessels and drilling).

1.1. Acoustic Modelling Scenario Details

This study considered the following activities associated with the drilling campaign at the Yolla WHP:

- Operational noise from an offshore platform,
- Drilling noise from a stationary jack-up drill rig,
- Vessel noise from an Offshore Support Vessel (OSV) conducting resupply operations under dynamic positioning (DP).

Three modelled sites were considered to model the noise footprints from individual sources. Details of the modelled sites are presented Table 3 and displayed graphically in Figure 1. Each scenario may contain a single or multiple sites (to represent multiple sources) as indicated in Table 4. The modelled scenarios considered below and detailed in Table 4 and consider various combinations modelled sites and activity durations of the drilling campaign activities.

Table 3. Modelled site locations and source information.

Site	Source	Latitude (S)	Longitude (E)	MGA Zone 55 (GDA94)		Water Depth (m)
				X (m)	Y (m)	
1	Yolla Platform	39° 50' 37.98"	145° 49' 4.98"	398878	5588902	80.0
2	Jack-Up Drill Rig	39°50'40.65"	145° 49' 4.98"	398880	5588819	80.0
3	OSV	39° 50' 40.68"	145° 49' 7.85"	398948	5588819	80.0

Table 4. Description of modelled scenarios.

Scenario number	Site(s)	Source(s)	Description
1	1	Platform	Yolla Platform Operations
2	1,2	Platform Jack-Up Drill Rig	Yolla Platform Operations + Noble Tom Prosser Jack-Up Drilling
3	1,2,3	Platform Jack-Up Drill Rig OSV	Yolla Platform Operations + Tom Prosser Jack-Up Drilling + OSV under DP conducting Resupply Ops (4 h)
4	1,3	Platform OSV	Yolla Platform Operations + OSV under DP conducting Resupply Ops (4 h)

All scenarios include the continuous activity of the Yolla Well Head Platform (WHP) (Section 3.1), whose onboard systems are assumed to produce a constant source of noise operating 24 hrs a day. Specifically, Scenario 1 is solely this source. In Scenarios 2 and 3 a representative jack-up drill rig, proposed for this project is used to assess noise during regular drilling activities. The jack-up drill rig is considered to run parallel to the WHP operation.

Scenarios 3 and 4 include noise from the OSV, where scenario 3 is the combination of all three noise sources, and Scenario 4 is just the WHP and OSV. During a 24 h period, the OSV conducting resupply operations is considered to operate under DP for 4 h.

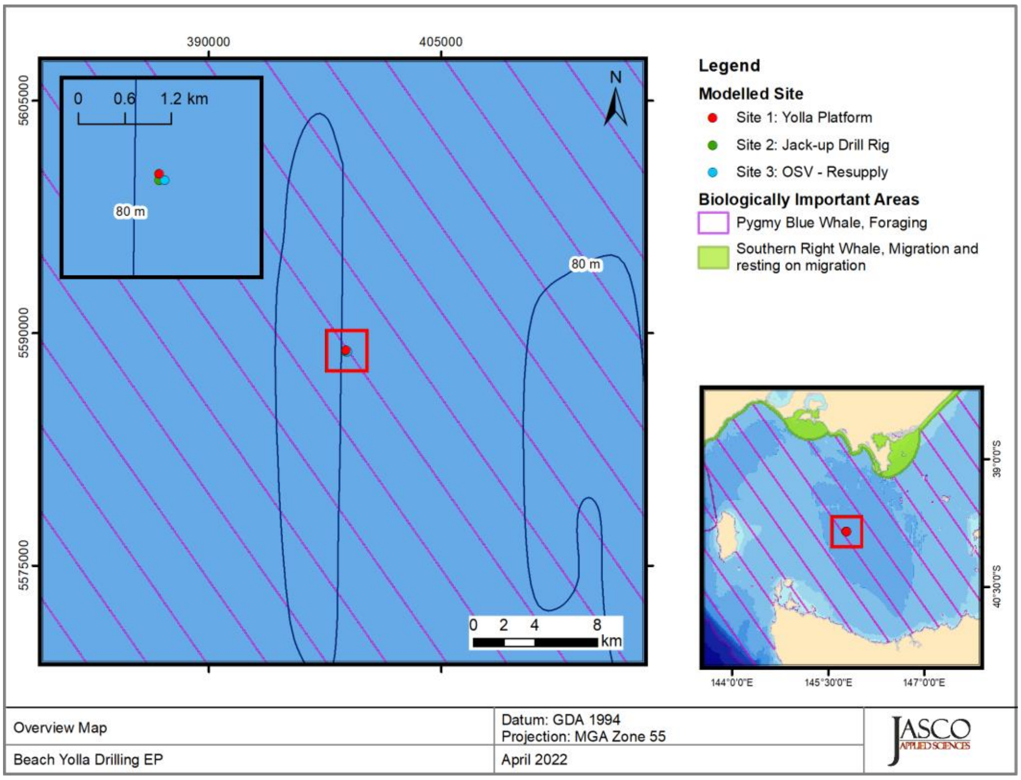

Figure 1. Overview map of the modelled extent and modelled sites.

2. Noise Effect Criteria

To assess the potential effects of a sound-producing activity, it is necessary to first establish exposure criteria (thresholds) for which sound levels may be expected to have a negative effect on animals. Whether acoustic exposure levels might injure or disturb marine fauna is an active research topic. Since 2007, several expert groups have developed SEL-based assessment approaches for evaluating auditory injury, with key works including Southall et al. (2007), Finneran and Jenkins (2012), Popper et al. (2014), United States National Marine Fisheries Service (NMFS 2018) and Southall et al. (2019). The number of studies that investigate the level of behavioural disturbance to marine fauna by anthropogenic sound has also increased substantially.

Two sound level metrics, SPL, and SEL, are commonly used to evaluate non-impulsive noise and its effects on marine life. In this report, the duration of the SEL accumulation is defined as integrated over a 24 h time period. Appropriate subscripts indicate any applied frequency weighting applied (Appendix A.4). The acoustic metrics in this report reflect the updated ANSI and ISO standards for acoustic terminology, ANSI S1.1 (S1.1-2013) and ISO 18405:2017 (2017).

The following thresholds and guidelines for this study were chosen because they represent the best available science, and sound levels presented in literature for fauna with no defined thresholds:

1. Frequency-weighted accumulated sound exposure levels (SEL; $L_{\mathrm{E,24h}}$) from Southall et al. (2019) for the onset of permanent threshold shift (PTS) and temporary threshold shift (TTS) in marine mammals for non-impulsive sources.
2. Marine mammal behavioural threshold based on the current interim U.S. National Oceanic and Atmospheric Administration (NOAA) (2019) criterion for marine mammals of 120 dB re 1 µPa (SPL; L_{p}) for non-impulsive sound sources.
3. Sound exposure guidelines for fish, fish eggs, and larvae (Popper et al. 2014).
4. Frequency-weighted accumulated sound exposure levels (SEL; $L_{\mathrm{E,24h}}$) from Finneran et al. (2017) for the onset of PTS and TTS in turtles for non-impulsive sound sources.

The following sections (Sections 2.1 and 2.2, along with Appendix A.3 and A.4), expand on the thresholds, guidelines and sound levels for marine mammals, fish, fish eggs, fish larvae, and sea turtles.

2.1. Marine Mammals

The criteria applied in this study to assess possible effects of non-impulsive and impulsive noise sources on marine mammals are summarised in Table 5. Cetaceans and otariid seals were identified as the hearing groups requiring assessment. Details on thresholds related to auditory threshold shifts or hearing loss and behavioural response are provided in Appendix A.3, with frequency weighting explained in detail in Appendix A.4. Of particular note, whilst the newly published 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 5. Criteria for effects of non-impulsive noise exposure, including vessel noise, for marine mammals: Unweighted SPL and SEL_{24h} thresholds.

Hearing group	NOAA (2019)	Southall et al. (2019)	
	Behaviour	PTS onset thresholds (received level)	TTS onset thresholds (received level)
	SPL (L_p; dB re 1 µPa)	Weighted SEL (L_E; dB re 1 µPa^2 s)	Weighted SEL (L_E; dB re 1 µPa^2 s)
Low-Frequency (LF) cetaceans	120	199	179
High-frequency (HF) cetaceans		198	178
Very High-frequency (VHF) cetaceans		173	153
Otariid seals		219	199

L_p denotes sound pressure level period and has a reference value of 1 µPa.
L_E denotes cumulative sound exposure over a 24 h period and has a reference value of 1 µPa^2·s.

2.2. Fish, Sea turtles, Fish Eggs, and Fish Larvae

In 2006, the Working Group on the Effects of Sound on Fish and Sea Turtles was formed to continue developing noise exposure criteria for fish and sea turtles, work begun by a NOAA panel two years earlier. The Working Group developed guidelines with specific thresholds for different levels of effects for several species groups (Popper et al. 2014). The guidelines define quantitative thresholds for three types of immediate effects:

- Mortality, including injury leading to death,
- Recoverable injury, including injuries unlikely to result in mortality, such as hair cell damage and minor haematoma, and
- TTS.

Masking and behavioural effects can be assessed qualitatively, by assessing relative risk rather than by specific sound level thresholds. However, as these depend upon activity-based subjective ranges, these effects are not addressed in this report and are included in Table 6 for completeness. Because the presence or absence of a swim bladder has a role in hearing, fish's susceptibility to injury from noise exposure depends on the species and the presence and possible role of a swim bladder in hearing. Thus, different thresholds were proposed for fish without a swim bladder (also appropriate for sharks and applied to whale sharks in the absence of other information), fish with a swim bladder not used for hearing, and fish that use their swim bladders for hearing. Sea turtles, fish eggs, and fish larvae are considered separately.

2.2.1. Sea Turtles

There is a paucity of data regarding responses of turtles to acoustic exposure, and no studies of hearing loss due to exposure to loud sounds. Popper et al. (2014) suggested thresholds for onset of mortal injury (including PTS) and mortality for sea turtles and, in absence of taxon-specific information, adopted the levels for fish that do not hear well (suggesting that this likely would be conservative for sea turtles).

Finneran et al. (2017) presented revised thresholds for sea turtle injury and hearing impairment (TTS and PTS). Their rationale is that sea turtles have best sensitivity at low frequencies and are known to have poor auditory sensitivity (Bartol and Ketten 2006, Dow Piniak et al. 2012). Accordingly, TTS and

PTS thresholds for turtles are likely more similar to those of fishes than to marine mammals (Popper et al. 2014). Table 6 lists the relevant effects thresholds from Popper et al. (2014) for vessel and drilling noise. Some evidence suggests that fish sensitive to acoustic pressure show a recoverable loss in hearing sensitivity, or injury when exposed to high levels of noise (Scholik and Yan 2002, Amoser and Ladich 2003, Smith et al. 2006); this is reflected in the SPL thresholds for fish with a swim bladder involved in hearing. Finneran et al. (2017) presented revised thresholds for turtle injury, considering frequency weighted SEL, which have been applied in this study for drilling and vessel noise (Table 7).

Table 6. Criteria for non-impulsive (vessel and drilling) noise exposure for fish, adapted from Popper et al. (2014).

Type of animal	Mortality and Potential mortal injury	Impairment			Behaviour
		Recoverable injury	TTS	Masking	
Fish: No swim bladder (particle motion detection)	(N) Low (I) Low (F) Low	(N) Low (I) Low (F) Low	(N) Moderate (I) Low (F) Low	(N) High (I) High (F) Moderate	(N) Moderate (I) Moderate (F) Low
Fish: Swim bladder not involved in hearing (particle motion detection)	(N) Low (I) Low (F) Low	(N) Low (I) Low (F) Low	(N) Moderate (I) Low (F) Low	(N) High (I) High (F) Moderate	(N) Moderate (I) Moderate (F) Low
Fish: Swim bladder involved in hearing (primarily pressure detection)	(N) Low (I) Low (F) Low	170 dB SPL for 48 h	158 dB SPL for 12 h	(N) High (I) High (F) High	(N) High (I) Moderate (F) Low
Sea turtles	(N) Low (I) Low (F) Low	(N) Low (I) Low (F) Low	(N) Moderate (I) Low (F) Low	(N) High (I) High (F) Moderate	(N) High (I) Moderate (F) Low
Fish eggs and fish larvae	(N) Low (I) Low (F) Low	(N) Low (I) Low (F) Low	(N) Low (I) Low (F) Low	(N) High (I) Moderate (F) Low	(N) Moderate (I) Moderate (F) Low

Sound pressure level dB re 1 µPa.

Relative risk (high, moderate, low) is given for animals at three distances from the source defined in relative terms as near (N), intermediate (I), and far (F).

Table 7. Acoustic effects of non-impulsive noise on sea turtles, weighted SEL_{24h}, Finneran et al. (2017).

PTS onset thresholds* (received level)	TTS onset thresholds* (received level)
220	200

3. Methods

The following sections provide a high-level description of the inputs used for this underwater noise modelling study. The sections are divided into subsections within Section 3.1 detailing the source inputs for the Production Platform, Jack-up Drill Rig and OSV, with Section 3.2 providing the details on the applied modelling technique and model configuration information.

3.1. Sound Sources

For the Yolla platform, jack-up drill rig and OSV Figure 2 presents a summary plot of consider source spectra for comparison purposes; additional detail is provided in Sections 3.1.1–3.1.3.

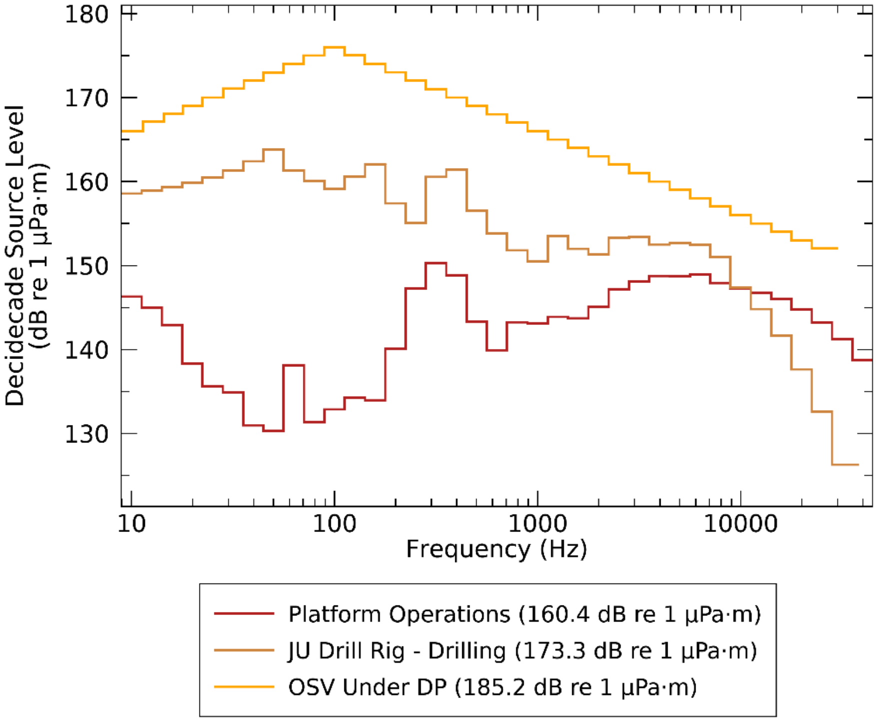

Figure 2. Energy source level (ESL) spectra (in decidecade frequency-band) for all three sound sources.

3.1.1. Production Platforms

Fixed structures such as the Production Platforms have lower radiated sound levels than floating platforms (Spence et al. 2007). Equipment operating onboard floating platforms can contribute to marine environment sound however, airborne and structure-borne (vibration) pathways are considered more significant on these facilities, where equipment can be located below the water line. Underwater noise produced from platforms standing on metal jack-up legs is relatively low given the small surface areas available for sound transmission and also given the location of machinery above the waterline. It is therefore expected that the dominant pathway for sound generation is structure-borne (i.e., vibration from machinery passing through the legs) (Spence et al. 2007).

A study involving the Endeavour Jack-up Rig, operating in Cook Inlet, was conducted by Illingworth and Rodkin (2014) during drilling activities. The results from the sound source verification indicated that sound generated from drilling or generators were below ambient sound levels. The generators used on the Endeavour are mounted on pedestals specifically to reduce sound transfer through the infrastructure, and they are enclosed in an insulated engine room, which may have reduced further underwater sound transmission to levels below those generated by the Spartan 151. The sound source verification revealed that the submersed deep-well pumps that charge the fire-suppression system and cool the generators (in a closed water system) were the most likely dominant contributor the sound field. The measurements are reported as near-source levels recorded close to the bow leg pump system (at 10 m range) (Figure 3-5 in Illingworth and Rodkin Inc. (2014). These were backpropagated using spherical spreading to determine an energy source level (ESL) spectrum. Considering the similarities between a Jack-up Rig and a static platform, the decidecade band spectrum is shown in Figure 3 was used in modelling noise emissions from the Yolla platform.

Jack-up platforms extend from the sea-surface to the sea-floor, and the noise production is distributed along this range non-uniformly. Our propagation model does not support distributed sources and as a conservative estimate, the platform's sound is modelled as a point source at a depth of 40 m, the mid-water depth.

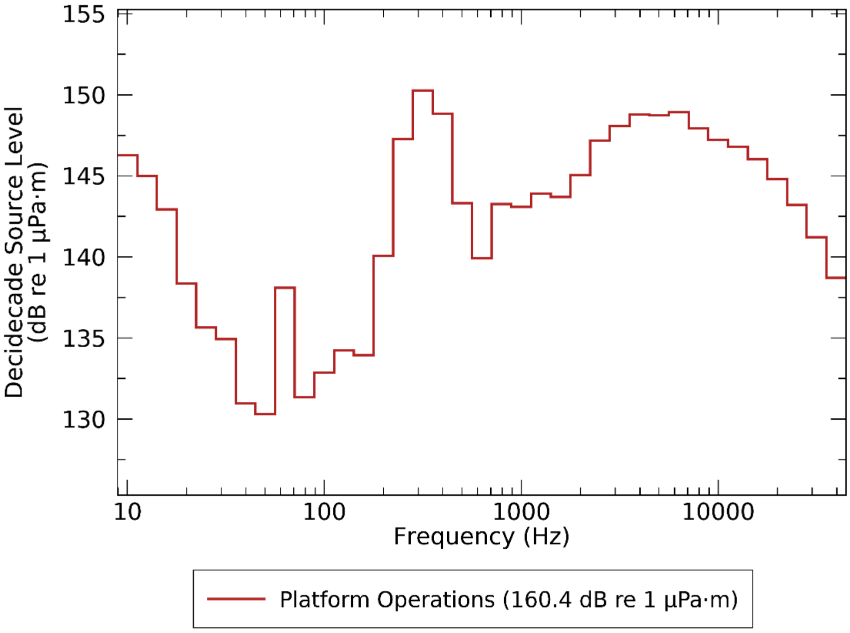

Figure 3. Energy source level (ESL) spectra (in decidecade frequency-band) for the Jack-up Rig considered as a proxy source for the Yolla Platform.

3.1.2. Jack-up Drill Rig

Jack-up rigs, such as the Noble Tom Prosser, are a type of mobile offshore drilling units; they are not fixed, and are usually less self-sufficient then fixed platforms. Therefore, they usually require a support vessel, standing-by within a certain distance from the rig.

Todd et al. (2020) reported on the near-field recordings of underwater noise from the sides of a jack-up rig during drilling operations in the North Sea (water depth of 40 m). Measurements were made of the *Noble Kolskaya*, a three-legged cantilever type jack-up rig, 69 m long and 80 m wide (Todd et al. 2020, Wikipedia 2022). The reported decidecade received levels for drilling operations (25 Hz to 12.5 kHz) were back propagated assuming spherical spreading over a distance of 60 m, to provide conservative estimates of the MSL. The spectrum was extrapolated by continuing the attenuation of the last decidecade, that is assuming a 10 dB per decade at frequencies below 25 Hz, and 25 dB per decade at frequencies above 12.5 kHz. Figure 4 presents the spectrum for the jack-up rig drilling.

The jack-up drill modelled source depth of 40 m is used again here, applying the same distributed source justification as the jack-up platform.

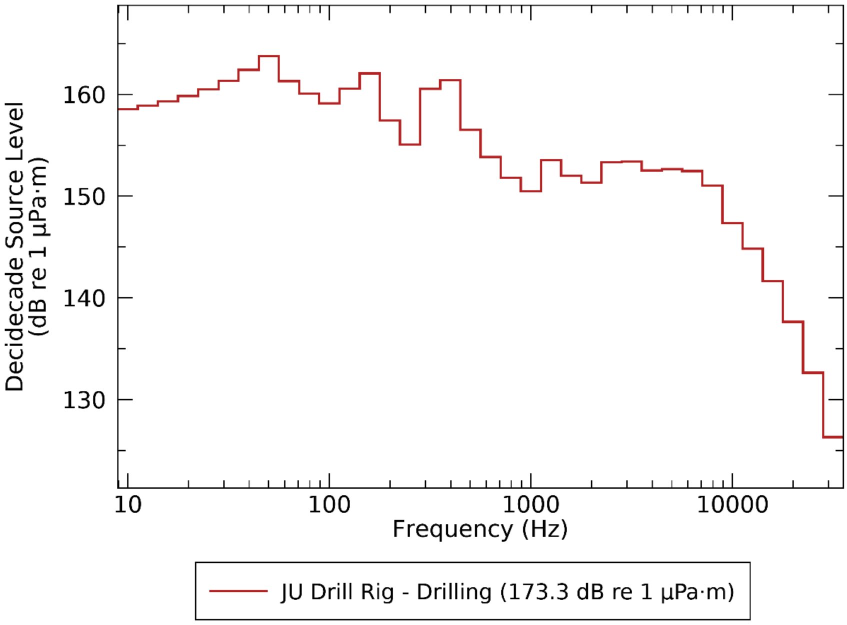

Figure 4. Monopole Source Level (MSL) spectra representing the jack-up rig during drilling operations.

3.1.3. Offshore Support Vessels

At the time of this study, the Offshore Support Vessel (OSV) to be used in the project was unconfirmed. A range of different vessels are being considered as potential choices of OSV, therefore the source level and spectrum used to represent any of these vessels was based potential nominal specifications of dimensions and power presented below.

The main propulsion system will have two aft propellers, with the following specifications likely:

- 3.2 m propeller diameter,
- 165 rpm nominal propeller speed, and
- 2200 kW maximum continuous power input.

Additional thruster modules active during DP operations include two bow tunnel thrusters and a single bow azimuth thruster. The two bow tunnel thrusters could have the following specifications:

- 2.0 m propeller diameter,
- 318 rpm nominal propeller speed, and
- 1000 kW maximum continuous power input.

The bow azimuth thruster could have the following specifications:

- 1.65 m propeller diameter,
- 373 rpm nominal propeller speed, and
- 830 kW maximum continuous power input.

Source spectra for the main propellers and bow azimuth thruster were determined by the method described in Appendix B.3. Estimates of the acoustic source levels were based on the parameters of the propulsion system, and the percent of Maximum Continuous Rating (MCR) the vessel is expected to be operating at during typical DP operations, as provided by the potential vessel operators.

The source spectrum for full power operation was determined by summing the spectra for the individual thrusters and main propellers. The source spectrum used for modelling was determined by offsetting the full power spectrum by 10log10(%MCR), where the %MCR is represented as a fraction of full power, and where power levels were supplied by the potential vessel operators. The ESL spectra is shown in Figure 5, and an overall broadband source level of 185.2 dB re 1 µPa m was used for operations involving the OSV under typical DP. The vessel was modelled as a monopole sound source at a depth of 4.9 m.

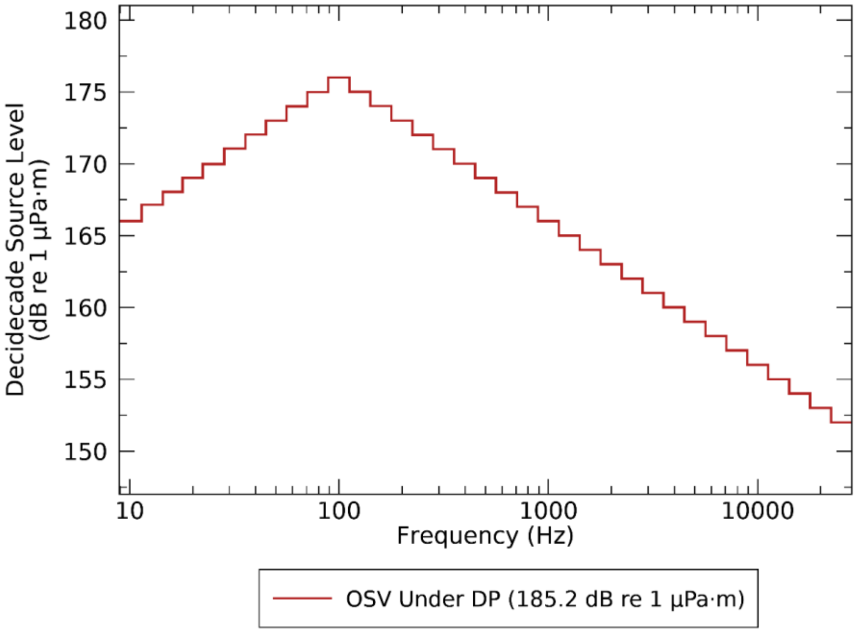

Figure 5. Decidecade energy source level (ESL) spectra of the support vessels. The support vessels have a broadband ESL (10 Hz to 25 kHz) of 185.2 dB re 1 uPa m.

3.2. Geometry and Modelled Regions

Several fit-for-purpose propagation models were used to model underwater noise emission from the scenarios considered for this study. Details on the model configuration is provided below.

JASCO's Marine Operations Noise Model (MONM-BELLHOP; Appendix B.1.2) was used to predict the acoustic field at frequencies of 10 Hz to 25 kHz for all vessels. To supplement the MONM results, high-frequency results for propagation loss were modelled using Bellhop for frequencies from 1.26 to 25 kHz. The sound field modelling calculated propagation losses up to 100 km from the source, with a horizontal separation of 20 m between receiver points along the modelled radials. A horizontal angular resolution of $\Delta\theta$ = 2.5° for a total of N = 144 radial planes were used. Receiver depths were chosen to span the entire water column over the modelled areas, from 2 m to a maximum of 85 m, with step sizes that increased with depth.

For all stationary vessels, the SPL modelling results were converted to SEL by the duration of the measurement, which is appropriate for a non-impulsive noise source. As SEL was assessed over 24 h and for a stationary vessel over a day, the conversion from SPL was obtained by increasing the levels by $10*\log_{10}(T)$, where T is 86,400 (the number of seconds in 24 h). In the case of the OSV which was considered as operating under DP for only 4 hours a day, it's 24 h SEL is calculated using a T value of 14,600 (seconds in 4 h).

4. Results

The maximum-over-depth sound fields for the modelled scenarios (described in Section 1.1) are presented below in two formats: as tables of distances to sound levels and, where the distances are long enough, and as contour maps showing the directivity and range to various sound levels.

4.1. Tabulated Results

Table 8 presents the maximum and 95% distances (defined in Appendix B.3) to SPL isopleths. Table 9 presents the maximum distances to frequency-weighted SEL_{24h} thresholds, as well as total ensonified area.

The SPL sound footprints presented here represent the instantaneous sound field and do not depend on accumulation time, whereas the unweighted and frequency-weighted SEL_{24h} thresholds do. For the results below, the distances to isopleths/thresholds were reported from the most dominant source if several sources were present. Maps are provided in Section 4.2 to assist in with contextualising tabulated distances.

Table 8. Vessel scenarios: Maximum (R_{max}) and 95% ($R_{95\%}$) horizontal distances (in km) to sound pressure level (SPL). A dash indicates the threshold is not reached within the limits of the modelled resolution (20 m). Scenario descriptions are given in Table 4. A slash indicates that $R_{95\%}$ is not reported when the R_{max} is greater than the maximum modelling extent.

SPL (L_p; dB re 1 µPa)	Scenario 1		Scenario 2		Scenario 3		Scenario 4	
	R_{max} (km)	$R_{95\%}$ (km)	R_{max} (km)	$R_{95\%}$ (km)	R_{max} (km)	$R_{95\%}$ (km)	R_{max} (km)	$R_{95\%}$ (km)
180	–	–	–	–	0.01	0.01	0.01	0.01
170[a]	–	–	–	–	0.03	0.03	0.03	0.03
160	–	–	0.02	0.02	0.11	0.11	0.11	0.11
158[b]	–	–	0.08	0.08	0.11	0.11	0.11	0.11
150	0.02	0.02	0.10	0.10	0.12	0.11	0.12	0.11
140	0.02	0.02	0.10	0.06	0.50	0.47	0.49	0.46
130	0.03	0.03	0.39	0.37	2.23	1.95	2.00	1.87
120[c]	0.16	0.16	2.14	2.06	6.20	5.85	5.94	5.55
110	0.81	0.77	8.08	7.67	17.8	16.9	15.5	14.6

[a] 48 h threshold for recoverable injury for fish with a swim bladder involved in hearing (Popper et al. 2014).
[b] 12 h threshold for TTS for fish with a swim bladder involved in hearing (Popper et al. 2014).
[c] Threshold for marine mammal behavioural response to non-impulsive noise (NOAA 2019).

Table 9. *Vessel Scenarios:* Maximum (R_{max}) horizontal distances (in km) to frequency-weighted SEL_{24h} PTS and TTS thresholds based on Southall et al. (2019) and Finneran et al. (2017) from the most appropriate location for considered sources per scenario, and ensonified area (km²). A dash indicates the level was not reached within the limits of the modelled resolution (20 m). A slash indicates that the area is less than an area associated with the modelled resolution (0.0013 km²). Scenario descriptions are given in Table 4.

Hearing group	Frequency-weighted SEL_{24h} threshold ($L_{E,24h}$; dB re 1 µPa²·s)	Scenario 1		Scenario 2		Scenario 3		Scenario 4	
		R_{max} (km)	Area (km²)	R_{max} (km)	Area (km²)	R_{max} (km)	Area (km²)	R_{max} (km)	Area (km²)
PTS									
Low-Frequency (LF) cetaceans	199	–	–	0.08	/	0.11	/	0.11	/
High-frequency (HF) cetaceans	198	–	–	0.08	/	0.11	/	0.11	/
Very High-frequency (VHF) cetaceans	173	0.02	/	0.10	/	0.12	0.01	0.12	/
Otariid seals	219	–	–	–	–	–	/	–	/
Sea Turtles	220	–	–	–	–	0.01	/	0.01	/
TTS									
Low-Frequency (LF) cetaceans	179	0.03	/	0.17	0.08	0.49	0.58	0.35	0.34
High-frequency (HF) cetaceans	178	0.02	/	0.10	/	0.12	/	0.12	/
Very High-frequency (VHF) cetaceans	153	0.28	0.22	0.44	0.47	0.55	0.81	0.47	0.57
Otariid seals	199	–	–	0.08	/	0.11	/	0.11	/
Sea Turtles	200	–	–	0.08	/	0.11	/	0.11	/

4.2. Sound Field Maps

Maps of the estimated sound fields, threshold contours, and isopleths of interest for SPL and SEL_{24h} sound fields are presented for the four modelled vessel scenarios. The SPL maps are in Figures 6–9 and the SEL_{24h} maps are in Figures 10–13.

4.2.1. Maximum-over-depth SPL Sound Fields

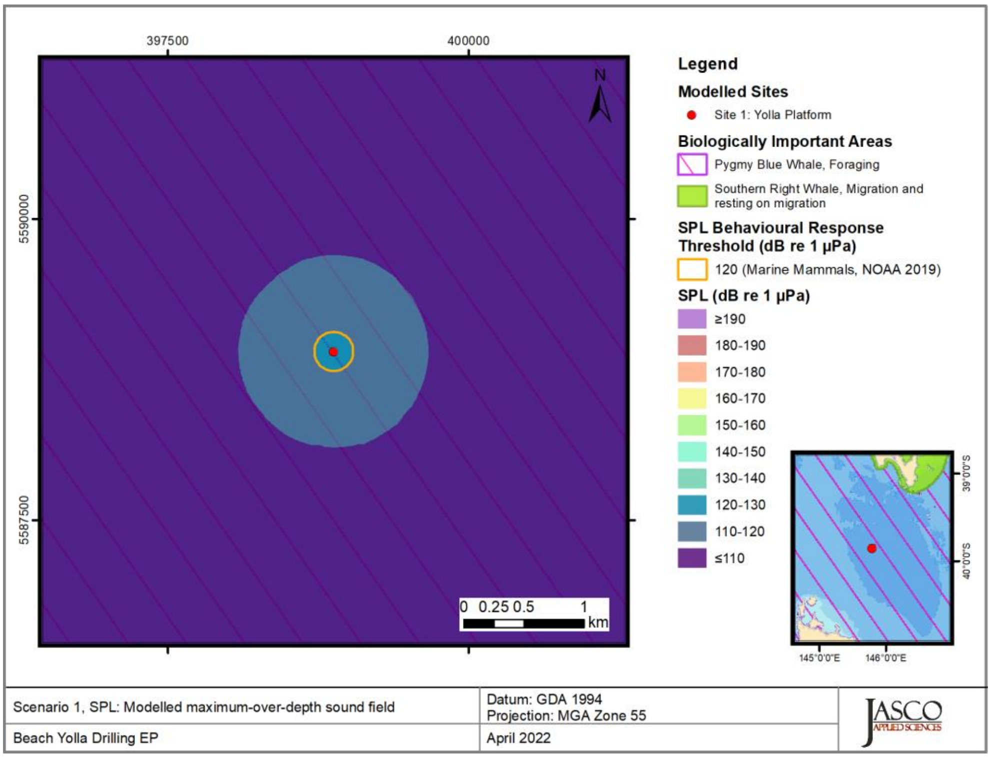

Figure 6. Scenario 1, Platform operations, SPL: Sound level contour map, showing unweighted maximum-over-depth SPL results. Isopleth for marine mammal (120 dB re 1 µPa) behavioural criteria is shown as an orange contour line.

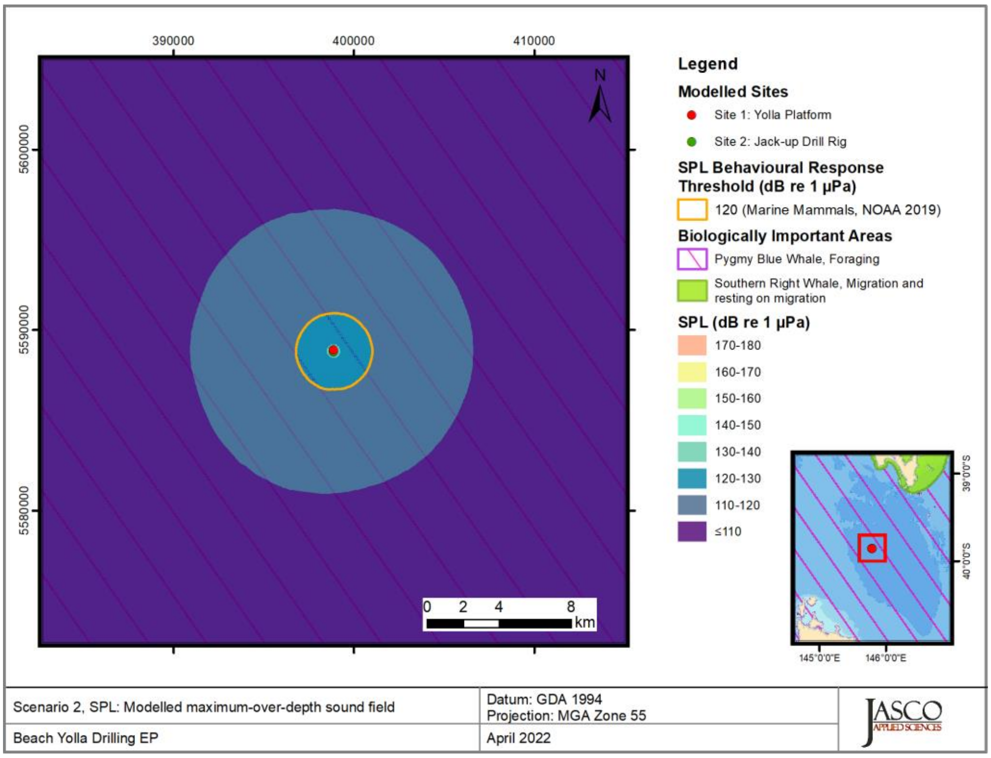

Figure 7. Scenario 2, Platform operations and jack-up drilling, SPL: Sound level contour map, showing unweighted maximum-over-depth SPL results. Isopleth for marine mammal (120 dB re 1 µPa) behavioural criteria is shown as an orange contour line.

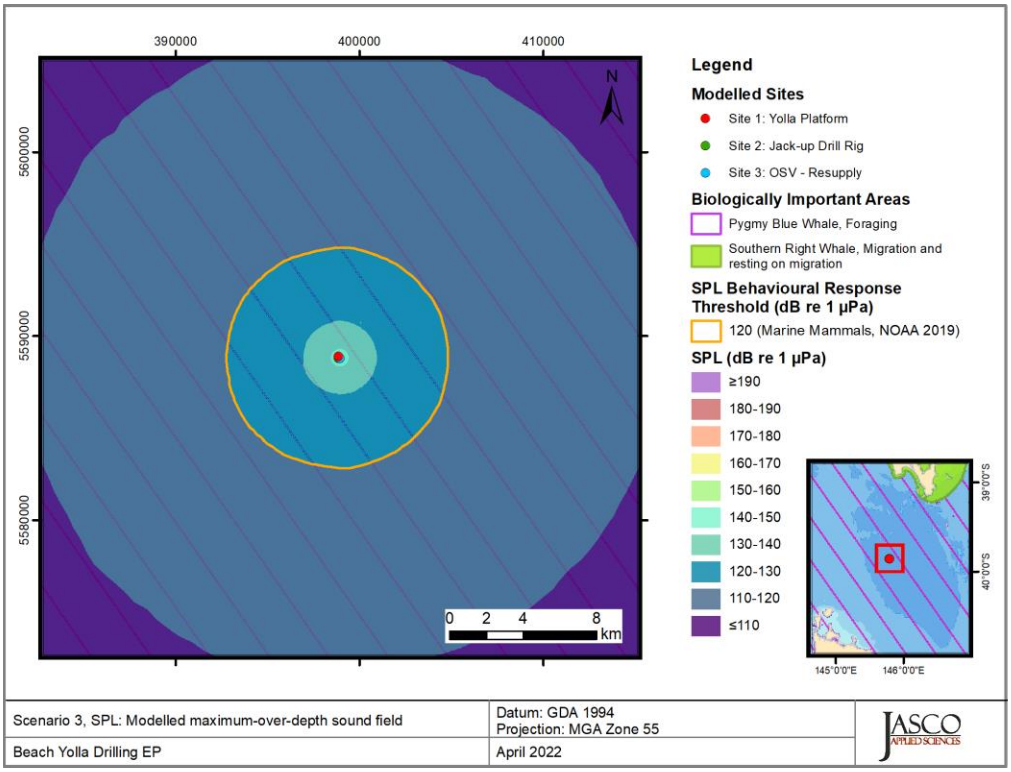

Figure 8. Scenario 3, Platform operations and jack-up drilling with OSV resupply, SPL: Sound level contour map, showing unweighted maximum-over-depth SPL results. Isopleth for marine mammal (120 dB re 1 µPa) behavioural criteria is shown as an orange contour line.

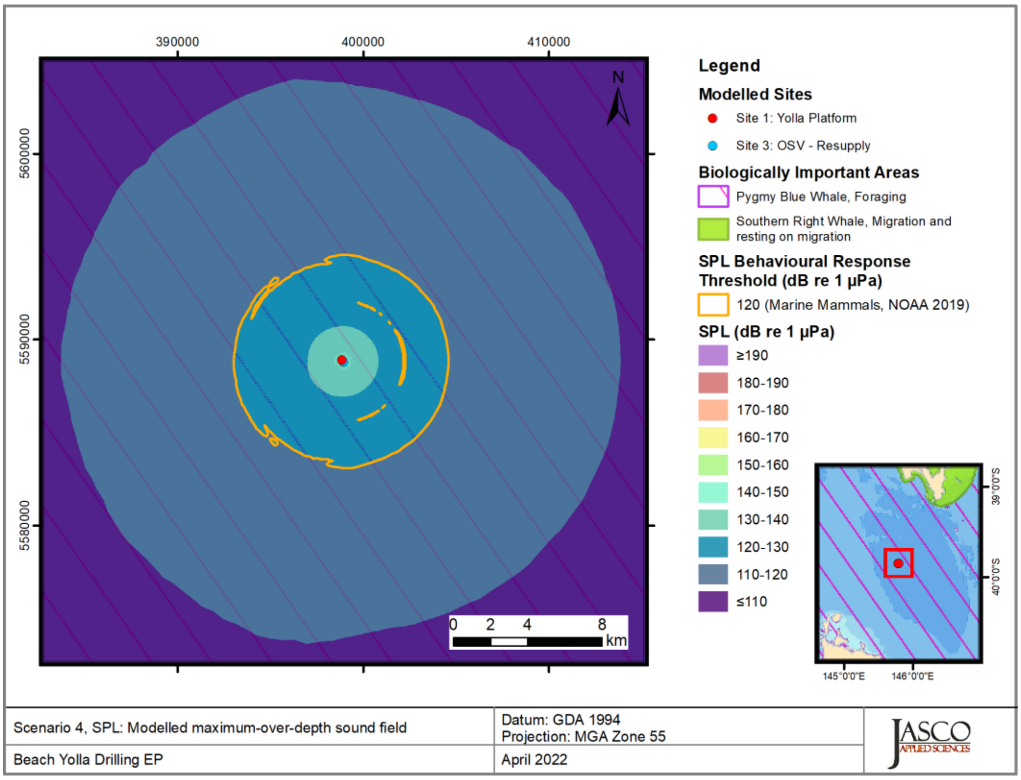

Figure 9. Scenario 4, Platform operations with OSV resupply, SPL: Sound level contour map, showing unweighted maximum-over-depth SPL results. Isopleth for marine mammal (120 dB re 1 µPa) behavioural criteria is shown as an orange contour line.

4.2.2. Accumulated 24-hour Sound Fields

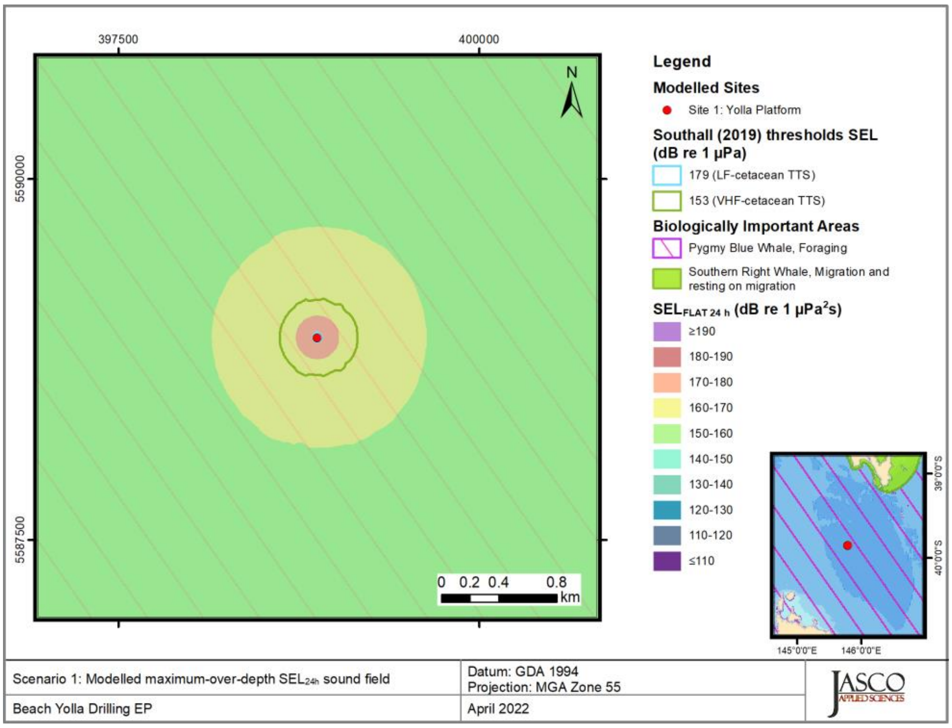

Figure 10. Scenario 1, Platform operations, SEL_{24h}: Sound level contour map showing unweighted maximum-over-depth SEL_{24h} results, along with isopleths for TTS thresholds. Thresholds for PTS and some thresholds for TTS were either not reached or were small enough such that they could not be displayed on a map. Refer to the radii tables in Section 4.1 for distances.

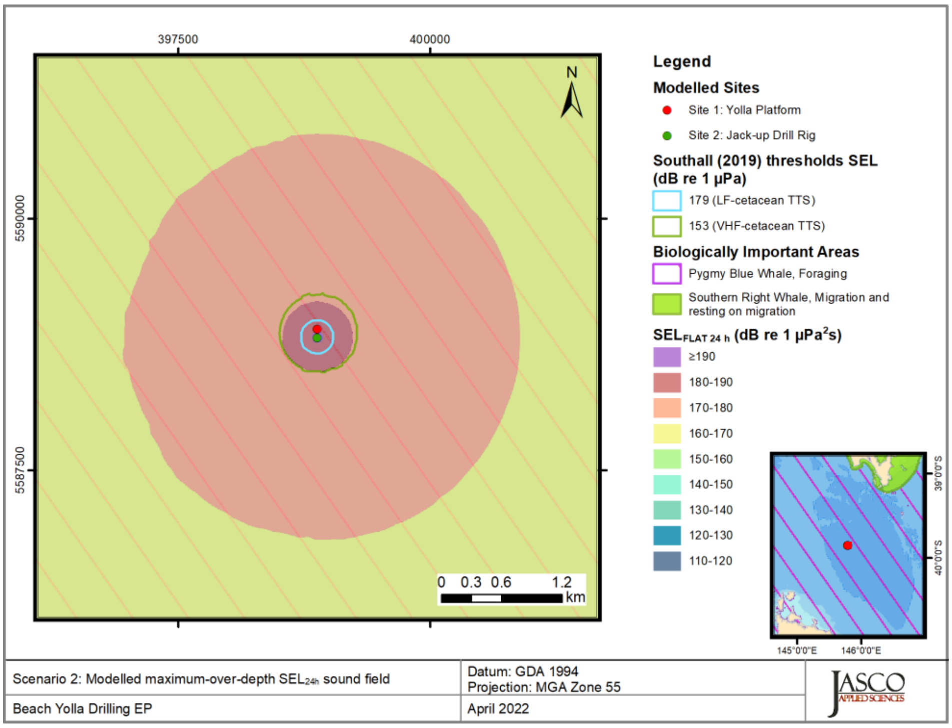

Figure 11. Scenario 2, Platform operations and jack-up drilling, SEL_{24h}: Sound level contour map showing unweighted maximum-over-depth SEL_{24h} results, along with isopleths for TTS thresholds. Thresholds for PTS and some thresholds for TTS were either not reached or were small enough such that they could not be displayed on a map. Refer to the radii tables in Section 4.1 for distances.

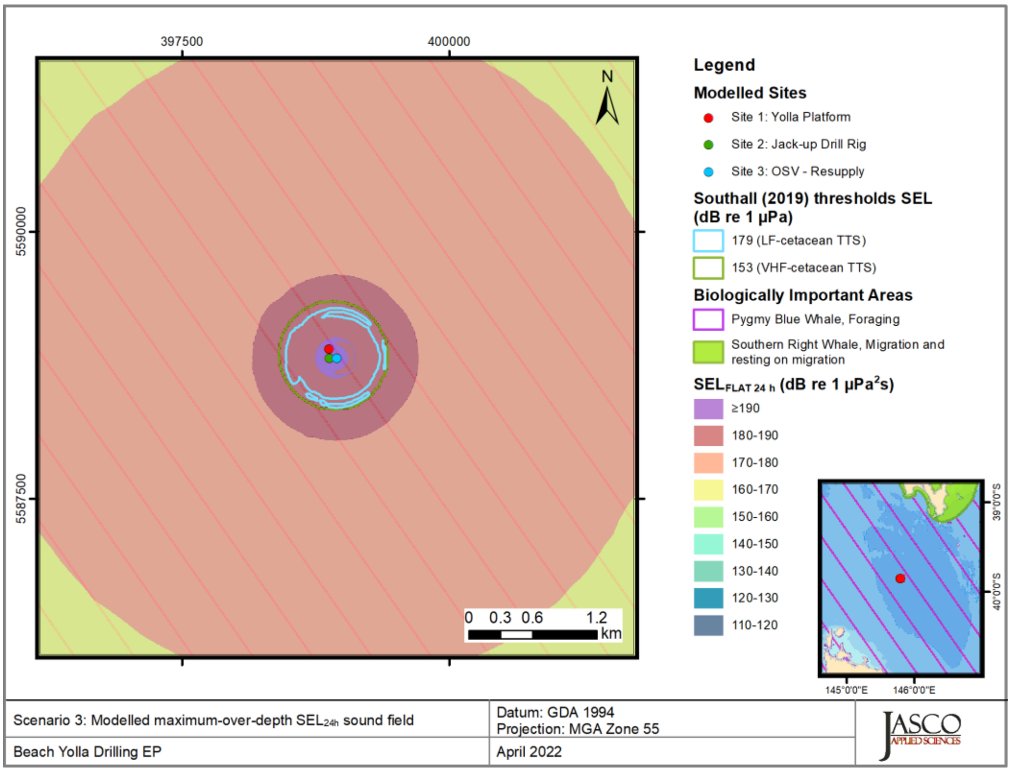

Figure 12. Scenario 3, Platform operations and jack-up drilling with OSV resupply (4 h), SEL_{24h}: Sound level contour map showing unweighted maximum-over-depth SEL_{24h} results, along with isopleths for TTS thresholds. Thresholds for PTS and some thresholds for TTS were either not reached or were small enough such that they could not be displayed on a map. Refer to the radii tables in Section 4.1 for distances.

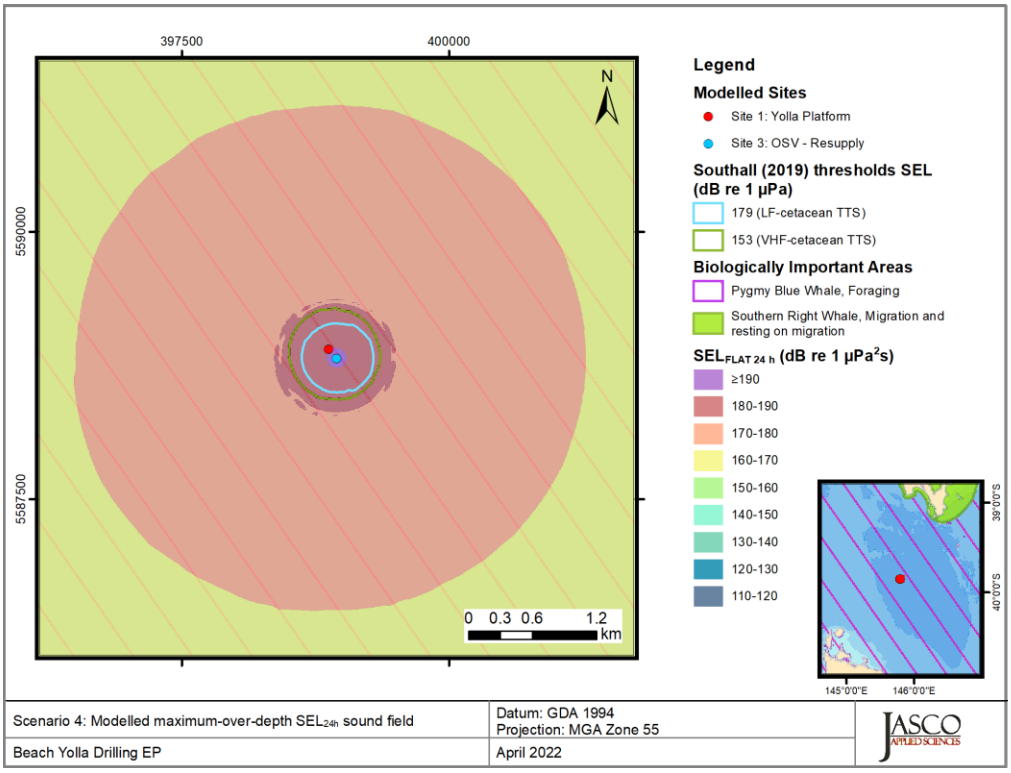

Figure 13. Scenario 4, Platform operations with OSV resupply (4 h), SEL_{24h}: Sound level contour map showing unweighted maximum-over-depth SEL_{24h} results, along with isopleths for TTS thresholds. Thresholds for PTS and some thresholds for TTS were either not reached or were small enough such that they could not be displayed on a map. Refer to the radii tables in Section 4.1 for distances.

5. Discussion and Conclusion

The Yolla platform location is located in central Bass Strait, and the modelled area had only gradual variation in bathymetry, with a slow decrease in depth towards the shores of Tasmania and Victoria. This bathymetry had little effect on the propagation model, as manifested in the generally symmetric sound field footprints. The modelled seabed composition is reflective at the sea-floor and increased the propagation distances for all scenarios.

The sound speed profile (Appendix B.2.2) was derived from data from the U.S. Naval Oceanographic Office's Generalized Digital Environmental Model V 3.0 (GDEM; Teague et al. 1990, Carnes 2009). The water conditions were chosen to provide the most conservative estimate. These correspond to the month of August, which was determined to result in the greatest sound propagation through a sensitivity analysis considering multiple months. The final sound speed profile consisted of a composite profile representative of the environmental conditions likely to occur within the modelled area to capture associated propagation effects.

The considered sound speed profile for August contained a small thermocline which resulted in an upward refracting layer extending from the sea-surface down to approximately 40 m depth. This layer has the potential to trap high frequency energy near the sea surface that would otherwise dissipate more rapidly in range due to propagation, absorption, and seabed losses. The slight upward refracting layer in the sound speed profile only has the potential to effectively trap frequencies above 741 Hz based on the thickness of the refracting layer (Jensen et al. 2011).

For the results tables presented in Section 4, thresholds may or may not have been reached for many scenarios, and in the results tables a dash is used in place of a horizontal distance. Due to the discretely sampled 20 m calculation grids of the modelled sound fields, distances to these thresholds could not be estimated for practicable computational purposes. It is likely that SPL isopleths could be reached at distances between the source and the modelled horizontal resolution (20 m); however, distances to injurious accumulated SEL thresholds may not be reached at any range greater than the point source representation of the platform, jack-up drill-rig and OSV, due to the species-specific frequency weighing functions. Additionally, if close-to-source radii are comparable to the dimensions of the modelled source then they may only be reached within close proximity to the source, if at all.

Glossary

Unless otherwise stated in an entry, these definitions are consistent with ISO 80000-3 (2017).

1/3-octave

One third of an octave. *Note*: A one-third octave is approximately equal to one decidecade (1/3 oct ≈ 1.003 ddec).

1/3-octave-band

Frequency band whose bandwidth is one one-third octave. *Note*: The bandwidth of a one-third octave-band increases with increasing centre frequency.

acoustic impedance

The ratio of the sound pressure in a medium to the volume flow rate of the medium through a specified surface due to the sound wave.

acoustic noise

Sound that interferes with an acoustic process.

ambient sound

Sound that would be present in the absence of a specified activity, usually a composite of sound from many sources near and far, e.g., shipping vessels, seismic activity, precipitation, sea ice movement, wave action, and biological activity.

attenuation

The gradual loss of acoustic energy from absorption and scattering as sound propagates through a medium.

audiogram

A graph or table of hearing threshold as a function of frequency that describes the hearing sensitivity of an animal over its hearing range.

auditory frequency weighting

The process of applying an auditory frequency weighting function. In human audiometry, C-weighting is the most commonly used function, an example for marine mammals are the auditory frequency weighting functions published by Southall et al. (2007).

auditory frequency weighting function

Frequency weighting function describing a compensatory approach accounting for a species' (or functional hearing group's) frequency-specific hearing sensitivity. Example hearing groups are low-, mid-, and high-frequency cetaceans, phocid and otariid pinnipeds.

azimuth

A horizontal angle relative to a reference direction, which is often magnetic north or the direction of travel. In navigation it is also called bearing.

bandwidth

The range of frequencies over which a sound occurs. Broadband refers to a source that produces sound over a broad range of frequencies (e.g., seismic airguns, vessels) whereas narrowband sources produce sounds over a narrow frequency range (e.g., sonar) (ANSI S1.13-2005 (R2010)).

broadband level

The total level measured over a specified frequency range.

cavitation

A rapid formation and collapse of vapor cavities (i.e., bubbles or voids) in water, most often caused by a rapid change in pressure. Fast-spinning vessel propellers typically cause cavitation, which creates a lot of noise.

cetacean

Any animal in the order Cetacea. These are aquatic species and include whales, dolphins, and porpoises.

compressional wave

A mechanical vibration wave in which the direction of particle motion is parallel to the direction of propagation. Also called primary wave or P-wave.

conductivity-temperature-depth (CTD)

Measurement data of the ocean’s conductivity, temperature, and depth; used to compute sound speed and salinity.

continuous sound

A sound whose sound pressure level remains above ambient sound during the observation period. A sound that gradually varies in intensity with time, for example, sound from a marine vessel.

decade

Logarithmic frequency interval whose upper bound is ten times larger than its lower bound (ISO 80000-3:2006).

decidecade

One tenth of a decade. *Note*: An alternative name for decidecade (symbol ddec) is “one-tenth decade”. A decidecade is approximately equal to one third of an octave (1 ddec ≈ 0.3322 oct) and for this reason is sometimes referred to as a “one-third octave”.

decidecade band

Frequency band whose bandwidth is one decidecade. *Note*: The bandwidth of a decidecade band increases with increasing centre frequency.

decibel (dB)

Unit of level used to express the ratio of one value of a power quantity to another on a logarithmic scale. Unit: dB.

energy source level

A property of a sound source obtained by adding to the sound exposure level measured in the far field the propagation loss from the acoustic centre of the source to the receiver position. Unit: decibel (dB). Reference value: 1 μPa^{2}m^{2}s.

energy spectral density

Ratio of energy (time-integrated square of a specified field variable) to bandwidth in a specified frequency band f_1 to f_2. In equation form, the energy spectral density E_f is given by:

$$E_f = \frac{2\int_{f_1}^{f_2} |X(f)|^2 \, \mathrm{d}f}{f_2 - f_1},$$

where $X(f)$ is the Fourier transform of the field variable $x(t)$

$$X(f) = \int_{-\infty}^{+\infty} x(t) \exp(-2\pi i f t) \, \mathrm{d}t \, .$$

The field variable $x(t)$ is a scalar quantity, such as sound pressure. It can also be the magnitude or a specified component of a vector quantity such as sound particle displacement, sound particle velocity, or sound particle acceleration. The unit of energy spectral density depends on the nature of x, as follows:

- If x = sound pressure: Pa^2 s/Hz
- If x = sound particle displacement: m^2 s/Hz
- If x = sound particle velocity: (m/s)^2 s/Hz
- If x = sound particle acceleration: (m/s^2)^2 s/Hz

The factor of two on the right-hand side of the equation for E_f is needed to express a spectrum that is symmetric about $f = 0$, in terms of positive frequencies only. See entry 3.1.3.9 of ISO 18405 (2017).

energy spectral density level

The level ($L_{E,f}$) of the **energy spectral density** (E_f). Unit: decibel (dB).

$$L_{E,f} := 10 \log_{10}\left(E_f / E_{f,0}\right) \mathrm{dB} \, .$$

The frequency band and integration time should be specified.

As with **energy spectral density**, energy spectral density level can be expressed in terms of various field variables (e.g., sound pressure, sound particle displacement). The reference value ($E_{f,0}$) for energy spectral density level depends on the nature of field variable.

energy spectral density source level

A property of a sound source obtained by adding to the energy spectral density level of the sound pressure measured in the far field the propagation loss from the acoustic centre of the source to the receiver position. Unit: decibel (dB). Reference value: 1 μPa^{2}m^{2}s/Hz.

ensonified

Exposed to sound.

far field

The zone where, to an observer, sound originating from an array of sources (or a spatially distributed source) appears to radiate from a single point.

Fourier transform (or Fourier synthesis)

A mathematical technique which, although it has varied applications, is referenced in the context of this report as a method used in the process of deriving a spectrum estimate from time-series data (or the reverse process, termed the inverse Fourier transform). A computationally efficient numerical algorithm for computing the Fourier transform is known as fast Fourier transform (FFT).

flat weighting

Term indicating that no frequency weighting function is applied. Synonymous with unweighted.

frequency

The rate of oscillation of a periodic function measured in cycles-per-unit-time. The reciprocal of the period. Unit: hertz (Hz). Symbol: f. 1 Hz is equal to 1 cycle per second.

frequency weighting

The process of applying a frequency weighting function.

frequency-weighting function

The squared magnitude of the sound pressure transfer function. For sound of a given frequency, the frequency weighting function is the ratio of output power to input power of a specified filter, sometimes expressed in decibels. Examples include the following:

- *Auditory frequency weighting function*: compensatory frequency weighting function accounting for a species' (or functional hearing group's) frequency-specific hearing sensitivity.
- *System frequency weighting function*: frequency weighting function describing the sensitivity of an acoustic acquisition system, typically consisting of a hydrophone, one or more amplifiers, and an analogue to digital converter.

geoacoustic

Relating to the acoustic properties of the seabed.

hearing group

Category of animal species when classified according to their hearing sensitivity and to the susceptibility to sound. Examples for marine mammals include very low-frequency (VLF) cetaceans, low-frequency (LF) cetaceans, mid-frequency (MF) cetaceans, high-frequency (HF) cetaceans, very high-frequency (VHF) cetaceans, otariid pinnipeds in water (OPW), phocid pinnipeds in water (PPW), sirenians (SI), other marine carnivores in air (OCA), and other marine carnivores in water (OCW) (NMFS 2018, Southall et al. 2019). See **auditory frequency weighting functions**, which are often applied to these groups. Examples for fish include species for which the swim bladder is involved in hearing, species for which the swim bladder is not involved in hearing, and species without a swim bladder (Popper et al. 2014).

hearing threshold

The sound pressure level for any frequency of the hearing group that is barely audible for a given individual for specified background noise during a specific percentage of experimental trials.

hertz (Hz)

A unit of frequency defined as one cycle per second.

high-frequency (HF) cetacean

See **hearing group**.

impulsive sound

Qualitative term meaning sounds that are typically transient, brief (less than 1 second), broadband, with rapid rise time and rapid decay. They can occur in repetition or as a single event. Examples of impulsive sound sources include explosives, seismic airguns, and impact pile drivers.

isopleth

A line drawn on a map through all points having the same value of some quantity.

knot

One nautical mile per hour. Symbol: kn.

level

A measure of a quantity expressed as the logarithm of the ratio of the quantity to a specified reference value of that quantity. Examples include sound pressure level, sound exposure level, and peak sound pressure level. For example, a value of sound exposure level with reference to 1 μPa^2 s can be written in the form x dB re 1 μPa^2 s.

low-frequency (LF) cetacean

See **hearing group**.

median

The 50th percentile of a statistical distribution.

mid-frequency (MF) cetacean

See **hearing group**.

monopole source level (MSL)

A source level that has been calculated using an acoustic model that accounts for the effect of the sea-surface and seabed on sound propagation, assuming a point-like (monopole) sound source. Also see **radiated noise level**.

M-weighting

See **auditory frequency weighting function** (as proposed by Southall et al. 2007).

mysticete

A suborder of cetaceans that use baleen plates to filter food from water. Members of this group include rorquals (Balaenopteridae), right whales (Balaenidae), and grey whales (*Eschrichtius robustus*).

N percent exceedance level

The sound level exceeded N% of the time during a specified time interval. Also see *Error! Reference source not found.*.

non-impulsive sound

Sound that is not an impulsive sound. A non-impulsive sound is not necessarily a continuous sound.

octave

The interval between a sound and another sound with double or half the frequency. For example, one octave above 200 Hz is 400 Hz, and one octave below 200 Hz is 100 Hz.

odontocete

The presence of teeth, rather than baleen, characterizes these whales. Members of the Odontoceti are a suborder of cetaceans, a group comprised of whales, dolphins, and porpoises. The skulls of toothed whales are mostly asymmetric, an adaptation for their echolocation. This group includes sperm whales, killer whales, belugas, narwhals, dolphins, and porpoises.

otariid

A common term used to describe members of the Otariidae, eared seals, commonly called sea lions and fur seals. Otariids are adapted to a semi-aquatic life; they use their large fore flippers for propulsion. Their ears distinguish them from phocids. Otariids are one of the three main groups in the superfamily Pinnipedia; the other two groups are phocids and walrus.

otariid pinnipeds in water (OPW)

See **hearing group**.

other marine carnivores in water (OCW)

See **hearing group**.

permanent threshold shift (PTS)

An irreversible loss of hearing sensitivity caused by excessive noise exposure. PTS is considered auditory injury.

phocid

A common term used to describe all members of the family Phocidae. These true/earless seals are more adapted to in-water life than are otariids, which have more terrestrial adaptations. Phocids use their hind flippers to propel themselves. Phocids are one of the three main groups in the superfamily Pinnipedia; the other two groups are otariids and walrus.

phocid pinnipeds in water (PPW)

See **hearing group**.

pinniped

A common term used to describe all three groups that form the superfamily Pinnipedia: phocids (true seals or earless seals), otariids (eared seals or fur seals and sea lions), and walrus.

point source

A source that radiates sound as if from a single point.

power spectral density

Generic term, formally defined as power in a unit frequency band. Unit: watt per hertz (W/Hz). The term is sometimes loosely used to refer to the spectral density of other parameters such as squared sound pressure. ratio of **energy spectral density**, E_f, to time duration, Δt, in a specified temporal observation window. In equation form, the power spectral density P_f is given by:

$$P_f = \frac{E_f}{\Delta t}.$$

Power spectral density can be expressed in terms of various field variables (e.g., sound pressure, sound particle displacement).

power spectral density level

The level ($L_{P,f}$) of the **power spectral density** (P_f). Unit: decibel (dB).

$$L_{P,f} := 10 \log_{10}\left(P_f / P_{f,0}\right) \text{ dB} .$$

The frequency band and integration time should be specified.

As with **power spectral density**, power spectral density level can be expressed in terms of various field variables (e.g., sound pressure, sound particle displacement). The reference value ($P_{f,0}$) for power spectral density level depends on the nature of field variable.

power spectral density source level

A property of a sound source obtained by adding to the power spectral density level of the sound pressure measured in the far field the propagation loss from the acoustic centre of the source to the receiver position. Unit: decibel (dB). Reference value: 1 μPa^{2}m^2/Hz.

pressure, acoustic

The deviation from the ambient pressure caused by a sound wave. Also called sound pressure. Unit: pascal (Pa).

pressure, hydrostatic

The pressure at any given depth in a static liquid that is the result of the weight of the liquid acting on a unit area at that depth, plus any pressure acting on the surface of the liquid. Unit: pascal (Pa).

propagation loss (PL)

Difference between a source level (SL) and the level at a specified location, PL(x) = SL − L(x). Also see **transmission loss**.

radiated noise level (RNL)

A source level that has been calculated assuming sound pressure decays geometrically with distance from the source, with no influence of the sea-surface and seabed. Also see **monopole source level**.

received level

The level measured (or that would be measured) at a defined location. The type of level should be specified.

reference values

standard underwater references values used for calculating sound **levels**, e.g., the reference value for expressing sound pressure level in decibels is 1 μPa.

Quantity	Reference value
Sound pressure	1 μPa
Sound exposure	1 μPa^2 s
Sound particle displacement	1 pm
Sound particle velocity	1 nm/s
Sound particle acceleration	1 μm/s^2

rms

abbreviation for root-mean-square.

shear wave

A mechanical vibration wave in which the direction of particle motion is perpendicular to the direction of propagation. Also called a secondary wave or S-wave. Shear waves propagate only in solid media, such as sediments or rock. Shear waves in the seabed can be converted to compressional waves in water at the water-seabed interface.

sound

A time-varying disturbance in the pressure, stress, or material displacement of a medium propagated by local compression and expansion of the medium.

sound exposure

Time integral of squared sound pressure over a stated time interval. The time interval can be a specified time duration (e.g., 24 hours) or from start to end of a specified event (e.g., a pile strike, an airgun pulse, a construction operation). Unit: Pa^2 s.

sound exposure level

The level (L_E) of the sound exposure (E). Unit: decibel (dB). Reference value (E_0) for sound in water: 1 µPa^2 s.

$$L_E := 10 \log_{10}(E/E_0)\,\mathrm{dB} \ = 20 \log_{10}\left(E^{1/2}/E_0^{1/2}\right)\ \mathrm{dB}$$

The frequency band and integration time should be specified. Abbreviation: SEL.

sound exposure spectral density

Distribution as a function of frequency of the time-integrated squared sound pressure per unit bandwidth of a sound having a continuous spectrum. Unit: Pa^2 s/Hz.

sound field

Region containing sound waves.

sound intensity

Product of the sound pressure and the sound particle velocity. The magnitude of the sound intensity is the sound energy flowing through a unit area perpendicular to the direction of propagation per unit time.

sound pressure

The contribution to total pressure caused by the action of sound.

sound pressure level (rms sound pressure level)

The level ($L_{p,\mathrm{rms}}$) of the time-mean-square sound pressure (p^2_{rms}). Unit: decibel (dB). Reference value (p_0^2) for sound in water: 1 µPa^2.

$$L_{p,\mathrm{rms}} := 10 \log_{10}(p^2_{\mathrm{rms}}/p_0^2)\,\mathrm{dB} \ = 20 \log_{10}(p_{\mathrm{rms}}/p_0)\ \mathrm{dB}$$

The frequency band and averaging time should be specified. Abbreviation: SPL or Lrms.

sound speed profile

The speed of sound in the water column as a function of depth below the water surface.

soundscape

The characterization of the ambient sound in terms of its spatial, temporal, and frequency attributes, and the types of sources contributing to the sound field.

source level (SL)

A property of a sound source obtained by adding to the sound pressure level measured in the far field the propagation loss from the acoustic centre of the source to the receiver position. Unit: decibel (dB). Reference value: 1 $\mu Pa^2 m^2$.

spectrogram

A visual representation of acoustic amplitude compared with time and frequency.

spectrum

An acoustic signal represented in terms of its power, energy, mean-square sound pressure, or sound exposure distribution with frequency.

surface duct

The upper portion of a water column within which the sound speed profile gradient causes sound to refract upward and therefore reflect off the surface resulting in relatively long-range sound propagation with little loss.

temporary threshold shift (TTS)

Reversible loss of hearing sensitivity. TTS can be caused by noise exposure.

thermocline

The depth interval near the ocean surface that experiences temperature gradients due to warming or cooling by heat conduction from the atmosphere and by warming from solar heating.

transmission loss (TL)

The difference between a specified level at one location and that at a different location, TL(x1,x2) = L(x1) − L(x2). Also see **propagation loss**.

unweighted

Term indicating that no frequency weighting function is applied. Synonymous with flat weighting.

very high-frequency (VHF) cetacean

See **hearing group**.

very low-frequency (VLF) cetacean

See **hearing group**.

wavelength

Distance over which a wave completes one cycle of oscillation. Unit: metre (m). Symbol: λ.

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Appendix A. Acoustic Metrics

This section describes in detail the acoustic metrics, impact criteria, and frequency weighting relevant to the modelling study.

A.1. Pressure Related Acoustic Metrics

Underwater sound pressure amplitude is measured in decibels (dB) relative to a fixed reference pressure of p_0 = 1 μPa. Because the perceived loudness of sound, especially pulsed sound such as from seismic airguns, pile driving, and sonar, is not generally proportional to the instantaneous acoustic pressure, several sound level metrics are commonly used to evaluate sound and its effects on marine life. Here we provide specific definitions of relevant metrics used in the accompanying report. Where possible, we follow International Organization for Standardization definitions and symbols for sound metrics (e.g., ISO 2017, ANSI S1.1-2013).

The sound pressure level (SPL or L_p; dB re 1 μPa) is the root-mean-square (rms) pressure level in a stated frequency band over a specified time window (T; s). It is important to note that SPL always refers to an rms pressure level and therefore not instantaneous pressure:

$$L_p = 10\log_{10}\left(\frac{1}{T}\int_T g(t)\,p^2(t)\,dt\Big/p_0^2\right)\ \mathrm{dB} \qquad \text{(A-1)}$$

where $g(t)$ is an optional time weighting function. In many cases, the start time of the integration is marched forward in small time steps to produce a time-varying SPL function.

The sound exposure level (SEL or LE; dB re 1 μPa2·s) is the time-integral of the squared acoustic pressure over a duration (T):

$$L_E = 10\log_{10}\left(\int_T p^2(t)\,dt\Big/T_0 p_0^2\right)\ \mathrm{dB} \qquad \text{(A-2)}$$

where T_0 is a reference time interval of 1 s. SEL continues to increase with time when non-zero pressure signals are present. It is a dose-type measurement, so the integration time applied must be carefully considered for its relevance to impact to the exposed recipients.

SEL can be calculated over a fixed duration, such as the time of a single event or a period with multiple acoustic events. When applied to pulsed sounds, SEL can be calculated by summing the SEL of the N individual pulses. For a fixed duration, the square pressure is integrated over the duration of interest. For multiple events, the SEL can be computed by summing (in linear units) the SEL of the N individual events:

$$L_{E,N} = 10\log_{10}\left(\sum_{i=1}^{N} 10^{\frac{L_{E,i}}{10}}\right)\ \mathrm{dB}\,. \qquad \text{(A-3)}$$

If applied, the frequency weighting of an acoustic event should be specified, as in the case of weighted SEL (e.g., $L_{E,LFC,24h}$; Appendix A.4). The use of fast, slow, or impulse exponential-time-averaging or other time-related characteristics should also be specified.

A.2. Decidecade Band Analysis

The distribution of a sound's power with frequency is described by the sound's spectrum. The sound spectrum can be split into a series of adjacent frequency bands. Splitting a spectrum into 1 Hz wide bands, called passbands, yields the power spectral density of the sound. This splitting of the spectrum into passbands of a constant width of 1 Hz, however, does not represent how animals perceive sound.

Because animals perceive exponential increases in frequency rather than linear increases, analysing a sound spectrum with passbands that increase exponentially in size better approximates real-world scenarios. In underwater acoustics, a spectrum is commonly split into decidecade bands, which are one tenth of a decade wide. A decidecade is sometimes referred to as a "decidecade" because one tenth of a decade is approximately equal to one third of an octave. Each decade represents a factor 10 in sound frequency. Each octave represents a factor 2 in sound frequency. The centre frequency of the ith band, $f_{\mathrm{c}}(i)$, is defined as:

$$f_{\mathrm{c}}(i) = 10^{\frac{i}{10}}\ \mathrm{kHz} \tag{A-4}$$

and the low (f_{lo}) and high (f_{hi}) frequency limits of the ith decade band are defined as:

$$f_{\mathrm{lo},i} = 10^{\frac{-1}{20}} f_{\mathrm{c}}(i) \quad \text{and} \quad f_{\mathrm{hi},i} = 10^{\frac{1}{20}} f_{\mathrm{c}}(i) \tag{A-5}$$

The decidecade bands become wider with increasing frequency, and on a logarithmic scale the bands appear equally spaced (Figure A-1). The acoustic modelling spans from band 10 (f_c (10) = 10 Hz) to band 44 ($f_{\mathrm{c}}(44)$ = 25 kHz).

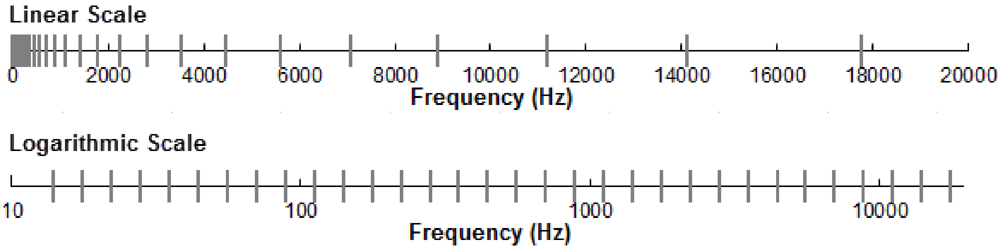


Figure A-1. Decidecade frequency bands (vertical lines) shown on a linear frequency scale and a logarithmic scale.

The sound pressure level in the ith band $(L_{p,i})$ is computed from the spectrum $S(f)$ between $f_{\mathrm{lo},i}$ and $f_{\mathrm{hi},i}$:

$$L_{p,i} = 10\, log_{10} \int_{f_{\mathrm{lo},i}}^{f_{\mathrm{hi},i}} S(f)\, \mathrm{d}f\ \ \mathrm{dB} \tag{A-6}$$

Summing the sound pressure level of all the bands yields the broadband sound pressure level:

$$\text{Broadband SPL} = 10 \log_{10} \sum_i 10^{\frac{L_{p,i}}{10}}\ \mathrm{dB} \tag{A-7}$$

Figure A-2 shows an example of how the decidecade band sound pressure levels compare to the sound pressure spectral density levels of an ambient noise signal. Because the decidecade bands are wider than 1 Hz, the decidecade band SPL is higher than the spectral levels at higher frequencies. Acoustic modelling of decidecade bands requires less computation time than 1 Hz bands and still resolves the frequency-dependence of the sound source and the propagation environment.

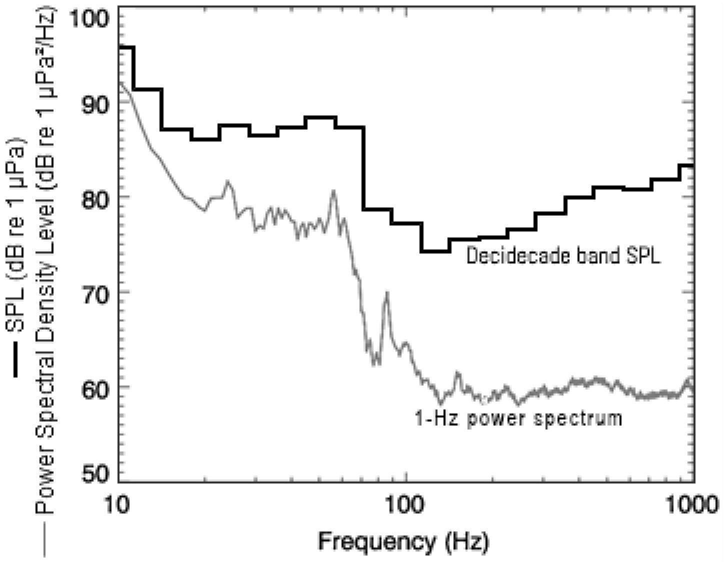


Figure A-2. Sound pressure spectral density levels and the corresponding decidecade band sound pressure levels of example ambient noise shown on a logarithmic frequency scale.Because the decidecade bands are wider with increasing frequency, the decidecade-octave-band SPL is higher than the power spectrum.

A.3. Marine Mammal Noise Effect Criteria

It has been long recognised that marine mammals can be adversely affected by underwater anthropogenic noise. For example, Payne and Webb (1971) suggest that communication distances of fin whales are reduced by shipping sounds. Subsequently, similar concerns arose regarding effects of other underwater noise sources and the possibility that impulsive sources—primarily airguns used in seismic surveys—could cause auditory injury. This led to a series of workshops held in the late 1990s, conducted to address acoustic mitigation requirements for seismic surveys and other underwater noise sources (NMFS 1998, ONR 1998, Nedwell and Turnpenny 1998, HESS 1999, Ellison and Stein 1999). In the years since these early workshops, a variety of thresholds have been proposed for auditory injury, impairment, and disturbance. The following sections summarise the recent development of thresholds; however, this field remains an active research topic.

A.3.1. Injury and Hearing Sensitivity Changes

In recognition of shortcomings of the SPL-only based auditory injury criteria, in 2005 NMFS sponsored the Noise Criteria Group to review literature on marine mammal hearing to propose new noise exposure criteria. Some members of this expert group published a landmark paper (Southall et al. 2007) that suggested assessment methods similar to those applied for humans. The resulting recommendations introduced dual auditory injury criteria for impulsive sounds that included peak pressure level thresholds and SEL_{24h} thresholds, where the subscripted 24h refers to the accumulation period for calculating SEL. The peak pressure level criterion is not frequency weighted whereas SEL_{24h} is frequency weighted according to one of four marine mammal species hearing groups: low-, mid- and high-frequency cetaceans (LF, MF, and HF cetaceans, respectively) and Pinnipeds in Water (PINN). These weighting functions are referred to as M-weighting filters (analogous to the A-weighting filter for humans; see Appendix A.4). The SEL_{24h} thresholds were obtained by extrapolating measurements of onset levels of Temporary Threshold Shift (TTS) in belugas by the amount of TTS required to produce Permanent Threshold Shift (PTS) in chinchillas. The Southall et al. (2007) recommendations do not specify an exchange rate, which suggests that the thresholds are the same regardless of the duration of exposure (i.e., it implies a 3 dB exchange rate).

Wood et al. (2012) refined Southall et al.'s (2007) thresholds, suggesting lower PTS and TTS values for LF and HF cetaceans while retaining the filter shapes. Their revised thresholds were based on TTS-onset levels in harbour porpoises from Lucke et al. (2009), which led to a revised impulsive sound PTS threshold for HF cetaceans of 179 dB re 1 µPa^2·s. Because there were no data available for baleen whales, Wood et al. (2012) based their recommendations for LF cetaceans on results obtained from MF cetacean studies. In particular they referenced the Finneran and Schlundt (2010) research, which found mid-frequency cetaceans are more sensitive to non-impulsive sound exposure than Southall et al. (2007) assumed. Wood et al. (2012) thus recommended a more conservative TTS-onset level for LF cetaceans of 192 dB re 1 µPa^2·s.

As of 2017, a definitive approach is still not apparent. There is consensus in the research community that an SEL-based method is preferable, either separately or in addition to an SPL-based approach to assess the potential for injuries. In August 2016, after substantial public and expert input into three draft versions and based largely on the above-mentioned literature (NOAA 2013, 2015, 2016), NMFS finalised technical guidance for assessing the effect of anthropogenic sound on marine mammal hearing (NMFS 2016). The guidance describes auditory injury criteria with new thresholds and frequency weighting functions for the five hearing groups described by Finneran and Jenkins (2012). The latest revision to this work was published in 2018 (NMFS 2018). Southall et al. (2019) revisited the interim criteria published in 2007. All noise exposure criteria in NMFS (2018) and Southall et al. (2019) are identical (for impulsive and non-impulsive sounds); 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).

A.3.2. Behavioural Response

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. However, it is recognised that the context in which the sound is received affects the nature and extent of responses to a stimulus (Southall et al. 2007, Ellison and Frankel 2012, Southall et al. 2016, Southall et al. 2021).

A.3.2.1. Non-Impulsive Noise

NMFS currently uses step function (all-or-none) threshold of 120 dB re 1 µPa SPL (unweighted) for non-impulsive sounds to assess and regulate noise-induced behavioural impacts on marine mammals (NOAA 2019). The 120 dB re 1 µPa threshold is associated with continuous sources and was derived based on studies examining behavioural responses to drilling and dredging, referring to Malme et al. (1983), Malme et al. (1984), and Malme et al. (1986), which were considered in Southall et al. (2007). Malme et al. (1986) found that playback of drillship noise did not produce clear evidence of disturbance or avoidance for levels below 110 dB re 1 µPa (SPL), possible avoidance occurred for exposure levels approaching 119 dB re 1 µPa. Malme et al. (1984) determined that measurable reactions usually consisted of rather subtle short-term changes in speed and/or heading of the whale(s) under observation. It has been shown that both received level and proximity of the sound source is a contributing factor in eliciting behavioural reactions in humpback whales (Dunlop et al. 2017, Dunlop et al. 2018).

A.4. Marine Mammal Frequency Weighting

The potential for noise to affect animals of a certain species depends on how well the animals can hear it. Noises are less likely to disturb or injure an animal if they are at frequencies that the animal cannot hear well. An exception occurs when the sound pressure is so high that it can physically injure an animal by non-auditory means (i.e., barotrauma). For sound levels below such extremes, the importance of sound components at particular frequencies can be scaled by frequency weighting relevant to an animal's sensitivity to those frequencies (Nedwell and Turnpenny 1998, Nedwell et al. 2007).

A.4.1. Marine Mammal Frequency Weighting Functions

In 2015, a US Navy technical report by Finneran (2015) recommended new auditory weighting functions. The auditory weighting functions for marine mammals are applied in a similar way as A-weighting for noise level assessments for humans. The new frequency-weighting functions are expressed as:

$$G(f) = K + 10\log_{10}\left\{\frac{(f/f_1)^{2a}}{[1+(f/f_1)^2]^a[1+(f/f_2)^2]^b}\right\} \tag{A-8}$$

Finneran (2015) proposed five functional hearing groups for marine mammals in water: low-, mid-, and high-frequency cetaceans, phocid pinnipeds, and otariid pinnipeds. The parameters for these frequency-weighting functions were further modified the following year (Finneran 2016) and were adopted in NOAA's technical guidance that assesses acoustic impacts on marine mammals (NMFS 2018). The updates did not affect the content related to either the definitions of M-weighting functions or the threshold values. Table A-1 lists the frequency-weighting parameters for each hearing group; Figure A-3 shows the resulting frequency-weighting curves.

Table A-1. Parameters for the auditory weighting functions as recommended by Southall et al. (2019).

Hearing group	a	b	f_{lo} (Hz)	f_{hi} (kHz)	K (dB)
Low-frequency cetaceans (baleen whales)	1.0	2	200	19,000	0.13
High-frequency cetaceans (dolphins, plus toothed, beaked, and bottlenose whales)	1.6	2	8,800	110,000	1.20
Very High-frequency cetaceans (true porpoises, *Kogia*, river dolphins, cephalorhynchid, *Lagenorhynchus cruciger* and *L. australis*)	1.8	2	12,000	140,000	1.36
Phocid seals in water	1.0	2	1,900	30,000	0.75
Otariid seals in water	2.0	2	940	25,000	0.64

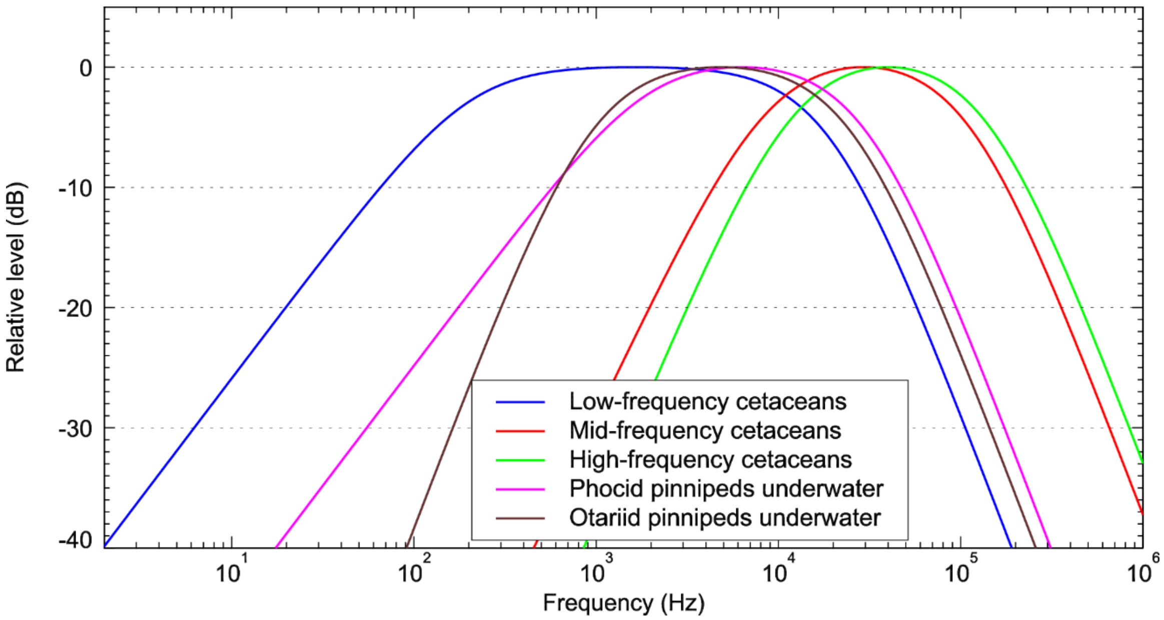


Figure A-3. Auditory weighting functions for functional marine mammal hearing groups as recommended by Southall et al. (2019).

Appendix B. Methods and Parameters

B.1. Sound Propagation Models

B.1.1. Propagation Loss

The propagation of sound through the environment was modelled by predicting the acoustic propagation loss—a measure, in decibels, of the decrease in sound level between a source and a receiver some distance away. Geometric spreading of acoustic waves is the predominant way by which propagation loss occurs. Propagation loss also happens when the sound is absorbed and scattered by the seawater, and absorbed scattered, and reflected at the water surface and within the seabed. Propagation loss depends on the acoustic properties of the ocean and seabed; its value changes with frequency.

If the acoustic energy source level (ESL), expressed in dB re 1 µPa^2·s m^2, and propagation loss (PL), in units of dB, at a given frequency are known, then the received level (RL) at a receiver location can be calculated in dB re 1 µPa^2·s by:

$$\mathrm{RL} = \mathrm{SL} - \mathrm{PL}. \tag{B-1}$$

B.1.2. MONM-BELLHOP

Long-range sound fields were computed using JASCO's Marine Operations Noise Model (MONM). While other models may be more accurate for steep-angle propagation in high-shear environment, MONM is well suited for effective longer-range estimation. This model computes sound propagation at frequencies of 10 Hz to 1.6 kHz via a wide-angle parabolic equation solution to the acoustic wave equation (Collins 1993) based on a version of the U.S. Naval Research Laboratory's Range-dependent Acoustic Model (RAM), which has been modified to account for a solid seabed (Zhang and Tindle 1995). MONM computes sound propagation at frequencies > 1.6 kHz via the BELLHOP Gaussian beam acoustic ray-trace model (Porter and Liu 1994).

The parabolic equation method has been extensively benchmarked and is widely employed in the underwater acoustics community (Collins et al. 1996). MONM accounts for the additional reflection loss at the seabed, which results from partial conversion of incident compressional waves to shear waves at the seabed and sub-bottom interfaces, and it includes wave attenuations in all layers. MONM incorporates the following site-specific environmental properties: a bathymetric grid of the modelled area, underwater sound speed as a function of depth, and a geoacoustic profile based on the overall stratified composition of the seafloor.

MONM computes acoustic fields in three dimensions by modelling propagation loss within two-dimensional (2-D) vertical planes aligned along radials covering a 360° swath from the source, an approach commonly referred to as N×2-D. These vertical radial planes are separated by an angular step size of $\Delta\theta$, yielding $N = 360°/\Delta\theta$ number of planes (Figure B-1).

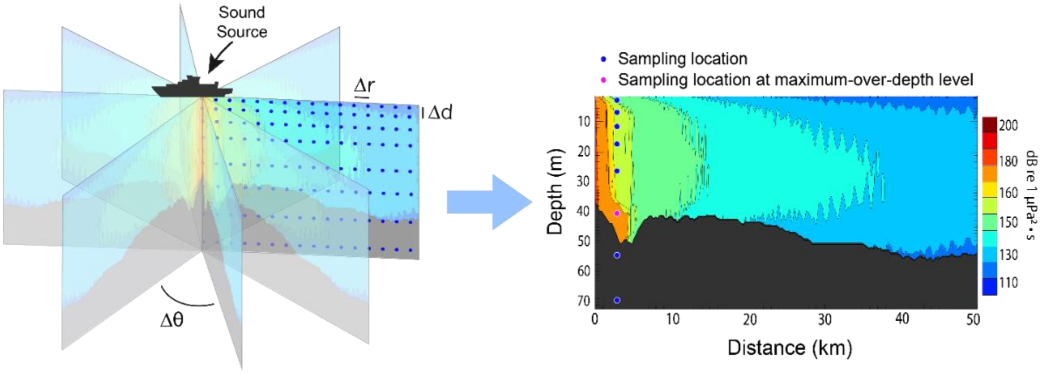


Figure B-1. The N×2-D and maximum-over-depth modelling approach used by MONM.

MONM treats frequency dependence by computing acoustic propagation loss at the centre frequencies of decidecade bands. Sufficiently many decidecade frequency-bands, starting at 10 Hz, are modelled to include most of the acoustic energy emitted by the source. At each centre frequency, the propagation loss is modelled within each of the N vertical planes as a function of depth and range from the source. The decidecade received per-second SEL are computed by subtracting the band propagation loss values from the directional source level in that frequency band. Composite broadband received per-second SEL are then computed by summing the received decidecade levels.

The received 1-s SEL sound field within each vertical radial plane is sampled at various ranges from the source, generally with a fixed radial step size. At each sampling range along the surface, the sound field is sampled at various depths, with the step size between samples increasing with depth below the surface. The step sizes are chosen to provide increased coverage near the depth of the source and at depths of interest in terms of the sound speed profile. For areas with deep water, sampling is not performed at depths beyond those reachable by marine mammals. The received per-pulse or per-second SEL at a surface sampling location is taken as the maximum value that occurs over all samples within the water column, i.e., the maximum-over-depth received per-second SEL. These maximum-over-depth per-second SEL are presented as colour contours around the source.

B.2. Environmental Parameters

B.2.1. Bathymetry

Water depths throughout the modelled area were extracted from the Australian Bathymetry and Topography Grid, a 9 arc-second grid rendered for Australian waters (Whiteway 2009). Bathymetry data were re-gridded onto a Map Grid of Australia (MGA) coordinate projection (Zone 55) with a regular grid spacing of 200 × 200 m (Figure B-2).

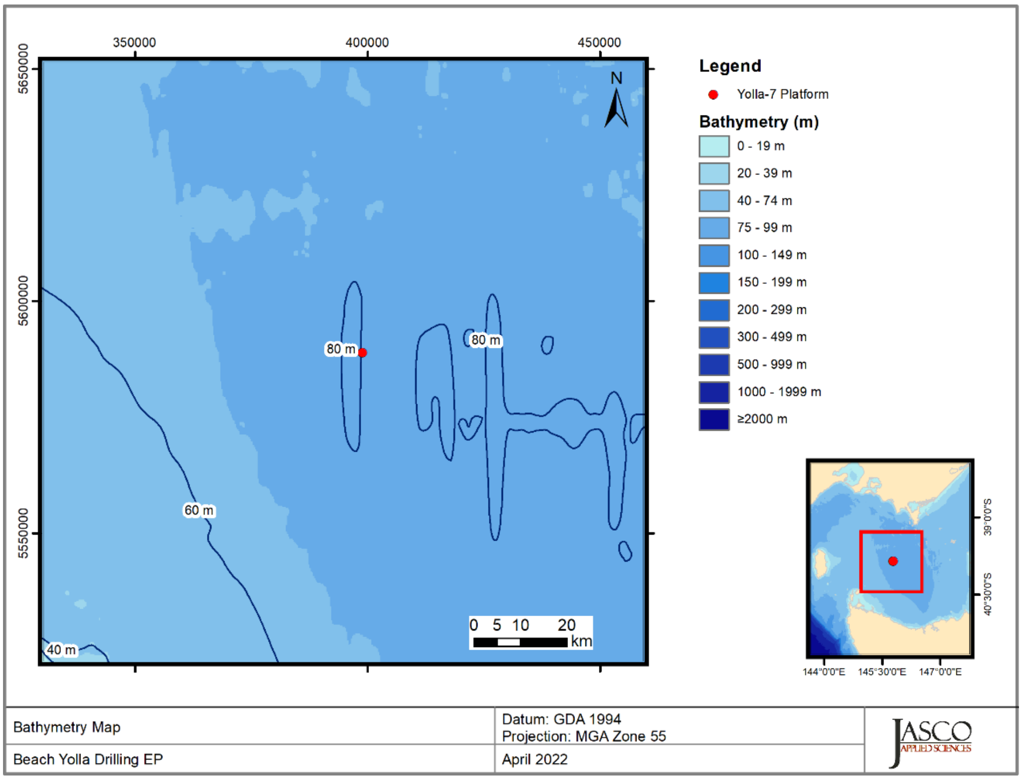


Figure B-2. Bathymetry in the modelled area.

B.2.2. Sound Speed Profile

The sound speed profile in the area was derived from temperature and salinity profiles from the US Naval Oceanographic Office’s Generalized Digital Environmental Model V 3.0 (GDEM; Teague et al. 1990, Carnes 2009). GDEM provides an ocean climatology of temperature and salinity for the world’s oceans on a latitude-longitude grid with 0.25° resolution, with a temporal resolution of one month, based on global historical observations from the US Navy’s Master Oceanographic Observational Data Set (MOODS). The climatology profiles include 78 fixed depth points to a maximum depth of 6800 m (where the ocean is that deep). The GDEM temperature-salinity profiles were converted to sound speed profiles according to Coppens (1981).

Mean monthly sound speed profiles were derived from the GDEM profiles within the modelled area. A small-scale sensitivity run was completed across all months of the year to test the which sound speed profile would provide the most conservative estimate for long range propagation. August was found to result in the furthest propagation, likely due to its favourable conditions for upward refraction and was thus chosen as the sound speed profile used for all further sound propagation modelling. Figure B-3 shows the resulting profile, which was used as input to the sound propagation modelling, as well as the other monthly profiles.

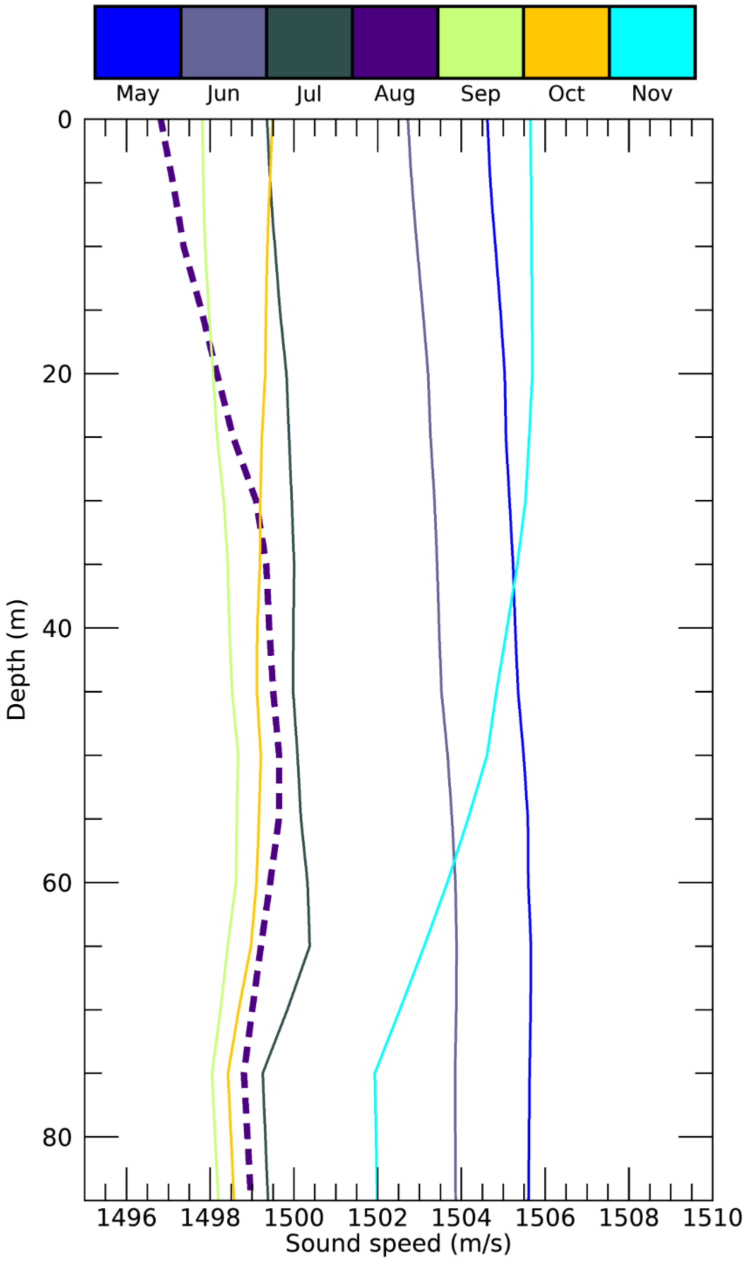


Figure B-3. The sound speed profile considered for acoustic modelling corresponding to August (dashed curve) and other considered monthly profiles Profiles are calculated from temperature and salinity profiles from *Generalized Digital Environmental Model* V 3.0 (GDEM; Teague et al. 1990, Carnes 2009).

B.2.3. Geoacoustics

A single representative geoacoustic profile was used for all modelled sites based on geotechnical site investigations conducted at the Yolla WHP. The seabed composition at the seafloor was taken from the results of multiple grab samples provided by the client surrounding the Yolla WHP. These data indicated that the seafloor sediments consist predominantly of fine sand. Additionally, a geotechnical survey report including the results of a core sample was also provided by the client. This described the composition at a depth of 100 m as very fine sand or silt. These grain sizes were then linearly interpolated as a function of depth between the two sediment grainsize.

The geoacoustic properties were then calculated using the sediment grain-shearing model of Buckingham (2005). The grain sizes were used as input to the grain-shearing model to estimate the geoacoustic parameters required by the sound propagation models. Table B-1 presents the geoacoustic profile for all modelled sites.

Table B-1. Geoacoustic profile for all modelled sites. Each parameter varies linearly within the stated range.

Depth below seafloor (m)	Predicted lithology	Density (g/cm3)	Compressional wave		Shear wave	
			Speed (m/s)	Attenuation (dB/λ)	Speed (m/s)	Attenuation (dB/λ)
0–10	Very Fine Sand (unconsolidated)	2.07–2.06	1665–1873	0.22–0.95	390	3.65
10–20	Very Fine Sand (unconsolidated increasing in compaction)	2.06–2.06	1873–1938	0.95–1.13		
20–50		2.06–2.05	1938–2009	1.13–1.34		
50–75	Sandy Silt (unconsolidated increasing in compaction)	2.05–2.02	2009–1989	1.34–1.34		
75–100		1.93	1989–1877	1.20–1.34		
100–150	Silt (unconsolidated increasing in compaction)	1.93	1877–1933	1.34–1.45		
150–200		1.93	1979–2053	1.34–1.60		
≥300	Consolidated sandy silt/sedimentary rock	1.93	2035	1.60		

B.3. Thruster Source Level Estimation

Underwater sound that radiates from vessels is produced mainly by propeller and thruster cavitation, with a smaller fraction of noise produced by sound transmitted through the hull, such as by engines, gearing, and other mechanical systems. Sound levels tend to be the highest when thrusters are used to position the vessel. A vessel's sound signature depends on the vessel's size, power output, propulsion system (e.g., conventional propellers vs. Voith Schneider propulsion), and the design characteristics of the given system (e.g., blade shape and size). A vessel produces broadband acoustic energy with most of the energy emitted below a few kilohertz. Sound from onboard machinery, particularly sound below 200 Hz, dominates the sound spectrum before cavitation begins—normally around 8–12 knots on many commercial vessels (Spence et al. 2007). Under higher speeds and higher propulsion system load, the acoustic output from the cavitation processes on the propeller blades dominates other sources of sound on the vessel such as machinery or hull vibration (Leggat et al. 1981).

A vessel equipped with propellers/thrusters has two primary sources of sound that propagate from the unit: the machinery and the propellers. For thrusters operating in the heavily loaded conditions, the acoustic energy generated by the cavitation processes on the propeller blades dominates (Leggat et al. 1981). The sound power from the propellers is proportional to the number of blades, the propeller diameter, and the propeller tip speed.

Based on an analysis of acoustic data, Ross (1976) provided the following formula for the sound levels from a vessel's propeller, operating in calm, open ocean conditions:

$$L_{100} = 155 + 60\log(u/25) + 10\log(B/4)\,, \tag{B-2}$$

where L_{100} is the spectrum level at 100 Hz, u is the propeller tip speed (m/s), and B is the number of propeller blades. Equation B-2 gives the total energy produced by the propeller cavitation at frequencies between 100 Hz and 10 kHz. This equation is valid for a propeller tip speed between 15 and 50 m/s. The spectrum is assumed to be flat below 100 Hz. Its level is assumed to fall off at a rate of −6 dB per octave above 100 Hz (Figure B-4).

Another method of predicting the source level of a propeller was suggested by Brown (1977). For propellers operating in heavily loaded conditions, the formula for the sound spectrum level is:

$$\mathrm{SL}_B = 163 + 40\log D + 30\log N + 10\log B + 20\log f + 10\log(A_c/A_D)\,, \tag{B-3}$$

where D is the propeller diameter (m), N is the propeller revolution rate per second, B is the number of blades, A_C is the area of the blades covered by cavitation, and A_D is the total propeller disc area. Similarly to Ross's approach, the spectrum below 100 Hz is assumed to be flat. The tests with a naval propeller operating at off-design heavily loaded conditions showed that Equation B-3 should be used with a value of $(A_c/A_D) = 1$ (Leggat et al. 1981).

The combined source level for multiple thrusters operating together can be estimated using the formula:

$$\mathrm{SL}_{\mathrm{total}} = 10\log_{10}\sum_i 10^{\frac{SL_i}{10}}, \tag{B-4}$$

where $\mathrm{SL}_{1,\ldots,N}$ are the source levels of individual thrusters. If the vessel is equipped with the same type of thrusters, the combined source level can be estimated using the formula:

$$\mathrm{SL}_N = \mathrm{SL} + 10\log N \tag{B-5}$$

where N is the total number of thrusters of the same type.

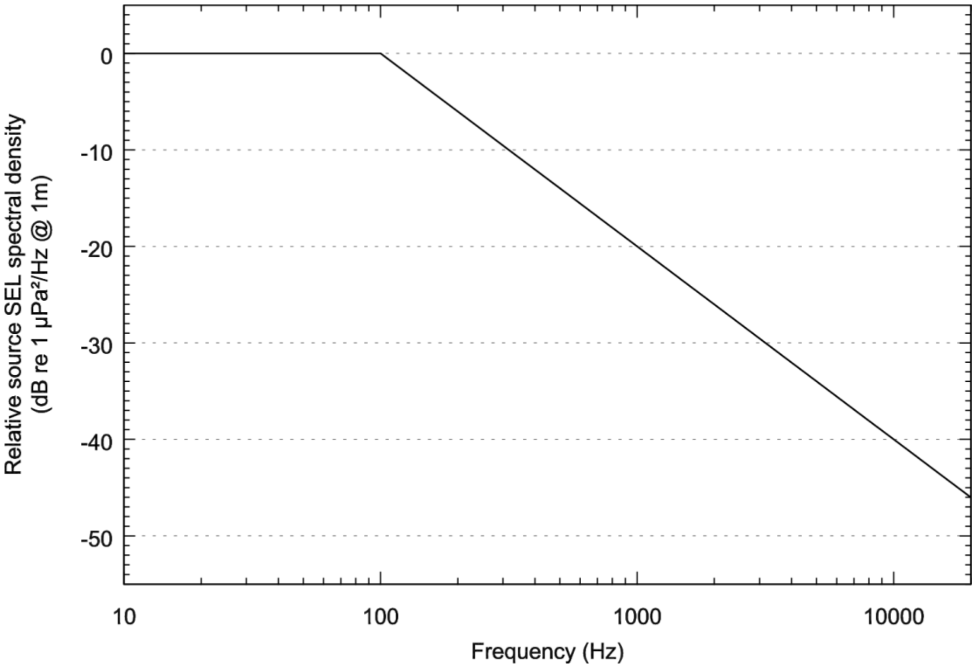
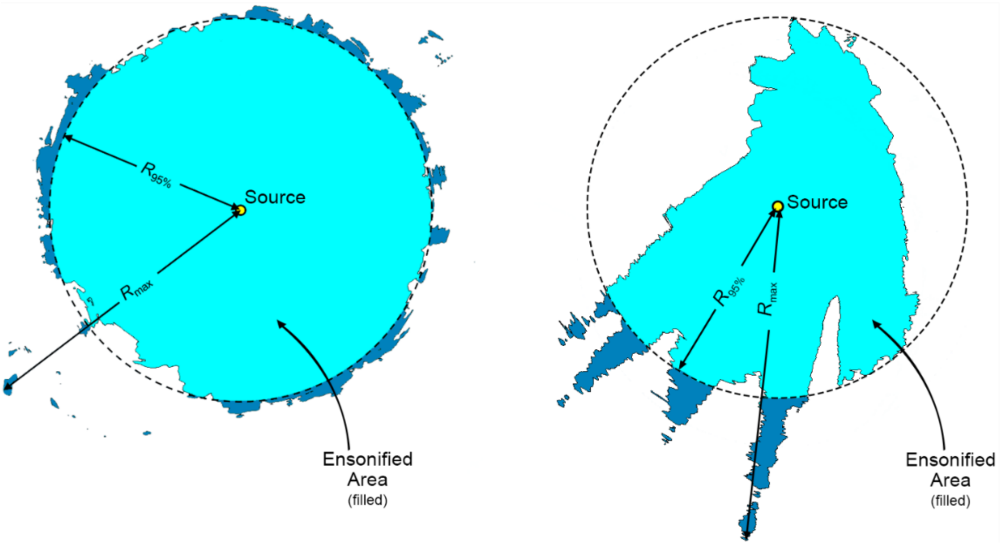


Figure B-4. Estimated sound spectrum from cavitating propeller. (Leggat et al. 1981).

B.4. Estimating Range to Thresholds Levels

Sound level contours were calculated based on the underwater sound fields predicted by the propagation models, sampled by taking the maximum value over all modelled depths above the sea floor for each location in the modelled region. The predicted distances to specific levels were computed from these contours. Two distances relative to the source are reported for each sound level: 1) R_{max}, the maximum range to the given sound level over all azimuths, and 2) $R_{95\%}$, the range to the given sound level after the 5% farthest points were excluded (see examples in Figure B-5).

The $R_{95\%}$ is used because sound field footprints are often irregular in shape. In some cases, a sound level contour might have small protrusions or anomalous isolated fringes. This is demonstrated in the image in Figure B-5(a). In cases such as this, where relatively few points are excluded in any given direction, R_{max} can misrepresent the area of the region exposed to such effects, and $R_{95\%}$ is considered more representative. In strongly asymmetric cases such as shown in Figure B-5(b), on the other hand, $R_{95\%}$ neglects to account for significant protrusions in the footprint. In such cases R_{max} might better represent the region of effect in specific directions. Cases such as this are usually associated with bathymetric features affecting propagation. The difference between R_{max} and $R_{95\%}$ depends on the source directivity and the non-uniformity of the acoustic environment.



(a) (b)

Figure B-5. Sample areas ensonified to an arbitrary sound level with R_{max} and $R_{95\%}$ ranges shown for two different scenarios. (a) Largely symmetric sound level contour with small protrusions. (b) Strongly asymmetric sound level contour with long protrusions. Light blue indicates the ensonified areas bounded by $R_{95\%}$; darker blue indicates the areas outside this boundary which determine R_{max}.

Appendix C. Model Validation Information

Predictions from JASCO's propagation models (MONM, FWRAM, and VSTACK) have been validated against experimental data from a number of underwater acoustic measurement programs conducted by JASCO globally, including the United States and Canadian Artic, Canadian and southern United States waters, Greenland, Russia and Australia (Hannay and Racca 2005, Aerts et al. 2008, Funk et al. 2008, Ireland et al. 2009, O'Neill et al. 2010, Warner et al. 2010, Racca et al. 2012a, Racca et al. 2012b, Matthews and MacGillivray 2013, Martin et al. 2015, Racca et al. 2015, Martin et al. 2017a, Martin et al. 2017b, Warner et al. 2017, MacGillivray 2018, McPherson et al. 2018, McPherson and Martin 2018).

In addition, JASCO has conducted measurement programs associated with a significant number of anthropogenic activities that have included internal validation of the modelling (including McCrodan et al. 2011, Austin and Warner 2012, McPherson and Warner 2012, Austin and Bailey 2013, Austin et al. 2013, Zykov and MacDonnell 2013, Austin 2014, Austin et al. 2015, Austin and Li 2016, Martin and Popper 2016).

Appendix F RPS Oil Spill Modelling Report – Bass

BEACH ENERGY – YOLLA PLATFORM MDO SPILL

Oil Spill Modelling

MAQ1131J
Beach Energy – Yolla
Platform MDO Spill
Rev3
26 April 2023

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TERMS AND ABBREVIATIONS

°	Degrees
‘	Minutes
“	Seconds
µm	Micrometre (unit of length; 1 µm = 0.001 mm)
AMP	Australian Marine Park
AMSA	Australian Maritime Safety Authority
ANZECC	Australian and New Zealand Environment and Conservation Council
API	American Petroleum Institute gravity. A measure of how heavy or light a petroleum liquid is compared to water.
ARMCANZ	Agriculture and Resource Management Council of Australia and New Zealand
ASTM	American Society for Testing and Materials
bbl	Barrel (unit of volume; 1 bbl = 0.159 m^3)
Beach	Beach Energy
BIA	Biologically Important Areas
Bonn Agreement	An agreement for cooperation in dealing with pollution of the North Sea by oil and other harmful substances, 1983, includes: Governments of the Kingdom of Belgium, the Kingdom of Denmark, the French Republic, the Federal Republic of Germany, the Republic of Ireland, the Kingdom of the Netherlands, the Kingdom of Norway, the Kingdom of Sweden, the United Kingdom of Great Britain and Northern Ireland and the European Union.
BMSL	Below Mean Sea Level
BP	Boiling point. The temperature at which the vapor pressure of the liquid is equal to the pressure exerted on it by the surrounding atmosphere
BTEX	Benzene, Toluene, Ethylbenzene, and Xylenes
˚C	degree Celsius (unit of temperature)
CFSR	Climate Forecast System Reanalysis
cm	Centimetre (unit of length)
cP	Centipoise (unit of dynamic viscosity)
Decay	The process where oil components are changed either chemically or biologically (biodegradation) to another compound. It includes breakdown to simpler organic carbon compounds by bacteria and other organisms, photo-oxidation by solar energy, and other chemical reactions.
Dynamic viscosity	The dynamic viscosity of a fluid expresses its resistance to shearing flows, where adjacent layers move parallel to each other with different speeds.
EP	Environmental Plan
Floating oil exposure	Contact by floating oil on the sea surface at concentrations equal to or exceeding defined threshold concentrations. The consequence will vary depending on the threshold and the receptors
g/m^2	Grams per square meter (unit of surface area density)
GODAE	Global Ocean Data Assimilation Experiment
HYCOM	Hybrid Coordinate Ocean Model. A data-assimilative, three-dimensional ocean model
HYDROMAP	Advanced ocean/coastal tidal model used to predict tidal water levels, current speed and current direction.

IOA	Index of Agreement
ITOPF	International Tanker Owners Pollution Federation Limited
KEF	Key Ecological Feature
km	Kilometre (unit of length)
km^2	Square Kilometres (unit of area)
Knots	unit of speed (1 knot = 0.514 m/s)
LGA	Local Government Areas
m	Meter (unit of length)
m/s	Meter per Second (unit of speed)
m^3	Cubic meter (unit of volume)
MAE	Mean Absolute Error
MAHs	Monoaromatic Hydrocarbons
MDO	Marine diesel oil
MNP	Marine National Park
MP	Marine Park
MS	Marine Sanctuary
N	Number of observations
NASA	National Aeronautics and Space Administration (USA)
NCEP	National Centres for Environmental Prediction (USA)
nm	Nautical mile
NOAA	National Oceanic and Atmospheric Administration (USA)
NOPSEMA	National Offshore Petroleum Safety and Environmental Management Authority
NP	National Park
NR	Nature Reserve
O	Observed variable
O_i	Observed surface elevation
P	Model-predicted variable
P_i	Model predicted surface elevation
PAH	Polynuclear Aromatic Hydrocarbons
Pour Point	The pour point of a liquid is the temperature below which the liquid loses its flow characteristics
ppb	Parts per billion (concentration)
psu	Practical salinity nits
RSB	Reefs, Shoals and Banks
Shoreline contact	Arrival of oil at or near shorelines at on-water concentrations equal to or exceeding defined threshold concentrations. Shoreline contact is judged for floating oil arriving within a 2 km buffer zone from any shoreline as a conservative measure
SIMAP	Spill Impact Model Application Package. SIMAP is designed to simulate the fate and effects of spilled hydrocarbons for surface or subsea releases
Single Oil spill modelling	Oil spill modelling involving a computer simulation of a single hypothetical oil spill event subject to a single sequence of wind, current and other sea conditions over time. Single oil spill modelling, also referred to as “deterministic modelling” provides a simulation of one possible outcome of a

	given spill scenario, subject to the metocean conditions that are imposed. Single oil spill modelling is commonly used to consider the fate and effects of ‘worst-case’ oil spill scenarios that are carefully selected in consideration of the nature and scale of the offshore petroleum activity and the local environment (NOPSEMA, 2017). Because the outcomes of a single oil spill simulation can only represent the outcome of that scenario under one sequence of metocean conditions, worst-case conditions are often identified from stochastic modelling. It is impossible to calculate the likelihood of any outcome from a single oil spill simulation. Single oil spill modelling is generally used for response planning, preparedness planning and for supporting oil spill response operations in the event of an actual spill
SRTM	Shuttle Radar Topography Mission
Stochastic oil spill modelling	Stochastic oil spill modelling is created by overlaying and statistically analysing the outcomes of many single oil-spill simulations of a defined spill scenario, where each simulation was subject to a different sequence of metocean conditions, selected objectively (typically by random selection) from a long sequence of historic conditions for the study area. Analysis of this larger set of simulations provides a more accurate indication of the environment that maybe affected (EMBA) and indicates which locations are more likely to be affected (as well as other statistics). Stochastic oil spill modelling avoids biases that affect single oil spill modelling (due to the reliance on only one possible sequence of conditions). However, when interpreting stochastic modelling, which is based on a wide range of potential conditions that might happen to occur, it is essential to understand that calculations will encompass a much larger area than could be affected in any single spill event, where a more limited set of conditions will occur. Consequently, it is misleading to imply that the region derived from stochastic modelling indicate the outcomes expected from a single spill event (NOPSEMA, 2017) Stochastic modelling is generally used for risk assessment and preparedness planning by indicating locations that could be exposed and may require response or subsequent impact assessment
Sub-LGA	Sub-Local Government Areas
TOPEX/Poseidon	A joint satellite mission between NASA and CNES to map ocean surface topography using an array of satellites equipped with detailed altimeters
USA	United States of America
US EPA	United States Environmental Protection Agency
US CG	United States Coast Guard
VIC	Victoria (State of Australia)
World Ocean Atlas	A collection of physicochemical parameters (e.g. temperature, salinity, oxygen, phosphate, silicate, and nitrate) based on profile data from the World Ocean Database (NCEI, 2021) established by NOAA’s National Centers for Environmental Information (NCEI)
WGS 1984	World Geodetic System 1984 (WGS84); reference coordinate system
X_{model}	Model predicted surface elevation
X_{obs}	Observed surface elevation

EXECUTIVE SUMMARY

Background

Beach Energy (Beach) is preparing the Environmental Plan (EP) for the Yolla field operations. The Yolla gas field is located in Bass Strait, 147 km south of Kilcunda, Victoria, in Production License T/L1.

In order to support the development of EP Beach had commissioned a detailed oil spill modelling study assessing the following hypothetical scenarios:

- **Scenario 1**: A 300 m³ surface release of marine diesel oil (MDO) over 6 hours following a vessel collision.

- **Scenario 2**: A 200 m³ surface release of marine diesel oil (MDO) over 6 hours following a vessel collision.

The purpose of the modelling is to provide an understanding of a conservative 'outer envelope' of the potential area that may be affected in the unlikely event of hydrocarbon spill. The modelling does not take into consideration any of the spill prevention, mitigation and response capabilities that would be implemented in response to the spill. Therefore, the modelling results represent the maximum extent that the released hydrocarbon may influence.

The spill modelling was performed using an advanced three-dimensional trajectory and fates model; Spill Impact Model Application Program (SIMAP). The SIMAP model calculates the transport, spreading, entrainment and evaporation of spilled hydrocarbons over time, based on the prevailing wind and current conditions and the physical and chemical properties.

Methodology

The modelling study was carried out in several stages. Firstly, a ten-year wind and current dataset (2010–2019) was generated and the currents included the combined influence of three-dimensional large-scale ocean currents and tidal currents. Secondly, the currents, winds and detailed hydrocarbon characteristics were used as inputs in the three-dimensional oil spill model (SIMAP) to simulate the drift, spread, weathering and fate of the spilled oil.

As spills can occur during any set of wind and current conditions, modelling was conducted using a stochastic (random or non-deterministic) approach, which involved running 100 spill simulations initiated using the same release information (spill volume, duration and composition of the oil) at random start times. This ensured that each simulation was subject to different wind and current conditions and, in turn, movement and weathering of the oil for an annual based assessment.

The SIMAP system, the methods and analysis presented herein, use modelling algorithms which have been anonymously peer reviewed and published in international journals. Further, RPS warrants that this work meets and exceeds the ASTM Standard F2067-13 "*Standard Practice for Development and Use of Oil Spill Models*".

Oil Properties

The MDO has an API of 37.6 and a density of 829.1 kg/m^3 (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. Six percent 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 < 160°C); and a further 54.4% should evaporate over several days (160°C < BP < 380°C). Approximately 5.0% of the oil is shown to be persistent.

Results

Scenario 1: 300 m³ loss of containment caused by vessel collision

- No shoreline oil accumulation above the low (10-100 g/m^2) shoreline contact threshold was predicted for the scenario.
- 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) exposure levels was 59.8 km (east), 13.8 km (south) and 1.9 km (south), respectively.
- A total of 13 BIAs, the Australian EEZ and the Central Bass Strait IMCRA were predicted to be exposed to floating oil at or above the low threshold during annualised conditions. The release location resides within all the exposed receptors. No other receptors were exposed to floating oil.
- In the surface (0-10 m) depth layer, a total of 13 BIAs, the Australian EEZ and the Central Bass Strait IMCRA were predicted to be exposed to dissolved hydrocarbons at, or above, the low threshold during the annualised assessment as the release location resides within all the exposed receptors. No other receptors were exposed to dissolved hydrocarbons. The probability of exposure at the low and moderate thresholds were predicted to be 65% and 5% respectively, for all receptors.
- Within the surface (0-10 m) depth layer, low and high entrained hydrocarbon exposures were predicted for BIA and IMCRA receptors. The highest concentration for a receptor which did not surround the release location was Flinders IMCRA (167 ppb) and the corresponding probabilities of exposure based on the low and high thresholds were 19% and 2% respectively.

Scenario 2: 200 m³ loss of containment caused by vessel collision

- No shoreline oil accumulation above the low (10 g/m^2) shoreline contact threshold was predicted for the scenario.
- 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) exposure levels was 23 km (south in summer), 14.5 km (east in winter) and 2.3 km (southeast in winter), respectively.
- A total of 13 BIAs, the Australian EEZ and the Central Bass Strait IMCRA were predicted to be exposed to floating oil at or above the low threshold during both summer and winter conditions. The release location resides within all the exposed receptors. No other receptors were exposed to floating oil.
- In the surface (0-10 m) depth layer, a total of 13 BIAs, the Australian EEZ and the Central Bass Strait IMCRA were predicted to be exposed to dissolved hydrocarbons at, or above, the low threshold during both summer and winter conditions, as the release location resides within all the exposed receptors. No other receptors were exposed to dissolved hydrocarbons. The probability of exposure at the low and moderate thresholds were predicted to be 53% and 3% respectively, for all receptors during winter conditions.
- Within the surface (0-10 m) depth layer, low and high entrained hydrocarbon exposures were predicted for BIA and IMCRA receptors. The highest concentration for a receptor which did not encompass the release location was Flinders IMCRA (150 ppb) during winter conditions and the probability of exposure based on the low and high thresholds was 10% and 1% respectively.

1 INTRODUCTION

1.1 Background

Beach Energy (Beach) is preparing the Environmental Plan (EP) for the Yolla field operations. The Yolla gas field is located in Bass Strait, 147 km south of Kilcunda, Victoria in Production License T/L1.

In order to support the development of EP Beach had commissioned a detailed oil spill modelling study assessing the following hypothetical scenarios:

- **Scenario 1**: A 300 m³ surface release of marine diesel oil (MDO) over 6 hours following a vessel collision.
- **Scenario 2**: A 200 m³ surface release of marine diesel oil (MDO) over 6 hours following a vessel collision.

Table 1-1 presents the coordinates of the release location and a location map is presented in Figure 1-1.

The results for the scenario are presented on an annual basis for Scenario 1, while Scenario 2 was a later addition to the study and was assessed for Summer and Winter conditions separately.

The purpose of the modelling is to provide an understanding of a conservative ‘outer envelope’ of the potential area that may be affected in the unlikely event of hydrocarbon spill. The modelling does not take into consideration any of the spill prevention, mitigation and response capabilities that would be implemented in response to the spill. Therefore, the modelling results represent the maximum extent that the released hydrocarbon may influence.

The spill modelling was performed using an advanced three-dimensional trajectory and fates model; Spill Impact Model Application Program (SIMAP). The SIMAP model calculates the transport, spreading, entrainment and evaporation of spilled hydrocarbons over time, based on the prevailing wind and current conditions and the physical and chemical properties.

Note that the oil spill model, the method and analysis presented herein uses modelling algorithms which have been anonymously peer reviewed and published in international journals. Furthermore, RPS warrants that this work meets and exceeds the American Society for Testing and Materials (ASTM) Standard F2067-13 “*Standard Practice for Development and Use of Oil Spill Models*”.

Table 1-1 Coordinates for the release location used in this study (WGS84).

Release Location	Latitude	Longitude	Depth (m BMSL)
Yolla Platform	39° 50.633' S	145° 49.083' E	~70

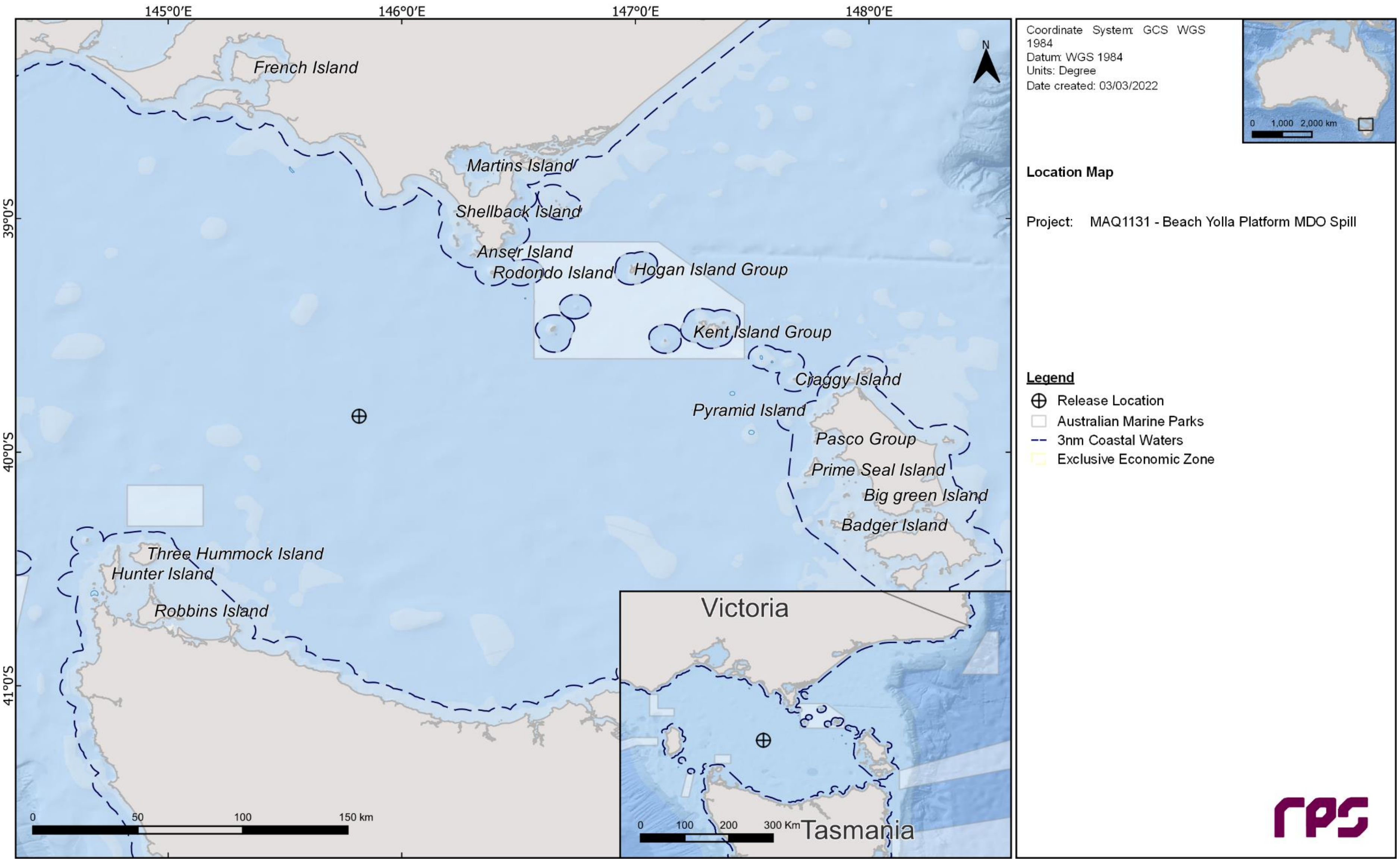


Figure 1-1 Map of the release location.

1.2 What is Oil Spill Modelling?

Oil spill modelling is a valuable tool widely used for risk assessment, emergency response and contingency planning where it can be particularly helpful to proponents and decision makers. By modelling a series of the most likely oil spill scenarios, decisions concerning suitable response measures and strategic locations for deploying equipment and materials can be made, and the locations at most risk can be identified. The two types of oil spill modelling often used are stochastic (Section 1.2.1) and deterministic (Section 1.2.2) modelling.

1.2.1 Stochastic Modelling (Multiple Spill Simulations)

Stochastic oil spill modelling is created by overlaying a great number (often hundreds) of individual, computer-simulated hypothetical spills (NOPSEMA, 2018; Figure 1.2).

Stochastic modelling is a common means of assessing the potential risks from oil spills related to new projects and facilities. Stochastic modelling typically utilises hydrodynamic data for the location in combination with historic wind data. Typically, 100 iterations of the model will be run utilising the data that is most relevant to the season or timing of the project.

The outcomes are often presented as a probability of exposure and is primarily used for risk assessment purposes in view to understand the range of environments that may be affected or impacted by a spill. Elements of the stochastic modelling can also be used in oil spill preparedness and planning.

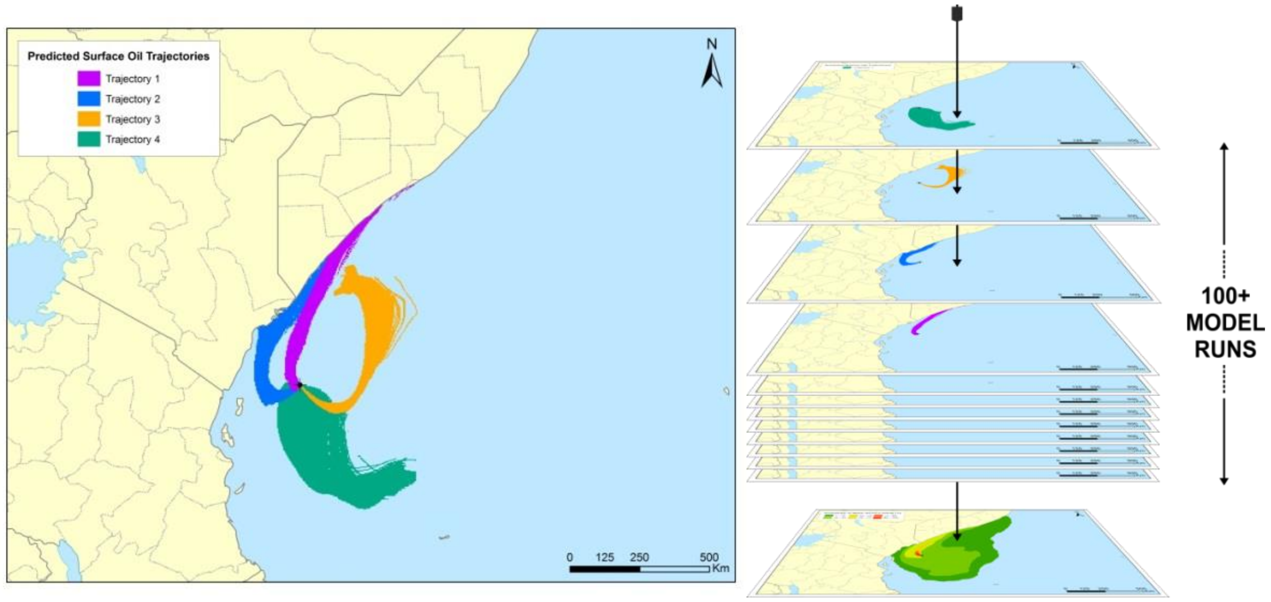


Figure 1-2 Examples of four individual spill trajectories (four replicate simulations) predicted by SIMAP for a spill scenario. The frequency of contact with given locations is used to calculate the probability of impacts during a spill. Essentially, all model runs are overlain (shown as the stacked runs on the right) and the number of times that trajectories contact a given location at a concentration is used to calculate the probability.

1.2.2 Deterministic Modelling (Single Spill Simulation)

Deterministic modelling is the predictive modelling of a single incident subject to a single sample of wind and weather conditions over time (NOPSEMA, 2018; Figure 1-3).

Deterministic modelling is often paired with stochastic modelling to place the large stochastic footprint into perspective. This deterministic analysis is generally a single run selected from the stochastic analysis and serves as the basis for developing the plans and equipment needs for a realistic spill response. Deterministic spills can be selected on several basis such as minimum time to shoreline, largest swept area, maximum volume ashore, longest length of shoreline contacted by oil or largest area of entrained or dissolved hydrocarbons.

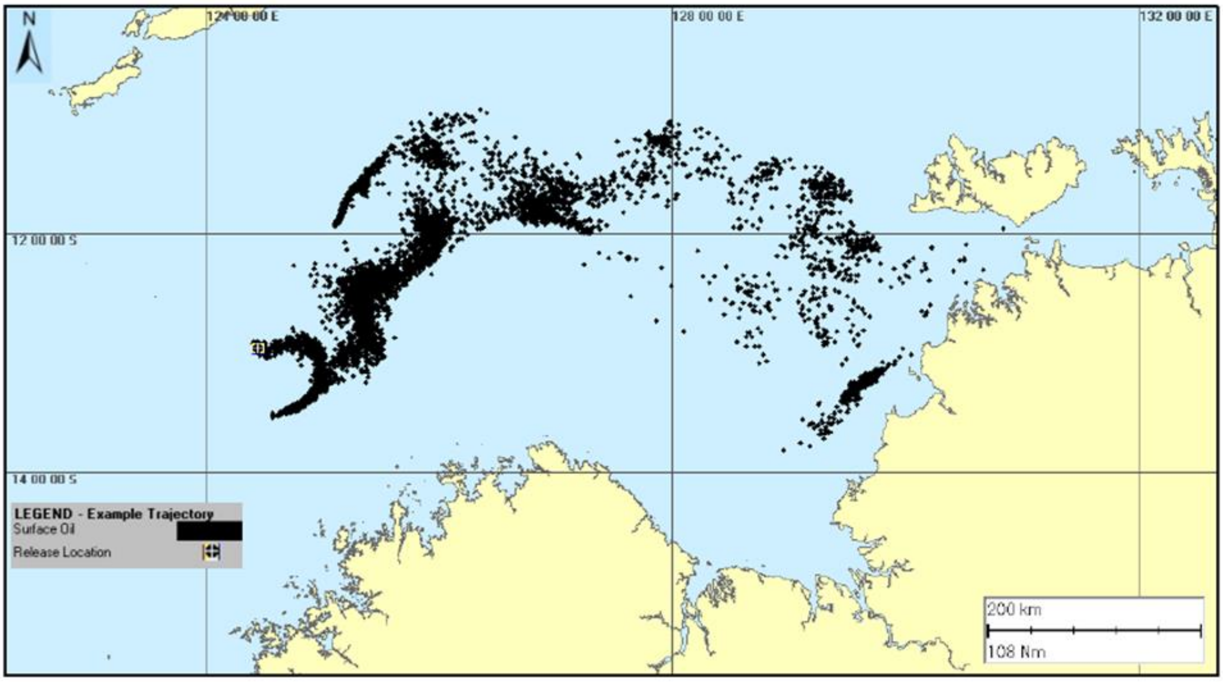


Figure 1-3 Example of an individual spill trajectory predicted by SIMAP for a spill scenario. Note, this image represents surface oil as spillets and do not take any thresholds into consideration.

2 SCOPE OF WORK

The scope of work included the following components:

- Generate 10 years of winds and three-dimensional currents from 2010 to 2019 (inclusive). The currents included the combined influence of tidal and ocean currents;
- Include the wind and current data and characteristics of the MDO as input into the three-dimensional oil spill model SIMAP, to model the movement, spreading, weathering and shoreline contact by hydrocarbons over time;
- Use SIMAP's stochastic model (also known as a probability model) to calculate exposure to surround waters and shorelines. This involved running 100 randomly selected single trajectory simulations, with each simulation having the same spill information (spill volume, duration and composition of hydrocarbons) but varying start times. This ensured that each spill simulation was subject to a unique set of wind and current conditions; and
- The stochastic modelling results were reviewed and the "worst case" deterministic runs were identified ,from Scenario 1 only, and presented based on the following criteria (if applicable):
    a. Largest swept area of floating oil above 1 g/m^2 (visible floating oil);
    b. Minimum time before shoreline accumulation above 10 g/m^2;
    c. Largest volume of oil ashore;
    d. Longest length of oil accumulation on shorelines above 10 g/m^2;
    e. Largest area of entrained hydrocarbon exposure above 10 ppb; and
    f. Largest area of dissolved hydrocarbon exposure above 10 ppb.

3 REGIONAL CURRENTS

Bass Strait is a body of water separating Tasmania from the southern Australian mainland, specifically the state of Victoria. The strait is a relatively shallow area of the continental shelf, connecting the southeast Indian Ocean with the Tasman Sea. Currents within the straight are primarily driven by tides, winds, incident continental shelf waves and density driven flows; high winds and strong tidal currents are frequent within the area (Jones, 1980).

The varied geography and bathymetry of the region, in addition to the forcing of the south-eastern Indian Ocean and local meteorology lead to complex shelf and slope circulation patterns (Middleton & Bye, 2007). Figure 3-1 displays seasonal current trends within the Bass Strait. During winter there is a strong eastward water flow due to the strengthening of the South Australian Current (fed by the Leeuwin Current in the Northwest Shelf), which bifurcates with one extension moving though the Bass Strait, and another forming the Zeehan Current off western Tasmania (Sandery & Kampf, 2007). During summer, water flow reverses off Tasmania, King Island and the Otway Basin travelling eastward, as the coastal current develops due to south-easterly winds.

To accurately describe the variability in currents between the inshore and offshore region, a hybrid regional dataset was developed by combining deep ocean predictions obtained from HYCOM (Hybrid Coordinate Ocean Model) with surface tidal currents developed by RPS. The following sections provide a summary of the hybrid regional data set.

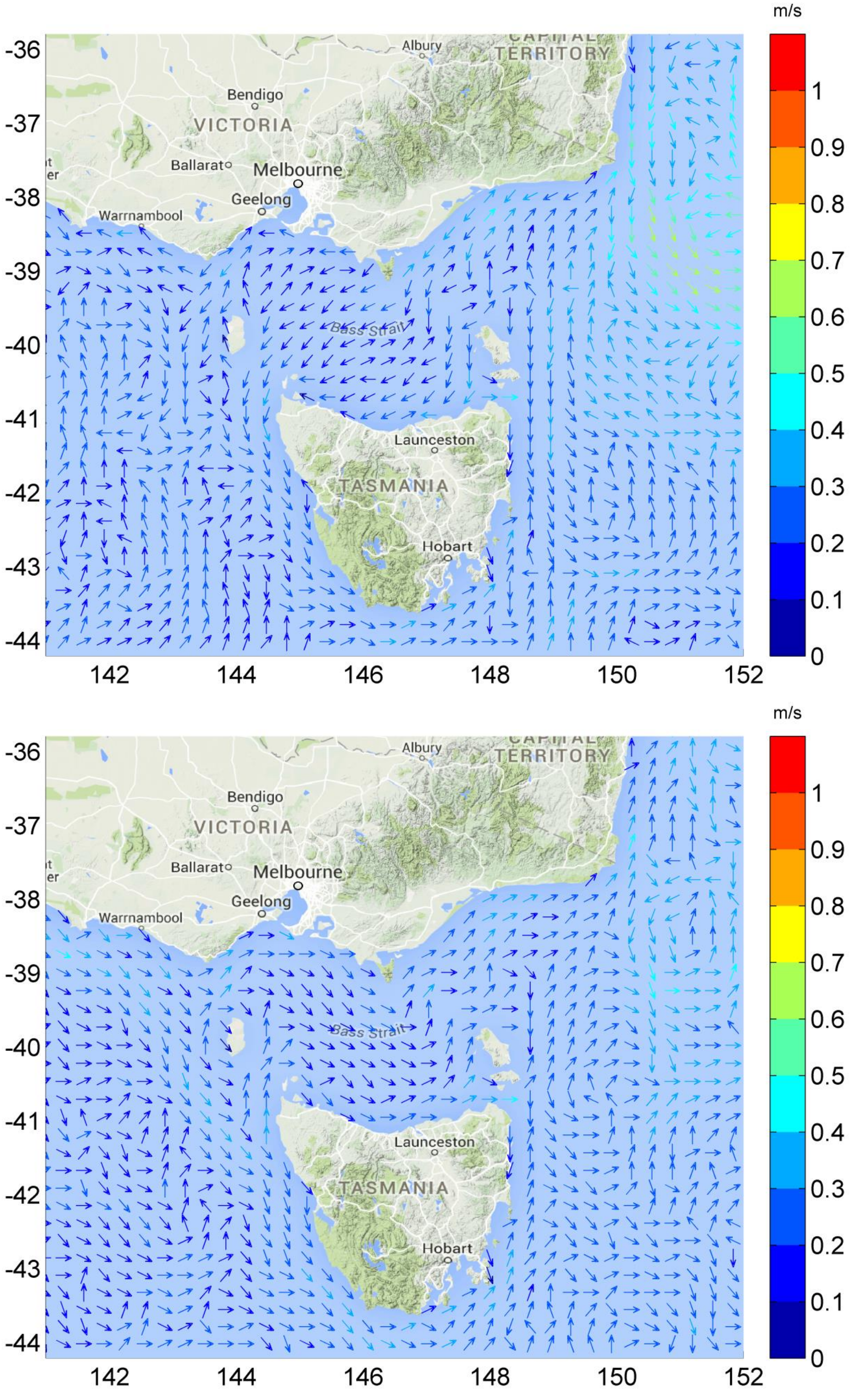


Figure 3-1 HYCOM averaged seasonal surface drift currents during summer (upper image) and winter (lower image).

3.1 Tidal currents

Tidal current data was generated using RPS's advanced ocean/coastal model, HYDROMAP. The HYDROMAP model has been thoroughly tested and verified through field measurements throughout the world for more than 30 years (Isaji & Spaulding, 1984; Isaji, et al., 2001; Zigic, et al., 2003). HYDROMAP tidal current data has been used as input to forecast (in the future) and hindcast (in the past) pollutant spills in Australian waters and forms part of the Australian National Oil Spill Emergency Response System operated by AMSA (Australian Maritime Safety Authority).

HYDROMAP employs a sophisticated sub-gridding strategy, which supports up to six levels of spatial resolution, halving the grid cell size as each level of resolution is employed. The sub-gridding allows for higher resolution of currents within areas of greater bathymetric and coastline complexity, and/or of interest to a study.

The numerical solution methodology follows that of Davies (1977a and 1977b) with further developments for model efficiency by Owen (1980) and Gordon (1982). A more detailed presentation of the model can be found in Isaji and Spaulding (1984) and Isaji et al. (2001).

3.1.1 Grid Setup

The tidal model domain is sub-gridded to a resolution of 500 m for shallow and coastal regions, starting from an offshore (or deep water) resolution of 8 km. The finer grids are progressively allocated in a step-wise fashion to more accurately resolve flows along the coastline, around islands and over regions with more complex bathymetry. Figure 3-2 shows the tidal model grid covering the study domain.

A combination of datasets was used and merged to describe the shape of the seabed within the grid domain (Figure 3-3). These included spot depths and contours which were digitised from nautical charts released by the hydrographic offices as well as Geoscience Australia database and depths extracted from the Shuttle Radar Topography Mission (SRTM30_PLUS) Plus dataset (see Becker et al., 2009).

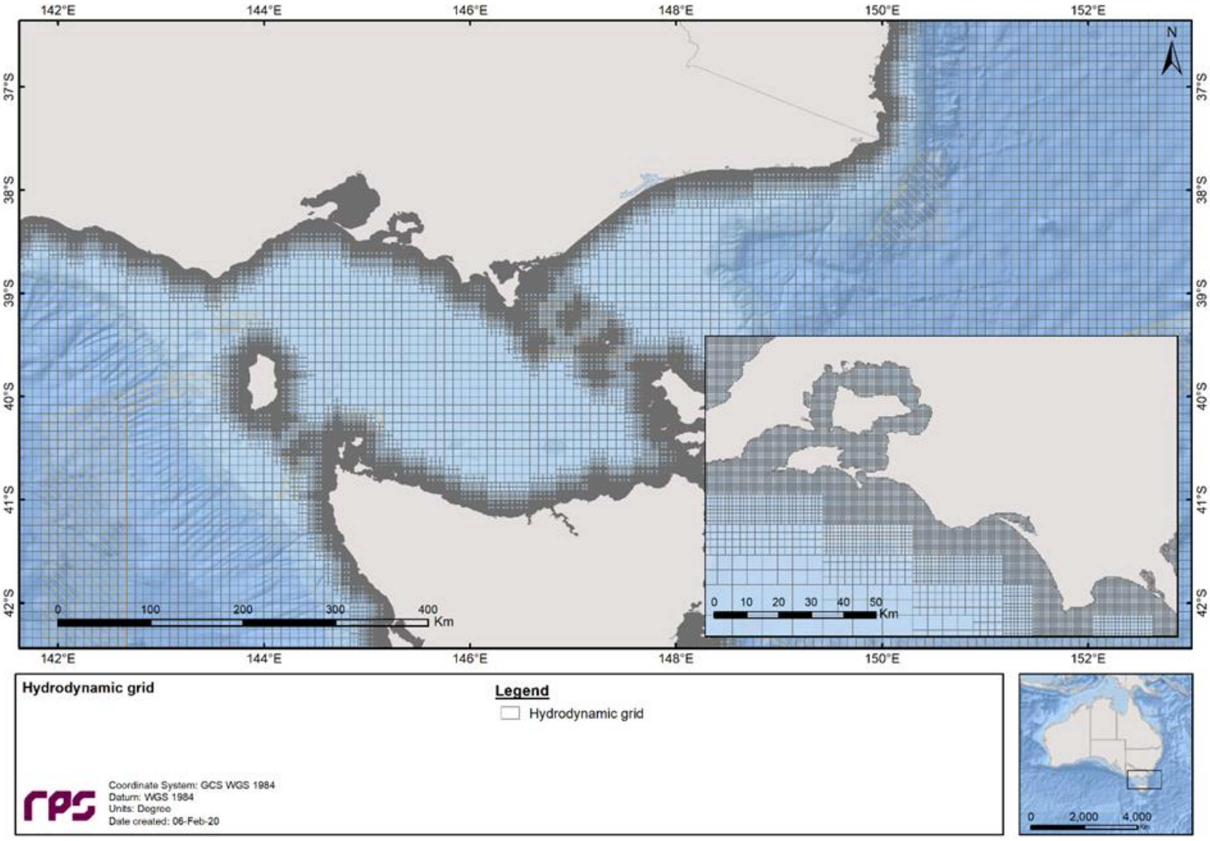


Figure 3-2 Sample of the model grid used to generate the tidal currents for the study region. Higher resolution areas are shown by the denser mesh.

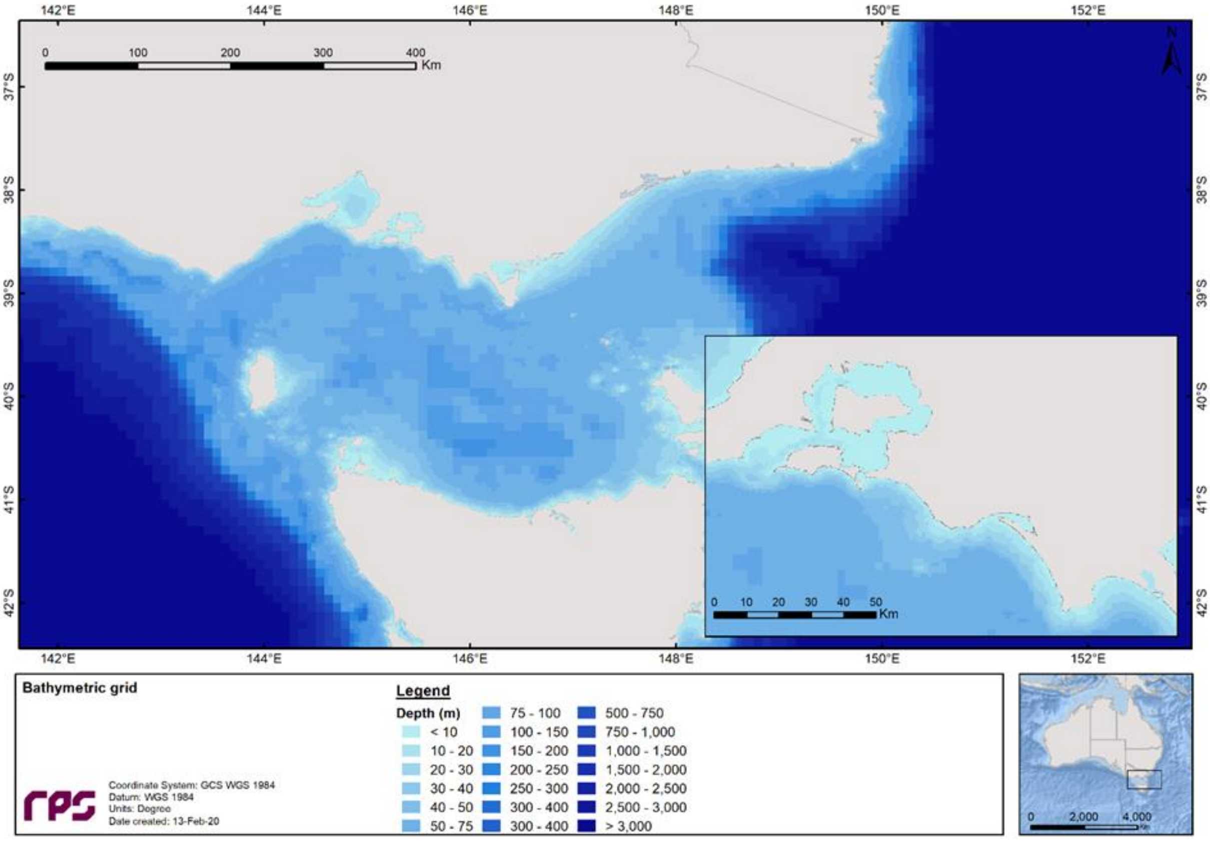


Figure 3-3 Bathymetry defined throughout the tidal model domain.

3.1.2 Tidal Conditions

The ocean boundary data for the regional model was obtained from satellite measured altimetry data (TOPEX/Poseidon 8.0) which provided estimates of the eight dominant tidal constituents at a horizontal scale of approximately 0.25 degrees. The eight major tidal constituents used were K_2, S_2, M_2, N_2, K_1, P_1, O_1 and Q_1. Using the tidal data, time series surface heights were calculated along the open boundaries for the simulation period.

The Topex/Poseidon satellite data has a resolution of 0.25 degrees globally, with higher resolution in coastal regions, and is produced and quality controlled by NASA (National Aeronautics and Space Administration). The data capturing satellites, equipped with two altimeters capable of taking sea level measurements accurate to less than ± 5 cm, measured oceanic surface elevations (and the resultant tides) for the period 1992–2005. In total these satellites carried out 62,000 orbits of the planet. The Topex-Poseidon tidal data has been widely used amongst the oceanographic community, being refereced in more than 2,100 research publications (e.g. Andersen, 1995; Ludicone et al., 1998; Matsumoto et al., 2000; Kostianoy et al., 2003; Yaremchuk & Tangdong, 2004; Qiu & Chen 2010). The Topex/Poseidon tidal data is considered suitably accurate for this study.

3.1.3 Surface Elevation Validation

To ensure that tidal predictions were accurate, predicted surface elevations were compared to data observed at a location situated within the study area (Figure 3-4).

To provide a statistical measure of the model performance, the Index of Agreement (IOA – Willmott, 1981) and the Mean Absolute Error (MAE – Willmott, 1982; Willmott & Matsuura, 2005) were used.

The MAE (Eq.1) is simply the average of the absolute values of the difference between the model-predicted (P) and observed (O) variables. It is a more natural measure of the average error (Willmott and Matsuura, 2005) and more readily understood. The MAE is determined by:

$$MAE = N^{-1} \sum_{i=1}^{N} |P_i - O_i| \qquad \text{Eq.1}$$

Where: N = Number of observations

P_i = Model predicted surface elevation

O_i = Observed surface elevation

The Index of Agreement (IOA; Eq. 2) in contrast, gives a non-dimensional measure of model accuracy or performance. A perfect agreement between the model predicted and observed surface elevations exists if the index gives an agreement value of 1, and complete disagreement between model and observed surface elevations will produce an index measure of 0 (Wilmott, 1981). Willmott et al. (1985) also suggests that values larger than 0.5 may represent good model performance. The IOA is determined by:

$$IOA = 1 - \frac{\sum |X_{model} - X_{obs}|^2}{\sum (|X_{model} - \overline{X_{obs}}| + |X_{obs} - \overline{X_{obs}}|)^2} \qquad \text{Eq.2}$$

Where: X_{model} = Model predicted surface elevation

X_{obs} = Observed surface elevation

Clearly, a greater IOA and lower MAE represent a better model performance.

Figure 3-5 and Figure 3-6 illustrate a comparison of the predicted and observed surface elevations in February 2017. As shown on the graph, the model accurately reproduced the phase and amplitudes throughout the spring and neap tidal cycles.

Table 3-1 shows the IOA and MAE values for the selected tide station locations indicating that the model is performing well.

Table 3-1 Statistical comparison between the observed and HYDROMAP predicted surface elevations.

Tide Station	IOA	MAE (m)
Gabo Island	0.98	0.08
Port MacDonnell	0.98	0.05
Port Welshpool	0.92	0.30
Portland	0.97	0.07
Stack Island	0.96	0.22

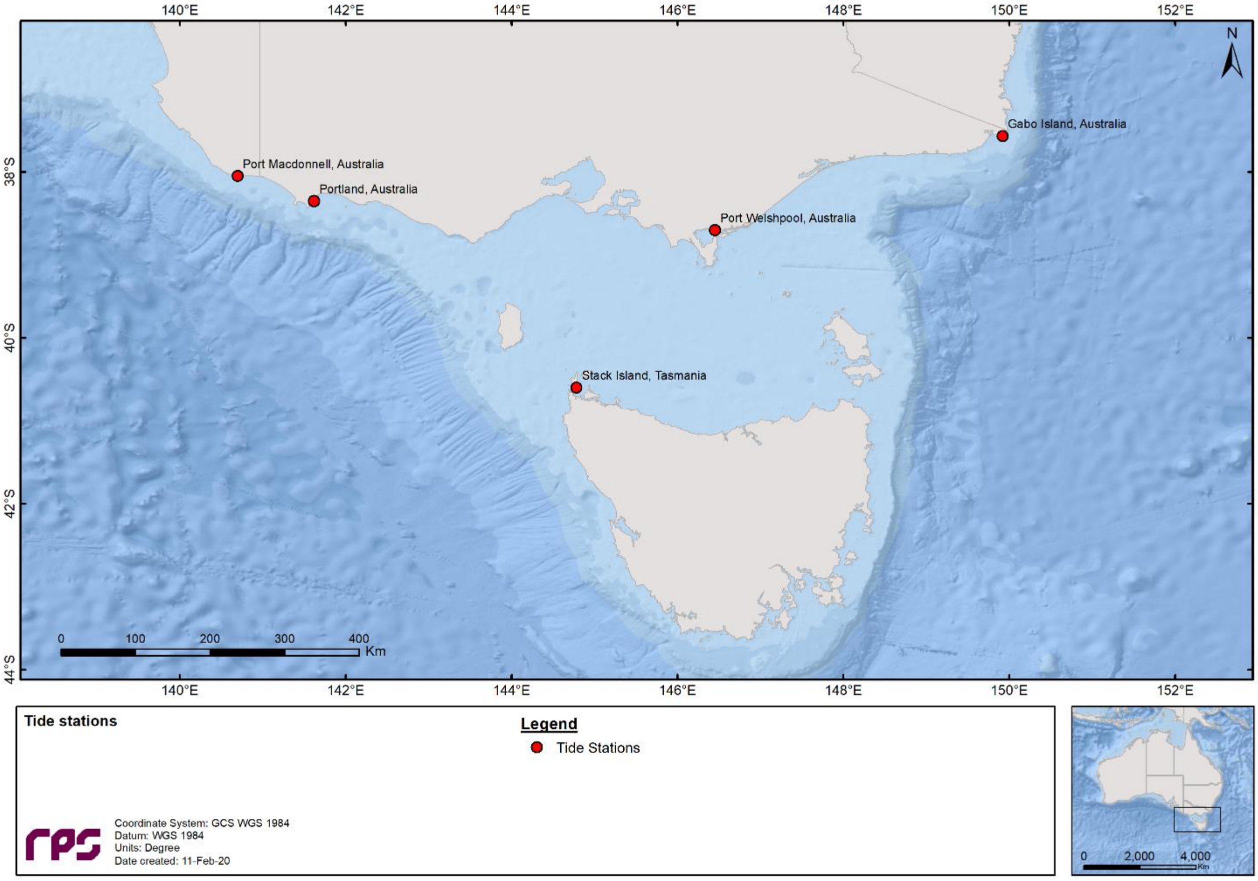
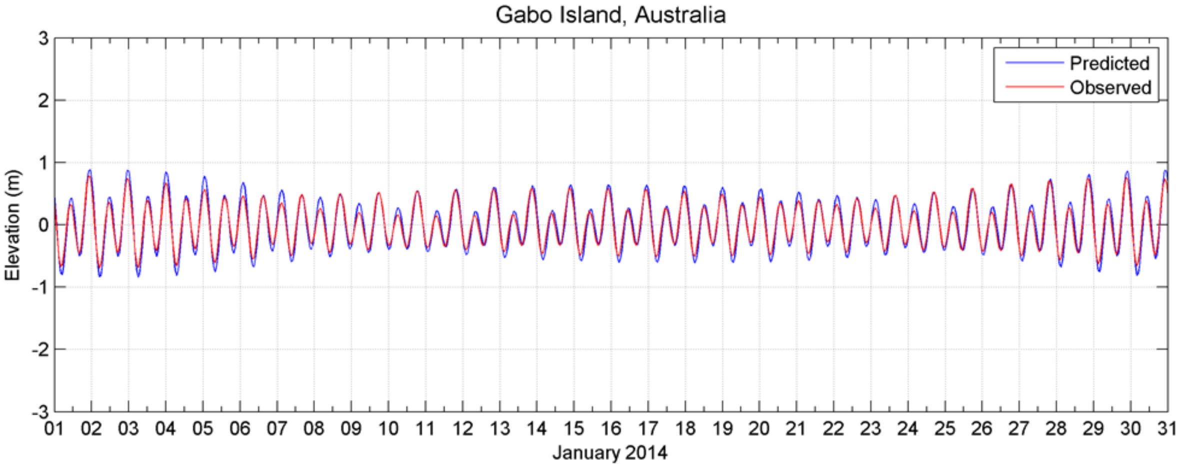
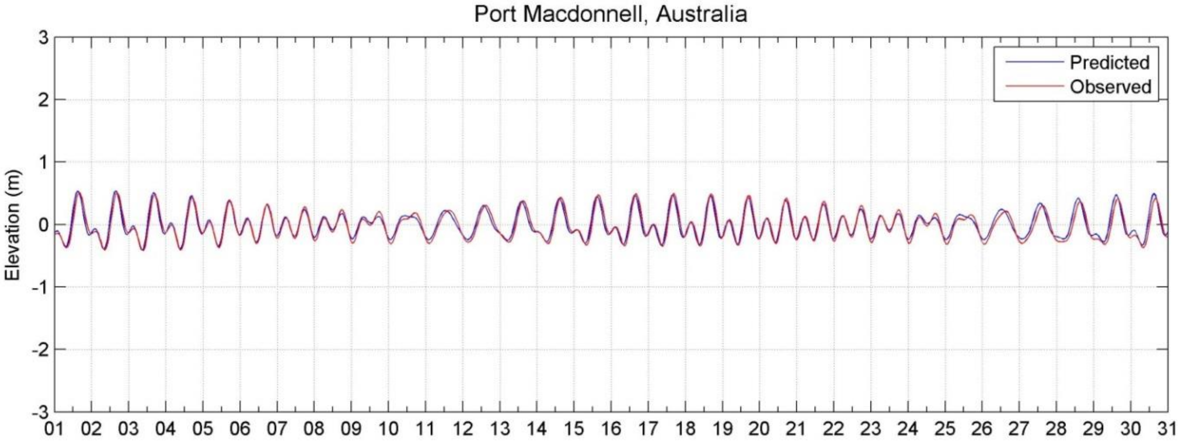


Figure 3-4 Location of the tide stations used in the surface elevation validation.





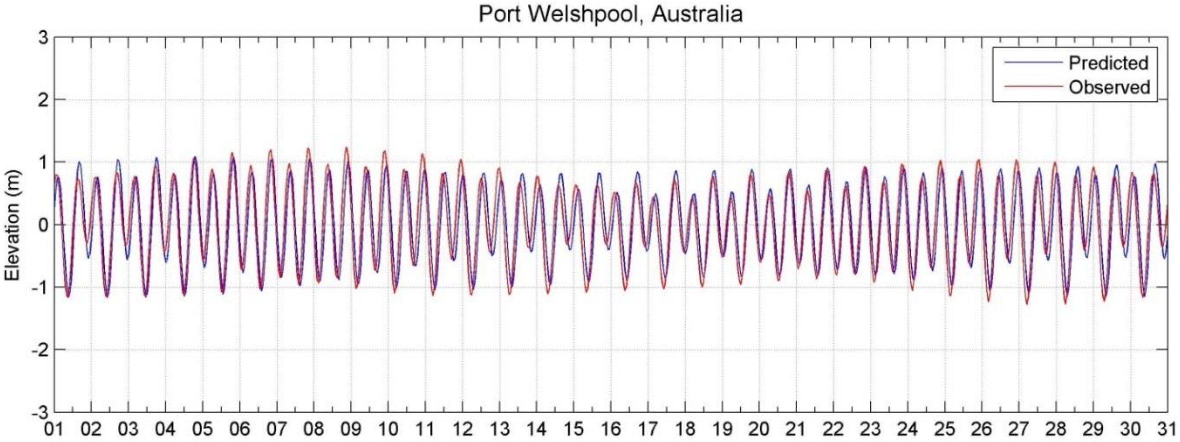
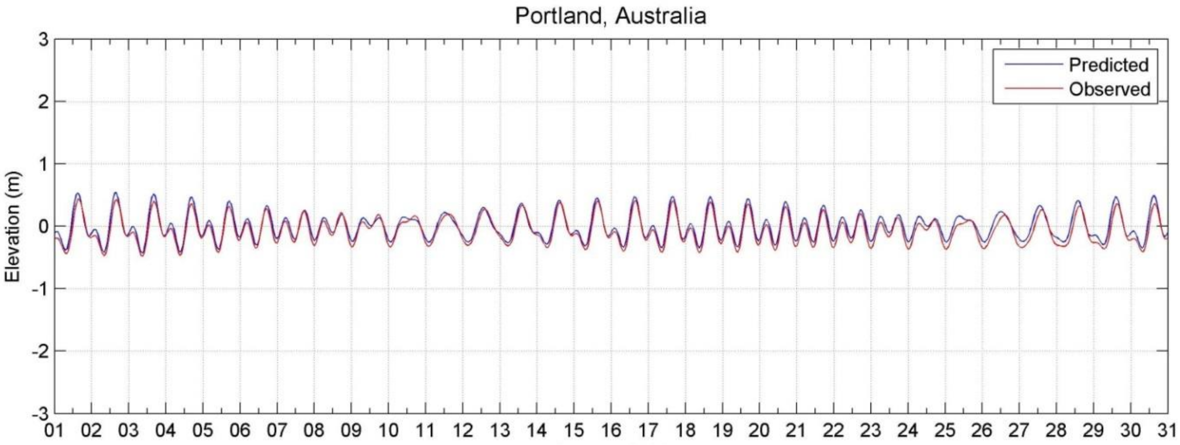


Figure 3-5 Comparison between HYDROMAP predicted (blue line) and observed (red line) surface elevation at tidal stations Gabo Island (upper image), Port MacDonnell (middle image) and Port Welshpool (lower image).



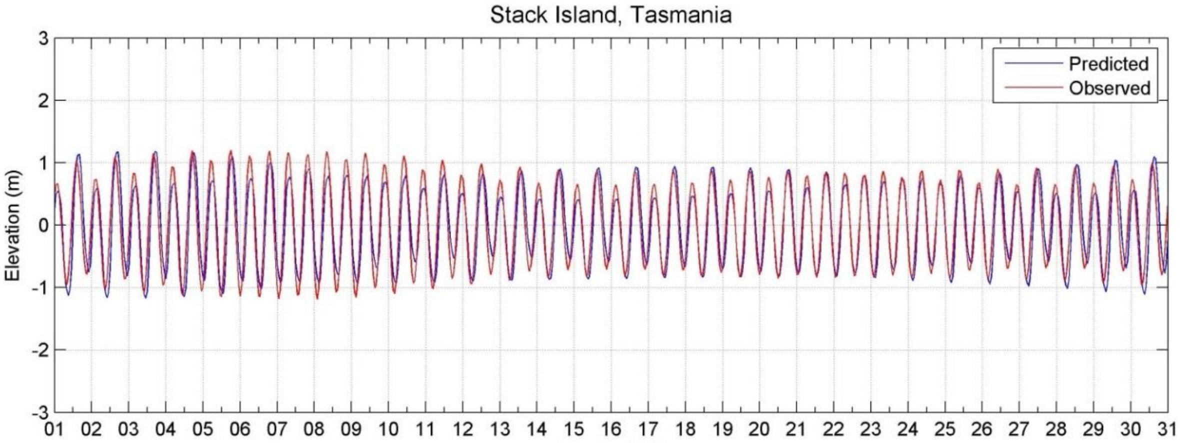


Figure 3-6 Comparison between HYDROMAP predicted (blue line) and observed (red line) surface elevation at tidal stations Portland (upper image) and Stack Island (lower image).

3.2 Ocean Currents

Data describing the flow of ocean currents was for the years 2010 to 2019 (inclusive) obtained from HYCOM (Hybrid Coordinate Ocean Model, (Chassignet et al., 2007), which is operated by the HYCOM Consortium, sponsored by the Global Ocean Data Assimilation Experiment (GODAE). HYCOM is a data-assimilative, three-dimensional ocean model that is run as a hindcast (for a past period), assimilating time-varying observations of sea surface height, sea surface temperature and in-situ temperature and salinity measurements (Chassignet et al., 2009). The HYCOM predictions for drift currents are produced at a horizontal spatial resolution of approximately 8.25 km (1/12th of a degree) over the region, at a frequency of once per day. HYCOM uses isopycnal layers in the open, stratified ocean, but uses the layered continuity equation to make a dynamically smooth transition to a terrain-following coordinate in shallow coastal regions, and to z-level coordinates in the mixed layer and/or unstratified seas. Figure 3-7 illustrates the spatial resolution of HYCOM currents.

For this study, the HYCOM hindcast currents were obtained.

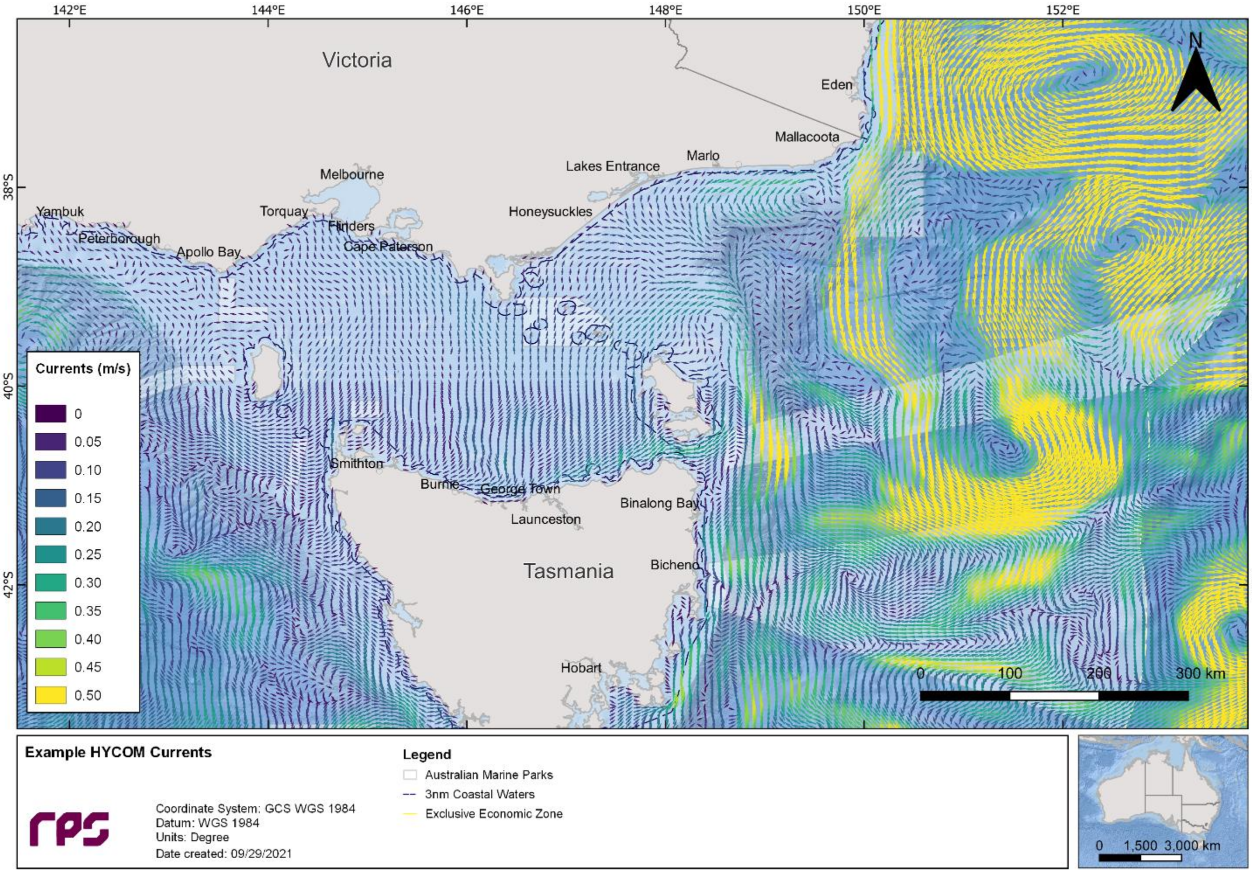


Figure 3-7 Map illustrating the spatial resolution of HYCOM currents.

3.3 Surface Currents

Table 3-2 presents the average and maximum net surface current speeds nearby the release location by combining the ocean and tidal currents. Current speeds varied throughout the year with peak current speeds ranging between approximately 0.61 m/s (December) and 0.96 m/s (July). The dominant direction between May to September was east, while no dominant current directions was observed between October to March.

Figure 3-8 and Figure 3-9 show the monthly and total surface current rose distributions nearby the release location.

Note the convention for defining current direction is the direction the current flows towards, which is used to reference current direction throughout this report. Each branch of the rose represents the currents flowing to that direction, with north to the top of the diagram. Sixteen directions are used. The branches are divided into segments of different colour, which represent the current speed ranges for each direction. Speed intervals of 0.1 m/s are predominantly used in these current roses. The length of each coloured segment is relative to the proportion of currents flowing within the corresponding speed and direction.

Table 3-2 Predicted monthly average and maximum surface current speeds nearby the release location. The data was derived by combining the HYCOM ocean data and HYDROMAP tidal data from 2010–2019 (inclusive).

Month	Average current speed (m/s)	Maximum current speed (m/s)	General direction(s) (Towards)
January	0.18	0.66	Variable
February	0.17	0.70	Variable
March	0.17	0.75	Variable
April	0.16	0.73	Variable
May	0.19	0.87	East
June	0.19	0.70	East & Northwest
July	0.22	0.96	East
August	0.20	0.95	East
September	0.19	0.81	East
October	0.18	0.64	Variable
November	0.17	0.63	Variable
December	0.17	0.61	Variable
Minimum	**0.16**	**0.61**	
Maximum	**0.22**	**0.96**	

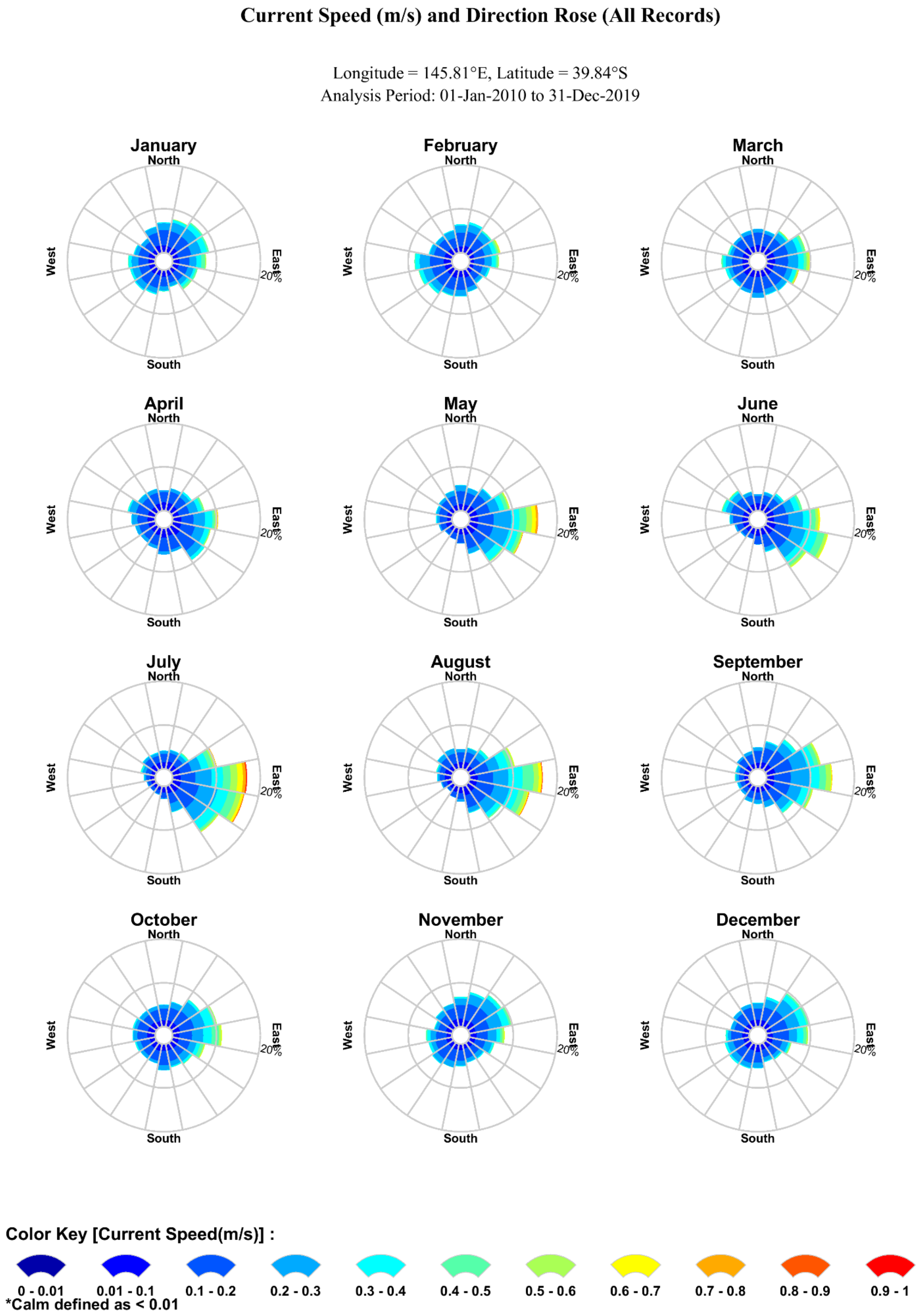


Figure 3-8 Monthly surface current rose plots nearby the release location (derived by combining the HYDROMAP tidal currents and HYCOM ocean currents for 2010–2019 (inclusive).

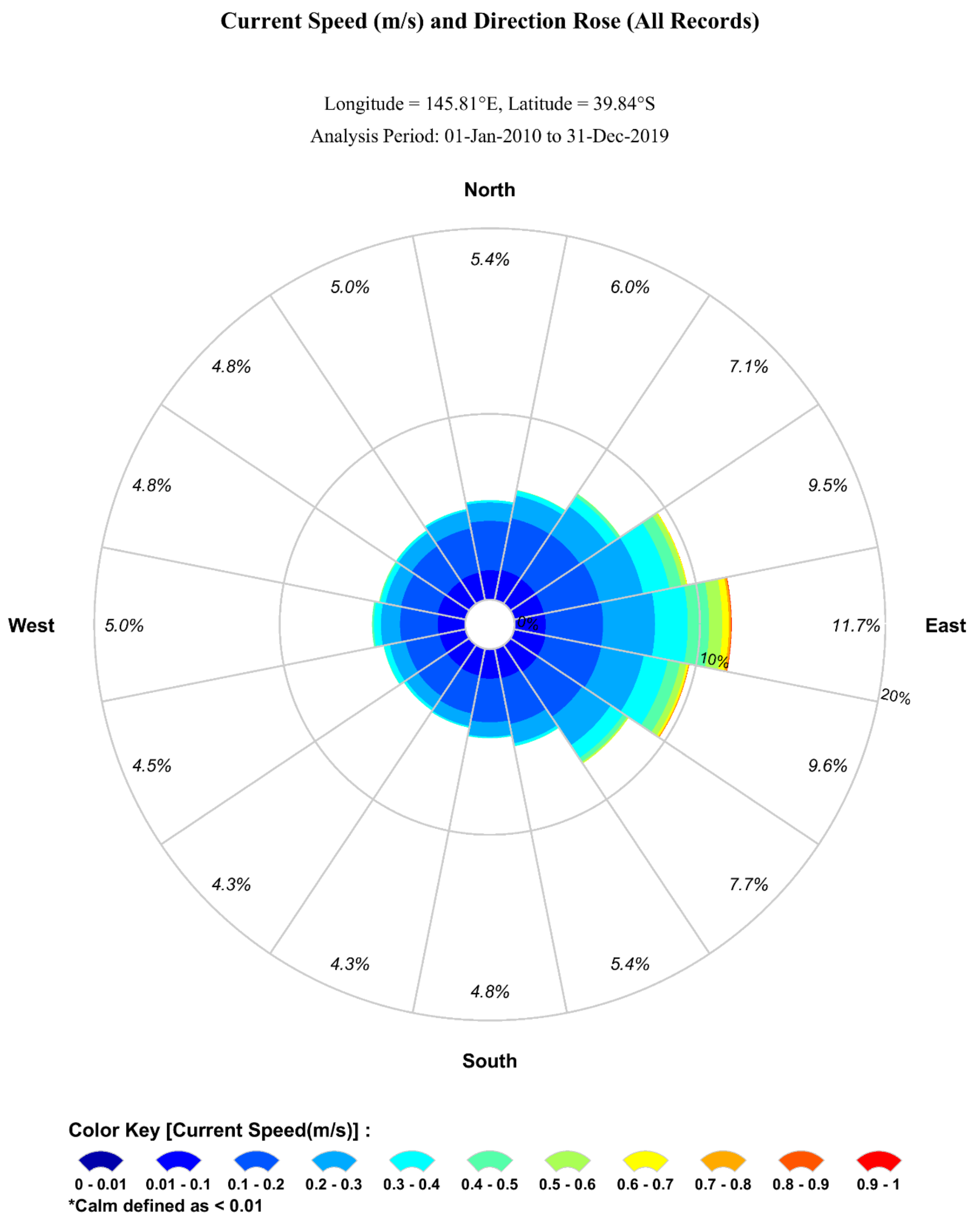


Figure 3-9 Total surface current rose plot nearby the release location (derived by combining the HYDROMAP tidal currents and HYCOM ocean currents for 2010–2019 (inclusive).

4 WIND DATA

High resolution wind data for the years 2010–2019 (inclusive) was sourced from the National Centre for Environmental Prediction (NCEP) Climate Forecast System Reanalysis dataset (CFSR; see Saha et al., 2010). The CFSR wind model is a fully coupled, data-assimilative hindcast model representing the interaction between the earth's oceans, land and atmosphere. The gridded wind data output is available at ¼ of a degree resolution (~33 km) and 1-hourly time intervals. Figure 4-1 shows the spatial resolution of the wind field used as input into the oil spill model.

Table 4-1 presents the monthly average and maximum winds derived from a CFSR station nearby the release location. The wind data demonstrated average monthly wind speeds ranging from 15.5 knots (January) to 19.6 knots (July) with maximums oscillating between 39.1 knots (January) and 50.2 knots (July). The wind direction between November to March was generally southwest and northeast, while the winds were mostly blowing from the west during May to October.

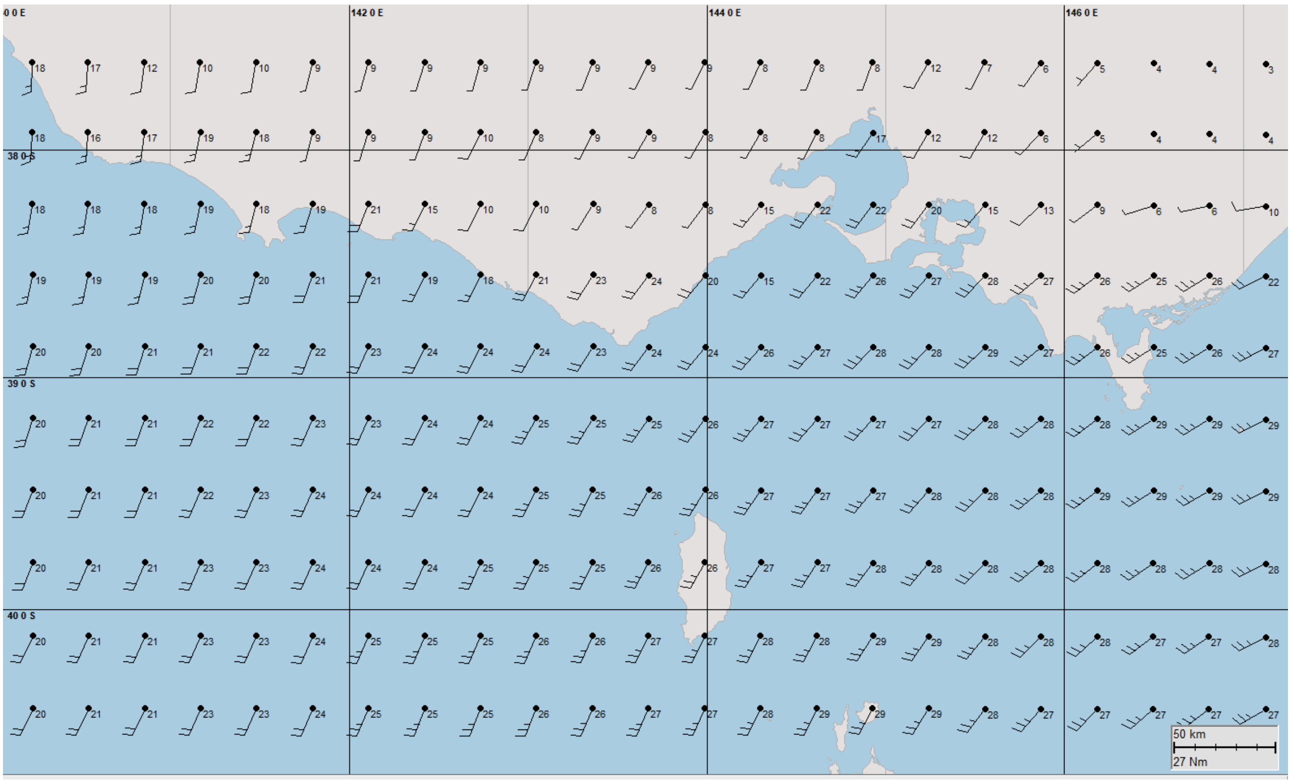


Figure 4-1 Spatial resolution of the CFSR modelled wind data used as input into the oil spill model.

Figure 4-2 and Figure 4-3 show the monthly and total wind rose distributions derived from the CFSR data for the nearest wind node to the release location.

Note that the atmospheric convention for defining wind direction, that is, the direction the wind blows from, is used to reference wind direction throughout this report. Each branch of the rose represents wind coming from that direction, with north to the top of the diagram. Sixteen directions are used. The branches are divided into segments of different colour, which represent wind speed ranges from that direction. Speed ranges of 3 knots are predominantly used in these wind roses. The length of each segment within a branch is proportional to the frequency of winds blowing within the corresponding range of speeds from that direction.

Table 4-1 **Predicted average and maximum winds for the representative wind station nearby the release location. Data derived from CFSR hindcast model from 2010–2019 (inclusive).**

Month	Average wind speed (knots)	Maximum wind speed (knots)	General direction (From)
January	15.6	39.1	Southwest - Northeast
February	15.9	42.3	Southwest - Northeast
March	15.9	43.1	Southwest - Northeast
April	15.5	44.4	Southwest - Northeast
May	17.9	48.7	West
June	17.3	45.4	West
July	19.6	50.2	West
August	18.7	44.2	West
September	18.0	45.4	West
October	16.7	45.8	West
November	16.3	40.7	Southwest - Northeast
December	16.0	42.2	Southwest - Northeast
Minimum	**15.5**	**39.1**	
Maximum	**19.6**	**50.2**	

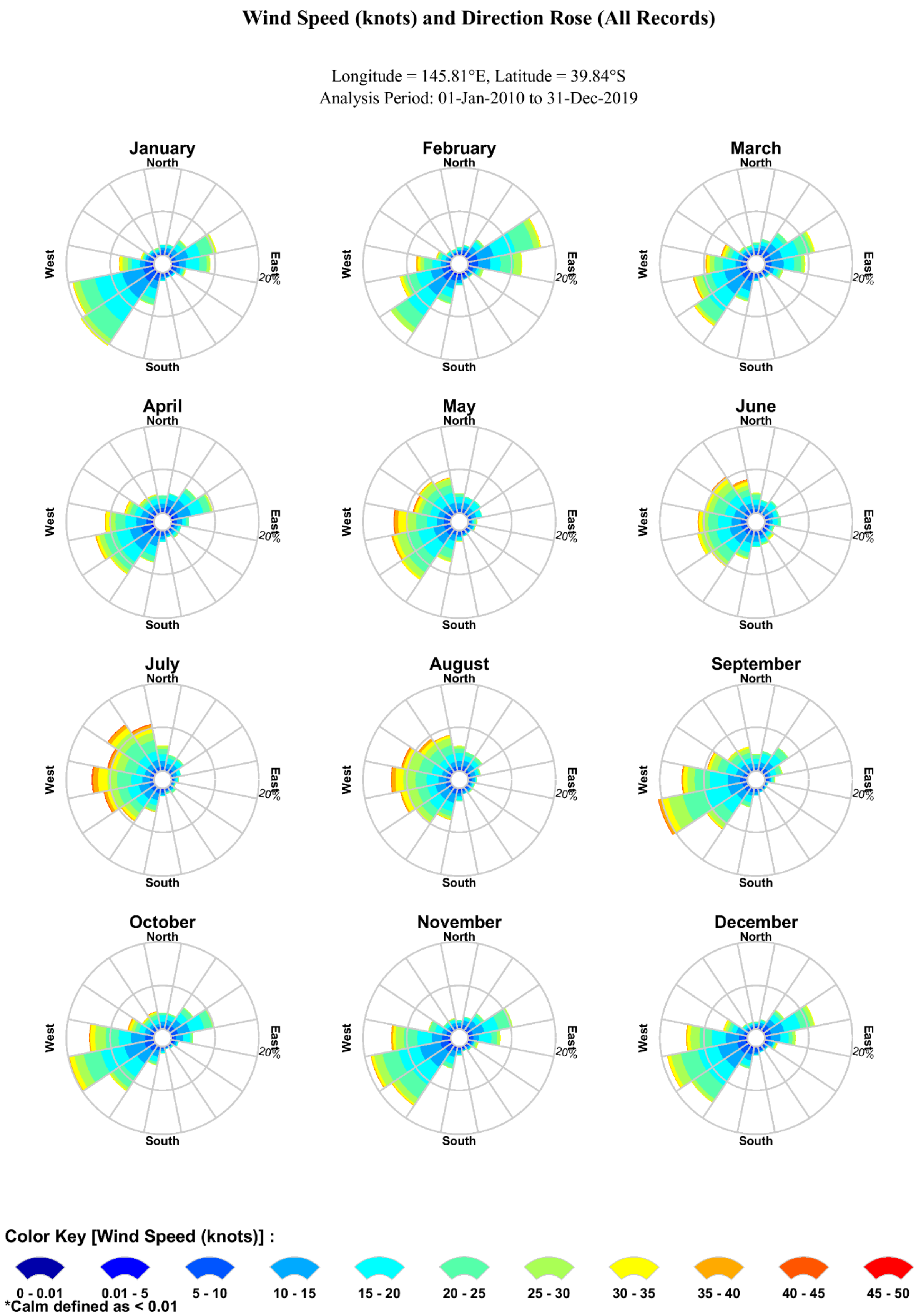


Figure 4-2 Modelled monthly wind rose distributions from 2010–2019 (inclusive), for the representative wind station nearby the release location.

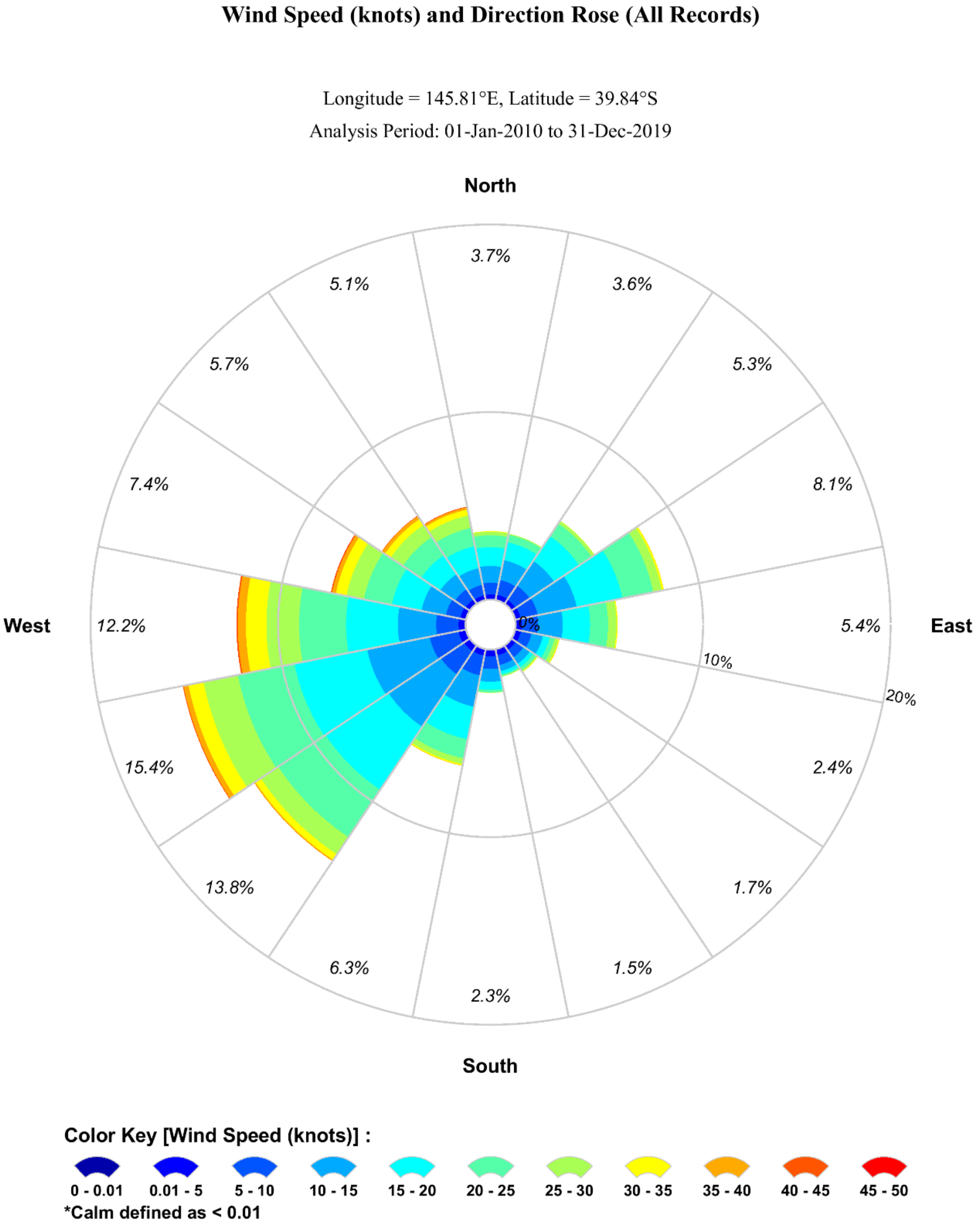


Figure 4-3 Modelled total wind rose distributions from 2010–2019 (inclusive), for the representative wind station nearby the release location.

5 WATER TEMPERATURE AND SALINITY

The monthly sea temperature and salinity profiles of the water column within the study was obtained from the World Ocean Atlas 2013 database produced by the National Oceanographic Data Centre (National Oceanic and Atmospheric Administration) and its co-located World Data Center for Oceanography (see Levitus et al., 2013). These parameters were used as factors to inform the weathering, movement and evaporative loss of hydrocarbon spills in the surface and sub-surface layers.

Figure 5-1 illustrates the vertical profile of sea temperature and salinity nearby the release location.

Table 5-1 presents the sea temperature and salinity of the surface layer nearby the release sites. The monthly average sea surface temperatures ranged between 12.7°C and 18.1°C. The monthly average salinity values remain relatively consistent ranging between 34.9 and 35.5 psu.

Table 5-1 Monthly average sea surface temperature and salinity in the study area.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Temperature (ºC)	17.1	18.0	18.1	17.0	17.3	13.0	12.7	13.2	13.1	14.3	15.7	15.1
Salinity (psu)	35.3	35.3	35.5	35.5	35.4	34.9	35.2	35.1	35.3	35.5	35.5	35.3

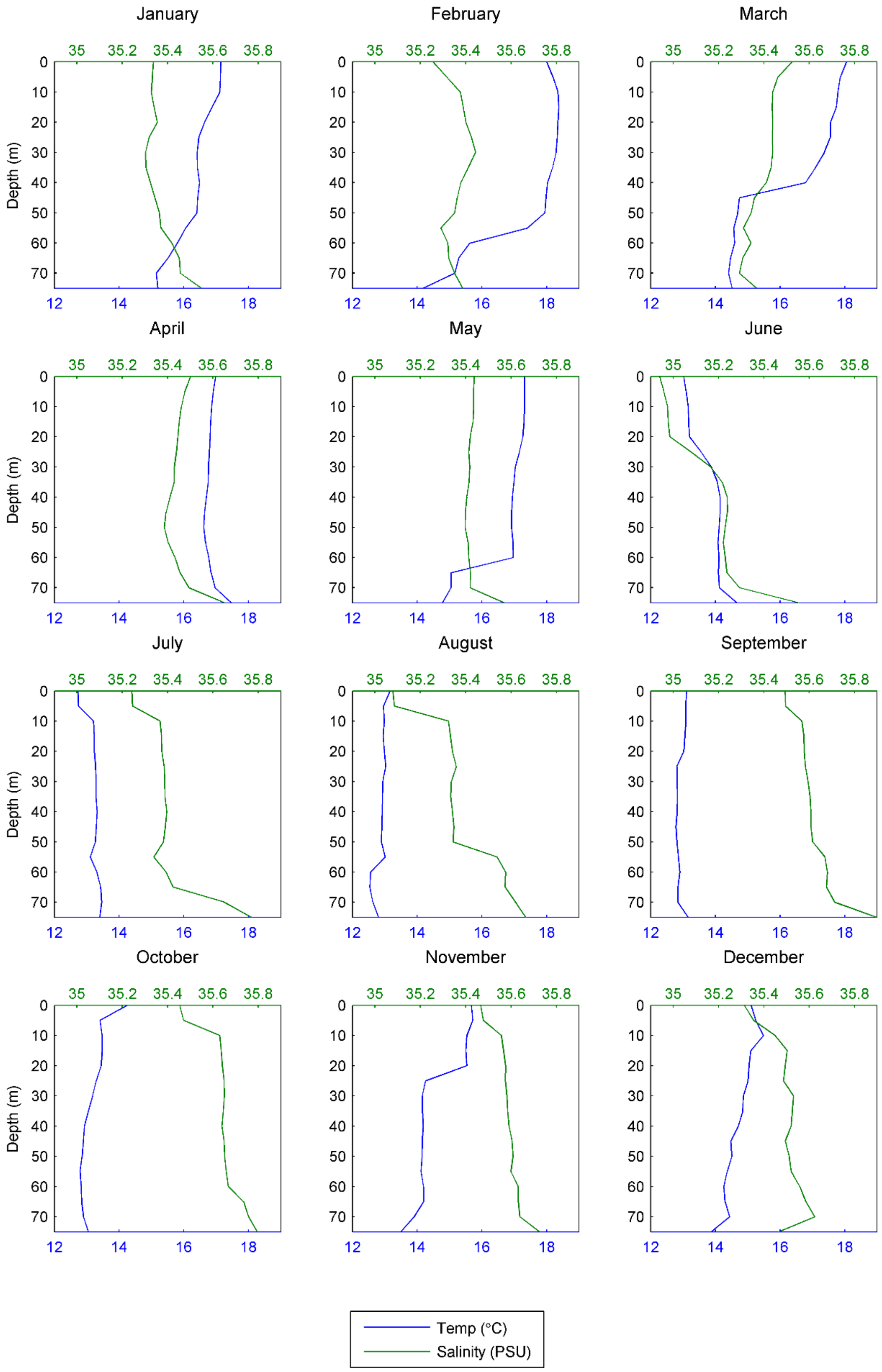


Figure 5-1 **Temperature and salinity profiles nearby the release site.**

6 OIL SPILL MODEL – SIMAP

Modelling of the fate of oil was performed using the Spill Impact Mapping Analysis Program (SIMAP). SIMAP is designed to simulate the fate and effects of spilled hydrocarbons for both the surface and subsurface releases (Spaulding et al., 1994; French et al., 1999; French-McCay, 2003, 2004; French-McCay et al., 2004).

SIMAP has been used to predict the weathering and fate of oil spills during and after major incidents including: Montara (Australia) well blowout August 2009 in the Timor Sea (Asia-Pacific ASA, 2010); Macondo (USA) well blowout April 2010 in the Gulf of Mexico; Bohai Bay (China) oil spill August 2011; and the pipeline oil spill July 2013 in the Gulf of Thailand.

The SIMAP model calculates the transport, spreading, entrainment, evaporation and decay of surface hydrocarbon slicks as well as the entrained and dissolved oil components in the water column, either from surface slicks or from oil discharged subsea. The movement and weathering of the spilled oil is calculated for specific oil types. Input specifications for oil mixtures include the density, viscosity, pour point, distillation curve (volume lost versus temperature) and the aromatic/aliphatic component ratios within given boiling point ranges.

SIMAP is a three-dimensional model that allows for various response actions to be modelled including oil removal from skimming, burning, or collection booms, and surface and subsurface dispersant application.

The SIMAP oil spill model includes advanced weathering algorithms, specifically focussed on unique oils that tend to form emulsions and/or tar balls. The weathering algorithms are based on 5 years of extensive research conducted in response to the Deepwater Horizon oil spill in the Gulf of Mexico (French-McCay et al., 2015).

Biodegradation is included in the oil spill model. In the model, SIMAP, degradation is calculated for the surface slick, deposited oil on the shore, the entrained oil and dissolved constituents in the water column, and oil in the sediments. For surface oil, water column oil and sedimented oil a first order degradation rate is specified. Biodegradation rates are relatively high for hydrocarbons in dissolved state or in dispersed small droplets.

6.1 Stochastic Modelling

For the stochastic modelling presented herein, **100 oil spills** were modelled the scenario using the same spill information (release location, spill volume, duration and oil type) but with varied start dates and times corresponding to the period represented by the available wind and current data. During each simulation, the model records whether any grid cells are exposed to any oil concentrations, the concentrations involved and the elapsed time before exposure. The results of all 100 oil spill simulations were analysed to determine the following annualised statistics for every grid cell:

- Exposure load (concentrations and volumes);
- Minimum time before exposure;
- Probability of contact above defined concentrations;
- Volume of oil that may strand on shorelines from any single simulation;
- Concentration that might occur on sections of individual shorelines;
- Exposure (instantaneous and/or over a specified duration) to dissolved hydrocarbons in the water column; and
- Exposure (instantaneous and/or over a specified duration) to entrained hydrocarbons in the water column.

6.1 Floating, Shoreline and In-Water Thresholds

The thresholds and their relationship to exposure for the sea surface, shoreline and water column (entrained and dissolved hydrocarbons) are presented in Sections 6.1.1 to 6.1.3. Supporting justifications of the adopted thresholds applied during the study and additional context relating to the area of influence are also provided. It is important to note that the thresholds herein are based on NOPSEMA (2019).

6.1.1 Floating Oil Exposure Thresholds

The modelling results can be presented to any levels; therefore, thresholds have been specified (based on scientific literature) to record floating oil exposure to the sea-surface at meaningful levels only, described in the following paragraphs.

The low threshold to assess the potential for floating oil exposure, was 1 g/m^2, which equates approximately to an average thickness of 1 µm, referred to as visible oil. Oil of this thickness is described as rainbow sheen in appearance, according to the Bonn Agreement Oil Appearance Code (Bonn Agreement, 2009; AMSA, 2014) (see Table 6-1). Figure 6-1 shows photographs highlighting the difference in appearance between a silvery sheen, rainbow sheen and metallic sheen. This threshold is considered below levels which would cause environmental harm and it is more indicative of the areas perceived to be affected due to its visibility on the sea surface and potential to trigger temporary closures of areas (i.e. fishing grounds) as a precautionary measure. Table 6-1 provides a description of the appearance in relation to exposure zone thresholds used to classify the zones of floating oil exposure.

Ecological impact has been estimated to occur at 10 g/m^2 (a film thickness of approximately 10 µm or 0.01 mm) according to French et al. (1996) and French-McCay (2009) as this level of fresh oiling has been observed to mortally impact some birds through adhesion of oil to their feathers, exposing them to secondary effects such as hypothermia. The appearance of oil at this average thickness has been described as a metallic sheen (Bonn Agreement, 2009).

Scholten et al. (1996) and Koops et al. (2004) indicated that at oil concentrations on the sea surface of 25 g/m^2 (or greater), would be harmful for all birds that have landed in an oil film due to potential contamination of their feathers, with secondary effects such as loss of temperature regulation and ingestion of oil through preening. The appearance of oil at this thickness is also described as metallic sheen (Bonn Agreement, 2009). For this study the high exposure threshold was set to 50 g/m^2 and above based on NOPSEMA (2019). This threshold can also be used to inform response planning.

Table 6-2 defines the thresholds used to classify the zones of floating oil exposure reported herein.

Table 6-1 The Bonn Agreement Oil Appearance Code.

Code	Description Appearance	Layer Thickness Interval (g/m^2 or µm)	Litres per km^2
1	Sheen (silvery/grey)	0.04 – 0.30	40 – 300
2	Rainbow	0.30 – 5.0	300 – 5,000
3	Metallic	5.0 – 50	5,000 – 50,000
4	Discontinuous True Oil Colour	50 – 200	50,000 – 200,000
5	Continuous True Oil Colour	≥ 200	≥ 200,000

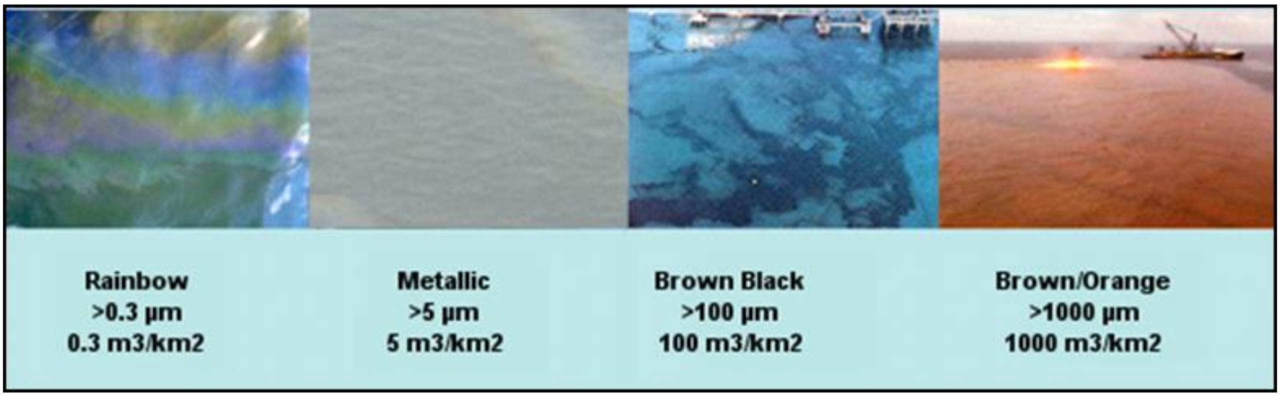


Figure 6-1 Photographs showing the difference between oil colour and thickness on the sea surface (source: adapted from Oilspillsolutions.org, 2015).

Table 6-2 Floating oil exposure thresholds used in this report (in alignment with NOPSEMA (2019)).

Threshold level	Floating oil (g/m^2)	Description
Low	1	Approximates range of socioeconomic effects and establishes planning area for scientific monitoring
Moderate	10	Approximates lower limit for harmful exposures to birds and marine mammals
High	50*	Approximates surface oil slick and informs response planning

6.1.2 Shoreline Accumulation Thresholds

There are many different types of shorelines, ranging from cliffs, rocky beaches, sandy beaches, mud flats and mangroves, and each of these influences the volume of oil that can remain stranded ashore and its thickness before the shoreline saturation point occurs. For instance, a sandy beach may allow oil to percolate through the sand, thus increasing its ability to hold more oil ashore over tidal cycles and various wave actions than an equivalent area of water; hence oil can increase in thickness onshore over time. A sandy beach shoreline was assumed as the default shoreline type for the modelling herein, as it allows for the highest carrying capacity of oil (of the available open/exposed shoreline types). Hence the results contained herein would be indicative of a worst-case scenario, where the highest volume of oil may be stranded on the shoreline (when compared to other shoreline types, such as exposed rocky shores).

In previous risk assessment studies, French-McCay et al. (2005a; 2005b) used a threshold of 10 g/m^2 to assess the potential for shoreline accumulation. This is a conservative threshold used to define regions of socio-economic impact, such as triggering temporary closures of adjoining fisheries or the need for shore clean-up on beaches or man-made features/amenities (breakwaters, jetties, marinas, etc.). It would equate to approximately 2 teaspoons of hydrocarbon per square meter of shoreline accumulation. The appearance is described as a stain/film. On that basis, the 10 g/m^2 shoreline accumulation threshold has been selected to define the zone of potential “low shoreline accumulation”.

French et al. (1996) and French-McCay (2009) define a shoreline oil accumulation threshold of 100 g/m^2, or above, would potentially harm shorebirds and wildlife (furbearing aquatic mammals and marine reptiles on or along the shore) based on studies for sub-lethal and lethal impacts. This threshold has been used in previous environmental risk assessment studies (see French-McCay, 2003; French-McCay et al., 2004, French-McCay et al., 2011; 2012; NOAA, 2013). Additionally, a shoreline concentration of 100 g/m^2, or above, is the minimum limit that the oil can be effectively cleaned according to the AMSA (2015) guideline. This threshold equates to approximately ½ a cup of oil per square meter of shoreline accumulation. The appearance is described as a thin oil coat. Therefore, 100 g/m^2 has been selected to define the zone of potential “moderate shoreline accumulation”.

Observations by Lin & Mendelssohn (1996), demonstrated that loadings of more than 1,000 g/m^2 of hydrocarbon during the growing season would be required to impact marsh plants significantly. Similar thresholds have been found in studies assessing hydrocarbon impacts on mangroves (Grant et al., 1993; Suprayogi & Murray, 1999). Hence, 1,000 g/m^2 has been selected to define the zone of potential "high shoreline accumulation". It equates to approximately 1 litre of hydrocarbon per square meter of shoreline accumulation. The appearance is described as a hydrocarbon cover.

It is worth noting that the shoreline accumulation thresholds derived from extensive literature review (outlined in Table 6-3) agree with the commonly used threshold values for oil spill modelling specified in NOPSEMA (2019).

Table 6-3 Thresholds used to assess shoreline accumulation.

Threshold level	Shoreline concentration (g/m^2)	Description
Low (socioeconomic/sublethal)	10	Predicts potential for some socio-economic impact
Moderate	100	Loading predicts area likely to require clean-up effort
High	> 1,000	Loading predicts area likely to require intensive clean-up effort

6.1.3 In-water Exposure Thresholds

Oil is a mixture of thousands of hydrocarbons of varying physical, chemical, and toxicological characteristics, and therefore, demonstrate varying fates and impacts on organisms. As such, for in-water exposure, the SIMAP model provides separate outputs for dissolved and entrained hydrocarbons from oil droplets. The consequences of exposure to dissolved and entrained components will differ because they have different modes and magnitudes of effect.

Entrained hydrocarbon concentrations were calculated based on oil droplets that are suspended in the water column, though not dissolved. The composition of this oil would vary with the state of weathering (oil age) and may contain soluble hydrocarbons when the oil is fresh. Calculations for dissolved hydrocarbons specifically calculates oil components which are dissolved in water, which are known to be the primary source of toxicity exerted by oil.

6.1.3.1 Dissolved Hydrocarbons

Laboratory studies have shown that dissolved hydrocarbons exert most of the toxic effects of oil on aquatic biota (Carls et al., 2008; Nordtug et al., 2011; Redman, 2015). The mode of action is a narcotic effect, which is positively related to the concentration of soluble hydrocarbons in the body tissues of organisms (French-McCay, 2002). Dissolved hydrocarbons are taken up by organisms directly from the water column by absorption through external surfaces and gills, as well as through the digestive tract. Thus, soluble hydrocarbons are termed "bioavailable".

Hydrocarbon compounds vary in water-solubility and the toxicity exerted by individual compounds is inversely related to solubility, however bioavailability will be modified by the volatility of individual compounds (Nirmalakhandan & Speece, 1988; Blum & Speece, 1990; McCarty, 1986; McCarty et al., 1992a, 1992b; Mackay et al., 1992; McCarty & Mackay, 1993; Verhaar et al., 1992, 1999; Swartz et al., 1995; French-McCay, 2002; McGrath and Di Toro, 2009). Of the soluble compounds, the greatest contributor to toxicity for water-column and benthic organisms are the lower-molecular-weight aromatic compounds, which are both volatile and soluble in water. Although they are not the most water-soluble hydrocarbons within most oil types, the polynuclear aromatic hydrocarbons (PAHs) containing 2-3 aromatic ring structures typically exert the largest narcotic effects because they are semi-soluble and not highly volatile, so they persist in the environment long enough for significant accumulation to occur (Anderson et al., 1974, 1987; Neff & Anderson, 1981; Malins & Hodgins, 1981; McAuliffe, 1987; NRC, 2003). The monoaromatic hydrocarbons (MAHs), including the BTEX compounds (benzene, toluene, ethylbenzene, and xylenes), and the soluble alkanes (straight chain hydrocarbons) also contribute to toxicity, but these compounds are highly volatile, so that their contribution will be low when oil is exposed to evaporation and higher when oil is discharged at depth where volatilisation does not occur (French-McCay, 2002).

French-McCay (2002) reviewed available toxicity data, where marine biota was exposed to dissolved hydrocarbons prepared from oil mixtures, finding that 95% of species and life stages exhibited 50% population mortality (LC_{50}) between 6 and 400 ppb total PAH concentration after 96 hrs exposure, with an average of 50 ppb. Hence, concentrations lower than 6 ppb total PAH value should be protective of 97.5% of species and life stages even with exposure periods of days (at least 96 hours). Early life-history stages of fish appear to be more sensitive than older fish stages and invertebrates.

Exceedances of 10, 50 or 400 ppb over a 1 hour timestep (see Table 6-4) was applied to indicate increasing potential for sub-lethal to lethal toxic effects (or low to high), based on NOPSEMA (2019).

6.1.3.2 Entrained Hydrocarbons

Entrained hydrocarbons consist of oil droplets that are suspended in the water column and insoluble. As such, insoluble compounds in oil cannot be absorbed from the water column by aquatic organisms, hence are not bioavailable through absorption of compounds from the water. Exposure to these compounds would require routes of uptake other than absorption of soluble compounds. The route of exposure of organisms to whole oil alone include direct contact with tissues of organisms and uptake of oil by direct consumption, with potential for biomagnification through the food chain (NRC, 2005).

The 10 ppb threshold represents the very lowest concentration and corresponds generally with the lowest trigger levels for chronic exposure for entrained hydrocarbons in the ANZECC (2000) water quality guidelines. Due to the requirement for relatively long exposure times (> 24 hours) for these concentrations to be significant, they are likely to be more meaningful for juvenile fish, larvae and planktonic organisms that might be entrained (or otherwise moving) within the entrained plumes, or when entrained hydrocarbons adhere to organisms or trapped against a shoreline for periods of several days or more.

This exposure zone is not considered to be of significant biological impact and is therefore outside the adverse exposure zone. This exposure zone represents the area contacted by the spill. This area does not define the area of influence as it is considered that the environment will not be affected by the entrained hydrocarbon at this level.

Thresholds of 10 ppb and 100 ppb were applied over a 1 hour time exposure (Table 6-4), to cover the range of thresholds outlined in ANZECC, (2000) water quality guidelines, the incremental change for greater potential effect and is per NOPSEMA (2019).

A complicating factor that should be considered when assessing the consequence of dissolved and entrained oil distributions is that there will be some areas where both physically entrained oil droplets and dissolved hydrocarbons co-exist. Higher concentrations of each will tend to occur close to the source where sea conditions can force mixing of relatively unweathered oil into the water column, resulting in more rapid dissolution of soluble compounds.

Table 6-4 Dissolved and entrained hydrocarbon exposure values assessed over a 1-hour time step, as per NOPSEMA (2019).

Threshold level	Dissolved hydrocarbon concentration (ppb)	Entrained hydrocarbon concentrations (ppb)
Low	10	10
Moderate	50	-
High	400	100

7 OIL PROPERTIES

7.1 Oil Characteristics

7.1.1 Overview

Table 7-1 and Table 7-2 present the physical properties and boiling point ranges of the MDO used in this study.

Table 7-1 Physical properties for MDO.

Characteristic	Marine Diesel Oil (MDO)
Density (kg/m^3)	829.1 (at 25 °C)
API	37.6
Dynamic viscosity (cP)	4.0 (at 25 °C)
Pour point (°C)	-14
Hydrocarbon property category	Group II
Hydrocarbon property classification	Light - Persistent

Table 7-2 Boiling point ranges for MDO.

Oil Type	Component	Volatile (%)	Semi-volatile (%)	Low-volatility (%)	Residual (%)
	Boiling point (°C)	<180 C_4 to C_{10}	180-265 C_{11} to C_{15}	265-380 C_{16} to C_{20}	>380 >C_{20}
MDO	% of total	6.0	34.6	54.4	5.0

The boiling points (BP) are dictated by the length of the carbon chains, with the longer and more complex compounds having a higher boiling point, and therefore lower volatility and evaporation rate.

Typical evaporation times once the hydrocarbons reach the surface and are exposed to the atmosphere are:

- Up to 12 hours for the C_4 to C_{10} compounds (or less than 180°C BP).
- Up to 24 hours for the C_{11} to C_{15} compounds (180-265°C BP).
- Several days for the C_{16} to C_{20} compounds (265-380°C BP).
- Not applicable for the residual compounds (BP > 380°C), which will resist evaporation, persist in the marine environment for longer periods, and be subject to relatively slow degradation.

The actual fate of oil will depend greatly on the amount that reaches the surface.

7.1.2 Marine Diesel Oil

The MDO has an API of 37.6 and a density of 829.1 kg/m^3 (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.

7.2 Weathering Characteristics

7.2.1 Overview

A series of model weather tests were conducted to illustrate the potential behaviour of the MDO when exposed to idealised and representative environmental conditions:

- A 25 m^3 surface release over 1-hour under calm wind conditions (constant 5 knots), assuming low seasonal water temperature (15°C) and ambient tidal and drift currents.

- A 50 m^3 surface release over 1-hour under variable wind conditions (1-12 knots, drawn from representative data files), assuming low seasonal water temperature (15°C) and ambient tidal and drift currents.

The first case is indicative conditions that would not generate entrainment, while the second case may represent conditions that could cause a minor degree of entrainment. Both scenarios provide examples of potential behaviour during a spill once the oil reaches the surface.

7.2.2 MDO Mass Balance Forecasts

The mass balance for the MDO under the constant 5 knot (~2.5 m/s) wind case (Figure 7-1) shows that 40.3% of the oil is predicted to evaporate within 24 hours. Under calm conditions, the majority of the remaining oil on the water surface will weather at a slower rate due to being comprised of the longer-chain compounds with higher boiling points. Evaporation shall cease when the residual compounds remain, and they will be subject to more gradual decay through biological and photochemical processes.

Under the variable-wind case (Figure 7-2), where the winds are of greater strength on average, entrainment of MDO into the water column is predicted to increase. Approximately 24 hours after the spill, 60.1% of the oil mass is forecast to have entrained and a further 38.4% is forecast to have evaporated, leaving only a small proportion of the oil floating on the water surface (<0.1%).

The increased level of entrainment in the variable-wind case result in a higher percentage decaying at an approximate rate of 1.5% per day with or ~10.5% after 7 days, compared to <0.1% per day and a total of 0.9% after 7 days for the constant-wind case. Given the proportion of entrained oil and the tendency for it to remain mixed in the water column, the remaining hydrocarbons will decay over time scales of several weeks.

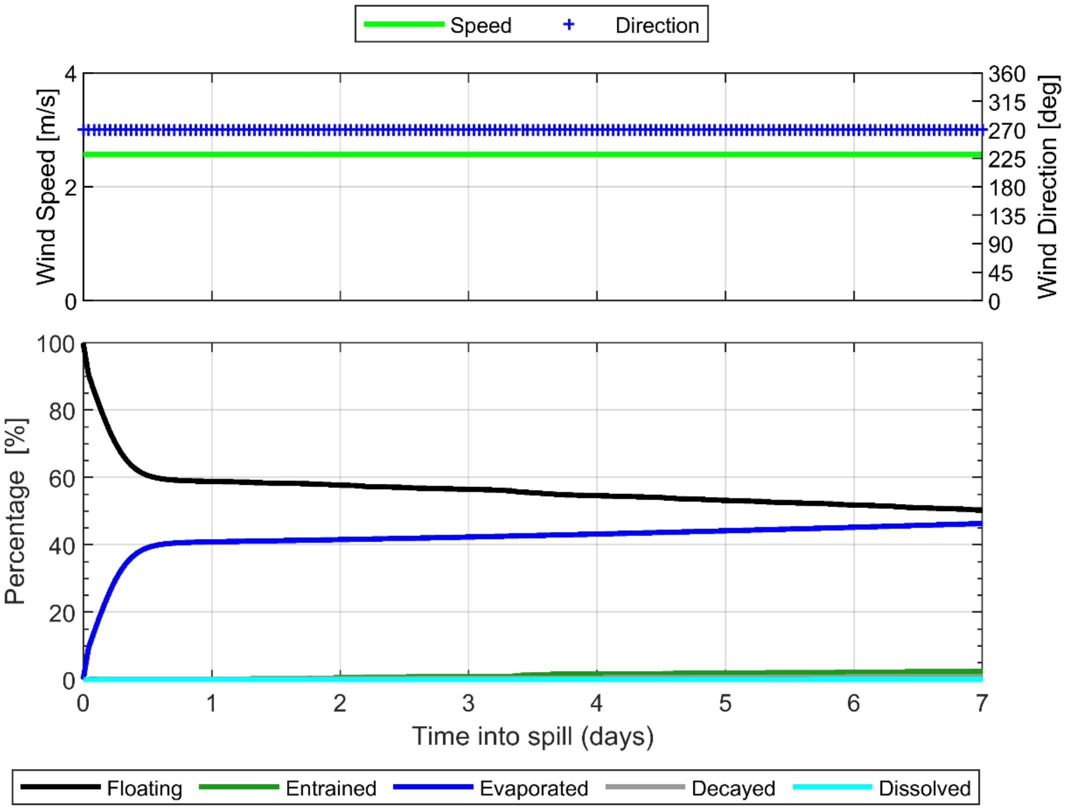


Figure 7-1 Proportional mass balance plot representing the weathering of MDO spilled onto the water surface over 1 hour and subject to a constant 5 knots (2.6 m/s) wind speed at 15°C water temperature and 20°C air temperature.

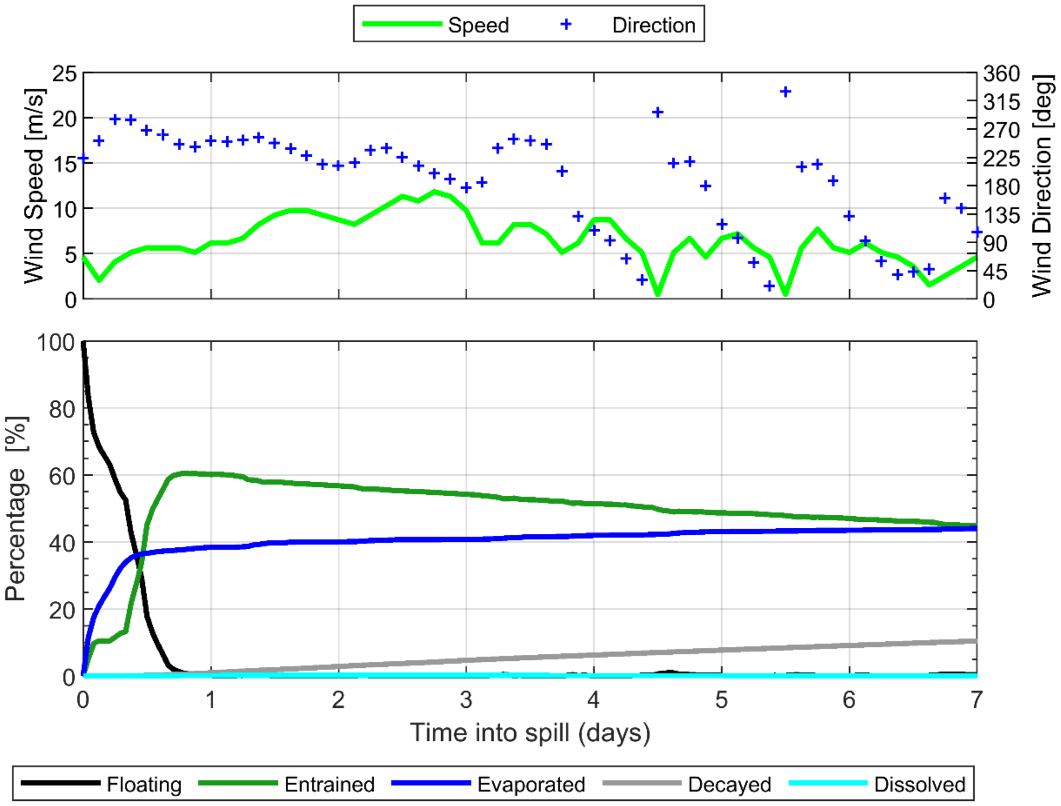


Figure 7-2 Proportional mass balance plot representing the weathering of MDO spilled onto the water over 1 hour and subject to variable wind speeds (1-12 knots) at 15°C water temperature and 20°C air temperature.

8 MODEL SETTINGS

Table 8-1 provides a summary of the oil spill model settings.

Table 8-1 Summary of the oil spill model settings and thresholds used in this assessment.

Parameter	Scenario 1	Scenario 2
Description	Vessel collision	Vessel collision
Number of randomly selected spill start times for scenario	100	100
Model period	Annual	Annual
Oil type	MDO	MDO
Spill volume (m^3)	300	200
Release type	Surface	Surface
Release duration	6 hours	6 hours
Simulation length (days)	20	20
Surface oil concentration thresholds and exposure risk (g/m^2) ^	1 (low); 10 (moderate); 50 (high)	1 (low); 10 (moderate); 50 (high)
Shoreline oil accumulation thresholds and exposure risk (g/m^2) ^	10 (low); 100 (moderate); 1,000 (high)	10 (low); 100 (moderate); 1,000 (high)
Dissolved hydrocarbon concentrations and exposure risk (ppb) ^	10 (low); 50 (moderate); 400 (high)	10 (low); 50 (moderate); 400 (high)
Entrained hydrocarbon concentrations and exposure risk (ppb) ^	10 (low); 100 (high)	10 (low); 100 (high)

^Thresholds based on NOPSEMA (2019)

9 PRESENTATION AND INTERPRETION OF MODEL RESULTS

The results from the modelling study are presented in a number of tables and figures, which aim to provide an understanding of the predicted sea-surface and water column (subsurface) exposure and shoreline accumulation (if predicted).

9.1 Annual Analysis

9.1.1 Statistics

The statistics are based on the following principles:

- The ***greatest distance travelled by a spill trajectory*** – is determined by a) recording the maximum and b) second greatest distance travelled (or 99th percentile) by a single trajectory, within a scenario, from the release location to the identified exposure thresholds.
- The ***probability of oil exposure to a receptor*** – is determined by recording the number of spill trajectories to reach a specified sea surface or subsea threshold within a receptor polygon, divided by the total number of spill trajectories within that scenario.
- The ***minimum time before oil exposure to a receptor*** – is determined by ranking the elapsed time before sea surface exposure, at a specified threshold, to grid cells within a receptor polygon and recording the minimum value.
- The ***probability of oil accumulation at a receptor*** – is determined by recording the number of spill trajectories to reach a specified shoreline accumulation threshold within a receptor polygon, divided by the total number of spill trajectories within that scenario.
- The ***maximum potential oil loading within a receptor*** – is determined by identifying the maximum loading to any grid cell within a receptor polygon, for a scenario.
- The ***dissolved and entrained hydrocarbon exposure*** – is determined by recording the maximum instantaneous concentrations at each grid cell by applying a 96-hour time-based averaging.

9.2 Deterministic Trajectories

The stochastic modelling results were assessed for each scenario, and the deterministic runs were identified and are presented in the result section based on the following criteria;

a. Largest volume of oil ashore;

b. Longest length of oil accumulation above 10 g/m^2;

c. Minimum time before shoreline accumulation above 10 g/m^2;

d. Largest swept area of floating oil above 1 g/m^2 (visible floating oil);

e. Largest area of entrained hydrocarbon exposure above 10 ppb; and

f. Largest area of dissolved hydrocarbon exposure above 10 ppb.

9.2.1 Receptors Assessed

A range of environmental receptors and shorelines were assessed for floating oil exposure, shoreline contact and water column exposure as part of the study (see Figure 9-1 to Figure 9-10). Receptor categories (see Table 9-1) include sections of shorelines which are defined by local government areas (LGAs), sub-LGAs and offshore islands. All other sensitive receptors other than submerged reefs, shoals and banks (RSB) were sourced from Australian Government Department of Agriculture, Water and the Environment (http://www.environment.gov.au/). Risks of exposure were separately calculated for each sensitive receptor area and have been tabulated. Note, due to the volume and geographical extent of Biologically Important Areas (BIAs) predicted to receive potential impacts from spilled hydrocarbon, it is recommended to use the following website to obtain detailed maps on all BIAs assessed: http://www.environment.gov.au/webgis-framework/apps/ncva/ncva.jsf.

Table 9-2 summarises the receptors that the release locations reside within.

Table 9-1 Summary of receptors used to assess floating oil, shoreline and in-water exposure to hydrocarbons.

Receptor Category	Acronym	Hydrocarbon Exposure Assessment		
		Water Column	Floating oil	Shoreline
Australian Marine Park	AMP	✓	✓	✗
Biologically Important Areas	BIA	✓	✓	✗
Interim Biogeographic Regionalisation for Australia bioregions	IBRA	✓	✓	✗
Integrated marine and coastal regionalisation areas	IMCRA	✓	✓	✗
Marine Park	MP	✓	✓	✗
Marine Sanctuary	MS	✓	✓	✗
Nature Reserve	NR	✓	✓	✗
RAMSAR Sites	Ramsar	✓	✓	✗
Reefs, Shoals and Banks	RSB	✓	✓	✗
Key Ecological Feature	KEF	✓	✓	✗
State Waters	State Waters	✓	✓	✗
Local and Sub-Local Government Area	LGA and Sub-LGA	✓ (Reported as: Nearshore Waters)	✓ (Reported as: Nearshore Waters)	✓ (Reported as: Shore)

Table 9-2 Summary of the receptors that the release locations reside within.

Acronym	Receptor
BIA	Black-browed Albatross - Foraging
	Bullers Albatross - Foraging
	Campbell Albatross - Foraging
	Common Diving-petrel - Foraging
	Indian Yellow-nosed Albatross - Foraging
	Pygmy Blue Whale - Distribution
	Pygmy Blue Whale - Foraging
	Short-tailed Shearwater - Foraging
	Shy Albatross - Foraging
	Southern Right Whale - Known core range
	Wandering Albatross - Foraging
	White Shark - Distribution
	White-faced Storm-petrel - Foraging
EEZ	Australian Exclusive Economic Zone
IMCRA	Central Bass Strait

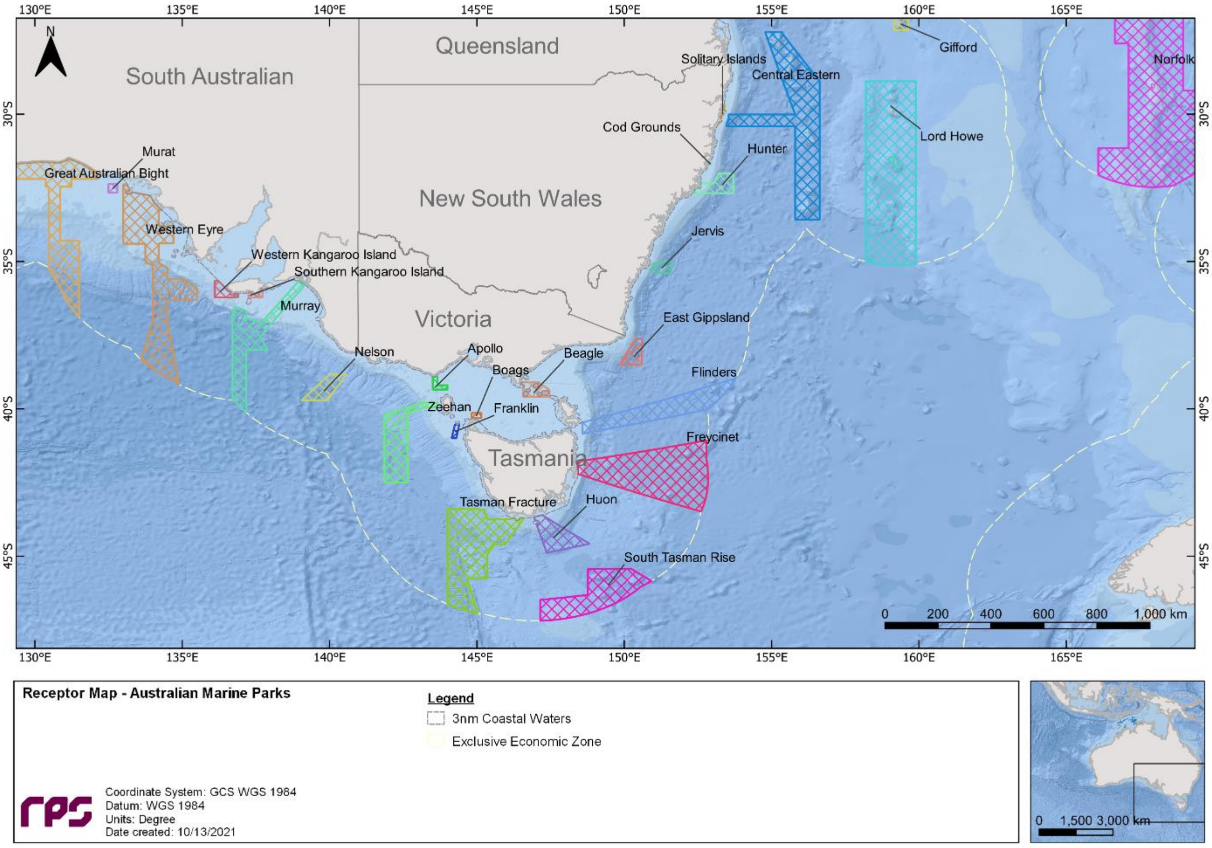


Figure 9-1 Receptor map for Australian Marine Parks (AMP).

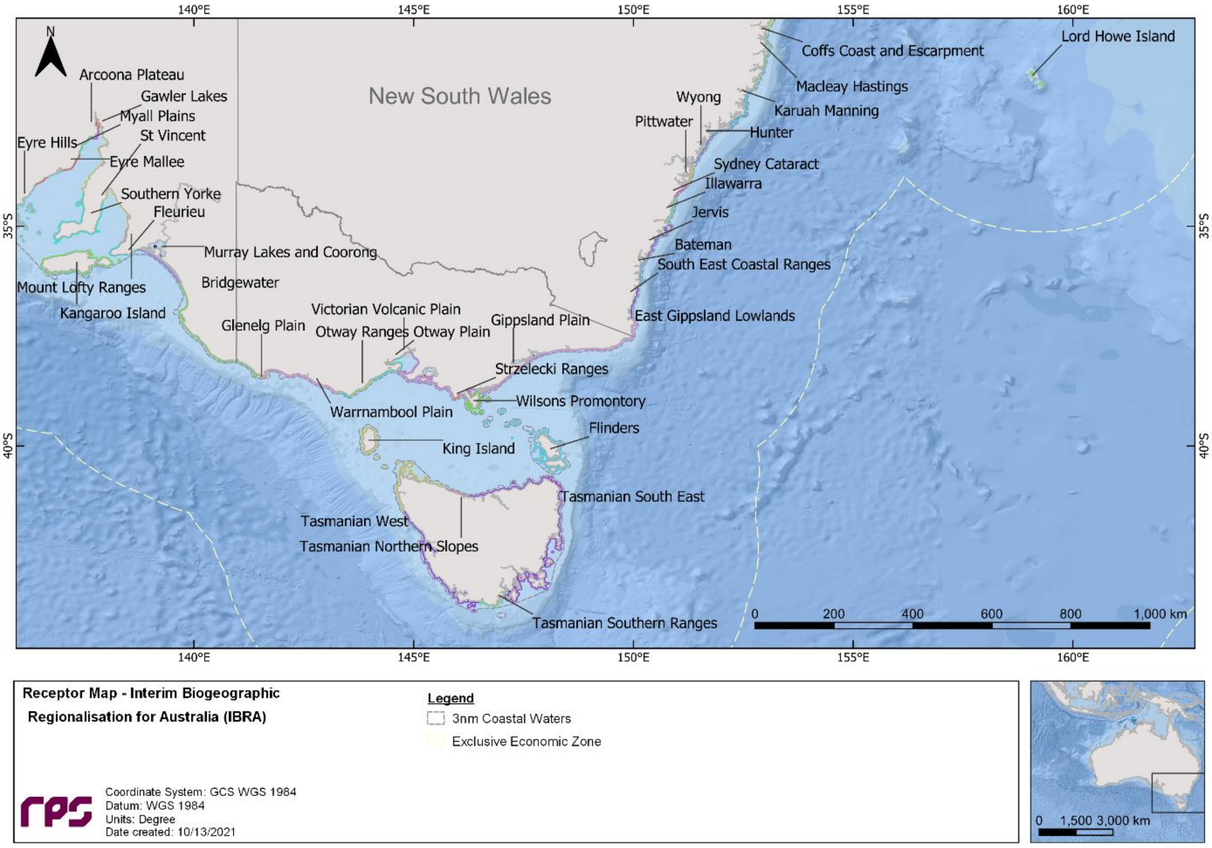


Figure 9-2 Receptor map for the Interim Biogeographic Regionalisation for Australia (IBRA) bioregions.

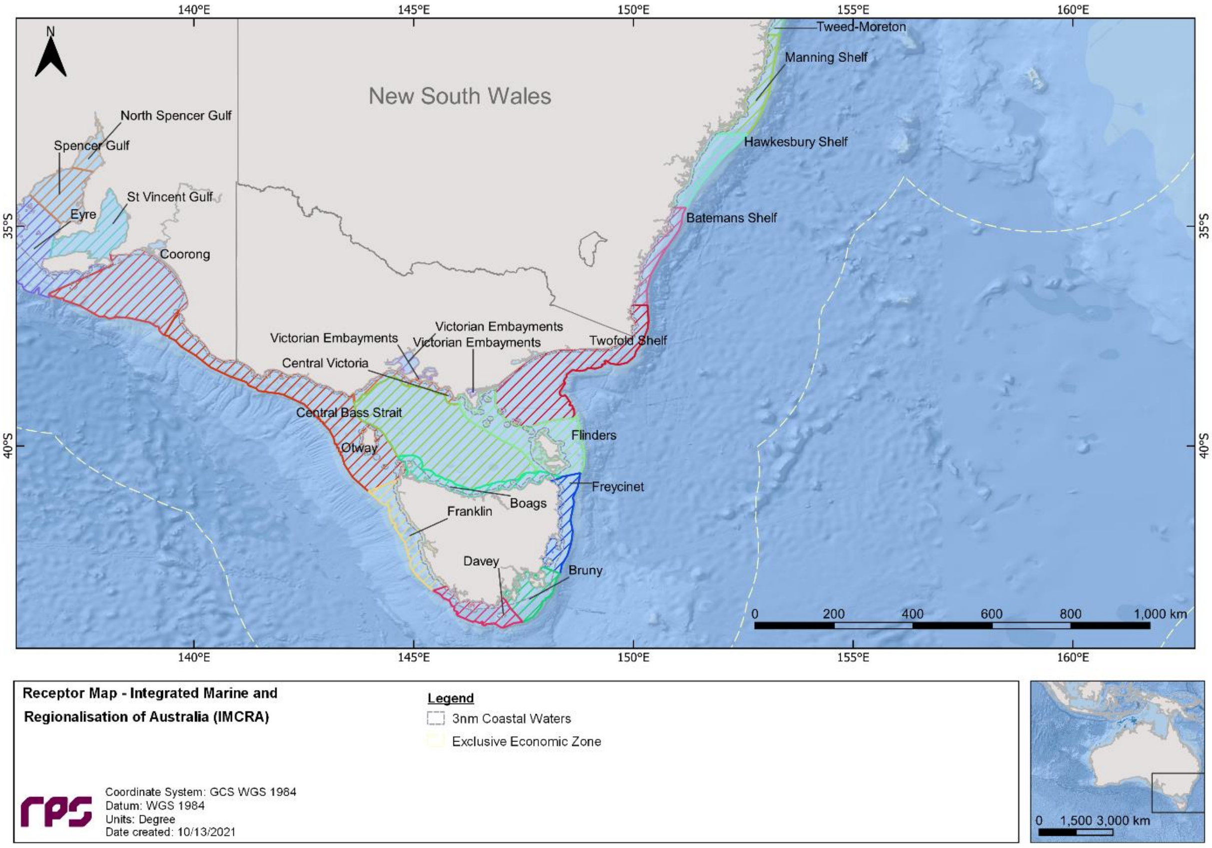


Figure 9-3 Receptor map for integrated marine and coastal regionalisation (IMCRA) areas.

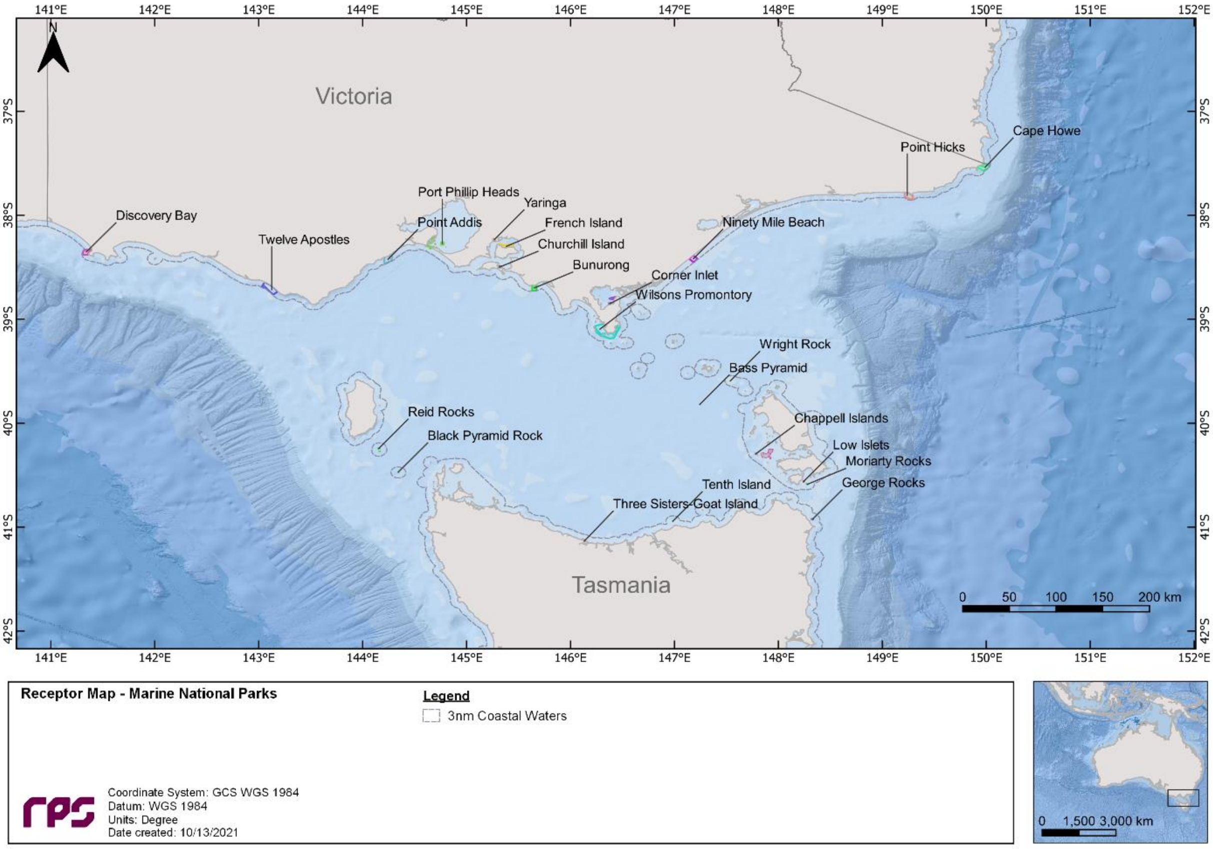


Figure 9-4 Receptor map for Marine National Parks (MNP).

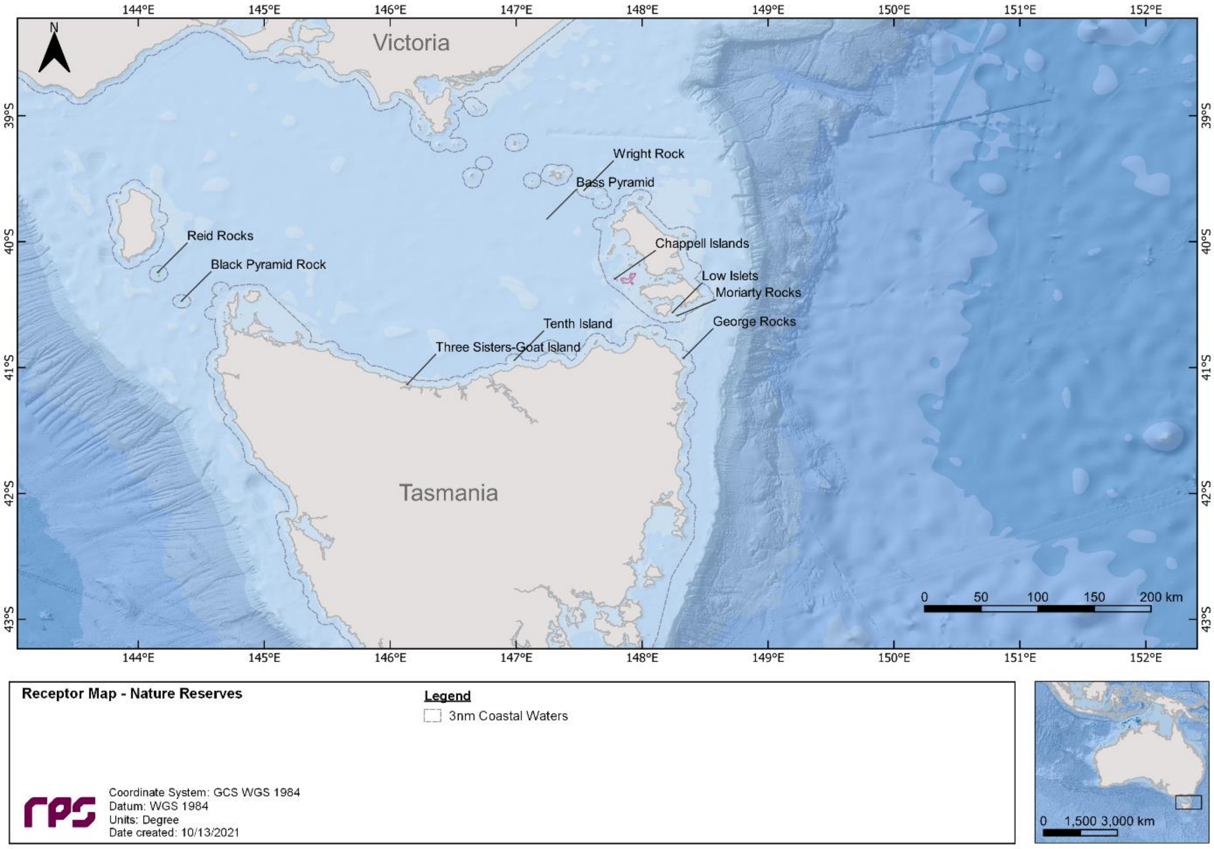


Figure 9-5 Receptor map for Nature Reserves (NR).

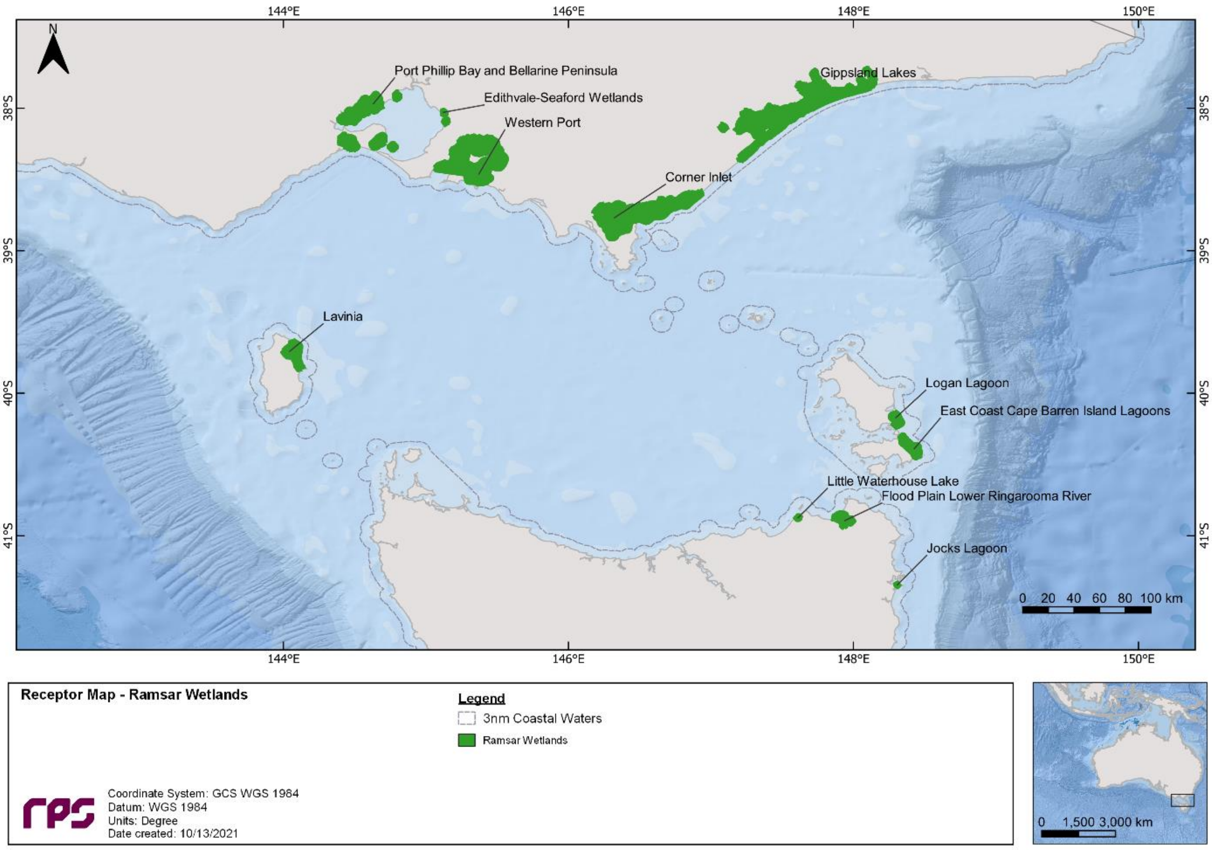


Figure 9-6 Receptor map for Ramsar Sites (RAMSAR).

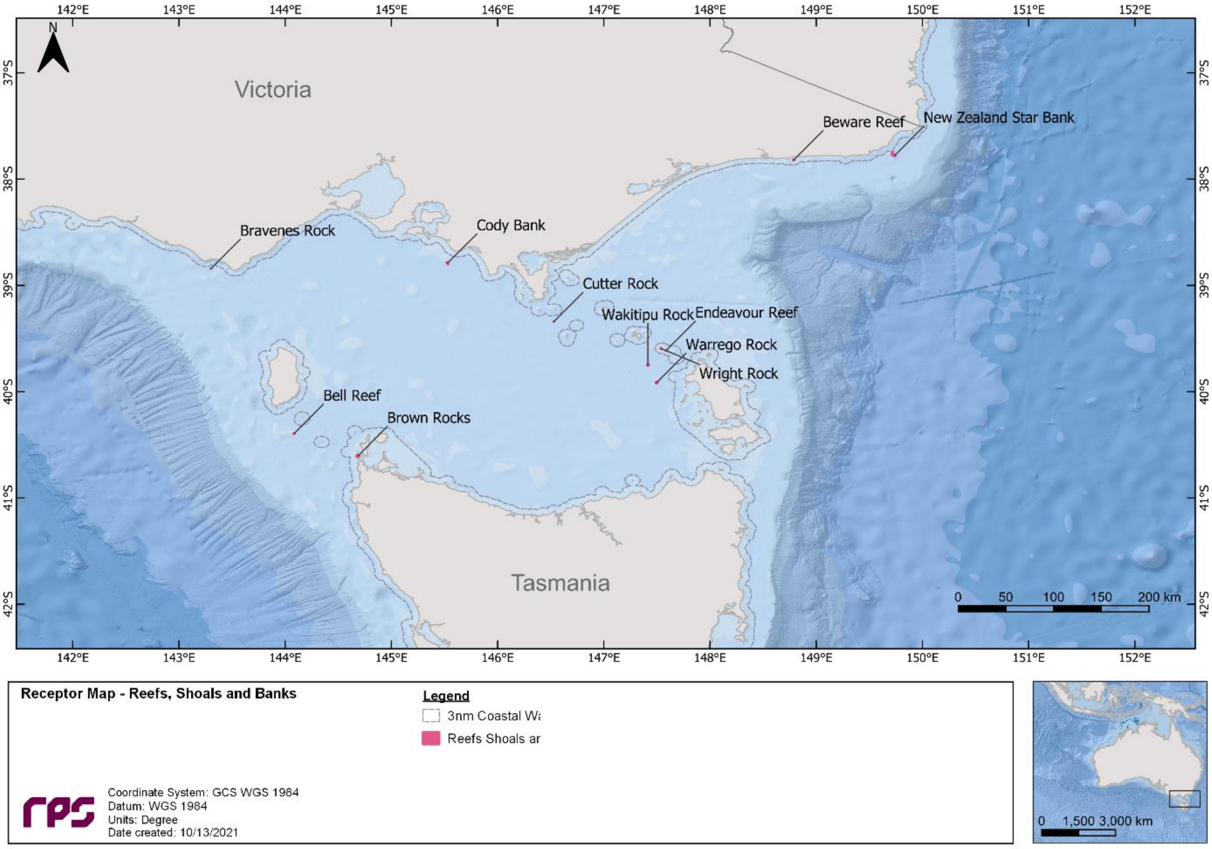


Figure 9-7 Receptor map for Reefs, Shoals and Banks (RSB).

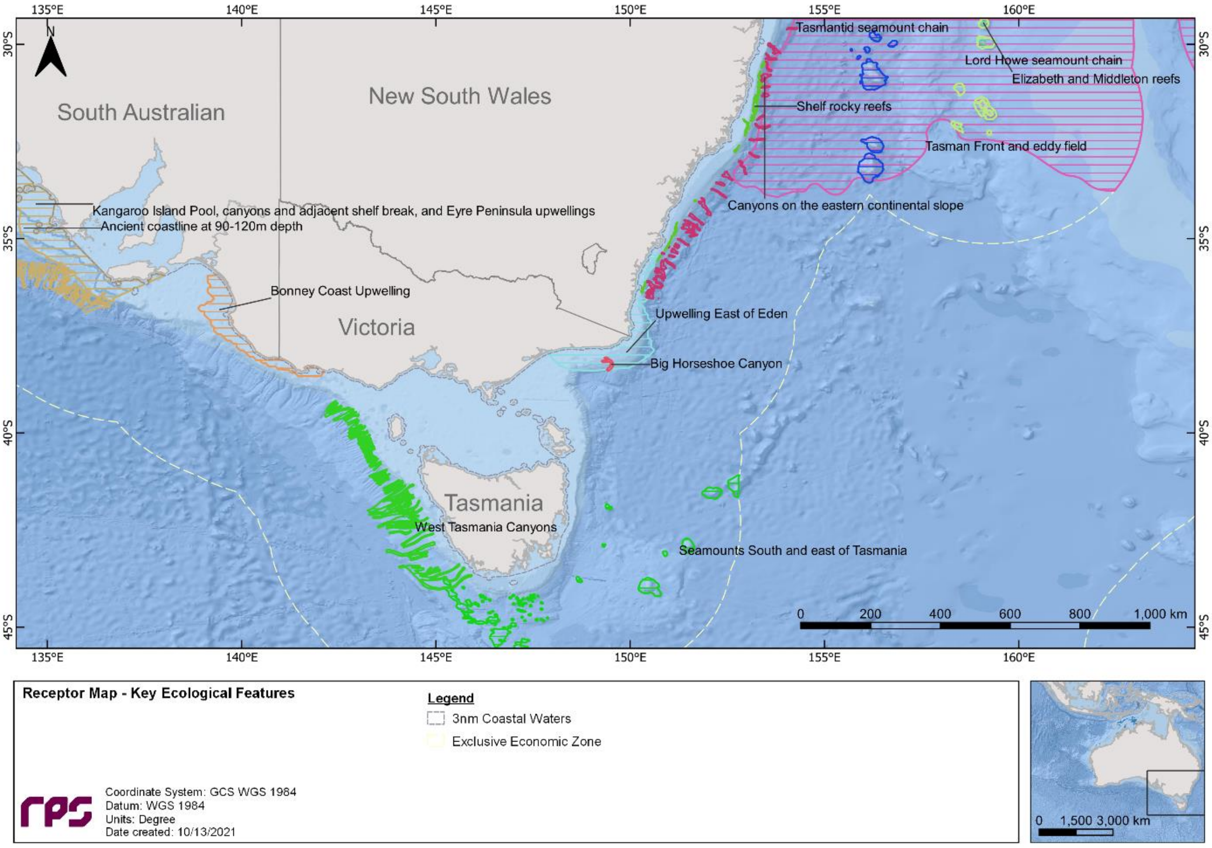


Figure 9-8 Receptor map for Key Ecological Features (KEF).

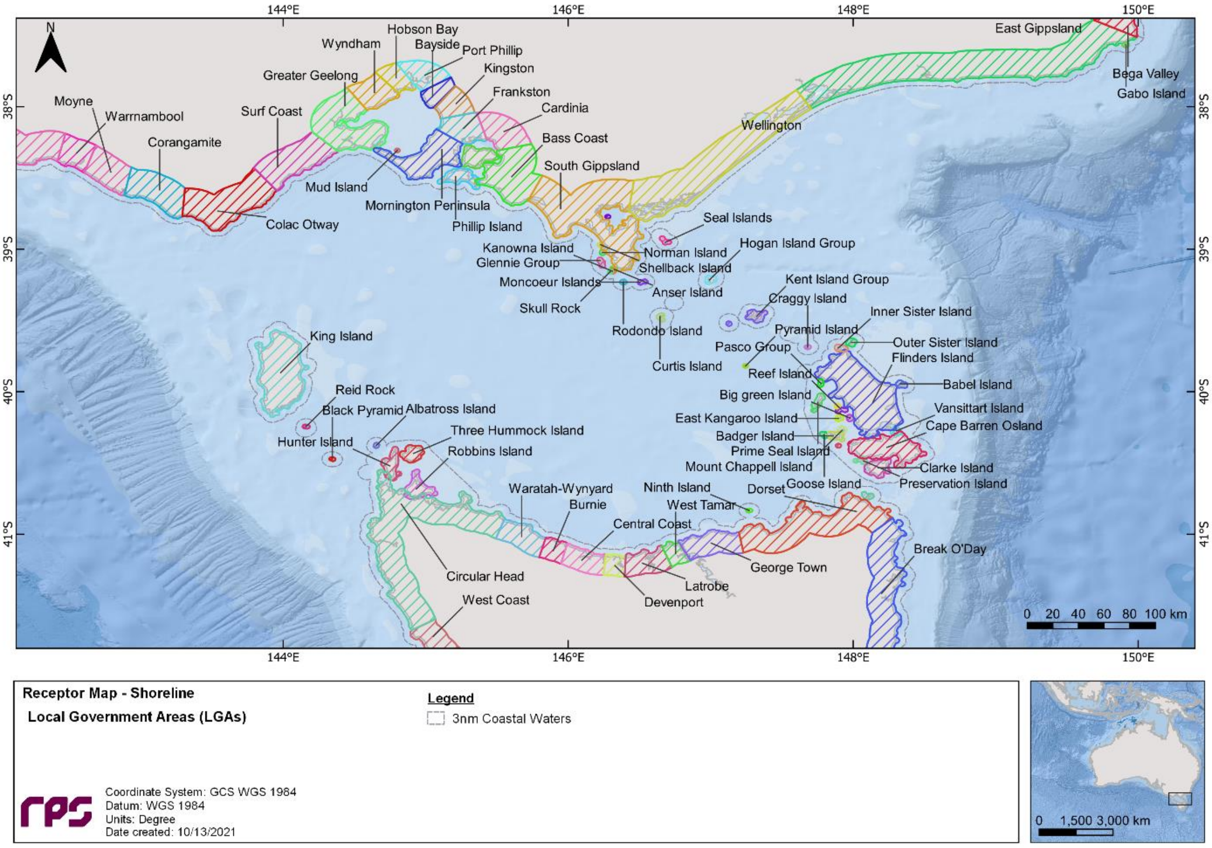


Figure 9-9 Receptor map for Local Government Areas (LGA).

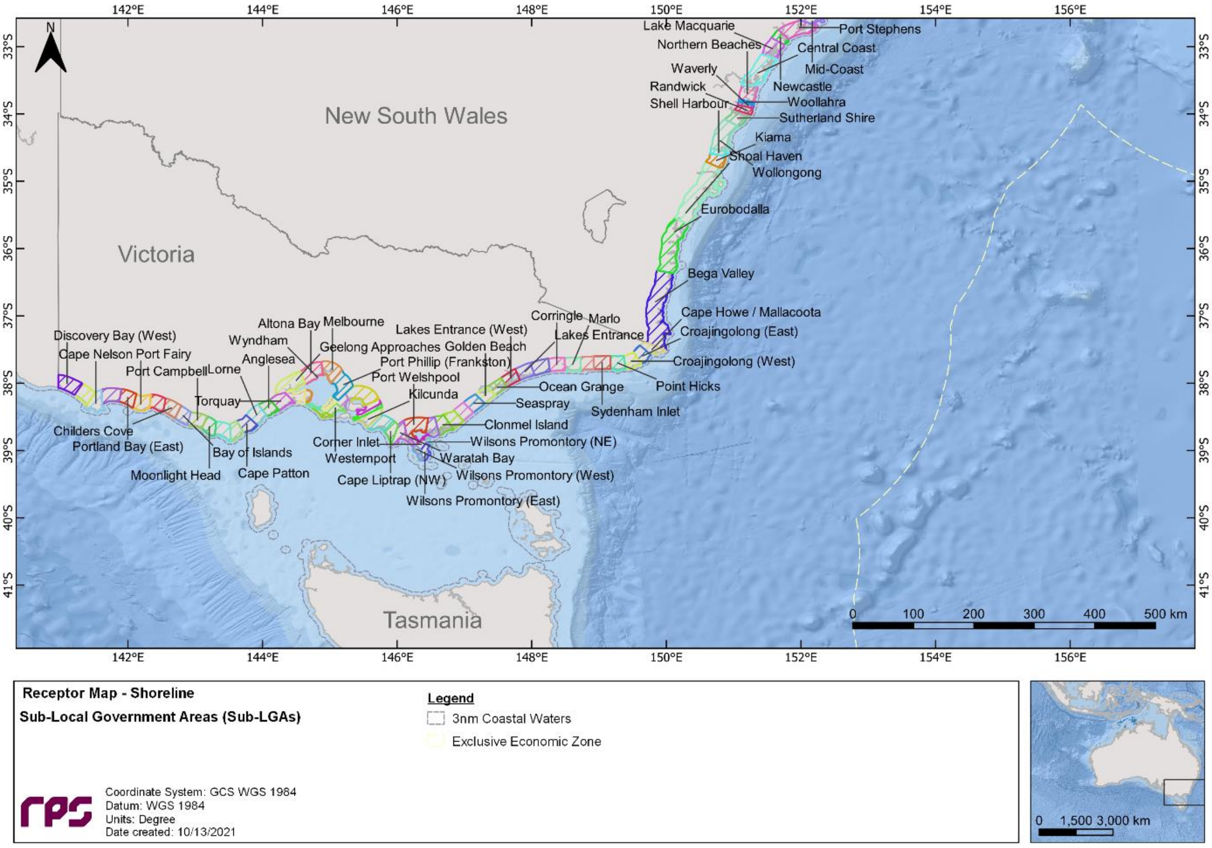


Figure 9-10 Receptor map for Sub Local Government Areas (Sub-LGA).

10 RESULTS – 300 M³ LOSS OF CONTAINMENT CAUSED BY VESSEL COLLISION

This scenario examined a 300 m³ surface release of MDO over 6 hours to represent a loss of containment caused by vessel collision. A total of 100 spill simulations were run and tracked for 20 days. The results for all 100 simulations were combined and are presented on an annual basis.

Sections 10.1 and 10.2 present the annual stochastic analysis and deterministic analysis results, respectively.

10.1 Stochastic Analysis

10.1.1 Floating Oil Exposure

Table 10-1 summarises the maximum distance travelled by floating oil on the sea surface at each threshold. 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) exposure levels was 59.8 km (east), 13.8 km (south) and 1.9 km (south), respectively.

Table 10-2 summarises the potential floating oil exposure to individual receptors during annual conditions.

A total of 13 BIAs, the Australian EEZ and the Central Bass Strait IMCRA were predicted to be exposed to floating oil at or above the low threshold during annualised conditions. The release location resides within all the exposed receptors. No other receptors were exposed to floating oil.

Figure 10-1 presents the zones of potential floating oil exposure for the thresholds under annualised conditions.

Table 10-1 Maximum distance and direction from the release location to floating oil exposure on the sea surface. Results are based on a 300 m³ surface release of MDO over 6 hours, tracked for 20 days. The results were calculated from 100 spill simulations and presented for annual conditions.

Distance and direction travelled	Zones of potential floating oil exposure		
	Low	Moderate	High
Maximum distance (km) from the release location	59.8	13.8	1.9
Maximum distance (km) from release site (99th percentile)	37.8	12.9	1.9
Direction	East	South	South

Table 10-2 Summary of the potential floating oil exposure to individual receptors. Results are based on a 300 m³ surface release of MDO over 6 hours, tracked for 20 days. The results were calculated from 100 spill trajectories during annual conditions.

Receptor		Probability of floating oil exposure (%)			Minimum time before floating oil exposure (days)		
		Low	Moderate	High	Low	Moderate	High
BIA	Black-browed Albatross – Foraging*	100	100	9	0.04	0.04	-
	Bullers Albatross - Foraging*	100	100	9	0.04	0.04	-
	Campbell Albatross - Foraging*	100	100	9	0.04	0.04	-
	Common Diving-petrel - Foraging*	100	100	9	0.04	0.04	-
	Indian Yellow-nosed Albatross - Foraging*	100	100	9	0.04	0.04	-
	Pygmy Blue Whale - Distribution*	100	100	9	0.04	0.04	-
	Pygmy Blue Whale - Foraging*	100	100	9	0.04	0.04	-
	Short-tailed Shearwater - Foraging*	100	100	9	0.04	0.04	-
	Shy Albatross - Foraging*	100	100	9	0.04	0.04	-
	Southern Right Whale - Known core range*	100	100	9	0.04	0.04	-
	Wandering Albatross - Foraging*	100	100	9	0.04	0.04	-
	White Shark - Distribution*	100	100	9	0.04	0.04	-
	White-faced Storm-petrel - Foraging*	100	100	9	0.04	0.04	-
EEZ	Australian Exclusive Economic Zone*	100	100	9	0.04	0.04	-
IMCRA	Central Bass Strait*	100	100	9	0.04	0.04	-

*The release location resides within the receptor boundaries.

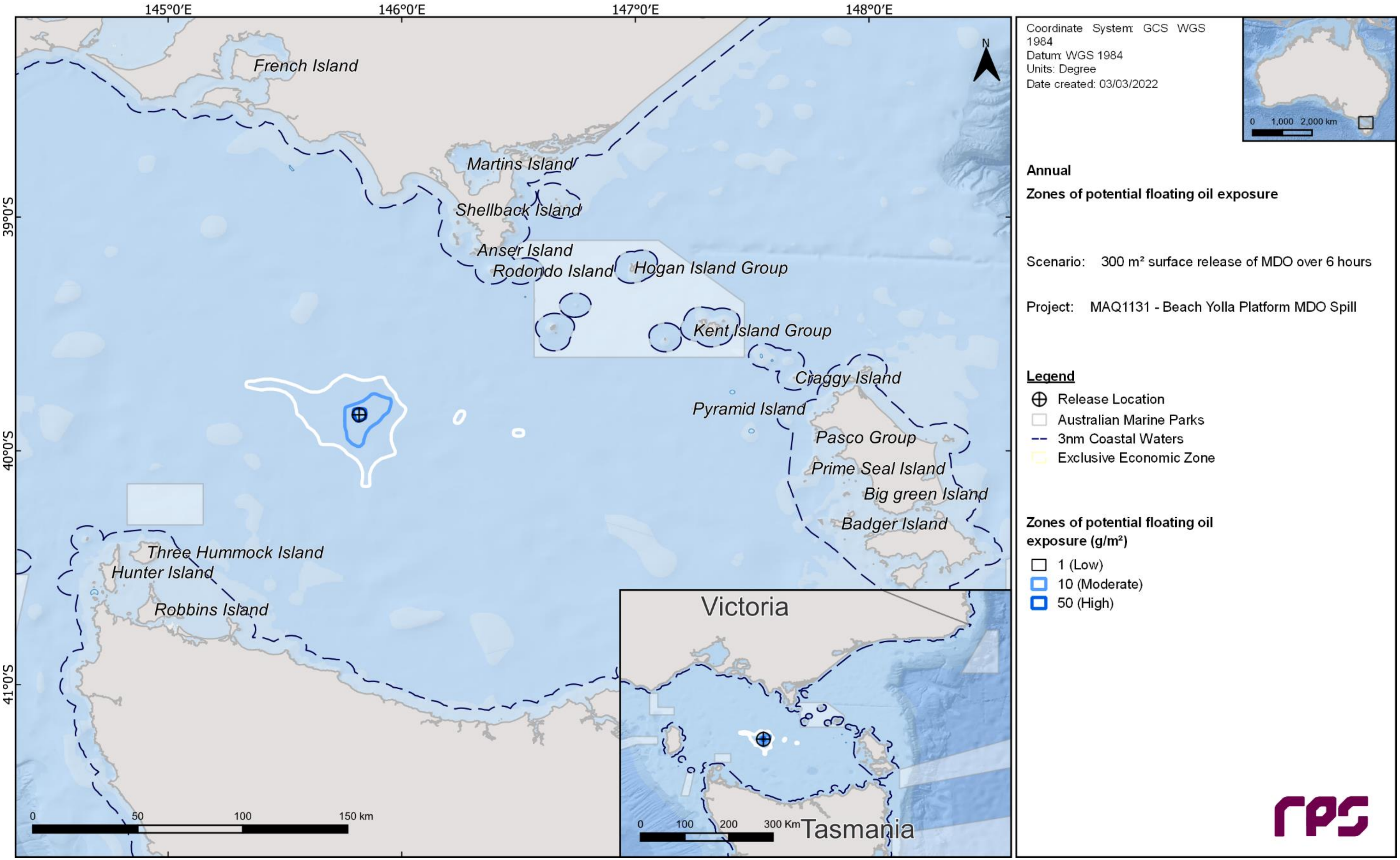


Figure 10-1 Zones of potential floating oil exposure in the event of a 300 m³ of MDO containment loss over 6 hours tracked for 20 days. The results were calculated from 100 spill simulations and presented for annual conditions.

10.1.2 Shoreline Accumulation

No shoreline oil accumulation above the low shoreline contact threshold was predicted for the scenario.

10.1.3 In-water exposure

10.1.3.1 Dissolved Hydrocarbons

Table 10-3 summarises the maximum distance and direction from the release location to dissolved hydrocarbon exposure in the 0-10 m depth layer at the low (10-50 ppb), moderate (50-400 ppb) and high (≥400 ppb) thresholds levels. The maximum distances to the low and moderate thresholds from the release location was predicted as 80.0 km (east-southeast) and 15.2 km (north), respectively. Note, no high exposure to dissolved hydrocarbons was recorded.

Table 10-4 summarises the probability of exposure to individual receptors from dissolved hydrocarbons in the 0-10 m layer for the annualised assessment.

A total of 13 BIAs, the Australian EEZ and the Central Bass Strait IMCRA were predicted to be exposed at, or above, the low threshold during the annualised assessment as the release location resides within all the exposed receptors. No other receptors were exposed to dissolved hydrocarbons. The probability of exposure at the low and moderate thresholds were predicted to be 65% and 5% respectively, for all receptors.

Figure 10-2 presents the zones of potential dissolved hydrocarbon exposure for the 0-10 m depth layer, for each threshold assessed.

Table 10-3 Maximum distance and direction from the release location to dissolved hydrocarbon exposure thresholds in the 0 – 10 m depth layer, based on a 300 m³ surface release of MDO over 6 hours, tracked for 20 days.

Distance and direction travelled	Zones of potential dissolved hydrocarbon exposure		
	Low	Moderate	High
Maximum distance (km) from the release location	80.0	15.2	-
Maximum distance (km) from release location (99th percentile)	60.1	15.2	-
Direction	East-southeast	North	-

Table 10-4 Probability of dissolved hydrocarbons exposure to marine based receptors in the 0–10 m dept. Results are based on a 300 m³ surface release of MDO over 6 hours, tracked for 20 days. The results were calculated from 100 spill simulations and presented for annual conditions.

Receptor		Maximum instantaneous dissolved hydrocarbon exposure	Probability of instantaneous hydrocarbon exposure		
			Low	Moderate	High
BIA	Black-browed Albatross – Foraging*	86	65	5	-
	Bullers Albatross - Foraging*	86	65	5	-
	Campbell Albatross - Foraging*	86	65	5	-
	Common Diving-petrel - Foraging*	86	65	5	-
	Indian Yellow-nosed Albatross - Foraging*	86	65	5	-
	Pygmy Blue Whale - Distribution*	86	65	5	-
	Pygmy Blue Whale - Foraging*	86	65	5	-
	Short-tailed Shearwater - Foraging*	86	65	5	-
	Shy Albatross - Foraging*	86	65	5	-
	Southern Right Whale - Known core range*	86	65	5	-
	Wandering Albatross - Foraging*	86	65	5	-
	White Shark - Distribution*	86	65	5	-
	White-faced Storm-petrel - Foraging*	86	65	5	-
EEZ	Australian Exclusive Economic Zone*	86	65	5	-
IMCRA	Central Bass Strait*	86	65	5	-

*The release location resides within the receptor boundaries.

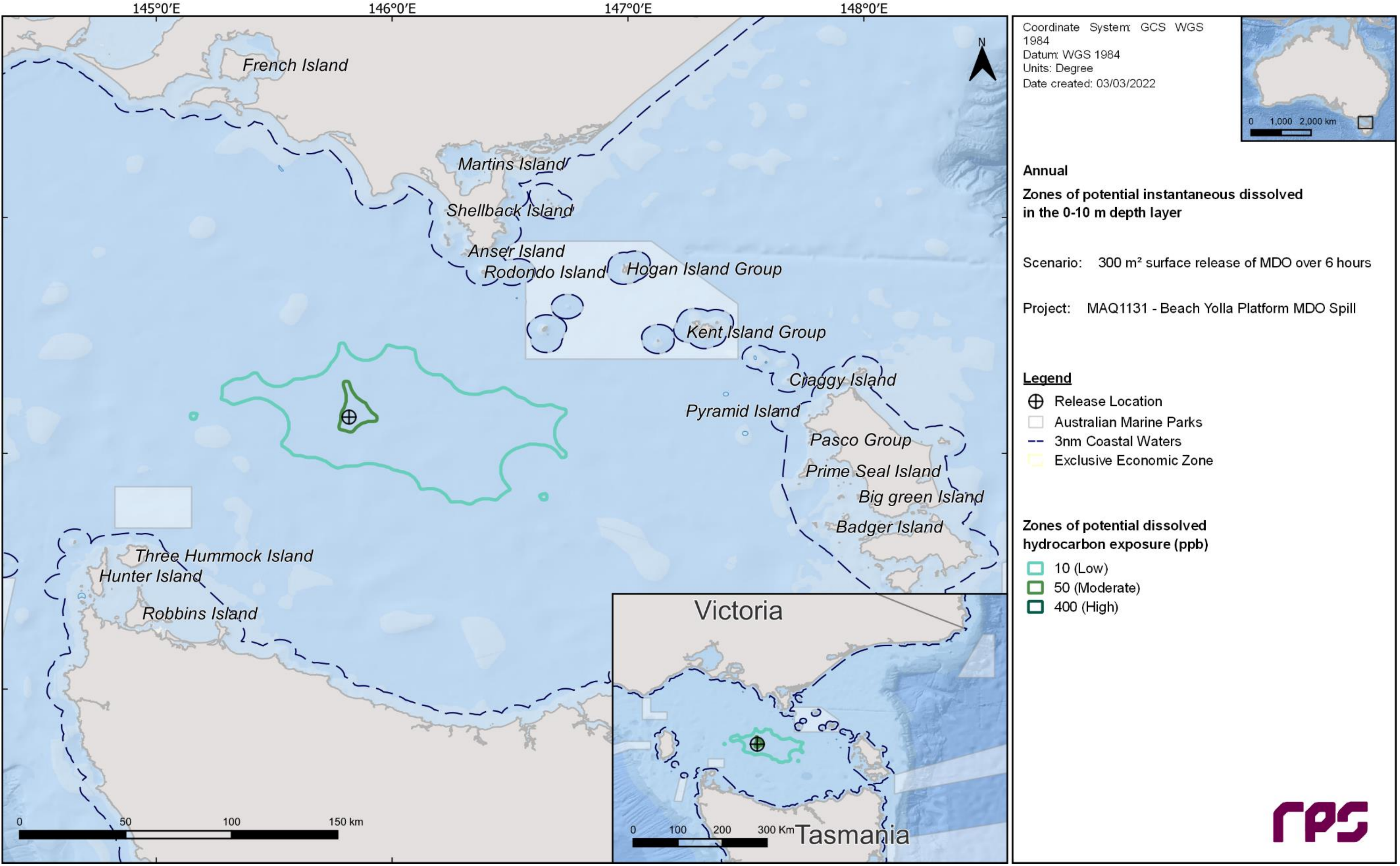


Figure 10-2 Zones of potential dissolved hydrocarbon exposure at 0-10 m below the sea in the event of a 300 m³ of MDO containment loss over 6 hours tracked for 20 days. The results were calculated from 100 spill simulations and presented for annual conditions.

10.1.3.2 Entrained Hydrocarbons

Table 10-5 summarises the maximum distance and direction from the release location to entrained hydrocarbons at the low (10-100 ppb) and high (≥ 100 ppb) exposure levels. The maximum distances to the low and high thresholds from the release location was 492.4 km (east-northeast) and 120.4 km (east-southeast), respectively.

Table 10-6 presents the probability of exposure to individual receptors from entrained hydrocarbons in the 0-10 m depth layer for the annualised assessment.

Low and high entrained hydrocarbon exposures were predicted for BIA and IMCRA receptors. Receptors demonstrating the greatest entrained hydrocarbons concentrations of 8,557 ppb contained the release location. The highest concentration for a receptors which did not surround the release location was Flinders IMCRA (167 ppb) and the probability of exposure based on the low and high thresholds was 19% and 2% respectively.

Figure 10-3 illustrate the zones of potential entrained hydrocarbon exposure for the 0-10 m depth.

Table 10-5 Maximum distance and direction from the release location to entrained hydrocarbon exposure thresholds in the 0 – 10 m depth layer. Results are based on a 300 m³ surface release of MDO over 6 hours, tracked for 20 days.

Distance and direction travelled	Zones of potential entrained hydrocarbon exposure	
	Low	High
Maximum distance (km) from the release location	492.4	120.4
Maximum distance (km) from release location (99th percentile)	318.7	104.0
Direction	East northeast	East-southeast

Table 10-6 **Probability of entrained hydrocarbons exposure to marine based receptors in the 0–10 m depth layer. Results are based on a 300 m³ surface release of MDO over 6 hours, tracked for 20 days. The results were calculated from 100 spill simulations and presented for annual conditions.**

Receptor		Maximum instantaneous entrained hydrocarbon exposure	Probability of instantaneous entrained hydrocarbon exposure	
			Low	High
AMP	Beagle	53	12	-
	Boags	73	8	-
	Franklin	37	3	-
BIA	Antipodean Albatross - Foraging	37	3	-
	Australasian Gannet - Foraging	43	4	-
	Black-browed Albatross – Foraging*	8,557	96	94
	Black-faced Cormorant - Foraging	34	3	-
	Bullers Albatross – Foraging*	8,557	96	94
	Campbell Albatross – Foraging*	8,557	96	94
	Common Diving-petrel - Foraging	8,557	96	94
	Humpback Whale - Foraging	13	1	-
	Indian Yellow-nosed Albatross – Foraging*	8,557	96	94
	Little Penguin - Foraging	54	11	-
	Pygmy Blue Whale – Distribution*	8,557	96	94
	Pygmy Blue Whale – Foraging*	8,557	96	94
	Short-tailed Shearwater – Foraging*	8,557	96	94
	Shy Albatross - Breeding	32	2	-
	Shy Albatross – Foraging*	8,557	96	94
	Southern Right Whale - Connecting Habitat	16	1	-
	Southern Right Whale – Known core range*	8,557	96	94
	Wandering Albatross – Foraging*	8,557	96	94
	Wedge-tailed Shearwater - Foraging	14	1	-
	White Shark - Breeding	14	1	-
	White Shark – Distribution*	8,557	96	94
	White Shark - Foraging	118	15	1
	White-faced Storm-petrel – Foraging*	8,557	96	94
EEZ	Australian Exclusive Economic Zone*	8,557	96	94

Receptor		Maximum instantaneous entrained hydrocarbon exposure	Probability of instantaneous entrained hydrocarbon exposure	
			Low	High
IBRA	Flinders	72	12	-
	King Island	34	3	-
	Wilsons Promontory	37	1	-
IMCRA	Boags	48	5	-
	Central Bass Strait*	8,557	96	94
	Central Victoria	15	1	-
	Flinders	167	19	2
	Franklin	32	2	-
	Otway	48	4	-
	Twofold Shelf	48	12	-
KEF	Big Horseshoe Canyon	12	1	-
	Upwelling East of Eden	15	2	-
NP	Kent Group	37	10	-
RSB	Bell Reef	21	1	-
	Cutter Rock	14	2	-
	Endeavour Reef	25	7	-
	Wakitipu Rock	40	9	-
	Warrego Rock	41	5	-
	Wright Rock	28	11	-
Shoreline (LGA)	Albatross Island	32	3	-
	Black Pyramid	33	2	-
	Chalky Island	12	1	-
	Craggy Island	37	6	-
	Curtis Island	52	9	-
	Flinders Island	14	1	-
	Hogan Island Group	22	2	-
	Hunter Island	17	2	-
	Kent Island Group	34	7	-
	Moncoeur Islands	37	1	-
	Outer Sister Island	15	1	-

Receptor		Maximum instantaneous entrained hydrocarbon exposure	Probability of instantaneous entrained hydrocarbon exposure	
			Low	High
	Pasco Group	15	1	-
	Prime Seal Island	16	1	-
	Pyramid Island	72	12	-
	Reid Rock	34	1	-
	Rodondo Island	15	1	-
	Seal Islands	11	1	-
	Three Hummock Island	14	1	-
State Waters	Tasmania State Waters	54	12	-
	Victoria State Waters	39	1	-

*The release location resides within the receptor boundaries.

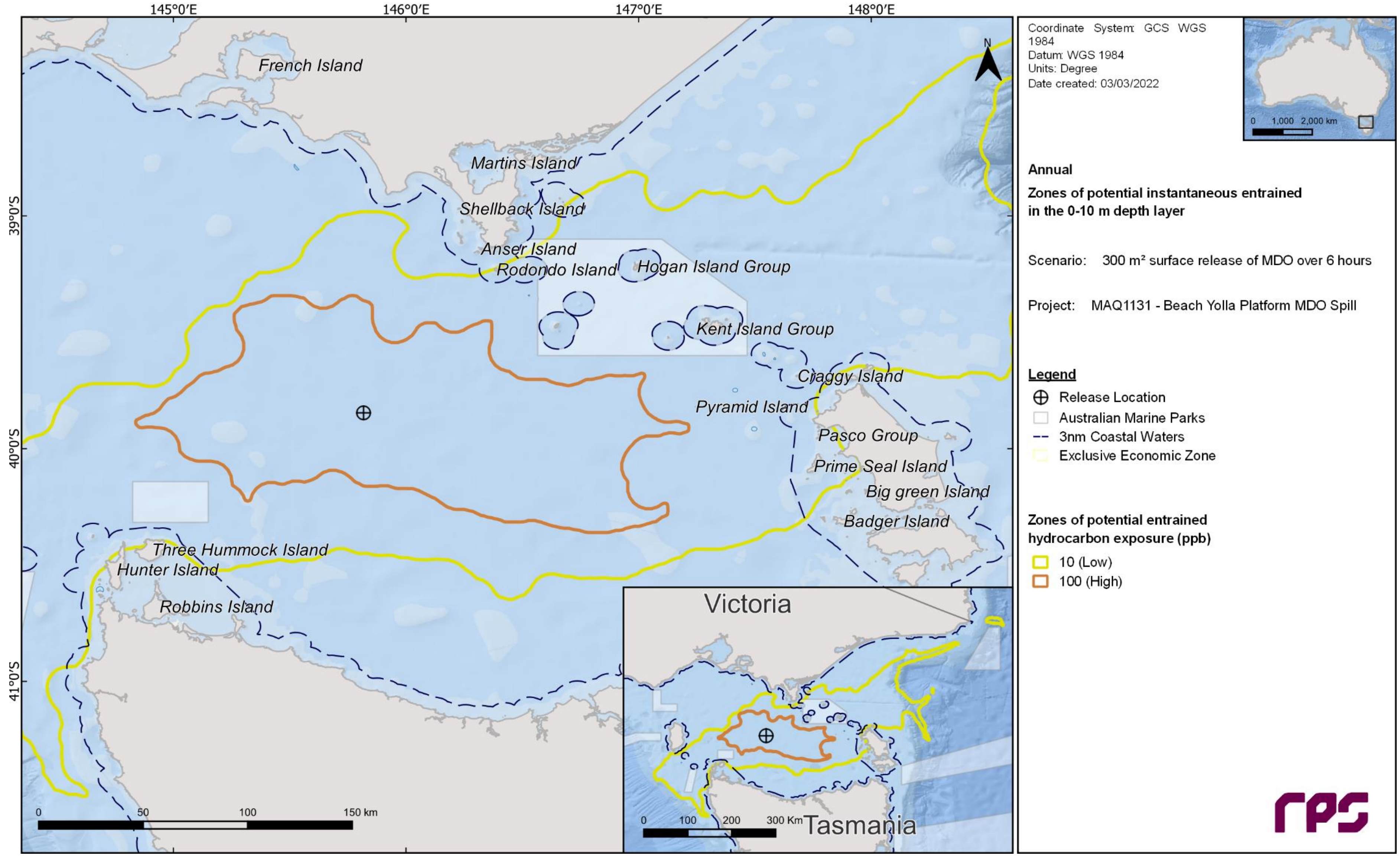


Figure 10-3 Zones of potential entrained hydrocarbon exposure at 0-10 m below the sea surface in the event of a 300 m³ of MDO containment loss over 6 hours tracked for 20 days. The results were calculated from 100 spill simulations and presented for annual conditions.

10.2 Deterministic Analysis

The stochastic modelling results were assessed, and the “worst case” deterministic runs were identified and presented below see Section 10.2.1 to Section 10.2.3.

Table 10-7 presents a summary of floating oil, shoreline accumulation, entrained hydrocarbon and dissolved hydrocarbon values at the assessed thresholds for the identified deterministic simulations.

Note, no shoreline contacts above the low shoreline contact threshold was predicted for the scenario, hence shoreline results are not presented in this section.

Table 10-7 Summary of the deterministic analysis. Results are based on a 300 m³ surface release of MDO over 6 hours, tracked for 20 days.

Variable	Threshold	Deterministic Analysis Criteria					
		Largest swept area of floating oil above 1 g/m^2	Minimum time before shoreline accumulation above 10 g/m^2	Largest volume of oil ashore	Longest length of shoreline accumulation above 10 g/m^2	Largest area of entrained hydrocarbons above 10 ppb	Largest area of dissolved hydrocarbons above 10 ppb
Run Number		74	-	-	-	82	28
Total area of floating Oil exposure (km^2)	1 g/m^2	111.9	-	-	-	19.6	6.5
	10 g/m^2	48.2	-	-	-	5.7	0.8
	50 g/m^2	1.6	-	-	-	-	-
Total length of shoreline accumulation (km)	10 g/m^2	-	-	-	-	-	-
	100 g/m^2	-	-	-	-	-	-
	1,000 g/m^2	-	-	-	-	-	-
Minimum time before accumulation on any shoreline (days)	10 g/m^2	NC	-	-	-	NC	NC
	100 g/m^2	NC	-	-	-	NC	NC
	1,000 g/m^2	NC	-	-	-	NC	NC
Maximum volume of oil ashore (m^3)		NC	-	-	-	NC	NC
Total area of entrained hydrocarbon exposure (km^2)	10 ppb	2,777	-	-	-	7,871	4,834
	100 ppb	402	-	-	-	437	975
Total area of dissolved hydrocarbon exposure (km^2)	10 ppb	-	-	-	-	2	168
	50 ppb	-	-	-	-	-	-
	400 ppb	-	-	-	-	-	-
Start Date		25th January 2011	-	-	-	24th April 2015	2nd May 2018

NC = No contact at, or above the specified shoreline accumulation threshold.

10.2.1 Deterministic Case: Largest swept area of floating oil above 1 g/m^2

The deterministic trajectory that resulted in the largest swept area of floating oil above 1 g/m^2 (low threshold and visible floating oil) was identified as run number 74, which started on 25th January 2011. Figure 10-4 is a map illustrating the floating oil exposure over the 20 days.

Figure 10-5 displays the time series of the swept area of low (1 g/m^2), moderate (10 g/m^2) and high (50 g/m^2) floating oil over the 20-day simulation.

Figure 10-6 presents the fates and weathering graph for the corresponding single spill trajectory and Table 10-8 summarises the mass balance at the peak and at end of the simulation.

Table 10-8 Summary of the mass balance for the trajectory that resulted in the largest swept area of floating oil above 1 g/m^2. Results are based on a 300 m³ surface release of MDO over 6 hours, tracked for 20 days.

Exposure Metrics	Peak Volume	Day of occurrence	Volume at day 20
Surface (m^3)	191.9	0.25	0.0
Entrained (m^3)	171.4	1.25	90.9
Dissolved (m^3)	0.3	2.33	0.1
Evaporation (m^3)	151.2	20.00	151.2
Decay (m^3)	61.0	20.00	61.0
Ashore (m^3)	0.0	0.0	0.0

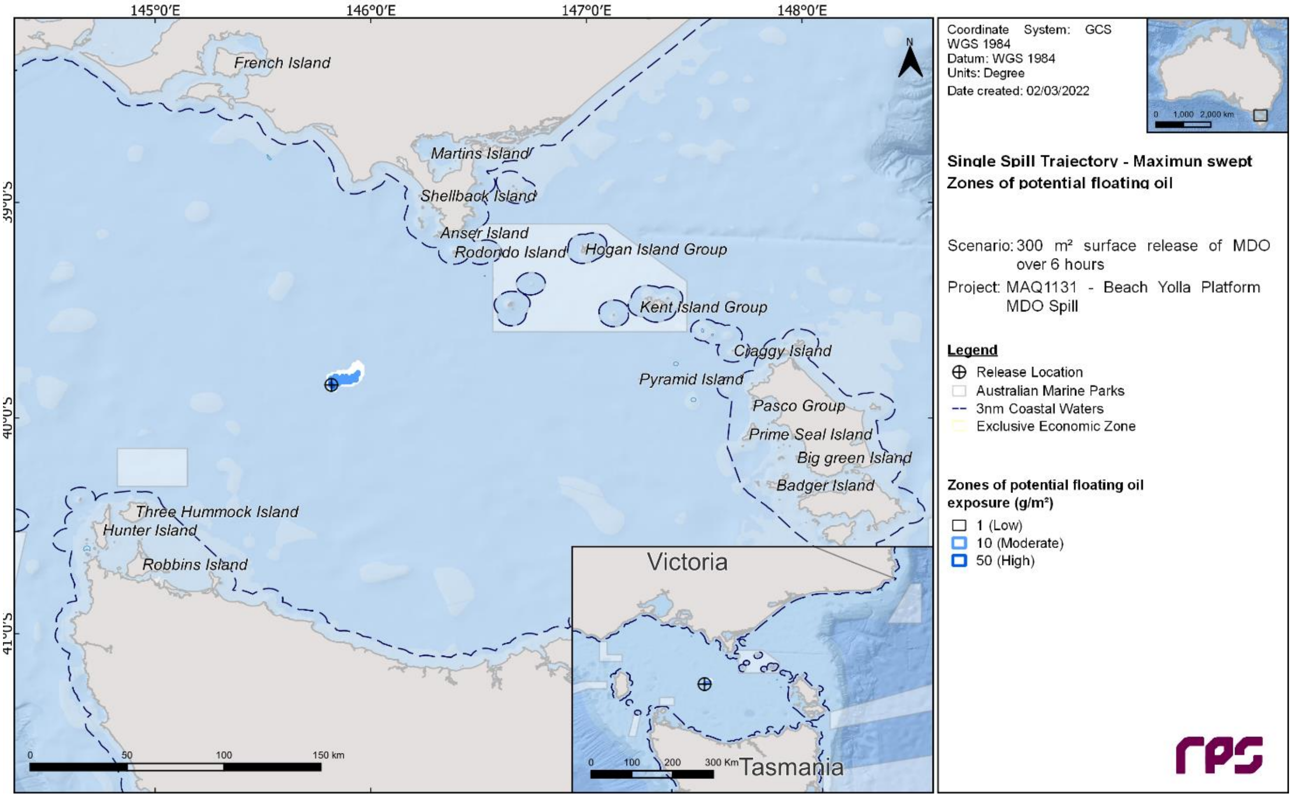


Figure 10-4 Zones of potential floating oil exposure over the 20-day simulation for the trajectory with the largest swept area of floating oil above 1 g/m^2. Results are based on a 300 m³ surface release of MDO over 6 hours, tracked for 20 days.

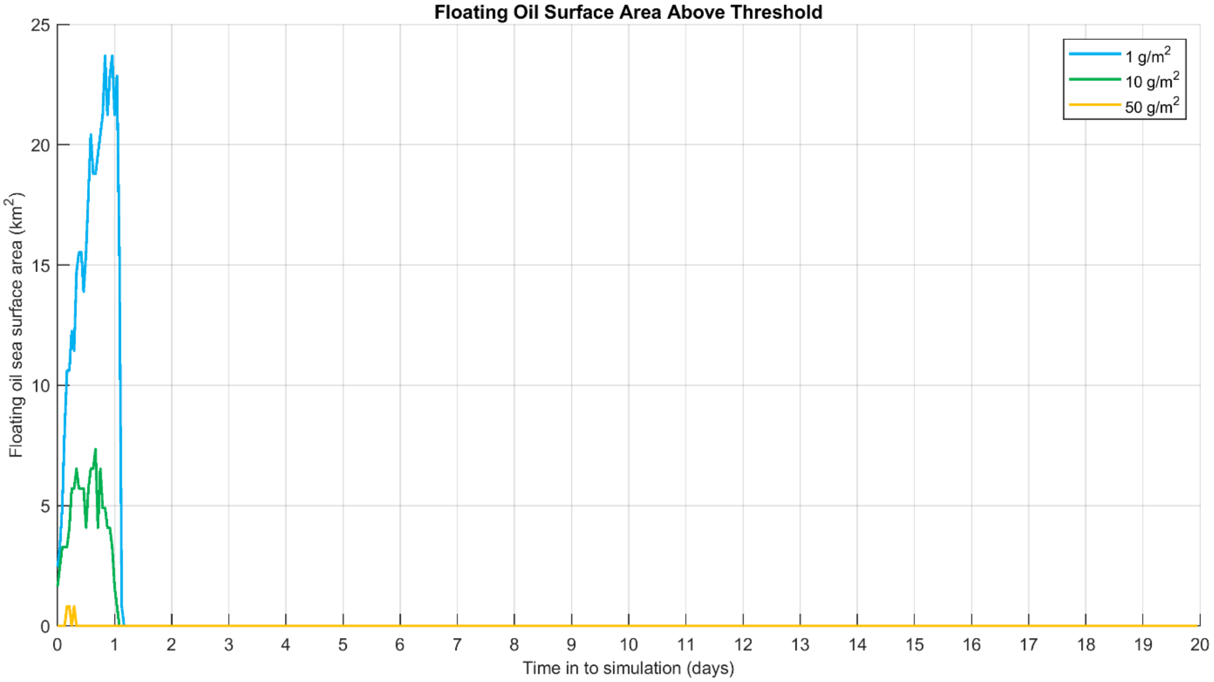


Figure 10-5 Time series of the area of floating oil for the trajectory with the largest swept area of floating oil above 1 g/m^2. Results are based on a 300 m³ surface release of MDO over 6 hours, tracked for 20 days.

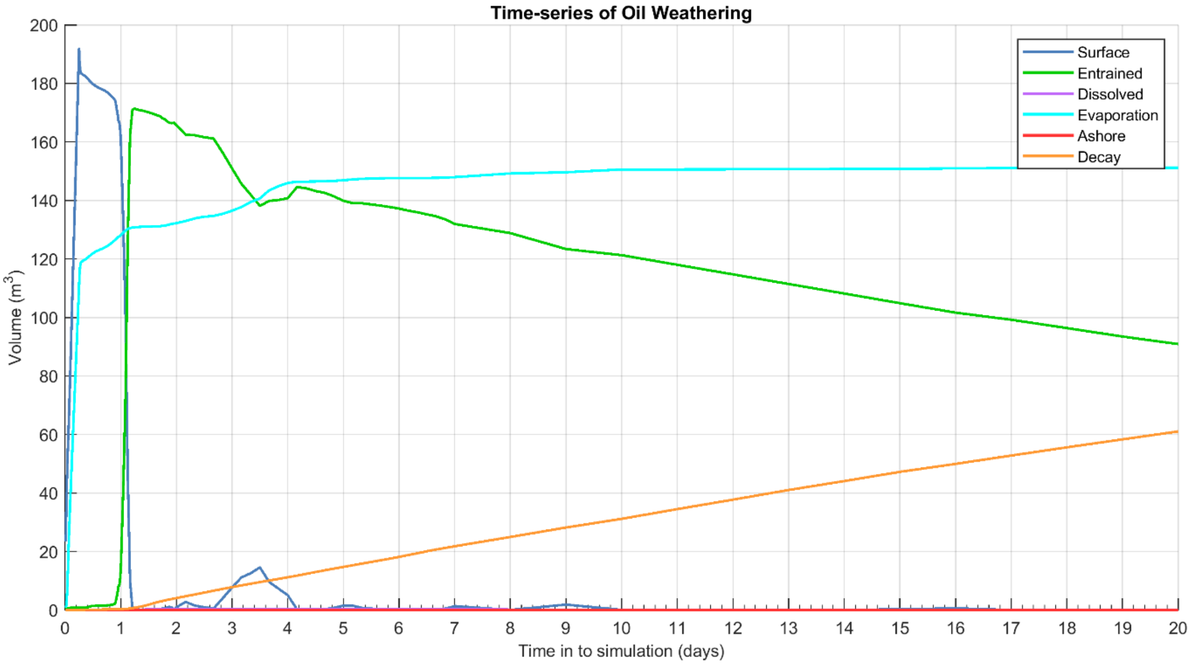


Figure 10-6 Predicted weathering and fates graph for the trajectory with the largest swept area of floating oil above 1 g/m^2. Results are based on a 300 m³ surface release of MDO over 6 hours, tracked for 20 days.

10.2.2 Deterministic Case: Largest area of entrained hydrocarbons above 10 ppb

The deterministic trajectory that resulted in the largest area of entrained hydrocarbons above 10 ppb (low threshold) was identified as run number 82, which started on the 24th April 2015. Figure 10-7 presents the zones of potential entrained hydrocarbon exposure.

Figure 10-8 displays the time series of the area of entrained hydrocarbons at the low (10 ppb) and moderate (100 ppb) thresholds over the 20-day simulation.

Figure 10-9 presents the fates and weathering graph for the corresponding single spill trajectory and Table 10-9 summarises the mass balance at the peak and at end of the simulation.

Table 10-9 Summary of the mass balance for the trajectory that resulted in the largest area of entrained hydrocarbons above 10 ppb. Results are based on a 300 m³ surface release of MDO over 6 hours, tracked for 20 days.

Exposure Metrics	Peak Volume	Day of occurrence	Volume at day 20
Surface (m^3)	113.8	0.25	0.0
Entrained (m^3)	187.6	0.50	94.7
Dissolved (m^3)	0.7	1.46	0.1
Evaporation (m^3)	129.8	20.00	129.8
Decay (m^3)	78.7	20.00	78.7
Ashore (m^3)	0.0	0.0	0.0

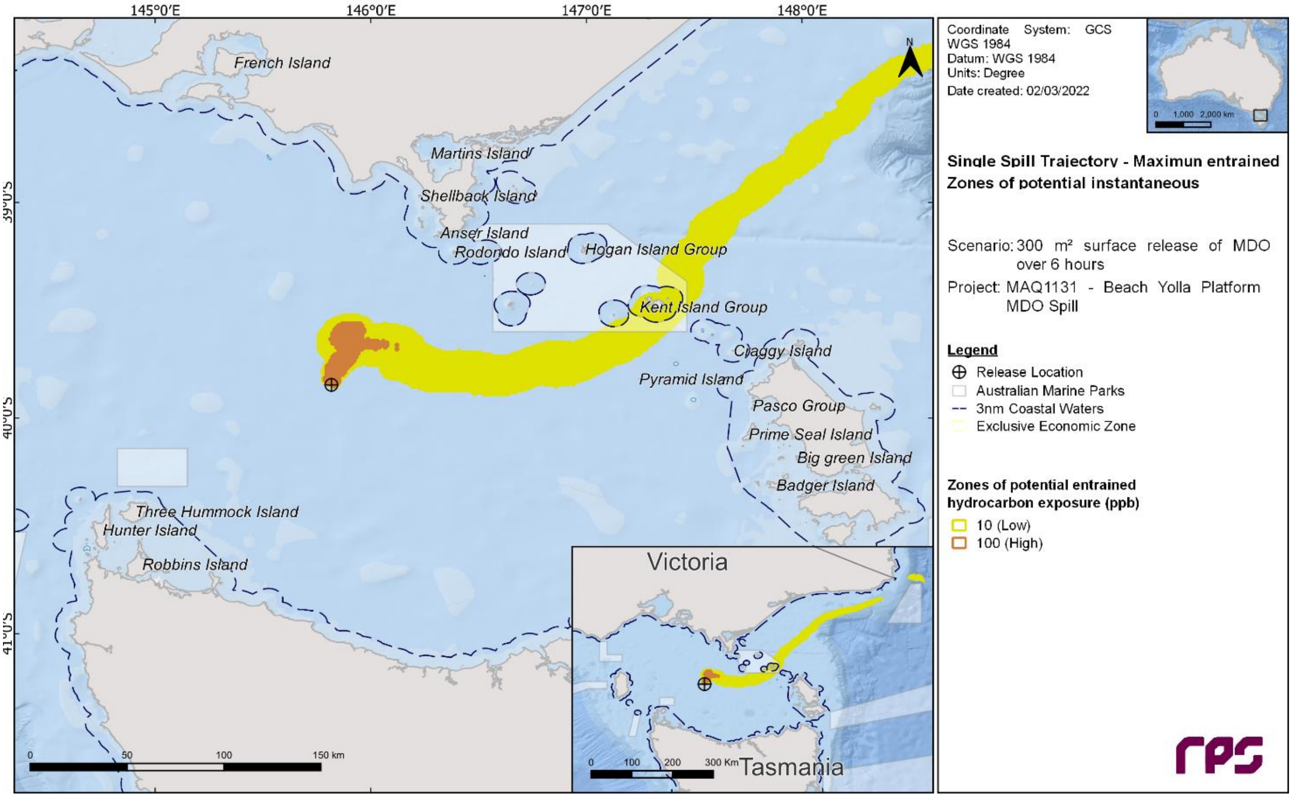


Figure 10-7 Zones of potential entrained hydrocarbon exposure, for the trajectory with the largest area of entrained hydrocarbons above 10 ppb. Results are based on a 300 m³ surface release of MDO over 6 hours, tracked for 20 days.

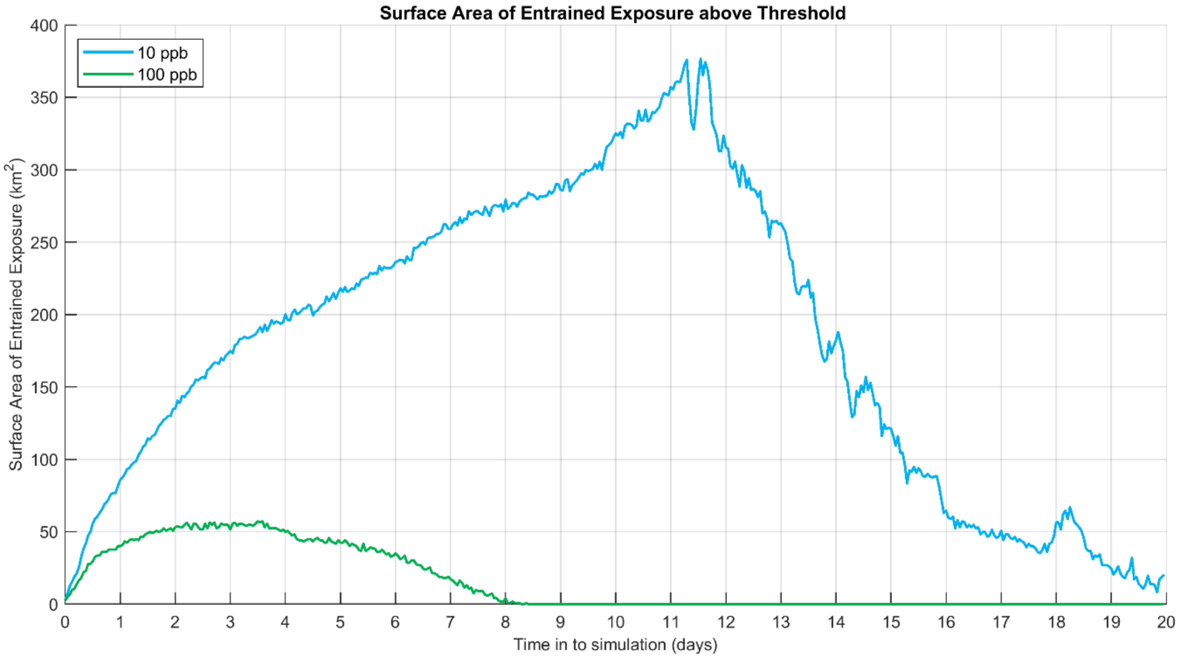


Figure 10-8 Time series of the predicted area of entrained hydrocarbon exposure for the trajectory with the largest area of entrained hydrocarbons above 10 ppb. Results are based on a 300 m³ surface release of MDO over 6 hours, tracked for 20 days.

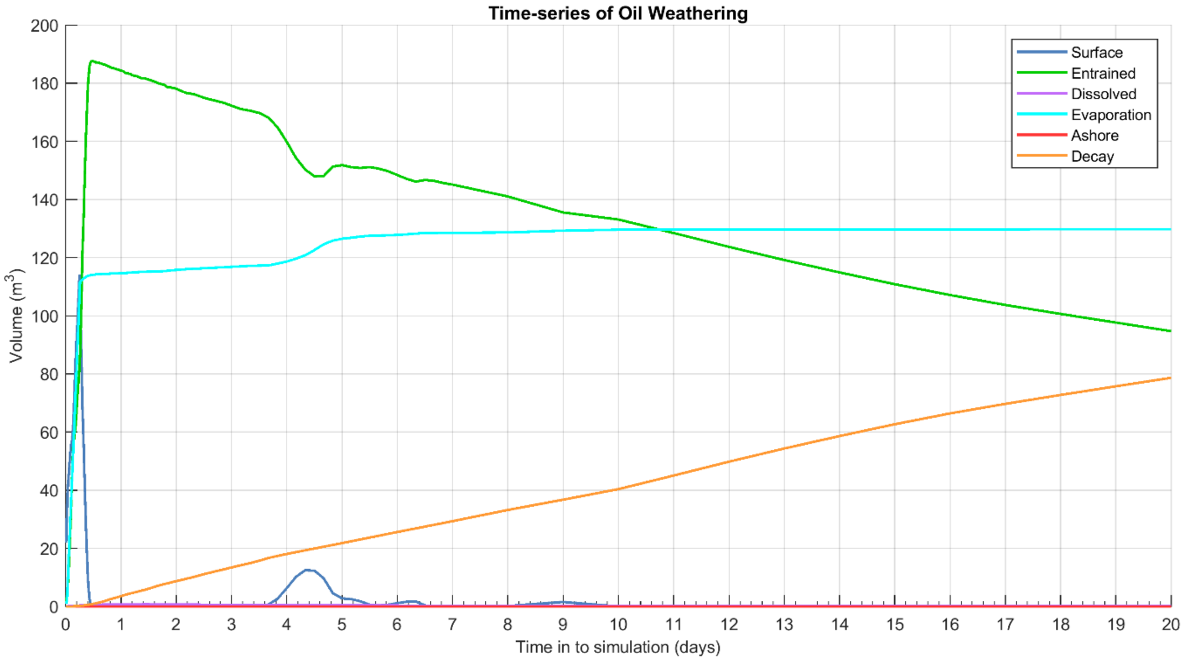


Figure 10-9 Predicted weathering and fates graph for the trajectory with the largest area of entrained hydrocarbon exposure above 10 ppb. Results are based on a 300 m³ surface release of MDO over 6 hours, tracked for 20 days.

10.2.3 Deterministic Case: Largest area of dissolved hydrocarbons above 10 ppb

The deterministic trajectory that resulted in the largest area of dissolved hydrocarbons above 10 ppb (low threshold) was identified as run number 28, which started on 2nd May 2018. Figure 10-10 map illustrates the zones of potential dissolved hydrocarbon exposure.

Figure 10-11 displays the time series of the area of dissolved hydrocarbons at the low (10 ppb), moderate (50 ppb) and high (400 g/m^2) thresholds over the 20-day simulation.

Figure 10-12 presents the fates and weathering graph for the corresponding single spill trajectory and Table 10-10 summarises the mass balance at the peak and at end of the simulation.

Table 10-10 Summary of the mass balance for the trajectory that resulted in the largest area of dissolved hydrocarbon exposure above 10 ppb. Results are based on a 300 m³ surface release of MDO over 6 hours, tracked for 20 days.

Exposure Metrics	Peak Volume	Day of occurrence	Volume at day 20
Surface (m^3)	36.1	0.07	0.0
Entrained (m^3)	220.0	0.29	87.8
Dissolved (m^3)	2.1	0.65	0.1
Evaporation (m^3)	131.3	20.00	131.3
Decay (m^3)	84.2	20.00	84.2
Ashore (m^3)	0.0	0.0	0.0

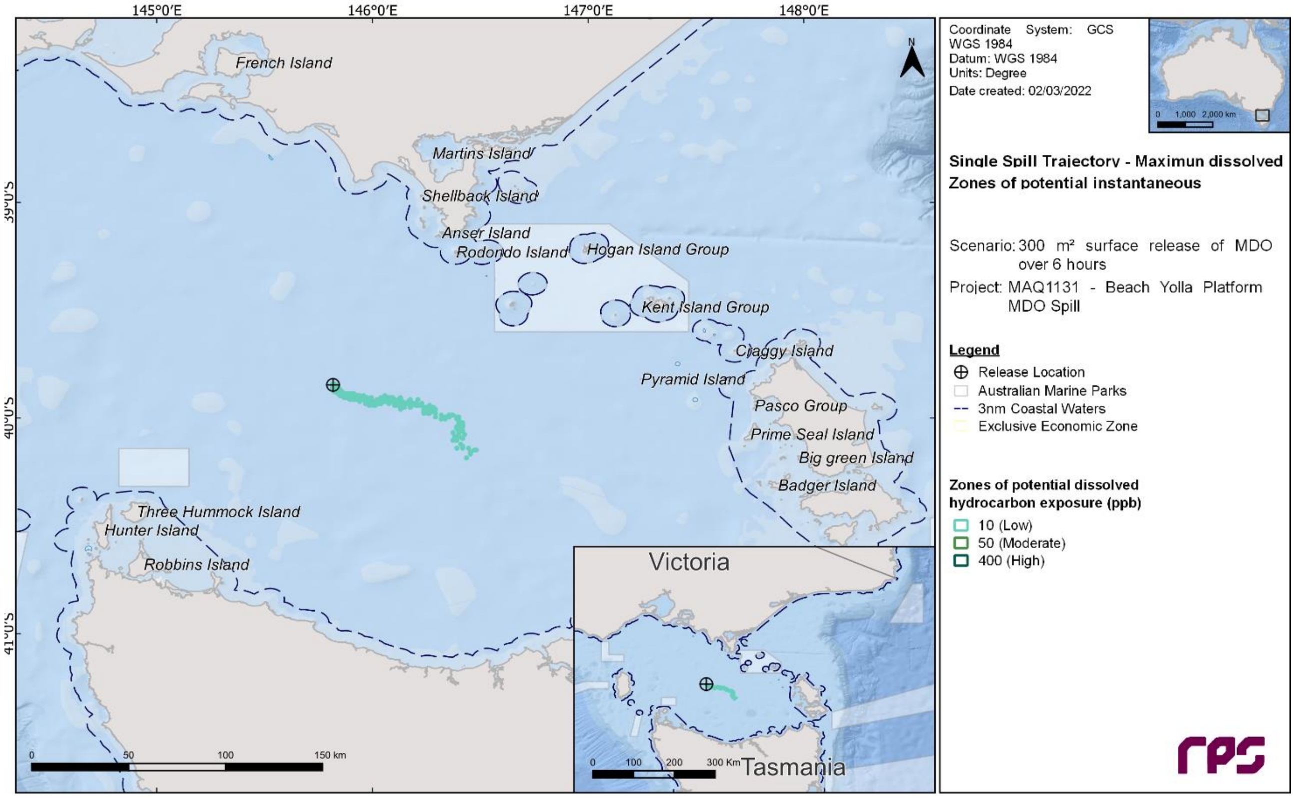


Figure 10-10 Zones of potential dissolved hydrocarbon exposure for the trajectory with the largest area of dissolved hydrocarbons above 10 ppb. Results are based on a 300 m³ surface release of MDO over 6 hours, tracked for 20 days.

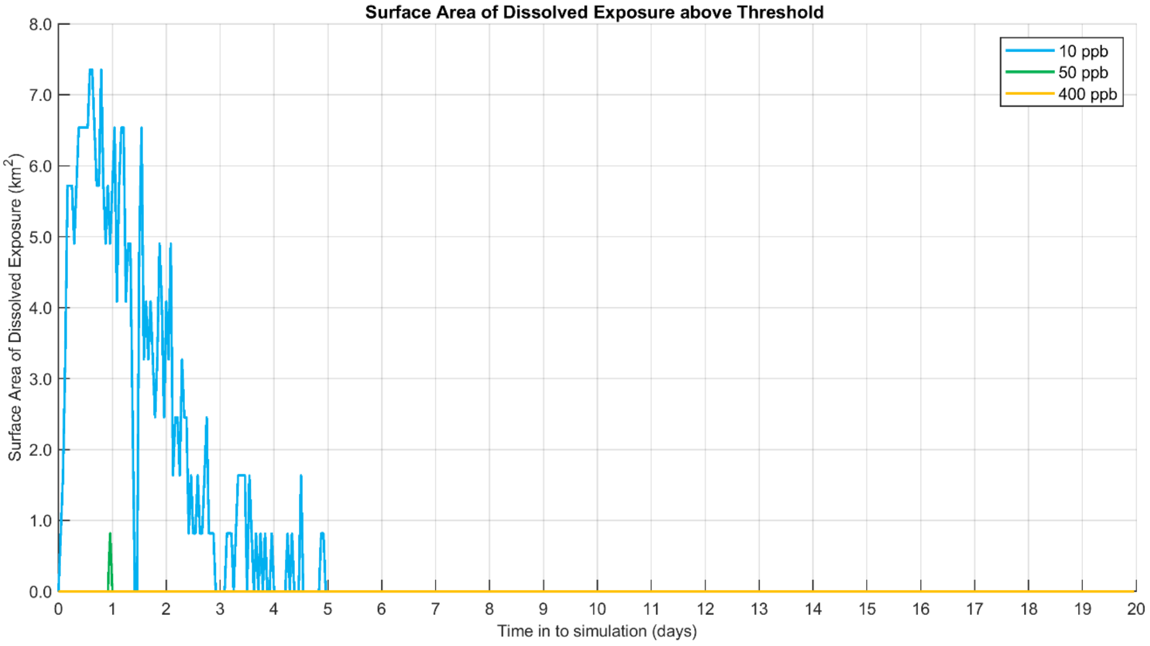


Figure 10-11 Time series of the area of dissolved hydrocarbon exposure for the trajectory with the largest area of dissolved hydrocarbons above 10 ppb. Results are based on a 300 m³ surface release of MDO over 6 hours, tracked for 20 days.

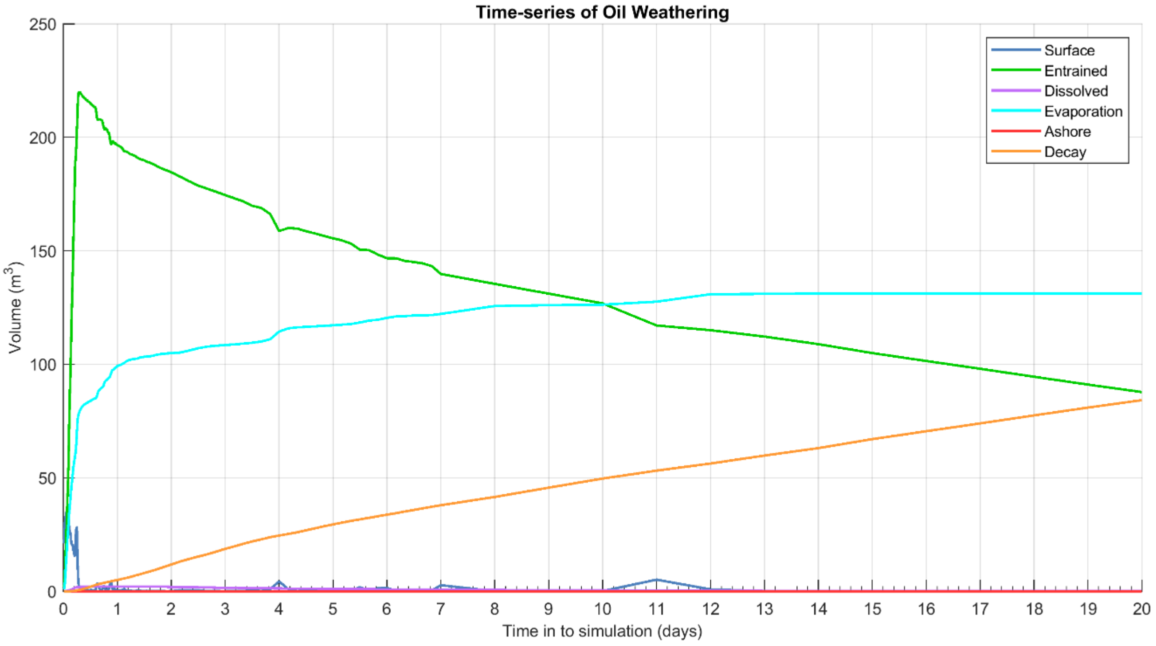


Figure 10-12 Predicted weathering and fates graph for the trajectory with the largest area of dissolved hydrocarbons above 10 ppb. Results are based on a 300 m³ surface release of MDO over 6 hours, tracked for 20 days.

11 RESULTS – 200 M³ LOSS OF CONTAINMENT CAUSED BY VESSEL COLLISION

This scenario examined a 200 m³ surface release of MDO over 6 hours to represent a loss of containment caused by vessel collision. A total of 100 spill simulations were run per season and tracked for 20 days. The results for all 100 simulations were combined and are presented for each season.

11.1 Stochastic Analysis

11.1.1 Floating Oil Exposure

Table 11-1 summarises the maximum distance travelled by floating oil on the sea surface at each threshold for each season. 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) exposure levels was 23 km (south in summer), 14.5 km (east in winter) and 2.3 km (southeast in winter), respectively.

Table 11-2 and Table 11-3 summarises the potential floating oil exposure to individual receptors, for summer and winter, respectively.

A total of 13 BIAs, the Australian EEZ and the Central Bass Strait IMCRA were predicted to be exposed to floating oil at or above the low threshold during both summer and winter conditions. The release location resides within all the exposed receptors. No other receptors were exposed to floating oil.

Figure 11-1 and Figure 11-2 present the zones of potential floating oil exposure for each threshold, for summer and winter, respectively.

Table 11-1 Maximum distance and direction from the release location to floating oil exposure on the sea surface. Results are based on a 200 m³ surface release of MDO over 6 hours, tracked for 20 days. The results were calculated from 100 spill simulations per season and presented for summer and winter conditions.

Distance and direction travelled	Zones of potential floating oil exposure		
	Low	Moderate	High
Summer			
Maximum distance (km) from the release location	23	7.2	2.1
Maximum distance (km) from release site (99th percentile)	20.1	7.2	2.1
Direction	S	N	WNW
Winter			
Maximum distance (km) from the release location	21.8	14.5	2.3
Maximum distance (km) from release site (99th percentile)	21	13.8	2.3
Direction	NW	E	SE

Table 11-2 Summary of the potential floating oil exposure to individual receptors. Results are based on a 200 m³ surface release of MDO over 6 hours, tracked for 20 days. The results were calculated from 100 spill trajectories during summer conditions.

Receptor		Probability of floating oil exposure (%)			Minimum time before floating oil exposure (hours)		
		Low	Moderate	High	Low	Moderate	High
BIA	Black-browed Albatross – Foraging*	100	84	11	1	1	2
	Buller’s Albatross - Foraging*	100	84	11	1	1	2
	Campbell Albatross - Foraging*	100	84	11	1	1	2
	Common Diving-petrel - Foraging*	100	84	11	1	1	2
	Indian Yellow-nosed Albatross - Foraging*	100	84	11	1	1	2
	Pygmy Blue Whale - Distribution*	100	84	11	1	1	2
	Pygmy Blue Whale - Foraging*	100	84	11	1	1	2
	Short-tailed Shearwater - Foraging*	100	84	11	1	1	2
	Shy Albatross - Foraging*	100	84	11	1	1	2
	Southern Right Whale – Known core range*	100	84	11	1	1	2
	Wandering Albatross - Foraging*	100	84	11	1	1	2
	White Shark - Distribution*	100	84	11	1	1	2
	White-faced Storm-petrel - Foraging*	100	84	11	1	1	2
EEZ	Australian Exclusive Economic Zone*	100	84	11	1	1	2
IMCRA	Central Bass Strait*	100	84	11	1	1	2

*The release location resides within the receptor boundaries.

Table 11-3 Summary of the potential floating oil exposure to individual receptors. Results are based on a 200 m³ surface release of MDO over 6 hours, tracked for 20 days. The results were calculated from 100 spill trajectories during winter conditions.

Receptor		Probability of floating oil exposure (%)			Minimum time before floating oil exposure (hours)		
		Low	Moderate	High	Low	Moderate	High
BIA	Black-browed Albatross – Foraging*	100	64	11	1	1	3
	Buller's Albatross - Foraging*	100	64	11	1	1	3
	Campbell Albatross - Foraging*	100	64	11	1	1	3
	Common Diving-petrel - Foraging*	100	64	11	1	1	3
	Indian Yellow-nosed Albatross - Foraging*	100	64	11	1	1	3
	Pygmy Blue Whale - Distribution*	100	64	11	1	1	3
	Pygmy Blue Whale - Foraging*	100	64	11	1	1	3
	Short-tailed Shearwater - Foraging*	100	64	11	1	1	3
	Shy Albatross - Foraging*	100	64	11	1	1	3
	Southern Right Whale - Known core range*	100	64	11	1	1	3
	Wandering Albatross - Foraging*	100	64	11	1	1	3
	White Shark - Distribution*	100	64	11	1	1	3
	White-faced Storm-petrel - Foraging*	100	64	11	1	1	3
EEZ	Australian Exclusive Economic Zone*	100	64	11	1	1	3
IMCRA	Central Bass Strait*	100	64	11	1	1	3

*The release location resides within the receptor boundaries.

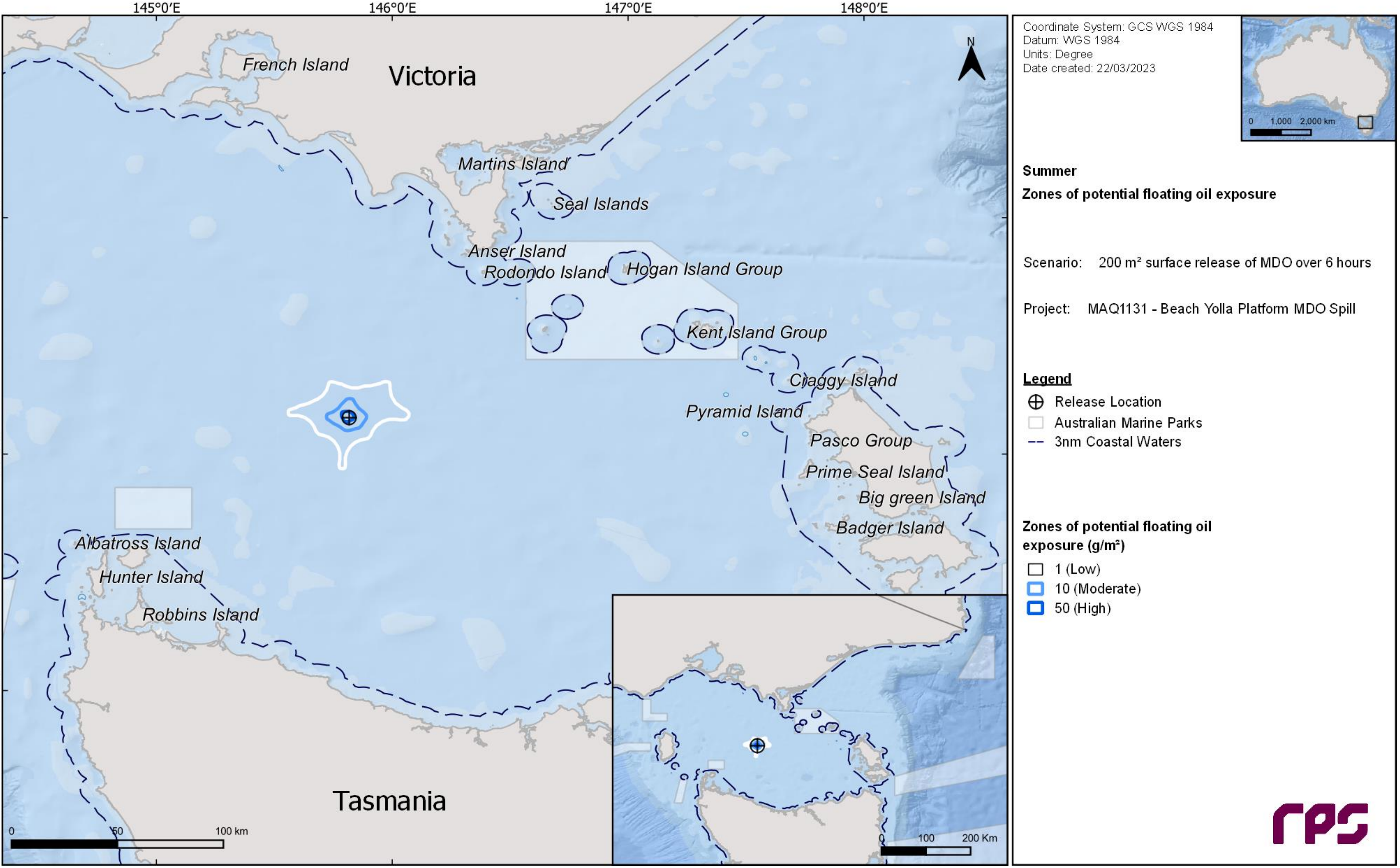


Figure 11-1 Zones of potential floating oil exposure in the event of a 200 m³ of MDO containment loss over 6 hours tracked for 20 days. The results were calculated from 100 spill simulations and presented for summer conditions.

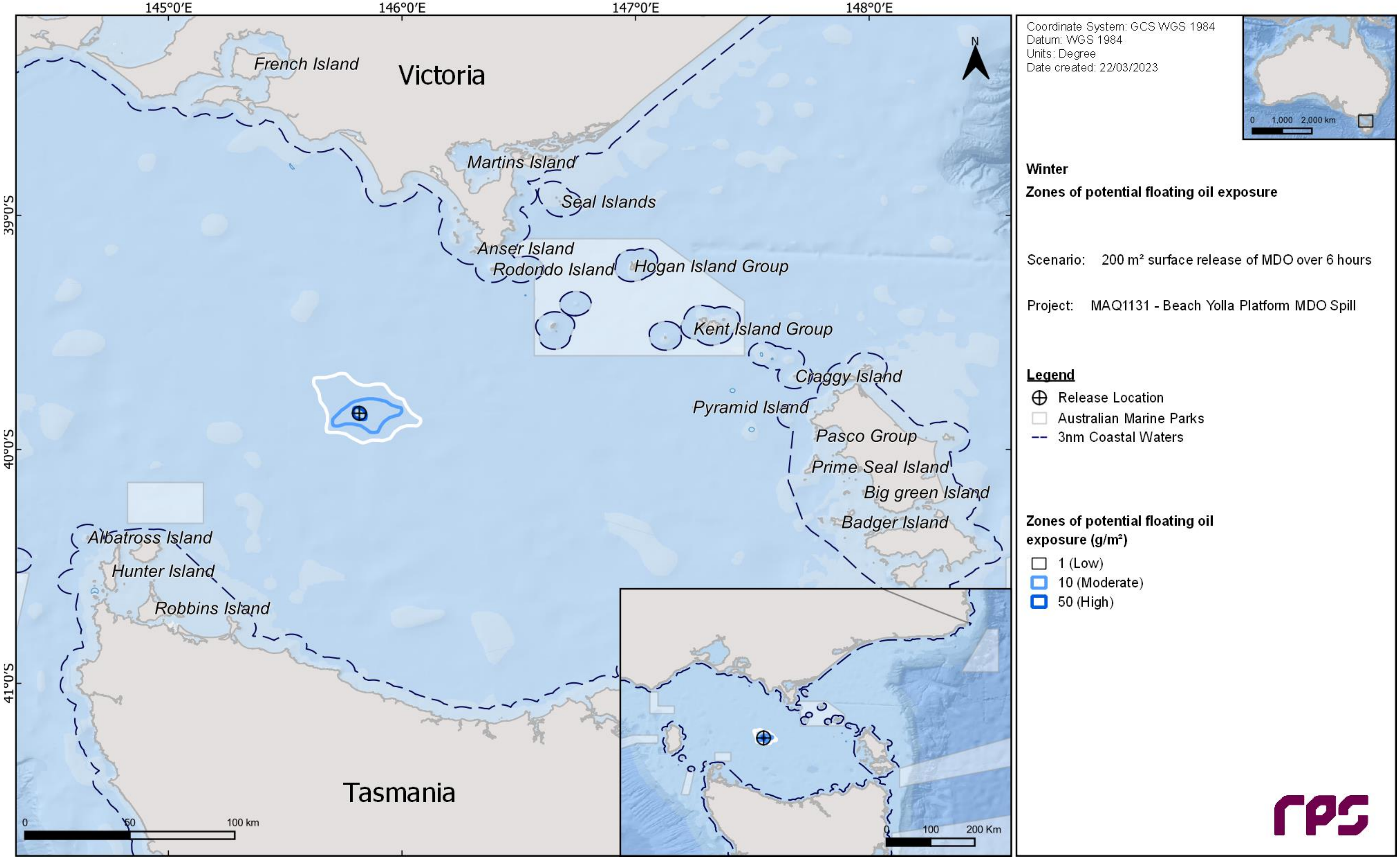


Figure 11-2 Zones of potential floating oil exposure in the event of a 200 m³ of MDO containment loss over 6 hours tracked for 20 days. The results were calculated from 100 spill simulations and presented for winter conditions.

11.1.2 Shoreline Accumulation

No shoreline oil accumulation above the low shoreline contact threshold was predicted for the scenario.

11.1.3 In-water exposure

11.1.3.1 Dissolved Hydrocarbons

Table 11-4 summarises the maximum distance and direction from the release location to dissolved hydrocarbon exposure in the 0-10 m depth layer at the low (10-50 ppb), moderate (50-400 ppb) and high (≥400 ppb) thresholds levels, for both summer and winter conditions. The maximum distances to the low and moderate thresholds from the release location was predicted as 68.5 km (east in winter) and 5.2 km (east-southeast in winter), respectively. Note, no high exposure to dissolved hydrocarbons was observed.

Table 11-5 and Table 11-6 summarises the probability of exposure to individual receptors from dissolved hydrocarbons in the 0-10 m layer, for each threshold assessed, for summer and winter, respectively.

A total of 13 BIAs, the Australian EEZ and the Central Bass Strait IMCRA were predicted to be exposed at, or above, the low threshold during both seasons assessment as the release location resides within all the exposed receptors. No other receptors were exposed to dissolved hydrocarbons. The maximum probability of exposure at the low and moderate thresholds were predicted to be 53% and 3% respectively, for all receptors during winter conditions.

Figure 11-3 and Figure 11-4 present the zones of potential dissolved hydrocarbon exposure for the 0-10 m depth layer, for each threshold assessed, for summer and winter, respectively.

Table 11-4 Maximum distance and direction from the release location to dissolved hydrocarbon exposure thresholds in the 0 – 10 m depth layer, based on a 300 m³ surface release of MDO over 6 hours, tracked for 20 days.

Distance and direction travelled	Zones of potential dissolved hydrocarbon exposure		
	Low	Moderate	High
Summer			
Maximum distance (km) from the release location	50.0	0.9	0
Maximum distance (km) from release location (99th percentile)	45.4	0.9	0
Direction	E	SSW	-
Winter			
Maximum distance (km) from the release location	68.5	5.2	0
Maximum distance (km) from release location (99th percentile)	51.0	5.2	0
Direction	E	ESE	-

Table 11-5 Probability of dissolved hydrocarbons exposure to marine based receptors in the 0–10 m depth. Results are based on a 200 m³ surface release of MDO over 6 hours, tracked for 20 days. The results were calculated from 100 spill simulations and presented for summer conditions.

Receptor		Maximum instantaneous dissolved hydrocarbon exposure	Probability of instantaneous hydrocarbon exposure		
			Low	Moderate	High
BIA	Black-browed Albatross – Foraging*	53.9	43	2	-
	Buller's Albatross - Foraging*	53.9	43	2	-
	Campbell Albatross - Foraging*	53.9	43	2	-
	Common Diving-petrel - Foraging*	53.9	43	2	-
	Indian Yellow-nosed Albatross - Foraging*	53.9	43	2	-
	Pygmy Blue Whale - Distribution*	53.9	43	2	-
	Pygmy Blue Whale - Foraging*	53.9	43	2	-
	Short-tailed Shearwater - Foraging*	53.9	43	2	-
	Shy Albatross - Foraging*	53.9	43	2	-
	Southern Right Whale - Known core range*	53.9	43	2	-
	Wandering Albatross - Foraging*	53.9	43	2	-
	White Shark - Distribution*	53.9	43	2	-
	White-faced Storm-petrel - Foraging*	53.9	43	2	-
EEZ	Australian Exclusive Economic Zone*	53.9	43	2	-
IMCRA	Central Bass Strait*	53.9	43	2	-

*The release location resides within the receptor boundaries.

Table 11-6 **Probability of dissolved hydrocarbons exposure to marine based receptors in the 0–10 m depth. Results are based on a 200 m³ surface release of MDO over 6 hours, tracked for 20 days. The results were calculated from 100 spill simulations and presented for winter conditions.**

Receptor		Maximum instantaneous dissolved hydrocarbon exposure	Probability of instantaneous hydrocarbon exposure		
			Low	Moderate	High
BIA	Black-browed Albatross – Foraging*	67.8	53	3	-
	Buller's Albatross - Foraging*	67.8	53	3	-
	Campbell Albatross - Foraging*	67.8	53	3	-
	Common Diving-petrel - Foraging*	67.8	53	3	-
	Indian Yellow-nosed Albatross - Foraging*	67.8	53	3	-
	Pygmy Blue Whale - Distribution*	67.8	53	3	-
	Pygmy Blue Whale - Foraging*	67.8	53	3	-
	Short-tailed Shearwater - Foraging*	67.8	53	3	-
	Shy Albatross - Foraging*	67.8	53	3	-
	Southern Right Whale - Known core range*	67.8	53	3	-
	Wandering Albatross - Foraging*	67.8	53	3	-
	White Shark - Distribution*	67.8	53	3	-
	White-faced Storm-petrel - Foraging*	67.8	53	3	-
EEZ	Australian Exclusive Economic Zone*	67.8	53	3	-
IMCRA	Central Bass Strait*	67.8	53	3	-

*The release location resides within the receptor boundaries.

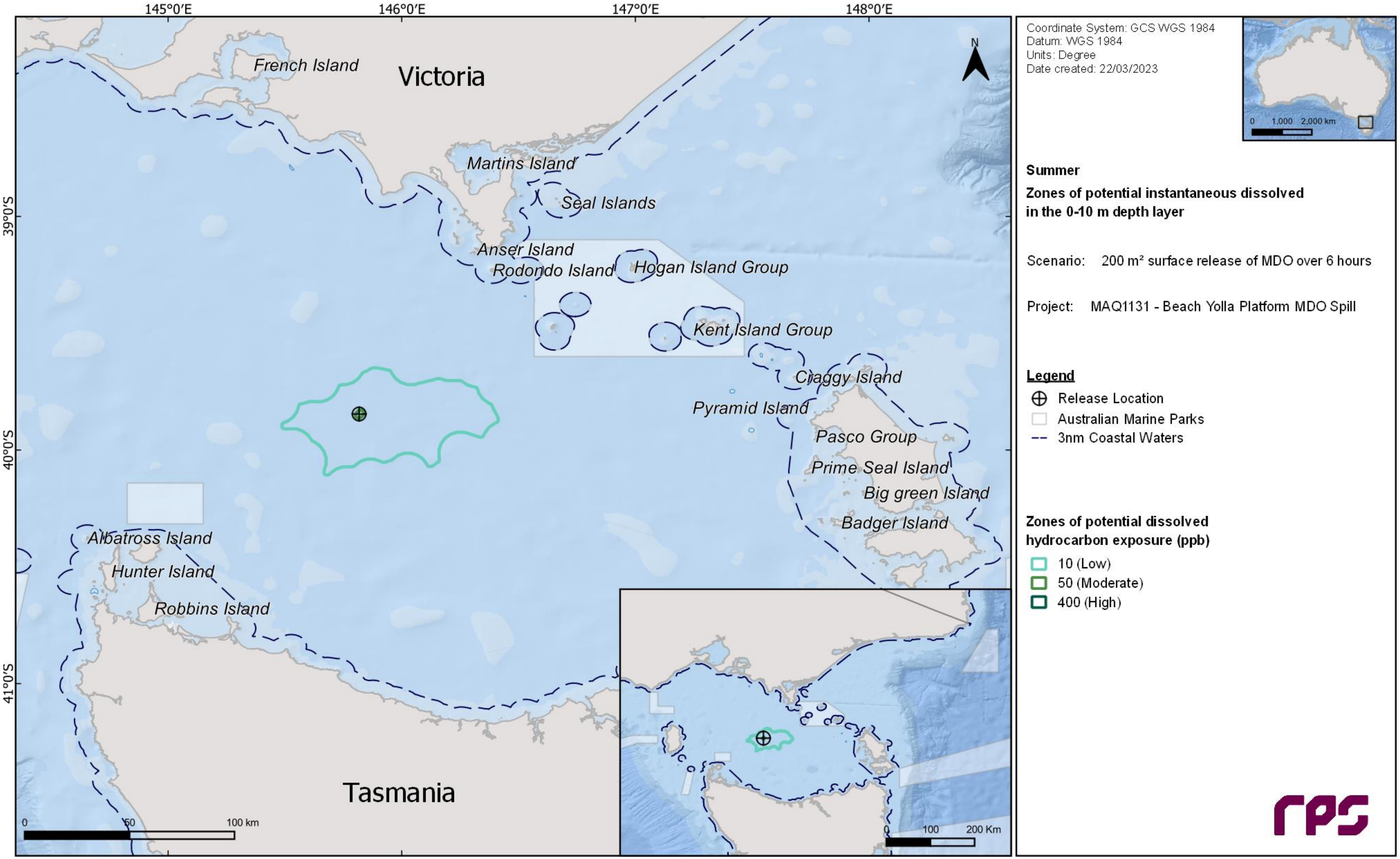


Figure 11-3 Zones of potential dissolved hydrocarbon exposure at 0-10 m below the sea in the event of a 200 m³ of MDO containment loss over 6 hours tracked for 20 days. The results were calculated from 100 spill simulations and presented for summer conditions.

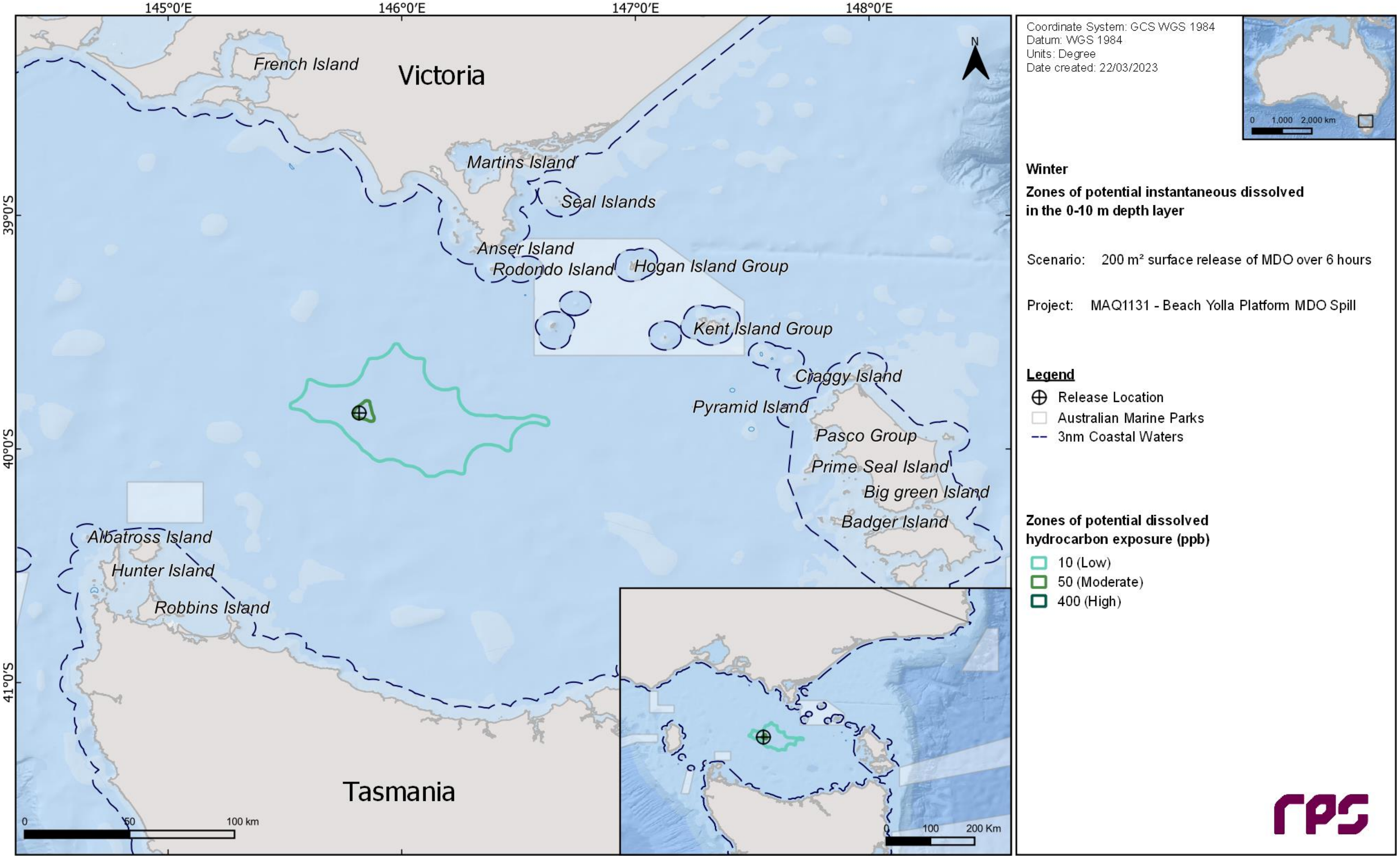


Figure 11-4 Zones of potential dissolved hydrocarbon exposure at 0-10 m below the sea in the event of a 200 m³ of MDO containment loss over 6 hours tracked for 20 days. The results were calculated from 100 spill simulations and presented for winter conditions.

11.1.3.2 Entrained Hydrocarbons

Table 11-7 summarises the maximum distance and direction from the release location to entrained hydrocarbons at the low (10-100 ppb) and high (≥ 100 ppb) exposure levels, for both summer and winter conditions. The maximum distances to the low and high thresholds from the release location was 275.7 km (east-northeast in winter) and 109.3 km (east in winter), respectively.

Table 11-8 presents the exposure to individual receptors from entrained hydrocarbons in the 0-10 m depth layer for both summer and winter.

Low and high entrained hydrocarbon exposures were predicted for BIA and IMCRA receptors. Receptors demonstrating the greatest entrained hydrocarbons concentrations of 6,509 ppb during winter all contained the release location. The highest concentration for a receptor which did not surround the release location was Flinders IMCRA (150 ppb) during winter conditions and the probability of exposure based on the low and high thresholds was 10% and 1% respectively.

Figure 11-5 and Figure 11-6 illustrate the zones of potential entrained hydrocarbon exposure for the 0-10 m depth for summer and winter, respectively.

Table 11-7 Maximum distance and direction from the release location to entrained hydrocarbon exposure thresholds in the 0 – 10 m depth layer. Results are based on a 200 m³ surface release of MDO over 6 hours, tracked for 20 days.

Distance and direction travelled	Zones of potential entrained hydrocarbon exposure	
	Low	High
Summer		
Maximum distance (km) from the release location	147.3	104.7
Maximum distance (km) from release location (99th percentile)	133.2	90.8
Direction	ENE	E
Winter		
Maximum distance (km) from the release location	275.7	109.3
Maximum distance (km) from release location (99th percentile)	239.3	99.3
Direction	ENE	E

Table 11-8 Probability of entrained hydrocarbons exposure to marine based receptors in the 0–10 m depth layer. Results are based on a 200 m³ surface release of MDO over 6 hours, tracked for 20 days. The results were calculated from 100 spill simulations and presented for summer and winter conditions.

Receptor		Summer			Winter		
		Maximum instantaneous entrained hydrocarbon exposure	Probability of instantaneous entrained hydrocarbon exposure		Maximum instantaneous entrained hydrocarbon exposure	Probability of instantaneous entrained hydrocarbon exposure	
			Low	High		Low	High
AMP	Beagle	46	5	-	46	5	-
	Boags	42	5	-	1	-	-
BIA	Antipodean Albatross - Foraging	11	1	-	12	1	-
	Australasian Gannet - Foraging	12	1	-	0	-	-
	Black-browed Albatross – Foraging*	5,192	97	93	6,509	96	86
	Black-faced Cormorant - Foraging	12	1	-	6	-	-
	Buller's Albatross – Foraging*	5,192	97	93	6,509	96	86
	Campbell Albatross – Foraging*	5,192	97	93	6,509	96	86
	Common Diving-petrel – Foraging*	5,192	97	93	6,509	96	86
	Indian Yellow-nosed Albatross – Foraging*	5,192	97	93	6,509	96	86
	Little Penguin - Foraging	45	6	-	21	1	-
	Pygmy Blue Whale – Distribution*	5,192	97	93	6,509	96	86
	Pygmy Blue Whale – Foraging*	5,192	97	93	6,509	96	86
	Short-tailed Shearwater – Foraging*	5,192	97	93	6,509	96	86
	Shy Albatross – Foraging*	5,192	97	93	6,509	96	86
	Southern Right Whale - Known core range*	5,192	97	93	6,509	96	86
	Wandering Albatross – Foraging*	5,192	97	93	6,509	96	86
	White Shark – Distribution*	5,192	97	93	6,509	96	86
	White Shark - Foraging	56	5	-	72	7	-
	White-faced Storm-petrel – Foraging*	5,192	97	93	6,509	96	86
EEZ	Australian Exclusive Economic Zone*	5,192	97	93	6,509	96	86
IBRA	Flinders	40	4	-	37	6	-
	Wilsons Promontory	11	1	-	13	1	-
IMCRA	Boags	25	4	-	0	-	-

Receptor		Summer			Winter		
		Maximum instantaneous entrained hydrocarbon exposure	Probability of instantaneous entrained hydrocarbon exposure		Maximum instantaneous entrained hydrocarbon exposure	Probability of instantaneous entrained hydrocarbon exposure	
			Low	High		Low	High
	Central Bass Strait*	5,192	97	93	6,509	96	86
	Flinders	100	7	1	150	10	1
	Otway	12	1	-	0	-	-
	Twofold Shelf	30	1	-	44	4	-
NP	Kent Group	30	1	-	37	4	-
RSB	Cutter Rock	13	1	-	12	1	-
	Endeavour Reef	4	-	-	13	1	-
	Wakitipu Rock	9	-	-	18	3	-
	Warrego Rock	5	-	-	12	2	-
Shoreline	Craggy Island	1	-	-	11	1	-
	Curtis Island	22	4	-	19	1	-
	Kent Island Group	30	1	-	37	4	-
	Pyramid Island	40	2	-	34	6	-
	Rodondo Island	11	1	-	13	1	-
State Waters	Tasmania State Waters	45	6	-	37	5	-
	Victoria State Waters	13	1	-	14	1	-

*The release location resides within the receptor boundaries.

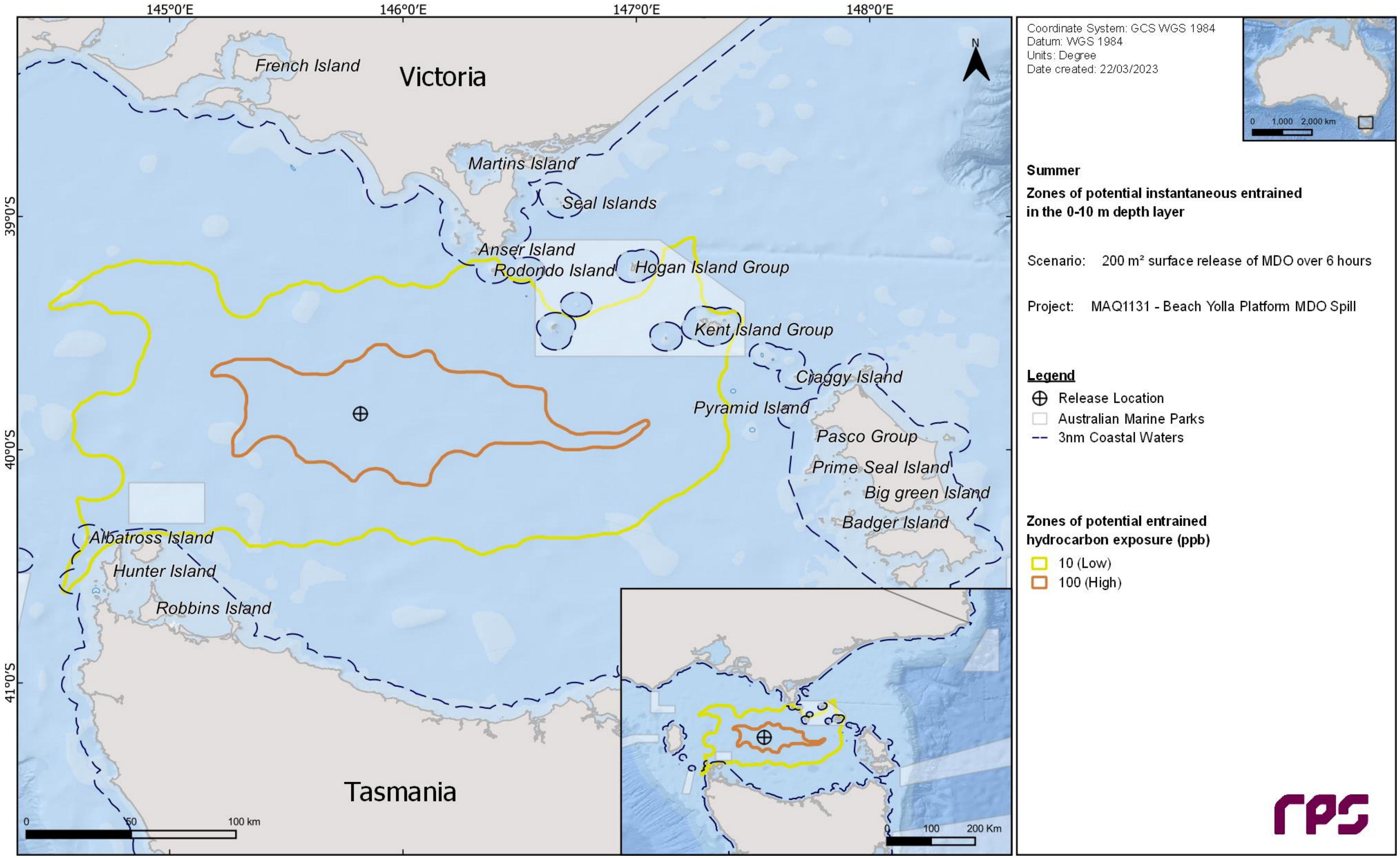


Figure 11-5 Zones of potential entrained hydrocarbon exposure at 0-10 m below the sea surface in the event of a 200 m³ of MDO containment loss over 6 hours tracked for 20 days. The results were calculated from 100 spill simulations and presented for summer conditions.

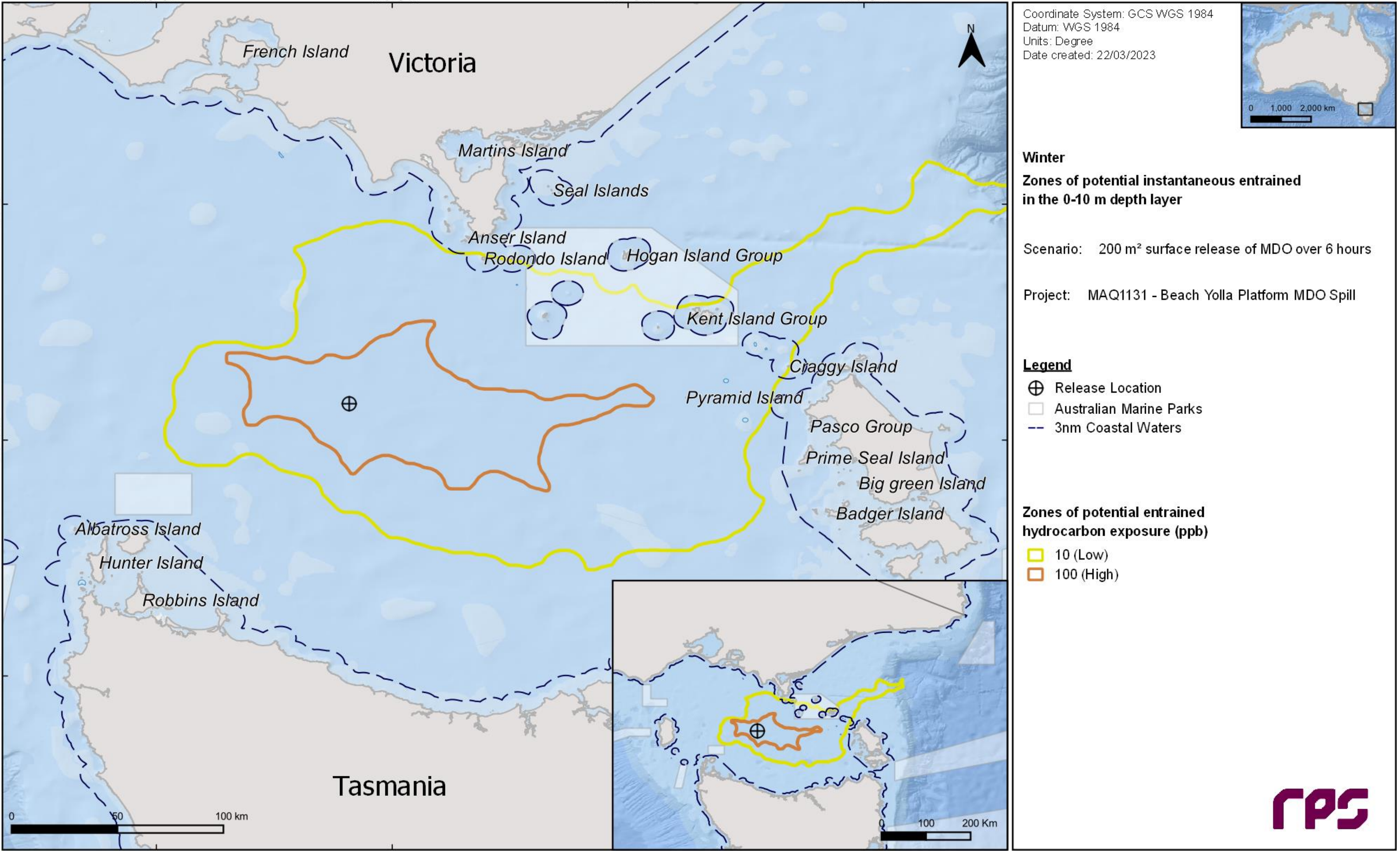


Figure 11-6 Zones of potential entrained hydrocarbon exposure at 0-10 m below the sea surface in the event of a 200 m³ of MDO containment loss over 6 hours tracked for 20 days. The results were calculated from 100 spill simulations and presented for winter conditions.

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Appendix G RPS Oil Spill Modelling Report – Otway

THYLACINE INSTALLATION AND COMMISSIONING – PHASE 5

Oil Spill Modelling – Variation 1

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Thylacine Installation and
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TERMS AND ABBREVIATIONS

AMP	Australian Marine Park
ANZECC	Australian and New Zealand Environment and Conservation Council
API	American Petroleum Institute gravity. A measure of how heavy or light a petroleum liquid is compared to water.
ARMCANZ	Agriculture and Resource Management Council of Australia and New Zealand
ASTM	American Society for Testing and Materials
BIA	Biologically Important Areas
Bonn Agreement	An agreement for cooperation in dealing with pollution of the North Sea by oil and other harmful substances, 1983, includes: Governments of the Kingdom of Belgium, the Kingdom of Denmark, the French Republic, the Federal Republic of Germany, the Republic of Ireland, the Kingdom of the Netherlands, the Kingdom of Norway, the Kingdom of Sweden, the United Kingdom of Great Britain and Northern Ireland and the European Union.
BP	Boiling point. The temperature at which the vapor pressure of the liquid is equal to the pressure exerted on it by the surrounding atmosphere
BTEX	Benzene, Toluene, Ethylbenzene, and Xylenes
CFSR	Climate Forecast System Reanalysis
Decay	The process where oil components are changed either chemically or biologically (biodegradation) to another compound. It includes breakdown to simpler organic carbon compounds by bacteria and other organisms, photo-oxidation by solar energy, and other chemical reactions.
Deterministic oil spill modelling	Oil spill modelling involving a computer simulation of a single hypothetical oil spill event subject to a single sequence of wind, current and other sea conditions over time. Single oil spill modelling, also referred to as “deterministic modelling” provides a simulation of one possible outcome of a given spill scenario, subject to the metocean conditions that are imposed. Single oil spill modelling is commonly used to consider the fate and effects of ‘worst-case’ oil spill scenarios that are carefully selected in consideration of the nature and scale of the offshore petroleum activity and the local environment (NOPSEMA, 2017). Because the outcomes of a single oil spill simulation can only represent the outcome of that scenario under one sequence of metocean conditions, worst-case conditions are often identified from stochastic modelling. It is impossible to calculate the likelihood of any outcome from a single oil spill simulation. Single oil spill modelling is generally used for response planning, preparedness planning and for supporting oil spill response operations in the event of an actual spill
Dynamic viscosity	The dynamic viscosity of a fluid expresses its resistance to shearing flows, where adjacent layers move parallel to each other with different speeds.
Floating oil exposure	Contact by floating oil on the sea surface at concentrations equal to or exceeding defined threshold concentrations. The consequence will vary depending on the threshold and the receptors
GODAE	Global Ocean Data Assimilation Experiment
HYCOM	Hybrid Coordinate Ocean Model. A data-assimilative, three-dimensional ocean model
HYDROMAP	Advanced ocean/coastal tidal model used to predict tidal water levels, current speed and current direction.
IBRA	Interim Biogeographic Regionalisation for Australia bioregions
IMCRA	Integrated marine and coastal regionalisation areas
IOA	Index of Agreement
ITOPF	International Tanker Owners Pollution Federation Limited
KEF	Key Ecological Feature
LGA	Local Government Areas
MAE	Mean Absolute Error
MAHs	Monoaromatic Hydrocarbons
MDO	Marine diesel oil
MEG	Mono-Ethylene Glycol
MNP	Marine National Park

MP	Marine Park
MS	Marine Sanctuary
NASA	National Aeronautics and Space Administration (USA)
NCEP	National Centres for Environmental Prediction (USA)
NOAA	National Oceanic and Atmospheric Administration (USA)
NOPSEMA	National Offshore Petroleum Safety and Environmental Management Authority
NP	National Park
NR	Nature Reserve
PAH	Polynuclear Aromatic Hydrocarbons
Pour Point	The pour point of a liquid is the temperature below which the liquid loses its flow characteristics
ppb	Parts per billion (concentration)
psu	Practical salinity units
Ramsar site	A site listed under the Ramsar Convention on wetlands which is an international intergovernmental treaty that provides the framework for the conservation and wise use of wetlands and their resources.
RSB	Reefs, Shoals and Banks
Shoreline accumulation	Arrival of oil at or near shorelines at on-water concentrations equal to or exceeding defined threshold concentrations. Shoreline contact is judged for floating oil arriving within a 2 km buffer zone from any shoreline as a conservative measure
SIMAP	Spill Impact Model Application Package. SIMAP is designed to simulate the fate and effects of spilled hydrocarbons for surface or subsea releases
SRTM	Shuttle Radar Topography Mission
State Waters	Low water mark seaward for three nautical miles
Stochastic oil spill modelling	Stochastic oil spill modelling is created by overlaying and statistically analysing the outcomes of many single oil-spill simulations of a defined spill scenario, where each simulation was subject to a different sequence of metocean conditions, selected objectively (typically by random selection) from a long sequence of historic conditions for the study area. Analysis of this larger set of simulations provides a more accurate indication of the environment that maybe affected (EMBA) and indicates which locations are more likely to be affected (as well as other statistics). Stochastic oil spill modelling avoids biases that affect single oil spill modelling (due to the reliance on only one possible sequence of conditions). However, when interpreting stochastic modelling, which is based on a wide range of potential conditions that might happen to occur, it is essential to understand that calculations will encompass a much larger area than could be affected in any single spill event, where a more limited set of conditions will occur. Consequently, it is misleading to imply that the region derived from stochastic modelling indicate the outcomes expected from a single spill event (NOPSEMA, 2017) Stochastic modelling is generally used for risk assessment and preparedness planning by indicating locations that could be exposed and may require response or subsequent impact assessment
Sub-LGA	Sub-Local Government Areas
TOPEX/Poseidon	A joint satellite mission between NASA and CNES to map ocean surface topography using an array of satellites equipped with detailed altimeters
US EPA	United States Environmental Protection Agency
US CG	United States Coast Guard
World Ocean Atlas	A collection of physicochemical parameters (e.g. temperature, salinity, oxygen, phosphate, silicate, and nitrate) based on profile data from the World Ocean Database (NCEI, 2021) established by NOAA's National Centers for Environmental Information (NCEI)
WGS 1984	World Geodetic System 1984 (WGS84); reference coordinate system

EXECUTIVE SUMMARY

Background

Beach Energy (Operations) Limited (Beach) plans to tie-in production from four new wells in the Thylacine field (T/L2) to the existing Otway Gas Production Pipeline (OGPP) and to extend the Mono-Ethylene Glycol (MEG) and control systems from the Thylacine Wellhead Platform (WHP) to the new wells.

The construction support vessel (CSV), *Acergy Skandi*, will be used for the installation and commissioning activities in Q1 2023. The largest marine diesel oil (MDO) fuel tank on the CSV is 603.7 m^3, however Beach has been in discussion with the operator of this vessel to fill the tanks only partially to either 200 or 300 m^3.

The locations of the well head platforms (WHP) and wells are shown in Table 1-1. Installation activities will require a buffer around these infrastructure components, thus for the purposes of this modelling study, an Activity Area was established using the infrastructure locations and the position closest to shore was selected as the release location for the modelling study.

In order to inform the offshore environmental impact and risk assessments Beach commissioned a detailed oil spill modelling study assessing the following hypothetical scenarios:

- **Scenario 1**: A 300 m^3 surface release of marine diesel oil over 6 hours following a vessel collision; and
- **Scenario 2**: A 200 m^3 surface release of marine diesel oil over 6 hours following a vessel collision.

The modelling assessment was undertaken on a seasonal basis as follows:

- Summer (November through to March); and
- Winter (April to October)

The purpose of the modelling is to provide an understanding of a conservative ‘outer envelope’ of the potential area that may be affected in the unlikely event of hydrocarbon spill. The modelling does not take into consideration any of the spill prevention, mitigation and response capabilities that would be implemented in response to the spill. Therefore, the modelling results represent the maximum extent that the released hydrocarbon may influence.

The spill modelling was performed using an advanced three-dimensional trajectory and fates model; Spill Impact Model Application Program (SIMAP). The SIMAP model calculates the transport, spreading, entrainment and evaporation of spilled hydrocarbons over time, based on the prevailing wind and current conditions and the physical and chemical properties.

Methodology

The modelling study was carried out in several stages. Firstly, a ten-year wind and current dataset (2010–2019) was generated and the currents included the combined influence of three-dimensional large-scale ocean currents and tidal currents. Secondly, the currents, winds and detailed hydrocarbon characteristics were used as inputs in the three-dimensional oil spill model (SIMAP) to simulate the drift, spread, weathering and fate of the spilled oil.

As spills can occur during any set of wind and current conditions, modelling was conducted using a stochastic (random or non-deterministic) approach, which involved running 100 randomly selected single trajectory simulations per season, with each simulation having the same spill information (spill volume, duration and composition of hydrocarbons) but varying start times from the selected location closest to shore based on the location of Beach’s Thylacine operations activity area. This ensured that each spill simulation was subject to a unique set of wind and current conditions

The SIMAP system, the methods and analysis presented herein, use modelling algorithms which have been anonymously peer reviewed and published in international journals. Further, RPS warrants that this work meets and exceeds the ASTM Standard F2067-13 “*Standard Practice for Development and Use of Oil Spill Models*”.

Oil Properties

The MDO has an API of 37.6 and a density of 829.1 kg/m^3 (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. Six percent 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 < 160°C) and a further 54.4% should evaporate over several days (160°C < BP < 380°C). Approximately 5.0% of the oil is shown to be persistent.

Results

Scenario: 300 m³ loss of containment caused by vessel collision

- 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) exposure zones was 39.3 km (east-southeast) during summer conditions, 15.3 km (east-southeast) during winter conditions and 2.7 km (west-southwest) during winter conditions, respectively.
- The probability of accumulation to any shoreline at, or above, the low level (10 g/m^2) threshold was 0% during summer conditions and 5% during winter conditions. The minimum time before oil accumulation at, or above, the low threshold was 7.58 days winter conditions.
- The maximum total volume ashore for a single spill trajectory during winter conditions was 4.3 m^3, and the maximum length of shoreline accumulation at the low threshold was 11 km. No shoreline accumulation was observed for the summer season nor the moderate or high thresholds for winter.
- A total of 14 BIAs were shown to be exposed to dissolved hydrocarbons above the low and moderate thresholds during both the summer and winter conditions. During the summer and winter conditions the maximum dissolved aromatic concentrations at any given receptor(s) was predicted to be 57 ppb and 58 ppb, respectively, which occurred within receptors containing the release location.
- During both summer and winter conditions entrained hydrocarbon exposures at, or above, the low threshold was predicted for AMP, BIA, IBRA, IMCRA, KEF, MNP, RSB, nearshore waters (LGA and sub-LGA) and State Water receptors. The maximum entrained hydrocarbon concentration predicted during the summer and winter conditions was 6,323 ppb and 7,007 ppb, respectively, which occurred within the receptors containing the release location.

Scenario: 200 m³ loss of containment caused by vessel collision

- 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) exposure zones was 36.5 km (east-southeast) during summer conditions, 9.4 km (southeast) during winter conditions and 0.5 km (southwest) during winter conditions, respectively.
- The probability of accumulation to any shoreline at, or above, the low level (10 g/m^2) threshold was 0% during summer conditions and 2% during winter conditions.
- The minimum time before oil accumulation at, or above, the low threshold was 8.13 days during the winter conditions. The maximum total volume ashore for a single spill trajectory during the winter conditions was 2.7 m^3, and the maximum length of shoreline accumulation at the low threshold was 5 km. No shoreline accumulation was observed for the summer season nor the moderate or high thresholds for winter.
- A total of 14 BIAs were shown to be exposed to dissolved hydrocarbons above the low threshold during both the summer and winter conditions. During the summer and winter conditions the maximum dissolved aromatic concentrations at any given receptor(s) was predicted to be 45 ppb and 43 ppb, respectively, which occurred within receptors containing the release location.
- During both summer and winter conditions entrained hydrocarbon exposures at, or above, the low and high threshold was predicted for AMP, BIA, IBRA, IMCRA, KEF, MNP, RSB, nearshore waters (LGA and sub-LGA) and State Water receptors. The maximum entrained hydrocarbon concentration predicted during the summer and winter conditions was 4,243 ppb and 4,604 ppb, respectively, which occurred within receptors containing the release location.

1 INTRODUCTION

1.1 Background

Beach Energy (Operations) Limited (Beach) plans to tie-in production from four new wells in the Thylacine field (T/L2) to the existing Otway Gas Production Pipeline (OGPP) and to extend the Mono-Ethylene Glycol (MEG) and control systems from the Thylacine Wellhead Platform (WHP) to the new wells.

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Note that the oil spill model, the method and analysis presented herein uses modelling algorithms which have been anonymously peer reviewed and published in international journals. Furthermore, RPS warrants that this work meets and exceeds the American Society for Testing and Materials (ASTM) Standard F2067-13 “*Standard Practice for Development and Use of Oil Spill Models*”.

Table 1-1 Location of Thylacine operations infrastructure used to define the Activity Area.

Infrastructure	Latitude	Longitude
Thylacine-A WHP	39º 14.241' S	142º 54.126' E
Thylacine North-1 (TN-1) well	39° 12.510' S	142° 52.496' E
Thylacine North-2 (TN-2) well	39° 12.284’ S	142° 51.557’ E
Thylacine West-1 (TW-1) well	39° 13.338' S	142° 50.318' E
Thylacine West-2 (TW-2) well	39° 13.332' S	142° 50.310' E

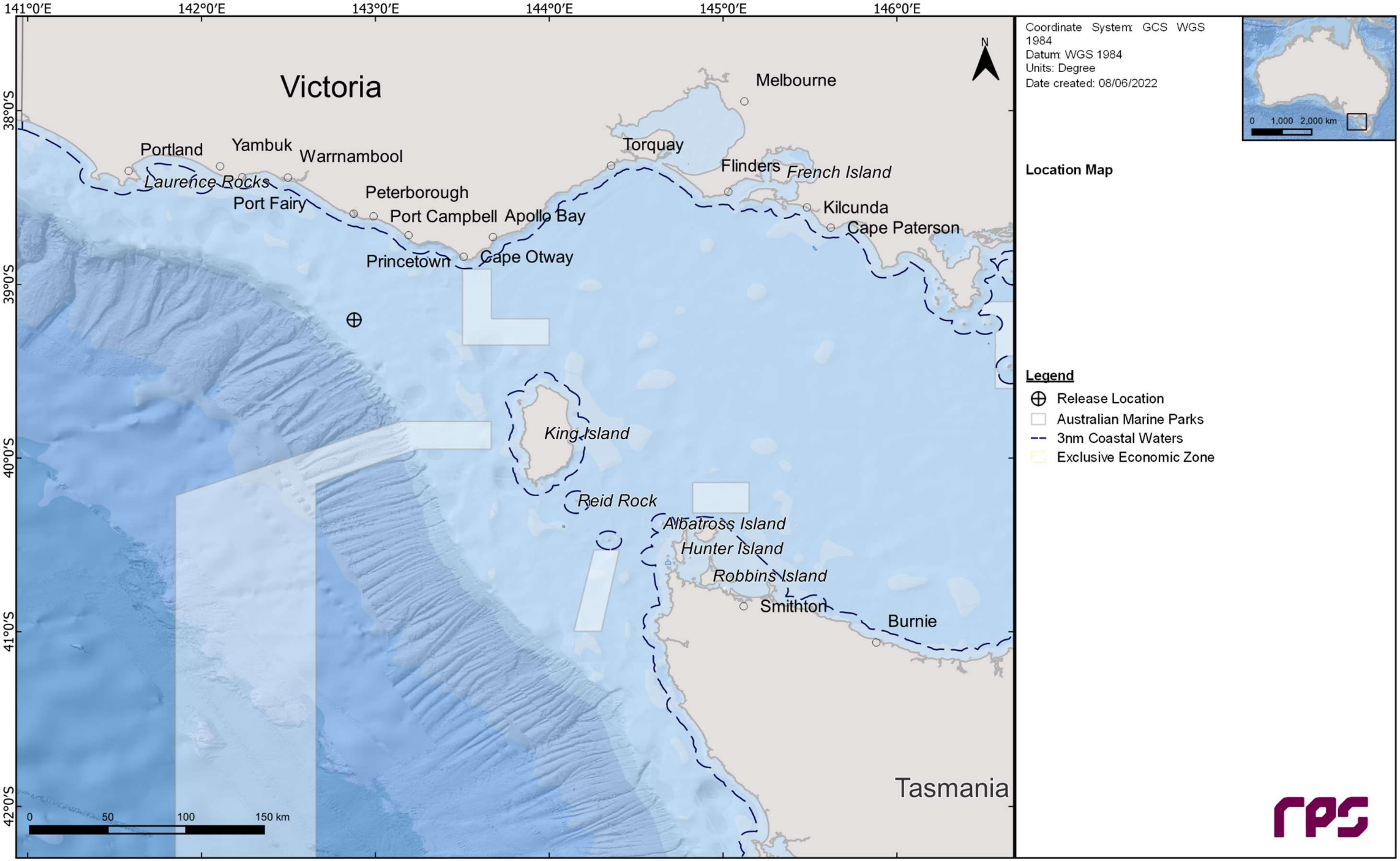

Figure 1-1 Map of the Thylacine Activity Area release location.

1.2 What is Oil Spill Modelling?

Oil spill modelling is a valuable tool widely used for risk assessment, emergency response and contingency planning where it can be particularly helpful to proponents and decision makers. By modelling a series of the most likely oil spill scenarios, decisions concerning suitable response measures and strategic locations for deploying equipment and materials can be made, and the locations at most risk can be identified. The two types of oil spill modelling often used are stochastic (Section 1.2.1) and deterministic (Section 1.2.2) modelling.

1.2.1 Stochastic Modelling (Multiple Spill Simulations)

Stochastic oil spill modelling is created by overlaying a great number (often hundreds) of individual, computer-simulated hypothetical spills (NOPSEMA, 2018; Figure 1.2).

Stochastic modelling is a common means of assessing the potential risks from oil spills related to new projects and facilities. Stochastic modelling typically utilises hydrodynamic data for the location in combination with historic wind data. Typically, 100 iterations of the model will be run utilising the data that is most relevant to the season or timing of the project.

The outcomes are often presented as a probability of exposure and is primarily used for risk assessment purposes in view to understand the range of environments that may be affected or impacted by a spill. Elements of the stochastic modelling can also be used in oil spill preparedness and planning.

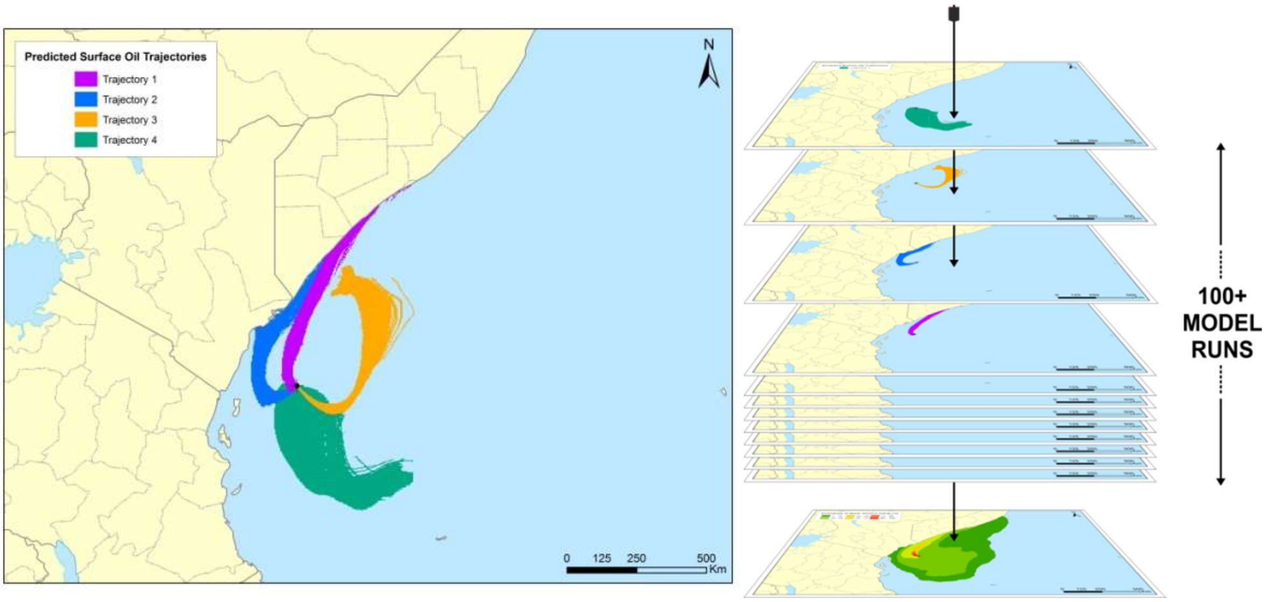

Figure 1-2 Examples of four individual spill trajectories (four replicate simulations) predicted by SIMAP for a spill scenario. The frequency of contact with given locations is used to calculate the probability of impacts during a spill. Essentially, all model runs are overlain (shown as the stacked runs on the right) and the number of times that trajectories contact a given location at a concentration is used to calculate the probability.

1.2.2 Deterministic Modelling (Single Spill Simulation)

Deterministic modelling is the predictive modelling of a single incident subject to a single sample of wind and weather conditions over time (NOPSEMA, 2018; Figure 1-3).

Deterministic modelling is often paired with stochastic modelling to place the large stochastic footprint into perspective. This deterministic analysis is generally a single run selected from the stochastic analysis and serves as the basis for developing the plans and equipment needs for a realistic spill response. Deterministic spills can be selected on several basis such as minimum time to shoreline, largest swept area, maximum volume ashore, longest length of shoreline contacted by oil or largest area of entrained or dissolved hydrocarbons.

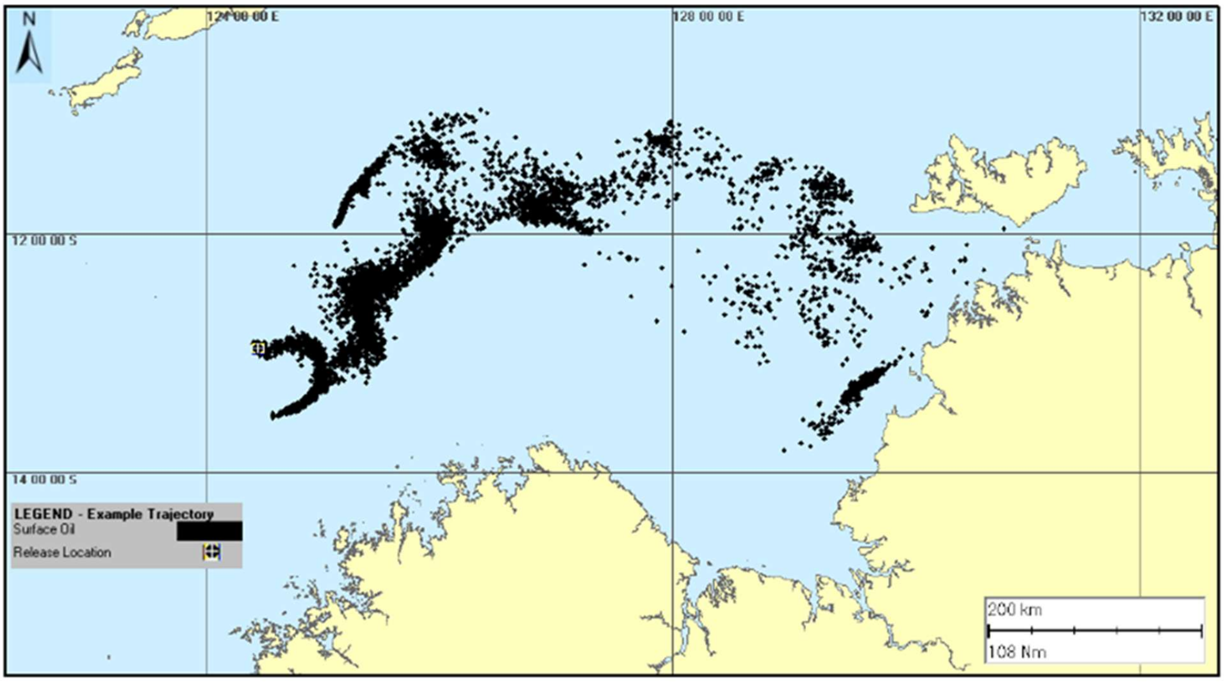

Figure 1-3 Example of an individual spill trajectory predicted by SIMAP for a spill scenario. Note, this image represents surface oil as spillets and do not take any thresholds into consideration.

2 SCOPE OF WORK

The scope of work included the following components:

- Generate 10 years of winds and three-dimensional currents from 2010 to 2019 (inclusive). The currents included the combined influence of tidal and ocean currents;
- Include the wind and current data and characteristics of the MDO as input into the three-dimensional oil spill model (SIMAP), to model the movement, spreading, weathering and shoreline contact by hydrocarbons over time;
- Use SIMAP's stochastic model (also known as a probability model) to calculate exposure to surround waters and shorelines. This involved running 100 randomly selected single trajectory simulations per season, with each simulation having the same spill information (spill volume, duration and composition of hydrocarbons) but varying start times from the selected location closest to shore based on the location of Beach's Thylacine operations Activity Area (see Figure 1-1 and Table 1-1). This ensured that each spill simulation was subject to a unique set of wind and current conditions;
- Results were assessed to determine the exposure to waters and contact to shorelines based upon the NOPSEMA thresholds; and
- The stochastic modelling results were reviewed, and the "worst case" deterministic runs were identified and presented based on the following criteria (if applicable):
  a. Largest volume of oil ashore;
  b. Longest length of oil accumulation on shorelines above 100 g/m^2;
  c. minimum time before shoreline contact above 10 g/m^2.

3 REGIONAL CURRENTS

Bass Strait is a body of water separating Tasmania from the southern Australian mainland, specifically the state of Victoria. The strait is a relatively shallow area of the continental shelf, connecting the southeast Indian Ocean with the Tasman Sea. Currents within the straight are primarily driven by tides, winds, incident continental shelf waves and density driven flows; high winds and strong tidal currents are frequent within the area (Jones, 1980).

The varied geography and bathymetry of the region, in addition to the forcing of the south-eastern Indian Ocean and local meteorology lead to complex shelf and slope circulation patterns (Middleton & Bye, 2007). Figure 3-1 displays seasonal current trends within the Bass Strait. During winter there is a strong eastward water flow due to the strengthening of the South Australian Current (fed by the Leeuwin Current in the Northwest Shelf), which bifurcates with one extension moving though the Bass Strait, and another forming the Zeehan Current off western Tasmania (Sandery & Kämpf, 2007). During summer, water flow reverses off Tasmania, King Island and the Otway Basin travelling eastward, as the coastal current develops due to south-easterly winds.

To accurately describe the variability in currents between the inshore and offshore region, a hybrid regional dataset was developed by combining deep ocean predictions obtained from HYCOM (Hybrid Coordinate Ocean Model) with surface tidal currents developed by RPS. The following sections provide a summary of the hybrid regional dataset.

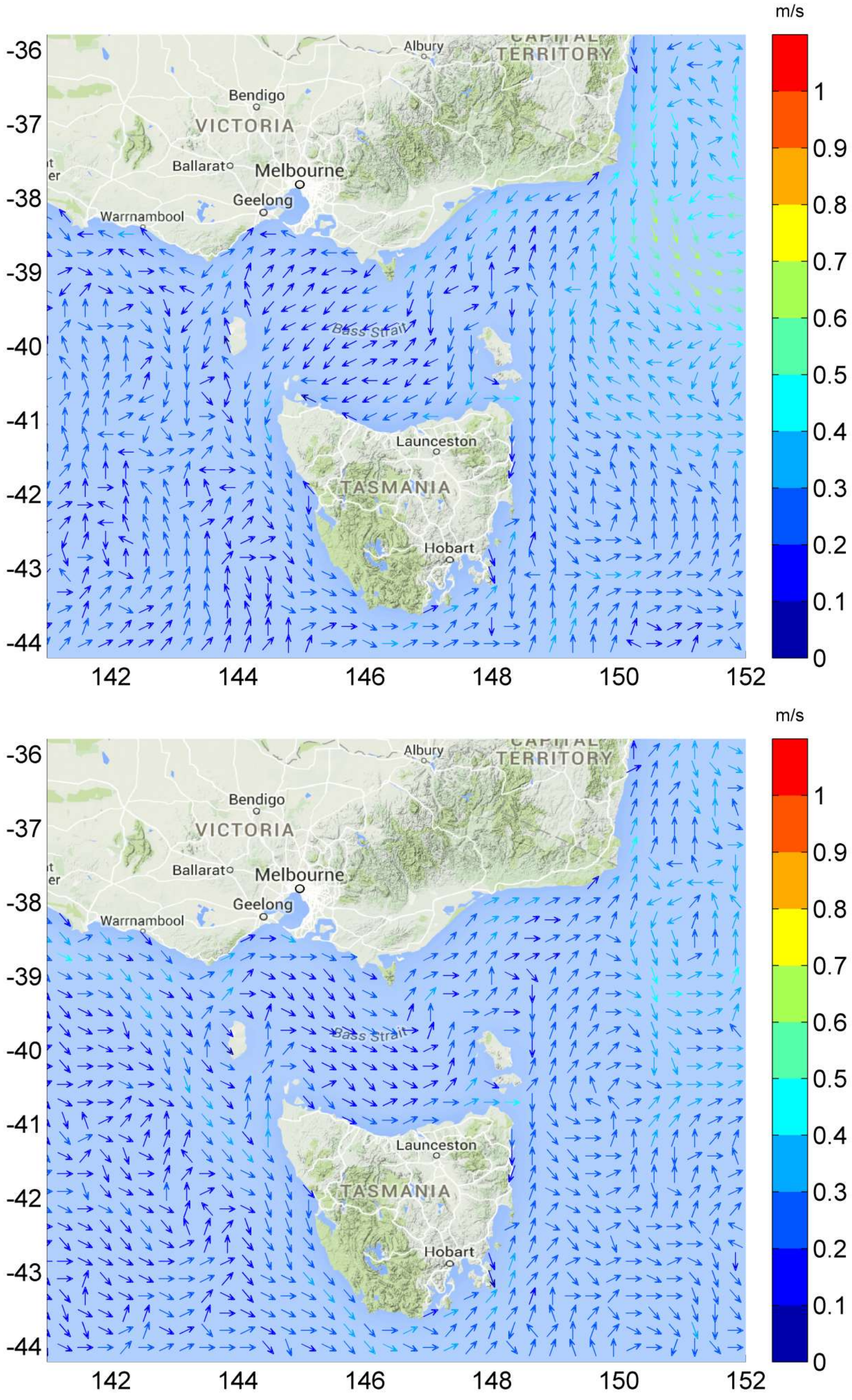

Figure 3-1 **HYCOM averaged seasonal surface drift currents during summer (upper image) and winter (lower image).**

3.1 Tidal currents

Tidal current data was generated using RPS's advanced ocean/coastal model, HYDROMAP. The HYDROMAP model has been thoroughly tested and verified through field measurements throughout the world for more than 30 years (Isaji & Spaulding, 1984; Isaji, et al., 2001; Zigic, et al., 2003). HYDROMAP tidal current data has been used as input to forecast (in the future) and hindcast (in the past) pollutant spills in Australian waters and forms part of the Australian National Oil Spill Emergency Response System operated by AMSA (Australian Maritime Safety Authority).

HYDROMAP employs a sophisticated sub-gridding strategy, which supports up to six levels of spatial resolution, halving the grid cell size as each level of resolution is employed. The sub-gridding allows for higher resolution of currents within areas of greater bathymetric and coastline complexity, and/or of interest to a study.

The numerical solution methodology follows that of Davies (1977a and 1977b) with further developments for model efficiency by Owen (1980) and Gordon (1982). A more detailed presentation of the model can be found in Isaji and Spaulding (1984) and Isaji et al. (2001).

3.1.1 Grid Setup

The tidal model domain is sub-gridded to a resolution of 500 m for shallow and coastal regions, starting from an offshore (or deep water) resolution of 8 km. The finer grids are progressively allocated in a step-wise fashion to more accurately resolve flows along the coastline, around islands and over regions with more complex bathymetry. Figure 3-2 shows the tidal model grid covering the study domain.

A combination of datasets was used and merged to describe the shape of the seabed within the grid domain (Figure 3-3). These included spot depths and contours which were digitised from nautical charts released by the hydrographic offices as well as Geoscience Australia database and depths extracted from the Shuttle Radar Topography Mission (SRTM30_PLUS) Plus dataset (see Becker et al., 2009).

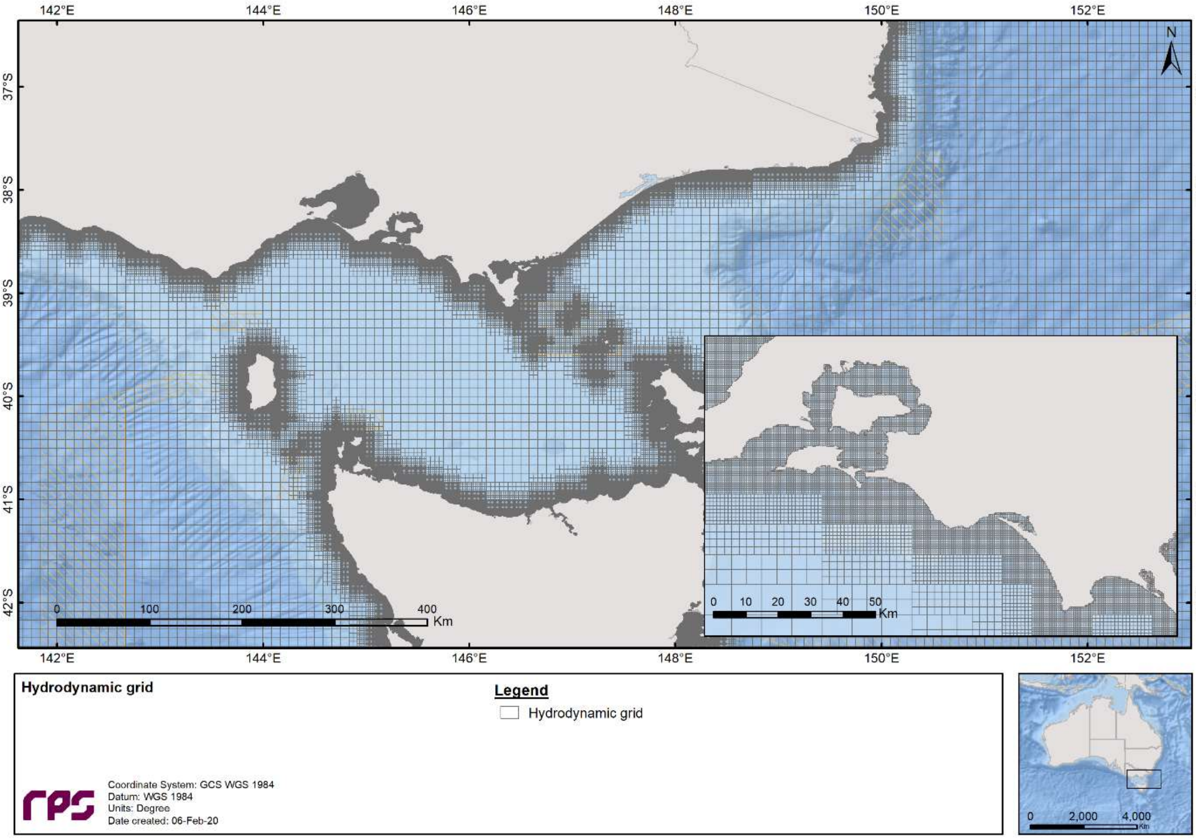

Figure 3-2 Sample of the model grid used to generate the tidal currents for the study region. Higher resolution areas are shown by the denser mesh.

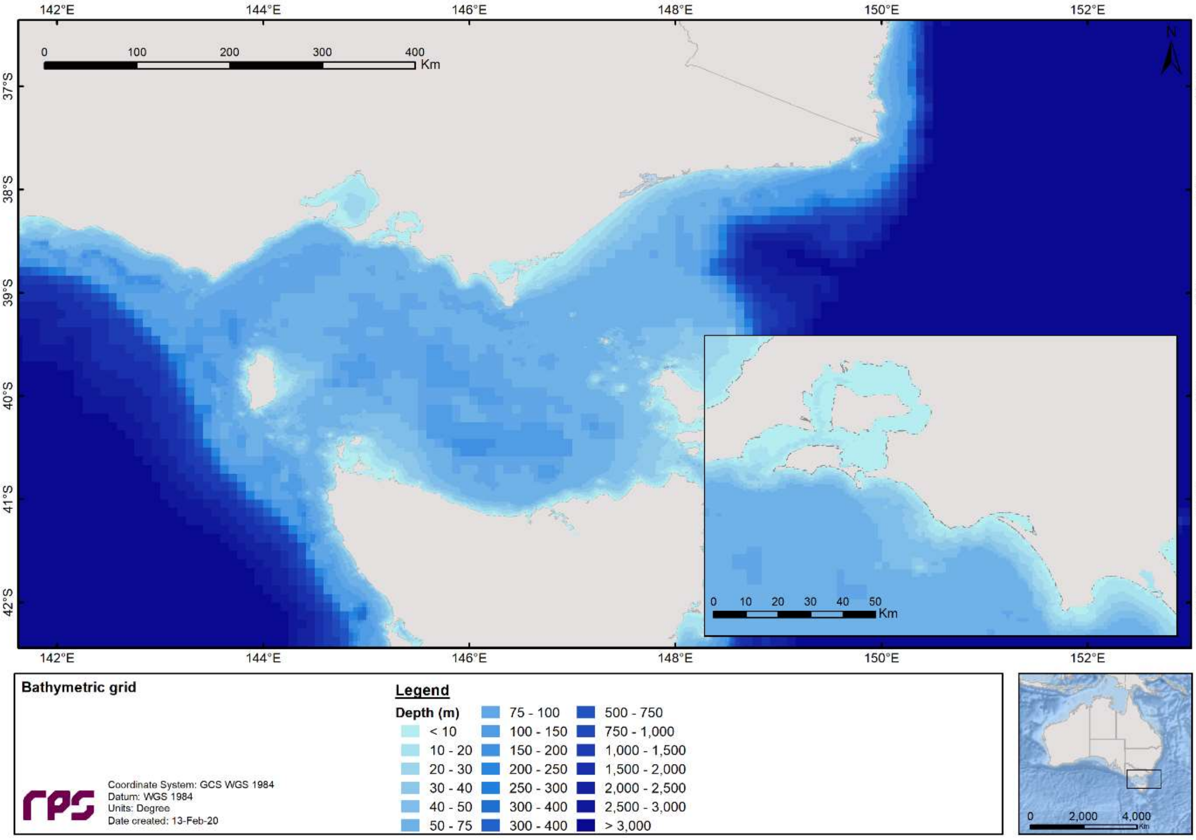

Figure 3-3 Bathymetry defined throughout the tidal model domain.

3.1.2 Tidal Conditions

The ocean boundary data for the regional model was obtained from satellite measured altimetry data (TOPEX/Poseidon 8.0) which provided estimates of the eight dominant tidal constituents at a horizontal scale of approximately 0.25 degrees. The eight major tidal constituents used were K_2, S_2, M_2, N_2, K_1, P_1, O_1 and Q_1. Using the tidal data, time series surface heights were calculated along the open boundaries for the simulation period.

The Topex/Poseidon satellite data has a resolution of 0.25 degrees globally, with higher resolution in coastal regions, and is produced and quality controlled by NASA (National Aeronautics and Space Administration). The data capturing satellites, equipped with two altimeters capable of taking sea level measurements accurate to less than ± 5 cm, measured oceanic surface elevations (and the resultant tides) for the period 1992–2005. In total these satellites carried out 62,000 orbits of the planet. The Topex/Poseidon tidal data has been widely used amongst the oceanographic community, being refereced in more than 2,100 research publications (e.g. Andersen, 1995; Ludicone et al., 1998; Matsumoto et al., 2000; Kostianoy et al., 2003; Yaremchuk & Tangdong, 2004; Qiu & Chen 2010). The Topex/Poseidon tidal data is considered suitably accurate for this study.

3.1.3 Surface Elevation Validation

To ensure that tidal predictions were accurate, predicted surface elevations were compared to data observed at a location situated within the study area (Figure 3-4).

To provide a statistical measure of the model performance, the Index of Agreement (IOA – Willmott, 1981) and the Mean Absolute Error (MAE – Willmott, 1982; Willmott & Matsuura, 2005) were used.

The MAE (Eq.1) is simply the average of the absolute values of the difference between the model-predicted (P) and observed (O) variables. It is a more natural measure of the average error (Willmott and Matsuura, 2005) and more readily understood. The MAE is determined by:

$$MAE = N^{-1} \sum_{i=1}^{N} |P_i - O_i| \qquad \text{Eq.1}$$

Where: N = Number of observations

P_i = Model predicted surface elevation

O_i = Observed surface elevation

The Index of Agreement (IOA; Eq. 2) in contrast, gives a non-dimensional measure of model accuracy or performance. A perfect agreement between the model predicted and observed surface elevations exists if the index gives an agreement value of 1, and complete disagreement between model and observed surface elevations will produce an index measure of 0 (Wilmott, 1981). Willmott et al. (1985) also suggests that values larger than 0.5 may represent good model performance. The IOA is determined by:

$$IOA = 1 - \frac{\sum |X_{model} - X_{obs}|^2}{\sum (|X_{model} - \overline{X_{obs}}| + |X_{obs} - \overline{X_{obs}}|)^2} \qquad \text{Eq.2}$$

Where: X_{model} = Model predicted surface elevation

X_{obs} = Observed surface elevation

Clearly, a greater IOA and lower MAE represent a better model performance.

Figure 3-5 and Figure 3-6 illustrate a comparison of the predicted and observed surface elevations in February 2017. As shown on the graph, the model accurately reproduced the phase and amplitudes throughout the spring and neap tidal cycles.

Table 3-1 shows the IOA and MAE values for the selected tide station locations indicating that the model is performing well.

Table 3-1 Statistical comparison between the observed and HYDROMAP predicted surface elevations.

Tide Station	IOA	MAE (m)
Gabo Island	0.98	0.08
Port MacDonnell	0.98	0.05
Port Welshpool	0.92	0.30
Portland	0.97	0.07
Stack Island	0.96	0.22

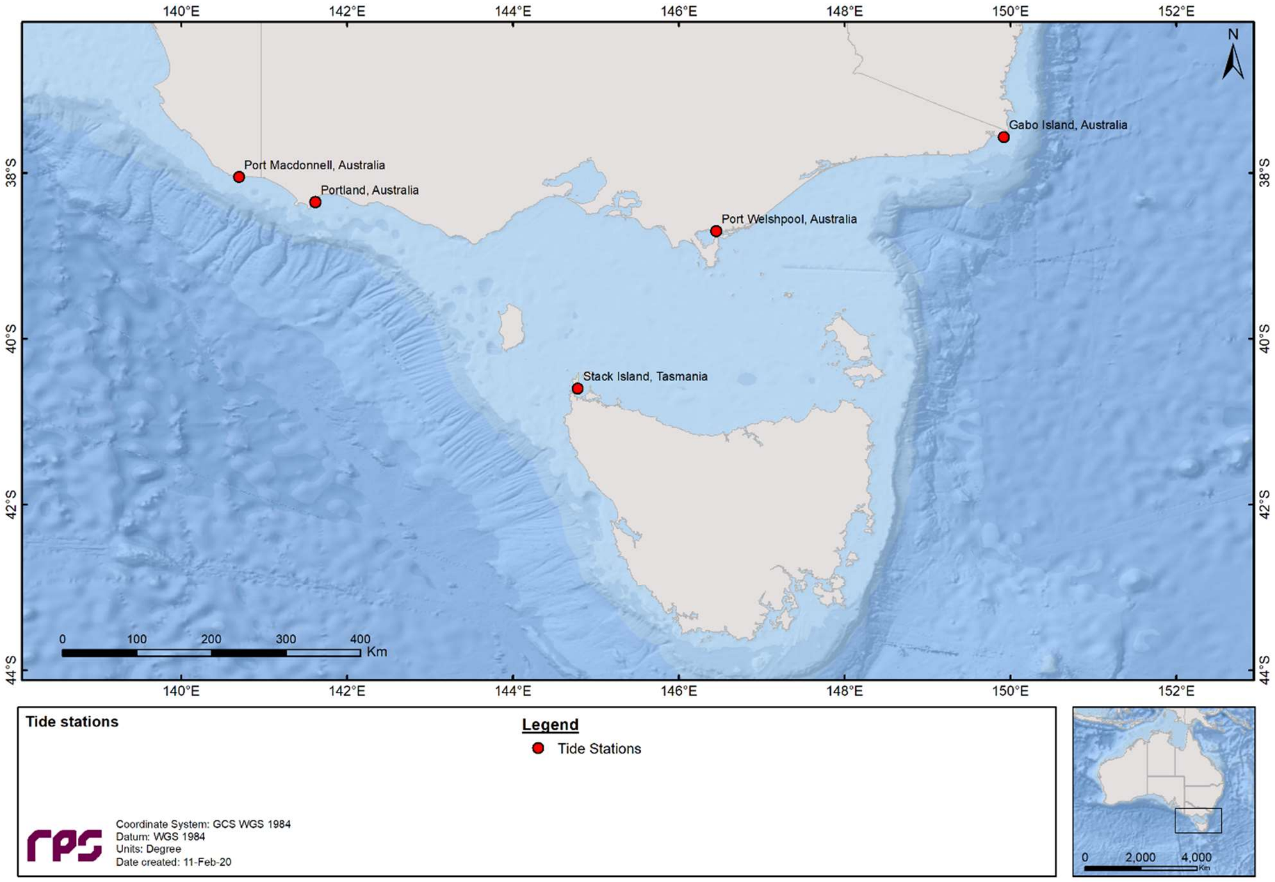

Figure 3-4 Location of the tide stations used in the surface elevation validation.

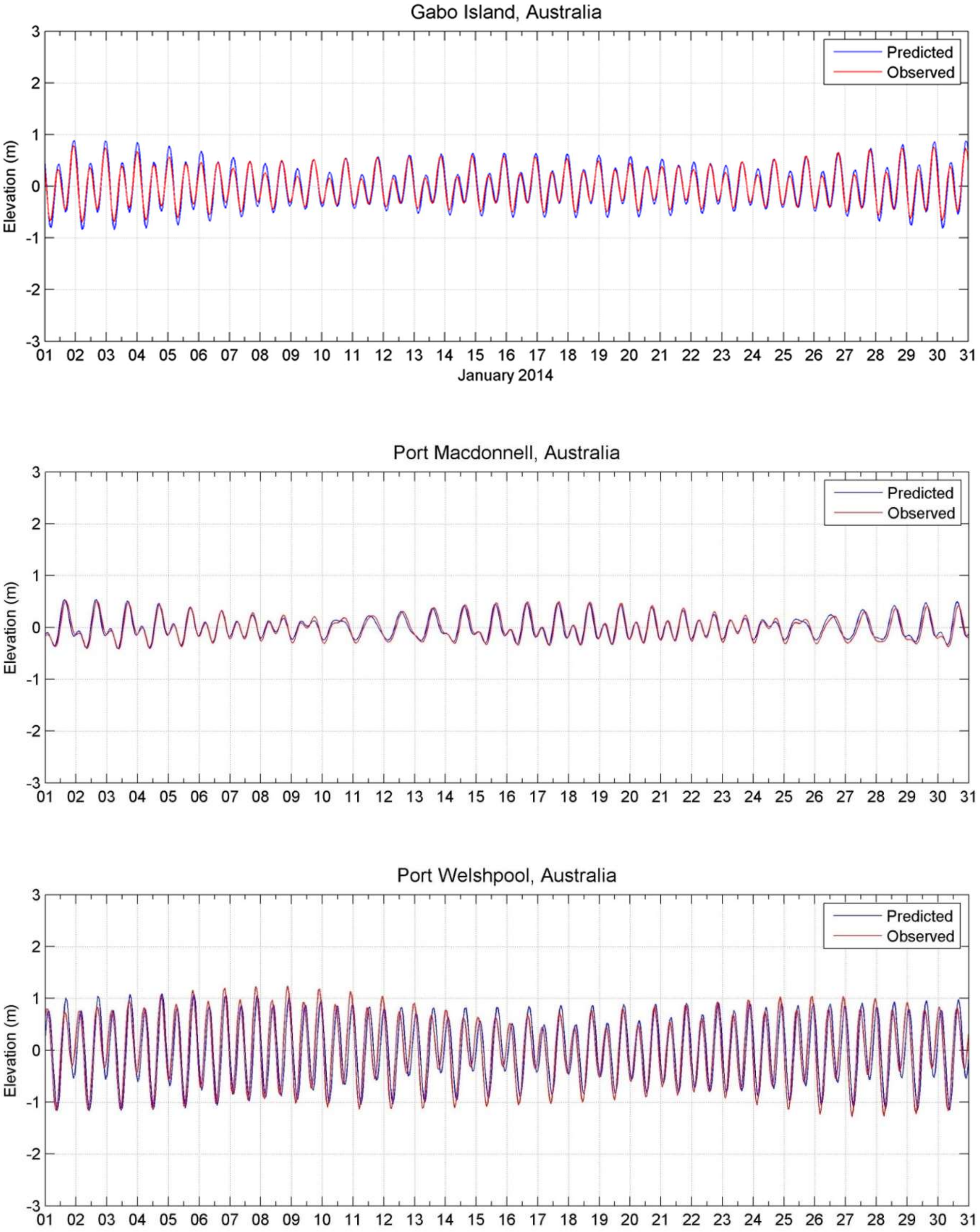

Figure 3-5 Comparison between HYDROMAP predicted (blue line) and observed (red line) surface elevation at tidal stations Gabo Island (upper image), Port MacDonnell (middle image) and Port Welshpool (lower image).

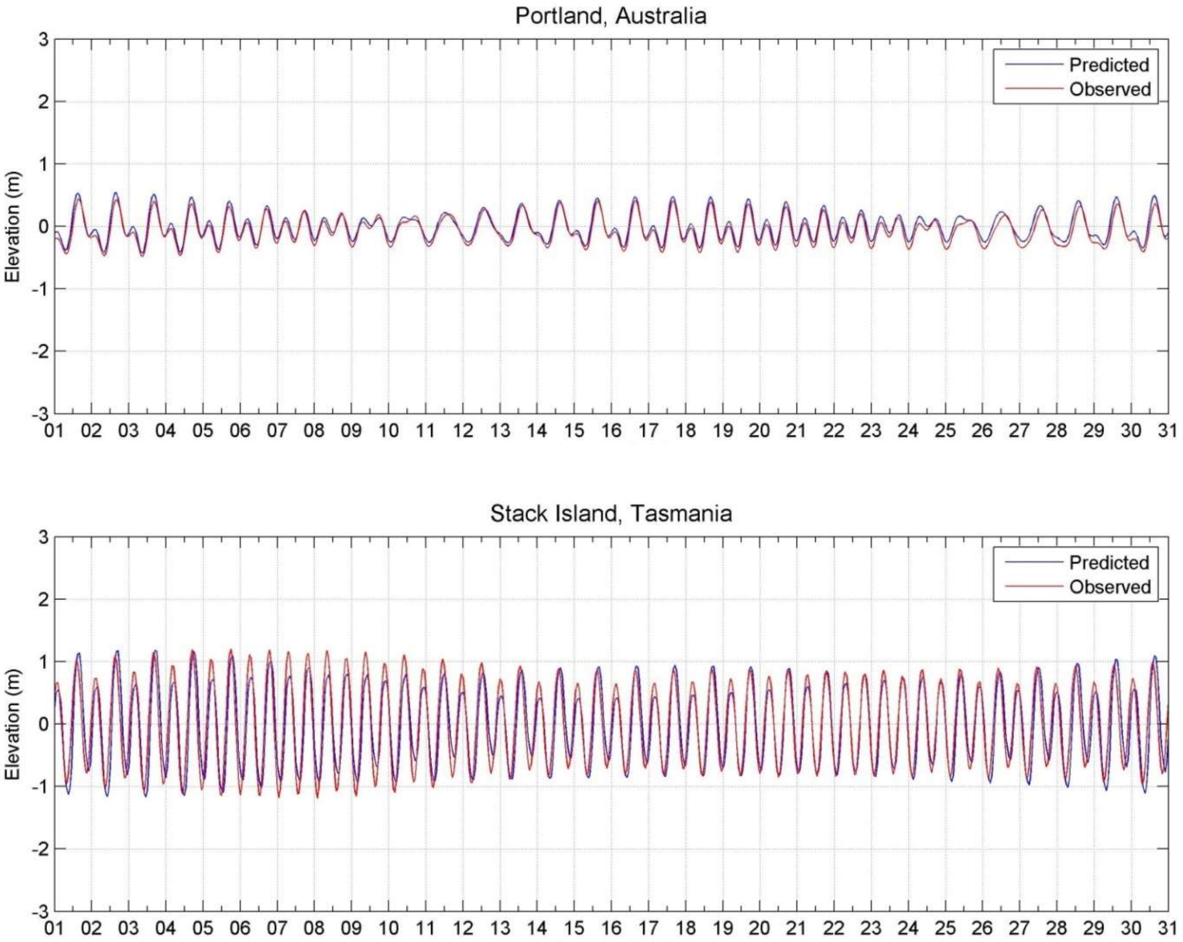

Figure 3-6 Comparison between HYDROMAP predicted (blue line) and observed (red line) surface elevation at tidal stations Portland (upper image) and Stack Island (lower image).

3.2 Ocean Currents

Data describing the flow of ocean currents for the years 2010 to 2019 (inclusive) was obtained from HYCOM (Hybrid Coordinate Ocean Model, (Chassignet et al., 2007), which is operated by the HYCOM Consortium, sponsored by the Global Ocean Data Assimilation Experiment (GODAE). HYCOM is a data-assimilative, three-dimensional ocean model that is run as a hindcast (for a past period), assimilating time-varying observations of sea surface height, sea surface temperature and in-situ temperature and salinity measurements (Chassignet et al., 2009). The HYCOM predictions for drift currents are produced at a horizontal spatial resolution of approximately 8.25 km (1/12th of a degree) over the region, at a frequency of once per day. HYCOM uses isopycnal layers in the open, stratified ocean, but uses the layered continuity equation to make a dynamically smooth transition to a terrain-following coordinate in shallow coastal regions, and to z-level coordinates in the mixed layer and/or unstratified seas. Figure 3-7 illustrates the spatial resolution of HYCOM currents.

For this study, the HYCOM hindcast currents were obtained.

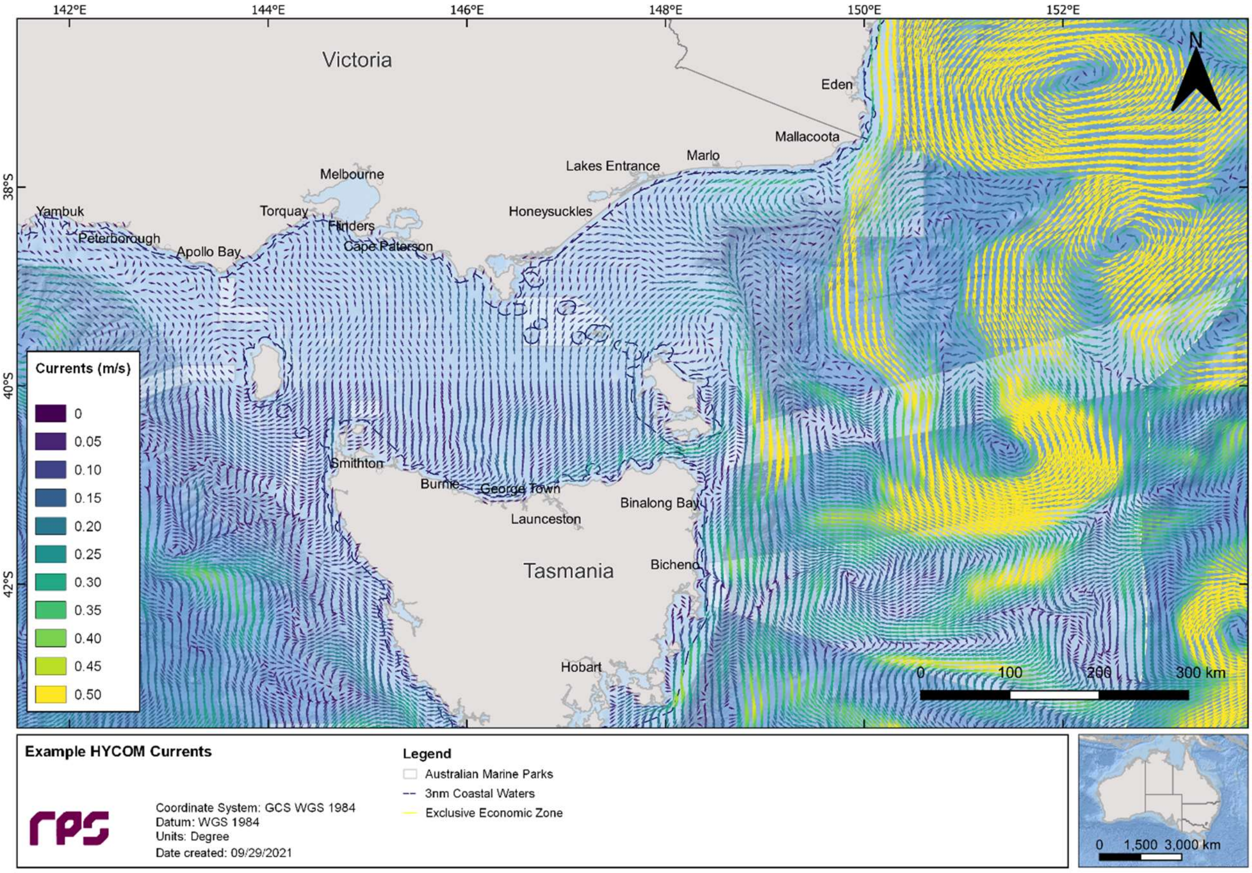

Figure 3-7 **Map illustrating the spatial resolution of HYCOM currents.**

3.3 Surface Currents

Table 3-2 presents the average and maximum net surface current speeds nearby the release location by combining the ocean and tidal currents. Current speeds varied throughout the year with peak current speeds ranging between approximately 0.81 m/s (October) and 1.15 m/s (August). The dominant surface current directions throughout the year were identified as (towards) east-southeast and west-northwest.

Figure 3-8 and Figure 3-9 show the monthly and total surface current rose distributions for the selected location.

Note the convention for defining current direction is the direction the current flows towards, which is used to reference current direction throughout this report. Each branch of the rose represents the currents flowing to that direction, with north to the top of the diagram. Sixteen directions are used. The branches are divided into segments of different colour, which represent the current speed ranges for each direction. Speed intervals of 0.1 m/s are predominantly used in these current roses. The length of each coloured segment is relative to the proportion of currents flowing within the corresponding speed and direction.

Table 3-2 Predicted monthly average and maximum surface current speeds for the selected location. The data was derived by combining the HYCOM ocean data and HYDROMAP tidal data from 2010–2019 (inclusive).

Month	Average current speed (m/s)	Maximum current speed (m/s)	General direction(s) (Towards)
January	0.20	0.90	East-northeast and West-southwest
February	0.21	1.00	East-northeast and West-southwest
March	0.22	1.14	East-northeast and West-southwest
April	0.22	0.90	East
May	0.27	1.03	East
June	0.25	0.99	East
July	0.29	0.94	East
August	0.26	1.15	East
September	0.23	0.98	East
October	0.22	0.81	East
November	0.21	0.83	East
December	0.22	0.82	East-northeast and West-southwest
Minimum	**0.20**	**0.81**	
Maximum	**0.29**	**1.15**	

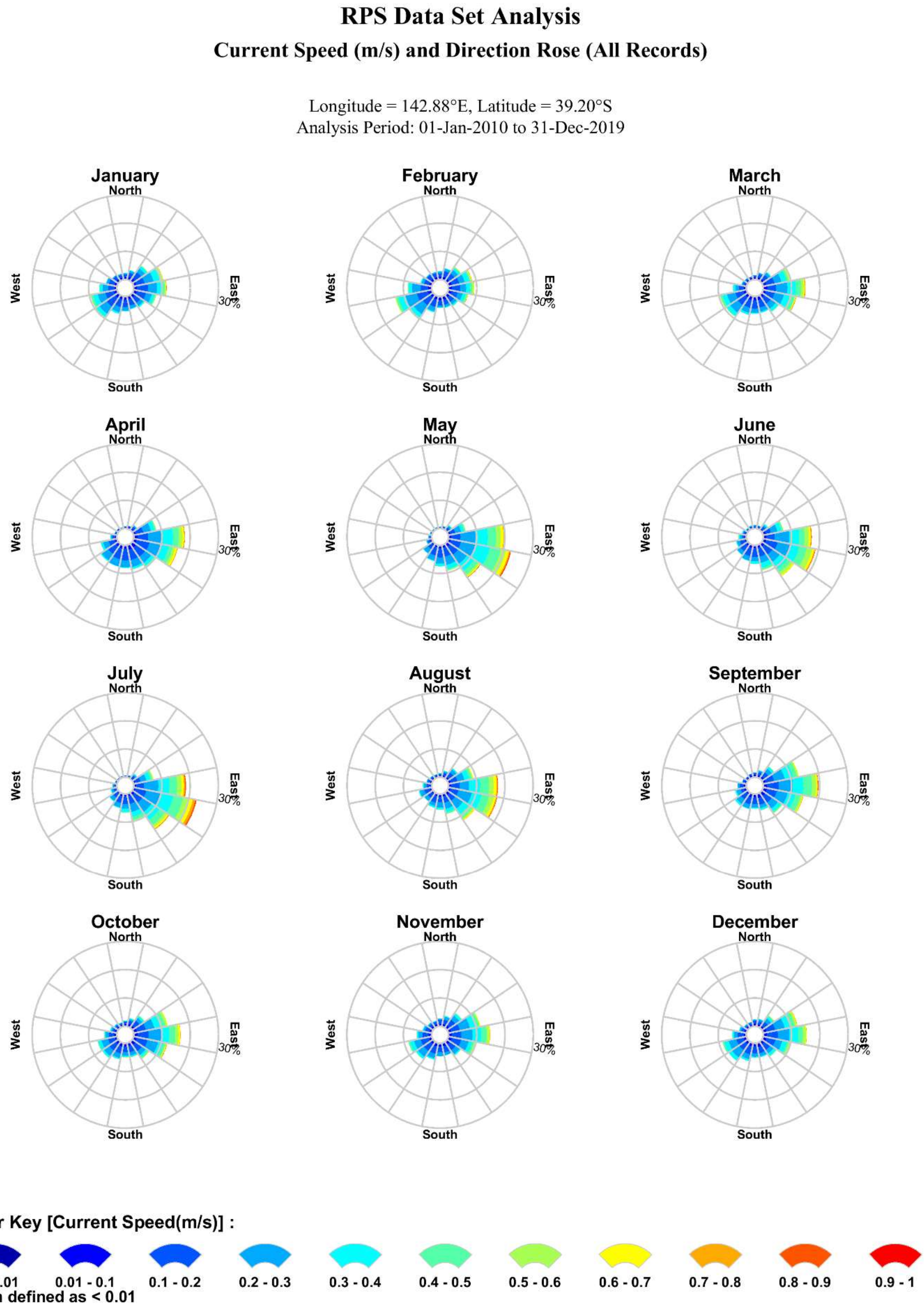

Figure 3-8 Monthly surface current rose plots nearby the release location (derived by combining the HYDROMAP tidal currents and HYCOM ocean currents for 2010–2019 (inclusive).

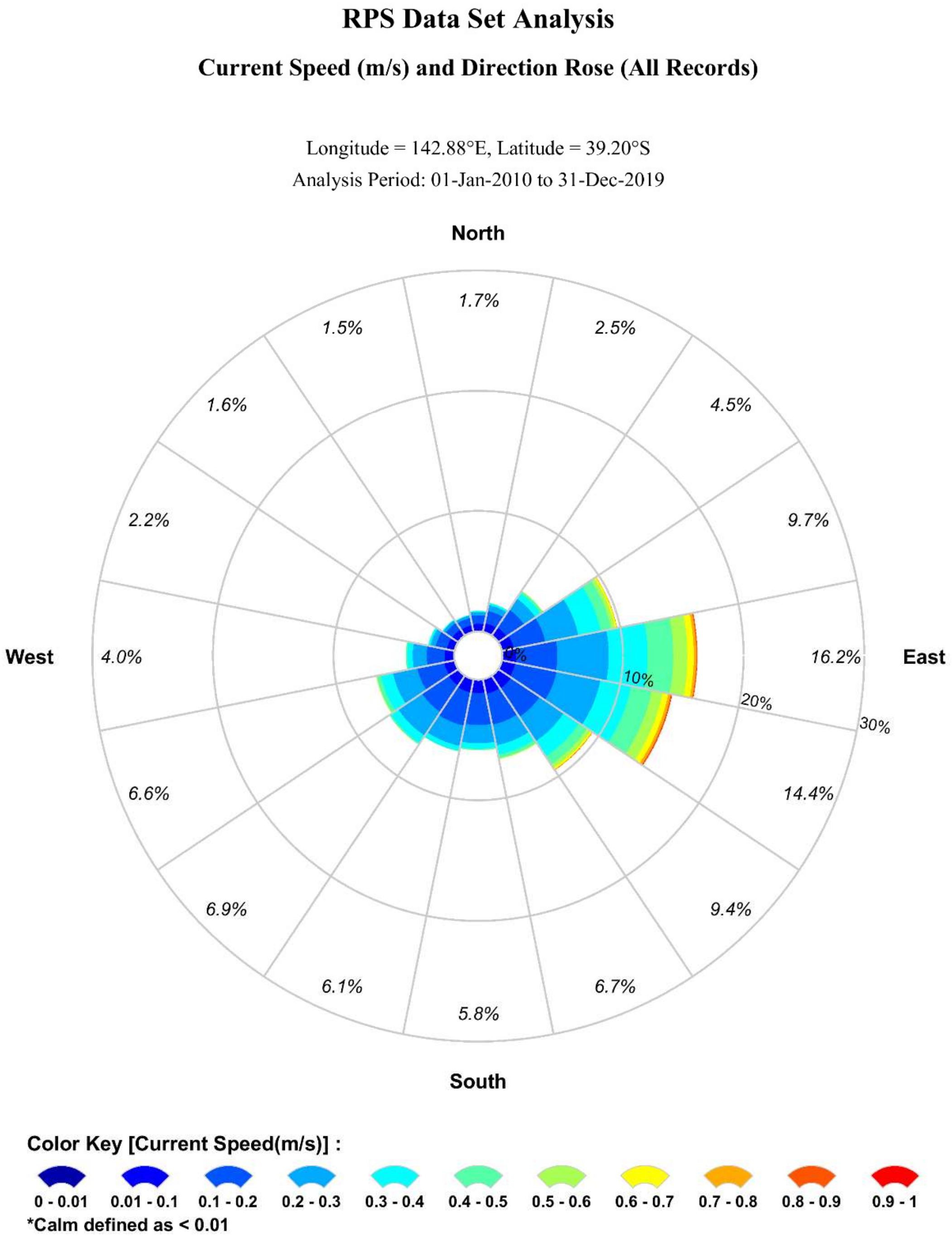

Figure 3-9 Total surface current rose plot nearby the release location (derived by combining the HYDROMAP tidal currents and HYCOM ocean currents for 2010–2019 (inclusive).

4 WIND DATA

High resolution wind data for the years 2010 to 2019 (inclusive) was sourced from the National Centre for Environmental Prediction (NCEP) Climate Forecast System Reanalysis dataset (CFSR; see Saha et al., 2010). The CFSR wind model is a fully coupled, data-assimilative hindcast model representing the interaction between the earth's oceans, land and atmosphere. The gridded wind data output is available at ¼ of a degree resolution (~33 km) and 1-hourly time intervals. Figure 4-1 shows the spatial resolution of the wind field used as input into the oil spill model.

Table 4-1 presents the monthly average and maximum winds derived from a CFSR wind node nearby the release location. The wind data demonstrated average monthly wind speeds ranging from 14.2 knots (January) to 20.1 knots (July) with maximums ranging between 58.9 knots (February) and 65.8 knots (December. The dominant wind direction throughout the year was from the west, whilst maximum wind speeds were typically associated with westerly winds during all months of the year.

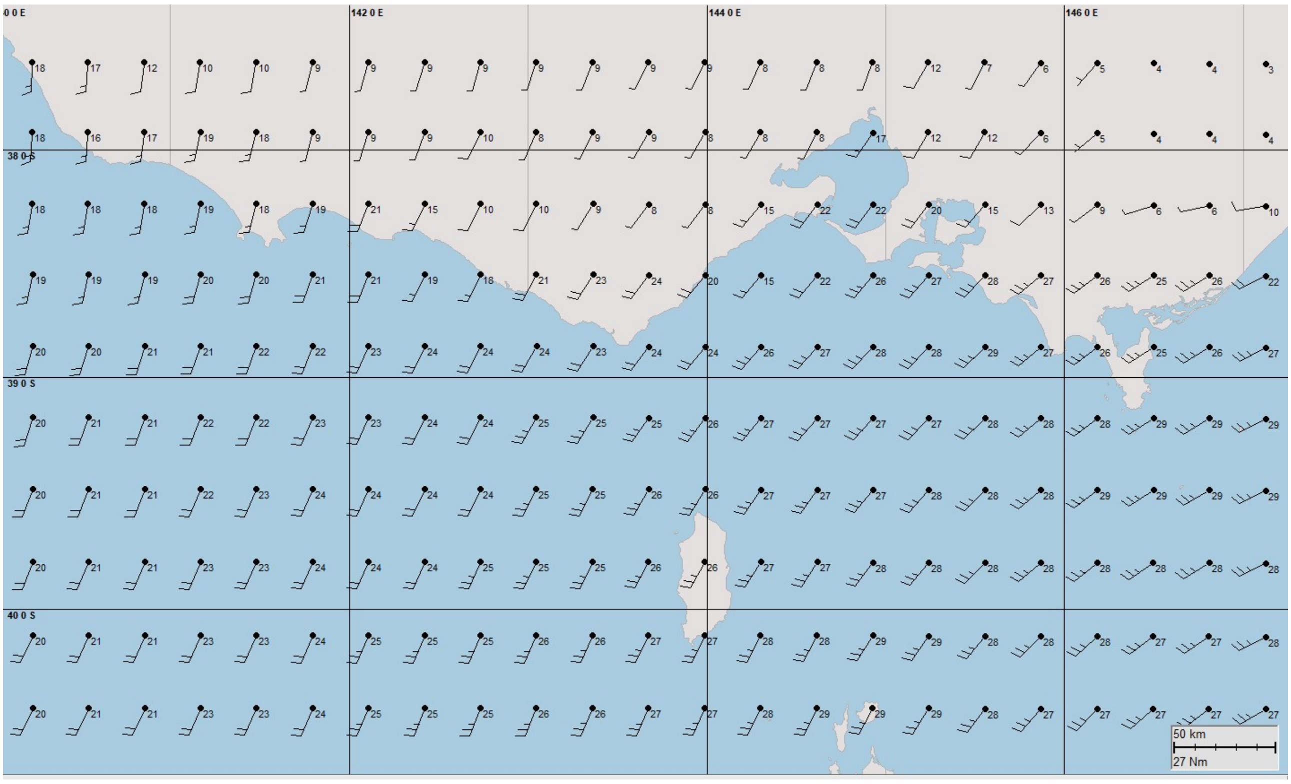

Figure 4-1 Spatial resolution of the CFSR modelled wind data used as input into the oil spill model.

Figure 4-2 and Figure 4-3 show the monthly and total wind rose distributions derived from the CFSR data for the selected node nearby the release location.

Note that the atmospheric convention for defining wind direction, that is, the direction the wind blows from, is used to reference wind direction throughout this report. Each branch of the rose represents wind coming from that direction, with north to the top of the diagram. Sixteen directions are used. The branches are divided into segments of different colour, which represent wind speed ranges from that direction. Speed ranges of 3 knots are predominantly used in these wind roses. The length of each segment within a branch is proportional to the frequency of winds blowing within the corresponding range of speeds from that direction.

Table 4-1 Predicted average and maximum winds representative for the selected node nearby the release location. Data derived from CFSR hindcast model from 2010–2019 (inclusive).

Month	Average wind speed (knots)	Maximum wind speed (knots)	General direction(s) (From)
January	14.2	62.8	East-southeast and West-southwest
February	14.8	58.9	Southeast
March	14.8	64.7	East and West
April	14.6	61.2	West
May	17.3	62.2	West
June	17.5	60.5	West to North
July	20.1	60.5	West to North
August	19.5	65.1	West to North
September	17.4	60.8	West
October	16.4	61.8	West
November	15.3	60.8	West
December	14.9	65.8	West and East-southeast
Minimum	**14.2**	**58.9**	
Maximum	**20.1**	**65.8**	

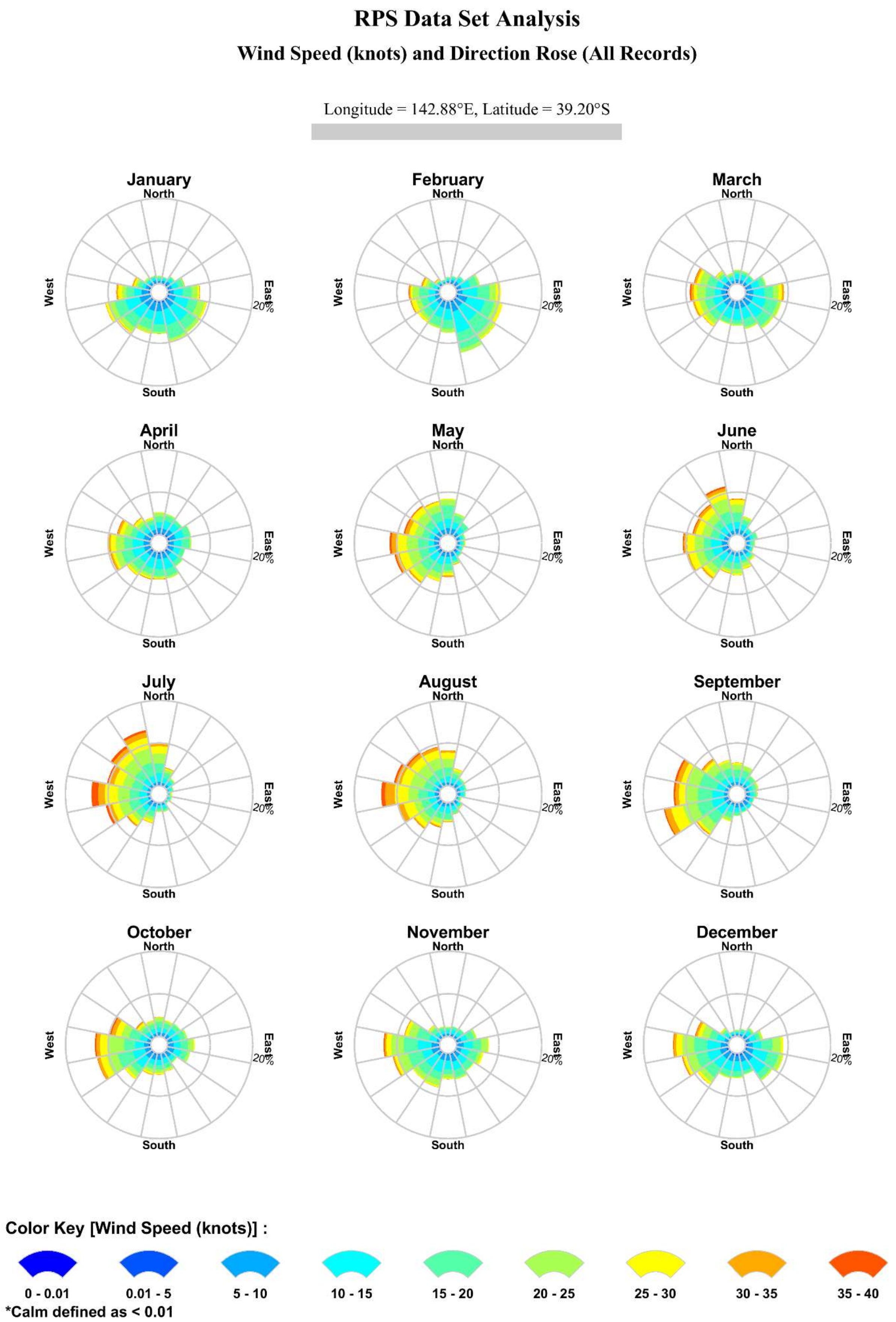

Figure 4-2 Modelled monthly wind rose distributions from 2010–2019 (inclusive) for the node nearby the release location.

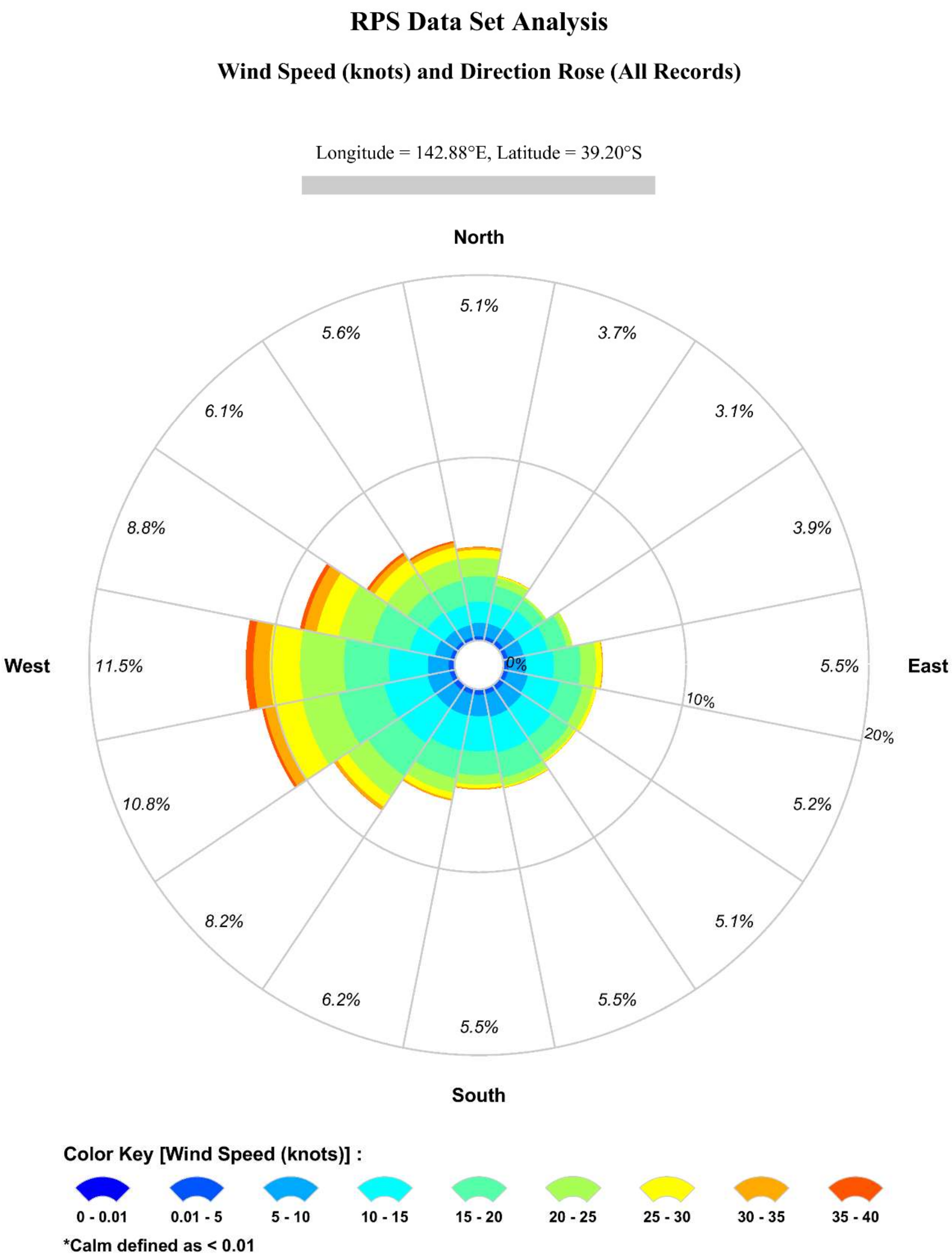

Figure 4-3 Modelled total wind rose distributions from 2010–2019 (inclusive) for the node nearby the release location.

5 WATER TEMPERATURE AND SALINITY

The monthly sea temperature and salinity profiles of the water column within the study was obtained from the World Ocean Atlas 2013 database produced by the National Oceanographic Data Centre (National Oceanic and Atmospheric Administration) and its co-located World Data Center for Oceanography (see Levitus et al., 2013). These parameters were used as factors to inform the weathering, movement and evaporative loss of hydrocarbon spills in the surface and sub-surface layers.

Figure 5-1 illustrates the vertical profile of sea temperature and salinity nearby the release location.

Table 5-1 presents the sea temperature and salinity of the surface layer nearby the selected location. The monthly average sea surface temperatures ranged between 13.2°C (September) and 17.8°C (March). The monthly average salinity values remain relatively consistent ranging between 35.1 psu (February) and 35.6 psu (July).

Table 5-1 Monthly average sea surface temperature and salinity in the study area.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Temperature (ºC)	17.7	17.2	17.8	16.3	16.0	16.0	14.8	13.5	13.2	14.3	14.3	15.9
Salinity (psu)	35.3	35.1	35.4	35.3	35.3	35.4	35.6	35.3	35.3	35.4	35.4	35.4

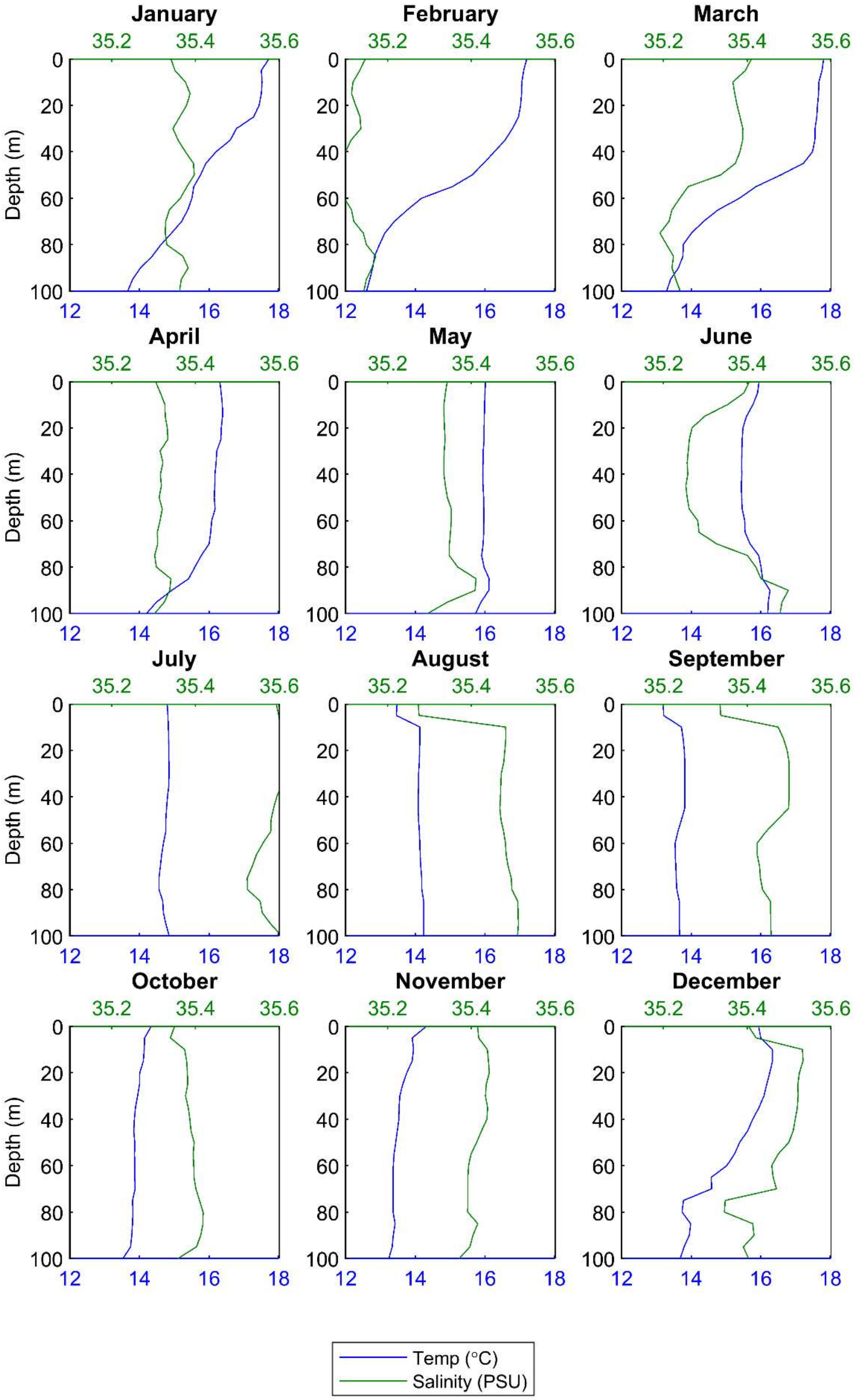

Figure 5-1 Temperature and salinity profiles nearby the selected location within the study area.

6 OIL SPILL MODEL – SIMAP

Modelling of the fate of oil was performed using the Spill Impact Mapping Analysis Program (SIMAP). SIMAP is designed to simulate the fate and effects of spilled hydrocarbons for both the surface and subsurface releases (Spaulding et al., 1994; French et al., 1999; French-McCay, 2003, 2004; French-McCay et al., 2004).

SIMAP has been used to predict the weathering and fate of oil spills during and after major incidents including: Montara (Australia) well blowout August 2009 in the Timor Sea (Asia-Pacific ASA, 2010); Macondo (USA) well blowout April 2010 in the Gulf of Mexico; Bohai Bay (China) oil spill August 2011; and the pipeline oil spill July 2013 in the Gulf of Thailand.

The SIMAP model calculates the transport, spreading, entrainment, evaporation and decay of surface hydrocarbon slicks as well as the entrained and dissolved oil components in the water column, either from surface slicks or from oil discharged subsea. The movement and weathering of the spilled oil is calculated for specific oil types. Input specifications for oil mixtures include the density, viscosity, pour point, distillation curve (volume lost versus temperature) and the aromatic/aliphatic component ratios within given boiling point (BP) ranges.

SIMAP is a three-dimensional model that allows for various response actions to be modelled including oil removal from skimming, burning, or collection booms, and surface and subsurface dispersant application.

The SIMAP oil spill model includes advanced weathering algorithms, specifically focussed on unique oils that tend to form emulsions and/or tar balls. The weathering algorithms are based on 5 years of extensive research conducted in response to the Deepwater Horizon oil spill in the Gulf of Mexico (French-McCay et al., 2015).

Biodegradation is included in the oil spill model. In the model, SIMAP, degradation is calculated for the surface slick, deposited oil on the shore, the entrained oil and dissolved constituents in the water column, and oil in the sediments. For surface oil, water column oil and sedimented oil a first order degradation rate is specified. Biodegradation rates are relatively high for hydrocarbons in dissolved state or in dispersed small droplets.

6.1 Stochastic Modelling

For the stochastic modelling presented herein, **200 oil spills** (100 per season) were modelled for the scenario using the same spill information (release location, spill volume, duration and oil type) but with varied start dates. During each simulation, the model records whether any grid cells are exposed to any oil concentrations, the concentrations involved and the elapsed time before exposure. The results of all 100 oil spill simulations per season were analysed to determine the following statistics for every grid cell:

- Exposure load (concentrations and volumes);
- Minimum time before exposure;
- Probability of contact above defined concentrations;
- Volume of oil that may accumulate on shorelines from any single simulation;
- Concentration that might occur on sections of individual shorelines;
- Exposure (instantaneous and/or over a specified duration) to dissolved hydrocarbons in the water column; and
- Exposure (instantaneous and/or over a specified duration) to entrained hydrocarbons in the water column.

6.1 Floating, Shoreline and In-Water Thresholds

The thresholds and their relationship to exposure for the sea surface, shoreline and water column (entrained and dissolved hydrocarbons) are presented in Sections 6.1.1 to 6.1.3. Supporting justifications of the adopted thresholds applied during the study and additional context relating to the area of influence are also provided. It is important to note that the thresholds herein are based on NOPSEMA (2019).

6.1.1 Floating Oil Exposure Thresholds

The modelling results can be presented to any levels; therefore, thresholds have been specified (based on scientific literature) to record floating oil exposure to the sea-surface at meaningful levels only, described in the following paragraphs.

The low threshold to assess the potential for floating oil exposure, was 1 g/m^2, which equates approximately to an average thickness of 1 μm, referred to as visible oil. Oil of this thickness is described as rainbow sheen in appearance, according to the Bonn Agreement Oil Appearance Code (Bonn Agreement, 2009; AMSA, 2014) (see Table 6-1). Figure 6-1 shows photographs highlighting the difference in appearance between a silvery sheen, rainbow sheen and metallic sheen. This threshold is considered below levels which would cause environmental harm and it is more indicative of the areas perceived to be affected due to its visibility on the sea surface and potential to trigger temporary closures of areas (i.e. fishing grounds) as a precautionary measure. Table 6-1 provides a description of the appearance in relation to exposure zone thresholds used to classify the zones of floating oil exposure.

Ecological impact has been estimated to occur at 10 g/m^2 (a film thickness of approximately 10 μm or 0.01 mm) according to French et al. (1996) and French-McCay (2009) as this level of fresh oiling has been observed to mortally impact some birds through adhesion of oil to their feathers, exposing them to secondary effects such as hypothermia. The appearance of oil at this average thickness has been described as a metallic sheen (Bonn Agreement, 2009).

Scholten et al. (1996) and Koops et al. (2004) indicated that at oil concentrations on the sea surface of 25 g/m^2 (or greater), would be harmful for all birds that have landed in an oil film due to potential contamination of their feathers, with secondary effects such as loss of temperature regulation and ingestion of oil through preening. The appearance of oil at this thickness is also described as metallic sheen (Bonn Agreement, 2009). For this study the high exposure threshold was set to 50 g/m^2 and above based on NOPSEMA (2019). This threshold can also be used to inform response planning.

Table 6-2 defines the thresholds used to classify the zones of floating oil exposure reported herein.

Table 6-1 The Bonn Agreement Oil Appearance Code.

Code	Description Appearance	Layer Thickness Interval (g/m^2 or μm)	Litres per km^2
1	Sheen (silvery/grey)	0.04 – 0.30	40 – 300
2	Rainbow	0.30 – 5.0	300 – 5,000
3	Metallic	5.0 – 50	5,000 – 50,000
4	Discontinuous True Oil Colour	50 – 200	50,000 – 200,000
5	Continuous True Oil Colour	≥ 200	≥ 200,000

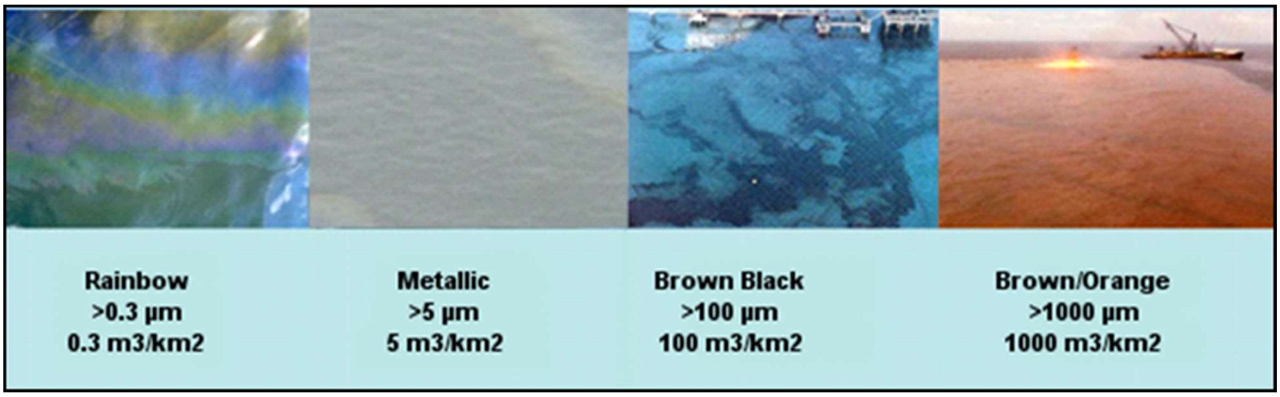

Figure 6-1 Photographs showing the difference between oil colour and thickness on the sea surface (source: adapted from Oil Spill Solutions, 2015).

Table 6-2 Floating oil exposure thresholds used in this report (in alignment with NOPSEMA (2019)).

Threshold level	Floating oil (g/m^2)	Description
Low	1	Approximates range of socioeconomic effects and establishes planning area for scientific monitoring
Moderate	10	Approximates lower limit for harmful exposures to birds and marine mammals
High	50	Approximates surface oil slick and informs response planning

6.1.2 Shoreline Accumulation Thresholds

There are many different types of shorelines, ranging from cliffs, rocky beaches, sandy beaches, mud flats and mangroves, and each of these influences the volume of oil that can remain stranded ashore and its thickness before the shoreline saturation point occurs. For instance, a sandy beach may allow oil to percolate through the sand, thus increasing its ability to hold more oil ashore over tidal cycles and various wave actions than an equivalent area of water; hence oil can increase in thickness onshore over time. A sandy beach shoreline was assumed as the default shoreline type for the modelling herein, as it allows for the highest carrying capacity of oil (of the available open/exposed shoreline types). Hence the results contained herein would be indicative of a worst-case scenario, where the highest volume of oil may be stranded on the shoreline (when compared to other shoreline types, such as exposed rocky shores).

In previous risk assessment studies, French-McCay et al. (2005a; 2005b) used a threshold of 10 g/m^2 to assess the potential for shoreline accumulation. This is a conservative threshold used to define regions of socio-economic impact, such as triggering temporary closures of adjoining fisheries or the need for shore clean-up on beaches or man-made features/amenities (breakwaters, jetties, marinas, etc.). It would equate to approximately 2 teaspoons of hydrocarbon per square meter of shoreline accumulation. The appearance is described as a stain/film. On that basis, the 10 g/m^2 shoreline accumulation threshold has been selected to define the zone of potential “low shoreline accumulation”.

French et al. (1996) and French-McCay (2009) define a shoreline oil accumulation threshold of 100 g/m^2, or above, would potentially harm shorebirds and wildlife (furbearing aquatic mammals and marine reptiles on or along the shore) based on studies for sub-lethal and lethal impacts. This threshold has been used in previous environmental risk assessment studies (see French-McCay, 2003; French-McCay et al., 2004, French-McCay et al., 2011; 2012; NOAA, 2013). Additionally, a shoreline concentration of 100 g/m^2, or above, is the minimum limit that the oil can be effectively cleaned according to the AMSA (2015) guideline. This threshold equates to approximately ½ a cup of oil per square meter of shoreline accumulation. The appearance is described as a thin oil coat. Therefore, 100 g/m^2 has been selected to define the zone of potential “moderate shoreline accumulation”.

Observations by Lin & Mendelssohn (1996), demonstrated that loadings of more than 1,000 g/m^2 of hydrocarbon during the growing season would be required to impact marsh plants significantly. Similar thresholds have been found in studies assessing hydrocarbon impacts on mangroves (Grant et al., 1993; Suprayogi & Murray, 1999). Hence, 1,000 g/m^2 has been selected to define the zone of potential "high shoreline accumulation". It equates to approximately 1 litre of hydrocarbon per square meter of shoreline accumulation. The appearance is described as a hydrocarbon cover.

It is worth noting that the shoreline accumulation thresholds derived from extensive literature review (outlined in Table 6-3) agree with the commonly used threshold values for oil spill modelling specified in NOPSEMA (2019).

Table 6-3 Thresholds used to assess shoreline accumulation.

Threshold level	Shoreline loading (g/m^2)	Description
Low (socioeconomic/sublethal)	10	Predicts potential for some socio-economic impact
Moderate	100	Loading predicts area likely to require clean-up effort
High	> 1,000	Loading predicts area likely to require intensive clean-up effort

6.1.3 In-water Exposure Thresholds

Oil is a mixture of thousands of hydrocarbons of varying physical, chemical, and toxicological characteristics, and therefore, demonstrate varying fates and impacts on organisms. As such, for in-water exposure, the SIMAP model provides separate outputs for dissolved and entrained hydrocarbons from oil droplets. The consequences of exposure to dissolved and entrained components will differ because they have different modes and magnitudes of effect.

Entrained hydrocarbon concentrations were calculated based on oil droplets that are suspended in the water column, though not dissolved. The composition of this oil would vary with the state of weathering (oil age) and may contain soluble hydrocarbons when the oil is fresh. Calculations for dissolved hydrocarbons specifically calculates oil components which are dissolved in water, which are known to be the primary source of toxicity exerted by oil.

6.1.3.1 Dissolved Hydrocarbons

Laboratory studies have shown that dissolved hydrocarbons exert most of the toxic effects of oil on aquatic biota (Carls et al., 2008; Nordtug et al., 2011; Redman, 2015). The mode of action is a narcotic effect, which is positively related to the concentration of soluble hydrocarbons in the body tissues of organisms (French-McCay, 2002). Dissolved hydrocarbons are taken up by organisms directly from the water column by absorption through external surfaces and gills, as well as through the digestive tract. Thus, soluble hydrocarbons are termed "bioavailable".

Hydrocarbon compounds vary in water-solubility and the toxicity exerted by individual compounds is inversely related to solubility, however bioavailability will be modified by the volatility of individual compounds (Nirmalakhandan & Speece, 1988; Blum & Speece, 1990; McCarty, 1986; McCarty et al., 1992a, 1992b; Mackay et al., 1992; McCarty & Mackay, 1993; Verhaar et al., 1992, 1999; Swartz et al., 1995; French-McCay, 2002; McGrath and Di Toro, 2009). Of the soluble compounds, the greatest contributor to toxicity for water-column and benthic organisms are the lower-molecular-weight aromatic compounds, which are both volatile and soluble in water. Although they are not the most water-soluble hydrocarbons within most oil types, the polynuclear aromatic hydrocarbons (PAHs) containing 2-3 aromatic ring structures typically exert the largest narcotic effects because they are semi-soluble and not highly volatile, so they persist in the environment long enough for significant accumulation to occur (Anderson et al., 1974, 1987; Neff & Anderson, 1981; Malins & Hodgins, 1981; McAuliffe, 1987; NRC, 2003). The monoaromatic hydrocarbons (MAHs), including the BTEX compounds (benzene, toluene, ethylbenzene, and xylenes), and the soluble alkanes (straight chain hydrocarbons) also contribute to toxicity, but these compounds are highly volatile, so that their contribution will be low when oil is exposed to evaporation and higher when oil is discharged at depth where volatilisation does not occur (French-McCay, 2002).

French-McCay (2002) reviewed available toxicity data, where marine biota was exposed to dissolved hydrocarbons prepared from oil mixtures, finding that 95% of species and life stages exhibited 50% population mortality (LC_{50}) between 6 and 400 ppb total PAH concentration after 96 hrs exposure, with an average of 50 ppb. Hence, concentrations lower than 6 ppb total PAH value should be protective of 97.5% of species and life stages even with exposure periods of days (at least 96 hours). Early life-history stages of fish appear to be more sensitive than older fish stages and invertebrates.

Exceedances of 10, 50 or 400 ppb over a 1 hour timestep (see Table 6-4) was applied to indicate increasing potential for sub-lethal to lethal toxic effects (or low to high), based on NOPSEMA (2019).

6.1.3.2 Entrained Hydrocarbons

Entrained hydrocarbons consist of oil droplets that are suspended in the water column and insoluble. As such, insoluble compounds in oil cannot be absorbed from the water column by aquatic organisms, hence are not bioavailable through absorption of compounds from the water. Exposure to these compounds would require routes of uptake other than absorption of soluble compounds. The route of exposure of organisms to whole oil alone include direct contact with tissues of organisms and uptake of oil by direct consumption, with potential for biomagnification through the food chain (NRC, 2005).

The 10 ppb threshold represents the very lowest concentration and corresponds generally with the lowest trigger levels for chronic exposure for entrained hydrocarbons in the ANZECC & ARMCANZ (2000) water quality guidelines. Due to the requirement for relatively long exposure times (> 24 hours) for these concentrations to be significant, they are likely to be more meaningful for juvenile fish, larvae and planktonic organisms that might be entrained (or otherwise moving) within the entrained plumes, or when entrained hydrocarbons adhere to organisms or trapped against a shoreline for periods of several days or more.

This exposure zone is not considered to be of significant biological impact and is therefore outside the adverse exposure zone. This exposure zone represents the area contacted by the spill. This area does not define the area of influence as it is considered that the environment will not be affected by the entrained hydrocarbon at this level.

Thresholds of 10 ppb and 100 ppb were applied over a 1 hour time exposure (Table 6-4), to cover the range of thresholds outlined in ANZECC & ARMCANZ (2000) water quality guidelines, the incremental change for greater potential effect and is per NOPSEMA (2019).

A complicating factor that should be considered when assessing the consequence of dissolved and entrained oil distributions is that there will be some areas where both physically entrained oil droplets and dissolved hydrocarbons co-exist. Higher concentrations of each will tend to occur close to the source where sea conditions can force mixing of relatively unweathered oil into the water column, resulting in more rapid dissolution of soluble compounds.

Table 6-4 Dissolved and entrained hydrocarbon exposure values assessed over a 1-hour time step, as per NOPSEMA (2019).

Threshold level	Dissolved hydrocarbon concentration (ppb)	Entrained hydrocarbon concentrations (ppb)
Low	10	10
Moderate	50	-
High	400	100

7 MARINE DIESEL PROPERTIES

7.1 Physical Properties

Table 7-1 and Table 7-2 present the physical properties and boiling point ranges of the MDO used in this study.

Table 7-1 Physical properties for MDO.

Characteristic	Marine Diesel Oil (MDO)
Density (kg/m^3)	829.1 (at 25 °C)
API	37.6
Dynamic viscosity (cP)	4.0 (at 25 °C)
Pour point (°C)	-14
Hydrocarbon property category	Group II
Hydrocarbon property classification	Light - Persistent

Table 7-2 Boiling point ranges for MDO.

Oil Type	Component	Volatile (%)	Semi-volatile (%)	Low-volatility (%)	Residual (%)
	Boiling point (°C)	<180 C_4 to C_{10}	180-265 C_{11} to C_{15}	265-380 C_{16} to C_{20}	>380 $>C_{20}$
MDO	% of total	6.0	34.6	54.4	5.0

The BP are dictated by the length of the carbon chains, with the longer and more complex compounds having a higher boiling point, and therefore lower volatility and evaporation rate.

Typical evaporation times once the hydrocarbons reach the surface and are exposed to the atmosphere are:

- Up to 12 hours for the C_4 to C_{10} compounds (or less than 180°C BP).
- Up to 24 hours for the C_{11} to C_{15} compounds (180-265°C BP).
- Several days for the C_{16} to C_{20} compounds (265-380°C BP).
- Not applicable for the residual compounds (BP > 380°C), which will resist evaporation, persist in the marine environment for longer periods, and be subject to relatively slow degradation.

The actual fate of oil will depend greatly on the amount that reaches the surface.

The MDO has an API of 37.6 and a density of 829.1 kg/m^3 (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.

7.2 Weathering Properties

A series of model weather tests were conducted to illustrate the potential behaviour of the MDO when exposed to idealised and representative environmental conditions:

- A 50 m^3 surface release over 1-hour under calm wind conditions (constant 5 knots), assuming low seasonal water temperature (15°C) and ambient tidal and drift currents.
- A 50 m^3 surface release over 1-hour under variable wind conditions (1-12 knots, drawn from representative data files), assuming low seasonal water temperature (15°C) and ambient tidal and drift currents.

The first case is indicative conditions that would not generate entrainment, while the second case may represent conditions that could cause a minor degree of entrainment. Both scenarios provide examples of potential behaviour during a spill once the oil reaches the surface.

The mass balance for the MDO under the constant 5 knot (~2.5 m/s) wind case (Figure 7-1) shows that 40.3% of the oil is predicted to evaporate within 24 hours. Under calm conditions, the majority of the remaining oil on the water surface will weather at a slower rate due to being comprised of the longer-chain compounds with higher boiling points. Evaporation shall cease when the residual compounds remain, and they will be subject to more gradual decay through biological and photochemical processes.

Under the variable-wind case (Figure 7-2), where the winds are of greater strength on average, entrainment of MDO into the water column is predicted to increase. Approximately 24 hours after the spill, 60.1% of the oil mass is forecast to have entrained and a further 38.4% is forecast to have evaporated, leaving only a small proportion of the oil floating on the water surface (<0.1%).

The increased level of entrainment in the variable-wind case result in a higher percentage decaying at an approximate rate of 1.5% per day with or ~10.5% after 7 days, compared to <0.1% per day and a total of 0.9% after 7 days for the constant-wind case. Given the proportion of entrained oil and the tendency for it to remain mixed in the water column, the remaining hydrocarbons will decay over time scales of several weeks.

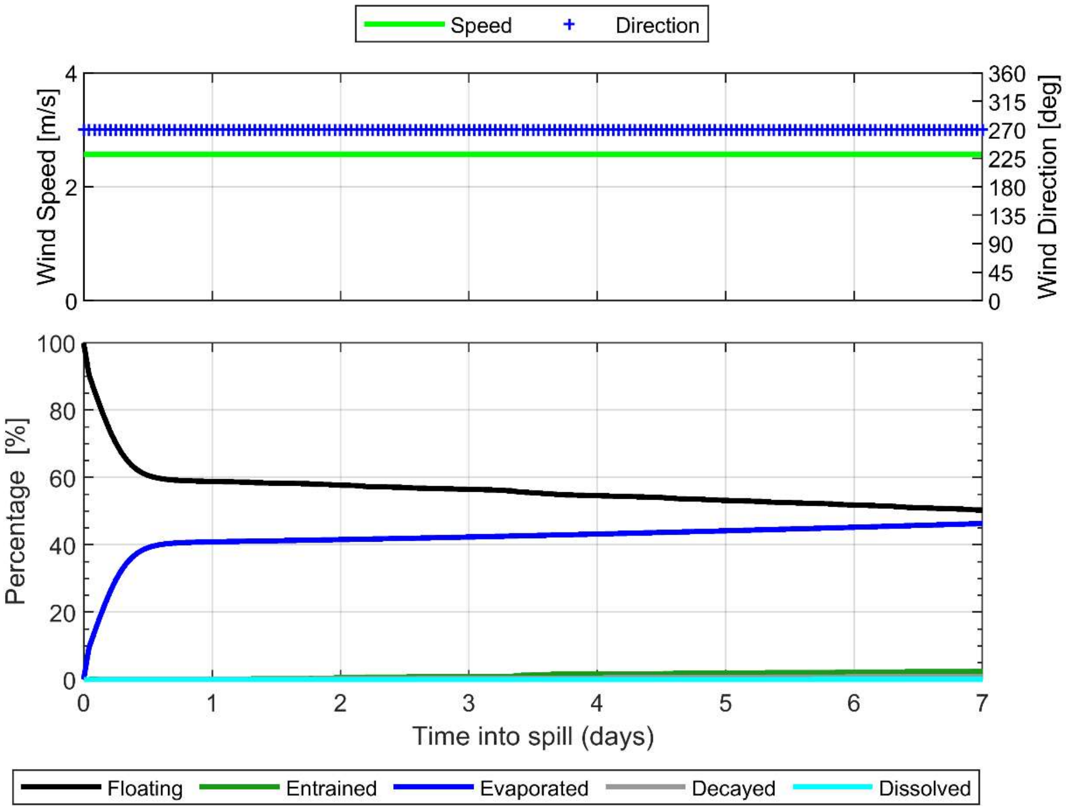

Figure 7-1 **Proportional mass balance plot representing the weathering of MDO spilled onto the water surface over 1 hour and subject to a constant 5 knots (2.6 m/s) wind speed at 15°C water temperature and 20°C air temperature.**

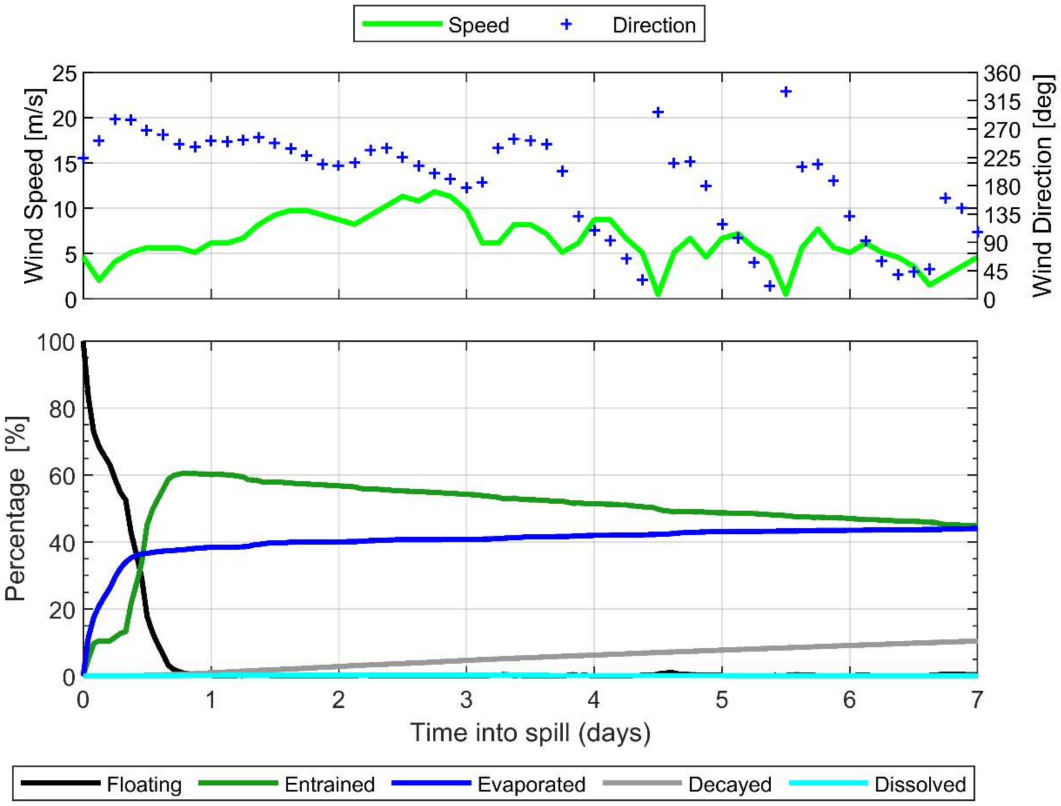

Figure 7-2 **Proportional mass balance plot representing the weathering of MDO spilled onto the water over 1 hour and subject to variable wind speeds (1-12 knots) at 15°C water temperature and 20°C air temperature.**

8 MODEL SETTINGS

Table 8-1 provides a summary of the oil spill model settings.

Table 8-1 Summary of the oil spill model settings and thresholds used in this assessment.

Parameter	Scenario 1	Scenario 2
Description	Vessel collision	Vessel collision
Number of randomly selected spill start times	200 (100 per season)	200 (100 per season)
Model period	Summer (November through to March) Winter (April to October)	
Oil type	MDO	MDO
Spill volume (m^3)	300	200
Release type	Surface	
Release duration	6 hours	
Simulation length (days)	30	
Surface oil concentration thresholds and exposure risk (g/m^2) ^	1 (low); 10 (moderate); 50 (high)	
Shoreline oil accumulation thresholds and exposure risk (g/m^2) ^	10 (low); 100 (moderate); 1,000 (high)	
Dissolved hydrocarbon concentrations and exposure risk (ppb) ^	10 (low); 50 (moderate); 400 (high)	
Entrained hydrocarbon concentrations and exposure risk (ppb) ^	10 (low); 100 (high)	

^Thresholds based on NOPSEMA (2019)

9 PRESENTATION AND INTERPRETION OF MODEL RESULTS

The results from the modelling study are presented in a number of tables and figures, which aim to provide an understanding of the predicted sea-surface and water column (subsurface) exposure and shoreline accumulation (if predicted).

9.1 Annual Analysis

9.1.1 Statistics

The statistics are based on the following principles:

- The ***greatest distance travelled by a spill trajectory*** – is determined by a) recording the maximum and b) second greatest distance travelled (or 99th percentile) by a single trajectory, within a scenario, from the release location to the identified exposure thresholds.
- The ***probability of oil exposure to a receptor*** – is determined by recording the number of spill trajectories to reach a specified sea surface or subsea threshold within a receptor polygon, divided by the total number of spill trajectories within that scenario.
- The ***minimum time before oil exposure to a receptor*** – is determined by ranking the elapsed time before sea surface exposure, at a specified threshold, to grid cells within a receptor polygon and recording the minimum value.
- The ***probability of oil accumulation at a receptor*** – is determined by recording the number of spill trajectories to reach a specified shoreline accumulation threshold within a receptor polygon, divided by the total number of spill trajectories within that scenario.
- The ***maximum potential oil loading within a receptor*** – is determined by identifying the maximum loading to any grid cell within a receptor polygon, for a scenario.
- The ***dissolved and entrained hydrocarbon exposure*** – is determined by recording the maximum instantaneous concentrations at each grid cell.

9.2 Deterministic Trajectories

The stochastic modelling results were assessed for each scenario, and the deterministic runs were identified and are presented in the result section based on the following criteria;

a. Largest volume of oil ashore;

b. Longest length of oil accumulation above 100 g/m^2;

c. Minimum time before shoreline accumulation above 10 g/m^2;

9.2.1 Receptors Assessed

A range of environmental receptors and shorelines were assessed for floating oil exposure, shoreline accumulation and water column exposure as part of the study (see Figure 9-1 to Figure 9-10). Receptor categories (see Table 9-1) include sections of shorelines which are defined by local government areas (LGAs), sub-LGAs and offshore islands. All other sensitive receptors other than submerged reefs, shoals and banks (RSB) were sourced from Australian Government Department of Agriculture, Water and the Environment (http://www.environment.gov.au/). Risks of exposure were separately calculated for each sensitive receptor area and have been tabulated. Note, due to the volume and geographical extent of Biologically Important Areas (BIAs) predicted to receive potential impacts from spilled hydrocarbon, it is recommended to use the following website to obtain detailed maps on all BIAs assessed: http://www.environment.gov.au/webgis-framework/apps/ncva/ncva.jsf.

Table 9-2 summarises the receptors that the release locations reside within.

Table 9-1 Summary of receptors used to assess floating oil, shoreline and in-water exposure to hydrocarbons.

Receptor Category	Acronym	Hydrocarbon Exposure Assessment		
		Water Column	Floating oil	Shoreline
Australian Marine Park	AMP	✓	✓	×
Biologically Important Areas	BIA	✓	✓	×
Interim Biogeographic Regionalisation for Australia bioregions	IBRA	✓	✓	×
Integrated marine and coastal regionalisation areas	IMCRA	✓	✓	×
Marine National Park	MNP	✓	✓	×
Marine Park	MP	✓	✓	×
Marine Sanctuary	MS	✓	✓	×
Nature Reserve	NR	✓	✓	×
Ramsar Sites	Ramsar	✓	✓	×
Reefs, Shoals and Banks	RSB	✓	✓	×
Key Ecological Feature	KEF	✓	✓	×
State Waters	State Waters	✓	✓	×
Local and Sub-Local Government Area	LGA and Sub-LGA	✓ (Reported as: Nearshore Waters)	✓ (Reported as: Nearshore Waters)	✓ (Reported as: Shore)

Table 9-2 Summary of the receptors that the release locations reside within.

Acronym	Receptor
BIA	Antipodean Albatross - Foraging
	Black-browed Albatross - Foraging
	Bullers Albatross - Foraging
	Campbell Albatross - Foraging
	Common Diving-petrel - Foraging
	Indian Yellow-nosed Albatross - Foraging
	Pygmy Blue Whale – Distribution
	Pygmy Blue Whale - Foraging
	Short-tailed Shearwater - Foraging
	Shy Albatross - Foraging
	Southern Right Whale - Migration
	Wandering Albatross - Foraging
	Wedge-tailed Shearwater - Foraging
	White Shark - Distribution
IMCRA	Otway

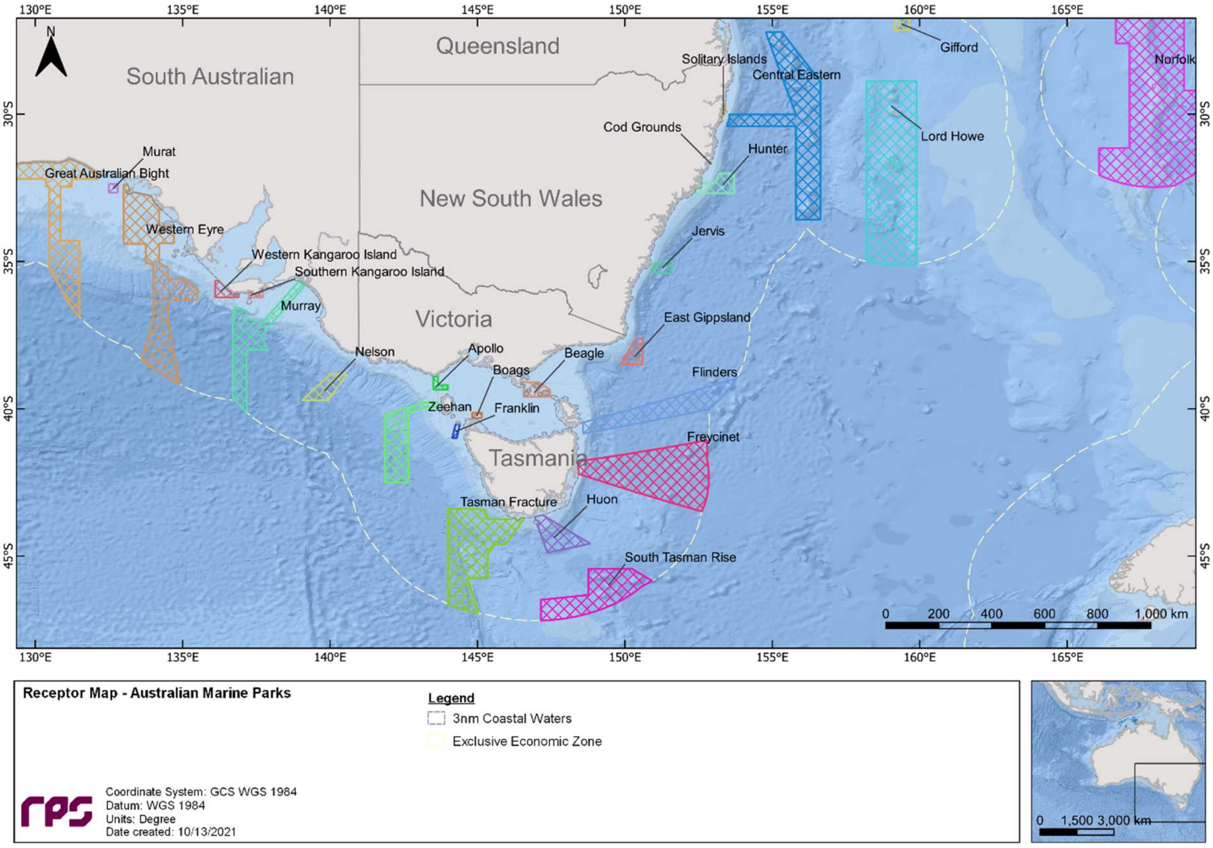

Figure 9-1 Receptor map for Australian Marine Parks (AMP).

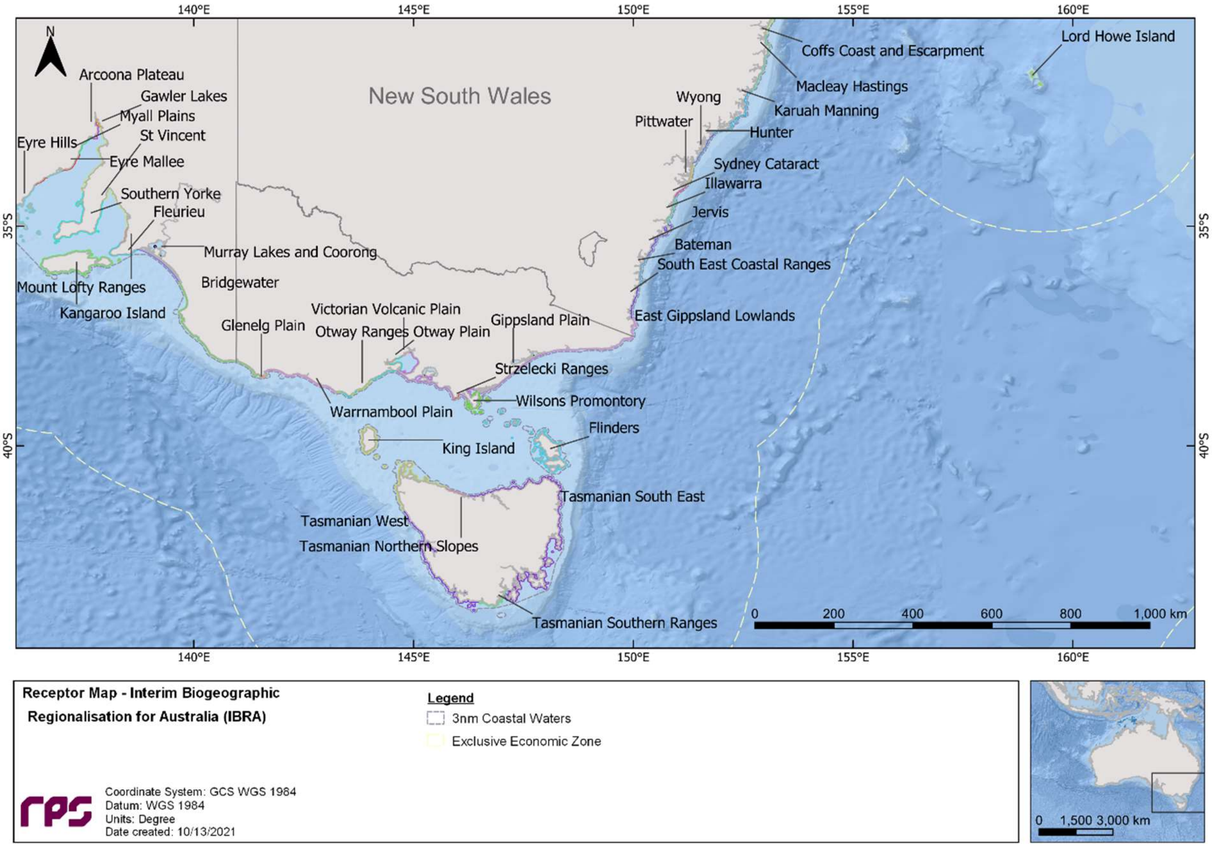

Figure 9-2 Receptor map for the Interim Biogeographic Regionalisation for Australia (IBRA) bioregions.

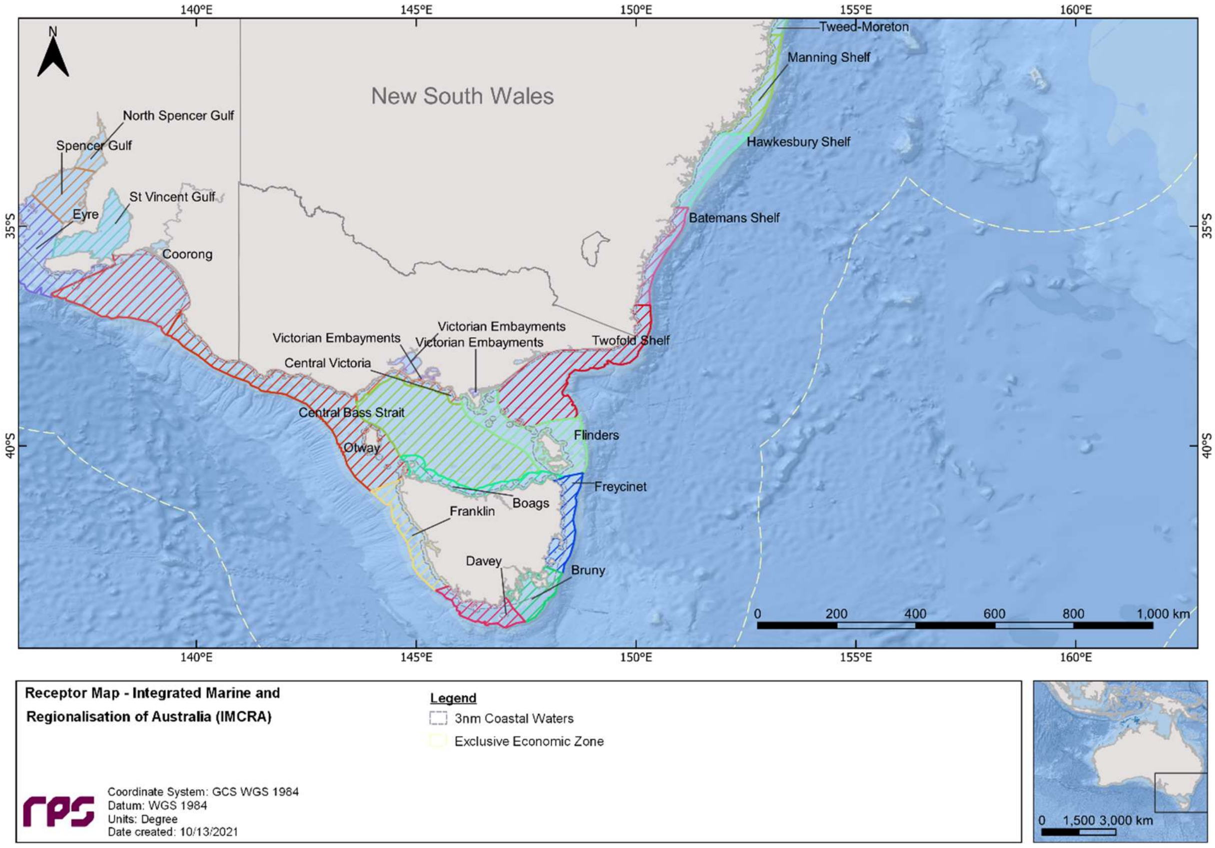

Figure 9-3 Receptor map for integrated marine and coastal regionalisation (IMCRA) areas.

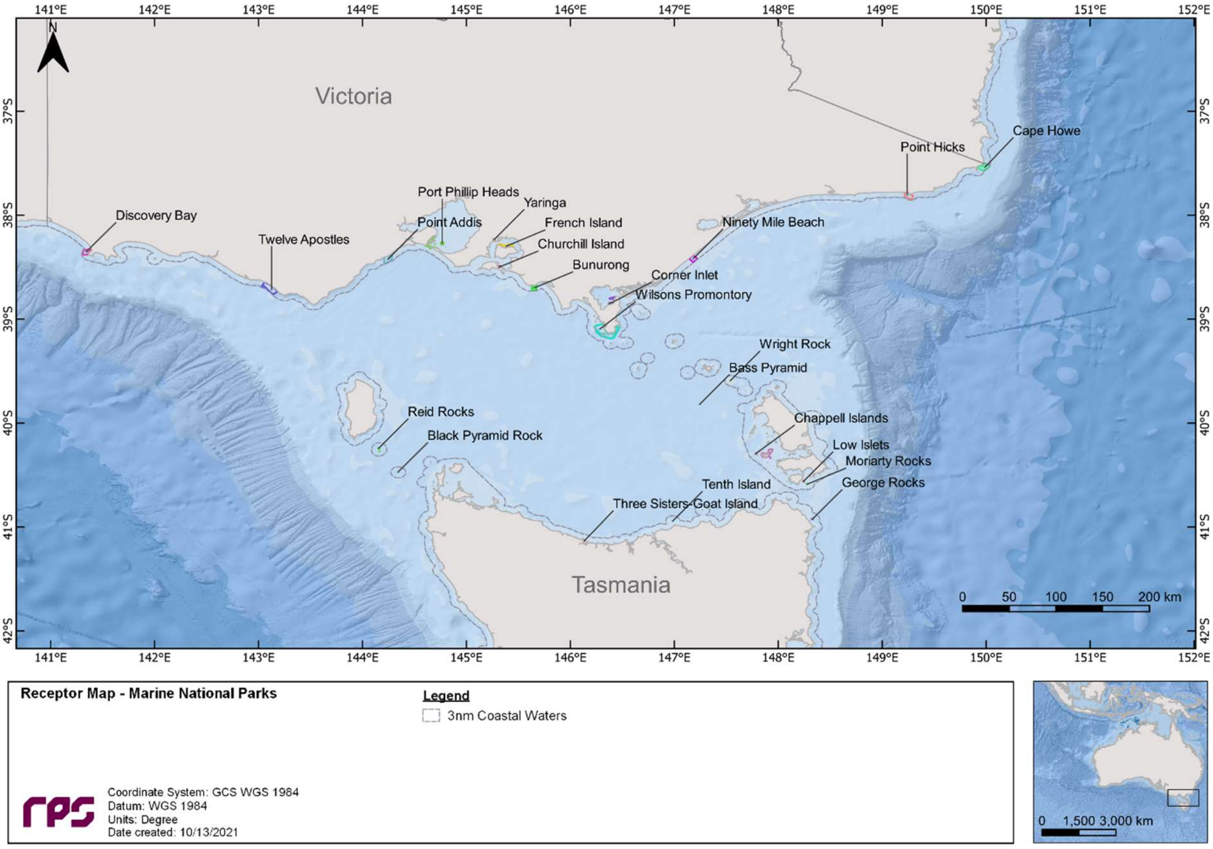

Figure 9-4 Receptor map for Marine National Parks (MNP).

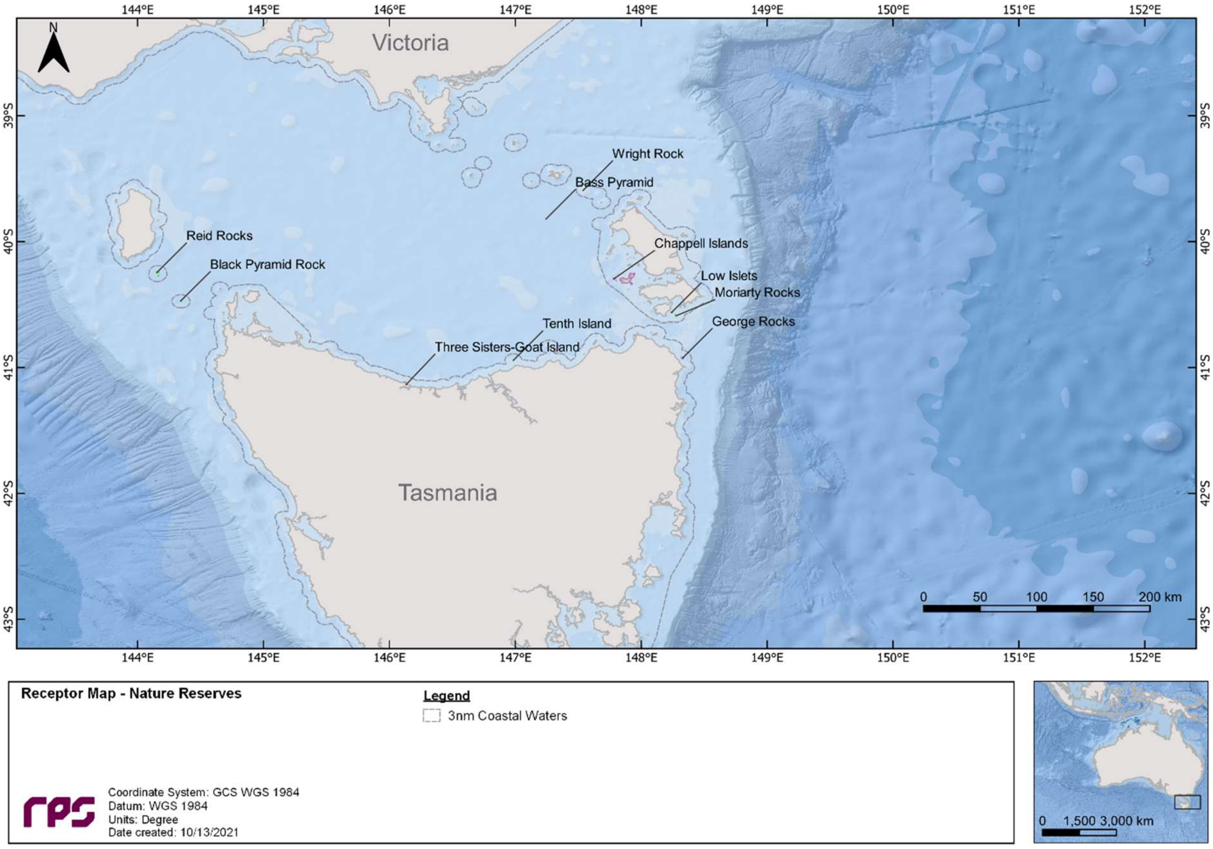

Figure 9-5 Receptor map for Nature Reserves (NR).

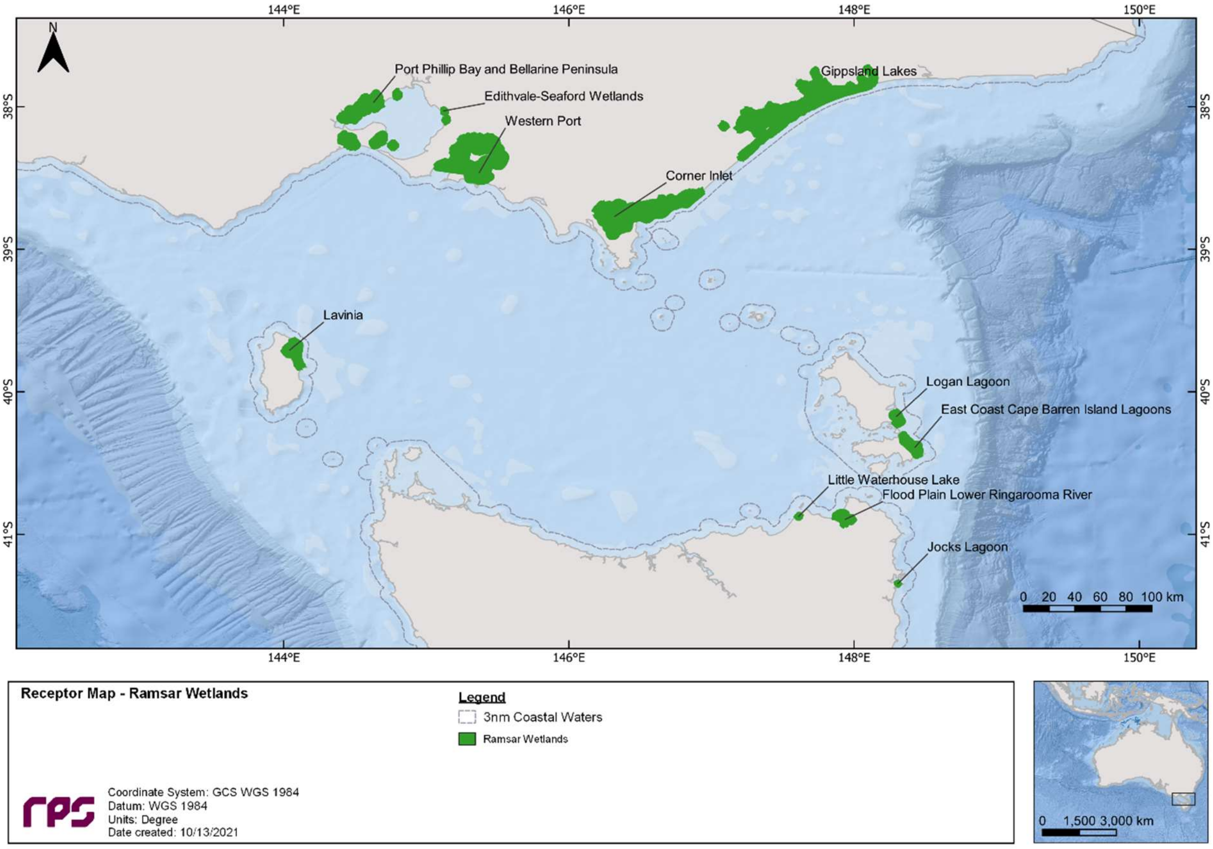

Figure 9-6 Receptor map for Ramsar Sites (Ramsar).

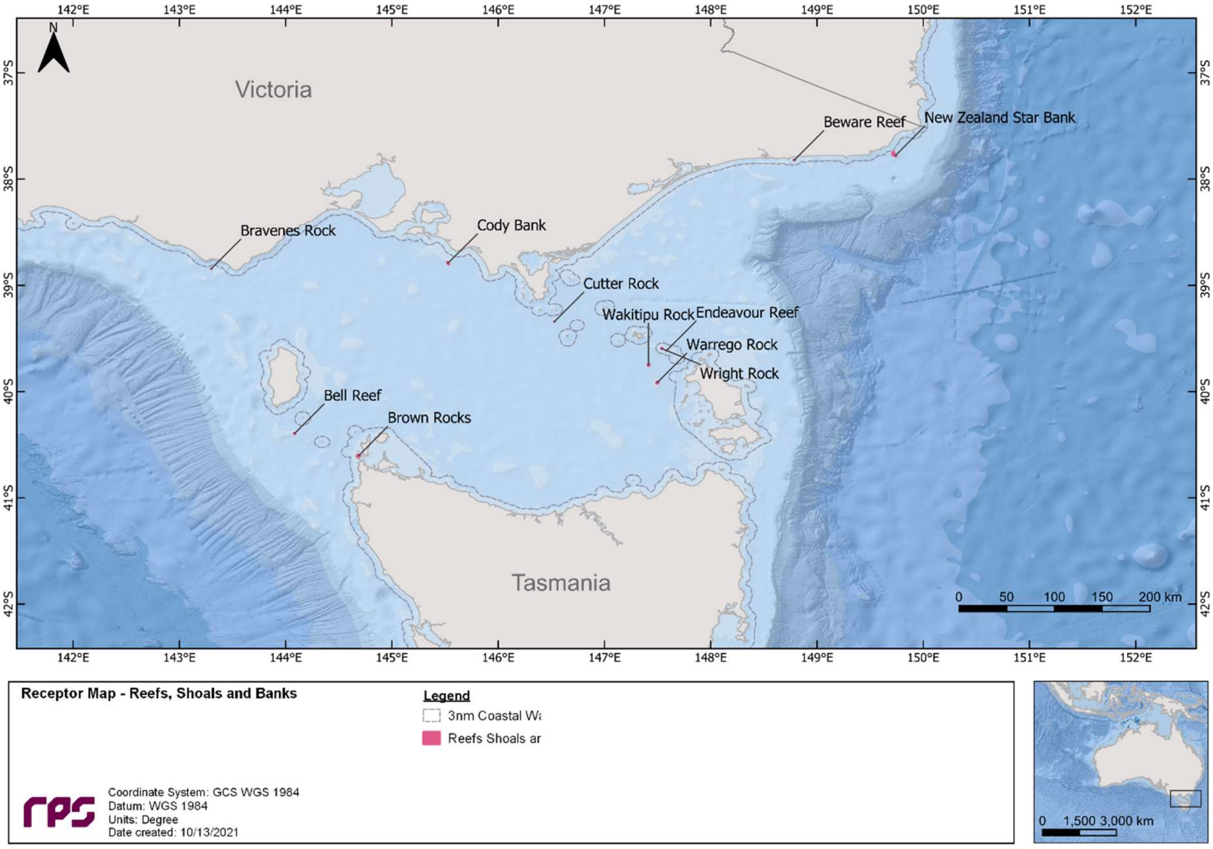

Figure 9-7 Receptor map for Reefs, Shoals and Banks (RSB).

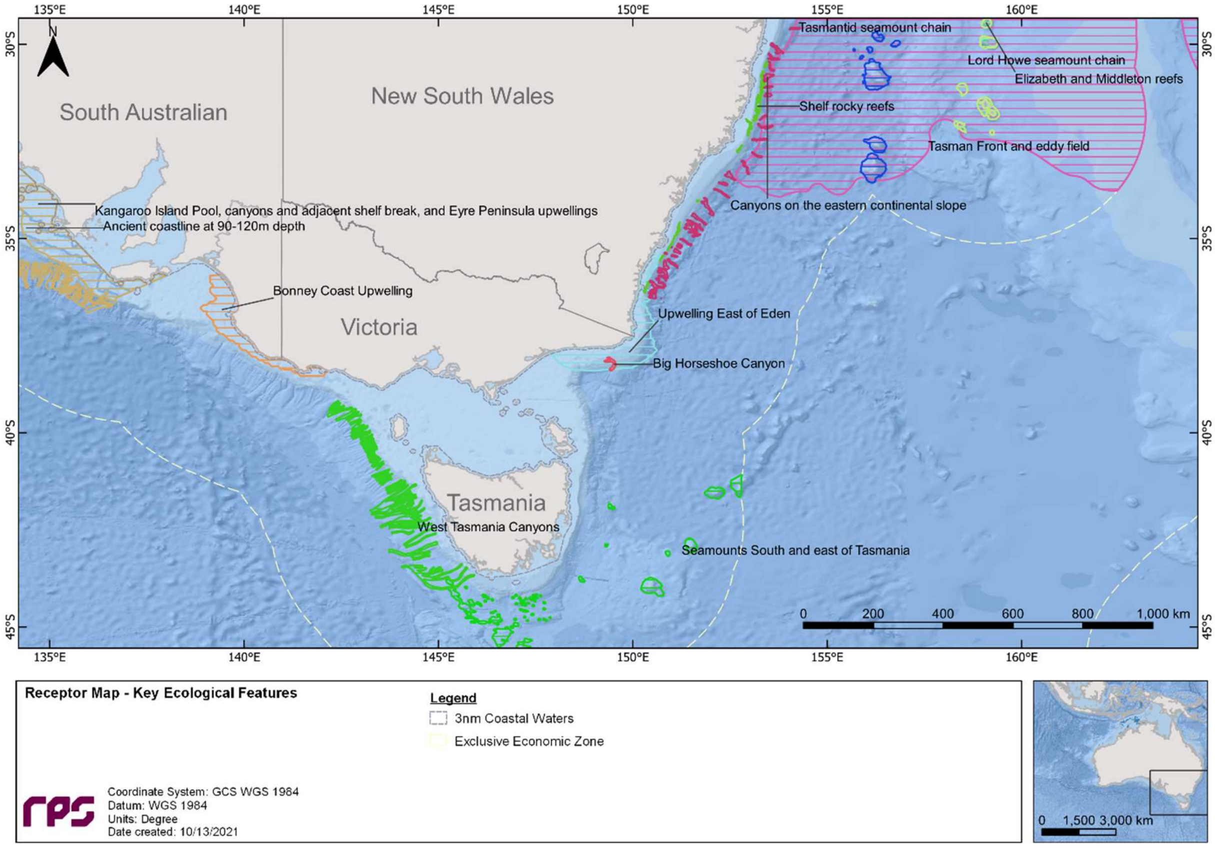

Figure 9-8 Receptor map for Key Ecological Features (KEF).

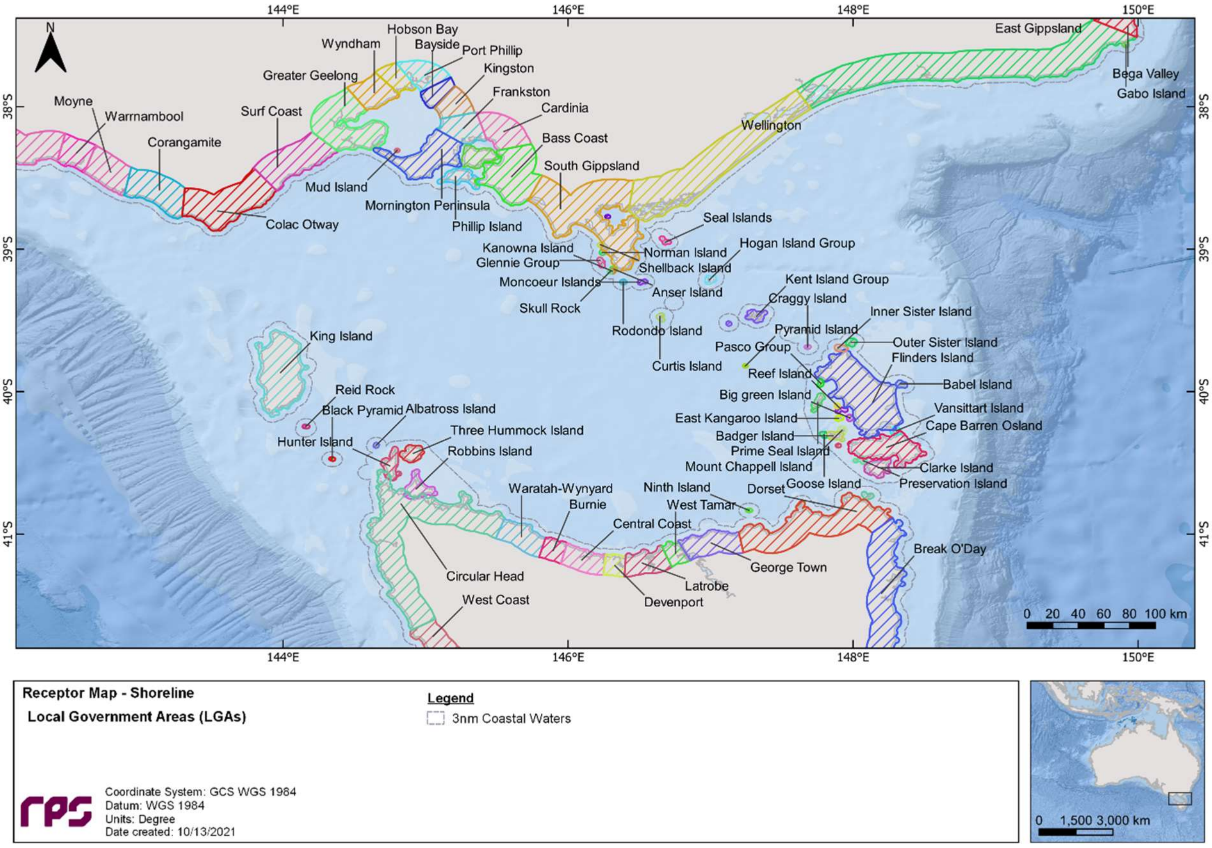

Figure 9-9 Receptor map for Local Government Areas (LGA).

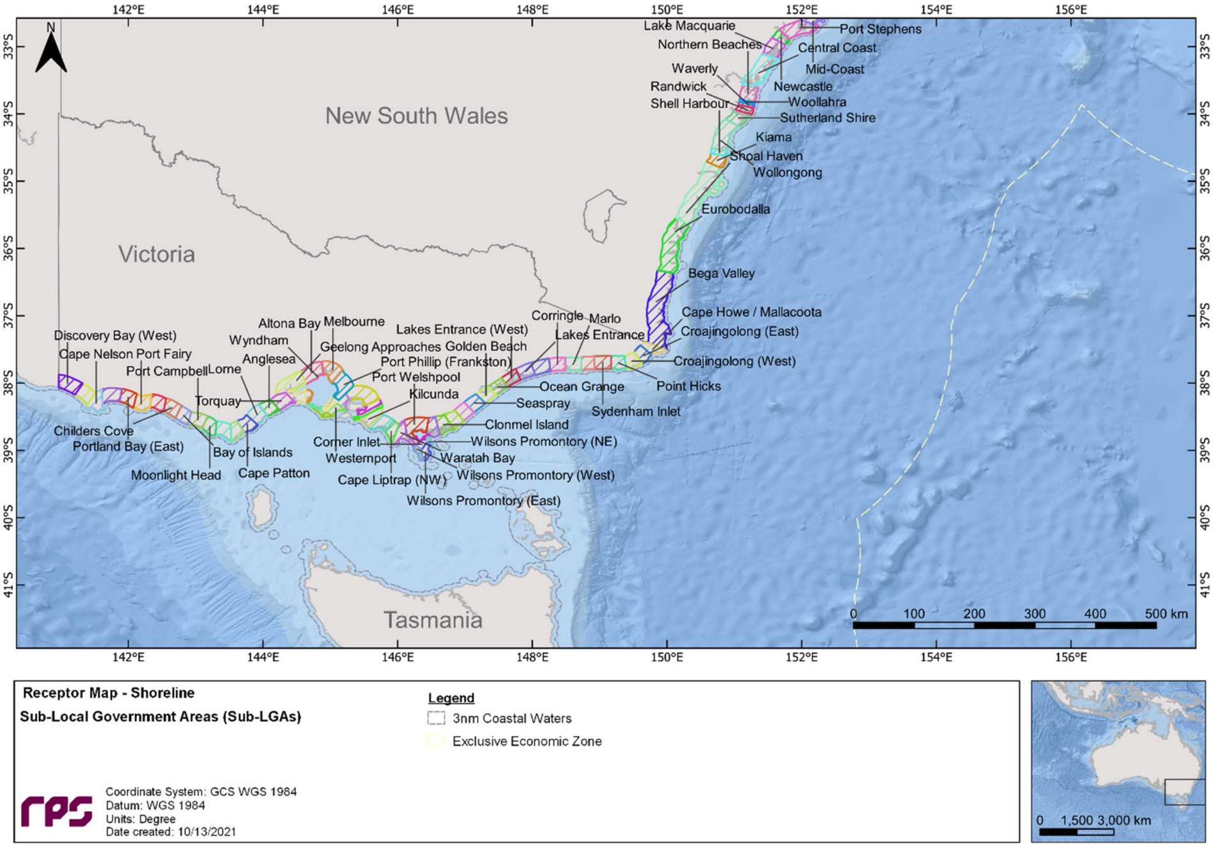

Figure 9-10 Receptor map for Sub Local Government Areas (Sub-LGA).

10 RESULTS – 300 m³ LOSS OF CONTAINMENT CAUSED BY VESSEL COLLISION

This scenario examined a 300 m^3 surface release of MDO over 6 hours to represent a loss of containment caused by vessel collision. A total of 200 spill simulations were run (i.e. 100 spills per season) and tracked for 30 days. The results for all 100 simulations per season were combined and are presented on a seasonal basis (i.e. summer and winter).

Sections 10.1 and 10.2 present the annual stochastic analysis and deterministic analysis results, respectively.

10.1 Stochastic Analysis

10.1.1 Environment that may be affected (EMBA)

Figure 10-1 presents the low threshold environment that maybe affected (EMBA) produced by overlaying the results from all 200 simulations (i.e. 100 per season) during summer and winter conditions.

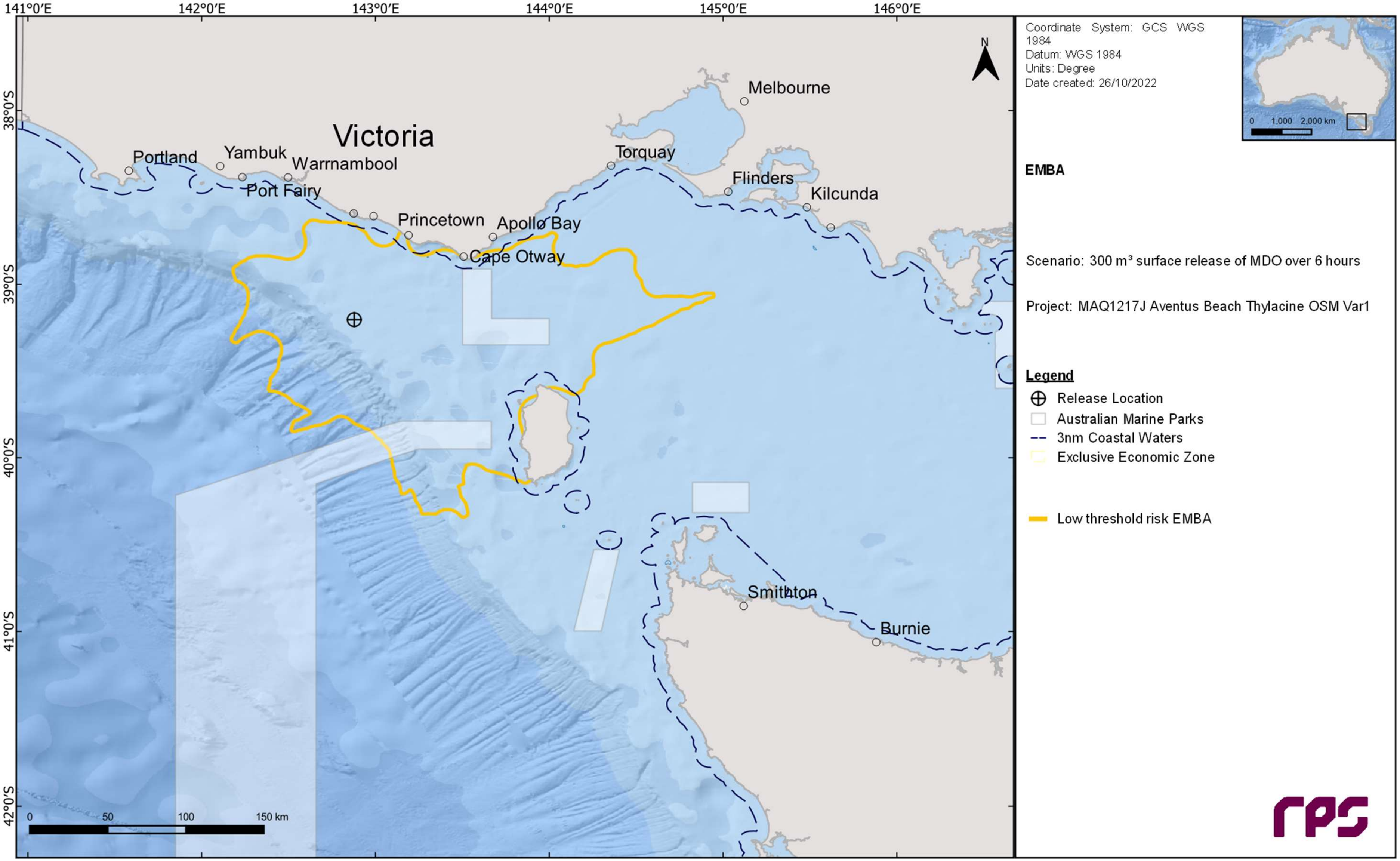

Figure 10-1 Predicted low threshold risk EMBA produced by overlaying the results from all 200 simulations, resulting from a 300 m^3 surface release of MDO over 6 hours during summer and winter conditions.

10.1.2 Floating Oil Exposure

Table 10-1 summarises the maximum distance travelled by floating oil on the sea surface at each threshold. 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) exposure zones was 39.3 km (east-southeast) during summer conditions, 15.3 km (east-southeast) during winter conditions and 2.7 km (west-southwest) during winter conditions, respectively.

Table 10-2 summarises the potential floating oil exposure to individual receptors during the summer and winter conditions.

A total of 14 BIAs were shown to be exposed to floating oil at, or above, the low threshold during the summer and winter conditions. Additionally, the Otway IMCRA was shown to be exposed to floating oil at, or above, the low threshold during both summer and winter conditions (see Table 10-2). The release locations reside within all 16 receptors listed in Table 10-2.

Figure 10-2 and Figure 10-3 present the zones of potential floating oil exposure for all thresholds under summer and winter conditions, respectively.

Table 10-1 Maximum distance and direction from the release location to the edge of floating oil exposure. Results are based on a 300 m^3 surface release of MDO over 6 hours, tracked for 30 days. The results were calculated from 100 spill simulations per season.

Season	Distance and direction travelled	Zones of potential floating oil exposure		
		Low	Moderate	High
Summer	Maximum distance (km) from release location	39.3	11.7	1.4
	Maximum distance (km) from release location (99th percentile)	37.6	11	1.4
	Direction	East-southeast	Southeast	West-southwest
Winter	Maximum distance (km) from release location	33.1	15.3	2.7
	Maximum distance (km) from release location (99th percentile)	31.1	13.8	2.7
	Direction	Southeast	East-southeast	West-southwest

Table 10-2 Summary of the potential floating oil exposure to individual receptors. Results are based on a 300 m^3 surface release of MDO over 6 hours, tracked for 30 days. The results were calculated from 100 spill simulations per season.

Receptor		Summer (November through to March)						Winter (April to October)					
		Probability of floating oil exposure (%)			Minimum time before floating oil exposure (hours)			Probability of floating oil exposure (%)			Minimum time before floating oil exposure (hours)		
		Low	Moderate	High	Low	Moderate	High	Low	Moderate	High	Low	Moderate	High
BIA	Antipodean Albatross – Foraging*	100	100	9	1	1	3	100	100	11	1	1	2
	Black-browed Albatross – Foraging*	100	100	9	1	1	3	100	100	11	1	1	2
	Bullers Albatross – Foraging*	100	100	9	1	1	3	100	100	11	1	1	2
	Campbell Albatross – Foraging*	100	100	9	1	1	3	100	100	11	1	1	2
	Common Diving-petrel – Foraging*	100	100	9	1	1	3	100	100	11	1	1	2
	Indian Yellow-nosed Albatross – Foraging*	100	100	9	1	1	3	100	100	11	1	1	2
	Pygmy Blue Whale – Distribution*	100	100	9	1	1	3	100	100	11	1	1	2
	Pygmy Blue Whale – Foraging*	100	100	9	1	1	3	100	100	11	1	1	2
	Short-tailed Shearwater – Foraging*	100	100	9	1	1	3	100	100	11	1	1	2
	Shy Albatross – Foraging*	100	100	9	1	1	3	100	100	11	1	1	2
	Southern Right Whale – Migration*	100	100	9	1	1	3	100	100	11	1	1	2
	Wandering Albatross – Foraging*	100	100	9	1	1	3	100	100	11	1	1	2
	Wedge-tailed Shearwater – Foraging*	100	100	9	1	1	3	100	100	11	1	1	2
	White Shark – Distribution*	100	100	9	1	1	3	100	100	11	1	1	2
EEZ	Australian Exclusive Economic Zone*	100	100	9	1	1	3	100	100	11	1	1	2
IMCRA	Otway*	100	100	9	1	1	3	100	100	11	1	1	2

*The release location resides within the receptor boundaries.

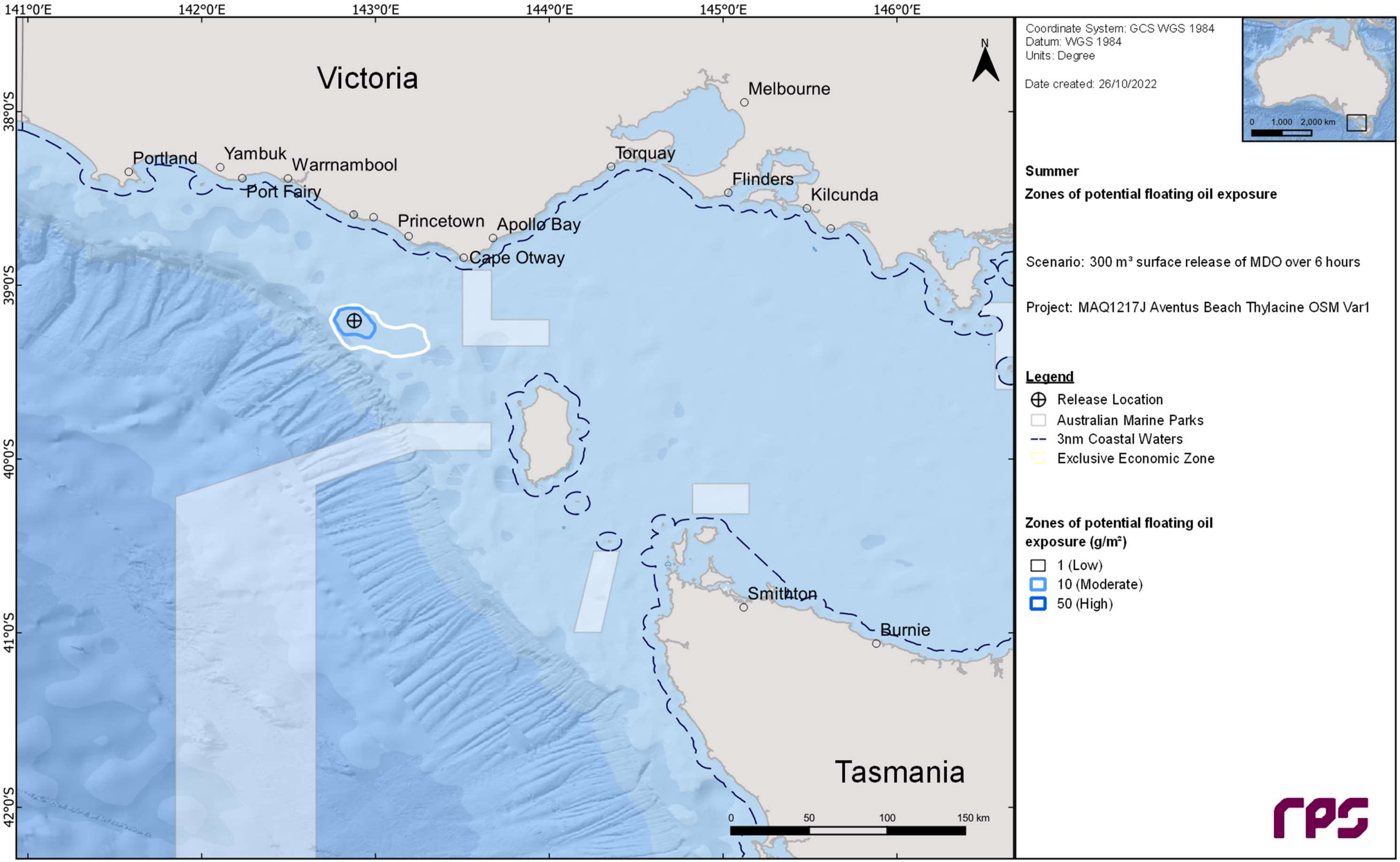

Figure 10-2 Zones of potential floating oil exposure in the event of a 300 m³ of MDO containment loss over 6 hours tracked for 30 days. The results were calculated from 100 spill simulations during summer conditions.

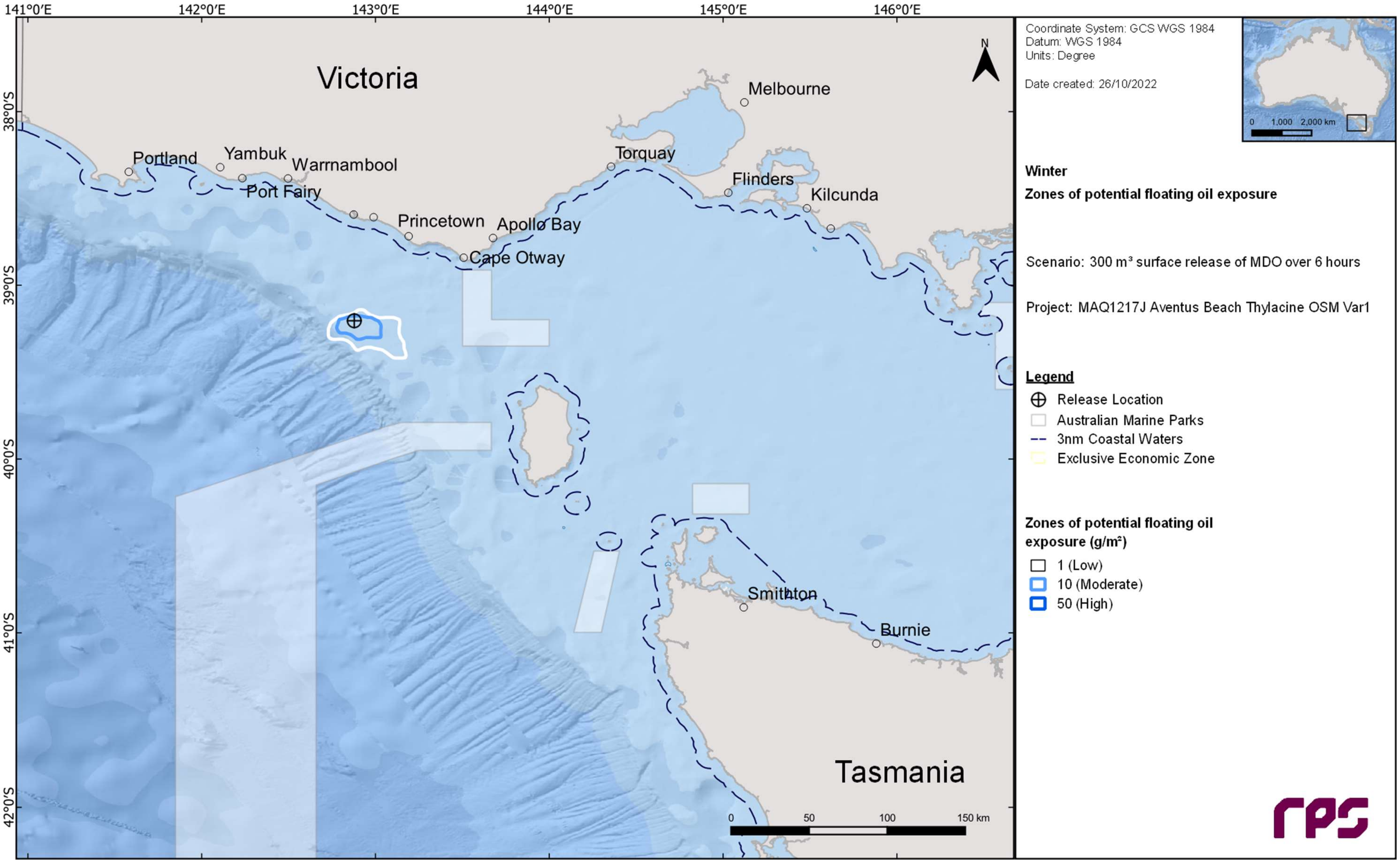

Figure 10-3 Zones of potential floating oil exposure in the event of a 300 m³ of MDO containment loss over 6 hours tracked for 30 days. The results were calculated from 100 spill simulations during winter conditions.

10.1.3 Shoreline Accumulation

Table 10-3 presents a summary of the predicted potential shoreline accumulation during the summer and winter conditions. The probability of accumulation to any shoreline at, or above, the low level (10 g/m^2) threshold was 0% during summer conditions and 5% during winter conditions. The minimum time before oil accumulation at, or above, the low threshold was 7.58 days winter conditions. The maximum total volume ashore for a single spill trajectory during winter conditions was 4.3 m^3, and the maximum length of shoreline accumulation at the low threshold was 11 km. No shoreline accumulation was observed for the summer season nor the moderate or high thresholds for winter.

Table 10-4 summarises the shoreline accumulation on individual receptors during the summer and winter conditions. During winter conditions one sub-LGA shorelines was shown to have shoreline accumulation above the low threshold with probability of 1%. The minimum time for low threshold shoreline accumulation was 7.58 days for King Island, where the maximum shoreline accumulation (4.3 m^3) also occurred.

The maximum potential shoreline loading above the low shoreline thresholds for winter conditions are presented in Figure 10-4.

Table 10-3 Summary of oil accumulation across all shorelines. Results are based on a 300 m^3 surface release of MDO over 6 hours, tracked for 30 days. The results were calculated from 100 spill simulations per season.

Shoreline Statistics	Summer	Winter
Probability of accumulation on any shoreline (%)	0	5
Absolute minimum time for visible oil to shore (days)	-	7.58
Maximum total volume of hydrocarbons ashore (m^3)	-	4.3
Average total volume of hydrocarbons ashore (m^3)	-	0.4
Maximum length of the shoreline at **10 g/m^2** (km)	-	11
Average shoreline length (km) at **10 g/m^2** (km)	-	3.6
Maximum length of the shoreline at **100 g/m^2** (km)	-	-
Average shoreline length (km) at **100 g/m^2** (km)	-	-
Maximum length of the shoreline at **1,000 g/m^2** (km)	-	-
Average shoreline length (km) at **1,000 g/m^2** (km)	-	-

Table 10-4 Summary of oil accumulation on individual shoreline receptors. Results are based on a 300 m^3 surface release of MDO over 6 hours, tracked for 30 days. The results were calculated from 100 spill simulations per season.

Shoreline Receptor		Summer																Winter															
		Maximum probability of shoreline loading (%)			Minimum time before shoreline accumulation (days)			Load on shoreline (g/m^2)		Volume on shoreline (m^3)		Mean length of shoreline accumulation (km)			Maximum length of shoreline accumulation (km)			Maximum probability of shoreline loading (%)			Minimum time before shoreline accumulation (days)			Load on shoreline (g/m^2)		Volume on shoreline (m^3)		Mean length of shoreline accumulation (km)			Maximum length of shoreline accumulation (km)		
		Low	Mod	High	Low	Mod	High	Mean	Peak	Mean	Peak	Low	Mod	High	Low	Mod	High	Low	Mod	High	Low	Mod	High	Mean	Peak	Mean	Peak	Low	Mod	High	Low	Mod	High
LGA	Colac Otway	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	9.92	-	-	1	15	< 0.1	0.5	1	-	-	1	-	-
	King Island	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	-	-	7.58	-	-	2	48	< 0.1	4.3	4.3	-	-	11	-	-
Sub-LGA	Cape Otway West	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	9.92	-	-	1	15	< 0.1	0.4	1	-	-	1	-	-

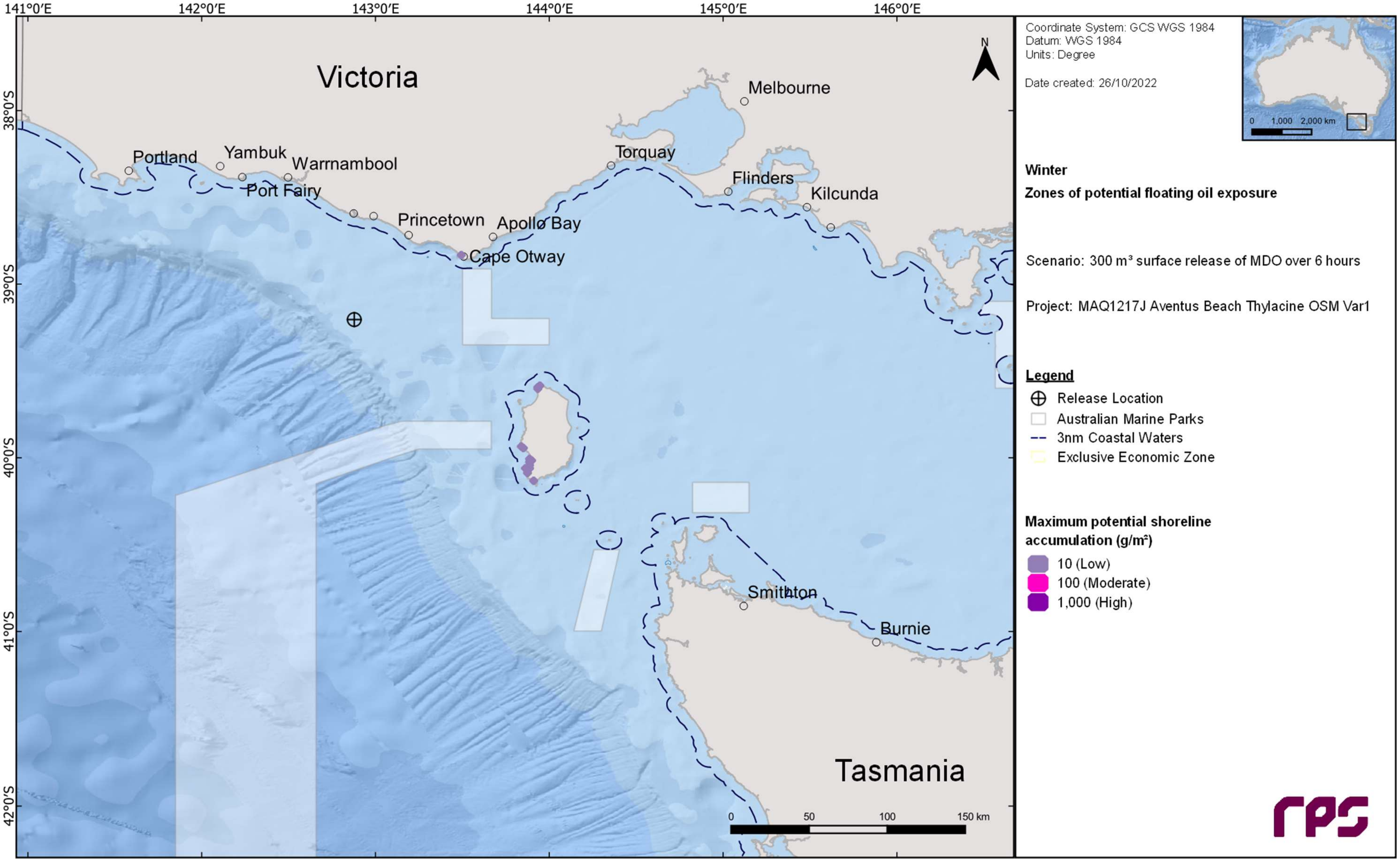

Figure 10-4 Maximum potential shoreline loading in the event of a 300 m^3 of MDO containment loss over 6 hours tracked for 30 days. The results were calculated from 100 spill simulations during winter conditions.

10.1.4 In-water exposure

10.1.4.1 Dissolved Hydrocarbons

Table 10-5 summarises the probability of exposure to individual receptors from dissolved hydrocarbons in the 0-10 m layer during the summer and winter conditions.

A total of 14 BIAs were shown to be exposed to dissolved hydrocarbons above the low and moderate thresholds during both the summer and winter conditions. Furthermore, the Apollo AMP, the Otway IMCRA and the West Tasmania Canyons KEF were also predicted to be exposed above the low threshold during both summer and winter conditions. The maximum probability of exposure for the low threshold for any receptor during either summer and winter was 60% and 58%, respectively. During the summer and winter conditions the maximum dissolved aromatic concentrations at any given receptor(s) was predicted to be 57 ppb and 58 ppb, respectively, which occurred within receptors containing the release location.

Figure 10-5 and Figure 10-6 presents the zones of potential dissolved hydrocarbon exposure for the 0-10 m depth layer, for each threshold assessed under summer and winter conditions.

Table 10-5 Probability of dissolved hydrocarbons exposure to marine based receptors in the 0–10 m dept. Results are based on a 300 m^3 surface release of MDO over 6 hours, tracked for 30 days. The results were calculated from 100 spill simulations per season.

Receptor		Summer (November through to March)				Winter (April to October)			
		Maximum instantaneous dissolved hydrocarbon exposure	Probability of instantaneous dissolved hydrocarbon exposure			Maximum instantaneous dissolved hydrocarbon exposure	Probability of instantaneous dissolved hydrocarbon exposure		
			Low	Moderate	High		Low	Moderate	High
AMP	Apollo	21	1	0	0	15	1	0	0
BIA	Antipodean Albatross – Foraging*	60	57	1	0	64	58	2	0
	Black-browed Albatross – Foraging*	60	57	1	0	64	58	2	0
	Bullers Albatross – Foraging*	60	57	1	0	64	58	2	0
	Campbell Albatross – Foraging*	60	57	1	0	64	58	2	0
	Common Diving-petrel – Foraging*	60	57	1	0	64	58	2	0
	Indian Yellow-nosed Albatross – Foraging*	60	57	1	0	64	58	2	0
	Pygmy Blue Whale – Distribution*	60	57	1	0	64	58	2	0
	Pygmy Blue Whale – Foraging*	60	57	1	0	64	58	2	0
	Short-tailed Shearwater – Foraging*	60	57	1	0	64	58	2	0
	Shy Albatross – Foraging*	60	57	1	0	64	58	2	0
	Southern Right Whale – Migration*	60	57	1	0	64	58	2	0
	Wandering Albatross – Foraging*	60	57	1	0	64	58	2	0
	Wedge-tailed Shearwater – Foraging*	60	57	1	0	64	58	2	0
	White Shark – Distribution*	60	57	1	0	64	58	2	0
EEZ	Australian Exclusive Economic Zone*	60	57	1	0	64	58	2	0
IMCRA	Otway*	60	57	1	0	64	58	2	0
KEF	West Tasmania Canyons	8	0	0	0	17	1	0	0

*The release location resides within the receptor boundaries.

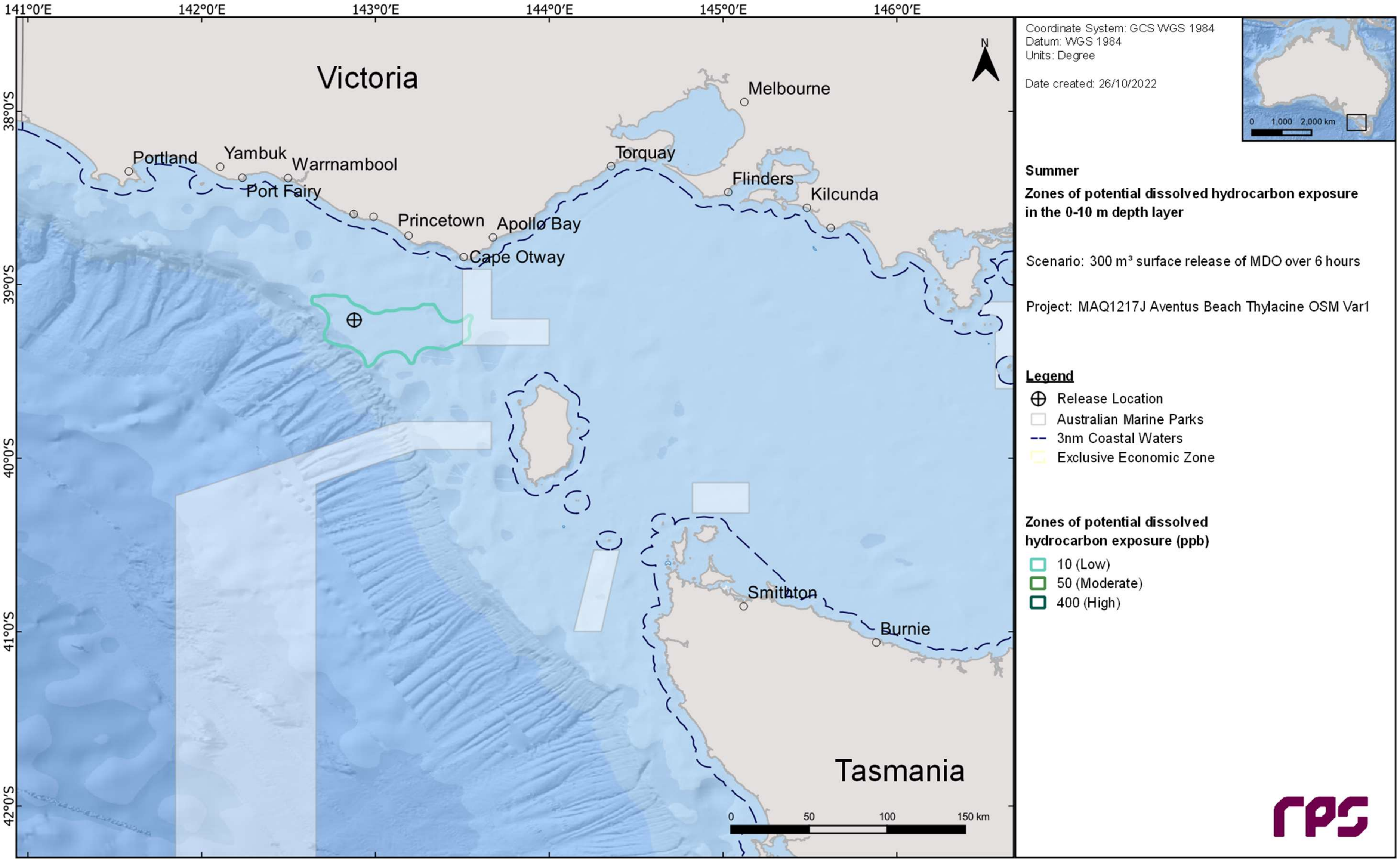

Figure 10-5 Zones of potential dissolved hydrocarbon exposure at 0-10 m below the sea in the event of a 300 m^3 of MDO containment loss over 6 hours tracked for 30 days. The results were calculated from 100 spill simulations during summer conditions.

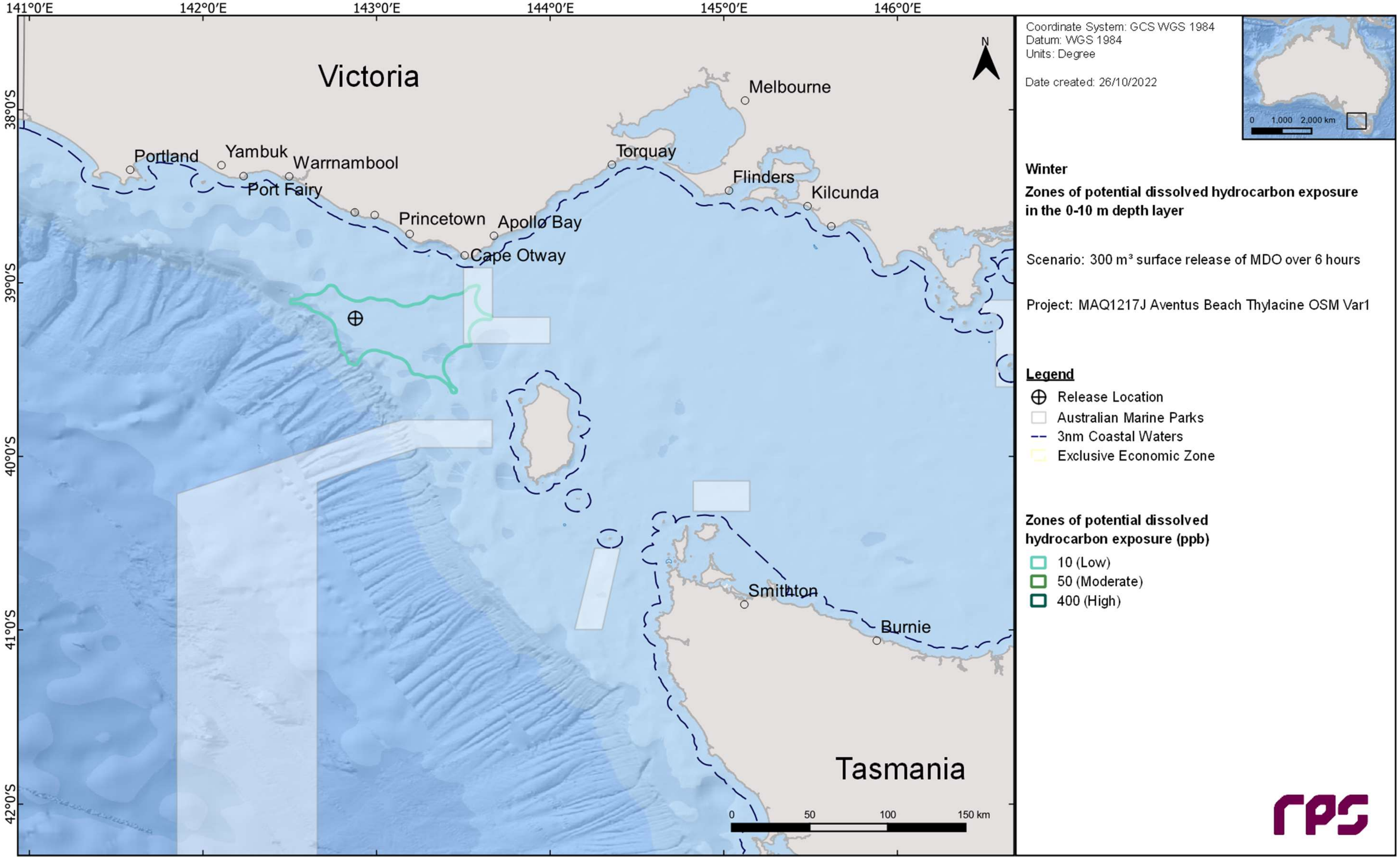

Figure 10-6 Zones of potential dissolved hydrocarbon exposure at 0-10 m below the sea in the event of a 300 m^3 of MDO containment loss over 6 hours tracked for 30 days. The results were calculated from 100 spill simulations during winter conditions.

10.1.4.2 Entrained Hydrocarbons

Table 10-6 presents the probability of exposure to individual receptors from entrained hydrocarbons in the 0-10 m depth layer for the summer and winter conditions.

During both summer and winter conditions entrained hydrocarbon exposures at, or above, the low threshold was predicted for AMP, BIA, IBRA, IMCRA, KEF, MNP, RSB, nearshore waters (LGA and sub-LGA) and State Water receptors. The maximum probability of exposure for the low threshold for any receptor during summer and winter was 95% and 98%, respectively and 89% for the high threshold for both seasons. The maximum entrained hydrocarbon concentration predicted during the summer and winter conditions was 6,323 ppb and 7,007 ppb, respectively, which occurred within the receptors containing the release location.

Figure 10-7 and Figure 10-8 presents the zones of potential entrained hydrocarbon exposure for the 0-10 m depth layer, for each threshold assessed under summer and winter conditions, respectively

Table 10-6 Probability of entrained hydrocarbons exposure to marine based receptors in the 0–10 m depth layer. Results are based on a 300 m^3 surface release of MDO over 6 hours, tracked for 30 days. The results were calculated from 100 spill simulations per season.

Receptor		Summer (November through to March)			Winter (April to October)		
		Maximum instantaneous entrained hydrocarbon exposure	Probability of instantaneous entrained hydrocarbon exposure		Maximum instantaneous entrained hydrocarbon exposure	Probability of instantaneous entrained hydrocarbon exposure	
			Low	High		Low	High
AMP	Apollo	238	15	2	230	37	3
	Zeehan	28	9	0	43	8	0
BIA	Antipodean Albatross – Foraging*	6,323	95	89	7,007	98	89
	Black-browed Albatross – Foraging*	6,323	95	89	7,007	98	89
	Black-faced Cormorant – Foraging	16	3	0	35	9	0
	Bullers Albatross – Foraging*	6,323	95	89	7,007	98	89
	Campbell Albatross – Foraging*	6,323	95	89	7,007	98	89
	Common Diving-petrel – Foraging*	6,323	95	89	7,007	98	89
	Indian Yellow-nosed Albatross – Foraging*	6,323	95	89	7,007	98	89
	Little Penguin - Foraging	14	2	0	34	9	0
	Pygmy Blue Whale – Distribution*	6,323	95	89	7,007	98	89
	Pygmy Blue Whale – Foraging*	6,323	95	89	7,007	98	89
	Short-tailed Shearwater – Foraging*	6,323	95	89	7,007	98	89
	Shy Albatross – Foraging*	6,323	95	89	7,007	98	89
	Southern Right Whale - Aggregation	1	0	0	10	1	0
	Southern Right Whale - Connecting Habitat	9	0	0	19	3	0
	Southern Right Whale – Migration*	6,323	95	89	7,007	98	89
	Wandering Albatross – Foraging*	6,323	95	89	7,007	98	89
	Wedge-tailed Shearwater – Foraging*	6,323	95	89	7,007	98	89
	White Shark – Distribution*	6,323	95	89	7,007	98	89
	White Shark - Foraging	6	0	0	12	2	0
	White-faced Storm-petrel - Foraging	108	7	1	110	11	1
EEZ	Australian Exclusive Economic Zone*	6,323	95	89	7,007	98	89
IBRA	King Island	9	0	0	18	3	0
	Otway Plain	2	0	0	12	1	0

Receptor		Summer (November through to March)			Winter (April to October)		
		Maximum instantaneous entrained hydrocarbon exposure	Probability of instantaneous entrained hydrocarbon exposure		Maximum instantaneous entrained hydrocarbon exposure	Probability of instantaneous entrained hydrocarbon exposure	
			Low	High		Low	High
	Warrnambool Plain	1	0	0	10	1	0
IMCRA	Central Bass Strait	196	9	1	165	26	2
	Central Victoria	66	7	0	113	11	1
	Otway*	6,323	95	89	7,007	98	89
KEF	West Tasmania Canyons	275	35	2	267	10	2
MNP	Twelve Apostles	2	0	0	10	1	0
SHORE	Colac Otway	2	0	0	12	1	0
	Corangamite	1	0	0	10	1	0
	King Island	9	0	0	18	3	0
SUB-LGA	Apollo Bay	2	0	0	11	1	0
	Cape Otway West	2	0	0	12	1	0
	Moonlight Head	1	0	0	10	1	0
State Waters	Tasmania State Waters	14	2	0	32	8	0
	Victoria State Waters	5	0	0	22	2	0

*The release location resides within the receptor boundaries.

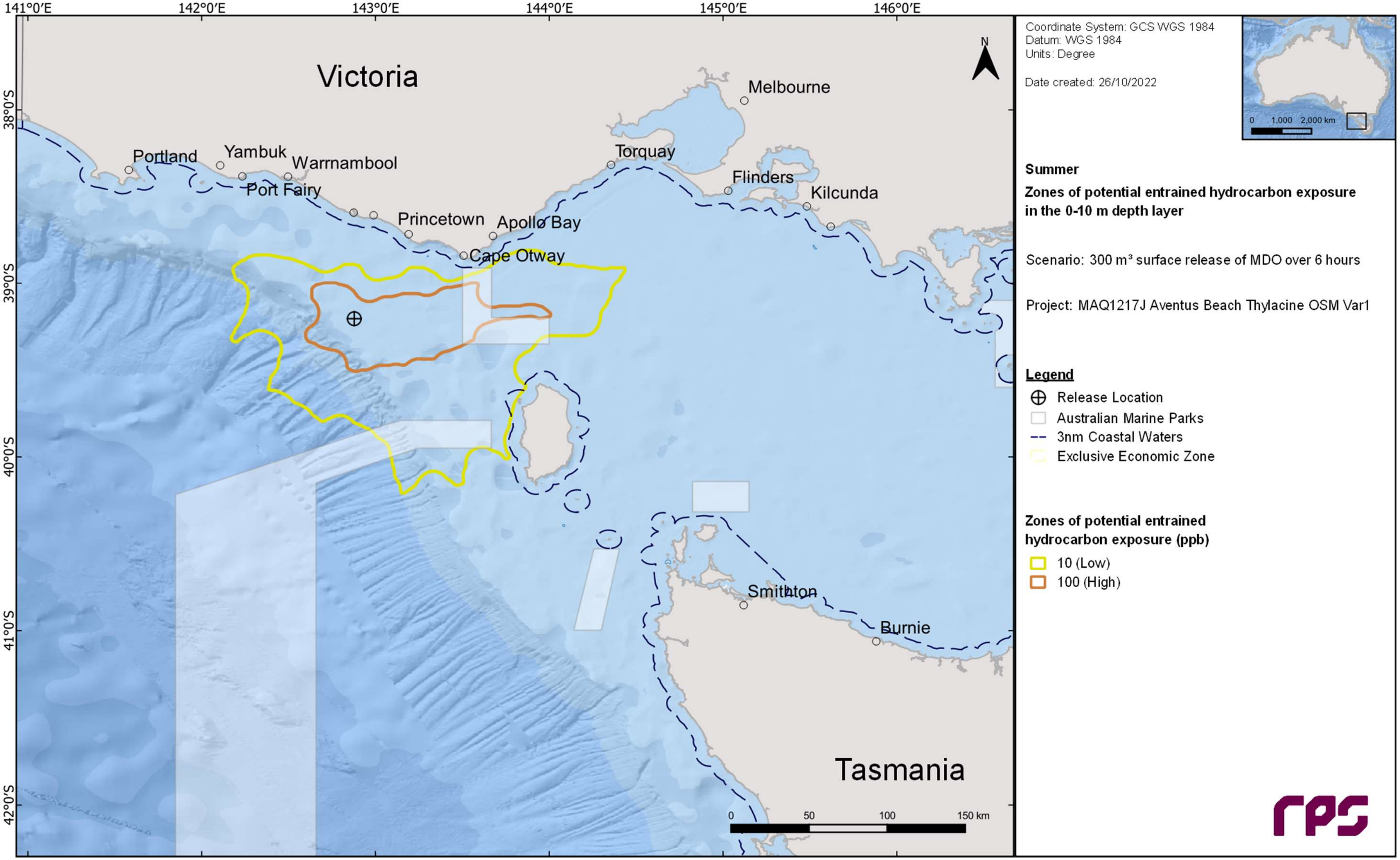

Figure 10-7 Zones of potential entrained hydrocarbon exposure at 0-10 m below the sea surface in the event of a 300 m^3 of MDO containment loss over 6 hours tracked for 30 days. The results were calculated from 100 spill simulations during summer conditions.

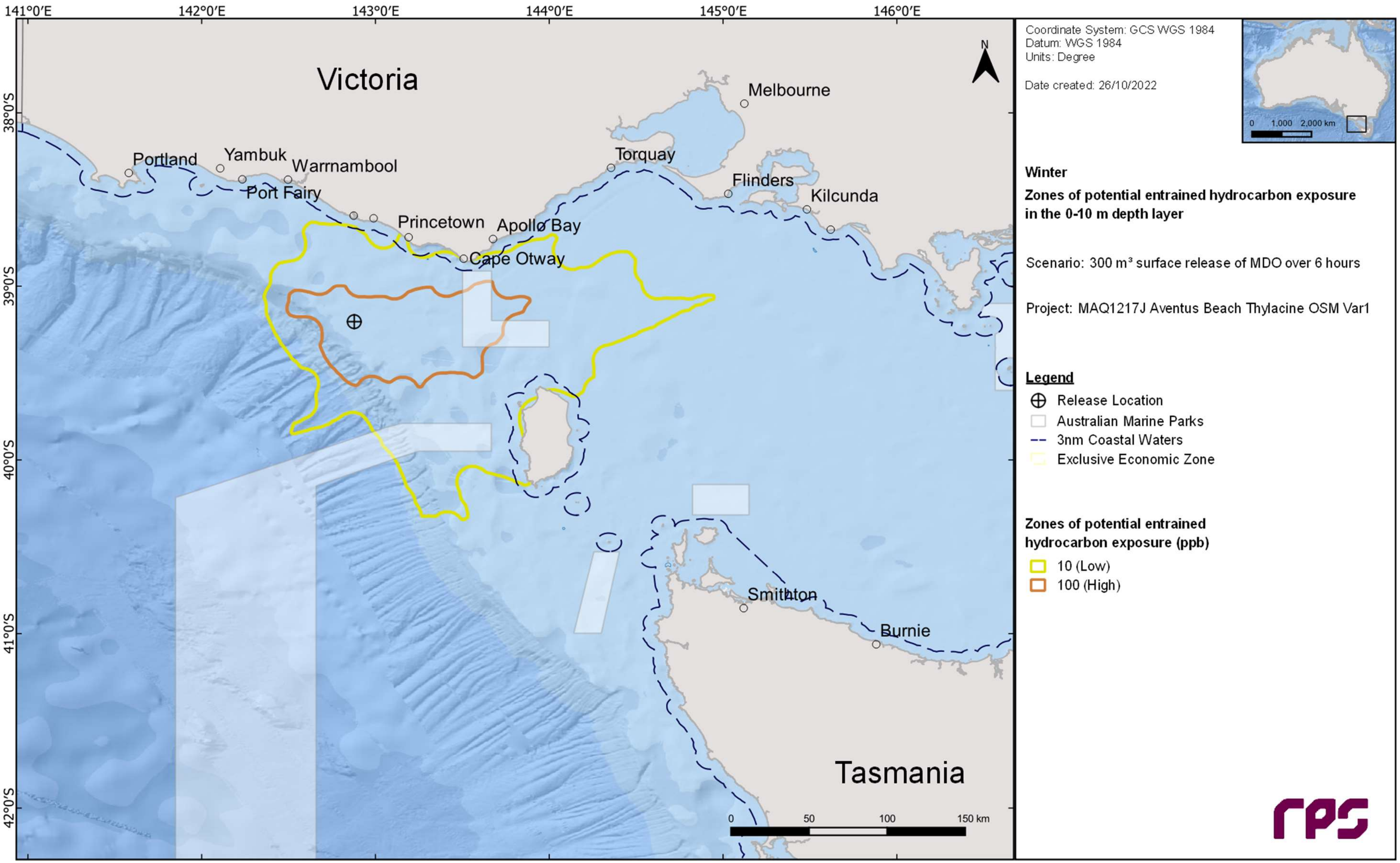

Figure 10-8 Zones of potential entrained hydrocarbon exposure at 0-10 m below the sea surface in the event of a 300 m^3 of MDO containment loss over 6 hours tracked for 30 days. The results were calculated from 100 spill simulations during winter conditions.

10.2 Deterministic Analysis

The stochastic modelling results were assessed, and the “worst case” deterministic runs were identified and are presented below. The deterministic analysis assessed the largest volume of oil ashore (Section 10.2.1), the longest length of shoreline accumulation above 100 g/m^2, and the minimum time before shoreline accumulation above 10 g/m^2 (see Section 10.2.2).

Please note there was no shoreline accumulation above the 100 g/m^2 threshold, so this deterministic case is not presented.

Table 10-7 presents a summary of shoreline accumulation at the assessed thresholds for the identified deterministic simulations.

Table 10-7 Summary of the worst-case deterministic analysis based on the scenario presented in the Stochastic Analysis Section.

Variable	Threshold	Deterministic Analysis Criteria	
		Largest volume of oil ashore	Minimum time before shoreline accumulation above 10 g/m^2
Season		Winter	Winter
Run Number		5	66
Total area of floating Oil exposure (km^2)	**1 g/m^2**	6	1.0
	10 g/m^2	2.0	1.0
	50 g/m^2	-	-
Total length of shoreline accumulation (km)	**10 g/m^2**	11	3.0
	100 g/m^2	NC	NC
	1,000 g/m^2	NC	NC
Minimum time before accumulation on any shoreline (days)	**10 g/m^2**	8.67	**7.58**
	100 g/m^2	NC	NC
	1,000 g/m^2	NC	NC
Total volume of oil ashore (m^3)		**4.3**	1.1
Total area of entrained hydrocarbon exposure (km^2)	**10 ppb**	2,238	2,297
	100 ppb	407	503
Total area of dissolved hydrocarbon exposure (km^2)	**10 ppb**	37.7	6.0
	50 ppb	-	-
	400 ppb	-	-
Start Date		6th June 2019	28th July 2013

NC = No contact at, or above the specified shoreline accumulation threshold.

10.2.1 Deterministic Case: Largest volume of oil ashore

The deterministic trajectory that resulted in the largest volume of oil ashore was identified as run number 5 during winter conditions, which started on 6th June 2019.

Figure 10.9 illustrates the floating oil exposure and shoreline accumulation over the 30-day simulation.

Figure 10.10 displays the time series of the volume of oil accumulating on shorelines at the low (10 g/m^2), moderate (100 g/m^2) and high (1,000 g/m^2) thresholds over the 30-day simulation.

Error! Reference source not found. displays the time series of the length of oil accumulation on shorelines at the low (10 g/m^2), moderate (100 g/m^2) and high (1,000 g/m^2) thresholds over the 30-day simulation.

Figure 10.11 presents the fates and weathering graph for the corresponding single spill trajectory and Table 10.8 summarises the mass balance at the end of the simulation.

Table 10.8 Summary of the mass balance for the trajectory that resulted in the largest volume of oil ashore. Results are based on a 300 m^3 surface release of MDO over 6 hours, tracked for 30 days.

Exposure Metrics	Peak Volume	Day of occurrence	Volume at day 30
Surface (m^3)	40.9	0.1	0.0
Entrained (m^3)	224.1	0.4	60.7
Dissolved (m^3)	1.4	0.7	0.1
Evaporation (m^3)	94.0	29.8	94.0
Decay (m^3)	146.6	30.0	146.6
Ashore (m^3)	3.0	10.0	0.7

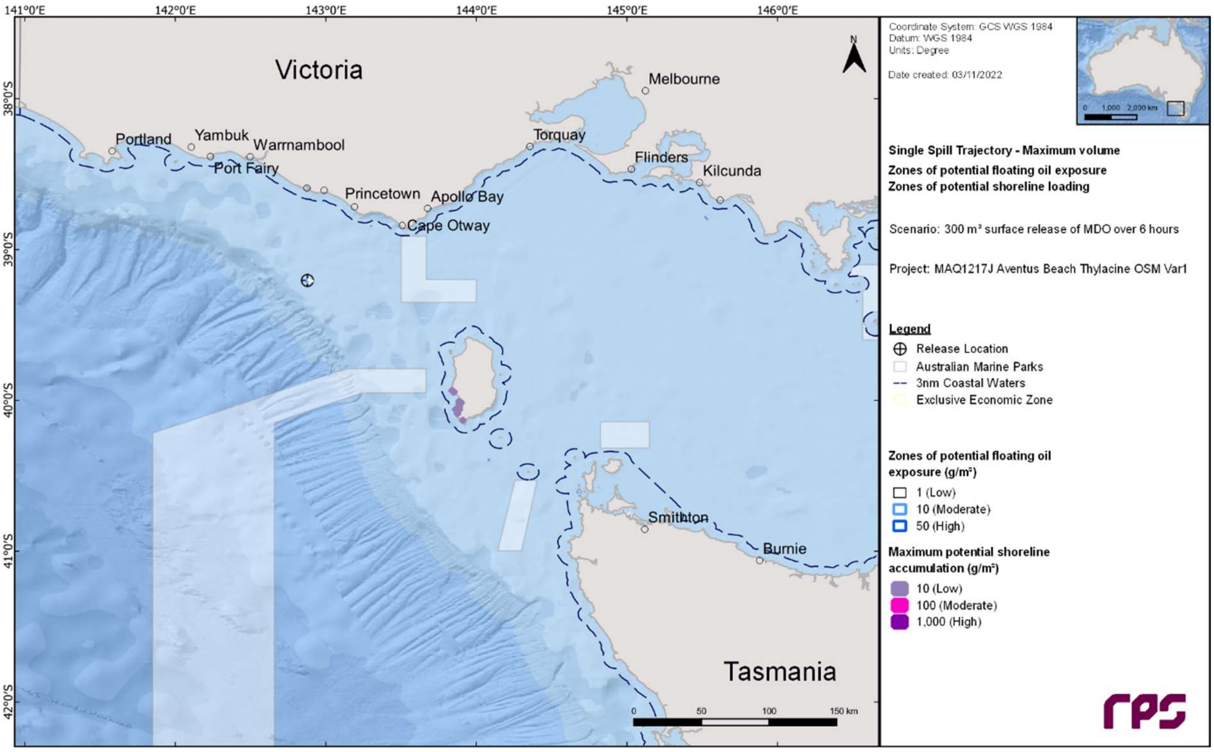

Figure 10.9 Zones of potential floating oil exposure and shoreline accumulation, for the trajectory with the largest volume of oil ashore. Results are based on a 300 m^3 surface release of MDO over 6 hours, tracked for 30 days.

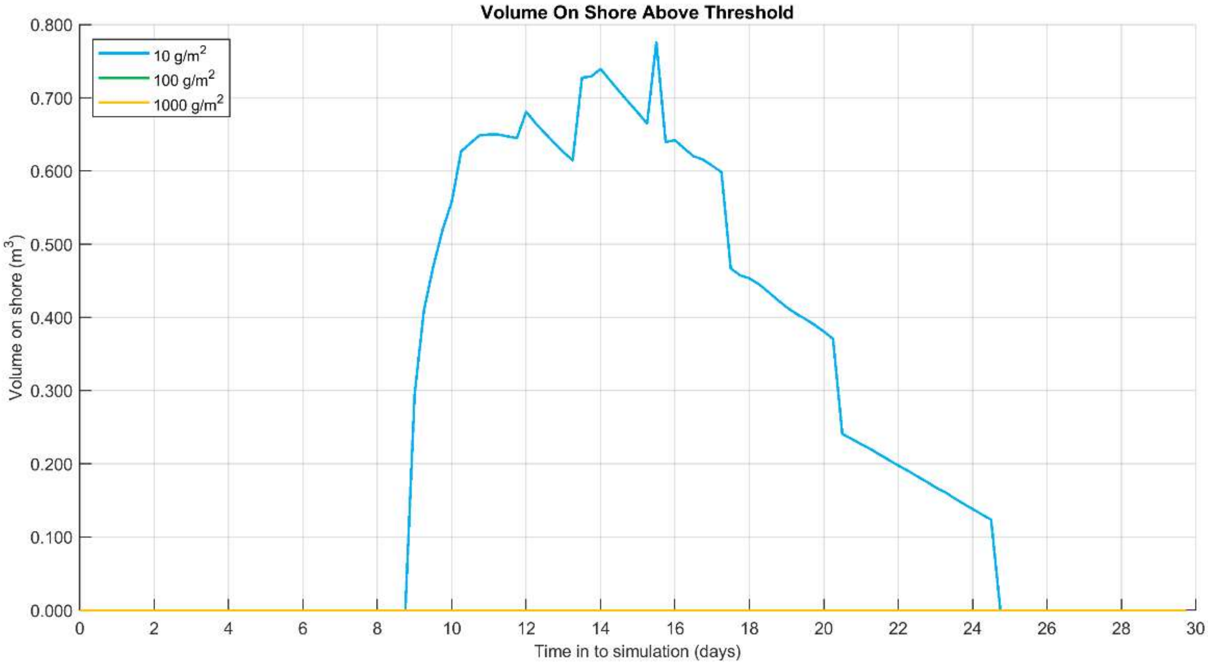

Figure 10.10 Time series of the volume of oil accumulating on shorelines at the low (10 g/m^2), moderate (100 g/m^2) and high (1,000 g/m^2) thresholds for the trajectory with the largest volume of oil ashore. Results are based on a 300 m^3 surface release of MDO over 6 hours, tracked for 30 days.

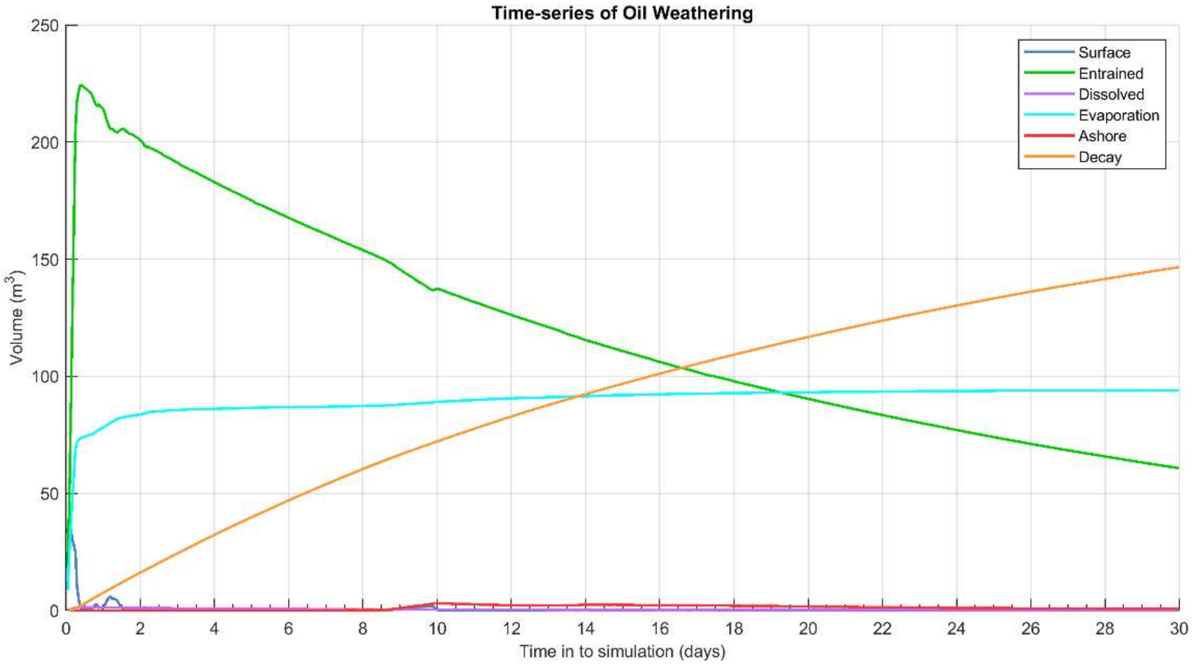

Figure 10.11 Predicted weathering and fates graph for the trajectory with the largest volume of oil ashore. Results are based on a 300 m^3 surface release of MDO over 6 hours, tracked for 30 days.

10.2.2 Deterministic Case: Minimum time before shoreline accumulation above 10 g/m²

The deterministic trajectory that resulted in the minimum time before shoreline accumulation above the low threshold (10 g/m²) was identified as run number 66 during winter conditions which started on 28th July 2013.

Figure 10.12 illustrates the floating oil exposure and shoreline accumulation over the 30 days.

Figure 10.13 presents the fates and weathering graph for the corresponding single spill trajectory and Table 10.9 summarises the mass balance at the end of the 30-day simulation.

Table 10.9 Summary of the mass balance for the trajectory that resulted in the minimum time before shoreline accumulation above the low threshold (10 g/m²). Results are based on a 300 m³ surface release of MDO over 6 hours, tracked for 30 days.

Exposure Metrics	Peak Volume	Day of occurrence	Volume at day 30
Surface (m^3)	13.4	0.1	0.0
Entrained (m^3)	272.7	0.3	59.1
Dissolved (m^3)	1.0	0.9	0.1
Evaporation (m^3)	83.0	30.0	83.0
Decay (m^3)	159.6	30.0	159.6
Ashore (m^3)	1.0	10.2	0.2

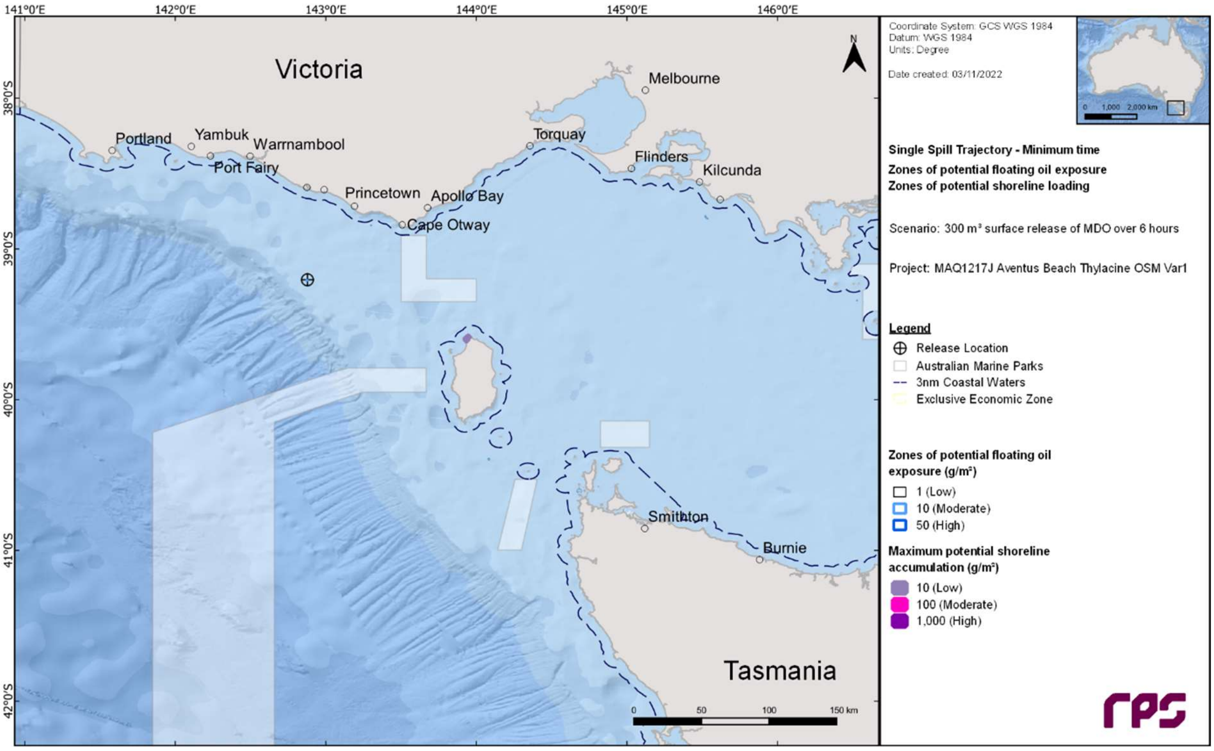

Figure 10.12 Zones of potential floating oil exposure and shoreline accumulation over the 30-day simulation, for the trajectory with the minimum time before shoreline accumulation above 10 g/m². Results are based on a 300 m³ surface release of MDO over 6 hours, tracked for 30 days.

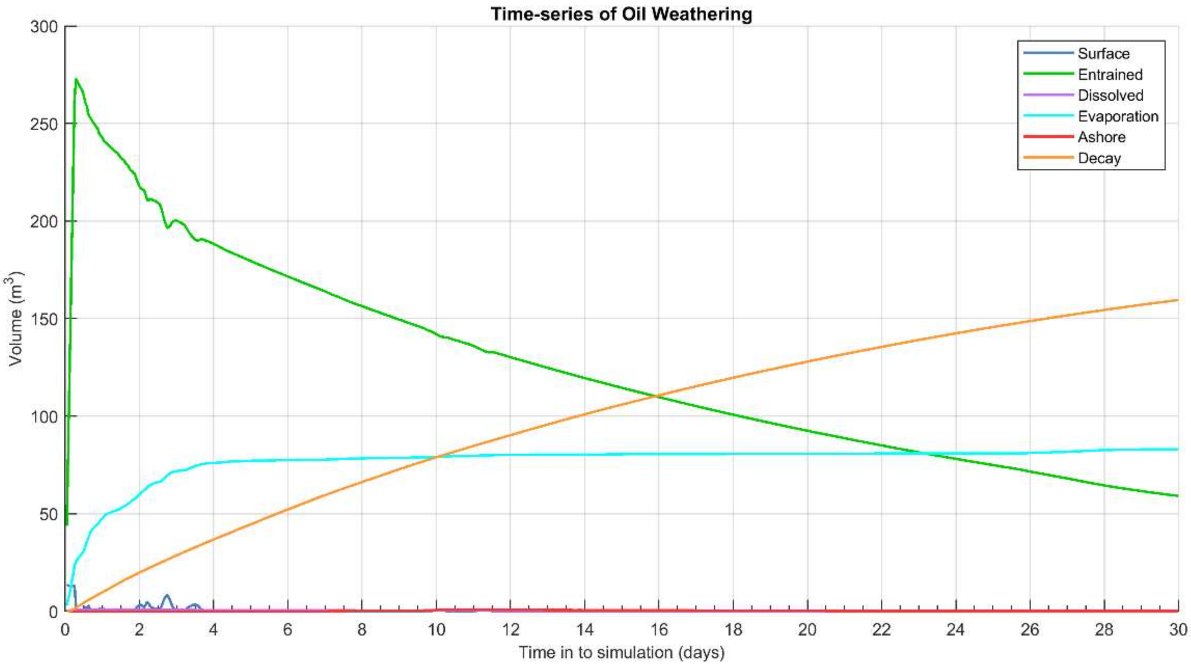

Figure 10.13 Predicted weathering and fates graph for the trajectory with the minimum time before shoreline accumulation above 10 g/m^2. Results are based on a 300 m^3 surface release of MDO over 6 hours, tracked for 30 days.

11 RESULTS – 200 m³ LOSS OF CONTAINMENT CAUSED BY VESSEL COLLISION

This scenario examined a 200 m^3 surface release of MDO over 6 hours to represent a loss of containment caused by vessel collision. A total of 200 spill simulations were run (i.e. 100 spills per season) and tracked for 30 days. The results for all 100 simulations per season were combined and are presented on a seasonal basis (i.e. summer and winter).

Sections 11.1 and 11.2 present the annual stochastic analysis and deterministic analysis results, respectively.

11.1 Stochastic Analysis

11.1.1 Environment that may be affected (EMBA)

Figure 11-1 presents the low threshold environment that maybe affected (EMBA) produced by overlaying the results from all 200 simulations (i.e. 100 per season) during summer and winter conditions.

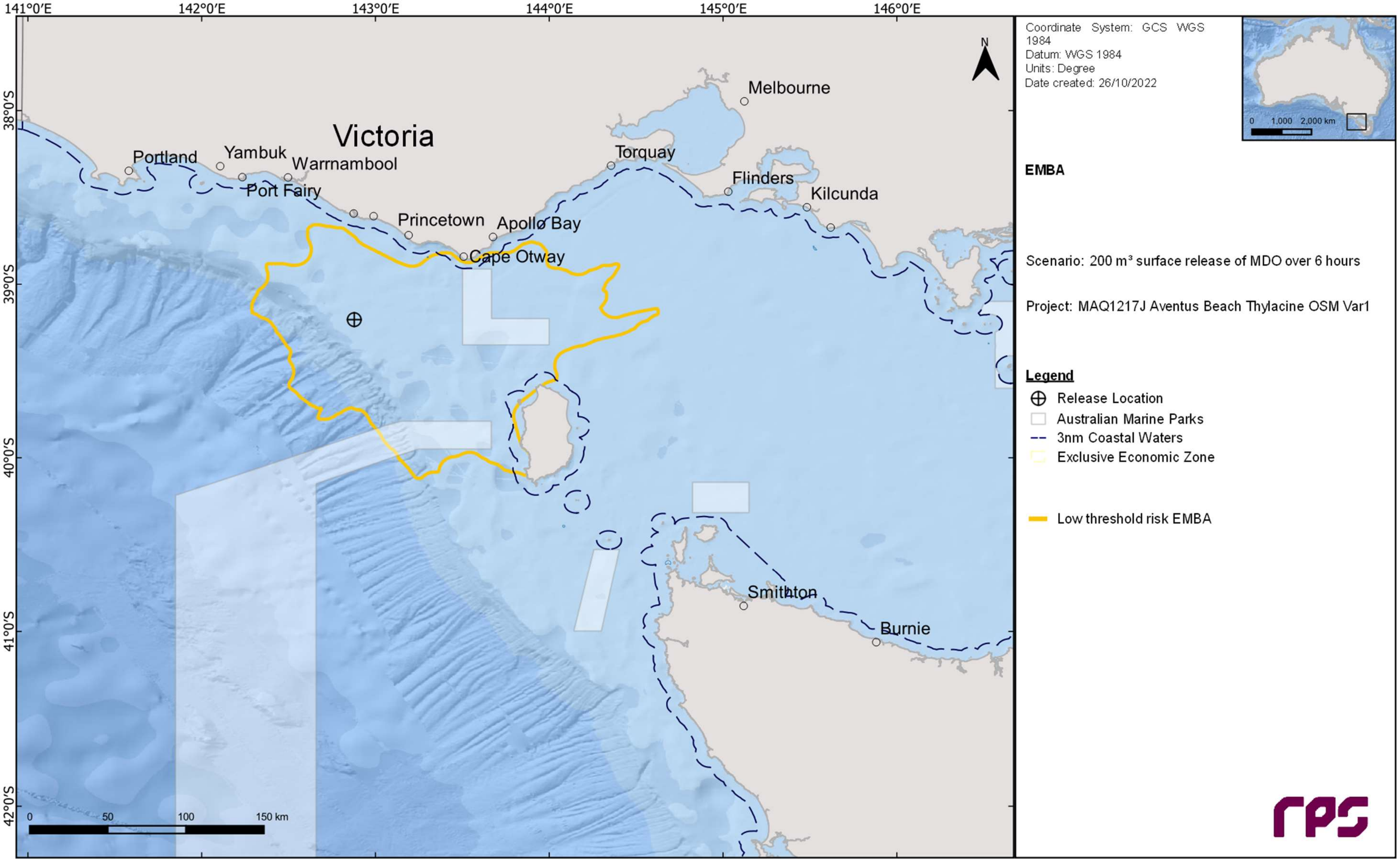

Figure 11-1 Predicted low threshold risk EMBA produced by overlaying the results from all 200 simulations, resulting from a 200 m^3 surface release of MDO over 6 hours during summer and winter conditions.

11.1.2 Floating Oil Exposure

Table 11-1 summarises the maximum distance travelled by floating oil on the sea surface at each threshold. 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) exposure zones was 36.5 km (east-southeast) during summer conditions, 9.4 km (southeast) during winter conditions and 0.5 km (southwest) during winter conditions, respectively.

Table 11-2 summarises the potential floating oil exposure to individual receptors during the summer and winter conditions.

A total of 14 BIAs were predicted to be exposed to floating oil at, or above, the low threshold during the summer and winter conditions. Additionally, the Otway IMCRA was shown to be exposed to floating oil at, or above, the low and moderate threshold during both summer and winter conditions (see Table 10-2). The release location resides within all receptors shown to be exposed to floating oil.

Figure 11-2 and Figure 11-3 present the zones of potential floating oil exposure for all thresholds under summer and winter conditions, respectively.

Table 11-1 Maximum distance and direction from the release location to the edge of floating oil exposure. Results are based on a 200 m^3 surface release of MDO over 6 hours, tracked for 30 days. The results were calculated from 100 spill simulations per season.

Season	Distance and direction travelled	Zones of potential floating oil exposure		
		Low	Moderate	High
Summer	Maximum distance (km) from release location	36.5	8.6	-
	Maximum distance (km) from release location (99th percentile)	34.2	8.1	-
	Direction	East-southeast	East-southeast	-
Winter	Maximum distance (km) from release location	31.6	9.4	0.5
	Maximum distance (km) from release location (99th percentile)	30.2	9.3	0.5
	Direction	Southeast	Southeast	Southwest

Table 11-2 Summary of the potential floating oil exposure to individual receptors. Results are based on a 200 m^3 surface release of MDO over 6 hours, tracked for 30 days. The results were calculated from 100 spill simulations per season.

Receptor		Summer (November through to March)						Winter (April to October)					
		Probability of floating oil exposure (%)			Minimum time before floating oil exposure (hours)			Probability of floating oil exposure (%)			Minimum time before floating oil exposure (hours)		
		Low	Moderate	High	Low	Moderate	High	Low	Moderate	High	Low	Moderate	High
BIA	Antipodean Albatross – Foraging*	100	75	-	1	1	-	100	50	3	1	1	3
	Black-browed Albatross – Foraging*	100	75	-	1	1	-	100	50	3	1	1	3
	Bullers Albatross – Foraging*	100	75	-	1	1	-	100	50	3	1	1	3
	Campbell Albatross – Foraging*	100	75	-	1	1	-	100	50	3	1	1	3
	Common Diving-petrel – Foraging*	100	75	-	1	1	-	100	50	3	1	1	3
	Indian Yellow-nosed Albatross – Foraging*	100	75	-	1	1	-	100	50	3	1	1	3
	Pygmy Blue Whale – Distribution*	100	75	-	1	1	-	100	50	3	1	1	3
	Pygmy Blue Whale – Foraging*	100	75	-	1	1	-	100	50	3	1	1	3
	Short-tailed Shearwater – Foraging*	100	75	-	1	1	-	100	50	3	1	1	3
	Shy Albatross – Foraging*	100	75	-	1	1	-	100	50	3	1	1	3
	Southern Right Whale – Migration*	100	75	-	1	1	-	100	50	3	1	1	3
	Wandering Albatross – Foraging*	100	75	-	1	1	-	100	50	3	1	1	3
	Wedge-tailed Shearwater – Foraging*	100	75	-	1	1	-	100	50	3	1	1	3
	White Shark – Distribution*	100	75	-	1	1	-	100	50	3	1	1	3
EEZ	Australian Exclusive Economic Zone*	100	75	-	1	1	-	100	50	3	1	1	3
IMCRA	Otway*	100	75	-	1	1	-	100	50	3	1	1	3

*The release location resides within the receptor boundaries.

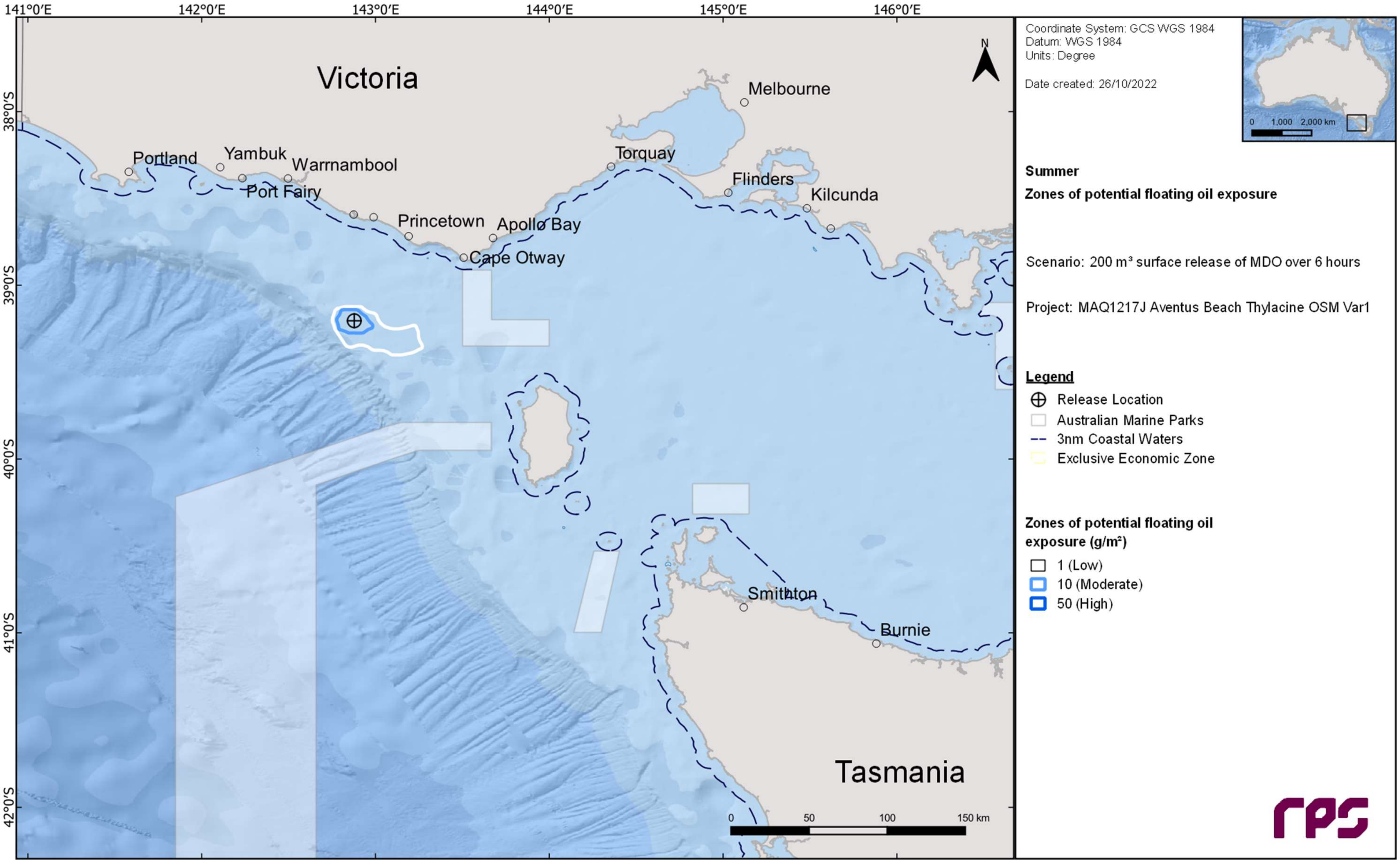

Figure 11-2 Zones of potential floating oil exposure in the event of a 200 m³ of MDO containment loss over 6 hours tracked for 30 days. The results were calculated from 100 spill simulations during summer conditions.

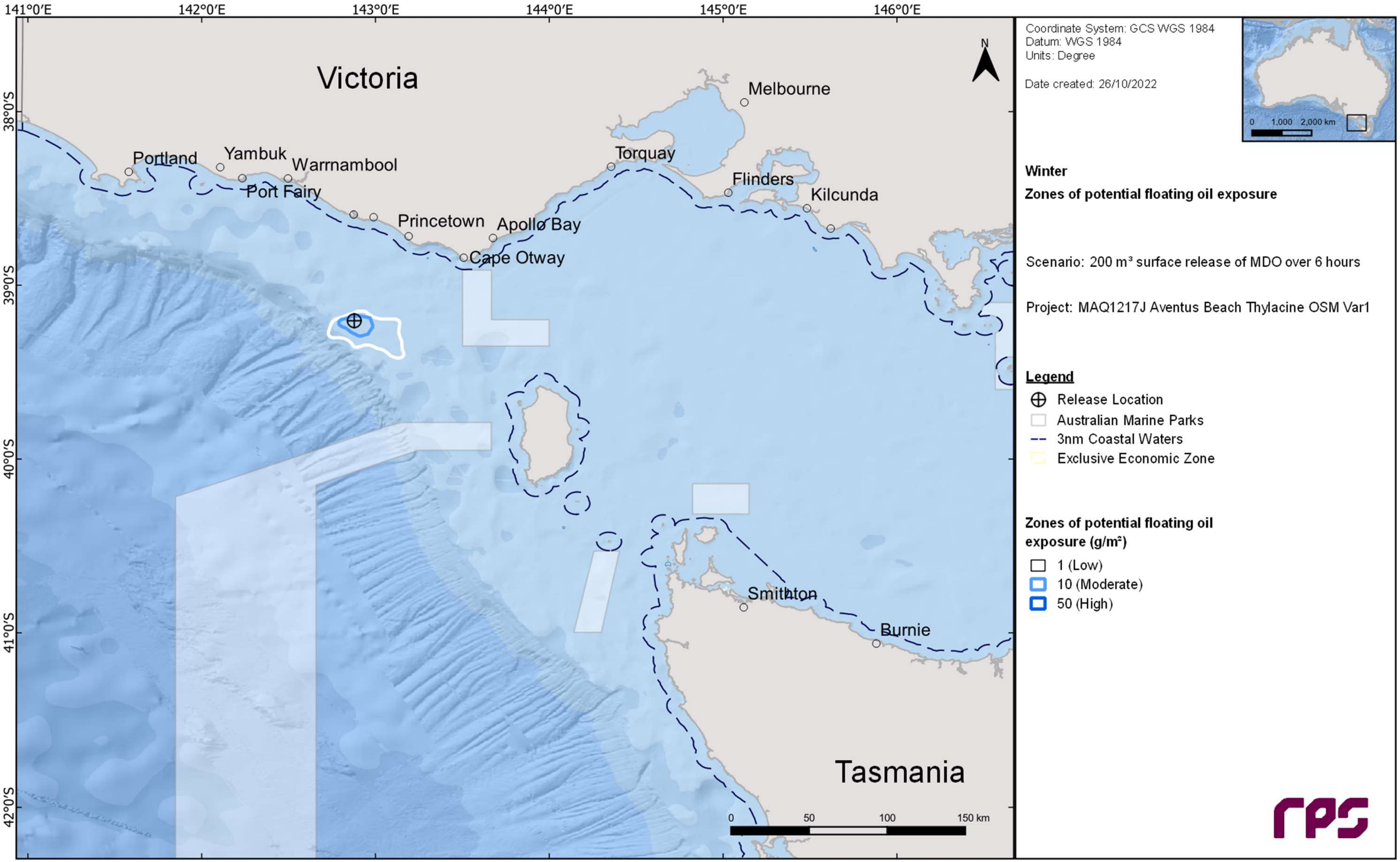

Figure 11-3 Zones of potential floating oil exposure in the event of a 200 m³ of MDO containment loss over 6 hours tracked for 30 days. The results were calculated from 100 spill simulations during winter conditions.

11.1.3 Shoreline Accumulation

Table 11-3 presents a summary of the predicted potential shoreline accumulation during the summer and winter conditions. The probability of accumulation to any shoreline at, or above, the low level (10 g/m^2) threshold was 0% during summer conditions and 2% during winter conditions. The minimum time before oil accumulation at, or above, the low threshold was 8.13 days during the winter conditions. The maximum total volume ashore for a single spill trajectory during the winter conditions was 2.7 m^3, and the maximum length of shoreline accumulation at the low threshold was 5 km. No shoreline accumulation was predicted for the moderate (100 g/m^2) or high (1,000 g/m^2) threshold.

Table 11-4 summarises the shoreline accumulation on individual receptors during the summer and winter conditions. During the winter conditions, King Island was the only shoreline receptor that was predicted to have shoreline accumulation above the low threshold (10 g/m^2) with a probability of low accumulation of 2%. The minimum time before shoreline accumulation at King Island during winter conditions was 8.13 days, whilst the maximum shoreline accumulation volume was 2.7 m^3.

The maximum potential shoreline loading above the low, moderate and high shoreline thresholds for winter conditions are presented in Figure 11-4.

Table 11-3 Summary of oil accumulation across all shorelines. Results are based on a 200 m^3 surface release of MDO over 6 hours, tracked for 30 days. The results were calculated from 100 spill simulations per season.

Shoreline Statistics	Summer	Winter
Probability of accumulation on any shoreline (%)	0	2
Absolute minimum time for visible oil to shore (days)	-	8.13
Maximum total volume of hydrocarbons ashore (m^3)	-	2.7
Average total volume of hydrocarbons ashore (m^3)	-	0.2
Maximum length of the shoreline at **10 g/m^2** (km)	-	5
Average shoreline length (km) at **10 g/m^2** (km)	-	4
Maximum length of the shoreline at **100 g/m^2** (km)	-	-
Average shoreline length (km) at **100 g/m^2** (km)	-	-
Maximum length of the shoreline at **1,000 g/m^2** (km)	-	-
Average shoreline length (km) at **1,000 g/m^2** (km)	-	-

Table 11-4 Summary of oil accumulation on individual shoreline receptors. Results are based on a 200 m^3 surface release of MDO over 6 hours, tracked for 30 days. The results were calculated from 100 spill simulations per season.

Shoreline Receptor		Summer																Winter															
		Maximum probability of shoreline loading (%)			Minimum time before shoreline accumulation (days)			Load on shoreline (g/m^2)		Volume on shoreline (m^3)		Mean length of shoreline accumulation (km)			Maximum length of shoreline accumulation (km)			Maximum probability of shoreline loading (%)			Minimum time before shoreline accumulation (days)			Load on shoreline (g/m^2)		Volume on shoreline (m^3)		Mean length of shoreline accumulation (km)			Maximum length of shoreline accumulation (km)		
		Low	Mod	High	Low	Mod	High	Mean	Peak	Mean	Peak	Low	Mod	High	Low	Mod	High	Low	Mod	High	Low	Mod	High	Mean	Peak	Mean	Peak	Low	Mod	High	Low	Mod	High
Shoreline	King Island	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	8.13	-	-	<1	35	< 0.1	2.7	4	-	-	5	-	-

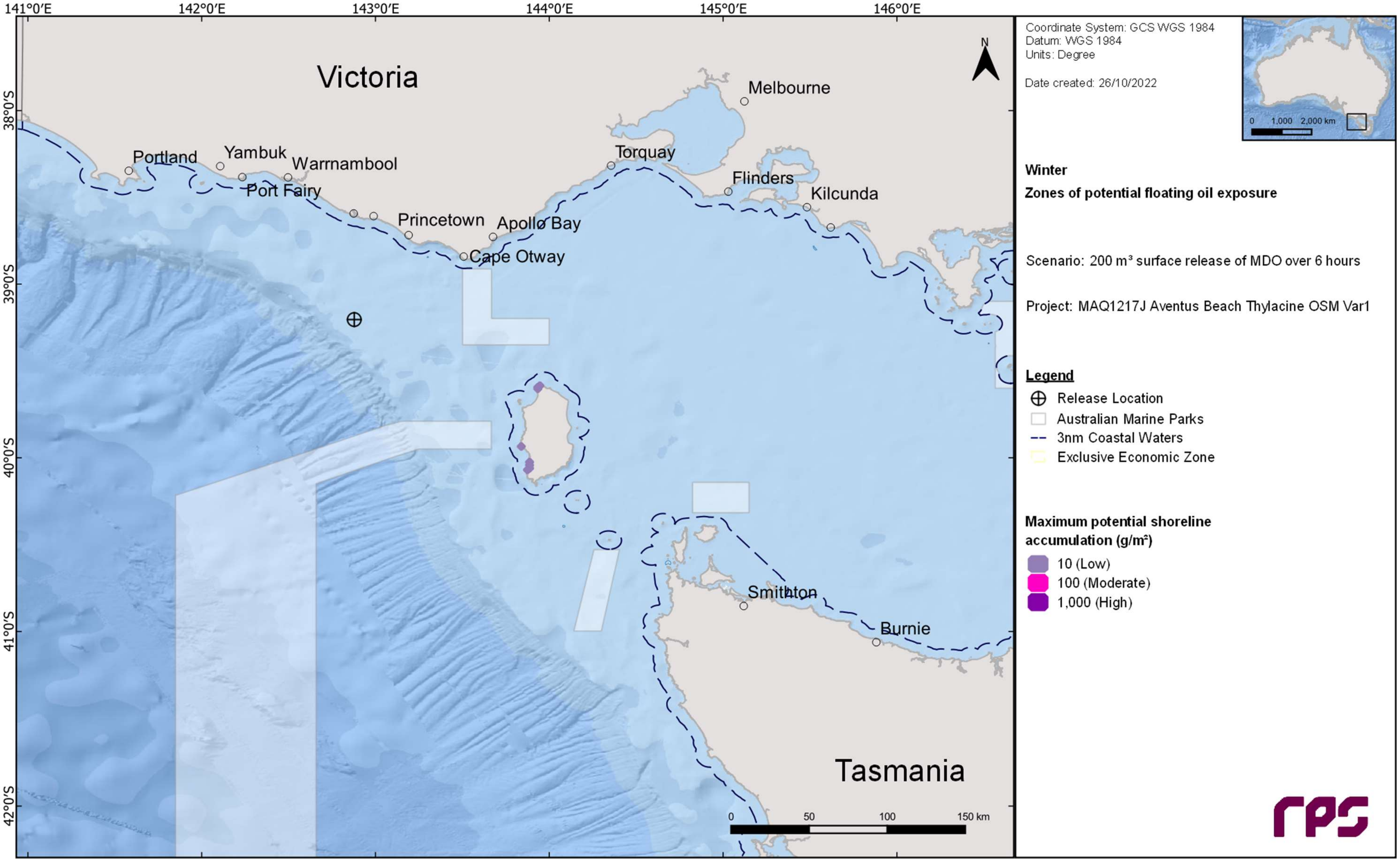

Figure 11-4 Maximum potential shoreline loading in the event of a 200 m^3 of MDO containment loss over 6 hours tracked for 30 days. The results were calculated from 100 spill simulations during winter conditions.

11.1.4 In-water exposure

11.1.4.1 Dissolved Hydrocarbons

Table 11-5 summarises the probability of exposure to individual receptors from dissolved hydrocarbons in the 0-10 m layer during the summer and winter conditions.

A total of 14 BIAs were shown to be exposed to dissolved hydrocarbons above the low threshold during both the summer and winter conditions. Furthermore, the Otway IMCRA was also shown to be exposed above the low threshold during both summer and winter conditions. The maximum probability of exposure for the low threshold for any receptor during either summer and winter was 43%. During the summer and winter conditions the maximum dissolved aromatic concentrations at any given receptor(s) was predicted to be 45 ppb and 43 ppb, respectively, which occurred within receptors containing the release location.

Figure 11-5 and Figure 11-6 presents the zones of potential dissolved hydrocarbon exposure for the 0-10 m depth layer, for each threshold assessed under summer and winter conditions, respectively.

Table 11-5 Probability of dissolved hydrocarbons exposure to marine based receptors in the 0–10 m dept. Results are based on a 200 m^3 surface release of MDO over 6 hours, tracked for 30 days. The results were calculated from 100 spill simulations per season.

Receptor		Summer (November through to March)				Winter (April to October)			
		Maximum instantaneous dissolved hydrocarbon exposure	Probability of instantaneous dissolved hydrocarbon exposure			Maximum instantaneous dissolved hydrocarbon exposure	Probability of instantaneous dissolved hydrocarbon exposure		
			Low	Moderate	High		Low	Moderate	High
BIA	Antipodean Albatross – Foraging*	45	43	0	0	38	43	0	0
	Black-browed Albatross – Foraging*	45	43	0	0	38	43	0	0
	Bullers Albatross – Foraging*	45	43	0	0	38	43	0	0
	Campbell Albatross – Foraging*	45	43	0	0	38	43	0	0
	Common Diving-petrel – Foraging*	45	43	0	0	38	43	0	0
	Indian Yellow-nosed Albatross – Foraging*	45	43	0	0	38	43	0	0
	Pygmy Blue Whale – Distribution*	45	43	0	0	38	43	0	0
	Pygmy Blue Whale – Foraging*	45	43	0	0	38	43	0	0
	Short-tailed Shearwater – Foraging*	45	43	0	0	38	43	0	0
	Shy Albatross – Foraging*	45	43	0	0	38	43	0	0
	Southern Right Whale – Migration*	45	43	0	0	38	43	0	0
	Wandering Albatross – Foraging*	45	43	0	0	38	43	0	0
	Wedge-tailed Shearwater – Foraging*	45	43	0	0	38	43	0	0
	White Shark – Distribution*	45	43	0	0	38	43	0	0
EEZ	Australian Exclusive Economic Zone*	45	43	0	0	38	43	0	0
IMCRA	Otway*	45	43	0	0	38	43	0	0

*The release location resides within the receptor boundaries.

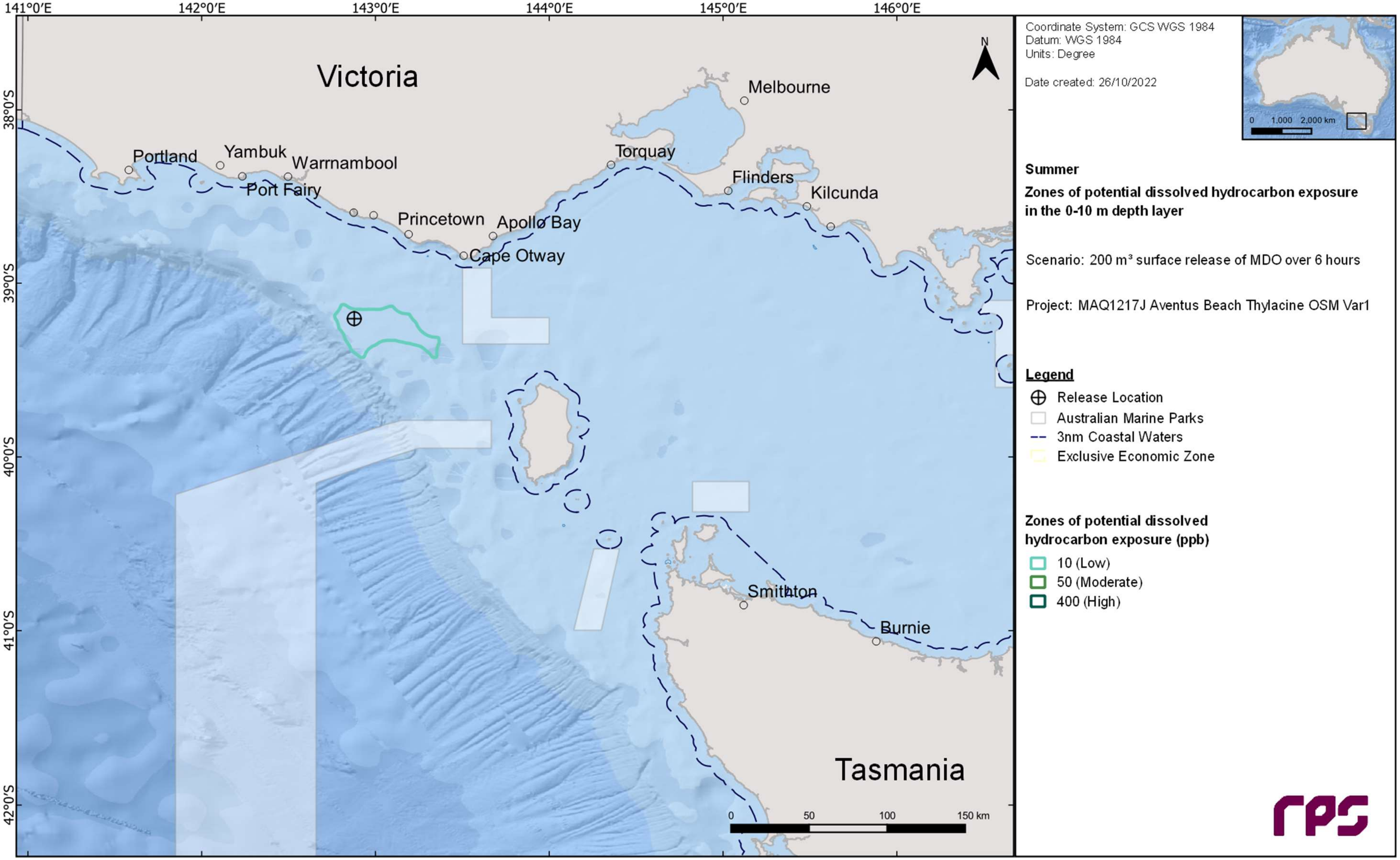

Figure 11-5 Zones of potential dissolved hydrocarbon exposure at 0-10 m below the sea in the event of a 200 m^3 of MDO containment loss over 6 hours tracked for 30 days. The results were calculated from 100 spill simulations during summer conditions.

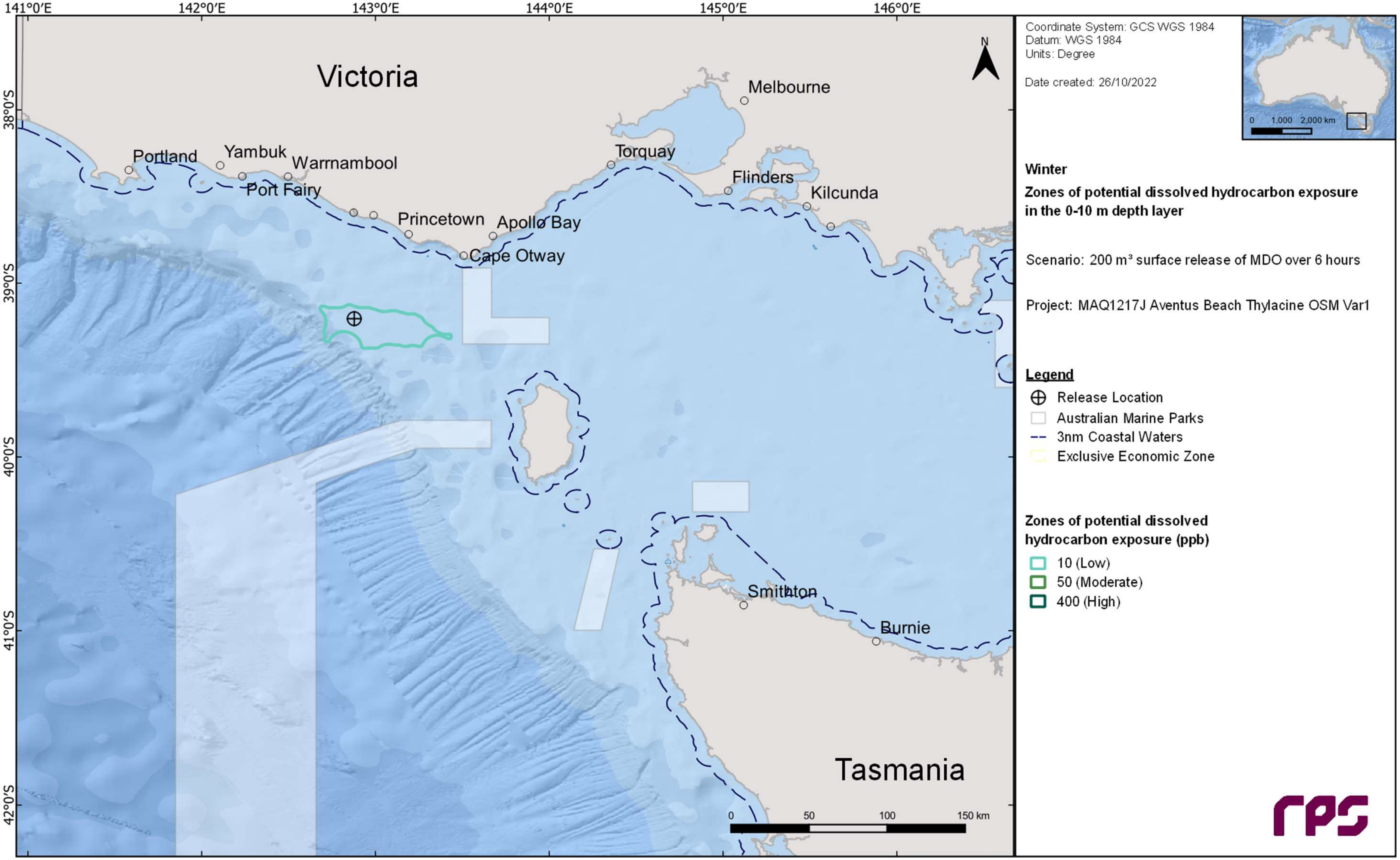

Figure 11-6 Zones of potential dissolved hydrocarbon exposure at 0-10 m below the sea in the event of a 200 m^3 of MDO containment loss over 6 hours tracked for 30 days. The results were calculated from 100 spill simulations during winter conditions.

11.1.4.2 Entrained Hydrocarbons

Table 11-6 presents the probability of exposure to individual receptors from entrained hydrocarbons in the 0-10 m depth layer for the summer and winter conditions.

During both summer and winter conditions entrained hydrocarbon exposures at, or above, the low and high threshold was predicted for AMP, BIA, IBRA, IMCRA, KEF, MNP, RSB, nearshore waters (LGA and sub-LGA) and State Water receptors. The maximum probability of exposure for the low threshold for any receptor during summer and winter was 95% during summer and 98% during winter. The maximum entrained hydrocarbon concentration predicted during the summer and winter conditions was 4,243 ppb and 4,604 ppb, respectively, which occurred within receptors containing the release location.

Figure 11-7 and Figure 11-8 presents the zones of potential entrained hydrocarbon exposure for the 0-10 m depth layer, for each threshold assessed under summer and winter conditions, respectively

Table 11-6 Probability of entrained hydrocarbons exposure to marine based receptors in the 0–10 m depth layer. Results are based on a 200 m^3 surface release of MDO over 6 hours, tracked for 30 days. The results were calculated from 100 spill simulations per season.

Receptor		Summer (November through to March)			Winter (April to October)		
		Maximum instantaneous entrained hydrocarbon exposure	Probability of instantaneous entrained hydrocarbon exposure		Maximum instantaneous entrained hydrocarbon exposure	Probability of instantaneous entrained hydrocarbon exposure	
			Low	High		Low	High
AMP	Apollo	162	14	2	155	30	3
	Zeehan	18	5	0	27	6	0
BIA	Antipodean Albatross – Foraging*	4,243	95	86	4,604	98	87
	Black-browed Albatross – Foraging*	4,243	95	86	4,604	98	87
	Black-faced Cormorant - Foraging	11	1	0	24	4	0
	Bullers Albatross – Foraging*	4,243	95	86	4,604	98	87
	Campbell Albatross – Foraging*	4,243	95	86	4,604	98	87
	Common Diving-petrel – Foraging*	4,243	95	86	4,604	98	87
	Indian Yellow-nosed Albatross – Foraging*	4,243	95	86	4,604	98	87
	Little Penguin - Foraging	9	0	0	22	4	0
	Pygmy Blue Whale – Distribution*	4,243	95	86	4,604	98	87
	Pygmy Blue Whale – Foraging*	4,243	95	86	4,604	98	87
	Short-tailed Shearwater – Foraging*	4,243	95	86	4,604	98	87
	Shy Albatross – Foraging*	4,243	95	86	4,604	98	87
	Southern Right Whale - Connecting Habitat	7	0	0	12	2	0
	Southern Right Whale – Migration*	4,243	95	86	4,604	98	87
	Wandering Albatross – Foraging*	4,243	95	86	4,604	98	87
	Wedge-tailed Shearwater – Foraging*	4,243	95	86	4,604	98	87
	White Shark - Distribution	4,243	95	86	4,604	98	87
	White-faced Storm-petrel - Foraging	70	5	0	75	7	0
EEZ	Australian Exclusive Economic Zone*	4,243	95	86	4,604	98	87
IBRA	King Island	7	0	0	12	2	0
IMCRA	Central Bass Strait	133	7	1	110	19	1
	Central Victoria	44	3	0	72	7	0
	Otway*	4,243	95	86	4,604	98	87

Receptor		Summer (November through to March)			Winter (April to October)		
		Maximum instantaneous entrained hydrocarbon exposure	Probability of instantaneous entrained hydrocarbon exposure		Maximum instantaneous entrained hydrocarbon exposure	Probability of instantaneous entrained hydrocarbon exposure	
			Low	High		Low	High
KEF	West Tasmania Canyons	182	31	1	175	9	1
Nearshore Waters	King Island	7	0	0	12	2	0
State Waters	Tasmania State Waters	9	0	0	21	4	0
	Victoria State Waters	3	0	0	16	2	0

*The release location resides within the receptor boundaries.

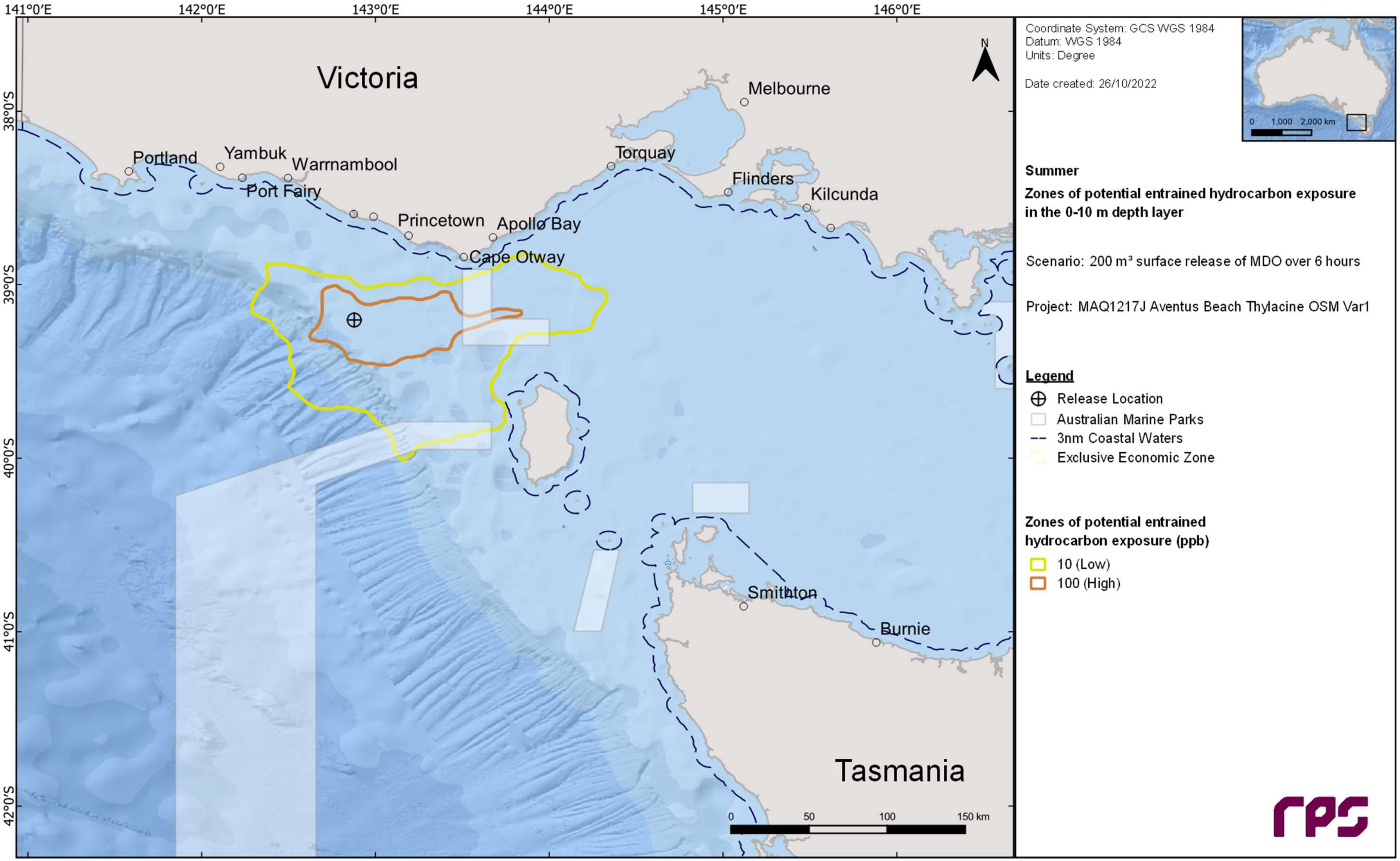

Figure 11-7 Zones of potential entrained hydrocarbon exposure at 0-10 m below the sea surface in the event of a 200 m^3 of MDO containment loss over 6 hours tracked for 30 days. The results were calculated from 100 spill simulations during summer conditions.

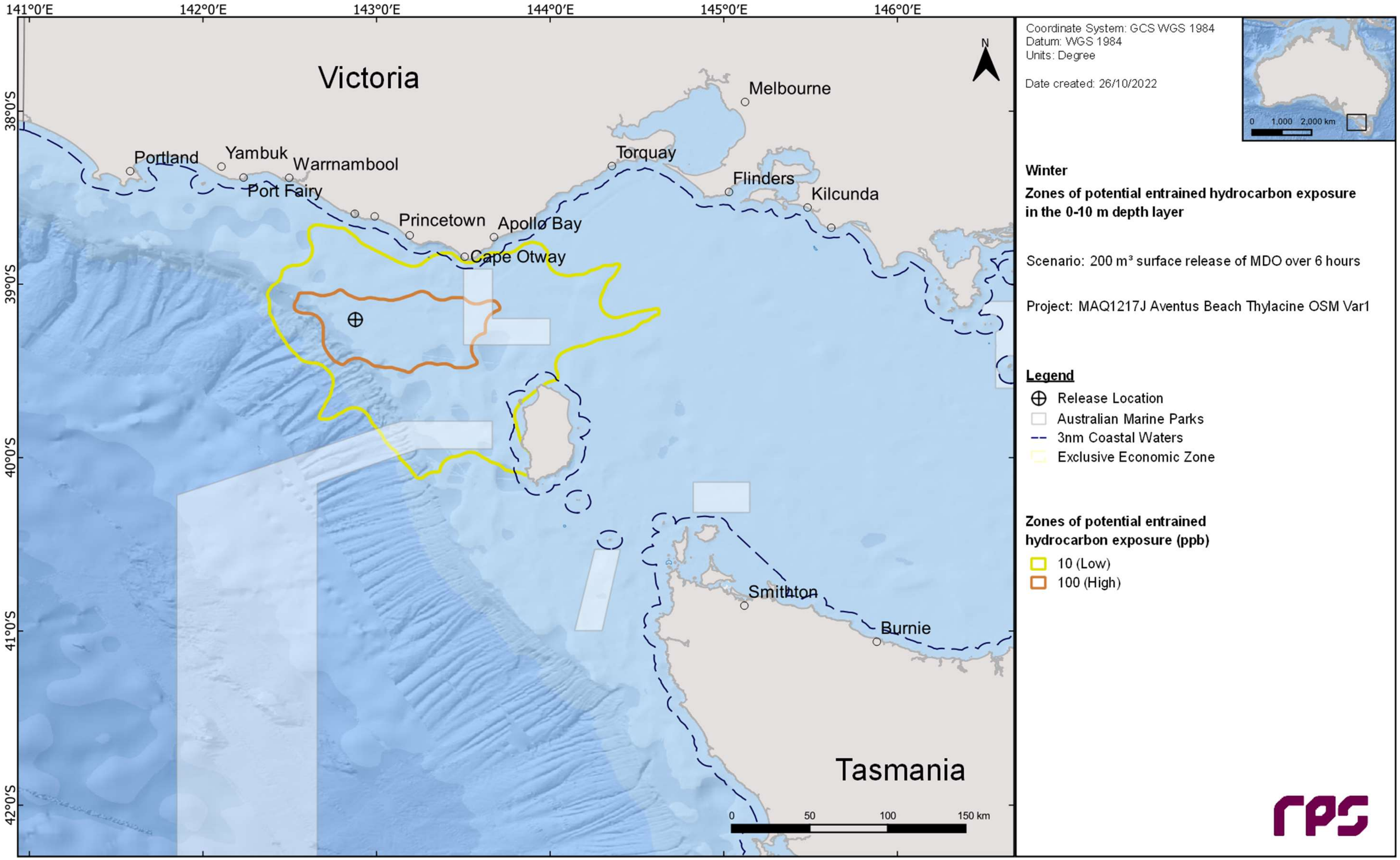

Figure 11-8 Zones of potential entrained hydrocarbon exposure at 0-10 m below the sea surface in the event of a 200 m^3 of MDO containment loss over 6 hours tracked for 30 days. The results were calculated from 100 spill simulations during winter conditions.

11.2 Deterministic Analysis

The stochastic modelling results were assessed, and the "worst case" deterministic runs were identified and are presented below. The deterministic analysis assessed the largest volume of oil ashore (Section 11.2.1), the longest length of shoreline accumulation above 100 g/m², and the minimum time before shoreline accumulation above 10 g/m² (see Section 11.2.2).

Please note there was no shoreline accumulation above the 100 g/m² threshold, so this deterministic case is not presented.

Table 11-7 presents a summary of shoreline accumulation at the assessed thresholds for the identified deterministic simulations.

Table 11-7 Summary of the worst-case deterministic analysis based on the scenario presented in the Stochastic Analysis Section.

Variable	Threshold	Deterministic Analysis Criteria	
		Largest volume of oil ashore	Minimum time before shoreline accumulation above 10 g/m²
Season		Winter	Winter
Run Number		5	66
Total area of floating Oil exposure (km²)	**1 g/m²**	5.0	1.0
	10 g/m²	1.0	-
	50 g/m²	-	-
Total length of shoreline accumulation (km)	**10 g/m²**	5.0	3.0
	100 g/m²	NC	NC
	1,000 g/m²	NC	NC
Minimum time before accumulation on any shoreline (days)	**10 g/m²**	8.83	**8.13**
	100 g/m²	NC	NC
	1,000 g/m²	NC	NC
Total volume of oil ashore (m³)		**2.7**	0.8
Total area of entrained hydrocarbon exposure (km²)	**10 ppb**	1,896	1,886
	100 ppb	268	397
Total area of dissolved hydrocarbon exposure (km²)	**10 ppb**	12.2	**-**
	50 ppb	-	-
	400 ppb	-	-
Start Date		6th June 2019	28th July 2013

NC = No contact at, or above the specified shoreline accumulation threshold.

11.2.1 Deterministic Case: Largest volume of oil ashore

The deterministic trajectory that resulted in the largest volume of oil ashore was identified as run number 5 during winter conditions, which started on 6th June 2019. Figure 11.9 illustrates the floating oil exposure and shoreline accumulation over the 30-day simulation.

Figure 11.10 displays the time series of the volume of oil accumulating on shorelines at the low (10 g/m²), moderate (100 g/m²) and high (1,000 g/m²) thresholds over the 30-day simulation.

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Figure 11.11 presents the fates and weathering graph for the corresponding single spill trajectory and Table 11.8 summarises the mass balance at the end of the simulation.

Table 11.8 Summary of the mass balance for the trajectory that resulted in the largest volume of oil ashore. Results are based on a 200 m³ surface release of MDO over 6 hours, tracked for 30 days.

Exposure Metrics	Peak Volume	Day of occurrence	Volume at day 30
Surface (m³)	27.1	0.1	0.0
Entrained (m³)	148.1	0.4	40.3
Dissolved (m³)	0.8	0.6	0.1
Evaporation (m³)	63.8	29.8	63.8
Decay (m³)	96.8	30.0	96.8
Ashore (m³)	1.9	10.0	0.4

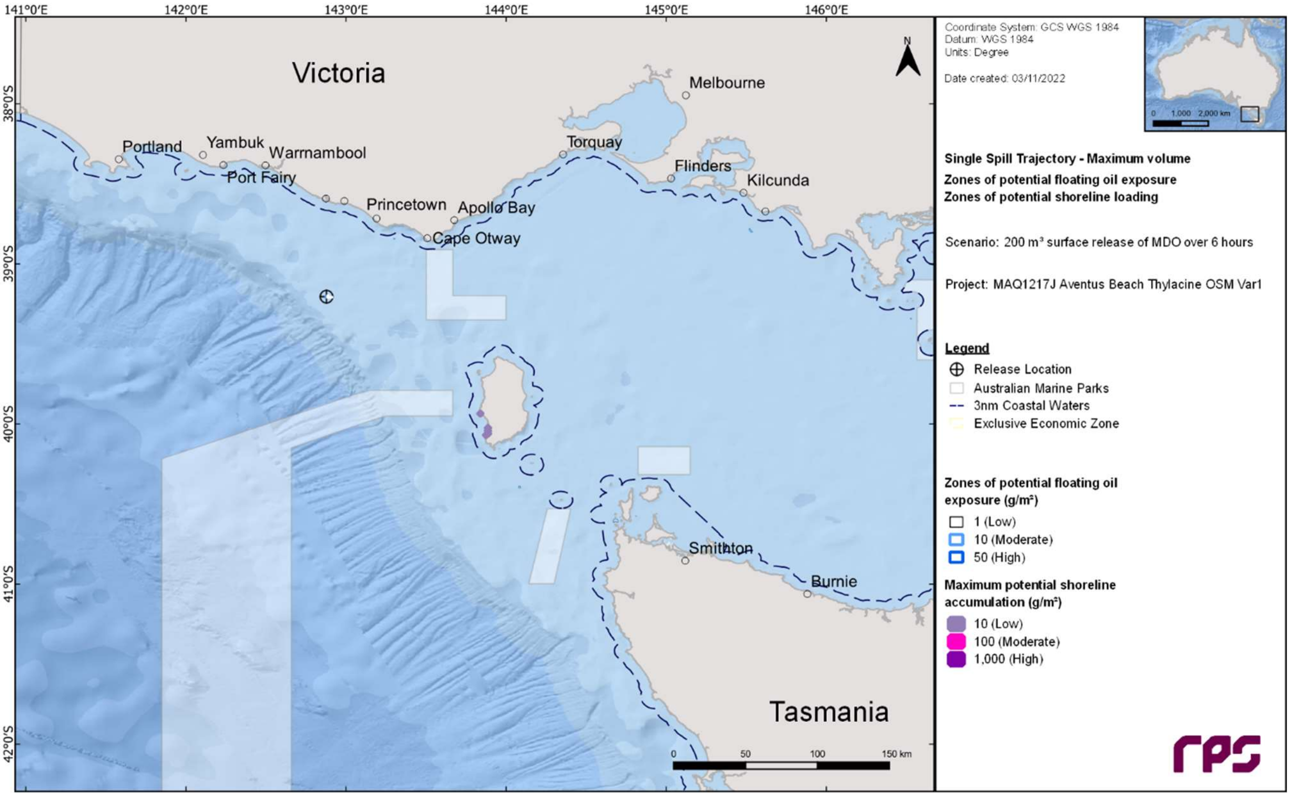

Figure 11.9 Zones of potential floating oil exposure and shoreline accumulation, for the trajectory with the largest volume of oil ashore. Results are based on a 200 m³ surface release of MDO over 6 hours, tracked for 30 days.

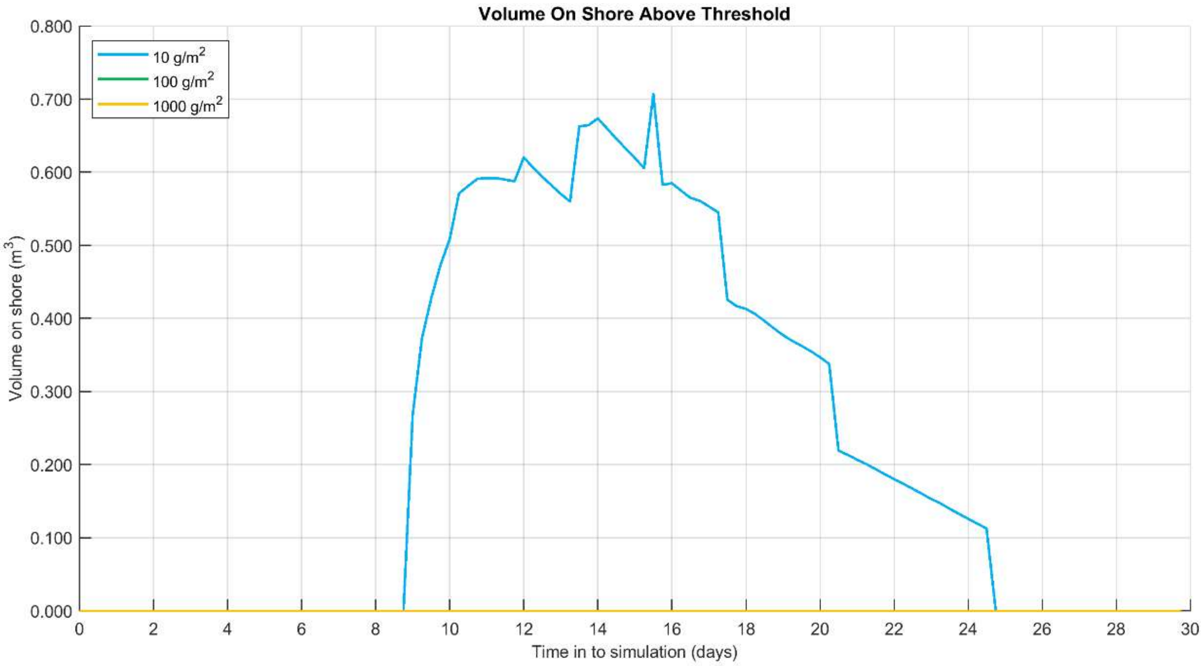

Figure 11.10 Time series of the volume of oil accumulating on shorelines at the low (10 g/m^2), moderate (100 g/m^2) and high (1,000 g/m^2) thresholds for the trajectory with the largest volume of oil ashore. Results are based on a 200 m^3 surface release of MDO over 6 hours, tracked for 30 days.

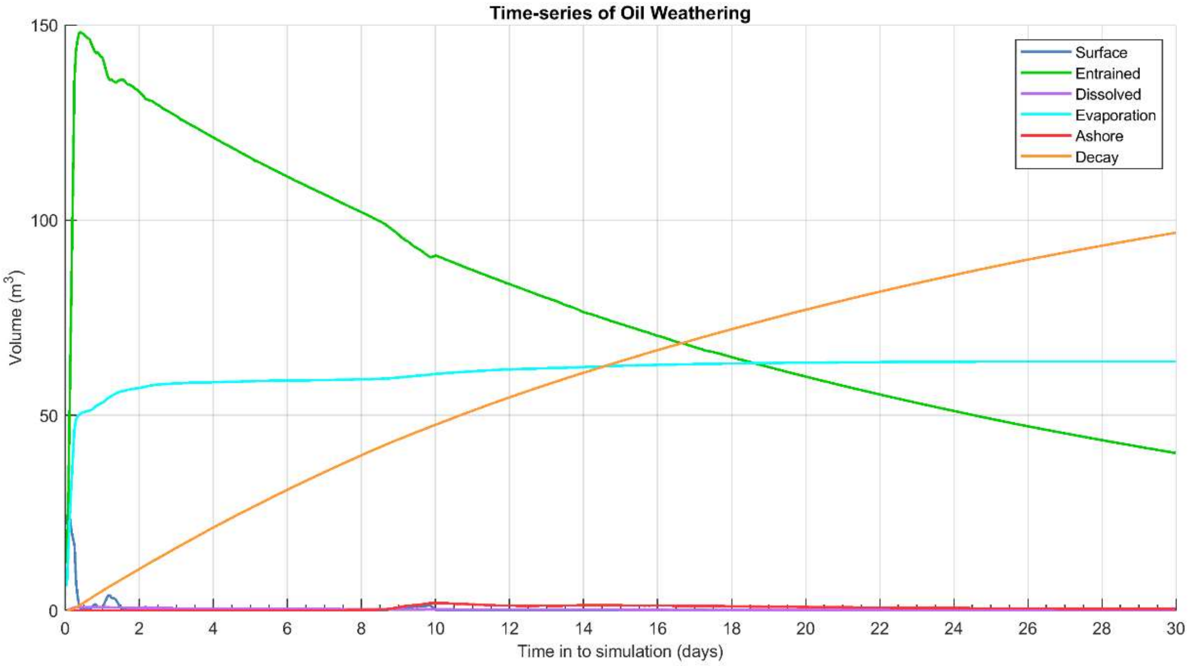

Figure 11.11 Predicted weathering and fates graph for the trajectory with the largest volume of oil ashore. Results are based on a 200 m^3 surface release of MDO over 6 hours, tracked for 30 days.

11.2.2 Deterministic Case: Minimum time before shoreline accumulation above 10 g/m^2

The deterministic trajectory that resulted in the minimum time before shoreline accumulation above the low threshold (10 g/m^2) was identified as run number 66 during winter conditions which started on 28th July 2013. Figure 11.12 illustrates the floating oil exposure and shoreline accumulation over the 30 days.

Figure 11.13 presents the fates and weathering graph for the corresponding single spill trajectory and Table 11.9 summarises the mass balance at the end of the 30-day simulation.

Table 11.9 Summary of the mass balance for the trajectory that resulted in the minimum time before shoreline accumulation above the low threshold (10 g/m^2). Results are based on a 200 m^3 surface release of MDO over 6 hours, tracked for 30 days.

Exposure Metrics	Peak Volume	Day of occurrence	Volume at day 30
Surface (m^3)	8.8	0.1	0.0
Entrained (m^3)	180.8	0.3	39.5
Dissolved (m^3)	0.5	1.5	0.0
Evaporation (m^3)	55.4	30.0	55.4
Decay (m^3)	106.3	30.0	106.3
Ashore (m^3)	0.7	10.3	0.1

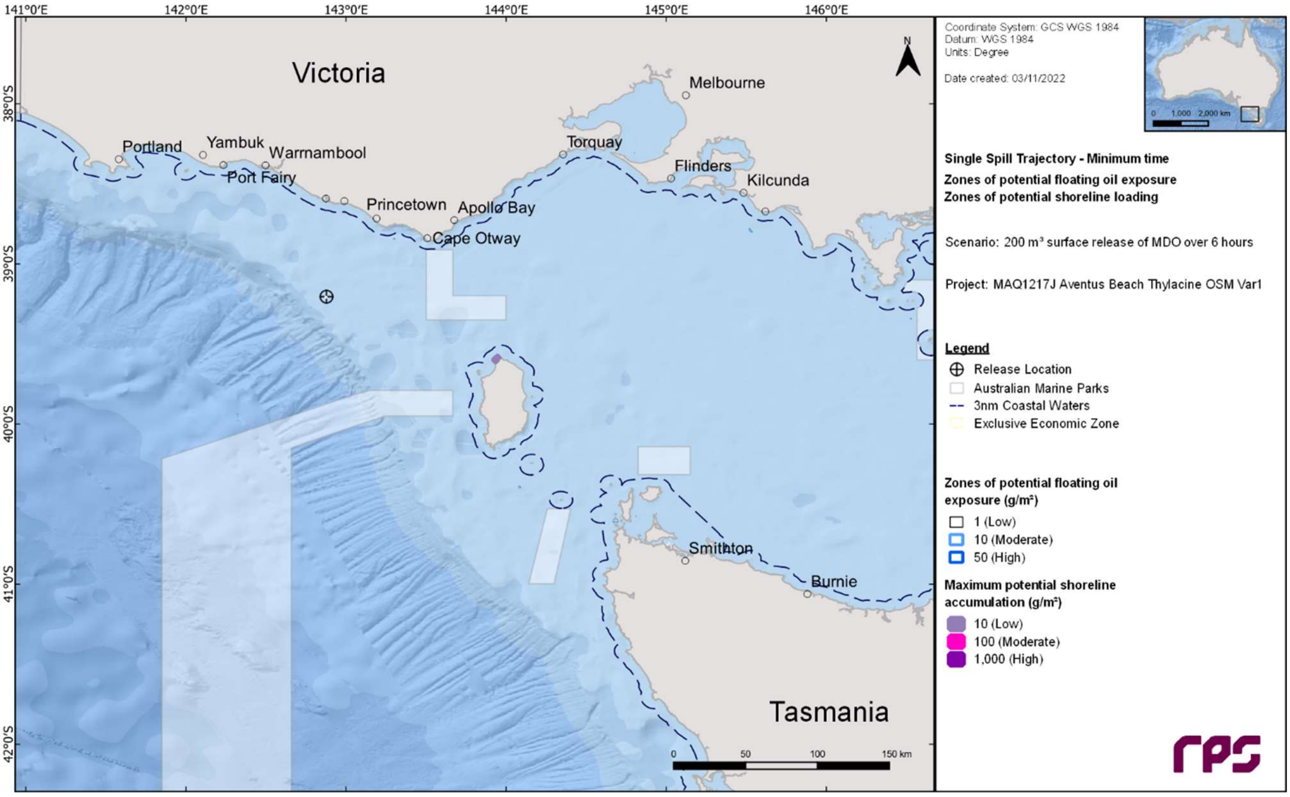

Figure 11.12 Zones of potential floating oil exposure and shoreline accumulation over the 30-day simulation, for the trajectory with the minimum time before shoreline accumulation above 10 g/m^2. Results are based on a 200 m^3 surface release of MDO over 6 hours, tracked for 30 days.

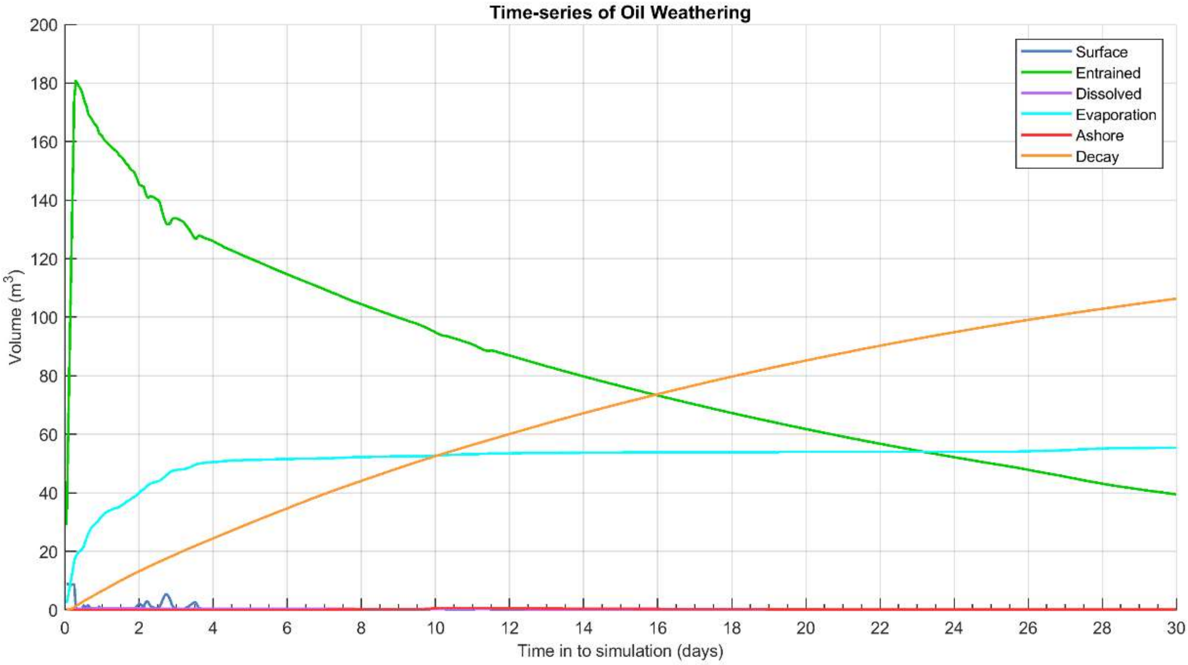

Figure 11.13 Predicted weathering and fates graph for the trajectory with the minimum time before shoreline accumulation above 10 g/m^2. Results are based on a 200 m^3 surface release of MDO over 6 hours, tracked for 30 days.

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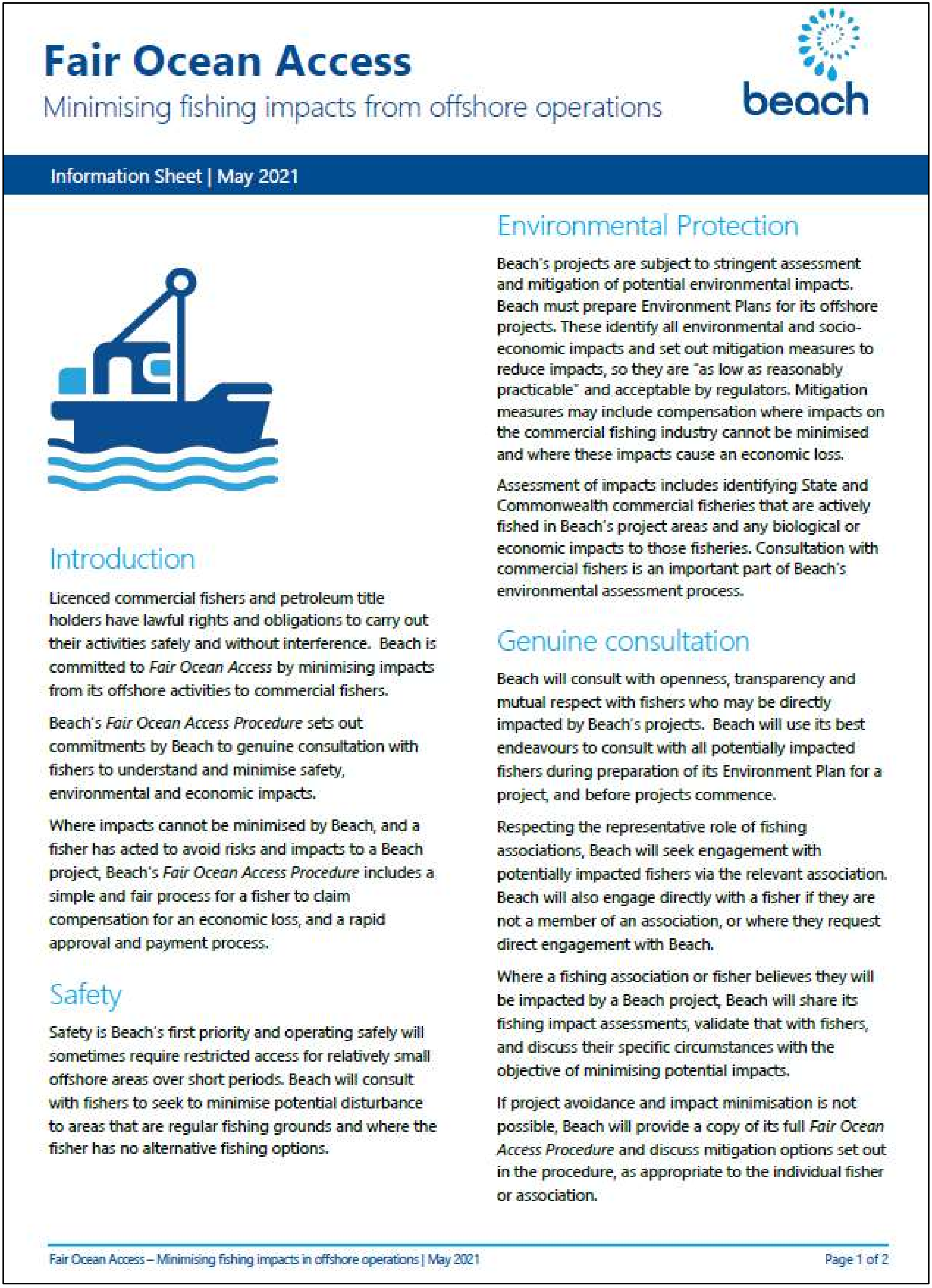
Appendix H Consultation Information

Appendix H.1 Beach Fair Ocean Access Information Sheet



Fair Ocean Access

Minimising fishing impacts from offshore operations

beach

Information Sheet | May 2021

Introduction

Licenced commercial fishers and petroleum title holders have lawful rights and obligations to carry out their activities safely and without interference. Beach is committed to *Fair Ocean Access* by minimising impacts from its offshore activities to commercial fishers.

Beach's *Fair Ocean Access Procedure* sets out commitments by Beach to genuine consultation with fishers to understand and minimise safety, environmental and economic impacts.

Where impacts cannot be minimised by Beach, and a fisher has acted to avoid risks and impacts to a Beach project, Beach's *Fair Ocean Access Procedure* includes a simple and fair process for a fisher to claim compensation for an economic loss, and a rapid approval and payment process.

Safety

Safety is Beach's first priority and operating safely will sometimes require restricted access for relatively small offshore areas over short periods. Beach will consult with fishers to seek to minimise potential disturbance to areas that are regular fishing grounds and where the fisher has no alternative fishing options.

Environmental Protection

Beach's projects are subject to stringent assessment and mitigation of potential environmental impacts. Beach must prepare Environment Plans for its offshore projects. These identify all environmental and socio-economic impacts and set out mitigation measures to reduce impacts, so they are "as low as reasonably practicable" and acceptable by regulators. Mitigation measures may include compensation where impacts on the commercial fishing industry cannot be minimised and where these impacts cause an economic loss.

Assessment of impacts includes identifying State and Commonwealth commercial fisheries that are actively fished in Beach's project areas and any biological or economic impacts to those fisheries. Consultation with commercial fishers is an important part of Beach's environmental assessment process.

Genuine consultation

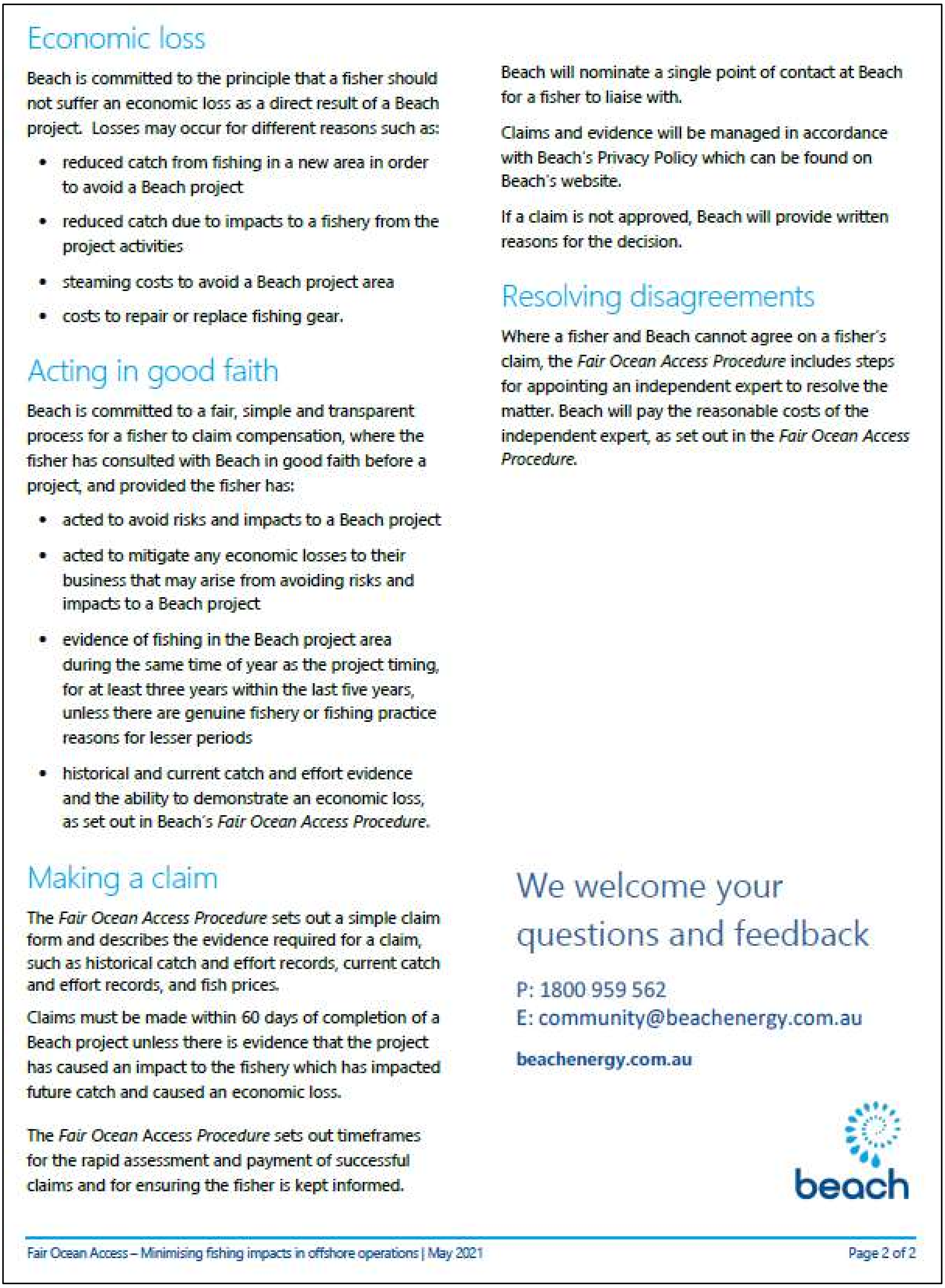
Beach will consult with openness, transparency and mutual respect with fishers who may be directly impacted by Beach's projects. Beach will use its best endeavours to consult with all potentially impacted fishers during preparation of its Environment Plan for a project, and before projects commence.

Respecting the representative role of fishing associations, Beach will seek engagement with potentially impacted fishers via the relevant association. Beach will also engage directly with a fisher if they are not a member of an association, or where they request direct engagement with Beach.

Where a fishing association or fisher believes they will be impacted by a Beach project, Beach will share its fishing impact assessments, validate that with fishers, and discuss their specific circumstances with the objective of minimising potential impacts.

If project avoidance and impact minimisation is not possible, Beach will provide a copy of its full *Fair Ocean Access Procedure* and discuss mitigation options set out in the procedure, as appropriate to the individual fisher or association.

Fair Ocean Access – Minimising fishing impacts in offshore operations | May 2021 Page 1 of 2



Economic loss

Beach is committed to the principle that a fisher should not suffer an economic loss as a direct result of a Beach project. Losses may occur for different reasons such as:

- reduced catch from fishing in a new area in order to avoid a Beach project
- reduced catch due to impacts to a fishery from the project activities
- steaming costs to avoid a Beach project area
- costs to repair or replace fishing gear.

Acting in good faith

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 before a project, 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, as set out in Beach's *Fair Ocean Access Procedure*.

Making a claim

The *Fair Ocean Access Procedure* sets out a simple claim form and describes the evidence required for a claim, such as historical catch and effort records, current catch and effort records, and fish prices.

Claims must be made within 60 days of completion of a Beach project unless there is evidence that the project has caused an impact to the fishery which has impacted future catch and caused an economic loss.

The *Fair Ocean Access Procedure* sets out timeframes for the rapid assessment and payment of successful claims and for ensuring the fisher is kept informed.

Beach will nominate a single point of contact at Beach for a fisher to liaise with.

Claims and evidence will be managed in accordance with Beach's Privacy Policy which can be found on Beach's website.

If a claim is not approved, Beach will provide written reasons for the decision.

Resolving disagreements

Where a fisher and Beach cannot agree on a fisher's claim, the *Fair Ocean Access Procedure* includes steps for appointing an independent expert to resolve the matter. Beach will pay the reasonable costs of the independent expert, as set out in the *Fair Ocean Access Procedure*.

We welcome your questions and feedback

P: 1800 959 562
E: community@beachenergy.com.au

beachenergy.com.au

Appendix H.2 OGV Project Summary Information Sheet

Offshore Gas Victoria Project

Program Summary

Information Sheet | October 2023

Project overview

Beach Energy (Beach) supplies the ongoing natural gas needs of Victorian homes, business and industry, through production at the Otway Gas Plant near Port Campbell and the Lang Lang Gas Plant, 80kms south-east of Melbourne CBD.

Beach successfully drilled one exploration well and six production wells in the Otway Basin offshore Commonwealth permits over the past four years. Four production wells have been connected and are now producing gas for the east coast market, with two remaining wells still to be connected.

Beach is continuing its commitment to supply natural gas to the east coast domestic market and has commenced planning for the Offshore Gas Victoria (OGV) Project to deliver the next phases of exploration and development.

The OGV Project is planning activities across several phases and remains subject to a final investment decision. As planning progresses, project timings and final scope will be confirmed and updated in our communications.

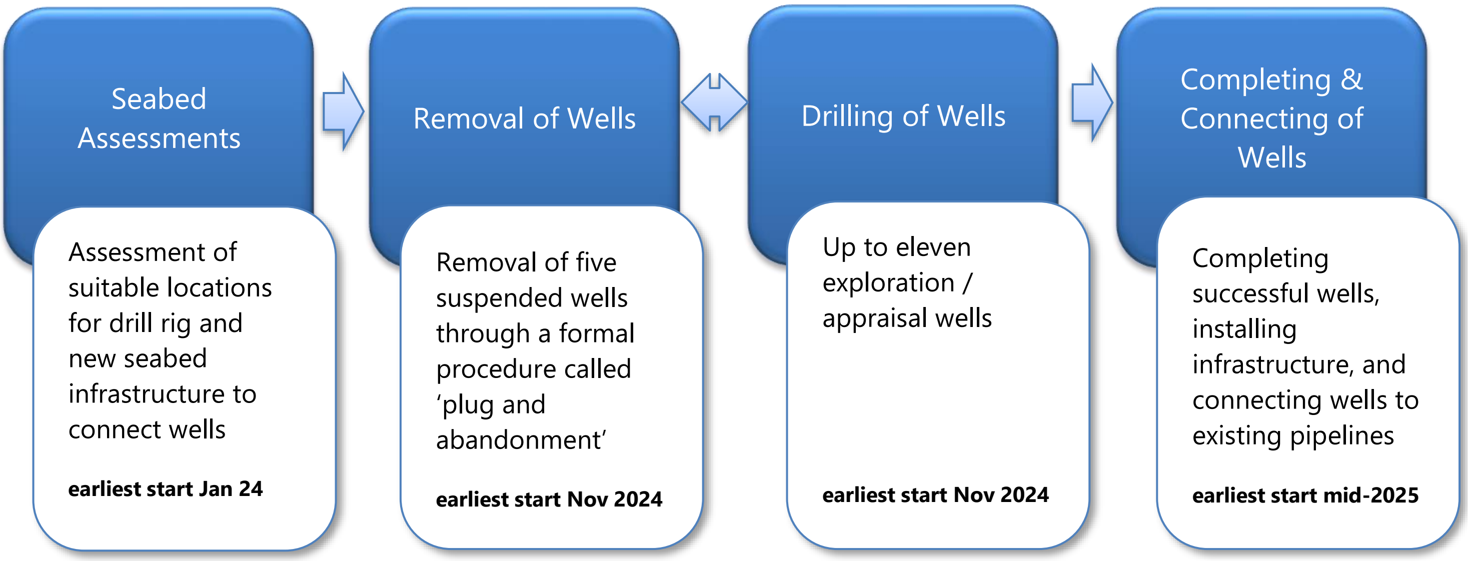
The OGV Project is considering a range of activity across several phases (summarised below).

Environment protection regulations

The National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA), regulates activities in accordance with the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations (2009)* (Environment Regulations). The OGV Project will require Environment Plans to be accepted by NOPSEMA before commencement of activities.

Environment Plans must include a description of the existing environment and the proposed activities, an evaluation of the impacts and risks, environmental performance outcomes and controls, implementation strategy, and reporting requirements. They must also demonstrate that consultations with persons or organisations whose functions, interests and activities may be affected by the activities in the Environment Plan ("*relevant persons*"), have been carried out in accordance with the regulations.

For successful gas discoveries that will proceed to development, an Offshore Project Proposal (OPP) will be required and will undergo a public consultation phase. Once an OPP is accepted, further Environment Plans will be required for construction activities and commissioning the new wells.



Seabed Assessments

Assessment of suitable locations for drill rig and new seabed infrastructure to connect wells

earliest start Jan 24

Removal of Wells

Removal of five suspended wells through a formal procedure called 'plug and abandonment'

earliest start Nov 2024

Drilling of Wells

Up to eleven exploration / appraisal wells

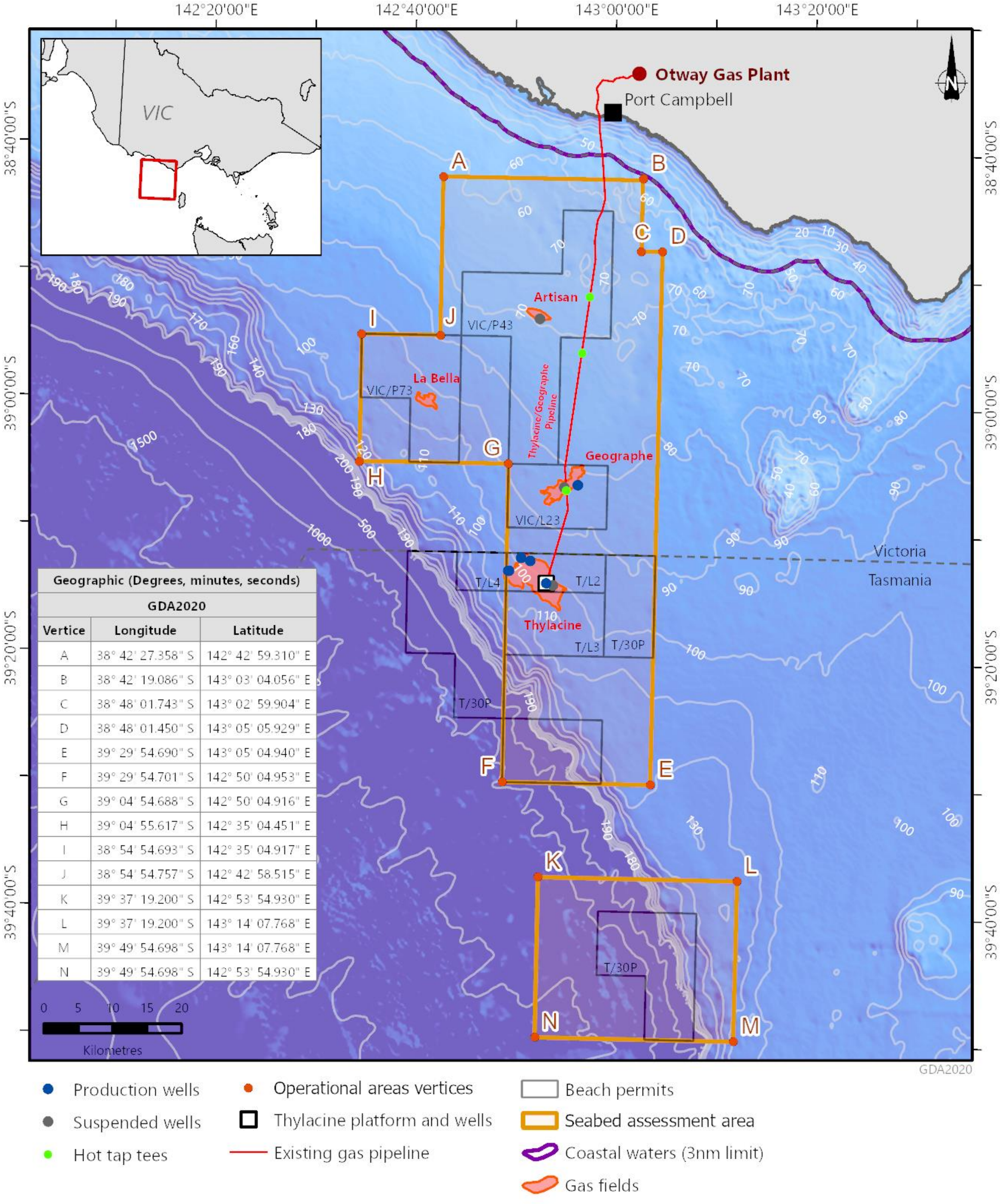
earliest start Nov 2024

Completing & Connecting of Wells

Completing successful wells, installing infrastructure, and connecting wells to existing pipelines

earliest start mid-2025

Otway Basin



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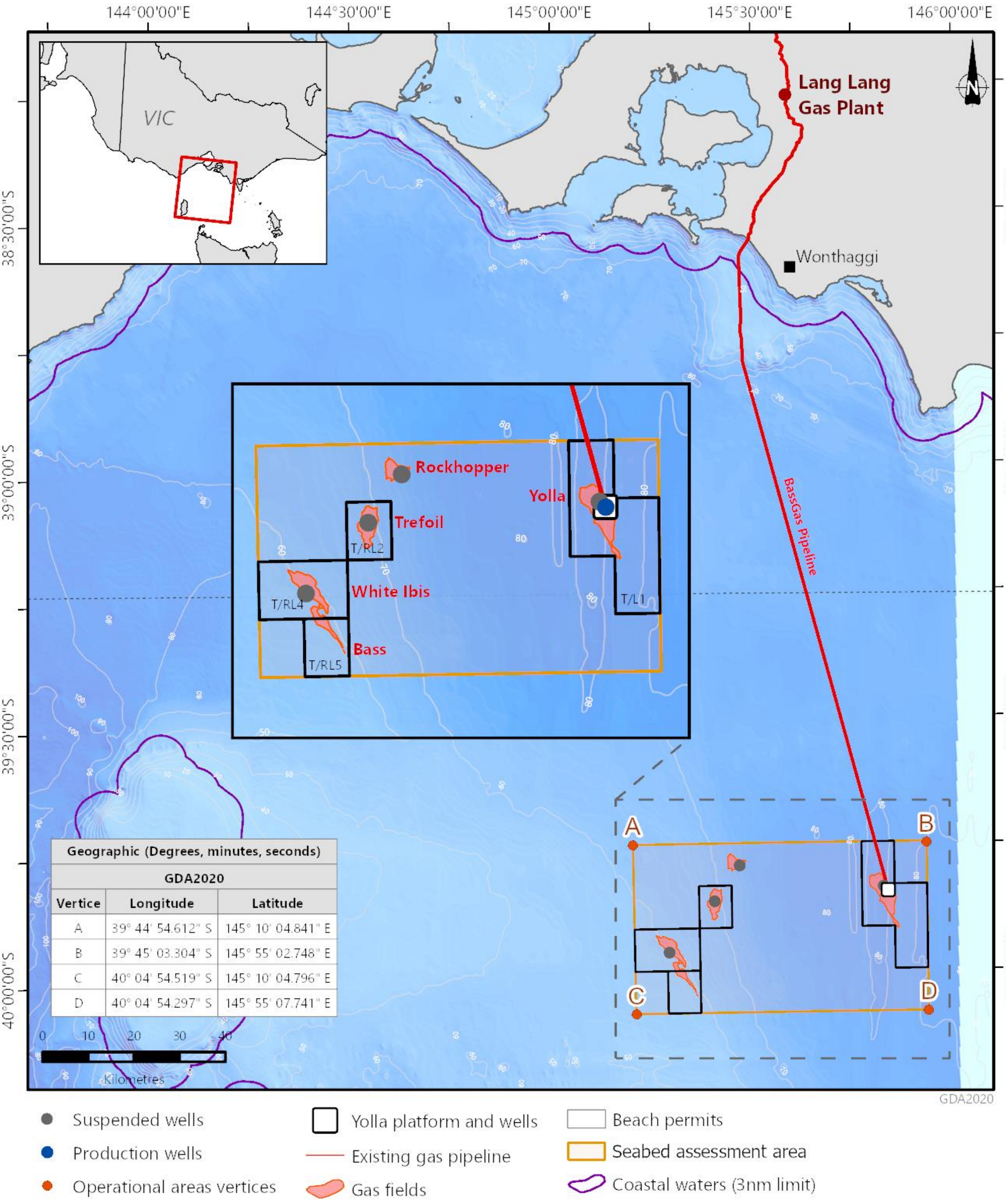
C	38° 48' 01.743" S	143° 02' 59.904" E
D	38° 48' 01.450" S	143° 05' 05.929" E
E	39° 29' 54.690" S	143° 05' 04.940" E
F	39° 29' 54.701" S	142° 50' 04.953" E
G	39° 04' 54.688" S	142° 50' 04.916" E
H	39° 04' 55.617" S	142° 35' 04.451" E
I	38° 54' 54.693" S	142° 35' 04.917" E
J	38° 54' 54.757" S	142° 42' 58.515" E
K	39° 37' 19.200" S	142° 53' 54.930" E
L	39° 37' 19.200" S	143° 14' 07.768" E
M	39° 49' 54.698" S	143° 14' 07.768" E
N	39° 49' 54.698" S	142° 53' 54.930" E

25/05/2023

The locations on this map are accurate at the time of publication and are subject to change

OT23-0015C

Bass Basin



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B	39° 45' 03.304" S	145° 55' 02.748" E
C	40° 04' 54.519" S	145° 10' 04.796" E
D	40° 04' 54.297" S	145° 55' 07.741" E

25/05/2023

The locations on this map are accurate at the time of publication and are subject to change

OT23-0015D

Questions and Answers

What's Beach's approach to climate change?

Beach recognises that climate change is one of the global challenges of this century and understands the role we must play in managing our carbon emissions.

Beach has an aspiration to reach net zero Scope 1 and 2 emissions by 2050 and a target to reduce emissions intensity by 35% from its entire portfolio by 2030. See further information in Beach's Sustainability Report.

What role is natural gas playing as Australia transitions to renewable energy?

Carbon emissions of natural gas are significantly lower than coal. As old coal fired power stations are removed from Australia's energy mix, electricity powered from natural gas ensures a stable energy supply as our economy transitions to a different mix of energy sources for electricity generation.

The Australian Energy Market Operator (AEMO | 2022 Integrated System Plan (ISP)) has forecast more gas-fired generation is required to reach Net Zero by 2050. In its "Step Change" scenario which achieves that objective, 40% more gas-fired generation capacity is required to enable energy from wind and solar to increase nine-fold, and battery storage to increase by a factor of 30.

Beach is committed to reducing emissions from its operations and has targets that are consistent with the changes to the Safeguard Mechanism, introduced from 1 July 2023.

Why do we still need natural gas?

Natural gas has a wide variety of uses in our daily lives. These include generating electricity, residential heating, hot water and cooking. In the industrial sector, gas is a primary heat source for manufacturing glass, steel, cement, bricks, wood, ceramics, tiles, paper and in producing food. Gas is a common ingredient in the manufacturing of fertilisers, plastics, pharmaceuticals and fabrics. The Australian Energy Market Operator's latest Victorian Gas Planning Report in March 2023 forecasts demand shortfall risks as soon as 2023.

Is Beach Energy increasing retail gas prices?

No. Beach Energy is a gas wholesaler and supplies the majority of its gas under contract to energy retailers in Australia. Beach does not set retail prices.

Is Beach exporting gas from the Otway and Bass basins? No. Beach does not export gas from the Otway or Bass basins. The gas processed at the Otway Gas Plant and Lang Lang Gas Plant in Victoria is supplied to the local gas market via an existing pipeline to meet residential, business and industry demand

Consultation and Feedback

Consultation and feedback is an important part of developing Environmental Plans and Offshore Project Proposals.

This information sheet has been prepared to provide a summary of proposed activities and commence consultation with relevant persons whose functions, interests or activities may be affected by the activities to be carried out under the Environment Plan.

Please contact us if you would like further information or to consult with us about how this project may impact your functions, interests or activities.

Beach will consider all feedback, including any concerns or objections and will explore measures to reduce any impacts and risks.

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 Plan.

If there is someone you believe may be affected by the proposed activities, please have them contact us.

P: 1800 797011

E: community@beachenergy.com.au

beachenergy.com

beach

Appendix H.3 OGV Seabed Assessment Information Sheet

Offshore Gas Victoria Project

Seabed assessment

Information sheet | October 2023

Beach Energy supplies the ongoing natural gas needs of Victorian homes, business and industry, through production at the Otway Gas Plant near Port Campbell and the Lang Lang Gas Plant, 80kms south-east of Melbourne CBD.

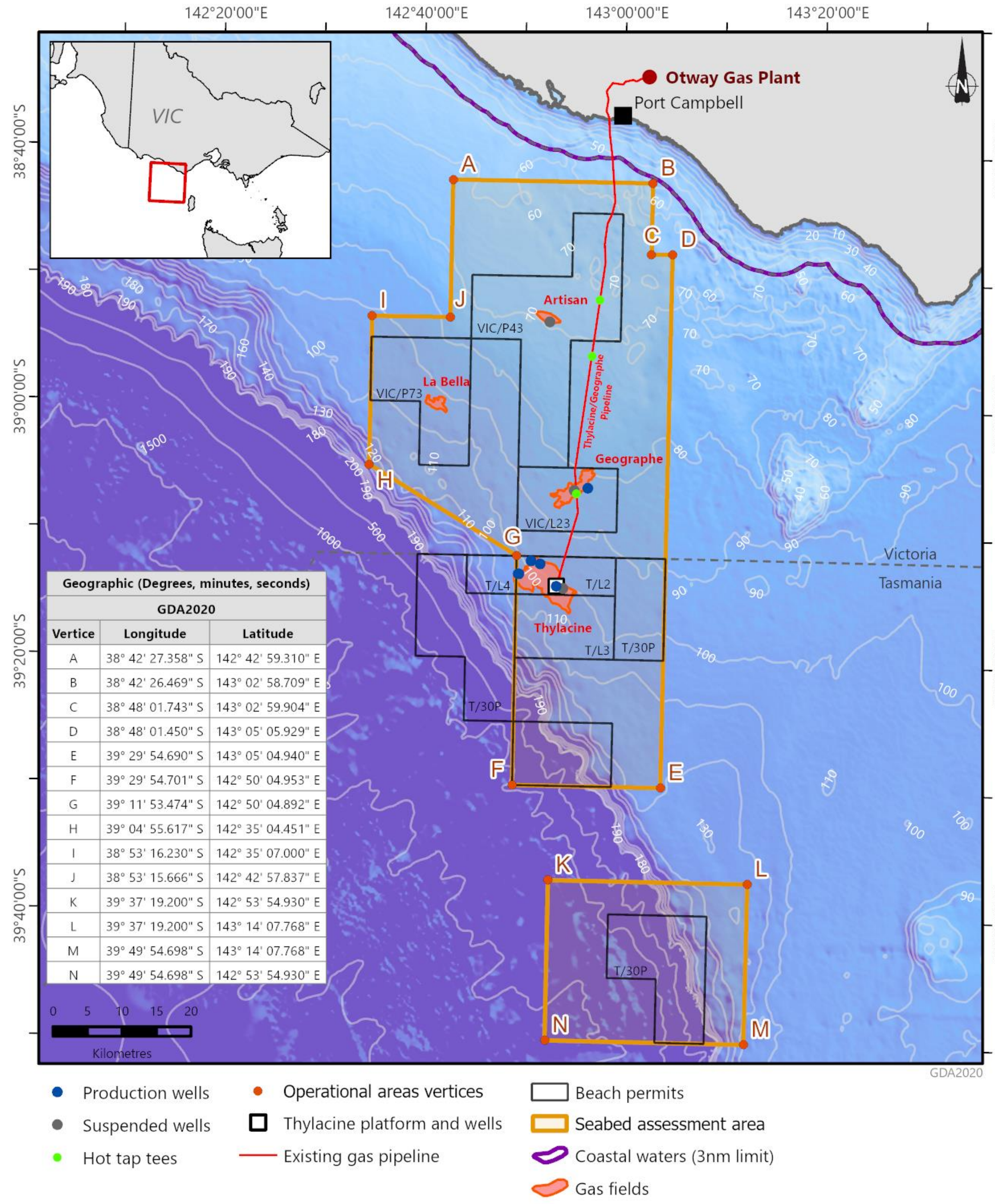
Beach successfully drilled one exploration well and six production wells in the Otway Basin offshore Commonwealth permits over the past four years. Four production wells have been connected and are now producing gas for the east coast market, with two remaining wells still to be connected.

Beach is continuing its commitment to supply natural gas to the east coast domestic market and has commenced planning for the Offshore Gas Victoria (OGV) Project to deliver the next phases of exploration and development.

The OGV Project is planning activities across several phases and remains subject to a final investment decision. As planning progresses, project timings and final scope will be confirmed and updated in our communications. This information sheet focuses on seabed assessments that are carried out to determine suitable seabed locations for drilling operations and installation of infrastructure to connect new production wells to the existing pipeline.

Seabed assessment	Removal of wells	Drilling of wells	Completing and connecting of wells
Assessment of suitable locations for drill rig and new seabed infrastructure to connect wells	Removal of five suspended wells through a formal procedure called ‘plug and abandonment’	Up to 11 exploration / appraisal wells	Completing successful wells, installing infrastructure, and connecting wells to existing pipelines
Earliest start January 2024	**Earliest start November 2024**	**Earliest start November 2024**	**Earliest start mid-2025**

Otway Basin



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H	39° 04' 55.617" S	142° 35' 04.451" E
I	38° 53' 16.230" S	142° 35' 07.000" E
J	38° 53' 15.666" S	142° 42' 57.837" E
K	39° 37' 19.200" S	142° 53' 54.930" E
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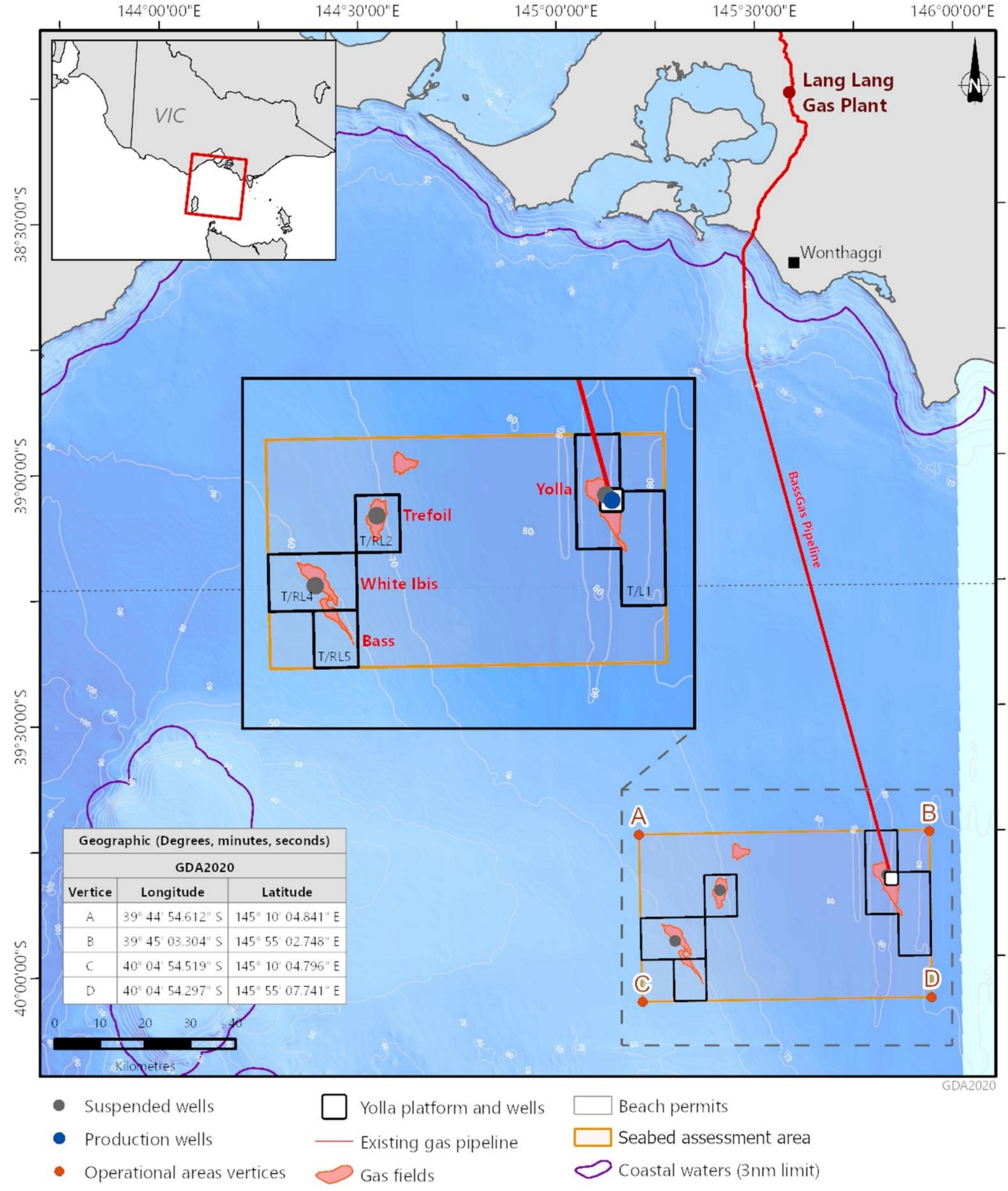
M	39° 49' 54.698" S	143° 14' 07.768" E
N	39° 49' 54.698" S	142° 53' 54.930" E

21/08/2023 *The locations on this map are accurate at the time of publication and are subject to change* OT23-0015E

Bass Basin



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31/05/2023 *The locations on this map are accurate at the time of publication and are subject to change* OT23-0015D

Project overview

Location

The seabed assessments will take place in Commonwealth waters of the Otway and Bass Basins. The Otway Basin development area is approximately 7km from the Victorian coastline, 52km from the King Island coastline, and 168km from the Tasmanian coastline. The Bass Basin development area is approximately 82km from the Victorian coastline, 89km from the King Island coastline, and 39km from the Tasmanian coastline. The assessments will cover a 3048km2 activity operational area in the Otway Basin and a 2374km2 activity operational area in the Bass Basin. Coordinates of the seabed assessment area are provided in the map above.

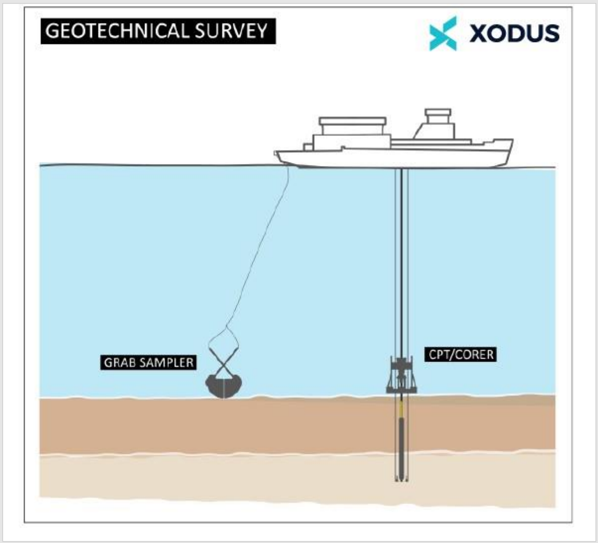
Timing

The seabed surveys are estimated to take on average around 20 days for each required well site location within the Operational Area. The surveys are subject to weather conditions and will be carried out no earlier than January 2024 and no later than December 2029. Marine users and other interested parties are notified of any activity to be undertaken by Beach via the Australian Hydrographic Office at least four weeks in advance.

Geotechnical activity description

The geotechnical activities will be undertaken by a vessel with specialised equipment to carry out the following activities:

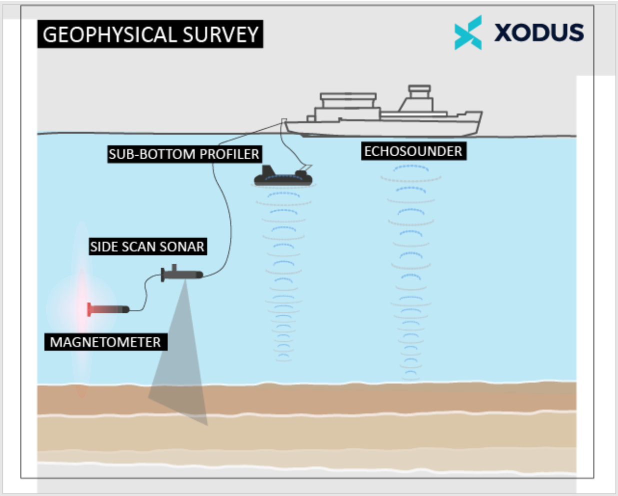
- Either a remotely operated vehicle or unmanned aerial vehicle could be used.
- Obtaining core samples for geological analysis of formations below the seabed, from boreholes up to 150m deep, drilled using seawater or or bentonite.
- Determining soil strength and delineating soil stratigraphy using Piezo Cone Penetration Test (PCPT) to a maximum of 30m depth.
- Collecting core samples to a depth of 4m for geological analysis.
- Collecting small samples of surface sediments from the seafloor.
- Using drop and tow cameras to visually observe the physical and biological environment.



Geophysical activity description

Geophysical activities and equipment include:

- Multibeam echosounder for bathymetry mapping.
- Side-scan sonar for identifying seabed features.
- Magnetometer to detect metallic objects on or below the seabed.
- Sub-bottom profiler to identify shallow formation structures below seafloor.



Emergency planning

When conducting any offshore activity, there is an extremely unlikely risk of release of hydrocarbon from a well during drilling (which is primarily gas) or from marine vessel fuel in the event of an accident.

Beach standard operating procedures include emergency response plans which are included in EPs. Preparing emergency response plans involves modelling of all possible hydrocarbon releases in the local area using a worst-case scenario, assuming no control measures are in place. The modelling calculates the transport, spreading, entrainment and evaporation over time, using data on the prevailing metocean conditions (wind, wave, and climate), the volume released, and the physical and chemical properties of the hydrocarbons.

The modelling determines the full extent of the “Environment that may be affected” known as the EMBA. Environment plans must describe the EMBA and include an assessment of the likelihood and consequences of any hydrocarbon release which must be reduced to ALARP through a range of control measures and include detailed response plans.

An emergency response plan describes the arrangements that must be in place for responding to and monitoring any release of hydrocarbon and include:

- 24/7 on-call team for rapid response clean-up actions including mobilisation of personnel and equipment
- 24/7 on-call team for modelling and monitoring of a hydrocarbon release to inform response activities, and monitoring of effectiveness of response activities
- Control measures necessary for ensuring rapid response and maintenance of capabilities (personnel and equipment).

These arrangements are based on the worse case event associated with the proposed activities to ensure that Beach has the appropriate level of response arrangements and capability. Beach maintains a current contract with Australian Marine Oil Spill Centre (AMOSC) based in Geelong for access to spill response resources and personnel. In Victoria, the Department of Transport is the control agency for marine pollution emergencies.

For more information on hydrocarbon release modelling and why it is required for the preparation of environment plans, click here to watch a video on the NOPSEMA website.

Marine environment

Beach recognises the environmental, heritage, social and economic value in the areas in which we operate. The environment within the project area is characterised by:

- Water depths will be on average 100m but can range up to 1500m.
- Hard sandy seabed consisting of sparsely scattered clumps of solitary sponges, polychaete worms, cone shells and featherstars.

A variety of marine fauna occur in the project area, including the potential presence of:

- Blue, humpback and fin whales, particularly during the summer months.
- Southern right and minke whales, particularly during the winter months.
- Common dolphin and shark species throughout the year.
- New Zealand and Australian fur seals throughout the year.
- Limited numbers of Loggerhead, green and leatherback turtles throughout the year.
- Economic value within the project area include:
- Commercial fishing activity.
- Commercial shipping activity.

Social and heritage values within the project area include:

- Multiple Use Zone of the Zeehan Australian Marine Park.
- Two shipwrecks: ‘S.S. Selje’ and ‘Albert’.
- West Tasmania Canyons key ecological feature.

Maritime safety

At Beach, safety is our number one priority. The marine vessels contracted by Beach will operate in accordance with Australian Maritime Standards, regulated by the Australian Maritime Safety Authority. Notices to Mariners will be issued by the Australian Hydrographic Office requesting that vessels do not approach closer than two nautical miles of the assessment vessel.

Environment protection regulations

The National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA), regulates activities in accordance with the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations (2009) (Environment Regulations) and the *Offshore Petroleum and Greenhouse Gas Storage Act 2006* (OPGGS Act). The OGV Project will require

Environment Plans to be accepted by NOPSEMA before commencement of activities.

Environment Plans must include a description of the existing environment and the proposed activities, an evaluation of the impacts and risks, environmental performance outcomes and controls, implementation strategy, and reporting requirements. They must also demonstrate that consultations with persons or organisations whose functions, interests and activities may be affected by the activities in the Environment Plan ('relevant persons'), have been carried out in accordance with the regulations.

For successful gas discoveries that will proceed to development, an Offshore Project Proposal (OPP) will be required and will undergo a public consultation phase. Once an OPP is accepted, further Environment Plans will be required for construction activities and commissioning the new wells. Development of an OPP requires Beach to identify impacts and risks of the activities conducted over the life of the project and to demonstrate to NOPSEMA that the impacts and risks will be managed to acceptable levels. The OPP process involves a completeness assessment by NOPSEMA, followed by a public comment period, before final acceptance of the OPP by NOPSEMA.

Questions and Answers

Why are seabed assessments needed?

The seabed assessments are required to obtain detailed information on the bathymetry, seabed features and shallow geology at potential well locations, as well as between the well locations and the Thylacine and Yolla platforms. This information will be used to determine future drilling and infrastructure opportunities for the OGV Project.

Is Beach conducting seismic surveys for its new drilling program?

No, the range of different well types being planned for the OGV project are in areas that have previously been assessed with a seismic survey.

What will happen to any discharges from the borehole drilling?

Seawater and/or bentonite will be used to lubricate the drill bit and stabilise the borehole, as well as remove seabed material produced through drilling, called cuttings. As the fluids and cuttings come out of the borehole they will be deposited onto the seabed. Bentonite is an inert material classed as posing little or no risk to the environment.

Will the site assessments impact upon commercial fishing?

The seabed assessment area is located within existing designated Commonwealth and State fisheries. Engagement with fisheries has identified the area as not a peak activity area. Each fishery covers a vast area, whereas the seabed assessments will only require access to a relatively small area for a very short period of time.

Beach is committed to minimising the impact of its activities and will consult with commercial fishers on arrangements to ensure each other's operational plans are understood, helping to minimise any impacts to fishing activities.

To avoid entanglement and safety risks, fishing nets, lines or pots should not be placed in the seabed assessment area during the activities.

Will the activities affect whales?

Based on the low intensity sound generated from the equipment, any impact to whales will be low and temporary given the short duration of the activities. Shutdown and exclusion zones will be used to manage any impacts to whales that may be in the area during the seabed assessment. Avoidance of whales and dolphins will be undertaken in accordance with the EPBC Regulations (2000), including adherence to distance and speed requirements

Will an exclusion zone exist?

Exclusion zones will not be in place during the seabed assessment and normal navigational requirements will be followed.

Why can seabed assessments be undertaken within the Zeehan Australian Marine Park?

The seabed assessment area overlaps a small area of the Zeehan Australian Marine Park Multiple Purpose and Special Purpose Zones, which allow for seabed assessments if they are undertaken as per the accepted Environment Plan. No geotechnical samples will be taken within the Zeehan Australian Marine Park so there will be no impacts to the seabed and associated values. Geophysical surveys, which are non-intrusive, will potentially be undertaken within the marine park to obtain information in relation to the seabed bathymetry and structure. If feasible, drop camera images will be obtained to gain information on the seabed habitat within the marine park. All information collected within the marine parks will be shared with the Parks Authority. There are no plans to undertake any drilling or other activity in the Marine Park.

Will the seabed assessments impact shipwrecks?

Though two shipwrecks have been identified within the seabed assessment areas, there is the possibility that unknown shipwrecks could also be present. The aim of the geophysical survey is to identify any seabed obstructions such as shipwrecks. This will allow any geotechnical samples to be taken outside of the area of any obstructions, including shipwrecks. Where a shipwreck is identified from the seabed surveys it will be reported to the Department of Climate Change, Energy, the Environment and Water as per the requirements of the *Underwater Cultural Heritage Act 2018*.

Will there be impacts to the West Tasmania Canyons Key Ecological Feature?

The West Tasmania Canyons are an area of high productivity and aggregations of marine life with sponges concentrated near the canyon heads, with the greatest diversity between 200m and 350m depth. The aim of undertaking the geophysical and drop camera surveys is to identify any key features that should be avoided for well and anchor locations and future infrastructure.

How much seabed will be disturbed by the seabed assessments?

The geophysical surveys will not disturb the seabed. To take a core seabed sample a coring frame ~5m x 5m (footprint of ~25m^2) is placed on the seabed to allow a core of ~15cm diameter to be taken. The PCPT is taken within the coring frame area. Thus, each sample may disturb an area up to 25m^2. Up to 150 core samples may be taken within the seabed assessment areas, which is ~3,750m^2. Due to the small area of disturbance at each location there is no impediment to the disturbed areas recolonising from the undisturbed surrounding areas.

Further information and consultation

This information sheet has been prepared to inform Relevant Persons whose functions, interests or activities may be affected by the activities to be carried out under the Environment Plan being prepared for the OGV Project drilling activities.

Consultation is an important part of developing Environment Plans as its purpose is to ensure that potential impacts have been identified and appropriate measures adopted because of the consultations.

Please contact us if you would like further information, have any questions, or feedback, or wish to consult with us about how this project may impact your functions, interests or activities.

Beach will consider all feedback, including any concerns or objections and will explore measures to reduce any impacts and risks.

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.

If there is someone you believe may be affected by the proposed activities, please have them contact us.

P: 1800 797 011

E: community@beachenergy.com.au

www.beachenergy.com.au

beach

Appendix H.4 Seabed Assessment Summary of Impacts and Risks

Summary of Impacts and Risks for Beach OGV Seabed Assessment

Table covers the OGV Seabed Surveys in the Otway and Bass Basins.

Aspect - Planned	Relevant Activities	Potential Impact	Summary of Beach Control Measures
Light emission	Acquisition	Vessel lighting is required for navigational and safety purposes. Artificial light may attract light sensitive species such as shorebirds, seabirds, and turtles.	• Vessel lighting complies with Australian Maritime Safety Authority (AMSA) Marine Orders Part 30 (Prevention of Collisions). • Beach Seabird Lighting Management Plan is implemented on vessels and details: ○ Non-essential lights are turned off when not in use. ○ Lighting is directed onto work areas. ○ Window screens or blinds are closed at night. ○ Crew environmental induction covers handling and reporting requirements for grounded or injured birds.
Seabed disturbance	Acquisition	Localised seabed disturbance with associated loss of benthic habitat or disturbance to cultural or heritage feature may occur from: • Temporary set-down of equipment on the seabed • Sediment displacement for the collection of samples.	• Seabed surveys, consisting of echo sounder, side scan sonar, sub bottom profiler and magnetometer, to identify and avoid, where possible, any key environmental, heritage or cultural features. • Vessels use dynamic positioning rather than anchor.
Underwater sound	Acquisition	Temporary disturbance to marine fauna may occur from underwater sound emissions from: • Vessel engines and thrusters	• Engines and thrusters are maintained in accordance with manufacturer's instructions via the Planned Maintenance System to ensure they are operating efficiently. • Vessels comply with the Environment Protection and Biodiversity Conservation (EPBC) Regulations 2000 – Part 8 Division 8.1 interacting with cetaceans which details minimum separation distances. • Beach Whale Management Procedure is implemented on vessels and requires:

Aspect - Planned	Relevant Activities	Potential Impact	Summary of Beach Control Measures
			○ Pre-activity survey undertaken for 30 min to identify whales that maybe within the activity area affected by underwater sound. ○ If a whale is sighted, the activity will not commence until no whales have been observed within the activity area affected by underwater sound for 30 minutes or whales have been observed leaving this area. ○ Once the activity has commenced observations are undertaken within the activity area affected by underwater sound. If a whale is sighted within this area the following will occur: ▪ If the vessel can do so it will move away from the whale and maintain a minimum separation distance equal to the activity area affected by underwater sound. ▪ If the vessel cannot move away from the whale, it will reduce thrusters if safe to do so. The activity will cease as soon as it is safe, and the vessel will move out of the activity area affected by underwater sound. • Vessels have a marine mammal observer (MMO) with experience in whale observation, distance estimation and reporting to implement the Beach Whale Management Procedure, for activities undertaken over a period greater than 24 hours. • In addition, vessel crew who act as Officer of the Watch receive training from the MMO in whale observation and distance estimation to assist the MMO during daylight hours.
Physical presence	Acquisition	The physical presence of vessels can result in the displacement of other marine users and snagging of fishing equipment.	• Consultation with relevant person that may be affected by the activity is undertaken as part of developing the environment plan and is ongoing prior to and during the activity to avoid or limit any displacement. • Beach's Fair Ocean Access 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. • Vessels comply with: ○ AMSA MO 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. ○ AMSA MO 27: Safety of navigation and radio equipment gives effect to International Convention for the Safety of Life at Sea (SOLAS) regulations

Aspect - Planned	Relevant Activities	Potential Impact	Summary of Beach Control Measures
			regarding radiocommunication and safety of navigation and provides for navigation safety measures and equipment and radio equipment requirements. • The Australian Hydrographic Office is notified of the activity at least three weeks prior to commencement to enable the promulgation of Notice to Mariners and AusCoast navigational warnings.
Marine discharges	Acquisition	Vessels discharge cooling water, brine, bilge water, deck drainage, putrescible waste, sewage, and grey water. Marine discharges can result in changes in water quality such as increased temperature, salinity, nutrients, chemicals, and hydrocarbons.	• Vessels comply with Protection of the Sea (Prevention of Pollution from Ships) Act 1983 which gives effect to MARPOL Annex IV relating to discharge of noxious liquid substances, sewage, and putrescible waste. • Equipment to treat marine discharges are maintained in accordance with manufacturer's instructions via the Planned Maintenance System to ensure they are operating efficiently. • Oil contaminated water is treated via a MARPOL (or equivalent) approved oily water separator and only discharge if oil content less than 15 ppm. • Sewage discharged at sea is treated via a MARPOL (or equivalent) approved sewage treatment system. • Food waste only discharged when macerated to ≤25 mm and at distance greater than 3 nm from land. • Beach Chemical Management Plan ensures that any chemicals within marine discharges are selected with the lowest toxicity, most biodegradable and least accumulative products that meet the technical requirements of the application.
Atmospheric emissions	Acquisition	Combustion of marine diesel oil (MDO) from vessel engines, generators and deck equipment may cause a localised and temporary decrease in air quality and add greenhouses gas (GHG) into the atmosphere.	• Vessels 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 International Air Pollution Prevention certificate and a current international energy efficiency certificate. ○ have a Ship Energy Efficiency Management Plan to reduce emissions. ○ engine NOx emission levels comply with Regulation 13 of MARPOL 73/78 Annex VI. ○ low-sulphur (<0.5% m/m) diesel used.

Aspect - Planned	Relevant Activities	Potential Impact	Summary of Beach Control Measures
			• Combustion equipment maintained in accordance with manufacturer's instructions via the Planned Maintenance System to ensure they are operating efficiently.

Aspect - Unplanned	Relevant Activities	Potential Impact	Summary of Beach Control Measures
Introduction and establishment of invasive marine species (IMS)	Acquisition	The introduction of IMS may occur as a result from discharge of vessel ballast water containing foreign species or translocation of foreign species through biofouling on hulls, niches or in-water equipment. The potential impacts of marine pest introduction include: • Change in native marine species diversity and abundance. • Change in commercial fish stocks and associated socio-economic effects. • Changes to conservation values of protected areas.	• Prior to the initial mobilisation for an activity by a vessel or submersible equipment, Beach completes a domestic IMS biofouling risk assessment to: o Validate compliance with regulatory requirements (Commonwealth and State) in relation to biosecurity. o Identify the potential IMS risk profile. o Identify potentially deficiency of IMS controls and additional controls to manage IMS risk profile at low. o Prevent the translocation and potential establishment of IMS into non-affected environments. • Suspected or confirmed IMS introduction are reported to Agriculture Victoria.
Vessel collision or disturbance of fauna	Acquisition	Vessels have the potential for collision with marine mammals which may cause injury or death.	• Vessels comply with the EPBC Regulations 2000 – Part 8 Division 8.1 interacting with cetaceans which details minimum separation distances. • Vessels have a MMO with experience in whale observation, distance estimation and reporting to implement the Beach Whale Management Procedure, • In addition, vessel crew who act as Officer of the Watch receive training from the MMO in whale observation and distance estimation to assist the MMO during daylight hours. • Vessel strike causing injury to, or death of a cetacean is reported to the Department of Climate Change, Energy, the Environment and Water.

Aspect - Unplanned	Relevant Activities	Potential Impact	Summary of Beach Control Measures
Loss of containment – marine diesel oil (MDO)	Acquisition	MDO is used in offshore vessels. A collision between a Beach contracted vessel and third-party vessel has the potential to result in a spill of fuel. Causes of a vessel collision may include mechanical failure, loss of dynamic positioning, navigational error or foundering due to weather.	• Vessel collisions are avoided by: ○ Consultation with relevant person that may be affected by the activity is undertaken as part of developing the environment plan and is ongoing prior to and during the activity to ensure they know where activity vessels are and how to contact. ○ The Australian Hydrographic Office is notified of the activity at least three weeks prior to commencement to enable the promulgation of Notice to Mariners and AusCoast navigational warnings. ○ Vessels comply with: ▪ AMSA MO 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. ▪ AMSA MO 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. ▪ AMSA MO 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. • Vessels have an automatic identification system (AIS) transceiver enabling them to receive the data broadcasted by surrounding vessels. • Vessels contracted to conduct activities only carry marine diesel. • The following plans are implemented in the event of a spill: ○ Shipboard Marine Pollution Emergency Plan (SMPEP) or Shipboard Oil Pollution Emergency Plan (SOPEP) (according to class). ○ Beach Offshore Victoria Oil Pollution Emergency Plan (OPEP). ○ Project-specific Operational and Scientific Monitoring Program (OSMP).

Aspect - Unplanned	Relevant Activities	Potential Impact	Summary of Beach Control Measures
Hydrocarbon spill response activities	Acquisition	Spill response strategies may be accompanied by a range of environmental and socio-economic impacts.	Preparedness measures: • Beach undertakes a spill response exercise prior to an activity commencing to test internal and external spill response arrangements and capability. • Beach maintains a current contract with Australian Marine Oil Spill Centre (AMOSC) for access to spill response resources and personnel. • Beach maintains access to spill response capabilities (including capable personnel and equipment) to implement well-specific SCCP) and RWP. Response measures: • NOPSEMA accepted Beach Offshore Victoria OPEP details: o Notification and reporting requirements. o Priority protection areas. o Response strategies including resources and equipment required. o Response actions and responsibilities. o Environmental monitoring requirements as per the NOPSEMA accepted Project-specific OSMP. • Implementation of response strategies is undertaken in consultation with/or under direction of the Commonwealth and/or State Control Agency.

Appendix H.5 Portland Observer Notice of Community Session

www.spec.com.au

PORTLAND OBSERVER Friday July 14 2023 19

Classifieds ONLINE PLACEMENT www.spec.com.au

CHURCHES

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Online via the
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p: 0493 111 762
swccportland

CHURCHES

UNITING CHURCH
Worship Times
Sunday 16th July
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9am Macarthur
10.15am Portland
11am Heywood
CONTACTS
Portland
Church Office
5523 2459
Heywood & Bolwarra
Heather Stewart
5527 1389

A place to share your
MEMORIES
of those who are forever in our hearts

DEATH

WINDSOR-FARLEY (nee Morrissey) - Margaret passed away 12th July 2023 aged 94 years.
You were the beautiful melody in the rhythm of life. Your love of music and dance will live on through us.
Dearly loved mother and mother-in-law of Michael and Trudy. Adored Nana of Darren, Regina, Brendan and Mitch. Cherished great grandmother of Ivy and Willow.
Rest in peace with Dad now.

WINDSOR - FARLEY (nee Morrissey) - Margaret Elizabeth 13/5/1929 - 12/7/2023
Loved mother and mother-in-law to Mary and Wally. Nanna to Olivia, Andre and Sarah. Great grandmother to Lenny and Jagger. Twin sister to Suzie.

MEMORIAM

SOPHIE WIESE
17/7/22
Loved wife of Marvin
Daughters - Jennifer Mrs Gail (1979) Elaine (1972)
Departed but never forgotten

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EMPATHY - COMPASSION - RESPECT

PUBLIC NOTICES

PUBLIC NOTICE

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Community Information Sessions

To continue meeting natural gas demand from homes, business and industry, Beach Energy has commenced planning and consultation for the Offshore Gas Victoria (OGV) Project.

The drop-in sessions will enable local communities to learn more about the OGV Project which is considering a range of activity in Commonwealth waters across several phases. These include seabed assessments (non-seismic), drilling and connecting new wells, and removing suspended wells.

We are committed to working with our local communities, ensuring people are informed of our projects and can provide feedback. Stakeholder consultation is an important part of our planning as it helps identify any local concerns and ensures management of potential impacts.

Please drop in any time at one of our information sessions below if you would like to ask our technical staff questions about our projects, or to provide feedback.

Tuesday 25 July, 2023 2.00 PM to 7.00 PM
Lee Breakwater Road, Portland

Wednesday 26 July, 2023 2.00 PM to 7.00 PM
Warrnambool RSL, 1 Artillery Crescent, Warrnambool

We welcome your questions, please contact:
P 1800 797 011
E community@beachenergy.com.au
beachenergy.com.au/ogv/

READ MORE

OBSERVER SPORT

Portlanders bring home eightball trophy

SOME of Portland's best eightball players competed in the Ladies Border Challenge against Mount Gambier on the weekend with the local side bringing home the shield. The Portland players compete annually against Mount Gambier with Saturday's event held at the Heywood Bowling Club. Photo: SUPPLIED

Junior football super session

RANI KANE

THERE was a large contingent of junior footballers at Tyrendarra on Monday night with AFL Western District hosting a combined training session to focus on coaching, umpiring and playing development.

Koroit premiership coach Chris McLaren led the coaching staff while David Harris (AFL Victoria Umpiring Education and Support Lead) was in charge of the umpires.

Aimed at all junior clubs in the region, any aspiring coaches, umpires and players were encouraged to attend.

AFL Western District's Club Development Lead Matt Sealey said they are working to give learning opportunities to improve connectedness and participation across the region.

"We haven't had a session in a long time where clubs can all get together and train, so it was really nice to be able to do that," Sealey said.

"There was a big focus on coach development, research indicates that a bad coach experience is a major factor why junior players don't return to the game. We wanted any emerging coaches or coaches who have been coaching for a while but wanted to freshen up their skills or learn some new drills to take back to their teams."

There was also a focus on player engagement regarding umpire roles as well as specifics for aspiring umpires to learn.

"The umpiring part was really important, young players got an understanding of how to umpire games and what it feels like to umpire a game of football," Sealey said.

"So the session was about educating players about the role of the umpires – there was some fun games involved in all of that too.

"We also have young players who are playing their games and then doing boundary umpiring for other games, so we wanted to give them the skills to be confident."

Along with the learning component of the session, Sealey also hopes it helps to improve connection between clubs.

"It's all about embracing community connection too," she said.

"I know we all compete against each other on a Saturday, but we want to build the capacity of our junior football in the region so it's so important we're getting together and learning off one another.

"There is a lot of communication between clubs regarding permits and playing Saturdays and Sundays and clubs are really good with that, so we want to keep building on that collaboration to boost our junior football."

JUNIOR footballers from across the region gathered at Tyrendarra on Monday night to participate in a super session training. Photo: SUPPLIED

Portland Table Tennis Association results

ROUND 10 of the Portland Table Tennis Association's season took place on Tuesday night, with two very close matches on show.

6 Amigos (G. Schroeder, K. Meaghan, D. Koenig, D. Belden, Noah Liersch, Z. Reeves) defeated AC/DC (R. Whiten, J. Mitchell, B. Koenig, Nathan Liersch, Koda MacLeod, L. Burgess) 11 to 8.

Spectrum (M. Wynd, K. Rogers, E. Reeves, P. Hayman, Kirby MacLeod, H. Bradbury) defeated Hit & Miss (D. Polkinghorne, J. Hurt, G. Brewster, T. Burgess, J. MacLeod, J. Hobbs) 10 to 9.

Appendix H.6 Warrnambool Standard Notice of Community Session

standard.net.au

Saturday, July 15, 2023 THE STANDARD 59

Public Notices

PUBLIC NOTICE

beach

Community Information Sessions

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We welcome your questions, please contact:

P 1800 797 011

E community@beachenergy.com.au

beachenergy.com.au/ogv/

READ MORE

Public Notices

WARRNAMBOOL

ANNUAL GENERAL MEETING

On Tuesday 8th August at 7:30pm
The Meeting will be held at the Warrnambool Swimming Club Clubrooms,
Jamieson st Warrnambool
Please RSVP to the club secretary
Anna Jenkins
secretary@warrnamboolswimmingclub.com.au

Massage

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Entertainment

SAT 15TH JULY - WED 19TH JULY

MISSION IMPOSSIBLE - DEAD RECKONING PT 1 (M) 163 MIN
SAT-MON/WED: 1.00PM 2.45PM♿* 6.45PM
TUES: 1.00PM 2.45PM♿* 8.40PM♿*

SPIDER-MAN: ACROSS THE SPIDER-VERSE (PG) 140 MIN (SDS)♿
SAT-WED: 5.45PM

TRANSFORMERS: RISE OF THE BEASTS (M) 127 MINS
SAT-WED: 12.00PM♿* 8.40PM♿*
TUES: 12.00PM♿* 9.00PM

NO HARD FEELINGS (MA15+) 103 MINS (SDS)♿
SAT-WED: 6.00PM

INDIANA JONES AND THE DIAL OF DESTINY (M) 154 MINS
SAT-WED: 10.00AM 2.30PM♿* 8.15PM♿*

THE LITTLE MERMAID (PG) 135 MINS (SDS)♿
SAT-WED: 9.30AM

ELEMENTAL (PG) 109 MINS
SAT-WED: 9.45AM♿* 12.15PM♿* 4.15PM

(SDS)♿ OR ♿ = SCREENING DOWNSTAIRS-WHEELCHAIR ACCESS (N) = MUM AND BUB SESSION ON WEDNESDAY
(CC) = CLOSED CAPTIONS (AD) = AUDIO DESCRIPTION SESSION TIMES ARE SUBJECT TO CHANGE WITHOUT NOTICE

54 Kepler Street Warrnambool. Phone 5563 2000 www.capitolcinema.com.au

VM4822496

Personal Notices

Love Is A Blending Of ♥ Two ♥
A slim build lady with brown hair & hazel eyes.
She loves the outdoors, country drives,
keeping active, swimming, cooking & trying new adventures/exploring.
She is looking for companionship built on mutual respect, trust and honesty.
To meet please Call
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Still have leftover items?
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☎ 0431 375 514
No Text

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THE STANDARD

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Pressure Cleaning
- Pressure Washing
- Dairy Cleaning Services
- Pipe/Drain Cleaning
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Call Tony on 0400 447 152 for a free quote
aquablast2018@outlook.com

VM4827057

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Express yourself!
205 different ways!
From $3 an insertion
If you are placing a classified ad, make it stand out with an Emoji!

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Appendix H.7 Cobden and Timboon Coast Times Notice of Community Session

Page 4 ~ Cobden Timboon Coast Times, Wednesday, July 12, 2023

Cobden Rotary celebrates year that was

COBDEN Rotary Club members have celebrated another busy year.

The club held its annual Changover Celebration recently which gave members a chance to reflect on efforts to support not only the local community, but internationally as well.

Club president David Childs took time to outline the achievements of the past 12 month.

"It has been a pleasure and privilege to lead the Rotarians in Cobden through an active and rewarding year," he said.

"Having shared the presidency this year with Mark Towner, I want to thank my fellow Rotarians and friends and supporters for helping make this a successful year of community activity and fun together."

Locally, support for community projects and initiatives included:

- Smoke detector battery changeover program for elderly members of the community;
- Youth awards in schools;
- Literacy projects in schools, kindergartens and Cobden Library;
- Student welfare in schools;
- Community Christmas hampers;
- The Good Friday Royal Children's Hospital appeal;
- Contributions to Foodshare Warrnambool;
- Supporting the BRICKS Club; and
- A resident safety initiative at Cobdenhalth and the Cobden Scouts.

Support by the Rotary Club of Cobden for international projects included funding shelterboxes, Rotary International's 'End Polio Now' project, Rotary's broad international projects funds and funding for the shipment of recycled goods and equipment from Australia to developing countries.

Altogether the Rotary Club of Cobden's financial outlay for these projects and programs has totalled more than $25,000.

However, the time spent by Rotarians in fundraising, running activities and completing the projects equals over 25000 hours of volunteer time or $30,000 to $35,000.

Mr Childs said Rotarians were ordinary members of the community who want to serve the community through volunteer effort.

"While our club is relatively strong, having 13 active members at the present time, we are always looking for people with a similar desire for service to join us - either as members or as 'Friends of Rotary'," he said.

To find out more about the Cobden Rotary Club speak with Mr Childs or any member of the club.

George Hanks receiving his Paul Harris Fellowship at the recent Cobden Rotary Club changeover dinner, also pictured with Gary Kimber, David Childs and Kaye Hanks in photo. 2023E

Joyce Roberts with Paul Harris Fellowship award next to David Childs. 2023E

David Childs being inducted for another term as president by Annie McDowell. 2023E

Moyne Shire set to welcome new director

MOYNE Shire Council will welcome Ed Small as it's new director corporate and governance at the end of the month.

Chief executive officer Brett Davis said Mr Small will join Moyne from the Victorian Planning Authority where he has just finished as board secretary and was previous executive director of corporate services.

"Ed has extensive experience in both local and state government - including over 15 years as corporate services director at some of Melbourne's largest councils," he said.

"He is a qualified accountant and has high level experience in finance, governance and wider corporate strategy.

"He has been with the Growth Areas/ Victorian Planning Authority more recently in partnership with a range of metropolitan and regional councils.

"I'm looking forward to welcoming Ed to the team at Moyne and really excited about the level of experience he will bring to our executive team and the organisation."

Mr Davis said Mr Small would have responsibility for organisational services including finance, information technology, governance, people and culture, customer service, procurement, licensing and land management.

Mr Small will begin at Moyne on July 24.

PUBLIC NOTICE

beach

Community Information Sessions

To continue meeting natural gas demand from homes, business and industry, Beach Energy has commenced planning and consultation for the Offshore Gas Victoria (OGV) Project.

The drop-in session will enable the local community to learn more about upcoming Beach projects:

- The OGV Project which is considering a range of activity in Commonwealth waters across several phases. These include seabed assessments (non-seismic), drilling and connecting new wells, and removing suspended wells.
- The Calico Survey (3D transitional zone seismic survey) which will be conducted between Nirranda South to the west and approximately 6km east of Port Campbell, out to 3 nautical miles offshore and approximately 4km inland.

We are committed to working with our local communities, ensuring people are informed of our projects and can provide feedback. Stakeholder consultation is an important part of our planning as it helps identify any local concerns and ensures management of potential impacts.

Please drop in any time at one of our information sessions below if you would like to ask our technical staff questions about our projects, or to provide feedback.

Monday 24 July, 2023 2.00 PM to 7.00 PM
Port Campbell Surf Life Saving Club,
1 Cairns Street, Port Campbell

We welcome your questions, please contact:

P 1800 797 011

E community@beachenergy.com.au

beachenergy.com.au/ogv/

READ MORE

Appendix H.8 Colac Herald Public Notice for Relevant Persons

20 | COLAC HERALD Friday, July 28, 2023

CLASSIFIEDS

https://colacherald.com.au

POSITIONS VACANT

SWAYN McCABE
CLAAS Harvest Centre

NOW HIRING

SPARE PARTS

We're looking for a trainee or experienced person for a full time role to join the Colac team in the spare parts department.

Requirements:

Visit Us Online

Contact Us

REACH AN AUDIENCE IN OUR CLASSIFIEDS

Join our team

Administration Coordinator Planning

- An exciting opportunity to join our planning team in a 12-month fixed-term role
- Excellent benefits including a 19-day month
- Competitive salary, $70,666 - $78,534 based on qualifications and experience
- Based in Camperdown

This role is responsible for the effective and efficient coordination of the planning department's administration function. This includes assisting the Manager Planning and Building with a variety of tasks across several different planning functions.

Applications close 5 pm, Sunday 13 August.

Environmental Health Officer

- Permanent full-time, based in Camperdown
- Salary range $81,696 - $100,241 based on qualifications and experience
- Excellent benefits including a 19-day month
- Applications welcomed from both qualified and unqualified candidates with transferable skills

The Environmental Health Officer will be responsible for delivering Council's environmental health, including customer service, community education, statutory compliance and the research and production of innovative and effective policies, management plans and strategies.

If you're seeking a career change and have transferable skills, get in touch. Corangamite Shire can fully fund training to become an Environmental Health Officer for the right applicant.

Applications close 5 pm, Sunday 13 August.

Apply online: corangamite.vic.gov.au/employment

corangamite.vic.gov.au

WEBBER & CHIVELL FERTILISERS

29 COWLEYS ROAD
COBDEN, VIC 3266
Ph: 03 5594 6294
Fax: 03 5594 6321
ABN: 73 062 446 217

Positions Vacant

Webber and Chivell are seeking highly skilled operators to become part of a great team that prides itself on a professional and quality service to our clients.

This is a great opportunity to join an open and friendly work environment leading the way with the modern machinery and new technologies.

- The successful applicants would have to be self motivated and able to work with or without supervision.
- Have good customer and communication skills.
- Have a keen eye for detail and continual improvement.
- Good time management with a focus on safety.

We currently have 3 positions available listed below.

SPREADER DRIVER

This role is for a Spreader driver to operate one of our Modern Fleet of spreader trucks with the latest in vehicle management technology to apply fertilisers to our clients farms.

A heavy combination licence and tractor/agricultural experience would be preferred however training can be arranged for the right applicant.

DRONE PILOT

This role is for a Drone pilot to join our team to operate our growing fleet of drones in an exciting new area of the business. Spreading, Spraying, Mapping and other various tasks.

Training and licensing will be provided to the successful applicant.

LOCAL TRUCK DRIVER

This position is to operate our modern fleet of trucks to deliver product to our local farms with Rigid trucks and dog trailers.

A Heavy combination license is required to complete this role.

Each of these secure positions will be based out of our Jancourt depot located 10 K's east of Cobden. Remuneration will be based on experience.

For further information please contact Mark
Webber & Chivell, 29 Cowleys Rd, Cobden, Vic 3266
Ph: (03) 5594 6294
Email: mark@webberchivell.com.au

CLASSIFIEDS

PHONE 5231 5322

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PUBLIC NOTICES

PUBLIC NOTICE

beach

Continuing to meet Australia's gas needs

Beach Energy supplies the Australian east-coast gas market through production at the Otway Gas Plant near Port Campbell and the Lang Lang Gas Plant 80km south-east of the Melbourne CBD. To continue meeting natural gas demand from homes, business and industry, Beach has commenced planning and consultation for the Offshore Gas Victoria (OGV) Project.

Activities and Timing

Subject to all required approvals, from early 2024, there will be several activities in offshore Commonwealth waters south of Port Campbell and in Bass Strait in existing production and exploration licenses held by Beach. Activities will involve different phases including seabed assessments (non-seismic), removing suspended wells, as well as drilling and connecting new wells to existing pipelines.

Environment Plans

The OGV Project will require Environment Plans to be accepted by the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) before commencement of activities.

Environment Plans must include a description of the existing environment and the proposed activities, an evaluation of the impacts and risks, environmental performance outcomes and controls, implementation strategy, and reporting requirements.

Consultation and feedback with Relevant Persons whose functions, interests or activities may be affected by the project activities is an important part of developing Environmental Plans.

Consultation

As a local operator in Victoria, Beach has conducted transparent and respectful consultations with Commercial Fishers, First Nations groups, local communities and other Relevant Persons for many years.

If you think your functions, interests or activities may be affected, we would like to consult with you to understand your concerns, and where possible, explore measures to reduce any impacts or risks.

Relevant Persons may request that the information they provide not be published in the Environment Plan.

If there is someone you believe may be affected by the proposed activities, please ask them to contact us.

Further Information

Project information sheets, activity location maps and further information on consultation can be accessed via the QR code below.

P 1800 797 011
E community@beachenergy.com.au

beachenergy.com.au/ogv

READ MORE

Appendix H.9 Cobden and Timboon Coast Times Notice for Relevant Persons

Cobden Timboon Coast Times, Wednesday, July 26, 2023 ~ Page 11

Email: ads@wdnews.com.au

Classifieds

Public Notices

PUBLIC NOTICE

beach

Continuing to meet Australia's gas needs

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P 1800 797 011
E community@beachenergy.com.au

beachenergy.com.au/ogv

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G/23 6167

Livestock/Cattle

CHARLES STEWART LIVESTOCK

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- Jsy hfrs unj 200kg del late Sept **$800+GST**
- Ang hfrs 240kg+ del early-August **$1200+GST**
- Ang hfrs 240kg del late Sept **$1100+GST**
- Simm hfrs unj 240kg + del mid-August **$POA**
- Wagyu hfrs unj 220kg + del mid- August **$4500+GST**
- Wagyu x ang hfrs unj 220kg + del mid-August **$1500+GST**
- Wagyu x ang hfrs unj 220kg + del late Sept **$1500+GST**
- Wagyu x ang hfrs unj 220kg + del late Sept **$1500+GST**
- Wagyu x fres hfrs unj 220kg del mid-August **$1000+GST**

China protocols
Contact your Charles Stewart agent

WANTED

- Agistment for various lengths and cattle. **Matt Baxter**

FOR SALE

- 10 frs hfr calves,4 weeks old,AI bred, **$250 +GST**
- 30 frs x ang calves, mixed sex,6-12 weeks old, **$250 +GST** Lindsay Robb

FORTHCOMING SALES

29/7/23	Irrewillipe Machinery & Sundry Clearing Sale Ac M & L Lockhart 10am **Alan Whelan 0428 376 180**
3/8/23	Mortlake Store Sale 10am **Matt Baxter**
8/8/23	CDownAssoc Agent Weaned Calf & Store Sale 10.30am Lindsay Robb

Matthew Baxter (Manager) 0428 926 614
Steve Lambert 0407 504 001
Malcolm Hallyburton 0418 384 152
Lindsay Robb 0427 501 791
Clarrie Smith 0407 058 174
Brian Gleeson 0417 132 077
James Breen 0429 402 445
Matthew Buckle 0427 358 900
Lochie McLauchlan 0457 427 737

Visit our Facebook page or website for livestock news charlesstewart.com.au

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PAYING
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Any reasonable condition considered
Phone Telly Katsaros on 0427 368 261

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Radiators, engines, farm machinery, copper, brass, aluminium, lead, steel, sheets of iron, fencing wire, milk vats, hot water services etc.
GOOD PRICE OFFERED
Call Gerard between 8am-9pm on 5566 5168 or 0409 245 895.

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WANTED
Tractors and farm machinery
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Livestock/Cattle

Timboon Poll Herefords
BULLS FOR SALE
Very quiet, herd improvers or dairy back-up.
Available now.
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WD NEWS PUBLICATIONS
◆ Camperdown Chronicle ◆ Terang Express ◆ Cobden Timboon Coast Times ◆ Mortlake Dispatch

Churches

CAMPERDOWN, NOORAT, TERANG PRESBYTERIAN CHURCH
Sunday Services:
1st and 3rd Sundays at Camperdown 9.30am
2nd and 4th Sundays at Terang 9.30am
Weekly at Noorat 11am
Preacher: Reverend Damian Meeuwissen
Session Clerk: Tom Fleming 0408 529 467

PORT CAMPBELL BAPTIST CHURCH
Every Sunday at 10.30am
All welcome
This week's speaker: James O'Brien
Enquiries: Pastor Paul Pallot on **0403 791 321**

UNITING CHURCH
Combined service for Cobden, Terang and Timboon Congregations
to be held at Cobden
10.30am Sunday July 30
Shared lunch to follow

Appendix H.10 South Gippsland Sentinel Notice of Webinar

SPORT | BASKETBALL

Coasters ready to break into a new season

Coasters stars Ruby Morris and Jett Garnham are ready to ball out this season.

By Aiden Box

BASKETBALL is once again taking off in Wonthaggi and surrounding areas, with domestic, representative and Country Basketball League (CBL) each entering new seasons.

The Wonthaggi Amateur Basketball Association (WABA) will again field both a men's and a women's CBL side and look to be competitive in the region's highest and most competitive basketball competition.

The proud Wonthaggi club has undergone a few changes in the offseason, following another successful season in the CBL last summer, when their men finished sixth and their women fifth.

Both teams welcome new head coaches, with the men to be led by Andrew Mortimore and the women now under the guidance of Cath Garnham.

Fresh into their new roles at the helm, Andrew and Cathy spoke to the Sentinel-Times last week ahead of the CBL's opening round.

'It's what I'm used to, I'm much more comfortable with the seniors role, I've coached up in New South Wales in youth league men's, NBL1 and played in that league for about 20 years as well," Mortimore said.

'I'm feeling much more at home with the older boys."

"I took on the role since they're a good bunch of girls, they've had a bit of recent success and I'm hoping to get that next group of women coming through and getting them involved," said Garnham.

Neither coach is a stranger to the role or the club itself for that matter, the Garnham name is entrenched in the WABA and Cathy herself has coached many successful representative teams of all ages, she also has three supremely talented children who have and will represent the club with flying colours.

As for Andrew, he and his family moved to the area during the pandemic and has since invested his time in the junior portion of the WABA, coaching his 11-year-old son in his junior representative team, he will now take on the big job and coach his other son Will.

Will is touted to be a massive drawcard to the Coasters games with a wealth of experience and height, standing 6'10".

'He's been in boarding school in Sydney for the last three years, playing NBL1 in NSW, he's just turned 18 and won the NSW Youth League State Championship, which was a big win for his club in Maitland," Mortimore said.

Will Mortimore will look to gel early with his new teammates, one of whom Jett Garnham, who was a top ten scorer in the competition last season and has recently played Youth League basketball at the Dandenong Basketball Club, Jett is also one of Cath's sons, and will again line up alongside his older brother Jenson, in what shapes to be Wonthaggi's best and most exciting line up yet.

'What excites me about the boys is that they've got a bit of mongrel about them, which is great, they're young, fit, aggressive and our strength will be to use that intensity on the defensive end to create a bit of pressure," Mortimore said.

'We've got a bit of height coming in this year with Will, so the combination of speed, aggression and height should see us have a bit of extra oomph compared to last year."

With a new coach and a true power forward/centre coming into an already potent machine, the Wonny' men are primed to make a finals run, and have their sights set on doing so.

'We sat down at our first session and as a team we targeted a top three finish so we can have a great advantage going into finals, so that's where we're aiming this year," Mortimore said.

On the women's side of the tape, their new leader is pumped to get to work with her fresh and young squad.

'We're travelling well, we've got a few junior girls coming through the junior program, which is good, it shows that our pathways are all working, we've got a good mix," said Garnham.

'I think we have that blend of good youth and experienced heads as well, our older lot, that are only in their early 20s, they have that experience of winning the title two seasons ago and playing at a high level themselves as juniors,

"So having that mix now and passing that information and skills onto the junior group and still having that chance to make finals and potentially win again makes this season really exciting."

Building off of this buzz, the 2021/22 champions will once again steel themselves for another finals tilt, or at least their coach certainly hopes so.

'We always hope to win, we know we've got to get time into the junior ones as well, so a lot of development but we'd be disappointed if we didn't make finals," she said.

All the preseason hype will finally come to an end this Saturday at Korumburra Indoor Recreation Centre, in a blockbuster rivalry double header.

The women will tip things off at 6pm in a clash of the champions, before the men hit the floor as one of the best local sporting rivalries adds another chapter, both coaches had their say on their huge season openers.

"The boys have said this is one they really want, all eyes are on Korumburra for us, it's a really important one, the boys are focused, and I'll get them ready on the day, we'll be ready to play," Mortimore said.

'We're hoping to get out and run, we've got some speed, they're the reigning champions, they've got great juniors and women's sides historically, they'll be super tough, we're going in as underdogs," said Garnham.

'But we'll try our best and take it to them and hopefully come away with the win."

Just to build even more excitement, in 2023/24 it will be easier than ever to watch the Coasters CBL stars strut their stuff out on their home floor, with five massive home games, all on Sundays!

This is a move which was requested by WABA president Michael Bell and his team, as a way of making the CBL action more accessible to families and locals in the area, Michael spoke of this change to the Sentinel-Times last week.

'It's really the perfect substitute for senior footy, it's the highest level we have around the region and its so easy to get to, we really want to build that family atmosphere," he said.

Wonthaggi's huge home opener double header tips off with the women at 12pm this Sunday at the Bass Coast Community Stadium, with the men to follow at 2pm, both against Southern Peninsula.

Both incoming coaches threw their support behind the change to Sunday afternoon home dates.

'I think particularly for local junior basketball players in the area it's a really good opportunity to come and see kids that have come through the same club and got to a point where they perform," said Mortimore.

'We've got Jenson, Jett and Dom who are all really solid local juniors who are going to be competing in high levels of basketball for a long time, so I think for juniors to come and see how far they can get to as basketballers in Wonthaggi it's a really good opportunity to come and support."

'Come down because you can see some great local talent, some people they've potentially grown up with our know around the area and see some role models for men and women," said Garnham.

'It's great for those younger people to see that there is quality high-level sport in their region that they can be part of, either through playing or just by coming and watching and we want to do our town - Wonthaggi and surrounds proud."

The club is hungry for more success this summer as it continues to grow at all levels.

'Numbers for the club overall are great, domestic is still growing, we've had to move to adding a Friday night to the schedule to fit everything in, rep' is going well too, we just hosted heaps of practice games for the local clubs over the weekend," said Bell.

Overall, the WABA is set for another bumper season of basketball, and it promises to be an unmissable one for the area's locals, who are all welcome to come get their piece of the action.

PUBLIC NOTICES

PUBLIC NOTICE

beach

Community Information Webinar

To continue meeting natural gas demand from homes, business and industry, Beach Energy has commenced planning and consultation for the Offshore Gas Victoria (OGV) Project.

The webinar will enable the local community to learn more about the OGV Project, which is considering a range of activity in the Commonwealth waters across several phases. These include seabed assessments (non-seismic), drilling and connecting new wells, and removing suspended wells.

We are committed to working with our local communities, ensuring people are informed of our projects and can provide feedback. Stakeholder consultation is an important part of our planning as it helps identify any local concerns and ensures management of potential impacts.

If you would like to ask our technical staff questions about our projects, or provide feedback, please register your interest in joining the webinar by emailing community@beachenergy.com.au.

Tuesday 17 October 2023 from 5pm to 6pm

We welcome your questions, please contact:

P 1800 797 011
E community@beachenergy.com.au
beachenergy.com.au

READ MORE

54 | TUESDAY, OCTOBER 10, 2023 | SOUTH GIPPSLAND SENTINEL-TIMES

Appendix H.11 The Border Watch Notice for Relevant Persons

General Notices

Public Notices and Event

PUBLIC NOTICE

Continuing to meet Australia's gas needs

beach

Beach Energy supplies the Australian east-coast gas market through production at the Otway Gas Plant near Port Campbell and the Lang Lang Gas Plant 80km south-east of the Melbourne CBD. To continue meeting natural gas demand from homes, business and industry, Beach has commenced planning and consultation for the Offshore Gas Victoria (OGV) Project.

Activities and Timing

Subject to all required approvals, from early 2024, there will be several activities in offshore Commonwealth waters south of Port Campbell and in Bass Strait in existing production and exploration licenses held by Beach. Activities will involve different phases including seabed assessments (non-seismic), removing suspended wells, as well as drilling and connecting new wells to existing pipelines.

Environment Plans

The OGV Project will require Environment Plans to be accepted by the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) before commencement of activities.

Environment Plans must include a description of the existing environment and the proposed activities, an evaluation of the impacts and risks, environmental performance outcomes and controls, implementation strategy, and reporting requirements.

Consultation and feedback with Relevant Persons whose functions, interests or activities may be affected by the project activities is an important part of developing Environmental Plans.

Consultation

As an established operator, Beach has conducted transparent and respectful consultations with Commercial Fishers, First Nations groups, local communities and other Relevant Persons for many years.

If you think your functions, interests or activities may be affected we would like to consult with you understand your concerns and where possible, to explore measures to reduce any impacts and risks.

Relevant Persons may request that the information they provide not be published in the Environment Plan.

If there is someone you believe may be affected by the proposed activities, please ask them to contact us.

Further information

Project information sheets, activity location maps and further information on consultation can be accessed via our website or scanning the QR code below.

P 1800 797 011
E community@beachenergy.com.au
beachenergy.com.au/ogv

READ MORE

12531060-JC36-23
GD23-0194

Public Notices and Event

GLENELG SHIRE

CONTRACT NO. 2023-24-24
Local Freight Roads Projects Portland Heathfield Linsday Road Rehabilitation & Widening
Full details found at: www.tenderlink.com/glenelg/
Closing Date: 28/09/2023 at 3pm.
LATE TENDERS WILL NOT BE CONSIDERED
12831303-MS36-23

GLENELG SHIRE

CONTRACT NO. 2023-24-25
Local Freight Roads Projects Portland Fitzgerald Street Upgrade
Full details found at: www.tenderlink.com/glenelg/
Closing Date: 28/09/2023 at 3pm.
LATE TENDERS WILL NOT BE CONSIDERED
12831252-AA36-23

Need cash?
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Network Classifieds
1300 666 808

Employment

Positions Vacant

Wattle Range

COMMUNITY DEVELOPMENT OFFICER

Wattle Range Council is seeking a suitably qualified applicant to join our organisation in a full-time Community Development Officer role.

The Community Development Officer is responsible for planning, developing, coordinating, implementing, and evaluating a range of community/social initiatives. These initiatives include but are not limited to, projects and events involving seniors, suicide prevention, people with a disability, early childhood, families, youth, community safety and volunteering. The position will work collaboratively with key agencies to develop sustainable partnerships.

For further information about the role and how to apply, visit Council's website at
www.wattlerange.sa.gov.au/employment
or contact Council's Human Resources Team on (08) 8733 0900.

Applications close **9am on Monday, 4 September 2023.**
12327419-JB34-23

Positions Vacant

Tourism & Events Coordinator

Wattle Range Council is seeking a suitably qualified applicant to join our organisation in a part-time Tourism & Events Coordinator role.

The Tourism & Events Coordinator works collaboratively with the Manager of Community Development in managing Council's Visitor Information Centres and promoting and organising tourism events in the Wattle Range Council region.

For further information about the role and how to apply, visit Council's website at
www.wattlerange.sa.gov.au/employment
or contact Council's Human Resources Team on
(08) 8733 0900.

Applications close **9 am on Monday, 11 September 2023.**
12833172-KO36-23

Buy, & Sell in our
Motoring
section of Network Classifieds.
Network Classifieds 1300 666 808

Employment

Positions Vacant

MAKING A DIFFERENCE SO SOUTH AUSTRALIA THRIVES
Government of South Australia

PROJECT OFFICER

Department for Environment and Water
Mount Gambier
Contract up to 2 years
Vacancy ID: 545838
$84,522 - $94,003 per annum (ASO5)

An exciting opportunity exists for a Project Officer in Water Licensing Branch. The Officer is responsible for management of specific programs and providing policy advice on water planning and management matters to industry representatives and customers. The position contributes to the development and implementation of agency objectives, programs and projects. Seeking a Project Officer to provide high level project management across water planning and management matters. The incumbent works with industry groups, water licence holders and the general public regarding complex water allocation and licensing matters. The role is the key contact for commercial forest licence holders and assists in regional and state-wide policy development and water compliance.

Head to I Work for SA to read the role description and follow the instructions to apply. Applications will only be accepted through I Work for SA.

Initial enquiries to:
Christine Fiebig, Manager, Customer Service & Regional Delivery,
Christine.Fiebig@sa.gov.au or
0427 813 850.

To apply and for more information visit the I WORK FOR SA website: www.iworkforsa.gov.au and search by vacancy number.

Applications close:
11pm, Monday 4 September 2023

The Department for Environment and Water is committed to building a diverse and inclusive workplace. We encourage applications from people with diverse backgrounds including all ages and gender identities, Aboriginal and Torres Strait Islander, people with disability, culturally and linguistically diverse and LGBTIQA+.

The South Australian Public Sector promotes diversity and flexible ways of working including part time. Applicants are encouraged to discuss the flexible working arrangement for this role.

12829320-MS35-23
WI 9086

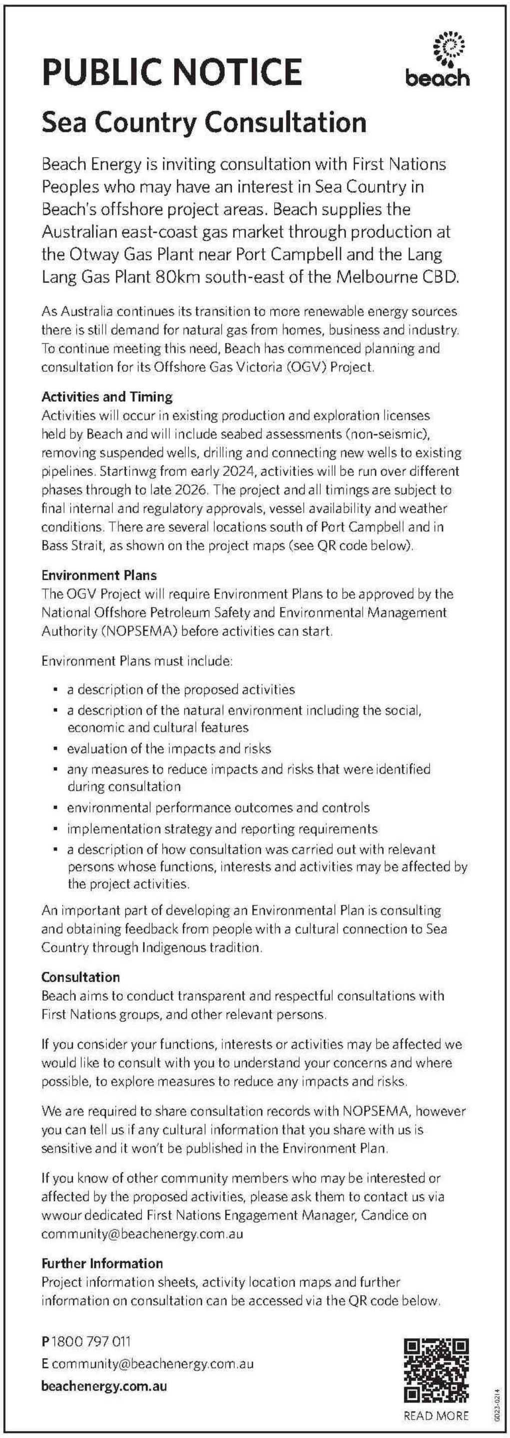
IWORKFOR.SA.gov.au

Find your Local Specialist in our
Professional Services
section of Network Classifieds.
Network Classifieds
1300 666 808

Advertise with us and get better results
CALL: 1300 666 808

Friday, 1 September, 2023 - 53

Appendix H.12 National Indigenous Times notice of Relevant Persons



PUBLIC NOTICE

beach

Sea Country Consultation

Beach Energy is inviting consultation with First Nations Peoples who may have an interest in Sea Country in Beach's offshore project areas. Beach supplies the Australian east-coast gas market through production at the Otway Gas Plant near Port Campbell and the Lang Lang Gas Plant 80km south-east of the Melbourne CBD.

As Australia continues its transition to more renewable energy sources there is still demand for natural gas from homes, business and industry. To continue meeting this need, Beach has commenced planning and consultation for its Offshore Gas Victoria (OGV) Project.

Activities and Timing
Activities will occur in existing production and exploration licenses held by Beach and will include seabed assessments (non-seismic), removing suspended wells, drilling and connecting new wells to existing pipelines. Startinwg from early 2024, activities will be run over different phases through to late 2026. The project and all timings are subject to final internal and regulatory approvals, vessel availability and weather conditions. There are several locations south of Port Campbell and in Bass Strait, as shown on the project maps (see QR code below).

Environment Plans
The OGV Project will require Environment Plans to be approved by the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) before activities can start.

Environment Plans must include:

- a description of the proposed activities
- a description of the natural environment including the social, economic and cultural features
- evaluation of the impacts and risks
- any measures to reduce impacts and risks that were identified during consultation
- environmental performance outcomes and controls
- implementation strategy and reporting requirements
- a description of how consultation was carried out with relevant persons whose functions, interests and activities may be affected by the project activities.

An important part of developing an Environmental Plan is consulting and obtaining feedback from people with a cultural connection to Sea Country through Indigenous tradition.

Consultation
Beach aims to conduct transparent and respectful consultations with First Nations groups, and other relevant persons.

If you consider your functions, interests or activities may be affected we would like to consult with you to understand your concerns and where possible, to explore measures to reduce any impacts and risks.

We are required to share consultation records with NOPSEMA, however you can tell us if any cultural information that you share with us is sensitive and it won't be published in the Environment Plan.

If you know of other community members who may be interested or affected by the proposed activities, please ask them to contact us via wwour dedicated First Nations Engagement Manager, Candice on community@beachenergy.com.au

Further Information
Project information sheets, activity location maps and further information on consultation can be accessed via the QR code below.

P 1800 797 011
E community@beachenergy.com.au
beachenergy.com.au

READ MORE

GD23-0214

4 NIT **NEWS** nit.com.au

Dad hopes for some good from girl's death

DECHLAN BRENNAN

The father of a young Indigenous girl who died in hospital in 2019 while in out-of-home care said he hopes the changes recommended by the Coroner will prevent "other children from experiencing" what his daughter did.

Sasha (not her real name), who was on the autism spectrum, was 12 when she died at The Royal Children's Hospital in Melbourne on August 2, 2019.

Earlier this month Coroner Paul Lawrie stated she died from complications resulting from pneumonia and heart valve infection in the setting of a heart abnormality that Sasha had.

Between July 12 and July 28, when she was admitted to Sale hospital in Gippsland — Sasha visited a GP three times; each doctor diagnosing her as having a viral illness.

She was transferred to RCH but despite emergency heart surgery she died on August 2.

Her father, a proud Palawa man, was born with congenital valvular heart disease and in 2009 had surgery to replace his aortic valve.

He told the coronial inquiry that no one from the Department of Families, Fairness and Housing or the hospital asked him about his medical history.

Despite Sasha's mother telling the inquiry that she had passed on this information; in his findings, the Coroner stated: "(He) cannot be satisfied that the information that Sasha's father had 'heart issues' was effectively communicated within the conversation."

The Coroner did find that the relaying of critical medical information about Sasha was at points delayed, and not communicated effectively.

The Victorian Aboriginal Legal Service represented Sasha's father during the inquest.

VALS chief executive, Yorta Yorta and Narrandjeri woman Nerita Waight, told National Indigenous Times Sasha's tragic death highlighted easily addressable gaps in the State's child protection and healthcare systems.

"VALS wants the Victorian Government to collaborate with the Aboriginal community and organisations to improve the health and child protection systems that failed Sasha," she said.

"The child protection system has a responsibility to be as informed as possible about the medical history of a child in care."

In a statement, Sasha's father said he missed his daughter who "was so bubbly and full of life".

"We were a big part of each other's lives and always shared a special bond," he said.

The Coroner made several recommendations to better improve communication between the child protection and healthcare systems.

These include that the Department of Families, Fairness and Housing reviews its child protection manual and other relevant policies to include guidance to child protection practitioners to seek familial medical history that may impact the health of a child in its care; the Department of Families, Fairness and Housing should implement effective urgent communication with its case-contracting agencies, supported by policy and procedures, in respect of a child in care; the means adopted should be available at all hours and capable of actively alerting the recipient and the department should review its child protection manual and other relevant policies or guidelines to make clear to case-contracting agencies the circumstances in which it expects to urgently receive information concerning a child in care.

Sasha's father said he hoped these changes would help others.

"One of the recommendations (from the Coroner) was about improving processes in the child protection system so that case workers try to gather important medical information like a child's family medical history," he said.

Ms Waight agreed.

"VALS supports the Coroner's recommendation that the DFFH review its policies to make sure that practitioners try to seek a child's family medical history," she said.

"A nine-hour delay of Sasha's critical pathology results is unacceptable. VALS strongly supports the Coroner's recommendation to improve communication of critical clinical information at Central Gippsland Health Service and in all Victorian health services in Victoria.

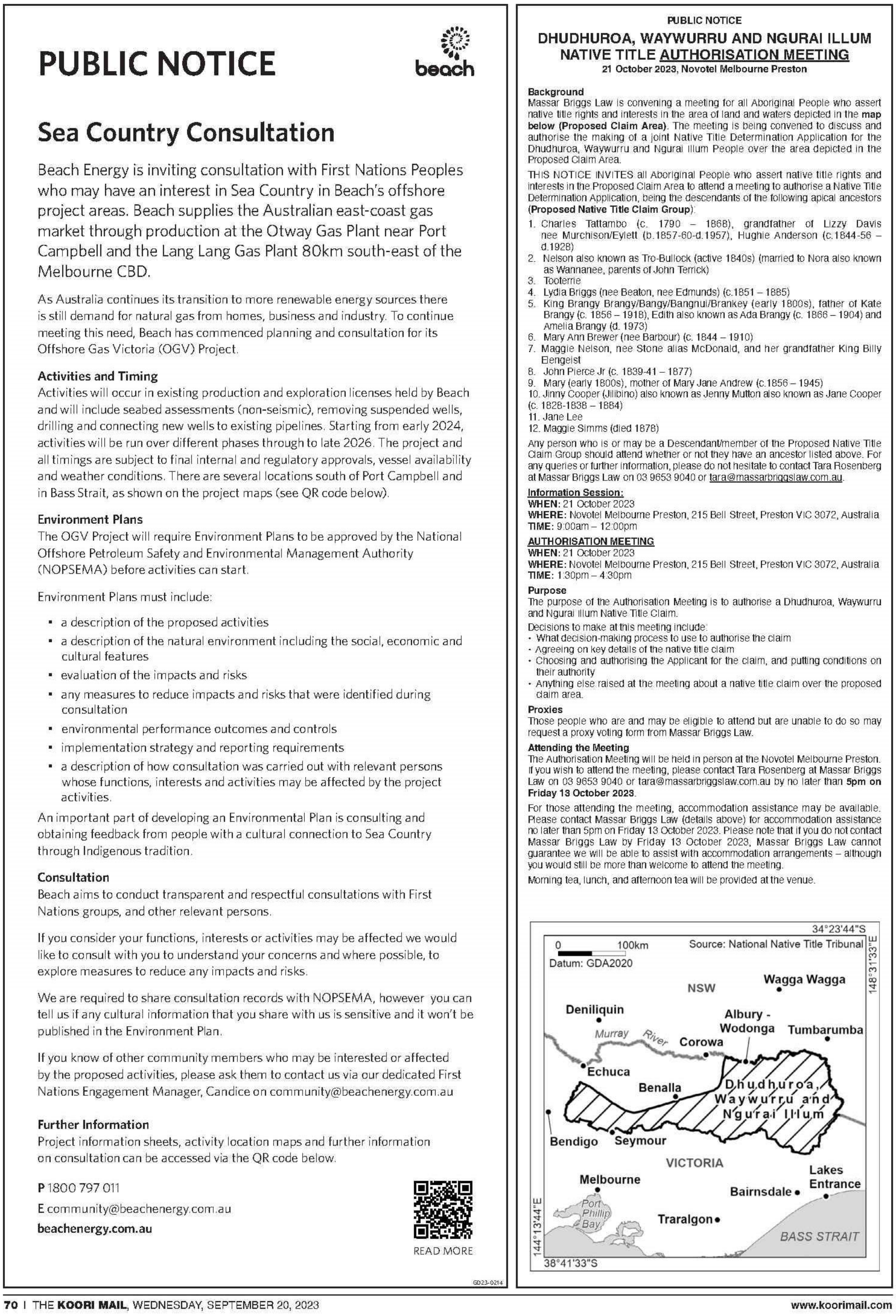
"VALS is proud of the hard work and courage of Sasha's father throughout the Coronial inquest. We would like to see all recommendations implemented so that all Aboriginal children in care are better managed and looked after when hospitalised."

Sasha's father said that while the changes were welcome, they had come too late for his daughter.

"It brings me some closure to know that they're starting to try to make changes to fix gaps in the system and that it's because of Sasha that these improvements will happen. But at the same time, I wish that Sasha had the opportunity to have the benefit of these changes," he said.

"I hope that the changes prevent other children from experiencing what Sasha experienced."

Appendix H.13 Koori Mail Notice for Relevant Persons



PUBLIC NOTICE

beach

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Activities and Timing

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- any measures to reduce impacts and risks that were identified during consultation
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- a description of how consultation was carried out with relevant persons whose functions, interests and activities may be affected by the project activities.

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Consultation

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Further Information

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P 1800 797 011
E community@beachenergy.com.au
beachenergy.com.au

READ MORE

GD23-0214

PUBLIC NOTICE

DHUDHUROA, WAYWURRU AND NGURAI ILLUM NATIVE TITLE AUTHORISATION MEETING

21 October 2023, Novotel Melbourne Preston

Background

Massar Briggs Law is convening a meeting for all Aboriginal People who assert native title rights and interests in the area of land and waters depicted in the **map below (Proposed Claim Area)**. The meeting is being convened to discuss and authorise the making of a joint Native Title Determination Application for the Dhudhuroa, Waywurru and Ngurai Illum People over the area depicted in the Proposed Claim Area.

THIS NOTICE INVITES all Aboriginal People who assert native title rights and interests in the Proposed Claim Area to attend a meeting to authorise a Native Title Determination Application, being the descendants of the following apical ancestors (**Proposed Native Title Claim Group**):

1. Charles Tattambo (c. 1790 – 1868), grandfather of Lizzy Davis nee Murchison/Eylett (b.1857-60-d.1957), Hughie Anderson (c.1844-56 – d.1928)
2. Nelson also known as Tro-Bullock (active 1840s) (married to Nora also known as Wannanee, parents of John Terrick)
3. Tooterrie
4. Lydia Briggs (nee Beaton, nee Edmunds) (c.1851 – 1885)
5. King Brangy Brangy/Bangy/Bangnul/Brankey (early 1800s), father of Kate Brangy (c. 1856 – 1918), Edith also known as Ada Brangy (c. 1866 – 1904) and Amelia Brangy (d. 1973)
6. Mary Ann Brewer (nee Barbour) (c. 1844 – 1910)
7. Maggie Nelson, nee Stone alias McDonald, and her grandfather King Billy Elengeist
8. John Pierce Jr (c. 1839-41 – 1877)
9. Mary (early 1800s), mother of Mary Jane Andrew (c.1856 – 1945)
10. Jinny Cooper (Jilibino) also known as Jenny Mutton also known as Jane Cooper (c. 1828-1838 – 1884)
11. Jane Lee
12. Maggie Simms (died 1878)

Any person who is or may be a Descendant/member of the Proposed Native Title Claim Group should attend whether or not they have an ancestor listed above. For any queries or further information, please do not hesitate to contact Tara Rosenberg at Massar Briggs Law on 03 9653 9040 or tara@massarbriggslaw.com.au.

Information Session:
WHEN: 21 October 2023
WHERE: Novotel Melbourne Preston, 215 Bell Street, Preston VIC 3072, Australia
TIME: 9:00am – 12:00pm

AUTHORISATION MEETING
WHEN: 21 October 2023
WHERE: Novotel Melbourne Preston, 215 Bell Street, Preston VIC 3072, Australia
TIME: 1:30pm – 4:30pm

Purpose

The purpose of the Authorisation Meeting is to authorise a Dhudhuroa, Waywurru and Ngurai Illum Native Title Claim.

Decisions to make at this meeting include:

- What decision-making process to use to authorise the claim
- Agreeing on key details of the native title claim
- Choosing and authorising the Applicant for the claim, and putting conditions on their authority
- Anything else raised at the meeting about a native title claim over the proposed claim area.

Proxies

Those people who are and may be eligible to attend but are unable to do so may request a proxy voting form from Massar Briggs Law.

Attending the Meeting

The Authorisation Meeting will be held in person at the Novotel Melbourne Preston. If you wish to attend the meeting, please contact Tara Rosenberg at Massar Briggs Law on 03 9653 9040 or tara@massarbriggslaw.com.au by no later than **5pm on Friday 13 October 2023**.

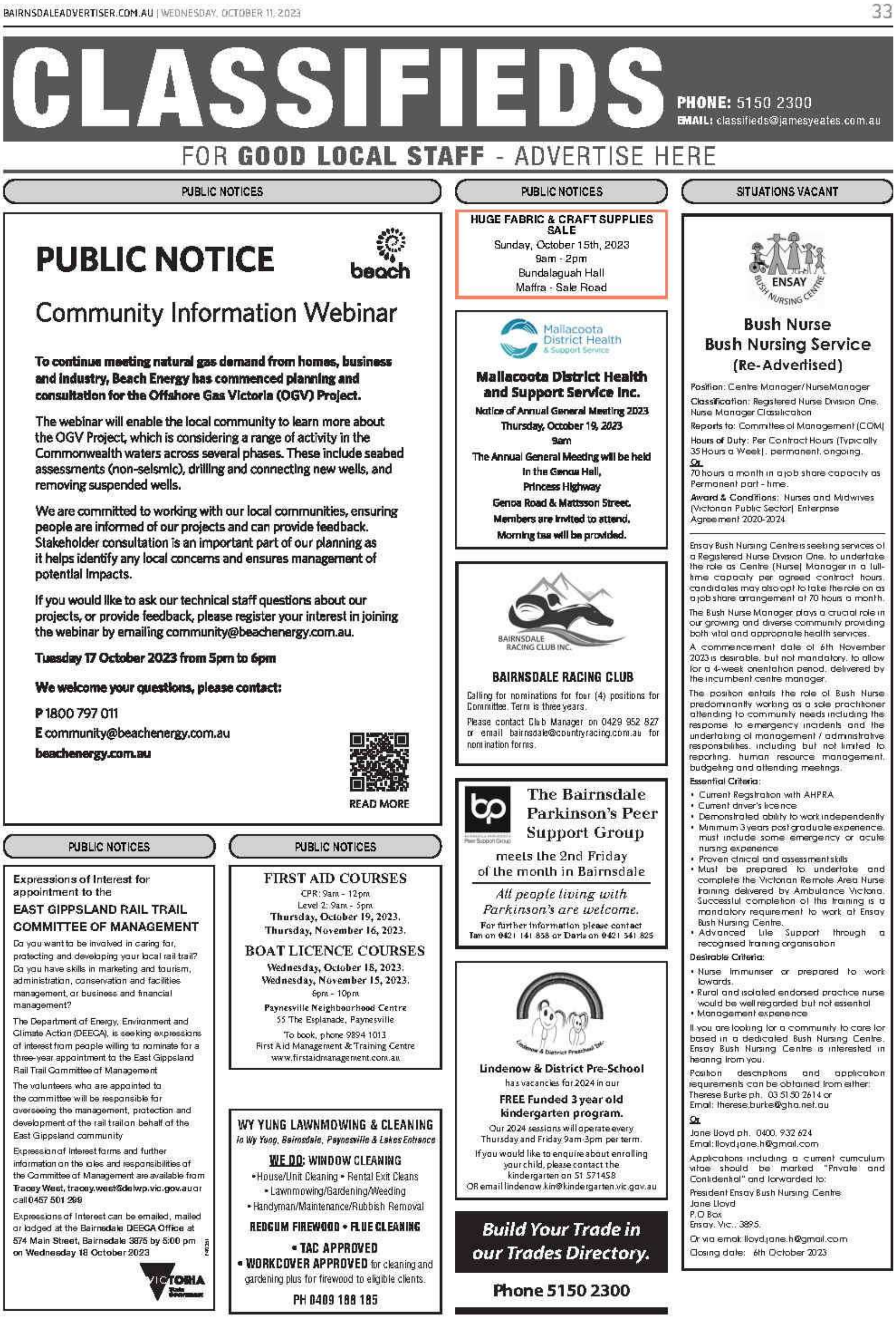
For those attending the meeting, accommodation assistance may be available. Please contact Massar Briggs Law (details above) for accommodation assistance no later than 5pm on Friday 13 October 2023. Please note that if you do not contact Massar Briggs Law by Friday 13 October 2023, Massar Briggs Law cannot guarantee we will be able to assist with accommodation arrangements – although you would still be more than welcome to attend the meeting.

Morning tea, lunch, and afternoon tea will be provided at the venue.

70 | THE **KOORI MAIL**, WEDNESDAY, SEPTEMBER 20, 2023

www.koorimail.com

Appendix H.14 Bairnsdale Advertiser Notice of Webinar



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EMAIL: classifieds@jamesyeates.com.au

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PUBLIC NOTICES

PUBLIC NOTICE

beach

Community Information Webinar

To continue meeting natural gas demand from homes, business and industry, Beach Energy has commenced planning and consultation for the Offshore Gas Victoria (OGV) Project.

The webinar will enable the local community to learn more about the OGV Project, which is considering a range of activity in the Commonwealth waters across several phases. These include seabed assessments (non-seismic), drilling and connecting new wells, and removing suspended wells.

We are committed to working with our local communities, ensuring people are informed of our projects and can provide feedback. Stakeholder consultation is an important part of our planning as it helps identify any local concerns and ensures management of potential impacts.

If you would like to ask our technical staff questions about our projects, or provide feedback, please register your interest in joining the webinar by emailing community@beachenergy.com.au.

Tuesday 17 October 2023 from 5pm to 6pm

We welcome your questions, please contact:

P 1800 797 011
E community@beachenergy.com.au
beachenergy.com.au

READ MORE

PUBLIC NOTICES

Expressions of Interest for appointment to the

EAST GIPPSLAND RAIL TRAIL COMMITTEE OF MANAGEMENT

Do you want to be involved in caring for, protecting and developing your local rail trail? Do you have skills in marketing and tourism, administration, conservation and facilities management, or business and financial management?

The Department of Energy, Environment and Climate Action (DEECA), is seeking expressions of interest from people willing to nominate for a three-year appointment to the East Gippsland Rail Trail Committee of Management

The volunteers who are appointed to the committee will be responsible for overseeing the management, protection and development of the rail trail on behalf of the East Gippsland community

Expression of Interest forms and further information on the roles and responsibilities of the Committee of Management are available from **Tracey West, tracey.west@delwp.vic.gov.au** or call **0457 501 299**

Expressions of Interest can be emailed, mailed or lodged at the **Bairnsdale DEECA Office at 574 Main Street, Bairnsdale 3875 by 5:00 pm on Wednesday 18 October 2023**

VICTORIA State Government

PUBLIC NOTICES

FIRST AID COURSES

CPR: 9am - 12pm
Level 2: 9am - 5pm
Thursday, October 19, 2023.
Thursday, November 16, 2023.

BOAT LICENCE COURSES

Wednesday, October 18, 2023.
Wednesday, November 15, 2023.
6pm - 10pm

Paynesville Neighbourhood Centre
55 The Esplanade, Paynesville

To book, phone 9894 1013
First Aid Management & Training Centre
www.firstaidmanagement.com.au

WY YUNG LAWNMOWING & CLEANING

In Wy Yung, Bairnsdale, Paynesville & Lakes Entrance

WE DO: WINDOW CLEANING
- House/Unit Cleaning • Rental Exit Cleans
- Lawnmowing/Gardening/Weeding
- Handyman/Maintenance/Rubbish Removal

REDGUM FIREWOOD • FLUE CLEANING

• TAC APPROVED
• WORKCOVER APPROVED for cleaning and gardening plus for firewood to eligible clients.

PH 0409 188 185

PUBLIC NOTICES

HUGE FABRIC & CRAFT SUPPLIES SALE

Sunday, October 15th, 2023
9am - 2pm
Bundalaguah Hall
Maffra - Sale Road

Mallacoota District Health & Support Service

Mallacoota District Health and Support Service Inc.

Notice of Annual General Meeting 2023
Thursday, October 19, 2023
9am
The Annual General Meeting will be held in the Genoa Hall,
Princess Highway
Genoa Road & Mattsson Street.
Members are invited to attend.
Morning tea will be provided.

BAIRNSDALE RACING CLUB INC.

BAIRNSDALE RACING CLUB

Calling for nominations for four (4) positions for Committee. Term is three years.

Please contact Club Manager on 0429 952 827 or email bairnsdale@countryracing.com.au for nomination forms.

The Bairnsdale Parkinson's Peer Support Group

meets the 2nd Friday of the month in Bairnsdale

All people living with Parkinson's are welcome.

For further information please contact Tam on 0421 141 858 or Darla on 0421 341 825

Lindenow & District Pre-School

has vacancies for 2024 in our

FREE Funded 3 year old kindergarten program.

Our 2024 sessions will operate every Thursday and Friday 9am-3pm per term.

If you would like to enquire about enrolling your child, please contact the kindergarten on 51 571458
OR email lindenow.kin@kindergarten.vic.gov.au

Build Your Trade in our Trades Directory.

Phone 5150 2300

SITUATIONS VACANT

ENSAY BUSH NURSING CENTRE

Bush Nurse
Bush Nursing Service
(Re-Advertised)

Position: Centre Manager/NurseManager

Classification: Registered Nurse Division One, Nurse Manager Classification

Reports to: Committee of Management (COM)

Hours of Duty: Per Contract Hours (Typically 35 Hours a Week), permanent, ongoing.
Or
70 hours a month in a job share capacity as Permanent part - time.

Award & Conditions: Nurses and Midwives (Victorian Public Sector) Enterprise Agreement 2020-2024

Ensay Bush Nursing Centre is seeking services of a Registered Nurse Division One, to undertake the role as Centre (Nurse) Manager in a full-time capacity per agreed contract hours, candidates may also opt to take the role on as a job share arrangement at 70 hours a month.

The Bush Nurse Manager plays a crucial role in our growing and diverse community providing both vital and appropriate health services.

A commencement date of 6th November 2023 is desirable, but not mandatory, to allow for a 4-week orientation period, delivered by the incumbent centre manager.

The position entails the role of Bush Nurse predominantly working as a sole practitioner attending to community needs including the response to emergency incidents and the undertaking of management / administrative responsibilities, including but not limited to reporting, human resource management, budgeting and attending meetings.

Essential Criteria:

- Current Registration with AHPRA
- Current driver's licence
- Demonstrated ability to work independently
- Minimum 3 years post graduate experience, must include some emergency or acute nursing experience
- Proven clinical and assessment skills
- Must be prepared to undertake and complete the Victorian Remote Area Nurse training delivered by Ambulance Victoria. Successful completion of this training is a mandatory requirement to work at Ensay Bush Nursing Centre.
- Advanced Life Support through a recognised training organisation

Desirable Criteria:

- Nurse immuniser or prepared to work towards.
- Rural and isolated endorsed practice nurse would be well regarded but not essential
- Management experience

If you are looking for a community to care for based in a dedicated Bush Nursing Centre, Ensay Bush Nursing Centre is interested in hearing from you.

Position descriptions and application requirements can be obtained from either:
Therese Burke ph. 03 5150 2614 or
Email: therese.burke@gha.net.au

Or

Jane Lloyd ph. 0400, 932 624
Email: lloyd.jane.h@gmail.com

Applications including a current curriculum vitae should be marked "Private and Confidential" and forwarded to:

President Ensay Bush Nursing Centre
Jane Lloyd
P.O Box
Ensay, Vic., 3895.

Or via email: lloyd.jane.h@gmail.com

Closing date: 6th October 2023

Appendix H.15 The Advocate Notice for Relevant Persons

theadvocate.com.au

Friday, September 1, 2023 THE ADVOCATE 55

Connect with Classifieds

The Advocate

Phone: 1300 363 789
Email: classifieds@theadvocate.com.au

The Advocate

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Digital Subscriptions: 1300 131 095; subscriptionsupport @austcommunitymedia.com.au
Newspaper circulation: 6336 7325, 1800 648 177, circulation@theadvocate.com.au

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CONNECT WITH CLASSIFIEDS

Place a classified ad: 1300 363 789, classifieds@theadvocate.com.au
Save time, submit online 24/7: addirect.com.au
Advertising self service enquiries: acmadonline@austcommunitymedia.com.au
Print and online packages available throughout Australia.

PLACE AN AD

SCAN HERE

Public Notices

Bagdad Uniting Cemetery Ownership Change

From 18.08.23 the cemetery at 2 Chauncy Vale Rd, Bagdad, 7030 Is managed by Ellen Jensen. Open to the public during daylight hours.
Enquires: 0488 313 205; b.uniting@protonmail.com; c/- PO Box 484, North Hobart, 7002.

SAVE TIME - SUBMIT ONLINE
Placing your classified ad through our self-service portal
addirect.com.au
- Submit your ad at any time of the day
- Access the portal from anywhere in Australia
- Select multiple publications across all Australian Community Media papers and receive up to 25% discount.

It's that easy!

Connect with Classifieds

Public Notices

Dog Control Act 2000 Section 51 (3) (a) (b)

NOTICE OF INTENTION TO APPLY FOR A LICENCE

Notice is hereby given that it is my intention to apply to the Central Coast Council for a licence to keep 4 dogs, 3 German Short Haired Pointers ,1 Patterdale Terrier at my premises situated at 2 Cheryl Court, wst Ulverstone, Tas.7315. Persons residing within 200 metres of the boundary of the above premises, may within 14 days after the publication of this notice object in writing to the Registrar of Dogs of the above Council stating their reasons of objection to the grant of the licence.

Positions Vacant

Penguin Guiding
Volunteers needed in Burnie, Lillico and Stanley.
Training Day Saturday 16 September, 2023
If you are interested, contact Evelyn **0437 149 747** for more information.

Work Wanted

CONCRETER & RENDERER avail for repairs and new work. 20 years exp, business reg and insured. No job too small. Free quotes. Pens disc 0499 199 385.

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Adult Services

0416 085 520
AA NEW Devonport, Rita, hot sexy body, pretty, busty beautiful .

ADD A LOGO TO YOUR AD

Adult Services

CHERRY, sz8, good service, busty, Somerset. 0426 138 083. Myumi D'port 0426 883 822.

NICE, Quiet. Friendly, 33 yr Lady. Mighty body rub. **ULVERSTONE** Text 0450 850 691.

NEW 25 yo good service. Everything, naughty. Burnie, 0450 378 885.

Looking for property?
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Public Notices

PUBLIC NOTICE

Continuing to meet Australia's gas needs

beach

Beach Energy supplies the Australian east-coast gas market through production at the Otway Gas Plant near Port Campbell and the Lang Lang Gas Plant 80km south-east of the Melbourne CBD. To continue meeting natural gas demand from homes, business and industry, Beach has commenced planning and consultation for the Offshore Gas Victoria (OGV) Project.

Activities and Timing

Subject to all required approvals, from early 2024, there will be several activities in offshore Commonwealth waters south of Port Campbell and in Bass Strait in existing production and exploration licenses held by Beach. Activities will involve different phases including seabed assessments (non-seismic), removing suspended wells, as well as drilling and connecting new wells to existing pipelines.

Environment Plans

The OGV Project will require Environment Plans to be accepted by the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) before commencement of activities.

Environment Plans must include a description of the existing environment and the proposed activities, an evaluation of the impacts and risks, environmental performance outcomes and controls, implementation strategy, and reporting requirements.

Consultation and feedback with Relevant Persons whose functions, interests or activities may be affected by the project activities is an important part of developing Environmental Plans.

Consultation

As an established operator, Beach has conducted transparent and respectful consultations with Commercial Fishers, First Nations groups, local communities and other Relevant Persons for many years.

If you think your functions, interests or activities may be affected we would like to consult with you understand your concerns and where possible, to explore measures to reduce any impacts and risks.

Relevant Persons may request that the information they provide not be published in the Environment Plan.

If there is someone you believe may be affected by the proposed activities, please ask them to contact us.

Further information

Project information sheets, activity location maps and further information on consultation can be accessed via our website or scanning the QR code below.

P 1800 797 011
E community@beachenergy.com.au
beachenergy.com.au/ogv

READ MORE

Death Notices

PINNER
Christopher
28/02/1933 - 28/08/2023

Loved and respected brother-in-law of Robbie and Margaret Burns and uncle to Tony, Christine and Mark (dec).

Our sincere condolences to Lexie and family.

We hope they have a warm one up there in the shed for you "Pal"

Rest in Peace

PINNER
Christopher

Brother-in-law of Rance and uncle of Lisa, Tina and Rodney.

Sincere condolences to Lexie and family.

Sleep peacefully. God Bless.

Funeral Notices

PINNER
(Chris)
Christopher

Family and friends of Mr Christopher Pinner, are warmly invited to attend his funeral service to be held at, **Mersey Gardens Chapel and Crematorium,** 20-24 Stony Rise Road, Devonport on MONDAY, 4th September, 2023 at 1:30 p.m.
For those unable to attend, we encourage you to use our livestreaming service available at, pinegrovefunerals .com.au

Pinegrove Funerals 6423 4000

Livestock

Ulverstone Pet Food
Stock wanted, suitable for pet food. 6425 5822 or 0408 141 972 (AH).

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Pet Death and Tributes notices now available in Classifieds
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SHOP ONLINE FOR LESS
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Appendix H.16 King Island Courier Notice of Community Meeting

King Island Courier

Thursday, September 14, 2023

Page - 11

Farm safety journey success

A FOUNDER of the Safe Farming Program Phillip John is leaving the organisation on September 21.

Mr John is well known to King Island farmers and regularly visited the island with his Safe Farming Program partner Stu Beams.

The Safe Farming Tasmania program is a joint initiative of WorkSafe Tasmania and the Department of Natural Resources and Environment. The Program is supported by an industry-led stakeholder reference group including Primary Employers Tasmania and has gained national and international attention.

Mr John grew up in the North West rural community of South Riana; he worked practically for many years in both the rural and forestry sectors prior to moving into Health and Safety and was known to King Islanders prior to the establishment of the Safe Farming program in due to his Work Health and Safety inspections and training workshops.

"Looking back on my journey with Safe Farming, I vividly recall the moment when our former agriculture minister Jeremy Rockliff, approached me at Agfest in May 2015.

"He challenged us to transform the culture of the agricultural sector - to shift it from one where farm safety had long been sidelined, deemed too difficult to tackle, to one where safety is not only acknowledged but embraced.

"We embarked on this journey together, and I firmly believe that thanks to our incredible supporters, acceptance and trust in Safe Farming, we have undoubtedly achieved the latter.

"Now, as we enter the eighth year of a program that was initially planned for three, I am confident that farm safety has become a serious and integral part of most farmers' daily routines.

"It is heartening to see that getting farm safety right is no longer a pipe dream but a recognized and attainable goal, particularly when leveraging the measured and professional assistance and guidance that Safe Farming provides. This positive momentum will undoubtedly persist.

"In collaboration with all of you, I believe we've created something truly special and unique. We have had a lasting and positive impact on farmers and farming communities across our state, including King, Flinders, and Cape Barron Islands. Moreover, our influence extends beyond our borders, as we inspire and educate colleagues from both interstate and overseas. Most significantly, Safe Farming is now a name trusted and respected by the majority of our farmers and farming communities.

"I want to express my heartfelt gratitude for the support, dedication, and unwavering commitment each of you has shown to Safe Farming. It has been an honour and a privilege to work alongside such a remarkable group of individuals. While my journey with Safe Farming may be coming to a close, I am confident that the legacy we've built together will endure and continue to make a positive impact on farm safety," Mr John said.

Dairy farmer Kelly Lancaster with Safe Farming advisor Phil John at Pegarah

PUBLIC NOTICE

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Community Information Meeting

To continue meeting natural gas demand from homes, business and industry, Beach Energy has commenced planning and consultation for the Offshore Gas Victoria (OGV) Project.

The community meeting will enable the local community to learn more about the OGV Project which is considering a range of activity in Commonwealth waters across several phases. These include seabed assessments (non-seismic), drilling and connecting new wells, and removing suspended wells.

We are committed to working with our local communities, ensuring people are informed of our projects and can provide feedback. Stakeholder consultation is an important part of our planning as it helps identify any local concerns and ensures management of potential impacts.

Our technical staff will be available from 4 pm for anyone wishing to drop in to ask questions about our projects, or to provide feedback.

Thursday 21 September, 2023 6.00 PM to 7.30 PM
Currie Town Hall, 10 George Street, Currie, King Island 7256

We welcome your questions, please contact:

P 1800 797 011

E community@beachenergy.com.au

For further project information use the QR code or visit beachenergy.com.au/ogv/

READ MORE

King Island Courier
A Beacon for the Community

CLASSIFIEDS

Appendix H.17 The Beacon newsletter notice of community session

PUBLIC NOTICE

beach

Community Information Sessions

To continue meeting natural gas demand from homes, business and industry, Beach Energy has commenced planning and consultation for the Offshore Gas Victoria (OGV) Project.

The drop-in session will enable the local community to learn more about upcoming Beach projects:

- The OGV Project which is considering a range of activity in Commonwealth waters across several phases. These include seabed assessments (non-seismic), drilling and connecting new wells, and removing suspended wells.
- The Calico Survey (3D transitional zone seismic survey) which will be conducted between Nirranda South to the west and approximately 6km east of Port Campbell, out to 3 nautical miles offshore and approximately 4km inland.

We are committed to working with our local communities, ensuring people are informed of our projects and can provide feedback. Stakeholder consultation is an important part of our planning as it helps identify any local concerns and ensures management of potential impacts.

Please drop in any time at one of our information sessions below if you would like to ask our technical staff questions about our projects, or to provide feedback.

Monday 24 July, 2023 2.00 PM to 7.00 PM
Port Campbell Surf Life Saving Club,
1 Cairns Street, Port Campbell

We welcome your questions, please contact:

P 1800 797 011
E community@beachenergy.com.au
beachenergy.com.au/ogv/

READ MORE

Gb23 0146

Appendix H.18 Webinar Presentation 17 October 23

Offshore Gas Victoria Project

Seabed Assessment Information Webinar

17 OCTOBER 2023

beach

OFFSHORE GAS VICTORIA – SEABED ASSESMENT

INFORMATION WEBINAR : AGENDA

Welcome and Introductions	• **Sharon Donovan** Senior Community Relations Manager (Vic)	
Offshore Gas Victoria - Project overview	• **Neale Scott** Community Relations Adviser - Offshore (Vic)	Presentation
Seabed Assessment activities	• **Zac Paparella** Geoscientist	Presentation
Emergency Planning	• **Phil Wemyss** Lead Health, Safety, Environment & Risk Adviser	Presentation
Speak to our Subject Matter Experts	• **Phil Wemyss** Lead Health, Safety, Environment & Risk Adviser • **Zac Paparella** Geoscientist • **Candice Nayda** First Nations Engagement Manager	Q&A
Close	• **Sharon Donovan** Senior Community Relations Manager (Vic)	

OFFSHORE GAS VICTORIA – SEABED ASSESMENT

OFFSHORE GAS VICTORIA PROJECT OVERVIEW

Seabed assessment

Assessment of suitable locations for drill rig and new seabed infrastructure to connect wells

Earliest start January 2024

Removal of wells

Removal of five suspended wells through a formal procedure called ‘plug and abandonment’

Earliest start January 2025

Drilling of wells

Up to 11 exploration / appraisal wells

Earliest start Feb 2025

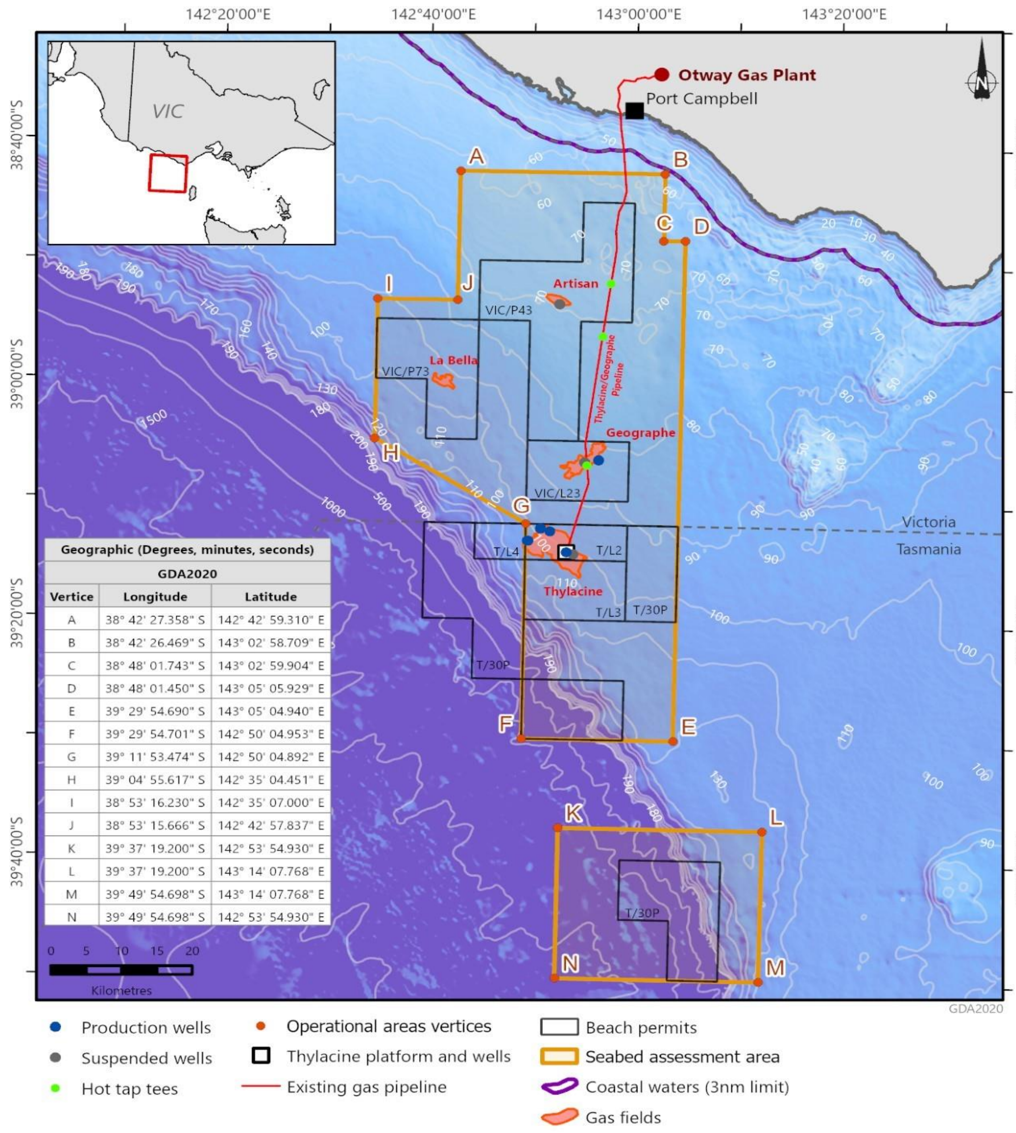
Completing and connecting of wells

Completing successful wells, installing infrastructure, and connecting wells to existing pipelines

Earliest start mid-2025

OFFSHORE GAS VICTORIA – SEABED ASSESMENT

OFFSHORE GAS VICTORIA PROJECT OVERVIEW



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Vertice	Longitude	Latitude
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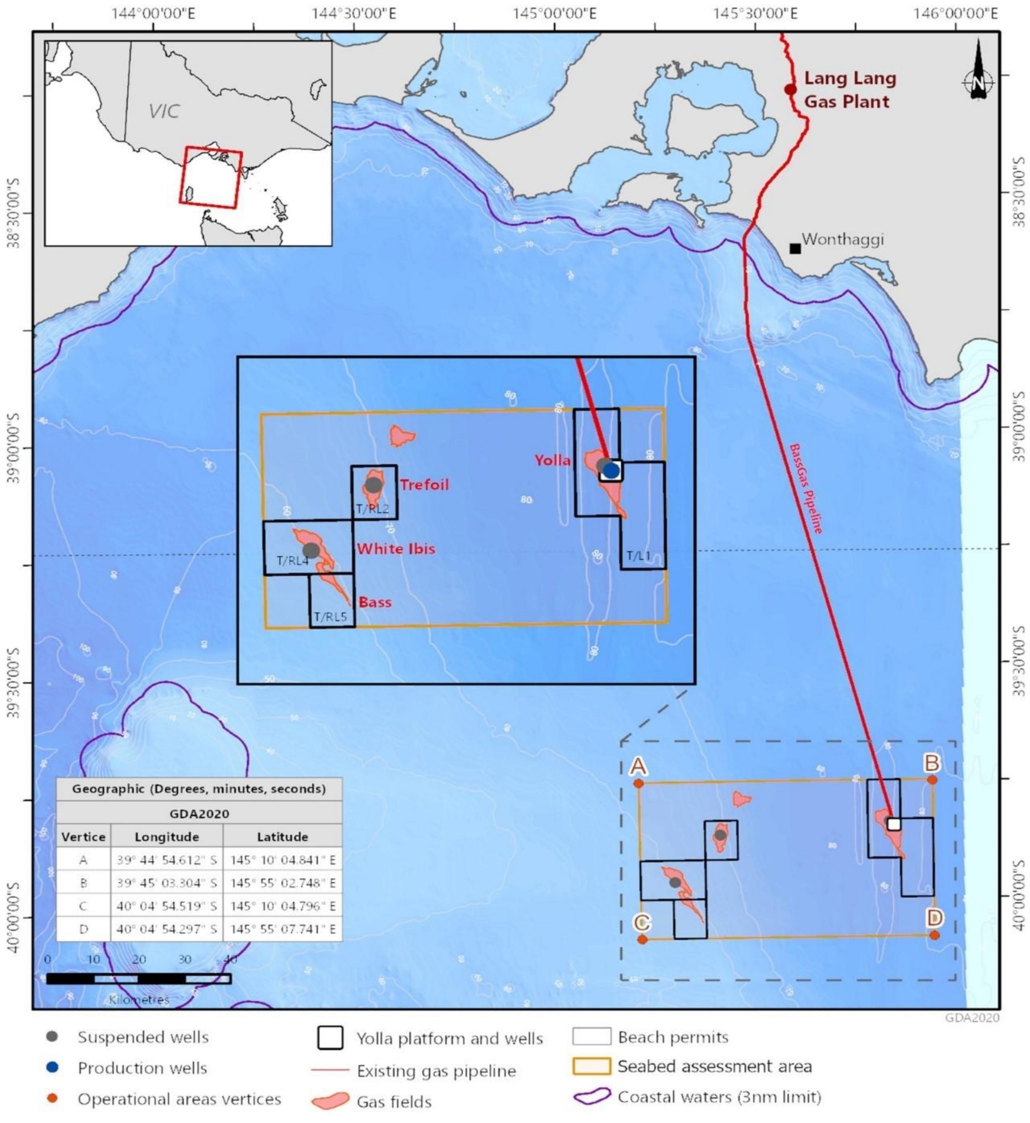
21/08/2023 *The locations on this map are accurate at the time of publication and are subject to change* OT23-0015E



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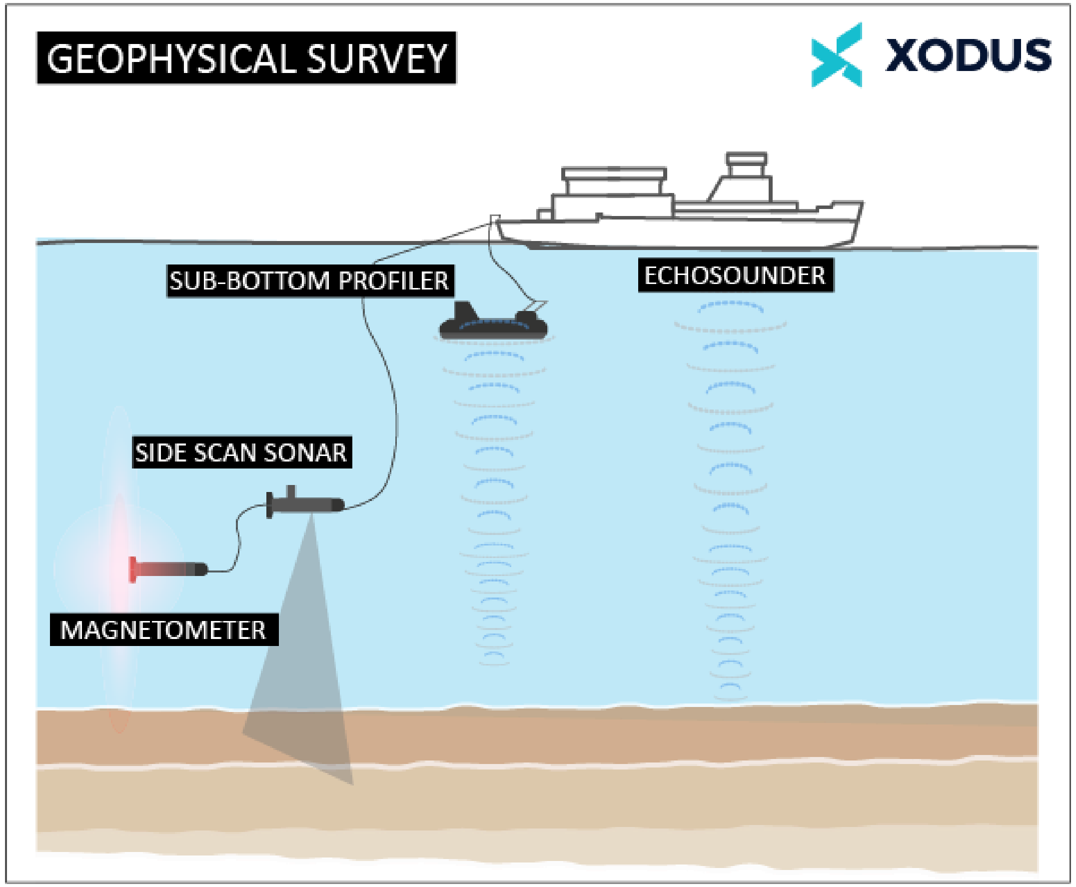
31/05/2023 *The locations on this map are accurate at the time of publication and are subject to change* OT23-0015D

OFFSHORE GAS VICTORIA – SEABED ASSESMENT

SEABED ASSESMENT ACTIVITIES

Geophysical activities and equipment include:

- A vessel, AUV or ROV or combination of all maybe used.
- Multibeam echosounder for bathymetry mapping.
- Side-scan sonar for identifying seabed features.
- Magnetometer to detect metallic objects on or below the seabed.
- Sub-bottom profiler to identify shallow formation structures below seafloor.

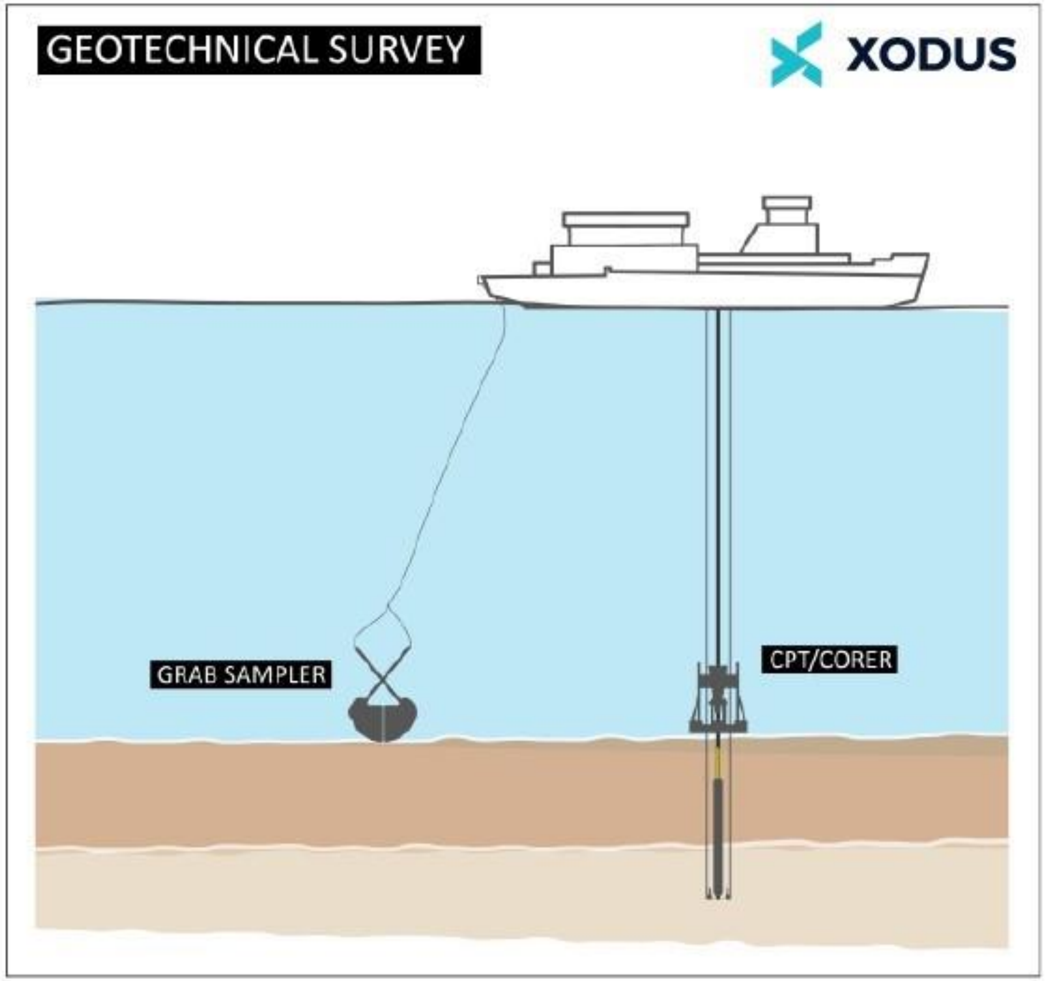


OFFSHORE GAS VICTORIA – SEABED ASSESMENT

SEABED ASSESMENT ACTIVITIES

The geotechnical activities will be undertaken by a vessel with specialised equipment to carry out the following activities:

- Determining soil strength and delineating soil stratigraphy using Piezo Cone Penetration Test (PCPT) to a maximum of 30m depth.
- Collecting core samples to a depth of 6m for geological analysis.
- Collecting small samples of surface sediments from the seafloor.
- Using drop and tow cameras to visually observe the physical and biological environment.



OFFSHORE GAS VICTORIA – SEABED ASSESMENT

SEABED ASSESMENT ACTIVITIES – Emergency Planning

Beach must have an accepted Emergency Response Plan prior to the activity taking place.

- Highly skilled teams based in Melbourne and Adelaide on 24/7 rosters;
- Supported by international experts based in Geelong (Australian Maritime Oil Spill Centre (AMOSC);
- Worst case modelling is undertaken on possible impact areas based on Australia Maritime Safety Authority (AMSA) guidance;
- Access to aerial and marine support with ground crews being available to mobilise in a short time period;
- Tactical response plans for specific areas pre-designed to ensure fast and specific response

OFFSHORE GAS VICTORIA – SEABED ASSESMENT

SPEAK WITH OUR SUBJECT MATTER EXPERTS

Phil Wemyss
Lead Health, Safety, Environment and Risk Adviser

Zacc Paparella
Geoscientist

Candice Nayda
First Nations Engagement Manager

OFFSHORE GAS VICTORIA – SEABED ASSESMENT

INFORMATION WEBINAR : CLOSE

Feedback received through consultation will be used to inform Environment Plans for the industry regulator, NOPSEMA.

Consultation and feedback with anyone whose functions, interests or activities may be affected by the project activities is an important part of developing these Environment Plans.

Beach will consider all feedback, including any concerns or objections and will explore measures to reduce any impacts and risks.

ENGAGE WITH US

Community Relations Team (Vic)

Contact: Neale Scott, Community Relations Adviser (Offshore)
T: 1800 797 011
E: community@beachenergy.com.au
Engage with us: Offshore Gas Victoria Project - Seabed assessment consultation

Beach Energy Limited

80 Flinders Street
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Community Relations Team (Vic)

Neale Scott
Community Relations Adviser (Offshore)
T: 1800 797011
E: community@beachenergy.com.au
Engage with us:
Offshore Gas Victoria Project - Seabed assessment consultation

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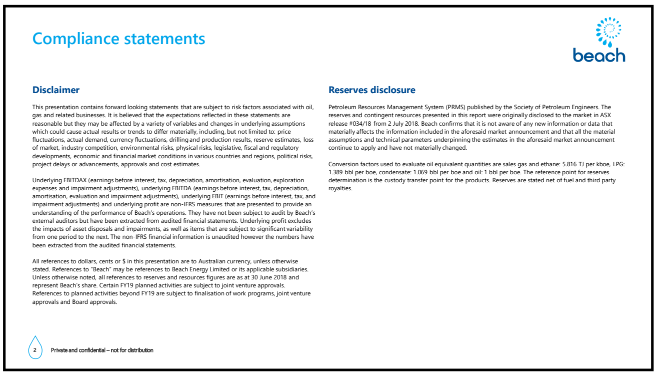
Appendix H.19 King Island Council Meeting 17 August 23

17 AUGUST 2023

Offshore Gas Victoria (OGV) Project

King Island Council

beach



Compliance statements

Disclaimer

This presentation contains forward looking statements that are subject to risk factors associated with oil, gas and related businesses. It is believed that the expectations reflected in these statements are reasonable but they may be affected by a variety of variables and changes in underlying assumptions which could cause actual results or trends to differ materially, including, but not limited to: price fluctuations, actual demand, currency fluctuations, drilling and production results, reserve estimates, loss of market, industry competition, environmental risks, physical risks, legislative, fiscal and regulatory developments, economic and financial market conditions in various countries and regions, political risks, project delays or advancements, approvals and cost estimates.

Underlying EBITDAX (earnings before interest, tax, depreciation, amortisation, evaluation, exploration expenses and impairment adjustments), underlying EBITDA (earnings before interest, tax, depreciation, amortisation, evaluation and impairment adjustments), underlying EBIT (earnings before interest, tax, and impairment adjustments) and underlying profit are non-IFRS measures that are presented to provide an understanding of the performance of Beach's operations. They have not been subject to audit by Beach's external auditors but have been extracted from audited financial statements. Underlying profit excludes the impacts of asset disposals and impairments, as well as items that are subject to significant variability from one period to the next. The non-IFRS financial information is unaudited however the numbers have been extracted from the audited financial statements.

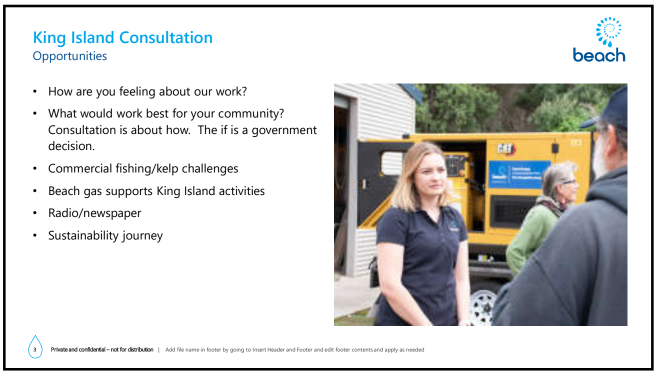
All references to dollars, cents or $ in this presentation are to Australian currency, unless otherwise stated. References to "Beach" may be references to Beach Energy Limited or its applicable subsidiaries. Unless otherwise noted, all references to reserves and resources figures are as at 30 June 2018 and represent Beach's share. Certain FY19 planned activities are subject to joint venture approvals. References to planned activities beyond FY19 are subject to finalisation of work programs, joint venture approvals and Board approvals.

Reserves disclosure

Petroleum Resources Management System (PRMS) published by the Society of Petroleum Engineers. The reserves and contingent resources presented in this report were originally disclosed to the market in ASX release #034/18 from 2 July 2018. Beach confirms that it is not aware of any new information or data that materially affects the information included in the aforesaid market announcement and that all the material assumptions and technical parameters underpinning the estimates in the aforesaid market announcement continue to apply and have not materially changed.

Conversion factors used to evaluate oil equivalent quantities are sales gas and ethane: 5.816 TJ per kboe, LPG: 1.389 bbl per boe, condensate: 1.069 bbl per boe and oil: 1 bbl per boe. The reference point for reserves determination is the custody transfer point for the products. Reserves are stated net of fuel and third party royalties.

2 Private and confidential – not for distribution

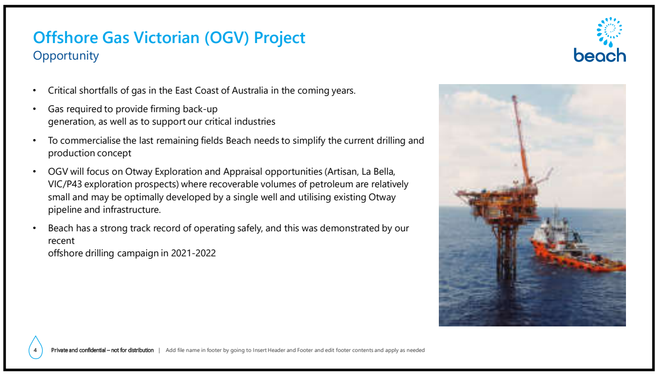


King Island Consultation

Opportunities

- How are you feeling about our work?
- What would work best for your community? Consultation is about how. The if is a government decision.
- Commercial fishing/kelp challenges
- Beach gas supports King Island activities
- Radio/newspaper
- Sustainability journey

3 Private and confidential – not for distribution | Add file name in footer by going to Insert Header and Footer and edit footer contents and apply as needed



Offshore Gas Victorian (OGV) Project

Opportunity

- Critical shortfalls of gas in the East Coast of Australia in the coming years.
- Gas required to provide firming back-up
generation, as well as to support our critical industries
- To commercialise the last remaining fields Beach needs to simplify the current drilling and production concept
- OGV will focus on Otway Exploration and Appraisal opportunities (Artisan, La Bella, VIC/P43 exploration prospects) where recoverable volumes of petroleum are relatively small and may be optimally developed by a single well and utilising existing Otway pipeline and infrastructure.
- Beach has a strong track record of operating safely, and this was demonstrated by our recent
offshore drilling campaign in 2021-2022

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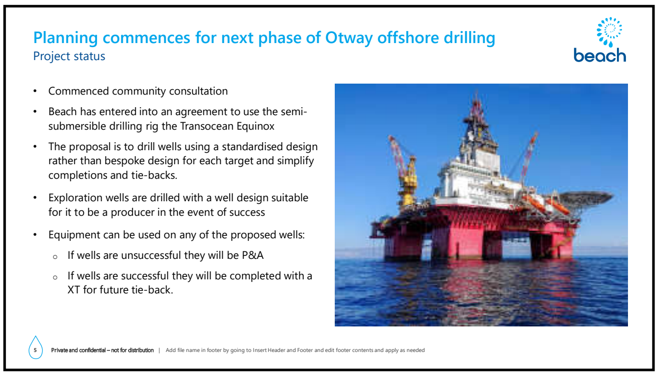

Planning commences for next phase of Otway offshore drilling

Project status

- Commenced community consultation
- Beach has entered into an agreement to use the semi-submersible drilling rig the Transocean Equinox
- The proposal is to drill wells using a standardised design rather than bespoke design for each target and simplify completions and tie-backs.
- Exploration wells are drilled with a well design suitable for it to be a producer in the event of success
- Equipment can be used on any of the proposed wells:
  - If wells are unsuccessful they will be P&A
  - If wells are successful they will be completed with a XT for future tie-back.

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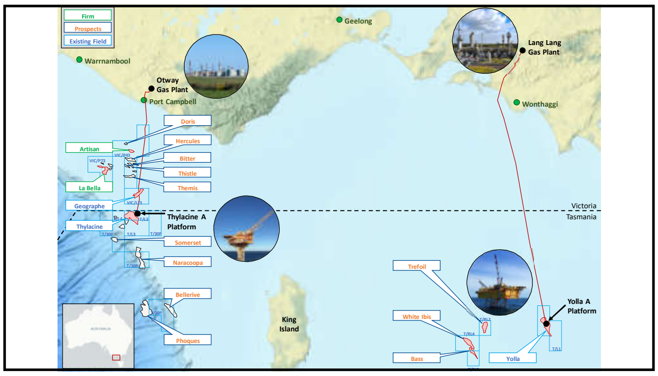
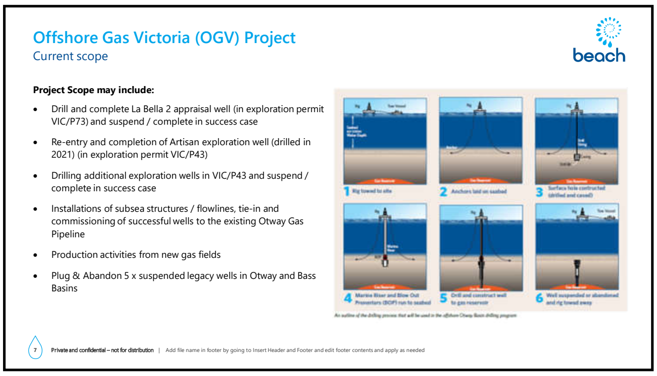




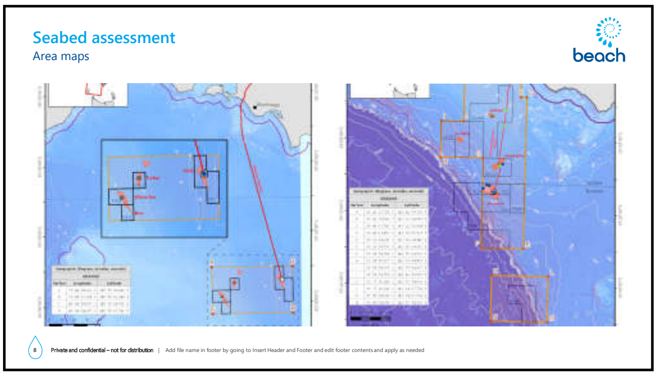
Offshore Gas Victoria (OGV) Project

Current scope

Project Scope may include:

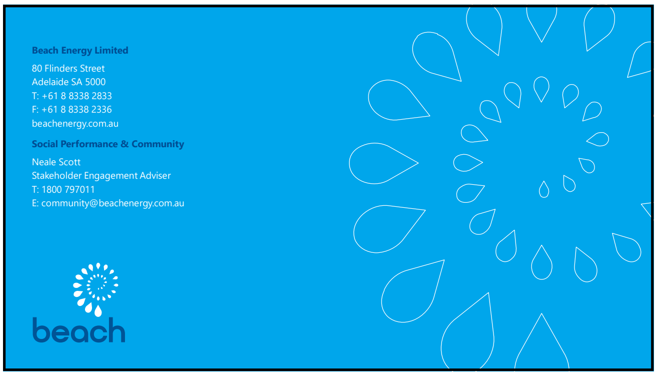
- Drill and complete La Bella 2 appraisal well (in exploration permit VIC/P73) and suspend / complete in success case
- Re-entry and completion of Artisan exploration well (drilled in 2021) (in exploration permit VIC/P43)
- Drilling additional exploration wells in VIC/P43 and suspend / complete in success case
- Installations of subsea structures / flowlines, tie-in and commissioning of successful wells to the existing Otway Gas Pipeline
- Production activities from new gas fields
- Plug & Abandon 5 x suspended legacy wells in Otway and Bass Basins

An outline of the drilling process that will be used in the offshore Otway Basin drilling program



Seabed assessment

Area maps



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Social Performance & Community
Neale Scott
Stakeholder Engagement Adviser
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E: community@beachenergy.com.au

Appendix H.20 Commercial Fishing Peak Bodies Round Table 31 August 23

Beach Energy Limited | **beachenergy.com.au**
ACN 007 617 969

Beach Energy Offshore Gas Victoria project

Meeting	Commercial Fishing Peak Bodies
Date and time	31 August 2023
Venue	Warrnambool RSL Boardroom / Teams Meeting
Attendees **Seafood Industry Victoria (SIV)**	Matt Wassnig, Chief Executive Officer
Seafood Industry Aust	Natasha Excel, Wildcatch Project and Policy Officer
Tuna Australia	Phil Ravanello, Program Manager
Beach Energy	Phil Wemyss, Lead Environmental Adviser (Vic/NZ) Wayne Mothershaw, Seismic Acquisition and Survey Lead Ming Hwa Lee, Lead Drilling Engineer Sharon Donovan, Senior Community Relations Manager (Vic) Neale Scott, Stakeholder Engagement Adviser (Vic)
Apologies	Simon Boag, SETFIA Christine Kershaw, CFA

Following the announcement that Beach Energy has commenced planning for the Offshore Gas Victoria (OGV) project – in order to continue to our commitment to supply natural gas to the Australian east coast domestic market - Beach Energy scheduled a meeting of relevant commercial fishing peak bodies to provide an overview of the project, broader Beach Energy work in Victoria, and to collaborate on engagement going forward.

Based on feedback already received we also scheduled a broader commercial fishers drop-in to follow (4-7pm) to allow for interaction between yourselves, your members, and Beach Energy. Attendees were able to attend in person or via a Teams meeting.

The commercial fishing sector is a priority for Beach, and we are acutely aware of the time and resource pressures the broader offshore energy industry is putting on the sector. As well as introducing the OGV activities we would like to explore more efficient ways to engage with peak bodies and directly with the fishers themselves. Beach is open to taking feedback and ideas back to the broader gas proponents to explore opportunities to streamline consultation for all.

A copy of the PowerPoint presentation has been attached to this email.

What we heard: The following focus areas were discussed.

General	• Apologies from Simon Boag of SETFIA. • Beach informed the group that Christine Kershaw from the CFA had informed us that they do not have the scope to engage. The CFA emailed "Thank you for trying to do something different to make the consultation process easier. You are the first developer that has acknowledged the extreme consultation burden we are all under".
OGV	• Beach confirmed that the OGV project activities has no seismic. • T30P was highlighted as an area of concern for fishers.
Calico project	• Calico seismic – Beach outlined the project highlighting it was relatively small compared to other surveys. Beach explained the plan to use a much-reduced array and that the survey would take place in the evenings to limit interference with abalone fishing. • Beach noted a regulatory commitment to survey the block or lose it. • Project offshore element will take two weeks. Beach will ask rock lobster fishers to fish in a different location if possible or negotiate to not fish. • Concerns around cumulative impact were raised. Beach explained this will be assessed by NOPSEMA and addressed in the EP. Beach confirmed that cumulative impact is being impact heavily assessed particularly around whales / migration.
Members Compensation	• Focus on Beach's compensation procedure. Beach explained their process and highlighted that it does consider future claims • Peak bodies asked whether Beach would be prepared to look at a common compensation framework. Beach's position is that their Fair Ocean Access Procedure goes further than other proponents so it is likely they would need to meet our standard. • SIV requested maps of expected displacement areas overlayed by the VFA reporting grid (attached), to make it easier for fishers to gauge potential impacts to their fishing operations. - **Action: Beach compensation policy to be shared post meeting**
Research	• In depth fishing report was commissioned in 2019. Report is currently being revisited and is expected in mid-October. • Peak bodies flagged there are unknown long-term impacts – research priorities around impact of seismic towards ecosystem and commercial species.
Communications	• SIV requested that all announcements regarding planned activity that could pose a safety risk to vessels or recommendations for mariners to avoid/vacate an area be channelled through AMSA or the appropriate authority. • Peak bodies raised the idea of a formal council to assess compensation • Future activities [changes to historical data] • SIA asked how the information was shared as they had learned more in this meeting than they have read before. • SIV suggested project briefing sheets that pull out the key points for their audience. Potentially covering a snapshot of all current work. • Communicate as early as possible

	• Maps of layering would be helpful
Future Engagement	• Online consultation platform – well received but peak bodies cautioned about expecting individual fishers to use the tech. • SIV said they were close to sharing an engagement/service policy • SIA said engagement should be channelled towards fisheries peak bodies potentially via a central hub • Fishers see the peak bodies as a trusted entity • What does engagement look like in the future – offering multiple opportunities for participation, collaborative engagement with other proponent such as a roadshow, useful maps with overlay of cells, sharing future plans. • Test new fishing data report with peak bodies • Feedback was positive on the peak bodies meeting. Agreed an on-going catch up on an as needs basis would be ideal.

Next steps:

Beach Energy will continue to engage with Peak Bodies and regularly check-in to assess the appropriateness of our material.

Beach Energy will continue to use a peak body meeting as and when required by Beach or the peak bodies.

Appendix H.21 King Island Community Meeting 21 September 2023

21 SEPTEMBER 2023

Offshore Gas Victoria (OGV) Project

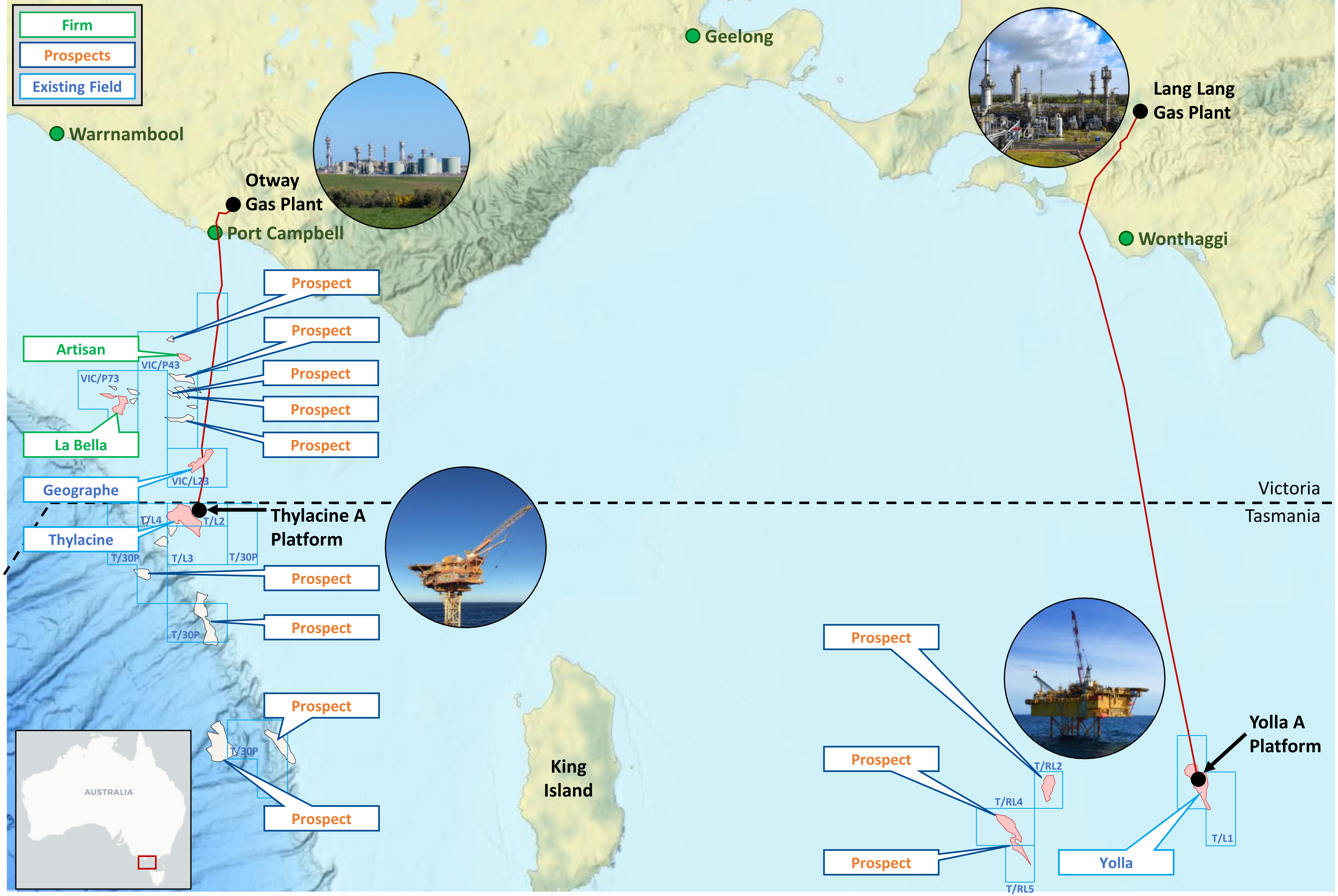
King Island Community

beach

Offshore Gas Victorian (OGV) Project

Opportunity

- Critical shortfalls of gas in the East Coast of Australia in the coming years
- Gas required to provide firming back-up generation, as well as to support our critical industries (inc. LPG)
- To commercialise the last remaining fields Beach needs to simplify the current drilling and production concept
  - Relatively small volumes
  - Optimally develop single wells and utilise pipeline and platform
- OGV will focus on Otway Exploration and Appraisal opportunities including T-30P permit (60 km west of King Island)
- Beach has a strong track record of operating safely, and this was demonstrated by our recent offshore drilling campaign in 2021-2022


Firm
Prospects
Existing Field
Warrnambool
Geelong
Lang Lang
Gas Plant
Otway
Gas Plant
Port Campbell
Wonthaggi
Prospect
Prospect
Artisan
VIC/P43
VIC/P73
Prospect
Prospect
La Bella
Prospect
Geographe
VIC/L23
Victoria
Tasmania
Thylacine A
Platform
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Thylacine
T/30P
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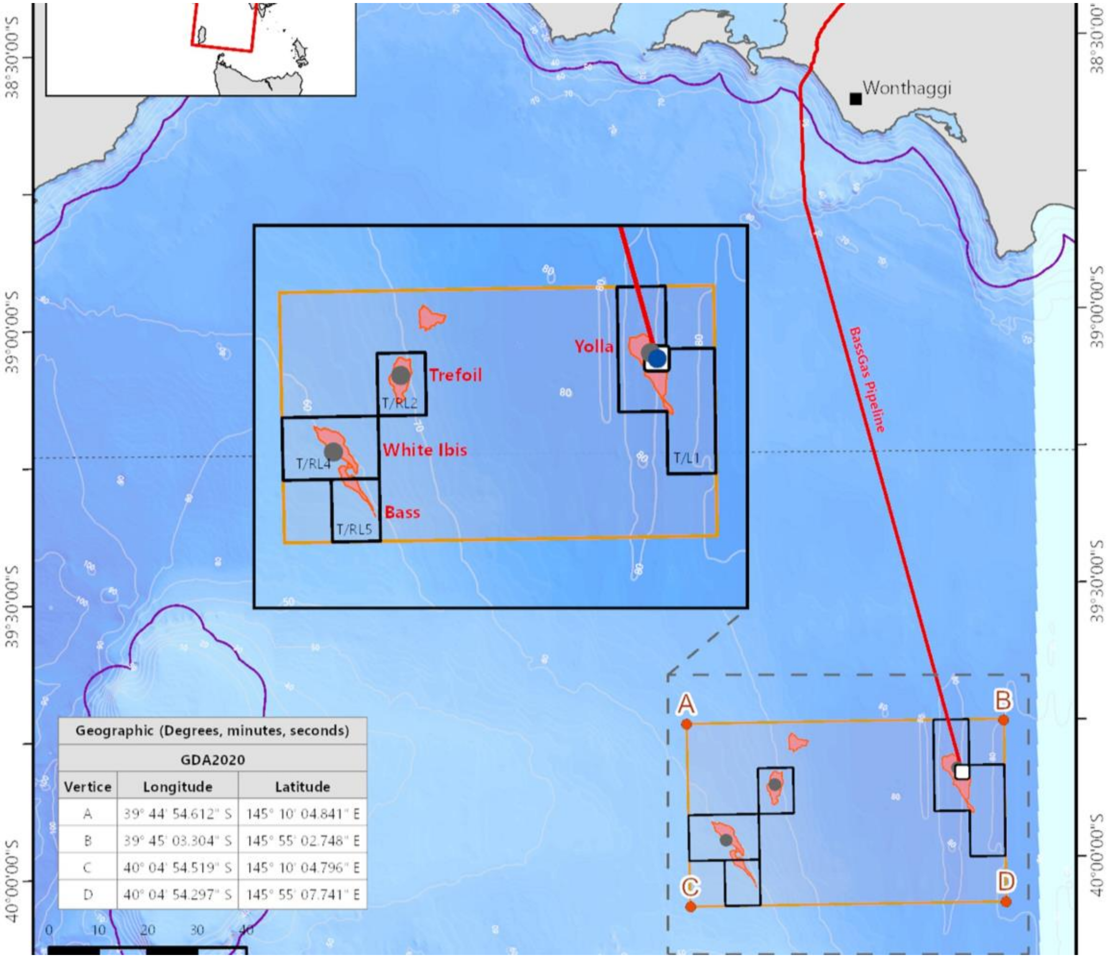
King
Island
AUSTRALIA
Prospect
Prospect
T/RL2
T/RL4
Prospect
T/RL5
Yolla A
Platform
T/L1
Yolla

Seabed assessment

Area maps



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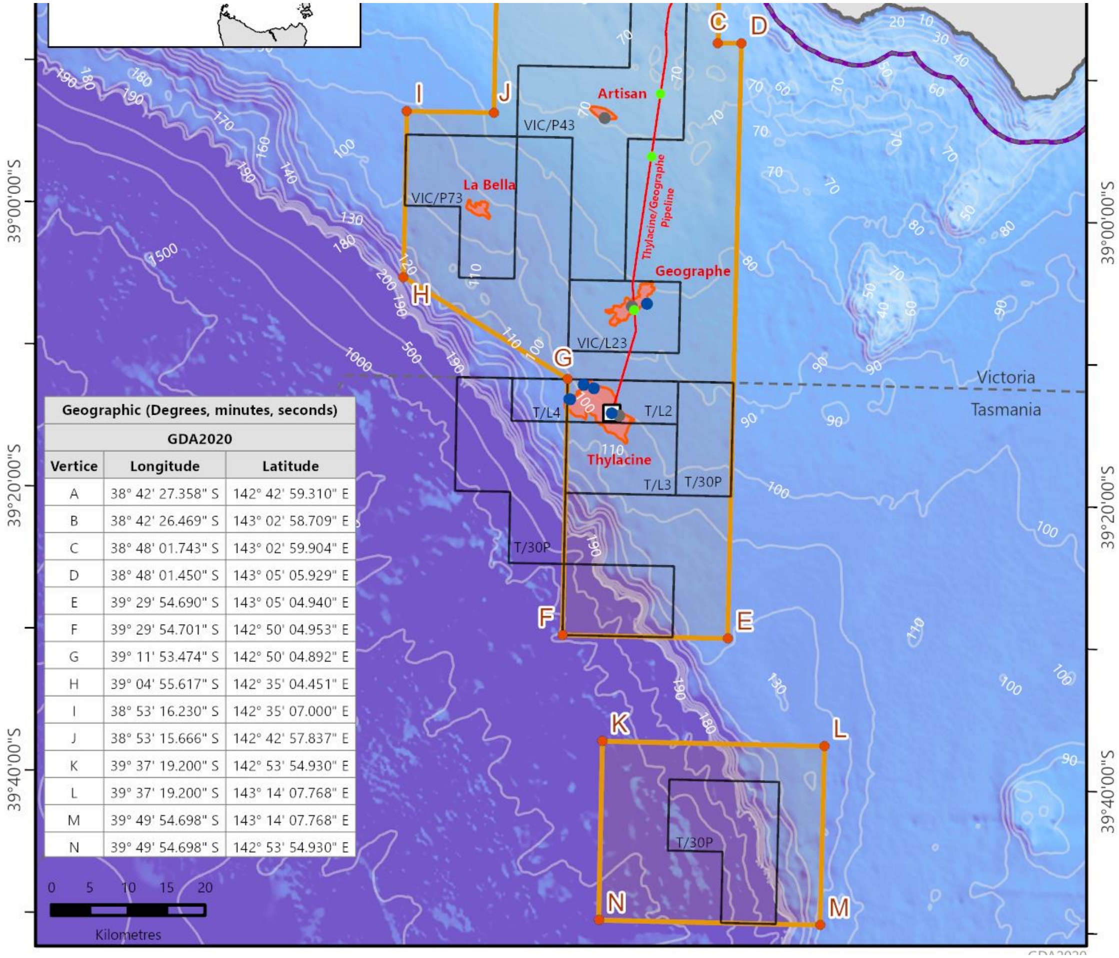

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M	39° 49' 54.698" S	143° 14' 07.768" E
N	39° 49' 54.698" S	142° 53' 54.930" E

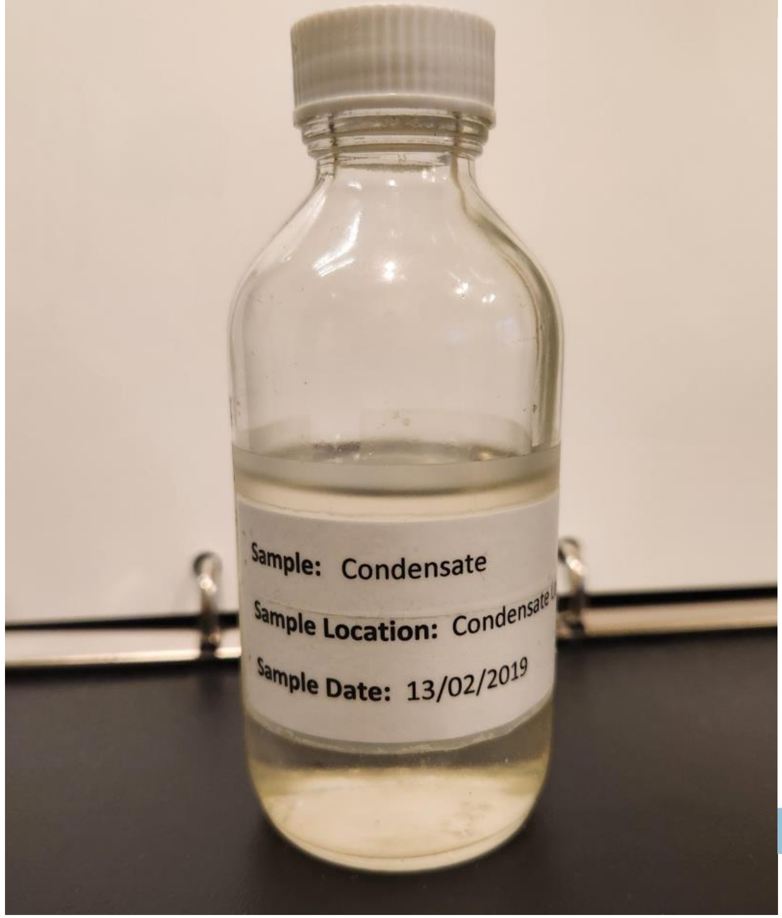
OGV Consultation

What's happening currently?

- Assessing fishing activity history
- Impacts to navigation
- Fishing gear assessment
- Community consultation sessions underway to prepare Environment Plans
    - Seabed assessment activity EP first
- Offshore Project Proposal submitted to NOPSEMA (public consultation)

Environmental Response Plan

What happens if there is a loss of well control and condensate release?



[Australian Marine Oil Spill Centre (amosc.com.au)](https://amosc.com.au)

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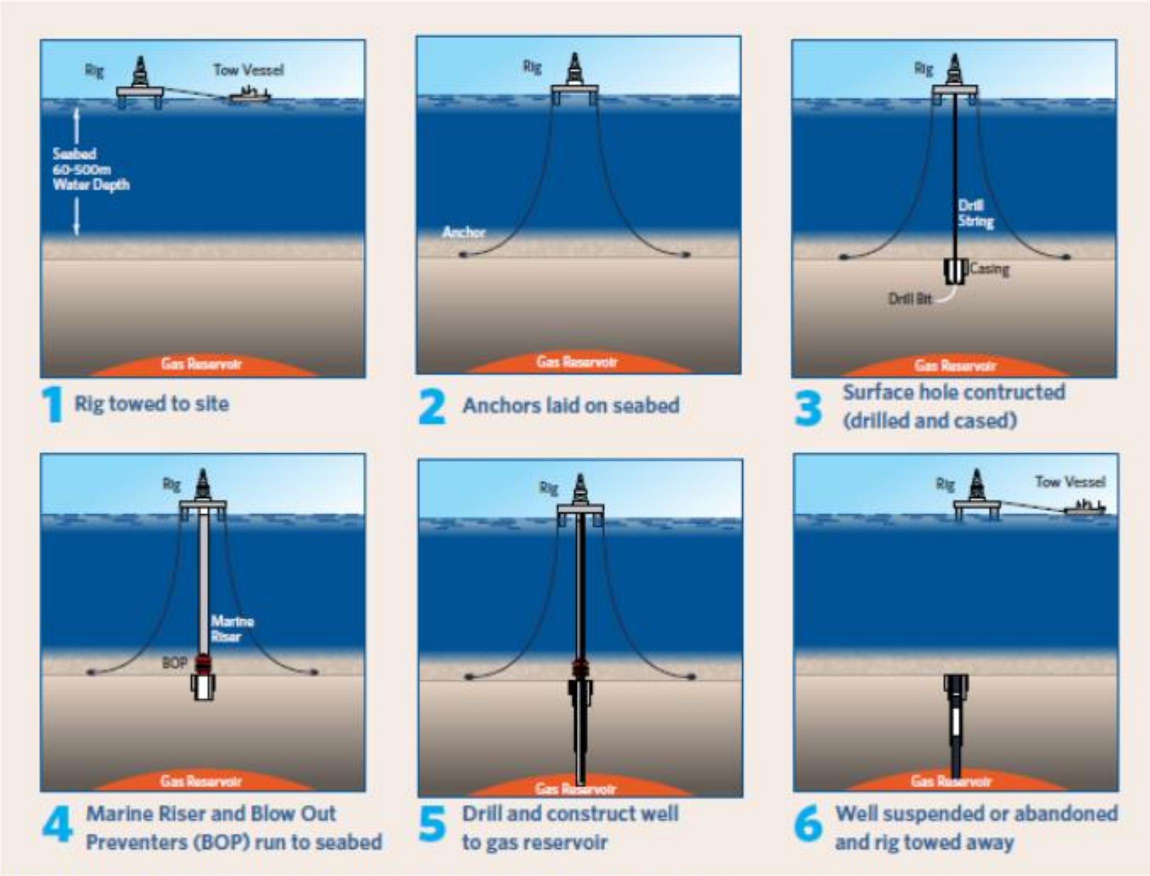
Offshore Gas Victoria (OGV) Project

Current scope

Project Scope may include:

- Drill and complete La Bella 2 appraisal well (in exploration permit VIC/P73) and suspend / complete in success case
- Re-entry and completion of Artisan exploration well (drilled in 2021) (in exploration permit VIC/P43)
- Drilling additional exploration wells in VIC/P43 and suspend / complete in success case
- Installations of subsea structures / flowlines, tie-in and commissioning of successful wells to the existing Otway Gas Pipeline
- Production activities from new gas fields
- Plug & Abandon 5 x suspended legacy wells in Otway and Bass Basins



An outline of the drilling process that will be used in the offshore Otway Basin drilling program

Planning commences for next phase of Otway offshore drilling

Project status

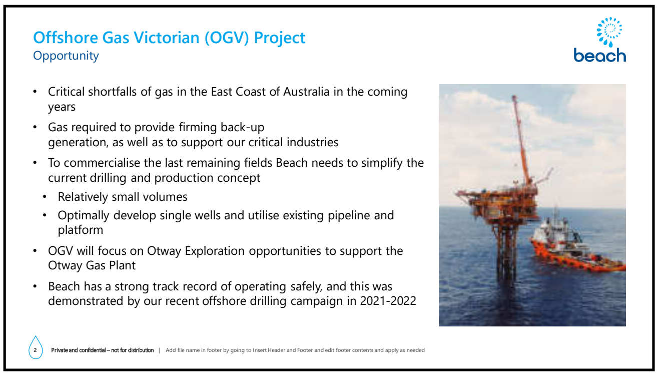
- Commenced community consultation
- Beach has entered into an agreement to use the semi-submersible drilling rig the Transocean Equinox
- The proposal is to drill wells using a standardised design rather than bespoke design for each target and simplify completions and tie-backs.
- Exploration wells are drilled with a well design suitable for it to be a producer in the event of success
- Equipment can be used on any of the proposed wells:
    - If wells are unsuccessful they will be P&A
    - If wells are successful they will be completed with a XT for future tie-back.

Appendix H.22 Moyne Shire Council Meeting 17 October 2023

17 OCTOBER 2023

Offshore Gas Victoria (OGV) Project

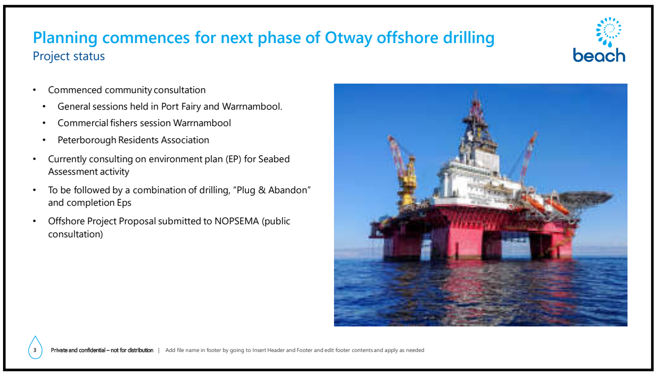
Moyne Shire Council 17 October 2023



Offshore Gas Victorian (OGV) Project

Opportunity

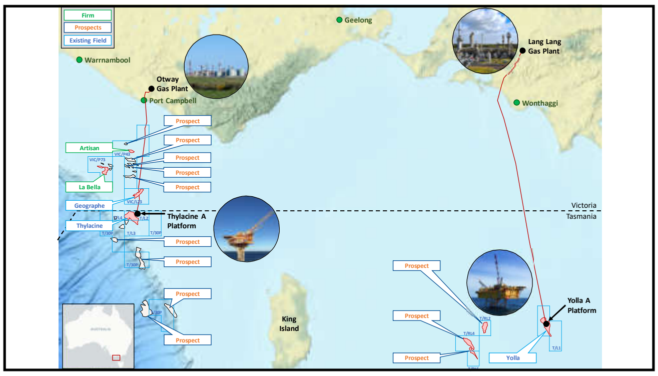
- Critical shortfalls of gas in the East Coast of Australia in the coming years
- Gas required to provide firming back-up generation, as well as to support our critical industries
- To commercialise the last remaining fields Beach needs to simplify the current drilling and production concept
  - Relatively small volumes
  - Optimally develop single wells and utilise existing pipeline and platform
- OGV will focus on Otway Exploration opportunities to support the Otway Gas Plant
- Beach has a strong track record of operating safely, and this was demonstrated by our recent offshore drilling campaign in 2021-2022

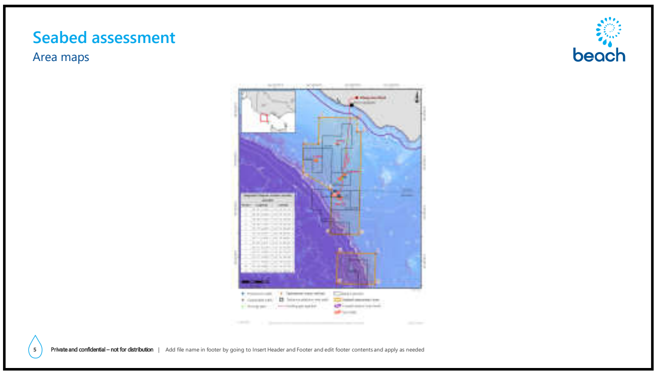


Planning commences for next phase of Otway offshore drilling

Project status

- Commenced community consultation
  - General sessions held in Port Fairy and Warrnambool.
  - Commercial fishers session Warrnambool
  - Peterborough Residents Association
- Currently consulting on environment plan (EP) for Seabed Assessment activity
- To be followed by a combination of drilling, "Plug & Abandon" and completion Eps
- Offshore Project Proposal submitted to NOPSEMA (public consultation)





Seabed assessment

Area maps

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Appendix H.23 Lang Lang Business & Community Group 19 October 2023

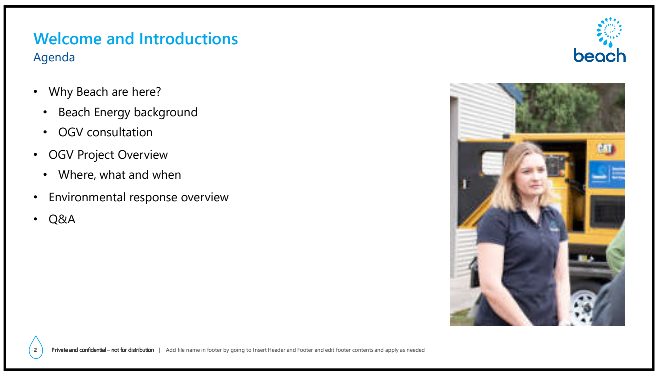
19 OCTOBER 2023

Offshore Gas Victoria (OGV) Project

Lang Lang 19 October 2023

beach

1

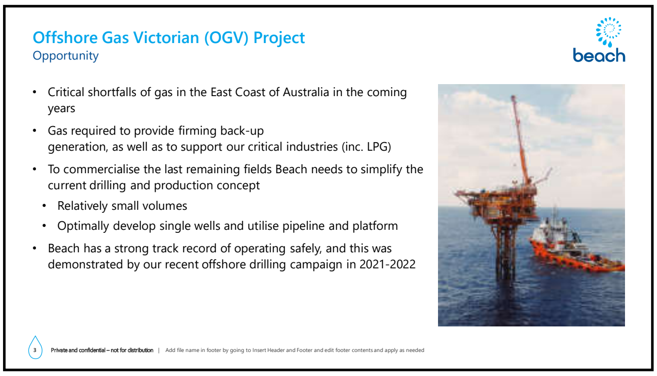


Welcome and Introductions

Agenda

- Why Beach are here?
  - Beach Energy background
  - OGV consultation
- OGV Project Overview
  - Where, what and when
- Environmental response overview
- Q&A

2

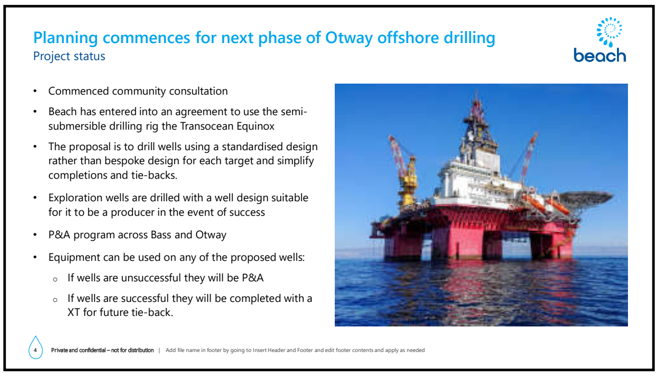


Offshore Gas Victorian (OGV) Project

Opportunity

- Critical shortfalls of gas in the East Coast of Australia in the coming years
- Gas required to provide firming back-up generation, as well as to support our critical industries (inc. LPG)
- To commercialise the last remaining fields Beach needs to simplify the current drilling and production concept
  - Relatively small volumes
  - Optimally develop single wells and utilise pipeline and platform
- Beach has a strong track record of operating safely, and this was demonstrated by our recent offshore drilling campaign in 2021-2022

3

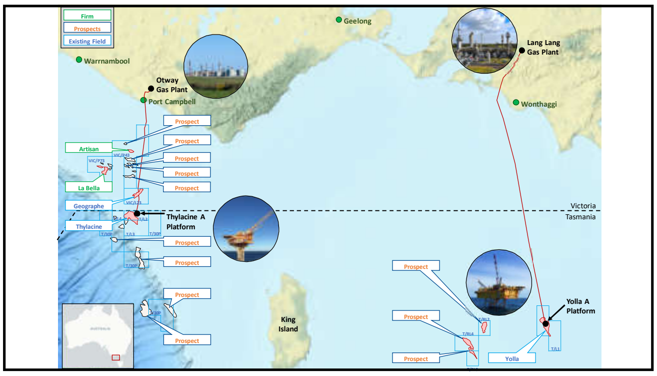


Planning commences for next phase of Otway offshore drilling

Project status

- Commenced community consultation
- Beach has entered into an agreement to use the semi-submersible drilling rig the Transocean Equinox
- The proposal is to drill wells using a standardised design rather than bespoke design for each target and simplify completions and tie-backs.
- Exploration wells are drilled with a well design suitable for it to be a producer in the event of success
- P&A program across Bass and Otway
- Equipment can be used on any of the proposed wells:
  - If wells are unsuccessful they will be P&A
  - If wells are successful they will be completed with a XT for future tie-back.

4



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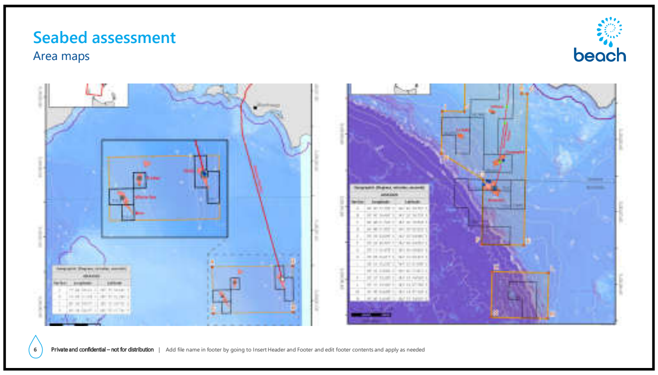
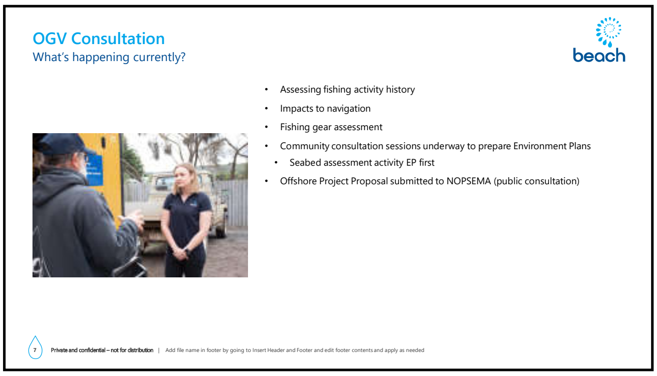


Seabed assessment

Area maps

6

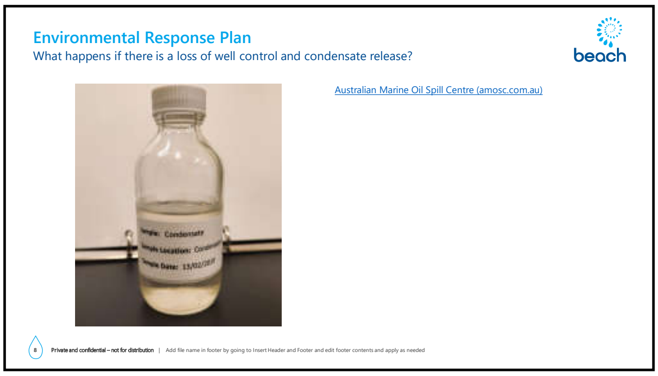


OGV Consultation

What's happening currently?

- Assessing fishing activity history
- Impacts to navigation
- Fishing gear assessment
- Community consultation sessions underway to prepare Environment Plans
  - Seabed assessment activity EP first
- Offshore Project Proposal submitted to NOPSEMA (public consultation)

7 Private and confidential – not for distribution | Add file name in footer by going to Insert Header and Footer and edit footer contents and apply as needed

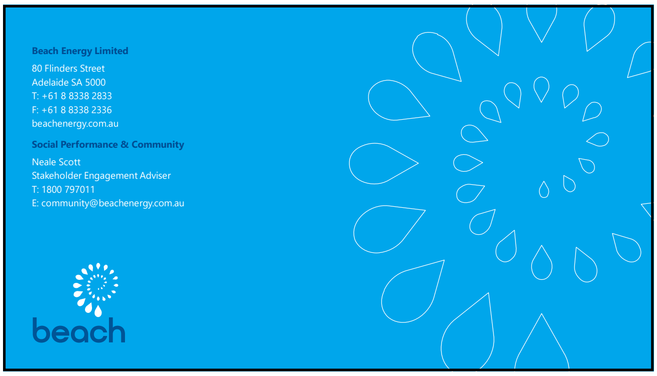


Environmental Response Plan

What happens if there is a loss of well control and condensate release?

[Australian Marine Oil Spill Centre (amosc.com.au)](amosc.com.au)

8 Private and confidential – not for distribution | Add file name in footer by going to Insert Header and Footer and edit footer contents and apply as needed



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Appendix H.24 General Meetings

19 JULY 2023

Offshore Gas Victoria (OGV) Project

Meeting

Offshore Gas Victorian (OGV) Project

Opportunity

- OGV will focus on Otway Exploration and Appraisal opportunities (Artisan, La Bella, VIC/P43 exploration prospects) where recoverable volumes of petroleum are relatively small and may be optimally developed by a single well and utilising existing Otway pipeline and infrastructure.
- To commercialise the last remaining fields Beach needs to simplify the current drilling and production concept.
- The proposal is to drill wells using a standardised design rather than bespoke design for each target and simplify completions and tie-backs.
- Exploration wells are drilled with a well design suitable for it to be a producer in the event of success
- Equipment can be used on any of the proposed wells:
  - If wells are unsuccessful they will be P&A
  - If wells are successful they will be completed with a XT for future tie-back.

Offshore Gas Victoria (OGV) Project

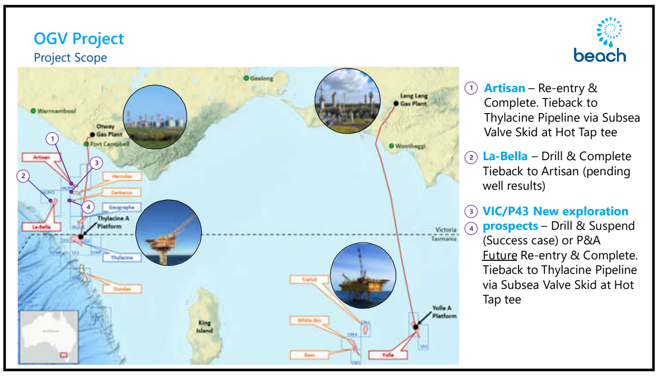
Otway Basin

Project Scope may include:

- Drilling of La Bella 2 appraisal well (in exploration permit VIC/P73) and suspend / complete in success case
- Re-entry and completion of Artisan exploration well (drilled in 2021) (in exploration permit VIC/P43)
- Drilling additional exploration wells in VIC/P43 and suspend / complete in success case
- Installations of subsea structures / flowlines, tie-in and commissioning of successful wells to the existing Otway Gas Pipeline
- Production activities from new gas fields
- Plug & Abandon 5 x suspended legacy wells in Otway and Bass Basins

OGV Project

Project Scope



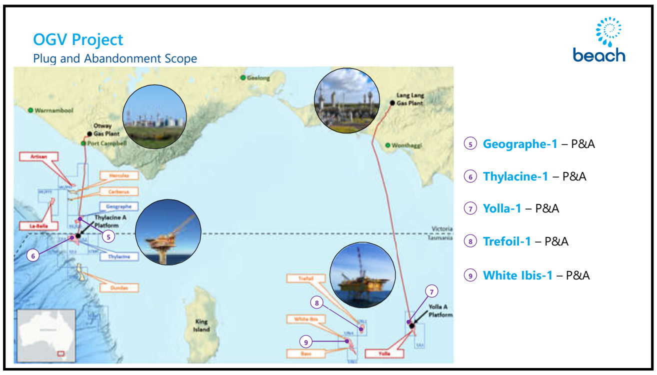
① **Artisan** – Re-entry & Complete. Tieback to Thylacine Pipeline via Subsea Valve Skid at Hot Tap tee

② **La-Bella** – Drill & Complete Tieback to Artisan (pending well results)

③ ④ **VIC/P43 New exploration prospects** – Drill & Suspend (Success case) or P&A Future Re-entry & Complete. Tieback to Thylacine Pipeline via Subsea Valve Skid at Hot Tap tee

OGV Project

Plug and Abandonment Scope



⑤ **Geographe-1** – P&A

⑥ **Thylacine-1** – P&A

⑦ **Yolla-1** – P&A

⑧ **Trefoil-1** – P&A

⑨ **White Ibis-1** – P&A

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Appendix I Consultation Summary Report

Entity ID	Organisation Name	Engagement Status	Summary of Information sent and responses	AssessmentSummary	Assessment of objections or claims, responses,measures adopted
1451	12 Apostles Helicopters & Port Campbell Heliport	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/ seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
1453	3D Oil Ltd	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/ seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
4838	Abalone Council Australia Ltd	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/ seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
1456	Abalone Council Victoria	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/ seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
1457	Abalone Victoria Central Zone	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/ seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
239075474	Aboriginal Land Council of Tasmania	Raised objection or claim	01/06/23 – Email outgoing. Advising that as per previous engagements Beach would continue to provide updates on our offshore activities to RP. Email provided an update on offshore gas Victoria and an invitation to consult with them. OGV information sheet was attached to the email. 05/06/23 – Email outgoing. Provided RP with introduction to First Nations Engagement Manager. Advised of upcoming activities in the Bass and Otway basin, attached information sheet. Requested opportunity to meet and discuss offshore activities and provide an opportunity to raise any questions or concerns. 05/06/23 -Phone call outgoing. No answer left voicemail requesting a call back to discuss offshore activities. 05/06/23 – Phone call outgoing. Spoke to RP. RP confirmed they have been receiving our project updates, however advised they do not have capacity to engage with beach. RP advised it is only him and one other person managing all Aboriginal land and resources in Tasmania and nearby Islands. RP advised e has been meaning to reach out and connect and would like further information on our activities. RP advised of the possibility of a Teams meeting. Beach confirmed we will send further information. 05/06/23 – Email outgoing. Follow up from phone call. Acknowledged that RP has been receiving our project updates and acknowledged they are under resourced. Provided RP with information for upcoming OGV project including the first activity being the seabed assessment (non-seismic) and requested opportunity to meet via Teams. Attached OGV information sheet. Included a	Objection or claim does not have merit	RP has acknowledged receiving Beach Energy activity updates. RP raised concerns about seismic activities in the region, despite Beach advising the activities do not include seismic. RP requested their formal opposition to our activities be included in the EP and have advised that they will not be undertaking any additional engagement with Beach in relation to our offshore activities.

Entity ID	Organisation Name	Engagement Status	Summary of Information sent and responses	AssessmentSummary	Assessment of objections or claims, responses,measures adopted
			description of regulatory requirements for consultation. Requested the opportunity to meet with RP. 06/06/23 – Email incoming. RP responded to email advising they had spoken to colleagues about our activities. RP attached an email provided to a separate proponent outlining that the RP formally opposes seismic in the Bass strait. RP is concerned about climate change and rising sea levels, seismic impacts on zooplankton, mutton birds, and whales, citing a stranding in Tasmania in 2022. RP has declared that as a statutory body for Tasmanian Aboriginal people, they formally oppose Beach activities in the Bass strait, advise that there is nothing to gain from any additional engagement. 14/07/23 - Email outgoing. Sent email providing an update on the OGV project, including Seabed Assessment information sheet, that consultation has commenced, and invitation to attend the upcoming community information sessions in Warrnambool, Port Campbell and Portland. 22/08/23 – Email outgoing. Attached seabed assessment information sheet and extended invitation to attend upcoming community information session in Port Fairy. Provided a link to the Beach Energy OGV project website. 30/08/23 – Email outgoing. Advised RP that we share their opposition in our EP and to NOPSEMA. Acknowledged RP that consultation is important and that we will remain open to consulting with them should they wish. Acknowledged the concern about climate change and advised RP of Beach actions during the transition to renewables. Advised RP that in the emails provided on the 5th and 6th June that our activities do not include seismic, however provided information on seismic impacts on plankton and mutton birds. Advised RP of the regulations in place to avoid impacting whales and their migration routes and again reiterated to RP that our activities do not include seismic. Advised RP of the importance of consultation and we are open to any further conversations.		
155189264	Allfresh Seafood	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
987	ANZT Fishing Company	N/A no responsereceived	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
4194721	Apollo Bay Chamber of Commerce	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
1469	Apollo Bay Dive Centre andSurf n Fish	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
4937	Apollo Bay Fishing and Adventure Tours	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	

Entity ID	Organisation Name	Engagement Status	Summary of Information sent and responses	AssessmentSummary	Assessment of objections or claims, responses,measures adopted
239075338	Apollo Bay Fishing Charters	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
4194724	Apollo Bay Landcare	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
239075339	Apollo Bay Police and Ocean Rescue	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
239075341	Apollo Bay Surf & Kayak	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
239075353	Apollo Bay Surf Life SavingClub	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
239075342	Apollo Bay Visitor Information Centre	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
4194523	Atlantis Fisheries Consulting Group	N/A no responsereceived	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
268435516	AusOcean	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
8388625	Australian Border Force - Maritime Border Command	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
4949	Australian Coastal Society - Victorian Chapter	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet	N/A no responsereceived	

Entity ID	Organisation Name	Engagement Status	Summary of Information sent and responses	AssessmentSummary	Assessment of objections or claims, responses,measures adopted
			11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch		
988	Australian Communicationsand Media Authority	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
268435459	Australian ConservationAlliance	N/A no responsereceived	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
239075467	Australian Conservation Foundation	N/A no responsereceived	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
989	Australian Fisheries Management Authority	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
4953	Australian Marine Conservation Society	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
1477	Australian Maritime Safety Authority - Joint Rescue Coordination Centre	Requested further information	29/5/23 Outgoing email projectintroduction/information sheet 1/6/23 Incoming email requesting whether BeachEnergy anticipates any structures to be installed above the well head. 1/6/23 Outgoing email providing detail on permanent structures which is not related to the seabed survey activity. 3/7/23 Incoming email with standard response requestingAHO are given 4 weeks' notice of activity commencement. 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 16/8/23 Incoming email standard response from AMSA informing us to contact AHO 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 12/9/23 Incoming email with standard response requestingAHO are given 4 wee-s notice of activity commencement. 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no objections orclaims made	Whilst feedback has been received, there were no objections or claims. AMSA reminded Beach that the AHO requires 4-weeks notice prior to commencement of the activity. This has been reflected in Section 5.16 Ongoing Consultation, and in our internal Offshore Notifications Requirements Procedure. Beach provided further detail on permanent structures which are not relevant to the seabed surveys.
4194736	Australian Oceanographic Services Pty Ltd	Requested further information	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 26/9/23 Incoming email requesting a copy of thecompensation procedure and a definition of 'tightgas' quoted in our information sheet. Responses provided 26/9/23 Outgoing email response confirming that by 'tight gas' we are referring to limited gas supply to south-east Australia. Compensation procedures alsoprovided. 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no objections orclaims made	Compensation procedure was provided as requested.

Entity ID	Organisation Name	Engagement Status	Summary of Information sent and responses	AssessmentSummary	Assessment of objections or claims, responses,measures adopted
1471	Australian Petroleum Production and Exploration Association	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
268435474	Australian Recreational Fishing Foundation	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
991	Australian Southern BluefinTuna Industry Association	N/A no responsereceived	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
4194356	Australian Wildcatch Fishing (Corporate Alliance Enterprises)	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
4194546	Aventus Consulting	N/A no responsereceived	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
1349	Bass Coast Shire Council	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 6/6/23 Outgoing email follow-up requesting a meeting 14/7/23 Outgoing email project update/community drop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
268435486	Bass Strait Freight	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/ seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
992	Bass Strait Scallop Industry Association	N/A no responsereceived	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
268435487	Bass Strait Transport	N/A no responsereceived	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
1483	Basslink	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet	N/A no responsereceived	

Entity ID	Organisation Name	Engagement Status	Summary of Information sent and responses	AssessmentSummary	Assessment of objections or claims, responses,measures adopted
			11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch		
239075345	Beach Patrol 3280	Requested further information	29/5/23 Outgoing email projectintroduction/information sheet 9/6/23 Incoming email requesting clarification that thisproject has no seismic. No seismic for OGV confirmedwith stakeholder 9/6/23 Outgoing email explaining Beach is currentlyconsulting on two different projects. OGV is non- seismic, and Calico is. 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no objections orclaims made	No concerns with the seabed survey activity.Interested in Beach's near shore seismic survey.
239075490	Beachport Surf Life SavingClub	N/A no responsereceived	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
1485	Name withheld	N/A no responsereceived	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
268435530	Beyond Gas Network	Requested consultation	9/6 23 Incoming email requesting meeting 9/6/23 Outgoing email offering a meeting and an offerco-design engagement with ENGOs. No further response 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no objections orclaims made	Beach made an offer of a meeting and expressed aninterest in working with the broader ENGOs to establish best practice. Offer to meet not followed upby the stakeholder. Beach continued to provide OGVinformation by email.
1489	Blue Whale Study Inc	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
4194731	Boon Wurrung Foundation	N/A no response received	14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet	N/A no responsereceived	
1492	Name withheld	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
4194603	Name withheld	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
1496	Bunurong Land Council Aboriginal Corporation	Requested consultation	/06/23 – Email outgoing. Advising that as per previous engagements Beach would continue to provide updates on our offshore activities to RP. Email provided an update on offshore gas Victoria and an invitation to consult with them. OGV information sheet was attached to the email. 12/07/23 – Email outgoing.	N/A no objections or claims made	Beach has undertaken extensive consultation with RP, including both in person and online meetings. RP has advised Beach they have no questions or concerns regarding the activities outlined in this EP.

Entity ID	Organisation Name	Engagement Status	Summary of Information sent and responses	AssessmentSummary	Assessment of objections or claims, responses,measures adopted
			17/07/23 – Email outgoing. Sent email providing an update on the OGV project, including Seabed Assessment information sheet, that consultation has commenced, and invitation to attend the upcoming community information sessions in Warrnambool, Port Campbell and Portland. 18/07/23 – Email incoming. Declined invitation to attend community information sessions and advised that a RP we have been consulting with is no longer at RP corporation. 14/08/23 – Email outgoing. Following up on availability to meet to discuss OGV project including seabed assessments. 22/08/23 – Email outgoing. Attached seabed assessment information sheet and extended invitation to attend upcoming community information session in Port Fairy. Provided a link to the Beach Energy OGV project website. 30/08/23 – Email incoming. Email from Cultural values manager requesting an update on any activities on Bunurong country. 30/08/23 – Email outgoing. Responded to RP with a meeting request to discuss offshore activities including seabed assessment, on the 6th September. 30/08/23- Email incoming. RP accepted offer to meet on the 6th September. 04/09/23 – Email outgoing. Emailed Bunurong CEO to request a meeting to discuss OGV Project including seabed assessment. Requested information on the best way to engage Bunurong. Requested project information be provided to their members and broader council. Requested that CEO send the email and information sheets to additional relevant persons that may be interested in or affected by Beach activities including seabed assessment. Attached information sheet for OGV and seabed assessment. 07/09/23 – Meeting in person. Met with RP to discuss offshore activities including seabed assessment, and the consultation that is required under the regulatory framework. No concerns raised about offshore activity including seabed assessment, during meeting. Requested feedback on best way to consult with RP to understand cultural values and sensitivities. RP advised to send a follow up email to which they will respond. 12/09/23 – Email outgoing. Emailed RP thanking them for meeting with us. Requested feedback on the most appropriate person to consult with for our offshore activities including seabed assessment. Requested the RP provide a copy of our emails and information sheets to anyone in the community who may have an interest in our activities. 18/09/23 – Email incoming. RP confirmed that the RP manager was the person to consult with for offshore activities. 22/09/23 – Email outgoing. Emailed to RP acknowledging receipt of their email and requesting the RP manager (as advised) could meet the following week. 03/10/23 – Email incoming. RP requesting a meeting for 19th October. 03/10/23 – Email outgoing. Confirmed with RP that Beach available for meeting on 19th October. 04/10/26 – Email outgoing. Meeting invite for 19th October. Meeting accepted. 11/10/23 –Email outgoing. Advised RP of seabed assessment EP submission date, and that broader consultation for additional offshore activities for the OGV Project will be ongoing. Provided RP information for upcoming Seabed Assessment seabed assessment webinar encouraging them to attend to understand our activities and ask questions. Provided RP the link for our new online consultation hub. Email also included link to broader OGV Project information via the webpage. 11/10/26 – Email incoming. Invitation to attend seabed assessment webinar email acknowledged by RP and advised it has been sent to relevant department. 16/10/26 – Email incoming. RP thanked us for the update and advised they are unable to attend the seabed assessment webinar.		

Entity ID	Organisation Name	Engagement Status	Summary of Information sent and responses	AssessmentSummary	Assessment of objections or claims, responses,measures adopted
			19/10/23 – Meeting online. Met to discuss seabed assessment EP. Outlined reasons for consultation as per the regulations. Discussed broader OGV Project and then discussed the first activity is the seabed assessment which requires the submission of an EP. RP confirmed they did not have any questions or concerns about the seabed assessment activity. Discussed emergency management procedures. The presentation provided at the seabed assessment webinar was provided with the email for RP to share amongst members. RP confirmed to continue to consult through current channels and RP is going to provide the contact details for the comms and media advisor who can share on social media channels. 26/10/23 – Email outgoing. Email to RP following on from meeting. Confirmed the RP did not have any questions or concerns regarding the activities outlined in the seabed assessment EP. Advised we will continue consultation for broader OGV Project activities.		
268435549	Burnie City Council	Acknowledgement of Beach email	6/9/23 Email outgoing with attached seabed assessment infosheet and information about Burnie Community drop-in. 6/9/23 Email inbound acknowledging receipt 11/10/23 Email outgoing Project update, seabed assessment webinar details ,Engage Beach launch	N/A no objections orclaims made	Beach ran a community drop-in in Burnie and invited Council. Zero attendees.
4194404	Burrandies Aboriginal Corporation	N/A no response received	14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet	N/A no responsereceived	
268435540	BW Digital	Requested further information	9/8/23 incoming email requesting meeting tounderstand each other's projects. 9/8/23 Outgoing email setting up meeting. 15/8/23 Online meeting held - both parties presented their projects. Established some interaction nearshorebut not relevant to OGV Project including seabed assessment. 22/8/23 Outgoing email project update 11/10/23 Outgoing email project update/seabed assessment webinar/Engage Beach launch 12/10/23 Incoming email expressing interest inregistering for Seabed assessment webinar	N/A no objections orclaims made	No impact was identified for seabed assessment activities as the BW Digital cable location is outside of the seabed assessment operational areas.
1357	Cardinia Shire Council	Requested further information	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/community drop-in sessions/seabed assessment info sheet 21/8/23 Meeting in-person to around safety management systems. Spoke to Council to offer an OGV update. 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 4/9/23 Incoming email confirming correct contact atcouncil 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no objections orclaims made	Council confirmed the material has been receivedand circulated to relevant contacts.
4194745	Circular Head Aboriginal Corporation	N/A no response received	3/10/23 Outgoing email requesting consultation and explaining our activities. 11/10/23 Outgoing email explaining the seabed assessment activity.	N/A no responsereceived	RP was consulted to request their support in identifying additional relevant persons in our activity area.
239075483	Circular Head Council	Requested further information	6/9/23 Outgoing email Project update and info sheets 12/9/23 Outgoing email contacting Mayor informing ofdrop-in session in Burnie and to offer a session to Circular Head community if required 14/9/23 Incoming email from council contacting acknowledging receipt of information and that they will assess the requirement for a community drop-insession in their area. 11/10/23 Outgoing email Project update/seabed assessment webinar,Engage Beach launch 12/10/23 Incoming email requesting registration forseabed assessment webinar	N/A no objections orclaims made	Council have not taken up the offer of a meeting ordrop-in session. Invited to seabed assessment webinar.
268435522	City of Port Phillip	N/A no responsereceived	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	

Entity ID	Organisation Name	Engagement Status	Summary of Information sent and responses	AssessmentSummary	Assessment of objections or claims, responses,measures adopted
1497	CO2CRC	N/A no responsereceived	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
239075429	Coastal Planning	Requested consultation	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 12/9/23 Incoming email requesting drop-in session inApollo Bay 12/9 23 Outgoing email confirming that a drop-insession will be held in Apollo Bay in the future 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	Not a relevant matter	Beach Energy will run a drop-in session for ApolloBay community for future OGV EPs. Seabed assessment activity will not impact Apollo Bay. Onthe mailing list for the seabed assessment webinar session.
239075407	Colac Otway Shire Council	N/A no responsereceived	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
994	Commonwealth Fisheries Association	Advised do not wantfurther consultation	29/5/23 Outgoing email projectintroduction/information sheet 6/7/23 Outgoing email inviting CFA to a new peakbodies round table meeting 14/7/23 Outgoing email project update/community drop-in sessions/seabed assessment info sheet 14/7/23 Incoming email thanking Beach for setting uppeak bodies round table and acknowledging consultation burden on the fishing sector. CFA informed us they do not have the resources to take part in any consultation. 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no objections orclaims made	Whilst feedback has been received, there were noobjections or claims CFA thanked Beach Energy for trying something different in establishing a peak bodies round table, and also for being "the first developer that has acknowledged the extreme consultation burden weare all under." CFA are unable partake in consultation due to a lackof resources.
1508	ConocoPhillips	N/A no responsereceived	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no objections orclaims made	
1509	Cooper Energy	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
239075452	Coorong Wild Seafood	N/A no responsereceived	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
71303169	Corangamite Catchment Management Authority	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
1038	Corangamite Shire Council	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet	N/A no responsereceived	

Entity ID	Organisation Name	Engagement Status	Summary of Information sent and responses	AssessmentSummary	Assessment of objections or claims, responses,measures adopted
			11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch 17/10/23 Attended seabed assessment webinar		
268435488	CRE Solutions	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
268435492	Currie Cargoes	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
41943052	Dan Tehan MP, FederalMember for Wannon	N/A no responsereceived	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
4194734	Name withheld	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
996	Deakin University - School ofLife and Environmental Sciences	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
1519	Department of Agriculture, Fisheries and Forestry - Biosecurity and Marine Pests	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
239075405	Department of Climate Change, Energy, the Environment and Water -Oceans	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
1520	Department of Defence - Australian Hydrographic Office	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
1521	Department of Defence - Infrastructure Division, Defence Support & ReformGroup	Acknowledgment of Beach email	29/5/23 Outgoing email projectintroduction/information sheet 5/7/23 Incoming email advised that unexploded ordnance (UXO) may be present on and in the sea floor. Beach Energy must, therefore, inform itself as to the risks associated with conducting activities in the area (for example, the detonation of UXO). 13//7/23 Outgoing email confirmation of UXO potential in SDG087 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet	Objection or claim has merit	Beach has mapped the available UXO information from the Department of Defence database in relation to the Operational Areas (Section 7.5.4) and the following controls will be implemented: CM#16: OGV Seabed Survey Scope of Work Geotechnical samples will not be taken within known locations of UXO.

Entity ID	Organisation Name	Engagement Status	Summary of Information sent and responses	AssessmentSummary	Assessment of objections or claims, responses,measures adopted
			22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch		Geotechnical sample locations will be finalised after the geophysical survey data is obtained and interpreted to identify any UXO.
239075362	Department of Energy, Environment and ClimateAction - Marine & Coasts	N/A no responsereceived	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
1527	Department of Energy, Environment and ClimateAction: Earth Resources Regulation	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
4905	Department of Industry,Science and Resources	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
264241159	Department of Infrastructure and Transport - Marine SafetySA	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
239075420	Department of Natural Resources and Environment Tasmania - Biosecurity	N/A no responsereceived	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
4194633	Department of Natural Resources and Environment Tasmania - Conservation	N/A no responsereceived	29/5/23 Outgoing email project introduction/information sheet 14/7/23 Outgoing email project update/community info sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
1529	Department of Natural Resources and Environment Tasmania - Marine/Fisheries (Fishing Tasmania)	N/A no responsereceived	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
268435457	Department of Natural Resources and Environment Tasmania - Strategic Projects and Policy	Acknowledgement ofBeach email	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 21/8/23 Outgoing email requesting confirmation ofEPA Tasmania contact 22/8/23 Incoming email confirming Beach has thecorrect EPA contact 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 22/8/23 Outgoing email offering ameeting/presentation 22/8/23 Incoming email confirming they will ask broader team if a meeting is required. They did notfollow up on our meeting offer. 12/9/23 Incoming email acknowledging receipt ofproject info 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no objections orclaims made	Beach presented on Otway Phase 5 earlier in the year. Offered to do the same for OGV Project which includes the seabed assessment but offer not taken up.

Entity ID	Organisation Name	Engagement Status	Summary of Information sent and responses	AssessmentSummary	Assessment of objections or claims, responses,measures adopted
239075432	Department of Natural Resources and Environment Tasmania - Tasmania Parksand Wildlife Services	Acknowledgement ofBeach email	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch 13/10/23 Incoming email requesting registration forseabed assessment webinar 17/10/23 Attended seabed assessment webinar	N/A no objections orclaims made	
243269638	Department of Premier and Cabinet - Office of Aboriginal Affairs - (Tasmania)	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/community in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
239075500	Department of Primary Industries and Regions South Australia - Commercial Fishing	Acknowledgement ofBeach email	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch 16/10/23 Incoming online feedback - Request to be added to project mailing list. Additional contact addedto Beach database.	N/A no objections orclaims made	
8388638	Department of State Growth - Mineral Resources Tasmania	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
999	Department of Transport and Planning: Marine Pollution	N/A no responsereceived	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
4898	Director of National Parks	Requested further information	29/5/23 Outgoing email projectintroduction/information sheet 27/6/23 Outgoing email project update 14/7/23 Outgoing email project update/community drop-in sessions/seabed assessment info sheet 8/8/23 Outgoing email with relevant information for Director of National Parks attached as per Petroleum Activities and Australian Marine Parks guidance note plus additional shape files as requested. 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 7/9/23 Outgoing email following up feedback andinforming of proposed EP submission date. 14/9/23 Incoming email with DNP requesting extension to feedback on info provided. 14/9/23 Outgoing email agreeing to extension andconfirming planned submission date for Seabed Assessment EP 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch 26/10/23 Outgoing phone call. Spoke with DNP contactwho confirmed Beach have provided all the required information, but DNP haven't assessed yet. 26/10/23 Incoming email from Director of National Parks stating they have no objections or claims to the activity. They note as the activity is partly within Zeehan Australia National Marine Park and best 31/10/23 Outgoing email – Beach acknowledged the DNP response. Beach confirmed that the EP has been updated to reflect notification requirements. Beach confirmed additional controls for low visibility conditions. Beach responded two MMOs is relevant for a seismic survey, and that Beach has committed to an MMO and at least one crew member with experience in whale observation.	N/A no objections orclaims made	DNP confirmed that based on the information Beach provided and proposed mitigations, they do not have any claims and objections. They note Beach are proposing to have one MMO onboard during the activities and that typically for these types of acoustic surveys where there is the potential for interference with cetaceans, it is recommended by the Migratory Species Section within the Department of Climate Change, Energy, the Environment and Water (separate to Marine Parks) that there are two dedicated MMOs onboard and that activities are not undertaken during periods of low visibility. These matters are considerations under Part 3 of the EPBC which under the program/strategic assessment NOPSEMA must consider. They would like notification of activity starts and ends plus notification of any spill. Beach acknowledged DNP response and confirmed that the seabed assessment EP has been updated to include the following: Emergency responses reporting requirements (Section 9.10.1). Activity commencement and cessation notifications (Section 5.16).

Entity ID	Organisation Name	Engagement Status	Summary of Information sent and responses	AssessmentSummary	Assessment of objections or claims, responses,measures adopted
					The only DCCEEW guidance Beach has found in relation to MMOs is for seismic surveys, which the seabed assessment activity does not include. As per CM#19: Marine Fauna Observer, Beach has committed to having a dedicated MMO on the seabed survey vessel with at least one crew member to support the MMO. Both the dedicated MMO and crew member are required to have proven experience in whale observation, distance estimation and reporting which is the training requirement for MMOs from DCCEEW guidance. Additional controls (CM#17 Geophysical Whale Management Procedure and CM#18: Geotechnical Whale Management Procedure), based on those from the DCCEEW guidance, will be implemented such that sampling can commence at night or in low visibility conditions (i.e., when observations cannot be undertaken) if no more than three whales have been seen in the pre-sampling survey zone in the preceding daylight hours. Three whales would be an indication that there is an increased likelihood of a whales being present during the period that observations cannot be undertaken. Though the activity does not include a seismic survey, these controls that align with the DCCEEW guidance, have been applied to ensure interference with cetaceans is managed to an acceptable level.
1903	District Council of Grant	Acknowledgement of Beach email	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch 12/10/23 Incoming email requesting registration toseabed assessment webinar	N/A no objections orclaims made	
1530	Dive Industry Association of Australia	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
268435478	Dolphin Research Institute	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
268435476	East Gippsland Catchment Management Authority	N/A no responsereceived	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
268435479	East Gippsland Shire Council	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	

Entity ID	Organisation Name	Engagement Status	Summary of Information sent and responses	AssessmentSummary	Assessment of objections or claims, responses,measures adopted
268435493	Eastern Line Shipping	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
1533	Eastern Maar Aboriginal Corporation		8/11/22 – On Country visit with cultural landscapes manager and other RP representatives, to learn and understand the cultural values of Sea Country, and to discuss OGV Project including seabed assessments. 18/11/23 – Email outgoing. Email thanking EMAC for the on-country visit. Acknowledged concerns about seismic activities on whale migration routes and discussed regulatory risk mitigation strategies required for managing impact to whales, including timing and marine mammal observers. Acknowledged RP's concern about eel migration routes including the offer to set up subject specific discussions to raise any questions or concerns, RP has not requested additional meetings. Email explained the purpose of consultation under the regulations. 29/05/23 –Advising that as per previous engagements Beach would continue to provide updates on our offshore activities to RP. Email provided an update on OGV Project and an invitation to consult with them. OGV Project information sheet was attached to the email. 14/07/23 – Email outgoing. Provided an update on the OGV Project, links to activity info sheets including seabed assessment, outlined the purpose of consultation is to inform the environmental plan which is to be submitted to the regulator. 22/08/23 – Email outgoing. Provided updated information sheet for seabed assessment. Advised that Beach are currently undertaking consultation for the seabed assessment EP, to be submitted to NOPSEMA. Advised of upcoming community information session in Port fairy. Provided link to OGV Project, including seabed assessment on Beach website. 25/09/23 – Email outgoing. Acknowledged that Beach has been sharing information about broader OGV activities to the Board. Email provided RP with information about OGV, including a description of the first activity seabed assessments (non-seismic). Explained that consultation with First nations group is an important part of developing an environmental plan. Requested an opportunity to meet with RP and members to discuss activity. Requested they share this information with anyone who may be interested. 09/10/23 – SMS outgoing. Requested a meeting to discuss seabed assessment EP. 09/10/23 – SMS incoming. RP advised they were out of office and would respond when they return to office. 11/10/23 – Email outgoing. Sent to multiple RPs within the corporation. Advised RP of seabed assessment EP submission date, and that broader consultation for additional offshore activities in the OGV Project will be ongoing. Provided RP information for upcoming Seabed Assessment seabed assessment webinar encouraging them to attend to understand our activities and ask questions. Provided RP the link for our new online consultation hub. Email also included link to broader OGV information via the webpage.	N/A no response received	Multiple attempts to consult with RP for the seabed assessment EP has been made. Correspondence has been sent to multiple representatives covering Executive, Managers, and cultural heritage roles. Broader consultation with RP has been undertaken by Beach for the development of previous EPs. Arising from those consultations and from publicly available reports Beach has established that the RP is concerned about the impact of offshore activities on marine mammals, eels in relation to seismic activities, and Beach emergency response planning activities. RP has not responded to any concerns relating to activities outlined in the seabed assessment EP. Beach has identified and documented in the seabed assessment EP the cultural values and sensitivities in relation to whale migration route and eels and detailed the emergency response arrangements for a spill risk which from information arising in consultation with this RP, and from publicly available information could impact their functions, interests, or activities.
268435472	Eastern Zone Abalone Industry Association	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
79691781	Name withheld	N/A no responsereceived	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	

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239075480	Environment Protection Authority (EPA) - SouthAustralia	Acknowledgement ofBeach email	29/5/23 Outgoing email projectintroduction/information sheet 11/7/23 Incoming email thanking us for sharing info 14/7/23 Outgoing email project update/community drop-in sessions/seabed assessment info sheet 21/8/23 Incoming email thanking us for info 22/8/23 Outgoing email project update/updated Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch 12/10/23 Incoming email requesting registration forseabed assessment webinar 17/10/23 Attended seabed assessment webinar	N/A no objections orclaims made	
1001	Environment Protection Authority (EPA) Tasmania	N/A no responsereceived	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
1537	Environment Protection Authority (EPA) Victoria	Acknowledgement ofBeach email	29/5/23 Outgoing email projectintroduction/information sheet 11/7/23 Incoming acknowledgement of info 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 16/8/23 Incoming email acknowledgement of info 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch 13/10/23 Incoming email requesting registration forseabed assessment webinar	N/A no objections orclaims made	
4945	Environment Tasmania	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
1536	Environment Victoria	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
1540	Esso	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
268435500	Far Out Fishing Charters	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
4999	Felix Ellis MP, Tasmanian Member for North West, West Coast and King Island	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
239075454	Ferguson Australia	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet	N/A no responsereceived	

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			14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch		
268435547	Fight for the Bight	Requested further information	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 30/8/23 Port Fairy Community drop-in. Beach met with 3 reps from Fight for the Bight and outlined thelocation and details of OGV Project activities, including seabed assessments. They wanted confirmation that our activities were not directly off the Port Fairy Coast and did not have a seismic element. Confirmation provided. Their reps spent time with all of Beach's technical experts (drilling, seabed surveys, environment) and said they had learned a lot.	Not a relevant matter	Beach met with 3 representatives from Fight for the Bight at the Port Fairy drop-in. Beach technical experts spent time with them explaining the details of the location and activities we are proposing, including seabed assessments. No concerns were raised regarding the seabed assessment activity. Fight for the Bight are against further gas exploration in general with a particular focus on no more seismic activity in the area. The seabed assessment does not include seismic. Fight for the Bight requested Beach Energy update one of their Q&A answers on the project info sheet as it could be misleading in their opinion. This is not relevant to the seabed assessment. Beach has drafted some amended words, but the original answer published is technically correct and is informed by the Australian Energy Market Operator Integrated System Plan 2022.
1542	First Nations Legal & Research Services Ltd	Acknowledgement of Beach email	16/06/23 – Phone call outgoing. Phone call to follow up on OGV email. Requested RP return call. 16/06/23 – Phone call incoming. RP acknowledged they received our emails, and they are forwarded onto the legal and research team. RP advised that they are a legal and research organisation and do not have anyone to advise on cultural or Country matters. RP advised they would like to continue to receive project updates, even if no formal response is provided. RP acknowledged Beach's RP identification methodology confirming that we have correctly identified all the relevant First Nations groups. Beach requested that should the RP become aware of any additional First Nations groups who could be considered relevant, RP confirmed they will do this. 17/06/23 – Email outgoing. Beach acknowledged that RP receives our emails, and they are forwarded on as appropriate. Beach acknowledged that RP would like to continue to receive email updates, even if no formal response is given. The email confirmed relevant person identification methodology, and confirmed RP advising that they will continue to keep us informed of any additional RP. 14/07/23 - Email outgoing. Sent email providing an update on the OGV Project, including Seabed Assessment information sheet, that consultation has commenced, and invitation to attend the upcoming community information sessions in Warrnambool, Port Campbell, and Portland. 22/08/23 – Email outgoing. Attached seabed assessment information sheet and extended invitation to attend upcoming community information session in Port Fairy. Provided a link to the Beach Energy OGV project website. 04/10/23 – Email outgoing. Email advising of Beach requirements to identify all RP's and provide an opportunity to consult. Asked RP if they are aware of any other First Nations community groups/individuals, other than those named, who in accordance with Indigenous tradition, may have spiritual and cultural connections to the environment, that may be affected by our offshore activities that have not yet been afforded the opportunity to provide information that may inform the management of the activity		RP is the Native Title Service Provider for Victoria. They were established by the Native Title Act to provide assistance in relation to native title matters. Beach has undertaken extensive consultation with RP over many years and for the development of the seabed assessment EP Beach consulted with them to assist in identifying additional First Nations peoples who in accordance with Indigenous tradition, may have spiritual and cultural connections to the environment, that may be affected by the activity that have not yet been afforded the opportunity to provide information that may inform the management of the activity. RP confirmed that Beach had correctly identified all RPs with connection to the activity area.

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1458	First Peoples - State Relations (Victoria)	Requested consultation	29/05/23 – Email outgoing. Advising that will continue to provide updates on our OGV Project to RP. Email provided an update on offshore gas Victoria and an invitation to consult with them. OGV information sheet was attached to the email. 31/7/23 Online meeting with Heritage Victoria and First Peoples State Relations. Noted that any research should be broader than just looking for artefacts and should consider re-imagining the submerged landscape. They advised to be mindful that some traditional owners do not recognise state boundaries so need to be sensitive to 'intangible' cultural value. Not relevant to seabed assessment but FPSR recommended that a Maritime archaeologist should develop a procedure for the future drilling activities to identify possible cultural landscapes and heritage. 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch 8/09/23 – Email outgoing. Thanked RP for meeting 31st October. Advised RP that Beach will attend the upcoming Underwater Cultural Heritage Conference in Canberra. 12/09/23 – Email outgoing. Email to newly identified RP at the Agency. Provided RP with information on upcoming seabed assessment activity, which forms a part of broader OGV activities. Advised RP of the purpose of consultation, as per regulatory requirements but also to provide RP with opportunity to share questions and concerns. Requested RP share email with any other community members who may be considered relevant. Provided RP with link to OGV web site, advising that seabed assessment information sheets and maps can be accessed there. 15/09/23 – Meeting in person. Met RP at Underwater cultural heritage conference. Discussed Beach Energy's offer to arrange community information sessions with other offshore proponents. 25/09/23 – Email outgoing. Followed up with RP following in person meeting. Thanked RP for supporting Beach engagement methodology and respectful approach to consultation with First Nations groups. Acknowledged feedback provided by RP as to broader offshore information sessions and await their feedback.		RP was consulted, as the state regulatory body, to request their support in identifying additional relevant persons in our activity area. RP has endorsed our RP identification methodology and engagement approach with First Nations groups in the OGV Project area.
4194748	First Peoples Assembly of Victoria		04/10/23 – Email outgoing. Sent email to RP introducing ourselves and providing a description of Beach offshore activities, including seabed assessments, outlining the regulatory requirements for consultation and to seek feedback on Beach RP identification methodology. Asked whether RP is aware of any other First Nations community groups/individuals, other than those formally recognised, who in accordance with Indigenous tradition, may have spiritual and cultural connections to the environment, that may be affected by our offshore activities that have not yet been afforded the opportunity to provide information that may inform the management of the activity. Attached seabed assessment information sheet and NOPSEMA consultation brochure. 11/10/23 – Email outgoing. Advised RP of seabed assessment EP submission date, and that broader consultation for additional offshore activities for the OGV Project will be ongoing. Provided RP information for upcoming Seabed Assessment seabed assessment webinar on the 17th October encouraging them to attend to understand our activities and ask questions. Provided RP the link for our new online consultation hub. Email also included link to broader OGV information via the webpage.		RP is an independent elected body representing the First Nations peoples in Victoria in the path to a Treaty. They are not relevant to the activities outlined in the seabed assessment EP, however Beach have consulted with the RP to assist in identifying any other relevant First Nations community groups/individuals, other than the formally recognised, who in accordance with Indigenous tradition, may have spiritual and cultural connections to the environment, that may be affected by our offshore activities that have not yet been afforded the opportunity to provide information that may inform the management of the activity.
4194528	Fisheries Research and Development Corporation	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	

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1002	Fishwell Consulting	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
268435480	Flinders Council	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
4194614	Flinders Island Aboriginal Association Inc	Acknowledgement of Beach email.	02/06/23 – Email outgoing. Email provided an update on offshore gas Victoria and an invitation to consult with them. OGV information sheet was attached to the email. 14/07/23 - Email outgoing. Sent email providing an update on the OGV project, including Seabed Assessment information sheet, that consultation has commenced, and invitation to attend the upcoming community information sessions in Warrnambool, Port Campbell and Portland. 22/08/23 – Email outgoing. Attached seabed assessment information sheet and extended invitation to attend upcoming community information session in Port Fairy. Provided a link to the Beach Energy OGV project website. 12/09/23 – Email outgoing. Followed up on previous OGV email. Outlined the requirements for consultation in the development of EPs and requested further information on how best to consult with RP. Attached information sheet and provided link to OGV website. 05/10/23 – Phone call outgoing. Advised RP that we have not had any response to emails. RP acknowledged receiving the emails and RP advised us that they had forwarded them onto the most appropriate team when received. RP advised they do not have a sea country or land management team. Asked RP if they know any other organisations that we could engage with for offshore activities. RP advised they would look into it; however, we received no response. 05/10/23 – Email outgoing. Follow up from phone call. Acknowledged that RP has been receiving our emails and forwarded them to relevant departments. Requested RP to advise if there are any other individuals or organisations who in accordance with Indigenous tradition, may have spiritual and cultural connections to the environment, that may be affected by our offshore activities that have not yet been afforded the opportunity to provide information, that may inform the management of the offshore activity. Advised the RP that consultation is an important part of developing an EP. 11/10/23 - Email outgoing. Advised RP of seabed assessment EP submission date, and that broader consultation for additional offshore activities in the OGV Project will be ongoing. Provided RP information for upcoming Seabed Assessment seabed assessment webinar encouraging them to attend to understand our activities and ask questions. Provided RP the link for our new online consultation hub. Email also included link to broader OGV information via the webpage.	N/A no response received	RP has acknowledged Beach emails and confirmed that they are forwarded to the relevant department. No objections or claims have been made.
268435494	Freight Connections	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
268435520	French Island CommunityGroup	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	

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268435489	Fresh Freight Tasmania	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
268435460	Friends of the Earth -Melbourne Chapter	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 1/6/23 Outgoing email answering general questionsaround Beach activities 11/7/23 Outgoing email to ascertain FoE engagementrequirements for OGV. Offered to meet and also suggested engaging with a group of reps across representative ENGOs 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
1545	Frying Nemo Fish and Chips	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
25165828	Gamefishing Association of Australia	Requested consultation	17/12/23 Attended seabed assessment webinar - noted much of Beach's material references commercial fishing directly but not recreational fishing.	N/A no objections orclaims made	
268435495	Game On Charters	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
1546	Name withheld	N/A no responsereceived	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
5004	Gavin Pearce MP, Federal Member for Braddon	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
155189270	Gayle Tierney MLC, Memberfor Western Victoria	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
268435484	Gippsland Ports	N/A no responsereceived	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
201326593	Glenelg Hopkins Catchment Management Authority	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	

Entity ID	Organisation Name	Engagement Status	Summary of Information sent and responses	AssessmentSummary	Assessment of objections or claims, responses,measures adopted
239075484	Glenelg Shire Council	N/A no response received	6/6/23 Outgoing email project introduction/informationsheet 14/7/23 Outgoing email project / request/seabedassessment info sheet 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
4881	Go Surf School	N/A no responsereceived	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
268435498	Gone Fishing Charters	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
1553	Grassroots Deli Cafe	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
1467	Great Ocean Abalone	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
184549378	Great Ocean Road Coast and Parks Authority	N/A no responsereceived	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
1554	Great Ocean Road Regional Tourism	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
1556	Great Ocean Road TouristPark	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
268435521	Greater Geelong Council	Acknowledgement of Beach email	29/5/23 Outgoing email projectintroduction/information sheet 14/6/23 Incoming email acknowledged receipt of info11/7/23 Incoming email Mayor acknowledged receiptof info 14/7/23 Outgoing email project update/communitydrop-in sessions 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no objections orclaims made	
268435461	Greenpeace	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment information sheet 22/8/23 Outgoing email project update/updated	N/A no responsereceived	

Entity ID	Organisation Name	Engagement Status	Summary of Information sent and responses	AssessmentSummary	Assessment of objections or claims, responses,measures adopted
			Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch		
4194613	Gunaikurnai Land and Waters Aboriginal Corporation		30/05/23 - Email outgoing. Advising that as per previous engagements Beach would continue to provide updates on our offshore activities to RP. The email provided an update on offshore gas Victoria and an invitation to consult with them. OGV information sheet was attached to the email 01/06/23 – Email incoming. Acknowledgement of email sent. RP advised of their role and advised they have a busy schedule. 01/06/23 – Email outgoing. Acknowledged RP email. Asked if there is anyone else in the organisation that would be interested in having a discussion. Requested a meeting in June. 14/07/23 - Email outgoing. Sent email providing an update on the OGV project, including Seabed Assessment information sheet, that consultation has commenced, and invitation to attend the upcoming community information sessions in Warrnambool, Port Campbell and Portland. 17/07/23 – Email outgoing. Following up invitation to community information sessions. Advised these are broader community and offered to make one for First Nations specifically. 14/08/23 – Email outgoing. Requested meeting with RP for 6th or 7th September while in Victoria. 14/08/23 – Email incoming. RP advised there is a conference 6th September, requested meeting time of 7th/8th September. 14/08/23 – Email outgoing. Requested time on 7th September to meet. 14/08/23 – Email incoming. RP suggested 10:30 meeting time. 15/08/23 – Phone call outgoing. Discussed upcoming visit to meet RP, RP invited Beach to attend conference to learn about them and their sea country 22/08/23 – Email outgoing. Attached seabed assessment information sheet and extended invitation to attend upcoming community information session in Port Fairy. Provided a link to the Beach Energy OGV project website. 01/09/23 – Phone call outgoing. Confirm details for upcoming meeting. 06/09/23 – Meeting on country. Invited on a boat cruise down Lakes Entrance to learn about Sea Country cultural values. Met RP GM and other members of the RP organisation. 07/09/23 – Meeting in person. Discussed OGV broadly. RP advised they have no concerns about our offshore activities, and their priority is the protection of the Lake system and bushfire management. Discussed emergency responses and the EMBA, RP would like to see sea country rangers equipped to respond to these incidents. RP advised they are receiving large volumes of requests for consultation and because of this they would prefer to receive project updates in form of newsletter/storyboard. RP expressed interest in broader community information session to provide broader community opportunity to learn about our activities. 1509/23 – Email outgoing. Follow up from meeting. Acknowledged the RPs cultural values shared with us. Advised RP that we will adapt our consultation methods based on his feedback. Thanked RP for their time and the opportunity to be on Country and learn about sea country. 11/10/23 - Email outgoing. Advised RP of EP submission date, and that broader consultation for additional offshore activities in the OGV Project will be ongoing. Provided RP information for upcoming Seabed Assessment seabed assessment webinar encouraging them to attend to understand our activities and ask questions. Provided RP the link for our new online consultation hub. Email also included a link to broader OGV information via the webpage.	Not a relevant matter	Beach has undertaken consultation with RP for broader OGV project. Through this consultation, including an on-country meeting, we have learnt about the RP's cultural values and sensitivities. We understand that the RP's functions interests and activities are not affected by the activities.
4194729	Gunditj Mirring Traditional Owners Aboriginal Corporation	Advised other contacts at Organisation.	01/06/23 -Email outgoing. Group email to 4 people. Advising that as per previous engagements Beach would continue to provide updates on our offshore activities to RP. Email provided an update on Offshore Gas Victoria and an invitation to consult with them. OGV information sheet was attached to the email.	N/A no objections or claims made	Multiple attempts to consult with RP for the seabed assessment EP have been made. Correspondence has been sent to multiple representatives covering Executive, Managers and cultural heritage roles. Broader consultation with RP has been undertaken by Beach for previous EPs. Arising from those consultations and from

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			14/07/23 -Email outgoing. Provided an update on the offshore gas Victoria project, outlined the purpose of consultation is to inform the environmental plan which is to be submitted to the regulator. 17/07/23 – Email outgoing. Invitation to attend the upcoming community information sessions in Warrnambool, Port Campbell and Portland that will provide information on Beach's OGV Project and seabed assessments. 14/08/23 –Email outgoing. Advised we will be in Victoria the following week and request an opportunity to meet in person to discuss offshore activities, including the seabed assessment. 17/08/23 – Email outgoing. Requested a meeting on Thursday 7th September for a meeting to discuss offshore activities. 22/08/23 – Email outgoing. Provided updated information sheet for seabed assessment. Advised that Beach are currently undertaking consultation for the seabed assessment EP, to be submitted to NOPSEMA. Advised of upcoming community information session in Port fairy. Provided link to OGV Project on Beach website, which includes information on the seabed assessment. 25/08/23 – Email outgoing. Emailed RP CEO to provide information about OGV, including a description of the first activity seabed assessments (non-seismic). Explained that consultation with First nations group is an important part of developing an environmental plan. Requested an opportunity to meet with RP and members to discuss activity. Requested they share this information with anyone who may be interested. 29/08/23 –Email incoming. CEO emailed to advise Beach that our email and information sheets were sent to RP Board of Directors to review. CEO advised that should there be an appetite to engage further on this project, the CEO will advise us. 31/08/23 –Phone call outgoing. No answer. Left to message advising was following up on previous emails regarding OGV project. Requesting meeting time between 18th – 22nd September. Requested a call back, however received no response. 08/09/23 – Email outgoing. Follow up email regarding OGV. Requesting feedback on how RP would like to be consulted. Requested information on OGV be shared with any other RP with cultural values and connection to Sea Country. 08/09/23 - Email incoming. Advised as an individual, they can't speak for the environmental values of group and requested a community session with all of the gas exploration projects as there are now quite a few, and individual consultation is not feasible. 08/09/23 – Email outgoing. Responded to RPs email outlining the feasibility of individual consultation and offered to support co-ordinating an information session for broader offshore activities. 14/09/23 – Email Incoming. RP has accepted Beach offer to support the facilitation for a community consultation session for broader OGV offshore activities, with other offshore proponents. Suggested a date to discuss further. 04/10/23 – Email outgoing. Follow up email to RP CEO, as to whether there was a response from the Board of Directors to engage further on the sea bed assessments. Clearly indicated the sea bed assessment is not seismic. Outlined the purpose of consultation is a requirement in the development of an EP and is a two-way process. Asked RP if they are aware of any other RP who in accordance with Indigenous values, may have spiritual or cultural connections to the activity area. 11/10/23 –Email outgoing. Advised RP of seabed assessment EP submission date, and that broader consultation for additional offshore activities in the OGV Project will be ongoing. Provided RP information for upcoming Seabed Assessment seabed assessment webinar encouraging them to attend to understand our activities and ask questions. Provided RP the link for our new online consultation hub. Email also included link to broader OGV information via the webpage which includes information on the seabed assessment.		publicly available Government reports, Beach has established that the RP is concerned about the impact of offshore activities on marine mammals, eels and the Budj Bim cultural landscape. Impacts from the seabed survey activities to marine mammals and eels are assessment in Section 8 of the EP. No impacts to the Budj Bim cultural landscape are predicted as it is onshore and outside of the area that maybe affected by seabed survey activities. Beach has consulted with Gunditj Mirring CEO, who acknowledged the receipt of our project emails, and advised that they had forwarded the email onto the Board of directors. Gunditj Mirring CEO confirmed that should there be any appetite for additional consultation they will advise. We have followed up with CEO and have not received any requests for additional consultation or information for seabed assessment. Beach was advised by additional RP at Corporation who advised they were unable to speak for the RPs cultural values and requested a community information session to discuss all the offshore activities. RP has acknowledged that they have received numerous requests for consultation from additional proponents in the area, and advised they are unable to respond individually. Beach advised we can support the facilitation of a community information session with the proponents, however following discussion with First Peoples State Relations (FPSR) they advised that they would take the lead in facilitating a community information session for proponents to discuss broader offshore activities. Beach will work closely with FPSR to support this; however, we have not received any concerns or questions for the seabed assessment EP.

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			18/10/23 – Email incoming. Email from RP requesting to explore our offer to co-ordinate an information session with other proponents in the area, to discuss broader offshore activities with the RP. Suggested a date of 25th October and enquired about funding for the RP community members. 24/10/23 – Email outgoing. Responding to RP email, advised that we are aware they are in discussions with First Peoples State Relations (FPSR) in facilitating a community information session.		
1561	Heritage Victoria	Requested consultation	29/5/23 Outgoing email projectintroduction/information sheet 7/6/23 Incoming email drawing attention to the VictorianHeritage Act 2017 and the Commonwealth Underwater Cultural Heritage Act 2018 7/7/23 Outgoing email proving details of the currentcontrols in place to meet the needs of the Acts. Beach requested advice on qualified marine archaeologists. 14/7/23 Outgoing email project update/community drop-in sessions/seabed assessment information sheet 31/7/23 Online meeting with Heritage Victoria and First Peoples State Relations. Heritage Victoria provided insights into what 'good' marine archaeologylooks like. They provided some recommended experts inthis field. Heritage Victoria noted that any research should be broader than just looking for artefacts and should consider re-imagining the submerged landscape. They advised to be mindful that some traditional owners don't recognise state boundaries so need tobe sensitive to 'intangible' cultural value. UNESCO protection of underwater cultural heritageact likely to be ratified soon, submerged aboriginal heritage would be protected just like shipwrecks. Shipwrecks can survive very well so surveying suchas multi beam to identify risks for the project will be necessary. Beach already has controls in place for this. Heritage Victoria raised it is important that research and methodology is run by an archaeologist to meet their requirements. Preference for an archaeologist to produce landscape models with some experience in aboriginal submerged landscapeespecially localised. Provided us with recommended marine archaeologistcontacts with local knowledge. Heritage Vic said it was useful Beach were using existing infrastructure so seabed impact should beminimal. Heritage Vic would like archaeologists to publish ongoing info/reports asap when data is available. Acknowledged that there will likely be minimal impact from the seabed assessment activity. 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet	Relevant matter	Beach requested advice on recommended experts in relation to cultural heritage. Heritage Victoria offered to set up a meeting to discuss our plans further with First Peoples State Relations Victoria. A positive meeting was held between the three parties. Beach Energy is engaging Wessex Archaeology (Stakeholder ID 293601290) to guide Beach's work on underwater cultural heritage.
239075406	Indigenous Land and Sea Corporation	N/A no responsereceived	14/7/23 Outgoing email 22/8/23 Outgoing email	N/A no responsereceived	
1564	Institute for Marine and Antarctic Studies, University of Tasmania	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment information sheet 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
1565	International Fund for Animal Welfare	Acknowledgement ofBeach email	29/5/23 Outgoing email projectintroduction/information sheet 11/7/23 Incoming email acknowledging receipt ofinformation 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment information sheet 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no objections orclaims made	

Entity ID	Organisation Name	Engagement Status	Summary of Information sent and responses	AssessmentSummary	Assessment of objections or claims, responses,measures adopted
1574	Name withheld	N/A no responsereceived	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment information sheet 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
239075455	Name withheld	N/A no responsereceived	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment information sheet 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
1580	Name withheld	N/A no responsereceived	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment information 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
239075456	Kelp Industries Pty Ltd	N/A no responsereceived	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment information sheet 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
1585	Name withheld	Acknowledgement of Beach email	29/5/23 Outgoing email projectintroduction/information sheet 11/7/23 Incoming email general concern of new OGV wells on rock lobster fishing. 14/7/23 Outgoing email project update/communitydrop-in sessions 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	Not a relevant matter	SIV represents stakeholder. Beach is working closely with SIV around our OGV activities including seabed assessment. Invited tocommercial fishing info session in Warrnambool. Seabed assessment activity does not include the drilling of new OGV wells.
268435517	Kina Commercial Diving	N/A no responsereceived	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment information sheet 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
5012	King Island Boat Club	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment information sheet 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
4720	King Island Chamber of Commerce	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/community in sessions/seabed assessment information sheet 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
8388624	King Island Council	Requested consultation	29/5/23 Outgoing email projectintroduction/information sheet 7/6/23 Outgoing email offering Council brief 7/6/23 Incoming email from Council accepting offerfor a brief. 14/7/23 Outgoing email project update/communitydrop-in sessions 17/8/23 Meeting with Mayor and council members. Presented on the OGV Project, including seabed assessment. Concerns raised around spill response (lack of equipment and a lack of trained responders on the Island) andenvironmental damage to tourism, commercial fishing, kelp and 'brand'. Beach explained that we have a Victorian Offshore Pollution Emergency Plan.	Relevant matter	Council raised concerns around emergency spill response for the broad OGV project and potential environmental impact to their brand. Their concerns included a lack of equipment and a lack of trained responders on the Island. Beach explained they have a Victorian Offshore Pollution Emergency Plan and would present it at the community meeting including the roles of AMOSC and EPA Tasmania. Beach outlined the modelling for King Island for a vessel spill.

Entity ID	Organisation Name	Engagement Status	Summary of Information sent and responses	AssessmentSummary	Assessment of objections or claims, responses,measures adopted
			Feedbackthat OGV project was preferable over other projects as utilising existing infrastructure and no seismic activity. Request for a community meeting. 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 25/8/23 Outgoing email confirming Beach intent torun a community meeting on King Island 21/9/23 Community meeting held on King Island - zero attendees. Meeting advertised in King Island Courier. Spill response key part of presentation. 22/9/23 In-person meeting with Mayor to reflect onlack of attendance. Mayor suggested stakeholder fatigue likely the cause. 5/10/23 Council article in King Island Courier drawingattention to Beach Energy's consultation and outliningCouncils position on gas exploration 12/10/23 Outgoing email to mayor requesting knowledge of those on the island who identify as First Nations 12/10/23 Incoming email from Mayor stating he doesnot serve constituents based on race or gender. 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch 26/10/23 Outgoing email advising of likelihood of a vessel collision resulting in a spill, predicted impacts of a spill to King Island and response arrangements Beach has in place to respond to a vessel diesel spill from the seabed assessment. 27/10/23 Incoming email acknowledging informationand modelling of seabed assessment bed spill response		Council requested a community meeting to be held. Beach agreed and held a meeting on 21/9/23 taking into account Councils concerns around spill response. No one attended. Information was provided on likelihood of a vessel collision resulting in a spill, predicted impacts of a spill to King Island and response arrangements Beach has in place to respond to a vessel diesel spill from the seabed assessment. No new controls were required. Council has taken a formal 'in-principal' position to oppose gas exploration and drilling in the waters offKing Island. They acknowledged they require gas fora 'decade to come' in King Island Courier article.
239075461	King Island Landcare	N/A no responsereceived	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
268435525	King Island Marine Research	N/A no responsereceived	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
4725	King Island Regional Development Organisation	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
268435527	King Island Seafoods	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
239075423	King Island Shipping Group	N/A no responsereceived	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
4750	King Island Surf Safaris	N/A no responsereceived	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	

Entity ID	Organisation Name	Engagement Status	Summary of Information sent and responses	AssessmentSummary	Assessment of objections or claims, responses,measures adopted
4737	King Island Tourism/Visitor Information Centre	N/A no responsereceived	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
4743	King Island Tours	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
4194605	Name withheld	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
268435473	Lakes Entrance Fishermen'sCo-operative	N/A no responsereceived	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
268435501	Lakes Entrance OffshoreCharters	N/A no responsereceived	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
268435511	Lakes Entrance Surf LifeSaving Club	N/A no responsereceived	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
243269640	Land and Sea Aboriginal Corporation Tasmania	Acknowledgement of Beach email.	05/06/23 – Email outgoing. Advising that as per previous engagements Beach would continue to provide updates on our offshore activities to RP. Email provided an update on offshore gas Victoria and an invitation to consult with them. OGV information sheet was attached to the email. 14/07/23 - Email outgoing. Sent email providing an update on the OGV project, including Seabed Assessment information sheet, that consultation has commenced, and invitation to attend the upcoming community information sessions in Warrnambool, Port Campbell and Portland. 22/08/23 – Email outgoing. Attached seabed assessment information sheet and extended invitation to attend upcoming community information session in Port Fairy. Provided a link to the Beach Energy OGV project website. 12/09/23 – Email outgoing. Follow up from email sent on 5th June. Requesting the best way to consult and provided RP link to OGV website. 11/10/23 - Email outgoing. Advised RP of EP submission date, and that broader consultation for additional offshore activities in the OGV Project will be ongoing. Provided RP information for upcoming Seabed Assessment seabed assessment webinar on the 17th October encouraging them to attend to understand our activities and ask questions. Provided RP the link for our new online consultation hub. Email also included link to broader OGV information via the webpage. 17/10/23 – Email incoming. Request from RP for the link to attend seabed assessment webinar. 17/10/23 – RP attended Beach Energy's seabed assessment webinar.	N/A no objections or claims made	Multiple attempts have been made to consult. RP attended the Beach Energy Seabed assessment seabed assessment webinar and did not discuss any questions or concerns. Beach followed up with RP the next day to seek any feedback and received no response.

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			18/10/23 – Email outgoing. Acknowledged RP's attendance at seabed assessment webinar. Requested any feedback. Provided RP link to consultation hub Engage Beach and advised if any questions to contact Beach's First Nations Engagement Manager		
264241166	Lang Lang District Businessand Community Group	Requested consultation	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch 19/10/23 In person presentation on the OGV projectand associated activities. Thanked us for taking thetime to share information. No concerns raised.	N/A no objections orclaims made	Presented on the OGV project and associated activities including seabed assessment. No objectionsor claims were made for seabed assessment. Some interest in plug and abandon activities in the future.
1593	Lang Lang Gas Plant Environment Liaison Group	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
4920	Life Saving Victoria	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch 17/10/23 Attended seabed assessment webinar	N/A no responsereceived	
1601	Lochard Energy	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
268435502	Long Jetty Prom Cruises	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
1709	MacTaggart Marine	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
8388636	Marine and Safety Tasmania	N/A no responsereceived	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
239075427	Marine Mammal Foundation	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
4194535	Marinus Link	Requested consultation	29/5/23 Outgoing email projectintroduction/information sheet 3/7/23 Incoming email requesting meeting to discussprojects	N/A no objections orclaims made	Both parties shared information about our projectsand no concerns raised on either side

Entity ID	Organisation Name	Engagement Status	Summary of Information sent and responses	AssessmentSummary	Assessment of objections or claims, responses,measures adopted
			14/7/23 Outgoing email project update/community drop-in sessions/seabed assessment info sheet 21/7/23 Online meeting - no concerns raised due tolocation and timing. Both companies discussed upcoming plans and activities. 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch 17/10/23 Attended seabed assessment webinar		
239075466	Name withheld	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
8388634	Mersey Yacht Club	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
4194608	Name withheld	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
1617	Mornigton Peninsula Shire Council	Acknowledgement ofBeach email	29/5/23 Outgoing email projectintroduction/information sheet 11/7/23 Incoming email acknowledging receipt ofemail 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no objections orclaims made	
1204	Moyne Shire Council	Requested consultation	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch 17/10/23 In person meeting with Mayor and Council -presented on OGV and associated activities. Confirmed OGV has no seismic. Council interested inunderstanding spill response for drilling activity.	N/A no objections orclaims made	Council were comfortable with the seabed assessment activity once we confirmed there was noseismic activity. They asked about future onshore plans. Council said gas was required to support localindustry into the future. Council would like to know more about emergency spill response once we move into consulting on thedrilling activity.
239075478	MP State Member for Port Adelaide	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment information sheet 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
1003	Muollo Fishing	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
1004	Mures Fishing	N/A no responsereceived	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet	N/A no responsereceived	

Entity ID	Organisation Name	Engagement Status	Summary of Information sent and responses	AssessmentSummary	Assessment of objections or claims, responses,measures adopted
			22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch		
1619	National Native Title Tribunal	N/A no responsereceived	14/7/23 Outgoing email 22/08/23 Outgoing email 11/10/23 Outgoing email	N/A no responsereceived	
8388630	National Offshore Petroleum Safety Environment Management Authority (NOPSEMA)	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
264241156	Nelson Coast Care Inc	N/A no responsereceived	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
268435518	Ocean Impact Organisation	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
1005	Ocean Racing Club of Victoria	N/A no responsereceived	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
4852	Ocean Road Abalone (Southern Ocean Mariculture)	N/A no responsereceived	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
268435475	OceanWatch Australia	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
4194371	Office of the Member for Northern Victoria Region	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
4194373	Office of the Member for Polwarth	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
4194374	Office of the Member for South West Coast	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet	N/A no responsereceived	

Entity ID	Organisation Name	Engagement Status	Summary of Information sent and responses	AssessmentSummary	Assessment of objections or claims, responses,measures adopted
			11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch		
155189260	Office of the Member for Western Victoria	N/A no responsereceived	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
4194372	Office of the Minister Energyand Resources	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
4194369	Office of the Minister for Resources	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
268435531	One Gippsland	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
4194679	Optus	N/A no response received	16/8/23 Outgoing email requesting meeting and information pertaining to Indigo Central. Singtel also cc'd. 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment seabed assessment webinar/'Engage Beach' launch 13/10/23 Outgoing email requesting shape files	N/A no responsereceived	
25165827	Other Contact – Name withheld	Acknowledgement of Beach email	16/10/23 Incoming online feedback from EngageBeach. Firmly against any gas development.	Not a relevant matter	Does not support gas exploration or development inany form. No specific concerns or objections raised towards the seabed assessment activity
25165826	Other Contact – Name withheld	Acknowledgement ofBeach email	16/10/23 Incoming online feedback from EngageBeach - supports more gas development	Not a relevant matter	Feedback is we need more gas on the east coast ofAustralia, more investment and access to gas to lower prices is welcomed. No concerns or objectionsraised against the seabed assessment activity
243269635	Other Contact – Name withheld	N/A no responsereceived	14/7/23 Outgoing email Project update andcommunity drop-in details 22/8/ Outgoing email Project update and updatedseabed assessment info sheet	N/A no responsereceived	
268435545	Other Contact – Name withheld	N/A no response received	22/8/23 Outgoing email project update and updatedseabed assessment info sheet 11/10/23 Outgoing email project update, seabed assessment seabed assessment webinardetails, Engage Beach launch	N/A no responsereceived	
268435546	Other Contact – Name withheld	Requested further information	24/7/23 In person meeting at drop-in session Portland. Interested in environmental controls around whale migration. Beach's environment expertspent time explaining all the controls currently in place and the role of MMOs. Our drilling expert shared his experiences with whales while offshore and offered to share photos. 16/8/23 Outgoing email containing whale spotting as requested 16/8/23 Incoming email thanking us for sharing info 22/8/23 Outgoing email Project update and updatedseabed assessment info sheet 11/10/23 Outgoing email Project update/seabed assessment webinardetails/Engage Beach launch	N/A no objections orclaims made	Stakeholder was interested in our controls for whale activity and our support of Blue Whale studies.We went through all our whale controls that we have in place. Further info (whale photos) shared as requested. No concerns or objections raised for seabedassessment activity.

Entity ID	Organisation Name	Engagement Status	Summary of Information sent and responses	AssessmentSummary	Assessment of objections or claims, responses,measures adopted
268435539	Other Contact – Name withheld	Requested further information	31/7/23 Incoming email requesting info be sent bypost 31/7/23 Outgoing email confirming postage 22/8/23 Outgoing email Project update and updatedseabed assessment info sheet 11/10/23 Outgoing email project update/seabed assessment webinardetails, Engage Beach launch	N/A no objections orclaims made	Requested information be mailed out by post whichwas done.
268435548	Other Contact – Name withheld	Requested further information	4/9/23 Incoming email upon seeing newspaper advert 4/9/23 Outgoing email answering questions 4/9/23 Incoming email outlining support for gas 11/10/23 Outgoing email Project update/seabed assessment webinardetails/Engage Beach launch	N/A no objections orclaims made	No concerns raised and in support of further gas development.
4755	Otway Climate Emergency Action Network (OCEAN)	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	Beach met with OCEAN in early 2023 to discuss ourOtway Phase 5 and discussed potential future development in the Otway Basin. Beach offered to meet again on the OGV but had no response. OCEAN spokesperson gave an interview in the Colac Herald stating they understand gas is requiredfor the energy transition and they are not opposing Beach's activities.
1633	Otway Gas Plant Community Reference Group	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated seabed assessment info sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
268435465	Outthere Outdoor Activities	Requested further information	29/5/23 Outgoing email projectintroduction/information sheet 10/7/23 Incoming email expressing interest incommunity sessions. 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updatedseabed assessment info sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no objections orclaims made	Invited to seabed assessment webinar. Community session in East Gippsland is not relevant for seabed assessment activity as seabed assessment activity will not impactEast Gippsland community.
4889	Paaratte Eel Company	N/A no responsereceived	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
1634	Parks Victoria	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
4194609	Name withheld	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
239075475	Name withheld	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
1639	Peterborough General Storeand Takeaway Food	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet	N/A no responsereceived	

Entity ID	Organisation Name	Engagement Status	Summary of Information sent and responses	AssessmentSummary	Assessment of objections or claims, responses,measures adopted
			14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch		
1640	Peterborough Golf Club	N/A no responsereceived	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
1641	Peterborough House	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
1642	Peterborough Licensedgrocers	N/A no responsereceived	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
1644	Peterborough Residents Association	Requested consultation	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions 19/7/23 Meeting in-person - presentation to group outlining project timing and activities. No concerns raised and group happy that we are utilising existinginfrastructure. Explained how far offshore the Thylacine platform is and some members said they did not know there was a platform out there. 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no objections orclaims made	
239075411	Petuna Sealord Deepwater Fishing Pty Ltd	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
268435466	Pioneer Kayaking	N/A no responsereceived	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
268435533	Port Anthony	N/A no responsereceived	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
1648	Port Campbell Board Riders Association	Requested further information	5//623 Outgoing email project introduction/informationsheet 14/7/23 Outgoing email project update/community drop-in sessions/seabed assessment info sheet 3/8/23 Incoming email requesting confirmation of no-seismic for OGV 4/8/23 Outgoing email conforming the OGV projecthas no seismic activity 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet	N/A no objections orclaims made	No concerns raised once understood no seismicactivity.

Entity ID	Organisation Name	Engagement Status	Summary of Information sent and responses	AssessmentSummary	Assessment of objections or claims, responses,measures adopted
			11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch		
1649	Port Campbell Boat Charters	N/A no responsereceived	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
1650	Port Campbell Community Group	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
1652	Port Campbell Hotel	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
4768	Port Campbell Lobster	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
205520898	Port Campbell Police	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
1653	Port Campbell Professional Fisherman's Association	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
1655	Port Campbell Progress Association	Requested further information	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch 20/10/23 Incoming email requesting notes from seabed assessment webinar 20/10/23 Outgoing email providing information onseabed assessment activity 23/10/23 Incoming email thanking us for the resources and said they will share amongst their broader group.	N/A no objections orclaims made	
1656	Port Campbell Rifle Range	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
1657	Port Campbell Surf Life Saving Club	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	

Entity ID	Organisation Name	Engagement Status	Summary of Information sent and responses	AssessmentSummary	Assessment of objections or claims, responses,measures adopted
1658	Port Campbell Take Away	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
1659	Port Campbell Trading Co.	N/A no responsereceived	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
1660	Port Campbell Visitor Information Centre	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
1661	Port Central Apartments	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
268435541	Port Fairy Angling Club	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
239075488	Port Fairy Boardriders	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
239075494	Port Fairy Surf Life SavingClub	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
239075495	Port Fairy Yacht Club	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
1662	Port O' Call Motel	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/community in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
239075487	Port of Port Fairy	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment info sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	

Entity ID	Organisation Name	Engagement Status	Summary of Information sent and responses	AssessmentSummary	Assessment of objections or claims, responses,measures adopted
239075486	Port of Portland	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment information sheet 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
239075492	Portland SCUBA	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment information sheet 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
239075459	Portland Sport Fishing Club	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment information sheet 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
239075491	Portland Surf Life Saving Club	N/A no responsereceived	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment information sheet 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
239075493	Portland Yacht Club	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment information sheet 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
268435503	Pro Red Fishing Charters	N/A no responsereceived	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment information sheet 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
268435504	Pro-line Fishing Charters	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment information sheet 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
268435543	Protect the West	Requested further information	26/7/23 Community drop-in Warrnambool - Met with 2 community members who were keen to understandwhether there were any seismic activities. They also requested information on P&A activities and environment controls. Beach's SMEs from Environment and drilling spent the afternoon workingthrough their issues and concerns. Nothing raised forthe seabed assessment activity. Asked if there was any flaring during OGV activities, Beach answered there is not. 16/8/23 Outgoing email containing details ofdiscussion at community drop-in group 22/8/23 Outgoing email project update/updatedseabed assessment info sheet 4/9/23 Incoming email asking what the relationshipbetween OGV and Calico is. Concerns around seismic activity 4/9/23 Outgoing email confirming no link between OGV and Calico and that seismic is not required forthe OGV project 11/10/23 Outgoing email project update/seabed assessment webinardetails/Engage Beach launch	N/A no objections orclaims made	Full record of community discussion attached to emails. Info requested on P&A and environmental controls. No concerns around the seabed assessment activity raised. Beach has confirmed the OGV has no flaring in the Otway.

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			17/10/23 Seabed assessment webinar attendance - asked about theintegrity of P&A wells. Beach's technical expert provided an overview of the P&A process and ongoing monitoring.		
268435532	Qube Ports	N/A no responsereceived	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment information sheet 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
1666	Name withheld	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment information sheet 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
4433	REAL Pizza Pasta Salads	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment information sheet 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
	RecFish West	Consultation requested	17/10/23 Attended seabed assessment webinar – noted much of Beach's material references commercial fishing directly but not recreational fishing	N/A no objections orclaims made	
268435505	Reel Time Fishing Charters	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment information sheet 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
1681	RHG Fisheries	N/A no responsereceived	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment information sheet 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
1694	Richey Fishing Company	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment information sheet 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
1910	Robe District Council	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 6/6/23 Outgoing email requesting meeting withcouncil 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment information sheet 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
1670	Name withheld	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment information sheet 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
8388633	Royal Yacht Club of Tasmania	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/community in sessions/seabed assessment information sheet 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet	N/A no responsereceived	

Entity ID	Organisation Name	Engagement Status	Summary of Information sent and responses	AssessmentSummary	Assessment of objections or claims, responses,measures adopted
			11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch		
4194611	Name withheld	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions//seabed assessment informationsheet 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
268435506	Salty Dog Charters	N/A no responsereceived	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment information sheet 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
268435471	San Remo Fishing Co-operative	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment information sheet 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
25165825	Savour King Island	Raised objection orclaim	12/10/23 Incoming email requesting registration toseabed assessment webinar 12/10/23 Outgoing email confirming registration toseabed assessment webinar and mailing list 17/10/23 Seabed assessment webinar - Representative from Savour KingIsland asked questions around spill response arrangements and equipment. Beach Environment and Safety lead discussed the role of Beach, AMOSC and EPA Tasmania. We discussed in detail the types of equipment that are at our disposal from the Geelong base.	Objection or claimhas merit	Questions around emergency response are similar to King Island Council. Lack of equipment on the island is a concern but we have an agreement with AMOSC who ensure correct and in working order equipment is readily available and can get to the island. Informed Savour King Island that we must have an emergency plan in place.
1006	Scallop Fishermen's of Tasmania Inc	N/A no response received	29/5/23 Outgoing email project sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment information sheet 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no response	
1676	Schlumberger Australia Pty Ltd	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment information sheet 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
268435463	Name withheld Photography	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment information sheet 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
1007	SCUBA Divers Federation of Victoria	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions//seabed assessment informationsheet 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
1679	Sea Foam Villas PortCampbell	N/A no responsereceived	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment information sheet 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	

Entity ID	Organisation Name	Engagement Status	Summary of Information sent and responses	AssessmentSummary	Assessment of objections or claims, responses,measures adopted
268435507	Sea Myth Fishing Charters	N/A no response	29/5/23 Outgoing email project sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment information sheet 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no response	
155189275	Seafood Industry Australia	Requested consultation	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment information sheet 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 31/8/23 Meeting online - Attended commercial fishingpeak bodies meeting via Teams. Positive feedback on sharing information and being able to discuss issues with peers. SIA reiterated that engagement should be via the relevant peak bodies. 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no objections orclaims made	Attended the commercial fishing peak bodies roundtable.
1008	Seafood Industry Victoria	Requested consultation	29/5/23 Outgoing email projectintroduction/information sheet 10/7/23 Meeting in-person introduction to OGV Project and discussion around peak bodies engagement. Met with SIV and VFA together to discuss the OGV project and how best to engage with the commercial fishing sector. Both parties saidthey found discussing issues with each other especially useful. We developed the concept of a peak bodiesround table to network, openly discuss issues, share information, and design engagement where appropriate 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment information sheet 21/8/23 Incoming email advising that SIV scripted and circulated an email inviting concerned licence holders in the West of the State to attend the commercial fishing drop-in session. 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 31/8/23 In person meeting at Commercial FishersPeak Bodies round table. Compensation mechanisms, stakeholder fatigue and fishing assessment were discussed. 2/10/23 Incoming email around peak bodies meetingnotes. Requested we note that peak bodies should not be relied on to send maritime notices. Beach's ensure that AMSA and AHO are used, with the peak bodies as optional should they wish. 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no objections orclaims made	No objections or claims received despite in relationto the seabed survey assessment. Beach Energy has trialed a peak bodies round tablewith support from SIV. The feedback was positive from the attendees. Beach has an ongoing service agreement with SIV toshare information with their members. Beach has commissioned a detailed fishing data report to ensure we have the latest Commonwealth and State data. Beach Ongoing Consultation section of the EP (Section 5.16) confirms our responsibilities to maritime notices.
4194538	SeaRoad Holdings Pty Ltd	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment information sheet 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
268435512	Seaspray Surf Life SavingClub	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment information sheet 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
4194593	Sharkmen Charters	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment information sheet 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
1009	South Australian Rock Lobster Advisory Council and South Eastern Professional Fishermen's Association	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment information sheet 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet	N/A no responsereceived	

Entity ID	Organisation Name	Engagement Status	Summary of Information sent and responses	AssessmentSummary	Assessment of objections or claims, responses,measures adopted
			11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch		
1010	South East Trawl Fishing Industry Association	Requested consultation	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment information sheet 21/7/23 Engage SETFIA for fishing report 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 26/9/23 Incoming email draft fishing report received -revisit of previous SETFIA report to provide latest fishing data. Report includes a fishing gear assessment. 2/10/23 Outgoing email requesting meeting and drop-in session for Lakes Entrance fishers 3/10/23 Incoming email confirming meeting or drop-in not required for seabed assessment activity. 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	Objection or claim has merit	SETFIA raised a new gear type for Beach to assess (handline/hand gathering). No impact to fishing gear from seabed assessment as detailed in Section 8. Beach has a service agreement in place with SETFIAto share our information with their members. SETFIA confirmed that they and their members would not require a commercial fishers session in lakes Entrance for the Seabed Assessment activity.
268435523	South Gippsland Shire Council	Requested further information	29/5/23 Outgoing email projectintroduction/information sheet 14/6/23 Incoming email thanking for information andconfirmed shared with council staff/seabed assessment information sheet 23/6/23 Incoming email advising port contacts to engage with. Contacts already on Beach database14/7/23 Outgoing email project update/communitydrop-in sessions 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch 12/10/23 Incoming email request for seabed assessment webinar registration 17/10/23 Attended seabed assessment webinar	N/A no objections orclaims made	
268435513	South Gippsland Yacht Club	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment information sheet 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
268435509	South West Fishing Charters	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment information sheet 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
205520905	South West RegionalExecutive Forum	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/community in sessions/seabed assessment information sheet 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
268435508	Southern Coast Charters	N/A no responsereceived	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment information sheet 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
239075453	Southern Fishermen's Association Inc.	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment information sheet 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
1011	Southern Rock Lobster Limited	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment information sheet	N/A no responsereceived	

Entity ID	Organisation Name	Engagement Status	Summary of Information sent and responses	AssessmentSummary	Assessment of objections or claims, responses,measures adopted
			22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch		
1689	Southern Shark IndustryAlliance (SSIA)	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment information sheet 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
268435467	Spindrift International Guiding	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/community in sessions/seabed assessment information sheet 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
1012	Spirit of Tasmania	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment information sheet 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
268435526	Star of the South	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment information sheet 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
155189261	State Member for Western Victoria Region	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment information sheet 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
155189272	State Member for Western Victoria Region	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment information sheet 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
268435528	Name withheld	N/A no responsereceived	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/community in sessions/seabed assessment information sheet 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
239075433	Superloop	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment information sheet 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
4194587	Surf Coast Shire Council	N/A no responsereceived	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment information sheet 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	Beach has previously received response fromCouncil outlining they are against any gas development.
239075460	Surfcoast Anglers	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet	N/A no responsereceived	

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			14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment information sheet 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch		
4830	Surfers For Climate	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment information sheet 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
79691782	Surfrider Foundation Australia	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/community in sessions/seabed assessment information sheet 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
1696	Sustainable Shark Fishing Association	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment information sheet 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
1015	TARFish	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment information sheet 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
239075457	TasKelp	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment information sheet 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
239075409	Tasmania Research Advisory Committee	N/A no responsereceived	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment information sheet 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
4912	Tasmania Salmonid Growers Association	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/community in sessions/seabed assessment information sheet 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
1698	Tasmanian Abalone CouncilLtd	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment information sheet 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
20971523	Tasmanian Aboriginal Centre	Advised do not want further consultation	01/06/23 – Email outgoing. Introduction of Beach. Requested assistance to correctly identify all RPs for King Island and Tasmania for the purpose of offshore consultation. 01/06/23 – Email outgoing. Advising that as per previous engagements Beach would continue to provide updates on our offshore activities to RP. Email provided an update on offshore gas Victoria and an invitation to consult with them. OGV information sheet was attached to the email.	N/A no objections or claims made	RP acknowledged Beach emails and advised emails were forwarded onto relevant people. Beach has made multiple requests to consult for the development of the Seabed Assessment EP have been made. Correspondence has been sent to multiple representatives

Entity ID	Organisation Name	Engagement Status	Summary of Information sent and responses	AssessmentSummary	Assessment of objections or claims, responses,measures adopted
			02/06/23 – Email incoming. Acknowledged Beach email. Advised the email has been forwarded to appropriate colleagues. 02/06/23 – Email outgoing. Acknowledged RP and thanked him for his assistance. 14/07/23 - Email outgoing. Sent email providing an update on the OGV project, including Seabed Assessment information sheet, that consultation has commenced, and invitation to attend the upcoming community information sessions in Warrnambool, Port Campbell and Portland. 22/08/23 – Email outgoing. Attached seabed assessment information sheet and extended invitation to attend upcoming community information session in Port Fairy. Provided a link to the Beach Energy OGV project website. 29/09/23 – Email outgoing. Provided RP with explanation as to regulatory requirements to submit an EP, and that consultation is an important part of developing an EP. Advised RP that under regulation 11a, Consultation is required to ensure that any RP is consulted on our activities and provided an opportunity to respond. Attached consultation brochure. Requested RP provide us 's who any additional contact details for RP's who in accordance with Indigenous tradition, may have spiritual and cultural connections to the environment, that may be affected by our offshore activities that have not yet been afforded the opportunity to provide information that may inform the management of the activity. 02/10/23 – Email incoming. Individual RP requested to be removed from our mailing list. 03/10/23 – Email outgoing. Acknowledged individual RP's email and advised them they have been removed from our database. 11/10/23 - Email outgoing. Advised RP of EP submission date, and that broader consultation for additional offshore activities in the OGV Project will be ongoing. Provided RP information for upcoming Seabed Assessment seabed assessment webinar encouraging them to attend to understand our activities and ask questions. Provided RP the link for our new online consultation hub. Email also included link to broader OGV information via the webpage.		covering Executive, Managers, and cultural heritage roles, but there have not been any questions or concerns raised.
4194746	Tasmanian Aboriginal Heritage Council	N/A no responsereceived	29/9/23 Outgoing email requesting engagement 11/10/23 Outgoing email project update/seabed assessment webinar/Engage Beach launch	N/A no response received	RP functions interests or activities are not affected by our seabed assessment activities. RP was consulted to request their support in identifying additional relevant persons in our activity area.
1017	Tasmanian Rock Lobster Fisherman's Association	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment information sheet 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project	N/A no responsereceived	
1018	Tasmanian Seafood Industry Council	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
155189276	Tasmanian Seafoods	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment information sheet 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
239075489	Tasports	N/A no responsereceived	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment information sheet 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	

Entity ID	Organisation Name	Engagement Status	Summary of Information sent and responses	AssessmentSummary	Assessment of objections or claims, responses,measures adopted
1019	Telstra	Requested consultation	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions 16/8/23 Incoming email confirming existing buffersare still appropriate 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 24/8/23 Incoming email requesting gps coordinates 24/8/23 Outgoing email with shape files/gps coordinates attached 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch 12/10/23 Incoming email requesting registration forseabed assessment webinar	N/A no objections orclaims made	As detailed in Section 7.5.3, two Telstra telecommunications cables intersect the Bass Operational Area. Beach shared activity coordinates with Telstra who confirmed the location of the cables and that a 1 km buffer either side of the cables where no geotechnical samples would be taken was appropriate. This has been implemented as part of CM#16: OGV Seabed Survey Scope of Work.
1699	TGS (previously SpectrumGeo)	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment information sheet 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
268435510	Think Big Fishing Charters	N/A no responsereceived	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment information sheet 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
1703	Timboon Action Group	Requested consultation	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment information sheet 3/8/23 Meeting - presented OGV project to the group.Group were interested in the future of the Otway gas plant and community investments. 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no objections orclaims made	
1708	Timboon Recreational Fishing Club	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment information sheet 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
4194360	Toberfish	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment information sheet 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
1020	Toll Group	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions//seabed assessment informationsheet 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
1021	Top Fish Tasmania	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment information sheet 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
1711	Transport Safety Victoria - Maritime Safety Victoria	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment information sheet 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet	N/A no responsereceived	

Entity ID	Organisation Name	Engagement Status	Summary of Information sent and responses	AssessmentSummary	Assessment of objections or claims, responses,measures adopted
			11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch		
1712	Name withheld	N/A no responsereceived	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment information sheet 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
1023	Trinsand Fisheries	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment information sheet 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
1713	Tuna Australia	Requested consultation	29/5/23 Outgoing email projectintroduction/information sheet 19/6/23 Incoming email confirming best contact11/7/23 Incoming email with info about service agreement 14/7/23 Outgoing email project update/communitydrop-in sessions 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 31/8/23 Commercial fishing Peak bodies round table 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no objections orclaims made	Beach has a service agreement in place with Tuna Australia to assist in engaging with their members. Tuna Australia attended the peak bodies round table where the seabed assessment was covered.
1714	Twelve Apostles Tourism and Business Group	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment information sheet 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
268435514	Venus Bay Surf Life SavingClub	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment information sheet 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
4194747	Name withheld	N/A no responsereceived	4/10/23 Outgoing email requesting consultation 11/10/23 Outgoing email sharing seabed information sheet and details of the seabed assessment webinar.	N/A no responsereceived	
293601291	Victorian Aboriginal Heritage Council	Acknowledged Beach email	29/08/23 – Email outgoing. Email introducing OGV project and consultation requirements under regulations. Provided RP with list of identified RP's in relation to sea country and asked whether RP is aware of any other First Nations community groups/individuals, other than the formally recognised, who in accordance with Indigenous tradition, may have spiritual and cultural connections to the environment, that may be affected by our offshore activities that have not yet been afforded the opportunity to provide information that may inform the management of the activity. Attached OGV and seabed assessment information sheet. 01/09/23 – Email incoming. RP advised that only two First Nations groups are relevant, not the five listed in original email. RP requested further confirmation that Beach offshore activities are contained entirely within Commonwealth waters, advising the Aboriginal Heritage Act will only be triggered if new pipeline or construction will take place. 25/09/2023 – Email outgoing. Confirmed to RP that Beach engages with two named First Nations groups due to having assets operating on their traditional lands, but Beach acknowledges the interconnectedness of Sea Country and asked RP whether there are any additional First Nations groups with whom functions, interests or activities may be impacted by our offshore activities. Provided RP confirmation that all activities are within Commonwealth waters, and we are connecting to existing infrastructure. Advised RP that should OGV scope change any assessments	N/A no objections or claims made	RP functions interests or activities are not affected by our seabed assessment activities. This RP was consulted to seek endorsement of our RP identification methodology and requested the RP advise of any additional First Nations community groups/individuals, other than the formally recognised, who in accordance with Indigenous tradition, may have spiritual and cultural connections to the environment, that may be affected by our offshore activities that have not yet been afforded the opportunity to provide information that may inform the management of the activity. Beach offered to present broader OGV Project to the Council. RP accepted this offer and will advise of date, possibly December 2023.

Entity ID	Organisation Name	Engagement Status	Summary of Information sent and responses	AssessmentSummary	Assessment of objections or claims, responses,measures adopted
			required under the Aboriginal heritage Act would be undertaken. This is got broader OGV activities and not seabed assessment. Requested Beach email be forwarded to any additional RP that may have an interest in our offshore activities. 27/09/23 – Email incoming. RP provided confirmation that the five groups listed in previous email, are the formally recognised Aboriginal Groups, and the RP is satisfied that consultation with these five groups is adequate. RP accepted our offer to present broader OGV activities to the Council. Proposed date in December 2023. 27/09/23 – Email outgoing. Thanked RP for their endorsement of our RP identification methodology, advised their feedback is much appreciated. Accepted the offer to present broader OGV activities to the Council in December 2023. 27/09/23 – Email incoming. RP advised they will be in touch closer to the meeting date. 11/10/23 - Email outgoing. Advised RP of EP submission date, and that broader consultation for additional offshore activities in the OGV Project will be ongoing. Provided RP information for upcoming Seabed Assessment seabed assessment webinar on the 17th October encouraging them to attend to understand our activities and ask questions. Provided RP the link for our new online consultation hub. Email also included link to broader OGV information via the webpage.		
1025	Victorian Fisheries Authority	Requested consultation	29/5/23 Outgoing email projectintroduction/information sheet 10/7/23 Meeting in person- Overview of OGV activities provided including locations. We discussedthe concept of meeting with relevant peak bodies as a collective. SIV and VFA liked the idea and saw no concerns with it. Both agreed there is benefit of networking and discussing issues with other peak bodies in the room. Beach confirmed that any such meeting would be in addition to one-to-one meetings with peak bodies and their members. VFA said direct engagement with fishers needs to be localised such as Warrnambool. 14/7/23 Outgoing email project update/communitydrop-in sessions 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no objections orclaims made	Supportive of a commercial fishing peak bodiesround table. Seabed assessment activity was covered at the round table, but VFA did not attend. Agreed that direct engagement with fishers needs to be localised. Beach held a commercial fishers specific drop-in in Warrnambool following the round table. The seabed assessment activity was discussed with attending fishers, but VFA were not present.
239075421	Victorian Marine and Coastal Council	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment information sheets 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
1718	Victorian National Parks Association	N/A no responsereceived	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment information sheets 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
1721	Victorian Scallop Fishermen's Association	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment information sheets 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
4194361	VR Fish	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment information sheets 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
4194727	Wadawurrung Traditional Owners Aboriginal Corporation	Requested consultation	05/06/23 – Email outgoing. As per commitments made in previous consultations, Beach provided RP with update on OGV project. Attached OGV information sheet. Advised the first activity in	N/A no objections or claims made	Beach has undertaken extensive consultation with RP, including both in person and online meetings.

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			OGV is seabed assessment making it clear this does not include seismic. Described the purpose of consultation for the EP and requested an opportunity to discuss our OGV activities. 12/07/23 – Email outgoing. Follow up to previous email. Requested RP's preferred engagement method for offshore activities. 14/07/23 –Email outgoing. Sent email providing an update on the OGV project, including Seabed Assessment information sheet, that consultation has commenced, and invitation to attend the upcoming community information sessions in Warrnambool, Port Campbell and Portland. 17/07/23 – Email outgoing with invitation to attend the upcoming community information sessions in Warrnambool, Port Campbell and Portland. 17/07/23 – Email incoming. RP advising Beach that unfortunately they will be unable to attend community information sessions. 18/07/23 – Email outgoing. Acknowledged the RP's email advising they are unable to attend community information sessions. Requested an additional date for consultation. 14/08/23 – Email outgoing. Requested a date for consultation. Requested the contact details for any additional RP's that may express an interest in Beach offshore activities. 22/08/23 – Email outgoing. Provided updated information sheet for seabed assessment. Advised that Beach are currently undertaking consultation for the seabed assessment EP, to be submitted to NOPSEMA. Advised of upcoming community information session in Port fairy. Provided link to OGV project on Beach website, which includes information on the seabed assessment. 25/08/23 – Email outgoing. RP CEO. Gave an overview of OGV Project including seabed assessment. Identified different activities and advised that EPs are required for each activity. Advised the purpose of consultation is to inform the seabed assessment EP. Requested further information on how best to consult with RP. 26/08/23 – Email incoming. RP EO acknowledged Beach email and advised he will identify who is best person to discuss Beach OGV. 28/08/23 – Email outgoing. Responded to RP. Advised the preference is to meet RP Board but will be guided by RP CEO. 28/08/23 – Email incoming. RP CEO advised they are going on leave and will be back in late September. 29/08/23 – Email outgoing. RP CEO, advising that we will be in contact when they return from leave 12/09/23 – Email outgoing. Follow up on initial OGV email. Advised that OGV requires EPs to be submitted and an important part of this is consultation. Requested feedback on best way to consult with RP members. Provided RP with link to OGV on Beach website, which includes information on the seabed assessment. 25/09/23 – Email outgoing. RP CEO, Asked RP for a time to discuss offshore activities, including seabed assessment and whether there is anyone else within the Corporation who may be interested. 25/09/23 – RP CEO advised that they are most appropriate point of contact and requested meeting on 4th October. 27/09/23 – Email outgoing. Meeting request for RP CEO. Meeting was accepted. 04/10/23 – Meeting online. Attended meeting with RP CEO. Discussed OGV broadly, explained to RP planning area and how that is used to determine RPs. Advised that planning area is full extent of area that may be affected in the unlikely event of an incident. Discussed with RP the purpose of consultation, which for the seabed assessment EP is to understand any cultural values and sensitivities that may be affect by the activity. Sought feedback from RP as to most appropriate person to consult with and was advised to continue to consult with RPs already identified. Asked RP for their cultural values and sensitivities and was advised that the RPs Healthy Country plan includes the RPs cultural values and sensitivities and to refer to that to understand their priorities.		RP advised Beach that all RP's cultural values and sensitivities are highlighted in the Country management plan, Lets Make Country Good Together, this plan was developed in consultation with RP community and addresses priority areas for RP. Beach reviewed the plan and highlighted cultural values and sensitivities that may be relevant to our activity area, and followed up with RP to acknowledge the values and sensitivities and advise that Beach will address any relevant cultural values in our EP. RP did not raise any concerns or questions. Advised RP that Beach will undertake further consultation for our broader OGV activities.

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			Confirmed with RP that we will review and provide an email summary back of what we understand to be their cultural values, RP agreed was satisfied with this approach. Beach advised RP that we will continue consultation for upcoming EPs. 11/10/23 –Email outgoing. Advised RP of Seabed assessment EP submission date, and that broader consultation for additional offshore activities in the OGV Project will be ongoing. Provided RP information for upcoming Seabed Assessment seabed assessment webinar encouraging them to attend to understand our activities and ask questions. Provided RP the link for our new online consultation hub. Email also included link to broader OGV information via the webpage. 11/10/23 – Email incoming. Email from RP, apologising for not responding to emails. Advised they have had a busy and heavy cultural load over previous 6 months. RP advised Beach they appreciate and acknowledge our engagement and continually reaching out and keeping them informed. RP requested we continue to do this, even if there is no response. 12/10/23 – Email outgoing. Responded to RP that we appreciate they are busy, and we will continue to keep them updated of our offshore activities. Asked RP if they had any questions relating to seabed assessment. Received no response. 12/10/23 – Email outgoing. RP CEO. Providing follow up call following on from meeting. Advised that the Let's Make Country good together plan was reviewed, as advised, and confirmed the cultural values of RP within our planning area. Advised that if they are relevant to the activity, we would address these values in this EP. We advised we will continue to consult with RP for the development of additional EP's. We also confirmed the engagement with RP is currently being undertaken through the most appropriate person.		
268435483	Waratah Wynyard Council	N/A no responsereceived	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment information sheets 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no objections or claims made	
1728	Warrnambool City Council	N/A no responsereceived	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment information sheets 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
4814	Warrnambool Coastcare Landcare Network	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment information sheets 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
1729	Warrnambool Professional Fishermen's Association	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment information sheets 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
4773	Warrnambool Surf Life Saving Club	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment information sheets 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
239075413	Warrnambool Visitor Information Centre	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet	N/A no responsereceived	

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			14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment information sheets 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch		
1478	Warrnambool Volunteer Coast Guard	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment information sheets 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
4782	Warrnambool Yacht Club	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment information sheets 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
1026	Watersure, Victorian Desalination Plant	N/A no responsereceived	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment information sheets 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
1899	Wattle Range Council	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment information sheets 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
1730	Waves Cafe, Bar andRestaurant	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment information sheets 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
1733	Name withheld	N/A no responsereceived	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment information sheets 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
268435482	Wellington Shire Council	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 23/6/23 Outgoing email requesting meeting 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment information sheets 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
293601290	Wessex Archaeology	Requested consultation	18/8/23 Meeting-online to discuss OGV project and work in cultural heritage - overview of our offshore activities starting with seabed assessment (geotechnical and geophysical surveys). Asked WESSEX to provide a description ofwhat assessments they complete including cultural mapping of landscapes including songlines, and submerged archaeology. 29/8/23 Outgoing email to discuss cultural heritagework 11/10/23 Outgoing email Project update/seabed assessment webinar/Engage Beach launch	N/A no objections orclaims made	Meeting was positive and informative. Beach has engaged WESSEX services for the OGV Project, including the seabed assessment.
268435477	West Gippsland Catchment Authority	N/A no responsereceived	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment information sheet	N/A no responsereceived	

Entity ID	Organisation Name	Engagement Status	Summary of Information sent and responses	AssessmentSummary	Assessment of objections or claims, responses,measures adopted
			22/8/23 Outgoing email project update/updated Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch		
1734	Western Abalone Divers Association	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment information sheet 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
268435497	Wild Life Fisheries	N/A no responsereceived	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in/seabed assessment information sheet 22/8/23 Outgoing email project update/updated Seabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
264241161	Wilderness Society Tasmania	N/A no responsereceived	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment information sheet 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
1737	Wilderness Society Victoria	N/A no responsereceived	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment information sheet 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
268435468	Wildlife Coast Cruises	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment information sheet 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
268435538	Women in Seafood Australasia	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment information sheet 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	
239075498	Wye River Surf Life SavingClub	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment information sheet 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch 17/10/23 Attended seabed assessment webinar	N/A no responsereceived	
4194726	Name withheld	N/A no response received	29/03/23 – Meeting online. Discussed the purpose for consultation. Discussed Beach offshore activities and concerns were raised about the impact of seismic on whale songlines and migration routes. RP was advised that our OGV Project activities, including the seabed assessments do not include seismic surveys. RP broadly objected to offshore activities and stated they do not consent to activities in sea country. 05/06/23 – Email outgoing. Provided RP an update on OGV Project and attached information sheet. Requested RP share this email with anyone else who may be considered relevant. Advised Beach would like to meet to discuss and requested a meeting date. Received no response. 08/06/23 – SMS outgoing. Asked RP if they will be attending the upcoming Community Reference Group meeting – which RP requested to be a member via Corangamite Shire Council advertising process. Received no response.	N/A no responsereceived	Multiple attempts have been made to consult with RP. No response was received for consultation for the seabed assessment EP. Consultation with RP has been undertaken to welcome them as a member of Beach's Otway Community Reference Group and broadly discuss Beach's offshore activities. Arising from those consultations and from publicly available social media content and posts by the RP, Beach established that the RP is opposed to seismic activities and is concerned about seismic on whale songlines and migration routes. Beach has advised RP that the OGV Project, including the seabed assessment does not include seismic activities.

Entity ID	Organisation Name	Engagement Status	Summary of Information sent and responses	AssessmentSummary	Assessment of objections or claims, responses,measures adopted
			14/07/23 – Email outgoing. Sent email providing an update on the OGV project, including Seabed Assessment information sheet, that consultation has commenced, and invitation to attend the upcoming community information sessions in Warrnambool, Port Campbell and Portland. 22/08/23 – Email outgoing. Attached updated information sheet on Seabed Assessment activities and advised again that Beach are consulting for the development of the environment plan. Advised RP of next community information session at Port Fairy and provided RP with link to the Beach OGV webpage. 11/09/2023 – Email outgoing. Followed up on previous email requesting RP engage with Beach to discuss offshore activities, received no response. Provided the link to the new OGV Project engagement webpage with dedicated Seabed Assessment project page. 04/10/23 – Phone call outgoing. No answer left a voicemail, stating that I was calling about the OGV Project emails I have been sending. Requested RP call me back. Had no response. 04/10/23 –SMS outgoing. Sent RP a message to follow up on our offshore Seabed Assessment that did not involve a seismic survey. Requested a time to meet to discuss any concerns. Received no response. 11/10/23 – Email outgoing. Sent RP an email providing an update on the submission of the Seabed Assessment EP. Email included the information to attend an online Beach Seabed Assessment seabed assessment webinar. Announced the launch of Beach new online consultation engagement hub, and provided the link to visit, also included the link to the OGV page on Beach website. Requested RP share with anyone else who may be interested.		Beach has identified and documented in this EP, the cultural values and sensitivities in relation to whale songlines from information arising in consultation with this RP, and from publicly available information in relation from other First Nations people's cultural values regarding whale songlines (Section 7.6), Section 8 details the impact assessment for cetaceans including control measures to ensure impacts and risks are of an acceptable level.
1741	Name withheld	N/A no response received	29/5/23 Outgoing email projectintroduction/information sheet 14/7/23 Outgoing email project update/communitydrop-in sessions/seabed assessment information sheet 22/8/23 Outgoing email project update/updatedSeabed Assessment information sheet 11/10/23 Outgoing email project update/seabed assessment webinar/'Engage Beach' launch	N/A no responsereceived	